THE

INDIAN

ASTRONOMICAL EPHEMERIS

FOR THE YEAR

2024

POSITIONAL ASTRONOMY CENTRE
INDIA METEOROLOGICAL DEPARTMENT
MINISTRY OF EARTH SCIENCES

भारत 2023 INDIA

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Issued under the authority of

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PREFACE

The Indian Astronomical Ephemeris is published annually by the India Meteorological Department (IMD) for providing data to astronomers. The specialty of this publication is that it contains calendric information which caters to the requirement of the countryøs panchang makers and other users. Thus, it has great civil and cultural significance. This has been the mandate given to the Positional Astronomy Centre at Kolkata by the Govt. of India.

The calculations of the Indian Calendar portion, such as tithe, nakshatra, etc. are given in Indian Standard Time (IST) and covers an extended period upto 21^{st} March, 2025 which is the end of the year 1946 Saka Era of the Indian National Calendar. A separate note has also been given to explain the terminology and the basis of different calculations relating to the Indian Calendar.

The epoch of the standard reference system in this publication is J 2000.0 and the argument of the ephemerides is Terrestrial Time (TT). The resolutions of the Indian Astronomical Union (IAU) recommending the changes from time to time including a list of new IAU constants are given in Part VI ï Indian Calendar and Explanation.

Our sincere thanks are due to the Nautical Almanac Office, United States Naval Observatory and Her Majestyøs Nautical Almanac office, U.K.

The work of preparation and publication of the Indian Astronomical Ephemeris for 2024 has been done under the supervision of Shri Debapriya Roy, Head, Positional Astronomy Centre, India Meteorological Department, Kolkata.

Dr. M. Mohapatra
Director General of Meteorology

Mausam Bhawan
New Delhi ï 110 003
30 August, 2023 A.D.
(12 Bhadra , 1945 Saka Era)

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CONTENTS

CONTENTS

PART - I

TIME, SUN, MOON, PLANETS

Julian date for Standard epoch

1900 January 0, 12^h U.T.					=	JD	241	5020.0
B	1950.0	=	1950	Jan. 0.923	=	JD	243	3282.423
B	2024.0	=	2024	Jan. 0.846	=	JD	246	0310.346
J	2024.5	=	2024	July 2.125	=	JD	246	0493.625
J	2000.0	=	2000	Jan. 1.5	=	JD	245	1545.0

Tabulations of Julian date against calendar date for 2020 are given on pages 4 to12 and for other years are given at Table IX of Part-V on page 359.

The fraction of the year from 2020.5 is tabulated with the Besselian day numbers on pages 244-251.

The lengths of the principal years and mean months at 2024.0 as derived from the Sunôs mean motion and mean Orbital elements respectively are:

Length of the year (ephemeris days) :

	d		d	h	m	s
Tropical (equinox to equinox)	365.242190	=	365	05	48	45.2
Sidereal (fixed star to fixed star)	365.256363	=	365	06	09	09.8
Anomalistic (perigee to perigee)	365. 259635	=	365	06	13	52.5
Eclipse (node to node)	346. 620074	=	346	14	52	54.4

Length of the Month (ephemeris days)

	d		d	h	m	s
Synodic (new moon to new moon)	29.5305888	=	29	12	44	02.9
Tropical (equinox to equinox)	27.3215822	=	27	07	43	04.7
Sidereal (fixed star to fixed star)	27.3216615	=	27	07	43	11.6
Anomalistic (perigee to perigee)	27.5545501	=	27	13	18	33.1
Nodical (node to node)	27.2122207	=	27	05	05	35.9

		h	m	s
Length of the day:	Mean Sidereal	23	56	04.09053 of mean Solar time.
	Mean Solar	24	03	56.55537 of mean Sidereal time.

CHRONOLOGICAL TABLE

CHRONOLOGICAL CYCLES

Golden Number or Lunar Cycle	XI	Solar Cycle	17
Epact	19	Roman Indiction	2
Dominical Letter	GF		

CHRONOLOGICAL ERAS

The year 1946 of the Saka Era (Indian National Calendar) begins on March 21, 2024.
The year 1946 of the Saka Era or Saka Shalivahana (Lunisolar, Traditional Calendar) begins on April 9, 2024.
The year 1946 of the Saka Era (Solar, Traditional Calendar) begins on April 14, 2024.
The year 5125 Kali Era begins on April 14, 2024.
The year 2081 of the Vikram Samvat begins on April 09, 2024 (Chaitradi) and November 2, 2024 (Kartikadi) according to different systems of reckoning.
The year 1431 of the Bengali on April 14, 2024.
The year 1200 of the Kollam Era begins on August 17, 2024.
Jovian year (Barhaspatya Varsa or 60-year cycle of Jupiter) 52 Pingala begins on May 15, 2024 (North Indian Usage), and 37 Sobhona March 22, 2023 (Lunar Chaitradi) or April 14, 2023 (Solar) (South Indian Usage).
Vedanga Jyotisa year 5- Idvatsara of the 5-year cycle (389 th cycle of Paitamaha Siddhanta) begins on February 10, 2024.
The year 2568 of the Buddha Nirvana era begins on May 23, 2024.
The year 2551 of the Mahavira Nirvana Era begins on November 2, 2024.
The year 1446 of the Mohammedan Era begins on July 8, 2024.
The year 1394 of the Yazdejardi Era begins on August 15, 2024 according to the Indian Parsi (Shahenshahi) Calendar.
The year 6737 of the Julian period begins on January 14, 2024.
The year 5785 of the Jewish Era (A.M.) begins on October 03, 2024.
The year 2800 of the Greek Olympiad, being the 4th year of the 4-Year cycle (700 th Olympiad) begins on July, 2024.
The year 2777 of the Foundation of Rome (A.U.C.) begins on January 14, 2024.
The year 2773 of the Nabonassar begins on April 17, 2024.
The year 2336 of the Seleucidean era begins in the present-day usage of the Syrians on September 14 or October 14, 2024 according to different sects.
The Gregorian Year 2024 begins on January 1, 2024.

CALENDAR, 2024

Day of Month	Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar: Day of Month	Indian Calendar: Day of Year	Phases of the Moon
					2460	1945 Saka Era		
Dec. 28	362	Thu	-187.125	-0.0110	306.5	Pausha 7	282	
29	363	Fri	186.125	-0.0082	307.5	8	283	
30	364	Sat	185.125	-0.0055	308.5	9	284	
Dec. 31	365	Sun	184.125	-0.0027	309.5	10	285	
Jan. 1	1	Mon	183.125	0.0000	310.5	11	286	
2	2	Tue	182.125	0.0027	311.5	12	287	
3	3	Wed	181.125	0.0055	312.5	13	288	
4	4	Thu	-180.125	0.0082	313.5	14	289	4-Last Quarter
5	5	Fri	179.125	0.0110	314.5	15	290	03^h 30^m U.T.
6	6	Sat	178.125	0.0137	315.5	16	291	
7	7	Sun	177.125	0.0164	316.5	17	292	
8	8	Mon	176.125	0.0192	317.5	18	293	
9	9	Tue	175.125	0.0219	318.5	19	294	
10	10	Wed	174.125	0.0246	319.5	20	295	
11	11	Thu	-173.125	0.0274	320.5	21	296	11-New Moon
12	12	Fri	172.125	0.0301	321.5	22	297	11^h 57^m U.T.
13	13	Sat	171.125	0.0329	322.5	23	298	
14	14	Sun	170.125	0.0356	323.5	24	299	
15	15	Mon	169.125	0.0383	324.5	25	300	
16	16	Tue	168.125	0.0411	325.5	26	301	
17	17	Wed	167.125	0.0438	326.5	27	302	
18	18	Thu	-166.125	0.0465	327.5	28	303	18-First Quarter
19	19	Fri	165.125	0.0493	328.5	29	304	3^h 53^m U.T.
20	20	Sat	164.125	0.0520	329.5	30	305	
21	21	Sun	163.125	0.0548	330.5	Magha 1	306	
22	22	Mon	162.125	0.0575	331.5	2	307	
23	23	Tue	161.125	0.0602	332.5	3	308	
24	24	Wed	160.125	0.0630	333.5	4	309	
25	25	Thu	-159.125	0.0657	334.5	5	310	25-Full Moon
26	26	Fri	158.125	0.0684	335.5	6	311	17^h 54^m U.T.
27	27	Sat	157.125	0.0712	336.5	7	312	
28	28	Sun	156.125	0.0739	337.5	8	313	
29	29	Mon	155.125	0.0767	338.5	9	314	
30	30	Tue	154.125	0.0794	339.5	10	315	
31	31	Wed	153.125	0.0821	340.5	11	316	
Feb. 1	32	Thu	-152.125	0.0849	341.5	12	317	
2	33	Fri	151.125	0.0876	342.5	13	318	2-Last Quarter
3	34	Sat	150.125	0.0904	343.5	14	319	23^h 18^m U.T.
4	35	Sun	149.125	0.0931	344.5	15	320	
5	36	Mon	148.125	0.0958	345.5	16	321	
6	37	Tue	147.125	0.0986	346.5	17	322	
7	38	Wed	-146.125	0.1013	347.5	18	323	

CALENDAR, 2024

Day of Month	Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar		Phases of the Moon
						Day of Month	Day of Year	
					2459	1945 Saka Era		
Feb. 8	39	Thu	-145.125	0.1040	348.5	Magha 19	324	
9	40	Fri	144.125	0.1068	349.5	20	325	9-New Moon
10	41	Sat	143.125	0.1095	350.5	21	326	22^h 59^m U.T.
11	42	Sun	142.125	0.1123	351.5	22	327	
12	43	Mon	141.125	0.1150	352.5	23	328	
13	44	Tue	140.125	0.1177	353.5	24	329	
14	45	Wed	139.125	0.1205	354.5	25	330	
15	46	Thu	-138.125	0.1232	355.5	26	331	
16	47	Fri	137.125	0.1259	356.5	27	332	16-First Quarter
17	48	Sat	136.125	0.1287	357.5	28	333	15^h 01^m U.T.
18	49	Sun	135.125	0.1314	358.5	29	334	
19	50	Mon	134.125	0.1342	359.5	30	335	
20	51	Tue	133.125	0.1369	360.5	Phalguna 1	336	
21	52	Wed	132.125	0.1396	361.5	2	337	
22	53	Thu	-131.125	0.1424	362.5	3	338	
23	54	Fri	130.125	0.1451	363.5	4	339	
24	55	Sat	129.125	0.1478	364.5	5	340	24-Full Moon
25	56	Sun	128.125	0.1506	365.5	6	341	12^h 30^m U.T.
26	57	Mon	127.125	0.1533	366.5	7	342	
27	58	Tue	126.125	0.1561	367.5	8	343	
28	59	Wed	125.125	0.1588	368.5	9	344	
29	60	Thu	-124.125	0.1615	369.5	10	345	
Mar. 1	61	Fri	123.125	0.1643	370.5	11	346	
2	62	Sat	122.125	0.1670	371.5	12	347	
3	63	Sun	121.125	0.1698	372.5	13	348	3-Last Quarter
4	64	Mon	120.125	0.1725	373.5	14	349	15^h 23^m U.T.
5	65	Tue	119.125	0.1752	374.5	15	350	
6	66	Wed	118.125	0.1780	375.5	16	351	
7	67	Thu	-117.125	0.1807	376.5	17	352	
8	68	Fri	116.125	0.1834	377.5	18	353	
9	69	Sat	115.125	0.1862	378.5	19	354	
10	70	Sun	114.125	0.1889	379.5	20	355	10-New Moon
11	71	Mon	113.125	0.1917	380.5	21	356	09^h 00^m U.T.
12	72	Tue	112.125	0.1944	381.5	22	357	
13	73	Wed	111.125	0.1971	382.5	23	358	
14	74	Thu	-110.125	0.1999	383.5	24	359	
15	75	Fri	109.125	0.2026	384.5	25	360	
16	76	Sat	108.125	0.2053	385.5	26	361	
17	77	Sun	107.125	0.2081	386.5	27	362	17-First Quarter
18	78	Mon	106.125	0.2108	387.5	28	363	4^h 11^m U.T.
19	79	Tue	105.125	0.2136	388.5	29	364	
20	80	Wed	-104.125	0.2163	389.5	30	365	

CALENDAR, 2024

Day of Month		Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month		Indian Calendar Day of Year	Phases of the Moon
						2460	1946 Saka Era			
Mar.	21	81	Thu	-103.125	0.2190	390.5	Chaitra	1	1	
	22	82	Fri	102.125	0.2218	391.5		2	2	
	23	83	Sat	101.125	0.2245	392.5		3	3	
	24	84	Sun	100.125	0.2272	393.5		4	4	
	25	85	Mon	99.125	0.2300	394.5		5	5	25-Full Moon
	26	86	Tue	98.125	0.2327	395.5		6	6	$7^h\ 00^m$ U.T.
	27	87	Wed	97.125	0.2355	396.5		7	7	
	28	88	Thu	-96.125	0.2382	397.5		8	8	
	29	89	Fri	95.125	0.2409	398.5		9	9	
	30	90	Sat	94.125	0.2437	399.5		10	10	
	31	91	Sun	93.125	0.2464	400.5		11	11	
Apr.	1	92	Mon	92.125	0.2491	401.5		12	12	
	2	93	Tue	91.125	0.2519	402.5		13	13	2-Last Quarter
	3	94	Wed	90.125	0.2546	403.5		14	14	$3^h\ 15^m$ U.T.
	4	95	Thu	-89.125	0.2574	404.5		15	15	
	5	96	Fri	88.125	0.2601	405.5		16	16	
	6	97	Sat	87.125	0.2628	406.5		17	17	
	7	98	Sun	86.125	0.2656	407.5		18	18	
	8	99	Mon	85.125	0.2683	408.5		19	19	8-New Moon
	9	100	Tue	84.125	0.2711	409.5		20	20	$18^h\ 21^m$ U.T.
	10	101	Wed	83.125	0.2738	410.5		21	21	
	11	102	Thu	-82.125	0.2765	411.5		22	22	
	12	103	Fri	81.125	0.2793	412.5		23	23	
	13	104	Sat	80.125	0.2820	413.5		24	24	
	14	105	Sun	79.125	0.2847	414.5		25	25	
	15	106	Mon	78.125	0.2875	415.5		26	26	15-First Quarter
	16	107	Tue	77.125	0.2902	416.5		27	27	$19^h\ 13^m$ U.T.
	17	108	Wed	76.125	0.2930	417.5		28	28	
	18	109	Thu	-75.125	0.2957	418.5		29	29	
	19	110	Fri	74.125	0.2984	419.5		30	30	
	20	111	Sat	73.125	0.3012	420.5		31	31	
	21	112	Sun	72.125	0.3039	421.5	Vaisakha	1	32	
	22	113	Mon	71.125	0.3066	422.5		2	33	
	23	114	Tue	70.125	0.3094	423.5		3	34	23-Full Moon
	24	115	Wed	69.125	0.3121	424.5		4	35	$23^h\ 49^m$ U.T.
	25	116	Thu	-68.125	0.3149	425.5		5	36	
	26	117	Fri	67.125	0.3176	426.5		6	37	
	27	118	Sat	66.125	0.3203	427.5		7	38	
	28	119	Sun	65.125	0.3231	428.5		8	39	
	29	120	Mon	64.125	0.3258	429.5		9	40	
	30	121	Tue	63.125	0.3285	430.5		10	41	
May	1	122	Wed	-62.125	0.3313	431.5		11	42	1-Last Quarter $11^h\ 27^m$ U.T.

CALENDAR, 2024

Day of Month		Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month	Indian Calendar Day of Year	Phases of the Moon
						2460	1946 Saka Era		
May	2	123	Thu	-61.125	0.3340	432.5	Vaisakha 12	43	
	3	124	Fri	60.125	0.3368	433.5	13	44	
	4	125	Sat	59.125	0.3395	434.5	14	45	
	5	126	Sun	58.125	0.3422	435.5	15	46	
	6	127	Mon	57.125	0.3450	436.5	16	47	
	7	128	Tue	56.125	0.3477	437.5	17	48	
	8	129	Wed	55.125	0.3505	438.5	18	49	8-New Moon
									3^h 22^m U.T.
	9	130	Thu	-54.125	0.3532	439.5	19	50	
	10	131	Fri	53.125	0.3559	440.5	20	51	
	11	132	Sat	52.125	0.3587	441.5	21	52	
	12	133	Sun	51.125	0.3614	442.5	22	53	
	13	134	Mon	50.125	0.3641	443.5	23	54	
	14	135	Tue	49.125	0.3669	444.5	24	55	
	15	136	Wed	48.125	0.3696	445.5	25	56	15-First Quarter
									11^h 48^m U.T.
	16	137	Thu	-47.125	0.3724	446.5	26	57	
	17	138	Fri	46.125	0.3751	447.5	27	58	
	18	139	Sat	45.125	0.3778	448.5	28	59	
	19	140	Sun	44.125	0.3806	449.5	29	60	
	20	141	Mon	43.125	0.3833	450.5	30	61	
	21	142	Tue	42.125	0.3860	451.5	31	62	
	22	143	Wed	41.125	0.3888	452.5	Jyaisha 1	63	
	23	144	Thu	-40.125	0.3915	453.5	2	64	23-Full Moon
	24	145	Fri	39.125	0.3943	454.5	3	65	13^h 53^m U.T.
	25	146	Sat	38.125	0.3970	455.5	4	66	
	26	147	Sun	37.125	0.3997	456.5	5	67	
	27	148	Mon	36.125	0.4025	457.5	6	68	
	28	149	Tue	35.125	0.4052	458.5	7	69	
	29	150	Wed	34.125	0.4079	459.5	8	70	
	30	151	Thu	-33.125	0.4107	460.5	9	71	30-Last Quarter
	31	152	Fri	32.125	0.4134	461.5	10	72	17^h 13^m U.T.
June	1	153	Sat	31.125	0.4162	462.5	11	73	
	2	154	Sun	30.125	0.4189	463.5	12	74	
	3	155	Mon	29.125	0.4216	464.5	13	75	
	4	156	Tue	28.125	0.4244	465.5	14	76	
	5	157	Wed	27.125	0.4271	466.5	15	77	
	6	158	Thu	-26.125	0.4299	467.5	16	78	6-New Moon
	7	159	Fri	25.125	0.4326	468.5	17	79	12^h 38^m U.T.
	8	160	Sat	24.125	0.4353	469.5	18	80	
	9	161	Sun	23.125	0.4381	470.5	19	81	
	10	162	Mon	22.125	0.4408	471.5	20	82	
	11	163	Tue	21.125	0.4435	472.5	21	83	
	12	164	Wed	-20.125	0.4463	473.5	22	84	

CALENDAR, 2024

Day of Month		Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar			Phases of the Moon
							Day of Month		Day of Year	
						2460	1946 Saka Era			
June	13	165	Thu	-19.125	0.4490	474.5	Jyaishtha	23	85	
	14	166	Fri	18.125	0.4518	475.5		24	86	14-First Quarter
	15	167	Sat	17.125	0.4545	476.5		25	87	5^h 18^m U.T.
	16	168	Sun	16.125	0.4572	477.5		26	88	
	17	169	Mon	15.125	0.4600	478.5		27	89	
	18	170	Tue	14.125	0.4627	479.5		28	90	
	19	171	Wed	13.125	0.4654	480.5		29	91	
	20	172	Thu	-12.125	0.4682	481.5		30	92	
	21	173	Fri	11.125	0.4709	482.5		31	93	
	22	174	Sat	10.125	0.4737	483.5	Ashadha	1	94	22-Full Moon
	23	175	Sun	9.125	0.4764	484.5		2	95	1^h 08^m U.T.
	24	176	Mon	8.125	0.4791	485.5		3	96	
	25	177	Tue	7.125	0.4819	486.5		4	97	
	26	178	Wed	6.125	0.4846	487.5		5	98	
	27	179	Thu	-5.125	0.4873	488.5		6	99	
	28	180	Fri	4.125	0.4901	489.5		7	100	28-Last Quarter
	29	181	Sat	3.125	0.4928	490.5		8	101	21^h 53^m U.T.
	30	182	Sun	2.125	0.4956	491.5		9	102	
July	1	183	Mon	1.125	0.4983	492.5		10	103	
	2	184	Tue	-0.125	0.5010	493.5		11	104	
	3	185	Wed	+0.875	0.5038	494.5		12	105	
	4	186	Thu	+1.875	0.5065	495.5		13	106	
	5	187	Fri	2.875	0.5093	496.5		14	107	5-New Moon
	6	188	Sat	3.875	0.5120	497.5		15	108	22^h 57^m U.T.
	7	189	Sun	4.875	0.5147	498.5		16	109	
	8	190	Mon	5.875	0.5175	499.5		17	110	
	9	191	Tue	6.875	0.5202	500.5		18	111	
	10	192	Wed	7.875	0.5229	501.5		19	112	
	11	193	Thu	+8.875	0.5257	502.5		20	113	
	12	194	Fri	9.875	0.5284	503.5		21	114	
	13	195	Sat	10.875	0.5312	504.5		22	115	13-First Quarter
	14	196	Sun	11.875	0.5339	505.5		23	116	22^h 49^m U.T.
	15	197	Mon	12.875	0.5366	506.5		24	117	
	16	198	Tue	13.875	0.5394	507.5		25	118	
	17	199	Wed	14.875	0.5421	508.5		26	119	
	18	200	Thu	+15.875	0.5448	509.5		27	120	
	19	201	Fri	16.875	0.5476	510.5		28	121	
	20	202	Sat	17.875	0.5503	511.5		29	122	
	21	203	Sun	18.875	0.5531	512.5		30	123	21-Full Moon
	22	204	Mon	19.875	0.5558	513.5		31	124	10^h 17^m U.T.
	23	205	Tue	20.875	0.5585	514.5	Sravana	1	125	
	24	206	Wed	+21.875	0.5613	515.5		2	126	

CALENDAR, 2024

Day of Month		Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month		Indian Calendar Day of Year	Phases of the Moon
						2460	1946 Saka Era			
July	25	207	Thu	+22.875	0.5640	516.5	Sravana	3	127	
	26	208	Fri	23.875	0.5667	517.5		4	128	
	27	209	Sat	24.875	0.5695	518.5		5	129	
	28	210	Sun	25.875	0.5722	519.5		6	130	28-Last Quarter
	29	211	Mon	26.875	0.5750	520.5		7	131	2^h 52^m U.T.
	30	212	Tue	27.875	0.5777	521.5		8	132	
	31	213	Wed	28.875	0.5804	522.5		9	133	
Aug.	1	214	Thu	+29.875	0.5832	523.5		10	134	
	2	215	Fri	30.875	0.5859	524.5		11	135	
	3	216	Sat	31.875	0.5887	525.5		12	136	
	4	217	Sun	32.875	0.5914	526.5		13	137	4-New Moon
	5	218	Mon	33.875	0.5941	527.5		14	138	11^h 13^m U.T.
	6	219	Tue	34.875	0.5969	528.5		15	139	
	7	220	Wed	35.875	0.5996	529.5		16	140	
	8	221	Thu	+36.875	0.6023	530.5		17	141	
	9	222	Fri	37.875	0.6051	531.5		18	142	
	10	223	Sat	38.875	0.6078	532.5		19	143	
	11	224	Sun	39.875	0.6106	533.5		20	144	
	12	225	Mon	40.875	0.6133	534.5		21	145	12-First Quarter
	13	226	Tue	41.875	0.6160	535.5		22	146	15^h 19^m U.T.
	14	227	Wed	42.875	0.6188	536.5		23	147	
	15	228	Thu	+43.875	0.6215	537.5		24	148	
	16	229	Fri	44.875	0.6242	538.5		25	149	
	17	230	Sat	45.875	0.6270	539.5		26	150	
	18	231	Sun	46.875	0.6297	540.5		27	151	
	19	232	Mon	47.875	0.6325	541.5		28	152	19-Full Moon
	20	233	Tue	48.875	0.6352	542.5		29	153	18^h 26^m U.T.
	21	234	Wed	49.875	0.6379	543.5		30	154	
	22	235	Thu	+50.875	0.6407	544.5		31	155	
	23	236	Fri	51.875	0.6434	545.5	Bhadra	1	156	
	24	237	Sat	52.875	0.6461	546.5		2	157	
	25	238	Sun	53.875	0.6489	547.5		3	158	
	26	239	Mon	54.875	0.6516	548.5		4	159	26-Last Quarter
	27	240	Tue	55.875	0.6544	549.5		5	160	09^h 26^m U.T.
	28	241	Wed	56.875	0.6571	550.5		6	161	
	29	242	Thu	+57.875	0.6598	551.5		7	162	
	30	243	Fri	58.875	0.6626	552.5		8	163	
	31	244	Sat	59.875	0.6653	553.5		9	164	
Sept.	1	245	Sun	60.875	0.6680	554.5		10	165	
	2	246	Mon	61.875	0.6708	555.5		11	166	
	3	247	Tue	62.875	0.6735	556.5		12	167	3-New Moon
	4	248	Wed	+63.875	0.6763	557.5		13	168	1^h 56^m U.T.

CALENDAR, 2024

Day of Month	Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month	Indian Calendar Day of Year	Phases of the Moon
					2460	1946 Saka Era		
Sept. 5	249	Thu	+64.875	0.6790	558.5	Bhadra 14	169	
6	250	Fri	65.875	0.6817	559.5	15	170	
7	251	Sat	66.875	0.6845	560.5	16	171	
8	252	Sun	67.875	0.6872	561.5	17	172	
9	253	Mon	68.875	0.6900	562.5	18	173	
10	254	Tue	69.875	0.6927	563.5	19	174	
11	255	Wed	70.875	0.6954	564.5	20	175	11-First Quarter $6^h\ 06^m$ U.T.
12	256	Thu	+71.875	0.6982	565.5	21	176	
13	257	Fri	72.875	0.7009	566.5	22	177	
14	258	Sat	73.875	0.7036	567.5	23	178	
15	259	Sun	74.875	0.7064	568.5	24	179	
16	260	Mon	75.875	0.7091	569.5	25	180	
17	261	Tue	76.875	0.7119	570.5	26	181	
18	262	Wed	77.875	0.7146	571.5	27	182	18-Full Moon $2^h\ 34^m$ U.T.
19	263	Thu	+78.875	0.7173	572.5	28	183	
20	264	Fri	79.875	0.7201	573.5	29	184	
21	265	Sat	80.875	0.7228	574.5	30	185	
22	266	Sun	81.875	0.7255	575.5	31	186	
23	267	Mon	82.875	0.7283	576.5	Asvina 1	187	
24	268	Tue	83.875	0.7310	577.5	2	188	24-Last Quarter
25	269	Wed	84.875	0.7338	578.5	3	189	$18^h\ 50^m$ U.T.
26	270	Thu	+85.875	0.7365	579.5	4	190	
27	271	Fri	86.875	0.7392	580.5	5	191	
28	272	Sat	87.875	0.7420	581.5	6	192	
29	273	Sun	88.875	0.7447	582.5	7	193	
30	274	Mon	89.875	0.7474	583.5	8	194	
Oct. 1	275	Tue	90.875	0.7502	584.5	9	195	
2	276	Wed	91.875	0.7529	585.5	10	196	2-New Moon $18^h\ 49^m$ U.T.
3	277	Thu	+92.875	0.7557	586.5	11	197	
4	278	Fri	93.875	0.7584	587.5	12	198	
5	279	Sat	94.875	0.7611	588.5	13	199	
6	280	Sun	95.875	0.7639	589.5	14	200	
7	281	Mon	96.875	0.7666	590.5	15	201	
8	282	Tue	97.875	0.7694	591.5	16	202	
9	283	Wed	98.875	0.7721	592.5	17	203	
10	284	Thu	+99.875	0.7748	593.5	18	204	10-First Quarter
11	285	Fri	100.875	0.7776	594.5	19	205	$18^h\ 55^m$ U.T.
12	286	Sat	101.875	0.7803	595.5	20	206	
13	287	Sun	102.875	0.7830	596.5	21	207	
14	288	Mon	103.875	0.7858	597.5	22	208	
15	289	Tue	104.875	0.7885	598.5	23	209	
16	290	Wed	+105.875	0.7913	599.5	24	210	

CALENDAR, 2024

Day of Month		Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar Day of Month		Indian Calendar Day of Year	Phases of the Moon
						2460	1946 Saka Era			
Oct.	17	291	Thu	+106.875	0.7940	600.5	Asvina	25	211	17-Full Moon
	18	292	Fri	107.875	0.7967	601.5		26	212	$11^h\ 26^m$ U.T.
	19	293	Sat	108.875	0.7995	602.5		27	213	
	20	294	Sun	109.875	0.8022	603.5		28	214	
	21	295	Mon	110.875	0.8049	604.5		29	215	
	22	296	Tue	111.875	0.8077	605.5		30	216	
	23	297	Wed	112.875	0.8104	606.5	Kartika	1	217	
	24	298	Thu	+113.875	0.8132	607.5		2	218	24-Last Quarter
	25	299	Fri	114.875	0.8159	608.5		3	219	$8^h\ 03^m$ U.T.
	26	300	Sat	115.875	0.8186	609.5		4	220	
	27	301	Sun	116.875	0.8214	610.5		5	221	
	28	302	Mon	117.875	0.8241	611.5		6	222	
	29	303	Tue	118.875	0.8268	612.5		7	223	
	30	304	Wed	119.875	0.8296	613.5		8	224	
	31	305	Thu	+120.875	0.8323	614.5		9	225	
Nov.	1	306	Fri	121.875	0.8351	615.5		10	226	1-New Moon
	2	307	Sat	122.875	0.8378	616.5		11	227	$12^h\ 47^m$ U.T.
	3	308	Sun	123.875	0.8405	617.5		12	228	
	4	309	Mon	124.875	0.8433	618.5		13	229	
	5	310	Tue	125.875	0.8460	619.5		14	230	
	6	311	Wed	126.875	0.8488	620.5		15	231	
	7	312	Thu	+127.875	0.8515	621.5		16	232	
	8	313	Fri	128.875	0.8542	622.5		17	233	
	9	314	Sat	129.875	0.8570	623.5		18	234	9-First Quarter
	10	315	Sun	130.875	0.8597	624.5		19	235	$5^h\ 55^m$ U.T.
	11	316	Mon	131.875	0.8624	625.5		20	236	
	12	317	Tue	132.875	0.8652	626.5		21	237	
	13	318	Wed	133.875	0.8679	627.5		22	238	
	14	319	Thu	+134.875	0.8707	628.5		23	239	
	15	320	Fri	135.875	0.8734	629.5		24	240	15-Full Moon
	16	321	Sat	136.875	0.8761	630.5		25	241	$21^h\ 28^m$ U.T.
	17	322	Sun	137.875	0.8789	631.5		26	242	
	18	323	Mon	138.875	0.8816	632.5		27	243	
	19	324	Tue	139.875	0.8843	633.5		28	244	
	20	325	Wed	140.875	0.8871	634.5		29	245	
	21	326	Thu	+141.875	0.8898	635.5		30	246	
	22	327	Fri	142.875	0.8926	636.5	Agrahayana	1	247	
	23	328	Sat	143.875	0.8953	637.5		2	248	23-Last Quarter
	24	329	Sun	144.875	0.8980	638.5		3	249	$01^h\ 28^m$ U.T.
	25	330	Mon	145.875	0.9008	639.5		4	250	
	26	331	Tue	146.875	0.9035	640.5		5	251	
	27	332	Wed	+147.875	0.9062	641.5		6	252	

CALENDAR, 2024

Day of Month	Day of Year	Day of Week	Days since J 2024.5	Fraction of Year since Jan. 1.0	Julian Day (at 0h U.T.)	Indian Calendar: Day of Month	Indian Calendar: Day of Year	Phases of the Moon
					2460	1946 Saka Era		
Nov. 28	333	Thu	+148.875	0.9090	642.5	Agrahayana 7	253	
29	334	Fri	149.875	0.9117	643.5	8	254	
30	335	Sat	150.875	0.9145	644.5	9	255	
Dec. 1	336	Sun	151.875	0.9172	645.5	10	256	1-New Moon
2	337	Mon	152.875	0.9199	646.5	11	257	$06^h\ 21^m$ U.T.
3	338	Tue	153.875	0.9227	647.5	12	258	
4	339	Wed	154.875	0.9254	648.5	13	259	
5	340	Thu	+155.875	0.9282	649.5	14	260	
6	341	Fri	156.875	0.9309	650.5	15	261	
7	342	Sat	157.875	0.9336	651.5	16	262	
8	343	Sun	158.875	0.9364	652.5	17	263	8-First Quarter
9	344	Mon	159.875	0.9391	653.5	18	264	$15^h\ 27^m$ U.T.
10	345	Tue	160.875	0.9418	654.5	19	265	
11	346	Wed	161.875	0.9446	655.5	20	266	
12	347	Thu	+162.875	0.9473	656.5	21	267	
13	348	Fri	163.875	0.9501	657.5	22	268	
14	349	Sat	164.875	0.9528	658.5	23	269	
15	350	Sun	165.875	0.9555	659.5	24	270	15-Full Moon
16	351	Mon	166.875	0.9583	660.5	25	271	$9^h\ 02^m$ U.T.
17	352	Tue	167.875	0.9610	661.5	26	272	
18	353	Wed	168.875	0.9637	662.5	27	273	
19	354	Thu	+169.875	0.9665	663.5	28	274	
20	355	Fri	170.875	0.9692	664.5	29	275	
21	356	Sat	171.875	0.9720	665.5	30	276	
22	357	Sun	172.875	0.9747	666.5	Pausha 1	277	22-Last Quarter
23	358	Mon	173.875	0.9774	667.5	2	278	$22^h\ 18^m$ U.T.
24	359	Tue	174.875	0.9802	668.5	3	279	
25	360	Wed	175.875	0.9829	669.5	4	280	
26	361	Thu	+176.875	0.9856	670.5	5	281	
27	362	Fri	177.875	0.9884	671.5	6	282	
28	363	Sat	178.875	0.9911	672.5	7	283	
29	364	Sun	179.875	0.9939	673.5	8	284	
30	365	Mon	180.875	0.9966	674.5	9	285	30-New Moon
31	366	Tue	181.875	0.9993	675.5	10	286	$22^h\ 27^m$ U.T.
32	1	Wed	+182.875	1.0021	676.5	11	287	

The new epoch is the middle of the Julian year, denoted by J 2023.5 (i.e. 2024, July 2.875) where the length of the Julian year is taken to be 365.25 days.

The Fraction of year is reckoned from January 1, 0^h U.T and is based on the tropical year of 365.2422 days.

The Julian Day begins at noon. In order to obtain the Julian Day Number completed at noon as given in Table IX, increase the above figure by 0.5.

The Day of year of the Gregorian Calendar is reckoned from January 1, and that of the Indian Calendar from Chaitra 1.

SIDEREAL TIME, 2024

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
Jan.	0	6	36	40.072	-0.328	17	20	29.003	Feb.	15	9	38	01.619	-0.255	14	19	37.167
	1	6	40	36.628	0.328	17	16	33.093		16	9	41	58.175	0.256	14	15	41.258
	2	6	44	33.183	0.330	17	12	37.184		17	9	45	54.730	0.253	14	11	45.348
	3	6	48	29.739	0.333	17	08	41.274		18	9	49	51.285	0.248	14	07	49.439
	4	6	52	26.294	0.337	17	04	45.365		19	9	53	47.841	0.242	14	03	53.529
	5	6	56	22.849	0.340	17	00	49.455		20	9	57	44.396	0.236	13	59	57.620
	6	7	00	19.405	-0.340	16	56	53.546		21	10	01	40.952	-0.232	13	56	01.710
	7	7	04	15.960	0.338	16	52	57.637		22	10	05	37.507	0.230	13	52	05.801
	8	7	08	12.515	0.333	16	49	01.727		23	10	09	34.062	0.230	13	48	09.891
	9	7	12	09.071	0.324	16	45	05.818		24	10	13	30.618	0.234	13	44	13.982
	10	7	16	05.626	0.312	16	41	09.908		25	10	17	27.173	0.240	13	40	18.072
	11	7	20	02.181	0.300	16	37	13.999		26	10	21	23.728	0.247	13	36	22.163
	12	7	23	58.737	-0.289	16	33	18.089		27	10	25	20.284	-0.255	13	32	26.254
	13	7	27	55.292	0.281	16	29	22.180		28	10	29	16.839	0.263	13	28	30.344
	14	7	31	51.848	0.278	16	25	26.270		29	10	33	13.395	0.270	13	24	34.435
	15	7	35	48.403	0.279	16	21	30.361	Mar.	1	10	37	09.950	0.275	13	20	38.525
	16	7	39	44.958	0.283	16	17	34.451		2	10	41	06.505	0.277	13	16	42.616
	17	7	43	41.514	0.287	16	13	38.542		3	10	45	03.061	0.275	13	12	46.706
	18	7	47	38.069	-0.291	16	09	42.632		4	10	48	59.616	-0.271	13	08	50.797
	19	7	51	34.624	0.291	16	05	46.723		5	10	52	56.171	0.265	13	04	54.887
	20	7	55	31.180	0.289	16	01	50.813		6	10	56	52.727	0.258	13	00	58.978
	21	7	59	27.735	0.283	15	57	54.904		7	11	00	49.282	0.253	12	57	03.068
	22	8	03	24.290	0.275	15	53	58.995		8	11	04	45.837	0.251	12	53	07.159
	23	8	07	20.846	0.266	15	50	03.085		9	11	08	42.393	0.252	12	49	11.249
	24	8	11	17.401	-0.258	15	46	07.176		10	11	12	38.948	-0.258	12	45	15.340
	25	8	15	13.957	0.252	15	42	11.266		11	11	16	35.504	0.267	12	41	19.430
	26	8	19	10.512	0.247	15	38	15.357		12	11	20	32.059	0.276	12	37	23.521
	27	8	23	07.067	0.246	15	34	19.447		13	11	24	28.614	0.283	12	33	27.611
	28	8	27	03.623	0.247	15	30	23.538		14	11	28	25.170	0.287	12	29	31.702
	29	8	30	60.178	0.251	15	26	27.628		15	11	32	21.725	0.286	12	25	35.793
	30	8	34	56.733	-0.256	15	22	31.719		16	11	36	18.280	-0.283	12	21	39.883
	31	8	38	53.289	0.262	15	18	35.809		17	11	40	14.836	0.278	12	17	43.974
Feb.	1	8	42	49.844	0.267	15	14	39.900		18	11	44	11.391	0.273	12	13	48.064
	2	8	46	46.400	0.271	15	10	43.990		19	11	48	07.947	0.269	12	09	52.155
	3	8	50	42.955	0.272	15	06	48.081		20	11	52	04.502	0.268	12	05	56.245
	4	8	54	39.510	0.271	15	02	52.171		21	11	56	01.057	0.269	12	02	00.336
	5	8	58	36.066	-0.266	14	58	56.262		22	11	59	57.613	-0.272	11	58	04.426
	6	9	02	32.621	0.258	14	55	00.352		23	12	03	54.168	0.279	11	54	08.517
	7	9	06	29.176	0.249	14	51	04.443		24	12	07	50.723	0.287	11	50	12.607
	8	9	10	25.732	0.239	14	47	08.533		25	12	11	47.279	0.296	11	46	16.698
	9	9	14	22.287	0.232	14	43	12.624		26	12	15	43.834	0.305	11	42	20.788
	10	9	18	18.843	0.230	14	39	16.714		27	12	19	40.389	0.313	11	38	24.879
	11	9	22	15.398	-0.231	14	35	20.805		28	12	23	36.945	-0.318	11	34	28.969
	12	9	26	11.953	0.237	14	31	24.896		29	12	27	33.500	0.321	11	30	33.060
	13	9	30	08.509	0.244	14	27	28.986		30	12	31	30.056	0.321	11	26	37.151
	14	9	34	05.064	0.251	14	23	33.077		31	12	35	26.611	0.319	11	22	41.241
	15	9	38	01.619	-0.255	14	19	37.167	Apr.	1	12	39	23.166	-0.314	11	18	45.332

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SIDEREAL TIME, 2024

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinoxes at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinoxes at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
Apr.	1	12	39	23.166	-0.314	11	18	45.332	May	17	15	40	44.713	-0.297	8	17	53.496
	2	12	43	19.722	0.308	11	14	49.422		18	15	44	41.269	0.302	8	13	57.586
	3	12	47	16.277	0.302	11	10	53.513		19	15	48	37.824	0.307	8	10	01.677
	4	12	51	12.832	0.299	11	06	57.603		20	15	52	34.379	0.312	8	06	05.768
	5	12	55	09.388	0.299	11	03	01.694		21	15	56	30.935	0.315	8	02	09.858
	6	12	59	05.943	0.304	10	59	05.784		22	16	00	27.490	0.316	7	58	13.949
	7	13	03	02.499	-0.311	10	55	09.875		23	16	04	24.045	-0.313	7	54	18.039
	8	13	06	59.054	0.320	10	51	13.965		24	16	08	20.601	0.308	7	50	22.130
	9	13	10	55.609	0.328	10	47	18.056		25	16	12	17.156	0.299	7	46	26.220
	10	13	14	52.165	0.332	10	43	22.146		26	16	16	13.712	0.289	7	42	30.311
	11	13	18	48.720	0.333	10	39	26.237		27	16	20	10.267	0.280	7	38	34.401
	12	13	22	45.275	0.329	10	35	30.327		28	16	24	06.822	0.271	7	34	38.492
	13	13	26	41.831	-0.323	10	31	34.418		29	16	28	03.378	-0.266	7	30	42.582
	14	13	30	38.386	0.317	10	27	38.508		30	16	31	59.933	0.265	7	26	46.673
	15	13	34	34.941	0.311	10	23	42.599		31	16	35	56.488	0.267	7	22	50.763
	16	13	38	31.497	0.307	10	19	46.689	June	1	16	39	53.044	0.271	7	18	54.854
	17	13	42	28.052	0.306	10	15	50.780		2	16	43	49.599	0.275	7	14	58.944
	18	13	46	24.608	0.308	10	11	54.871		3	16	47	46.155	0.278	7	11	03.035
	19	13	50	21.163	-0.312	10	07	58.961		4	16	51	42.710	-0.278	7	07	07.125
	20	13	54	17.718	0.319	10	04	03.052		5	16	55	39.265	0.273	7	03	11.216
	21	13	58	14.274	0.326	10	00	07.142		6	16	59	35.821	0.265	6	59	15.306
	22	14	02	10.829	0.334	9	56	11.233		7	17	03	32.376	0.255	6	55	19.397
	23	14	06	07.384	0.340	9	52	15.323		8	17	07	28.931	0.244	6	51	23.488
	24	14	10	03.940	0.345	9	48	19.414		9	17	11	25.487	0.234	6	47	27.578
	25	14	14	00.495	-0.347	9	44	23.504		10	17	15	22.042	-0.226	6	43	31.669
	26	14	17	57.051	0.346	9	40	27.595		11	17	19	18.597	0.222	6	39	35.759
	27	14	21	53.606	0.342	9	36	31.685		12	17	23	15.153	0.221	6	35	39.850
	28	14	25	50.161	0.336	9	32	35.776		13	17	27	11.708	0.222	6	31	43.940
	29	14	29	46.717	0.328	9	28	39.866		14	17	31	08.264	0.225	6	27	48.031
	30	14	33	43.272	0.321	9	24	43.957		15	17	35	04.819	0.229	6	23	52.121
May	1	14	37	39.827	-0.316	9	20	48.047		16	17	39	01.374	-0.233	6	19	56.212
	2	14	41	36.383	0.313	9	16	52.138		17	17	42	57.930	0.235	6	16	00.302
	3	14	45	32.938	0.314	9	12	56.228		18	17	46	54.485	0.235	6	12	04.393
	4	14	49	29.493	0.319	9	09	00.319		19	17	50	51.040	0.233	6	08	08.483
	5	14	53	26.049	0.326	9	05	04.410		20	17	54	47.596	0.227	6	04	12.574
	6	14	57	22.604	0.332	9	01	08.500		21	17	58	44.151	0.218	6	00	16.664
	7	15	01	19.160	-0.336	8	57	12.591		22	18	02	40.707	-0.207	5	56	20.755
	8	15	05	15.715	0.336	8	53	16.681		23	18	06	37.262	0.196	5	52	24.845
	9	15	09	12.270	0.331	8	49	20.772		24	18	10	33.817	0.186	5	48	28.936
	10	15	13	08.826	0.324	8	45	24.862		25	18	14	30.373	0.179	5	44	33.027
	11	15	17	05.381	0.315	8	41	28.953		26	18	18	26.928	0.176	5	40	37.117
	12	15	21	01.936	0.306	8	37	33.043		27	18	22	23.483	0.177	5	36	41.208
	13	15	24	58.492	-0.299	8	33	37.134		28	18	26	20.039	-0.180	5	32	45.298
	14	15	28	55.047	0.294	8	29	41.224		29	18	30	16.594	0.184	5	28	49.389
	15	15	32	51.603	0.293	8	25	45.315		30	18	34	13.149	0.187	5	24	53.479
	16	15	36	48.158	0.294	8	21	49.405	July	1	18	38	09.705	0.188	5	20	57.570
	17	15	40	44.713	-0.297	8	17	53.496		2	18	42	06.260	-0.184	5	17	01.660

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SIDEREAL TIME, 2024

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
July	1	18	38	09.705	-0.188	5	20	57.570	Aug.	16	21	39	31.252	-0.092	2	20	05.734
	2	18	42	06.260	0.184	5	17	01.660		17	21	43	27.807	0.084	2	16	09.825
	3	18	46	02.816	0.177	5	13	05.751		18	21	47	24.363	0.078	2	12	13.915
	4	18	49	59.371	0.168	5	09	09.841		19	21	51	20.918	0.075	2	08	18.006
	5	18	53	55.926	0.157	5	05	13.932		20	21	55	17.473	0.076	2	04	22.096
	6	18	57	52.482	0.147	5	01	18.022		21	21	59	14.029	0.081	2	00	26.187
	7	19	01	49.037	-0.139	4	57	22.113		22	22	03	10.584	-0.089	1	56	30.277
	8	19	05	45.592	0.134	4	53	26.203		23	22	07	07.139	0.097	1	52	34.368
	9	19	09	42.148	0.132	4	49	30.294		24	22	11	03.695	0.102	1	48	38.458
	10	19	13	38.703	0.133	4	45	34.385		25	22	15	00.250	0.104	1	44	42.549
	11	19	17	35.259	0.136	4	41	38.475		26	22	18	56.806	0.103	1	40	46.639
	12	19	21	31.814	0.140	4	37	42.566		27	22	22	53.361	0.098	1	36	50.730
	13	19	25	28.369	-0.144	4	33	46.656		28	22	26	49.916	-0.092	1	32	54.820
	14	19	29	24.925	0.148	4	29	50.747		29	22	30	46.472	0.086	1	28	58.911
	15	19	33	21.480	0.150	4	25	54.837		30	22	34	43.027	0.081	1	25	03.002
	16	19	37	18.035	0.149	4	21	58.928		31	22	38	39.582	0.078	1	21	07.092
	17	19	41	14.591	0.146	4	18	03.018	Sept.	1	22	42	36.138	0.079	1	17	11.183
	18	19	45	11.146	0.139	4	14	07.109		2	22	46	32.693	0.082	1	13	15.273
	19	19	49	07.701	-0.130	4	10	11.199		3	22	50	29.248	-0.088	1	09	19.364
	20	19	53	04.257	0.119	4	06	15.290		4	22	54	25.804	0.096	1	05	23.454
	21	19	57	00.812	0.110	4	02	19.380		5	22	58	22.359	0.105	1	01	27.545
	22	20	00	57.368	0.102	3	58	23.471		6	23	02	18.915	0.113	0	57	31.635
	23	20	04	53.923	0.099	3	54	27.561		7	23	06	15.470	0.120	0	53	35.726
	24	20	08	50.478	0.100	3	50	31.652		8	23	10	12.025	0.126	0	49	39.816
	25	20	12	47.034	-0.104	3	46	35.742		9	23	14	08.581	-0.128	0	45	43.907
	26	20	16	43.589	0.109	3	42	39.833		10	23	18	05.136	0.128	0	41	47.997
	27	20	20	40.144	0.114	3	38	43.924		11	23	22	01.691	0.125	0	37	52.088
	28	20	24	36.700	0.117	3	34	48.014		12	23	25	58.247	0.120	0	33	56.178
	29	20	28	33.255	0.116	3	30	52.105		13	23	29	54.802	0.114	0	30	00.269
	30	20	32	29.811	0.112	3	26	56.195		14	23	33	51.358	0.109	0	26	04.359
	31	20	36	26.366	-0.104	3	23	00.286		15	23	37	47.913	-0.106	0	22	08.450
Aug.	1	20	40	22.921	0.096	3	19	04.376		16	23	41	44.468	0.107	0	18	12.541
	2	20	44	19.477	0.088	3	15	08.467		17	23	45	41.024	0.112	0	14	16.631
	3	20	48	16.032	0.081	3	11	12.557		18	23	49	37.579	0.121	0	10	20.722
	4	20	52	12.587	0.077	3	07	16.648		19	23	53	34.134	0.130	0	06	24.812
	5	20	56	09.143	0.076	3	03	20.738		20	23	57	30.690	0.138	0	02	28.903
	6	21	00	05.698	-0.078	2	59	24.829		21	0	01	27.245	-0.143	23	54	37.084
	7	21	04	02.254	0.083	2	55	28.919		22	0	05	23.800	0.143	23	50	41.174
	8	21	07	58.809	0.089	2	51	33.010		23	0	09	20.356	0.139	23	46	45.265
	9	21	11	55.364	0.095	2	47	37.100		24	0	13	16.911	0.134	23	42	49.355
	10	21	15	51.920	0.102	2	43	41.191		25	0	17	13.467	0.128	23	38	53.446
	11	21	19	48.475	0.106	2	39	45.281		26	0	21	10.022	0.123	23	34	57.536
	12	21	23	45.030	-0.109	2	35	49.372		27	0	25	06.577	-0.121	23	31	01.627
	13	21	27	41.586	0.108	2	31	53.462		28	0	29	03.133	0.121	23	27	05.718
	14	21	31	38.141	0.105	2	27	57.553		29	0	32	59.688	0.125	23	23	09.808
	15	21	35	34.696	0.099	2	24	01.644		30	0	36	56.243	0.131	23	19	13.899
	16	21	39	31.252	-0.092	2	20	05.734	Oct.	1	0	40	52.799	-0.139	23	15	17.989

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SIDEREAL TIME, 2024

Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)			Date		Mean Greenwich Sidereal Time at 0^h U.T. (G.H.A. of the Equinox)			Equation of the Equinox-es at 0^h U.T.	Greenwich Transit of Mean Equinox (U.T. at 0^h G.M.S.T.)		
		h	m	s	s	h	m	s			h	m	s	s	h	m	s
Oct.	1	0	40	52.799	-0.139	23	15	17.989	Nov.	16	3	42	14.346	-0.168	20	14	26.154
	2	0	44	49.354	0.148	23	11	22.080		17	3	46	10.901	0.159	20	10	30.244
	3	0	48	45.910	0.156	23	07	26.170		18	3	50	07.456	0.149	20	06	34.335
	4	0	52	42.465	0.164	23	03	30.261		19	3	54	04.012	0.138	20	02	38.425
	5	0	56	39.020	0.170	22	59	34.351		20	3	58	00.567	0.129	19	58	42.516
	6	1	00	35.576	0.173	22	55	38.442		21	4	01	57.123	0.122	19	54	46.606
	7	1	04	32.131	-0.174	22	51	42.532		22	4	05	53.678	-0.119	19	50	50.697
	8	1	08	28.686	0.172	22	47	46.623		23	4	09	50.233	0.119	19	46	54.787
	9	1	12	25.242	0.167	22	43	50.713		24	4	13	46.789	0.122	19	42	58.878
	10	1	16	21.797	0.162	22	39	54.804		25	4	17	43.344	0.126	19	39	02.968
	11	1	20	18.352	0.157	22	35	58.894		26	4	21	39.899	0.131	19	35	07.059
	12	1	24	14.908	0.153	22	32	02.985		27	4	25	36.455	0.135	19	31	11.149
	13	1	28	11.463	-0.152	22	28	07.075		28	4	29	33.010	-0.137	19	27	15.240
	14	1	32	08.019	0.155	22	24	11.166		29	4	33	29.566	0.137	19	23	19.330
	15	1	36	04.574	0.162	22	20	15.257		30	4	37	26.121	0.134	19	19	23.421
	16	1	40	01.129	0.170	22	16	19.347	Dec.	1	4	41	22.676	0.128	19	15	27.511
	17	1	43	57.685	0.178	22	12	23.438		2	4	45	19.232	0.120	19	11	31.602
	18	1	47	54.240	0.183	22	08	27.528		3	4	49	15.787	0.110	19	07	35.692
	19	1	51	50.795	-0.184	22	04	31.619		4	4	53	12.342	-0.101	19	03	39.783
	20	1	55	47.351	0.181	22	00	35.709		5	4	57	08.898	0.092	18	59	43.874
	21	1	59	43.906	0.174	21	56	39.800		6	5	01	05.453	0.085	18	55	47.964
	22	2	03	40.462	0.166	21	52	43.890		7	5	05	02.008	0.082	18	51	52.055
	23	2	07	37.017	0.159	21	48	47.981		8	5	08	58.564	0.082	18	47	56.145
	24	2	11	33.572	0.154	21	44	52.071		9	5	12	55.119	0.085	18	44	00.236
	25	2	15	30.128	-0.151	21	40	56.162		10	5	16	51.675	-0.088	18	40	04.326
	26	2	19	26.683	0.152	21	37	00.252		11	5	20	48.230	0.091	18	36	08.417
	27	2	23	23.238	0.156	21	33	04.343		12	5	24	44.785	0.091	18	32	12.507
	28	2	27	19.794	0.162	21	29	08.433		13	5	28	41.341	0.087	18	28	16.598
	29	2	31	16.349	0.169	21	25	12.524		14	5	32	37.896	0.079	18	24	20.688
	30	2	35	12.904	0.176	21	21	16.615		15	5	36	34.451	0.067	18	20	24.779
	31	2	39	09.460	-0.182	21	17	20.705		16	5	40	31.007	-0.055	18	16	28.869
Nov.	1	2	43	06.015	0.187	21	13	24.796		17	5	44	27.562	0.043	18	12	32.960
	2	2	47	02.571	0.188	21	09	28.886		18	5	48	24.118	0.033	18	08	37.050
	3	2	50	59.126	0.187	21	05	32.977		19	5	52	20.673	0.027	18	04	41.141
	4	2	54	55.681	0.184	21	01	37.067		20	5	56	17.228	0.025	18	00	45.232
	5	2	58	52.237	0.178	20	57	41.158		21	6	00	13.784	0.025	17	56	49.322
	6	3	02	48.792	-0.170	20	53	45.248		22	6	04	10.339	-0.027	17	52	53.413
	7	3	06	45.347	0.163	20	49	49.339		23	6	08	06.894	0.031	17	48	57.503
	8	3	10	41.903	0.157	20	45	53.429		24	6	12	03.450	0.034	17	45	01.594
	9	3	14	38.458	0.153	20	41	57.520		25	6	15	60.005	0.036	17	41	05.684
	10	3	18	35.014	0.153	20	38	01.610		26	6	19	56.560	0.036	17	37	09.775
	11	3	22	31.569	0.156	20	34	05.701		27	6	23	53.116	0.033	17	33	13.865
	12	3	26	28.124	-0.161	20	30	09.791		28	6	27	49.671	-0.027	17	29	17.956
	13	3	30	24.680	0.167	20	26	13.882		29	6	31	46.227	0.019	17	25	22.046
	14	3	34	21.235	0.172	20	22	17.973		30	6	35	42.782	-0.009	17	21	26.137
	15	3	38	17.790	0.172	20	18	22.063		31	6	39	39.337	+0.002	17	17	30.227
	16	3	42	14.346	-0.168	20	14	26.154		32	6	43	35.893	+0.012	17	13	34.318

N.B.-Apparent Sidereal Time = Mean Sidereal Time + Equation of Equinoxes for the instant

SUN, 2024
MEAN LONGITUDE AND ANOMALY

Date		Horizontal Parallax	Mean Longitude			Mean Anomaly	Date		Horizontal Parallax	Mean Longitude			Mean Anomaly
		"	°	′	"	°			"	°	′	"	°
Jan.	1	8.94	280	9	28.880	356.808	July	9	8.65	107	40	12.339	184.328
	11	8.94	290	15	12.850	6.920		19	8.65	117	31	35.644	194.184
	21	8.94	300	6	36.155	16.776		29	8.66	127	22	58.949	204.040
	31	8.93	309	57	59.460	26.632	Aug.	8	8.67	137	14	22.254	213.896
Feb.	10	8.91	319	49	22.765	36.488		18	8.69	147	5	45.559	223.752
	20	8.9	329	40	46.070	46.344		28	8.71	156	57	8.864	233.608
Mar.	1	8.88	339	32	9.374	56.200	Sept.	7	8.73	166	48	32.169	243.464
	11	8.85	349	23	32.679	66.056		17	8.75	176	39	55.474	253.320
	21	8.83	359	14	55.984	75.912		27	8.77	186	31	18.779	263.176
Apr.	31	8.8	9	6	19.289	85.768	Oct.	7	8.8	196	22	42.084	273.032
	10	8.78	18	57	42.594	95.624		17	8.82	206	14	5.389	282.888
	20	8.75	28	49	5.899	105.480		27	8.85	216	5	28.694	292.744
May	30	8.73	38	40	29.204	115.336	Nov.	6	8.87	225	56	51.998	302.600
	10	8.71	48	31	52.509	125.192		16	8.89	235	48	15.303	312.456
	20	8.69	58	23	15.814	135.048		26	8.91	245	39	38.608	322.312
	30	8.68	68	14	39.119	144.904	Dec.	6	8.92	255	31	1.913	332.168
June	9	8.66	78	6	2.424	154.760		16	8.94	265	22	25.218	342.024
	19	8.66	87	57	25.729	164.616		26	8.94	275	13	48.523	351.880
	29	8.65	97	48	49.034	174.472		36	8.94	285	5	11.828	1.736
July	9	8.65	107	40	12.339	184.328		46	8.94	294	56	35.133	11.592

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra- tion	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Jan.	0	279	01	35.42	+0.68	279	01	09.26	20.84	-25.62	-5.36	+8.02	18.18
	1	280	02	43.60	0.58	280	02	17.45	20.84	25.48	5.36	8.07	18.23
	2	281	03	52.11	0.47	281	03	25.92	20.84	25.34	5.39	8.11	18.27
	3	282	05	00.96	0.36	282	04	34.72	20.84	25.20	5.45	8.13	18.29
	4	283	06	10.10	0.25	283	05	43.80	20.84	25.06	5.51	8.14	18.30
	5	284	07	19.56	+0.11	284	06	53.21	20.84	24.92	5.55	8.12	18.28
	6	285	08	29.23	-0.04	285	08	02.87	20.84	-24.79	-5.56	+8.09	18.25
	7	286	09	39.10	0.14	286	09	12.78	20.84	24.65	5.53	8.06	18.22
	8	287	10	49.11	0.25	287	10	22.87	20.84	24.51	5.44	8.02	18.18
	9	288	11	59.19	0.36	288	11	33.11	20.84	24.37	5.29	7.99	18.15
	10	289	13	09.24	0.40	289	12	43.34	20.84	24.23	5.10	7.99	18.15
	11	290	14	19.24	0.43	290	13	53.54	20.84	24.09	4.90	8.02	18.17
	12	291	15	28.97	-0.43	291	15	03.46	20.84	-23.95	-4.72	+8.07	18.22
	13	292	16	38.39	0.40	292	16	13.01	20.84	23.81	4.59	8.15	18.30
	14	293	17	47.35	0.36	293	17	22.02	20.84	23.67	4.54	8.23	18.38
	15	294	18	55.74	0.25	294	18	30.38	20.84	23.53	4.56	8.30	18.45
	16	295	20	03.48	0.14	295	19	38.06	20.84	23.39	4.62	8.34	18.49
	17	296	21	10.48	-0.04	296	20	44.99	20.83	23.26	4.70	8.36	18.50
	18	297	22	16.70	+0.11	297	21	51.16	20.83	-23.12	-4.75	+8.34	18.49
	19	298	23	22.08	0.25	298	22	56.53	20.83	22.98	4.76	8.31	18.46
	20	299	24	26.58	0.36	299	24	01.08	20.83	22.84	4.72	8.28	18.42
	21	300	25	30.24	0.47	300	25	04.84	20.83	22.70	4.63	8.25	18.39
	22	301	26	33.04	0.54	301	26	07.76	20.83	22.56	4.50	8.24	18.38
	23	302	27	34.96	0.58	302	27	09.83	20.83	22.42	4.36	8.25	18.39
	24	303	28	36.03	+0.61	303	28	11.03	20.82	-22.28	-4.22	+8.28	18.42
	25	304	29	36.29	0.61	304	29	11.40	20.82	22.14	4.11	8.33	18.47
	26	305	30	35.72	0.58	305	30	10.91	20.82	22.00	4.04	8.39	18.53
	27	306	31	34.38	0.50	306	31	09.59	20.82	21.86	4.02	8.46	18.59
	28	307	32	32.25	0.43	307	32	07.44	20.81	21.73	4.04	8.53	18.66
	29	308	33	29.37	+0.32	308	33	04.50	20.81	21.59	4.10	8.58	18.71
	30	309	34	25.72	+0.22	309	34	00.77	20.81	-21.45	-4.19	+8.62	18.75
	31	310	35	21.32	+0.07	310	34	56.28	20.81	21.31	4.28	8.64	18.77
Feb.	1	311	36	16.16	-0.04	311	35	51.04	20.80	21.17	4.37	8.65	18.77
	2	312	37	10.26	0.18	312	36	45.07	20.80	21.03	4.43	8.63	18.76
	3	313	38	03.59	0.29	313	37	38.39	20.80	20.89	4.45	8.61	18.73
	4	314	38	56.12	0.40	314	38	30.95	20.79	20.75	4.43	8.58	18.71
	5	315	39	47.81	-0.50	315	39	22.72	20.79	-20.61	-4.35	+8.56	18.68
	6	316	40	38.65	0.58	316	40	13.69	20.79	20.47	4.22	8.56	18.68
	7	317	41	28.57	0.61	317	41	03.77	20.78	20.33	4.06	8.57	18.69
	8	318	42	17.52	0.61	318	41	52.87	20.78	20.19	3.91	8.62	18.74
	9	319	43	05.39	0.58	319	42	40.86	20.78	20.06	3.80	8.70	18.81
	10	320	43	52.07	0.50	320	43	27.59	20.77	19.92	3.75	8.79	18.90
	11	321	44	37.46	-0.43	321	44	12.95	20.77	-19.78	-3.78	+8.87	18.98
	12	322	45	21.46	0.32	322	44	56.87	20.77	19.64	3.88	8.93	19.04
	13	323	46	03.92	0.18	323	45	39.20	20.76	19.50	4.00	8.96	19.07
	14	324	46	44.81	-0.04	324	46	19.99	20.76	19.36	4.10	8.96	19.07
	15	325	47	24.00	+0.07	325	46	59.12	20.75	-19.22	-4.17	+8.93	19.04

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

SUN, 2024

FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Jan.	0	18	39	15.65	-23	07	53.15	0.983 3326	16	15.91	12	02	50.30
	1	18	43	40.82	23	03	30.70	0.983 3183	16	15.93	12	03	18.79
	2	18	48	05.71	22	58	40.63	0.983 3099	16	15.93	12	03	46.98
	3	18	52	30.29	22	53	23.05	0.983 3070	16	15.94	12	04	14.86
	4	18	56	54.54	22	47	38.11	0.983 3095	16	15.93	12	04	42.38
	5	19	01	18.42	22	41	25.96	0.983 3172	16	15.93	12	05	09.52
	6	19	05	41.91	-22	34	46.78	0.983 3297	16	15.91	12	05	36.25
	7	19	10	04.98	22	27	40.74	0.983 3469	16	15.90	12	06	02.55
	8	19	14	27.59	22	20	08.06	0.983 3685	16	15.88	12	06	28.37
	9	19	18	49.74	22	12	08.96	0.983 3942	16	15.85	12	06	53.70
	10	19	23	11.37	22	03	43.67	0.983 4238	16	15.82	12	07	18.51
	11	19	27	32.46	21	54	52.46	0.983 4571	16	15.79	12	07	42.76
	12	19	31	52.99	-21	45	35.58	0.983 4939	16	15.75	12	08	06.42
	13	19	36	12.91	21	35	53.31	0.983 5343	16	15.71	12	08	29.48
	14	19	40	32.20	21	25	45.95	0.983 5782	16	15.67	12	08	51.89
	15	19	44	50.84	21	15	13.77	0.983 6258	16	15.62	12	09	13.64
	16	19	49	08.79	21	04	17.09	0.983 6775	16	15.57	12	09	34.70
	17	19	53	26.06	20	52	56.21	0.983 7334	16	15.51	12	09	55.05
	18	19	57	42.60	-20	41	11.48	0.983 7938	16	15.45	12	10	14.69
	19	20	01	58.43	20	29	03.23	0.983 8592	16	15.39	12	10	33.58
	20	20	06	13.51	20	16	31.81	0.983 9298	16	15.32	12	10	51.73
	21	20	10	27.83	20	03	37.58	0.984 0058	16	15.24	12	11	09.11
	22	20	14	41.40	19	50	20.90	0.984 0875	16	15.16	12	11	25.72
	23	20	18	54.19	19	36	42.13	0.984 1750	16	15.08	12	11	41.56
	24	20	23	06.20	-19	22	41.63	0.984 2685	16	14.98	12	11	56.61
	25	20	27	17.42	19	08	19.75	0.984 3680	16	14.88	12	12	10.87
	26	20	31	27.85	18	53	36.85	0.984 4734	16	14.78	12	12	24.33
	27	20	35	37.48	18	38	33.29	0.984 5848	16	14.67	12	12	37.00
	28	20	39	46.31	18	23	09.43	0.984 7022	16	14.55	12	12	48.88
	29	20	43	54.34	18	07	25.64	0.984 8252	16	14.43	12	12	59.95
	30	20	48	01.56	-17	51	22.28	0.984 9539	16	14.30	12	13	10.21
	31	20	52	07.99	17	34	59.72	0.985 0880	16	14.17	12	13	19.68
Feb.	1	20	56	13.61	17	18	18.34	0.985 2272	16	14.03	12	13	28.35
	2	21	00	18.44	17	01	18.52	0.985 3715	16	13.89	12	13	36.22
	3	21	04	22.47	16	44	00.65	0.985 5204	16	13.74	12	13	43.29
	4	21	08	25.71	16	26	25.13	0.985 6737	16	13.59	12	13	49.56
	5	21	12	28.15	-16	08	32.36	0.985 8311	16	13.44	12	13	55.05
	6	21	16	29.81	15	50	22.74	0.985 9922	16	13.28	12	13	59.74
	7	21	20	30.68	15	31	56.72	0.986 1567	16	13.12	12	14	03.64
	8	21	24	30.76	15	13	14.70	0.986 3242	16	12.95	12	14	06.76
	9	21	28	30.06	14	54	17.14	0.986 4946	16	12.78	12	14	09.09
	10	21	32	28.56	14	35	04.47	0.986 6675	16	12.61	12	14	10.64
	11	21	36	26.28	-14	15	37.13	0.986 8428	16	12.44	12	14	11.41
	12	21	40	23.22	13	55	55.56	0.987 0205	16	12.26	12	14	11.40
	13	21	44	19.38	13	36	00.20	0.987 2007	16	12.09	12	14	10.62
	14	21	48	14.77	13	15	51.47	0.987 3836	16	11.91	12	14	09.07
	15	21	52	09.40	-12	55	29.82	0.987 5695	16	11.72	12	14	06.77

SUN, 2024

FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Feb.	15	325	47	24.00	+0.07	325	46	59.12	20.75	-19.22	-4.17	+8.93	19.04
	16	326	48	01.48	0.22	326	47	36.60	20.75	19.08	4.18	8.89	19.00
	17	327	48	37.22	0.32	327	48	12.38	20.75	18.94	4.14	8.86	18.97
	18	328	49	11.15	0.40	328	48	46.40	20.74	18.80	4.06	8.84	18.95
	19	329	49	43.31	0.47	329	49	18.66	20.74	18.66	3.96	8.85	18.95
	20	330	50	13.70	0.47	330	49	49.15	20.73	18.53	3.86	8.87	18.97
	21	331	50	42.32	+0.47	331	50	17.84	20.73	-18.39	-3.79	+8.92	19.02
	22	332	51	09.21	0.47	332	50	44.77	20.72	18.25	3.76	8.97	19.07
	23	333	51	34.38	0.40	333	51	09.94	20.72	18.11	3.77	9.04	19.14
	24	334	51	57.83	0.32	334	51	33.34	20.71	17.97	3.82	9.10	19.20
	25	335	52	19.59	0.22	335	51	55.01	20.71	17.83	3.92	9.15	19.25
	26	336	52	39.76	+0.11	336	52	15.06	20.71	17.69	4.04	9.19	19.29
	27	337	52	58.28	-0.04	337	52	33.46	20.70	-17.55	-4.17	+9.21	19.31
	28	338	53	15.22	0.14	338	52	50.27	20.70	17.41	4.31	9.21	19.31
	29	339	53	30.59	0.29	339	53	05.53	20.69	17.27	4.42	9.20	19.29
Mar.	1	340	53	44.42	0.40	340	53	19.28	20.69	17.13	4.49	9.17	19.26
	2	341	53	56.68	0.54	341	53	31.52	20.68	16.99	4.52	9.13	19.22
	3	342	54	07.45	0.61	342	53	42.32	20.67	16.86	4.50	9.10	19.19
	4	343	54	16.71	-0.68	343	53	51.65	20.67	-16.72	-4.44	+9.08	19.17
	5	344	54	24.45	0.72	344	53	59.50	20.66	16.58	4.34	9.08	19.17
	6	345	54	30.63	0.76	345	54	05.80	20.66	16.44	4.23	9.11	19.19
	7	346	54	35.25	0.72	346	54	10.51	20.65	16.30	4.14	9.16	19.24
	8	347	54	38.23	0.68	347	54	13.54	20.65	16.16	4.10	9.23	19.31
	9	348	54	39.52	0.58	348	54	14.80	20.64	16.02	4.13	9.31	19.38
	10	349	54	39.04	-0.47	349	54	14.22	20.64	-15.88	-4.23	+9.37	19.44
	11	350	54	36.66	0.32	350	54	11.70	20.63	15.74	4.37	9.40	19.47
	12	351	54	32.33	0.22	351	54	07.24	20.63	15.60	4.52	9.39	19.47
	13	352	54	25.93	-0.07	352	54	00.72	20.62	15.46	4.63	9.36	19.43
	14	353	54	17.41	+0.07	353	53	52.15	20.61	15.32	4.69	9.30	19.38
	15	354	54	06.63	0.18	354	53	41.39	20.61	15.19	4.68	9.25	19.32
	16	355	53	53.65	+0.29	355	53	28.46	20.60	-15.05	-4.62	+9.21	19.28
	17	356	53	38.40	0.36	356	53	13.31	20.60	14.91	4.54	9.19	19.26
	18	357	53	20.89	0.40	357	52	55.88	20.59	14.77	4.46	9.20	19.27
	19	358	53	01.10	0.40	358	52	36.16	20.59	14.63	4.40	9.22	19.29
	20	359	52	39.07	0.40	359	52	14.16	20.58	14.49	4.38	9.26	19.33
	21	0	52	14.78	0.32	0	51	49.86	20.58	14.35	4.39	9.31	19.37
	22	1	51	48.31	+0.25	1	51	23.33	20.57	-14.21	-4.45	+9.36	19.42
	23	2	51	19.68	0.18	2	50	54.60	20.56	14.07	4.56	9.39	19.46
	24	3	50	48.91	+0.07	3	50	23.71	20.56	13.93	4.69	9.42	19.48
	25	4	50	16.04	-0.07	4	49	50.70	20.55	13.79	4.84	9.43	19.49
	26	5	49	41.16	0.22	5	49	15.67	20.55	13.66	4.98	9.42	19.47
	27	6	49	04.23	0.32	6	48	38.63	20.54	13.52	5.11	9.39	19.44
	28	7	48	25.37	-0.47	7	47	59.68	20.53	-13.38	-5.21	+9.34	19.40
	29	8	47	44.63	0.58	8	47	18.89	20.53	13.24	5.26	9.29	19.34
	30	9	47	02.00	0.68	9	46	36.26	20.52	13.10	5.26	9.24	19.29
	31	10	46	17.56	0.76	10	45	51.88	20.52	12.96	5.21	9.20	19.25
Apr.	1	11	45	31.35	-0.79	11	45	05.76	20.51	-12.82	-5.13	+9.17	19.22

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

SUN, 2024
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Feb.	15	21	52	09.40	-12	55	29.82	0.987 5695	16	11.72	12	14	06.77
	16	21	56	03.28	12	34	55.70	0.987 7586	16	11.54	12	14	03.72
	17	21	59	56.43	12	14	09.53	0.987 9512	16	11.35	12	13	59.94
	18	22	03	48.86	11	53	11.74	0.988 1475	16	11.16	12	13	55.44
	19	22	07	40.58	11	32	02.76	0.988 3477	16	10.96	12	13	50.24
	20	22	11	31.60	11	10	43.00	0.988 5521	16	10.76	12	13	44.35
	21	22	15	21.94	-10	49	12.87	0.988 7607	16	10.55	12	13	37.79
	22	22	19	11.61	10	27	32.76	0.988 9737	16	10.34	12	13	30.58
	23	22	23	00.64	10	05	43.07	0.989 1910	16	10.13	12	13	22.73
	24	22	26	49.04	9	43	44.19	0.989 4127	16	09.91	12	13	14.27
	25	22	30	36.83	9	21	36.49	0.989 6388	16	09.69	12	13	05.21
	26	22	34	24.03	8	59	20.36	0.989 8692	16	09.47	12	12	55.57
	27	22	38	10.66	-8	36	56.16	0.990 1038	16	09.24	12	12	45.38
	28	22	41	56.75	8	14	24.28	0.990 3423	16	09.00	12	12	34.65
	29	22	45	42.31	7	51	45.08	0.990 5847	16	08.77	12	12	23.40
Mar.	1	22	49	27.36	7	28	58.93	0.990 8308	16	08.53	12	12	11.65
	2	22	53	11.93	7	06	06.22	0.991 0801	16	08.28	12	11	59.43
	3	22	56	56.04	6	43	07.32	0.991 3326	16	08.04	12	11	46.75
	4	23	00	39.70	-6	20	02.61	0.991 5878	16	07.79	12	11	33.63
	5	23	04	22.93	5	56	52.48	0.991 8453	16	07.53	12	11	20.09
	6	23	08	05.75	5	33	37.33	0.992 1049	16	07.28	12	11	06.16
	7	23	11	48.18	5	10	17.56	0.992 3660	16	07.03	12	10	51.84
	8	23	15	30.23	4	46	53.58	0.992 6283	16	06.77	12	10	37.15
	9	23	19	11.92	4	23	25.79	0.992 8915	16	06.52	12	10	22.11
	10	23	22	53.27	-3	59	54.61	0.993 1552	16	06.26	12	10	06.74
	11	23	26	34.28	3	36	20.45	0.993 4194	16	06.00	12	09	51.05
	12	23	30	14.98	3	12	43.72	0.993 6838	16	05.74	12	09	35.06
	13	23	33	55.39	2	49	04.81	0.993 9485	16	05.49	12	09	18.77
	14	23	37	35.51	2	25	24.14	0.994 2138	16	05.23	12	09	02.22
	15	23	41	15.38	2	01	42.09	0.994 4797	16	04.97	12	08	45.41
	16	23	44	55.01	-1	37	59.08	0.994 7466	16	04.71	12	08	28.36
	17	23	48	34.42	1	14	15.49	0.995 0146	16	04.45	12	08	11.11
	18	23	52	13.62	0	50	31.69	0.995 2841	16	04.19	12	07	53.66
	19	23	55	52.64	0	26	48.05	0.995 5551	16	03.93	12	07	36.04
	20	23	59	31.50	-0	03	04.95	0.995 8278	16	03.67	12	07	18.27
	21	0	03	10.21	+0	20	37.27	0.996 1023	16	03.40	12	07	00.37
	22	0	06	48.81	+0	44	18.27	0.996 3788	16	03.13	12	06	42.37
	23	0	10	27.31	1	07	57.69	0.996 6573	16	02.86	12	06	24.29
	24	0	14	05.74	1	31	35.22	0.996 9378	16	02.59	12	06	06.14
	25	0	17	44.12	1	55	10.51	0.997 2203	16	02.32	12	05	47.97
	26	0	21	22.47	2	18	43.24	0.997 5049	16	02.05	12	05	29.78
	27	0	25	00.83	2	42	13.09	0.997 7912	16	01.77	12	05	11.59
	28	0	28	39.20	+3	05	39.73	0.998 0794	16	01.49	12	04	53.44
	29	0	32	17.63	3	29	02.84	0.998 3692	16	01.21	12	04	35.35
	30	0	35	56.12	3	52	22.09	0.998 6603	16	00.93	12	04	17.33
	31	0	39	34.70	4	15	37.16	0.998 9525	16	00.65	12	03	59.42
Apr.	1	0	43	13.40	+4	38	47.70	0.999 2456	16	00.37	12	03	41.62

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Apr.	1	11	45	31.35	-0.79	11	45	05.76	20.51	-12.82	-5.13	+9.17	19.22
	2	12	44	43.37	0.83	12	44	17.88	20.50	12.68	5.03	9.17	19.22
	3	13	43	53.63	0.79	13	43	28.24	20.50	12.54	4.94	9.20	19.24
	4	14	43	02.16	0.76	14	42	36.83	20.49	12.40	4.89	9.24	19.29
	5	15	42	08.96	0.68	15	41	43.62	20.49	12.26	4.89	9.30	19.34
	6	16	41	14.01	0.58	16	40	48.61	20.48	12.12	4.97	9.34	19.39
	7	17	40	17.22	-0.47	17	39	51.70	20.48	-11.99	-5.09	+9.37	19.41
	8	18	39	18.53	0.32	18	38	52.87	20.47	11.85	5.24	9.36	19.41
	9	19	38	17.88	0.18	19	37	52.10	20.46	11.71	5.36	9.32	19.36
	10	20	37	15.24	-0.04	20	36	49.39	20.46	11.57	5.43	9.26	19.30
	11	21	36	10.47	+0.11	21	35	44.63	20.45	11.43	5.44	9.19	19.22
	12	22	35	03.52	0.22	22	34	37.74	20.45	11.29	5.38	9.12	19.15
	13	23	33	54.37	+0.29	23	33	28.69	20.44	-11.15	-5.28	+9.07	19.11
	14	24	32	42.98	0.36	24	32	17.41	20.43	11.01	5.18	9.05	19.09
	15	25	31	29.33	0.36	25	31	03.86	20.43	10.87	5.08	9.06	19.09
	16	26	30	13.41	0.36	26	29	48.01	20.42	10.73	5.02	9.08	19.11
	17	27	28	55.31	0.32	27	28	29.93	20.42	10.59	5.01	9.11	19.14
	18	28	27	34.94	0.25	28	27	09.54	20.41	10.45	5.03	9.14	19.17
	19	29	26	12.42	+0.18	29	25	46.96	20.41	-10.32	-5.11	+9.17	19.19
	20	30	24	47.78	+0.07	30	24	22.21	20.40	10.18	5.21	9.18	19.21
	21	31	23	20.99	-0.04	31	22	55.31	20.40	10.04	5.33	9.18	19.21
	22	32	21	52.19	0.18	32	21	26.39	20.39	9.90	5.46	9.16	19.18
	23	33	20	21.36	0.29	33	19	55.45	20.39	9.76	5.56	9.12	19.14
	24	34	18	48.62	0.43	34	18	22.64	20.38	9.62	5.64	9.07	19.09
	25	35	17	14.01	-0.54	35	16	48.00	20.37	-9.48	-5.68	+9.00	19.02
	26	36	15	37.58	0.65	36	15	11.59	20.37	9.34	5.66	8.94	18.96
	27	37	13	59.40	0.72	37	13	33.49	20.36	9.20	5.59	8.88	18.90
	28	38	12	19.57	0.79	38	11	53.77	20.36	9.06	5.49	8.84	18.86
	29	39	10	38.14	0.79	39	10	12.47	20.35	8.92	5.37	8.83	18.84
	30	40	08	55.17	0.79	40	08	29.62	20.35	8.78	5.25	8.83	18.85
May	1	41	07	10.71	-0.76	41	06	45.25	20.34	-8.65	-5.16	+8.86	18.87
	2	42	05	24.79	0.68	42	04	59.38	20.34	8.51	5.12	8.90	18.91
	3	43	03	37.42	0.61	43	03	11.99	20.33	8.37	5.14	8.95	18.95
	4	44	01	48.62	0.47	44	01	23.12	20.33	8.23	5.22	8.97	18.98
	5	44	59	58.38	0.36	44	59	32.78	20.32	8.09	5.32	8.97	18.97
	6	45	58	06.67	0.22	45	57	40.97	20.32	7.95	5.43	8.93	18.94
	7	46	56	13.47	-0.07	46	55	47.71	20.31	-7.81	-5.49	+8.87	18.88
	8	47	54	18.69	+0.07	47	53	52.94	20.31	7.67	5.49	8.79	18.80
	9	48	52	22.27	0.18	48	51	56.59	20.30	7.53	5.42	8.72	18.72
	10	49	50	24.20	0.29	49	49	58.66	20.30	7.39	5.30	8.66	18.66
	11	50	48	24.39	0.32	50	47	58.99	20.29	7.25	5.15	8.62	18.62
	12	51	46	22.84	0.36	51	45	57.60	20.29	7.12	5.00	8.61	18.61
	13	52	44	19.53	+0.36	52	43	54.41	20.28	-6.98	-4.88	+8.63	18.62
	14	53	42	14.42	0.36	53	41	49.38	20.28	6.84	4.81	8.65	18.65
	15	54	40	07.57	0.29	54	39	42.55	20.28	6.70	4.78	8.68	18.68
	16	55	37	58.95	0.22	55	37	33.92	20.27	6.56	4.80	8.71	18.70
	17	56	35	48.61	+0.11	56	35	23.53	20.27	-6.42	-4.86	+8.73	18.72

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

SUN, 2024
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Apr.	1	0	43	13.40	+4	38	47.70	0.999 2456	16	00.37	12	03	41.62
	2	0	46	52.23	5	01	53.38	0.999 5392	16	00.09	12	03	23.96
	3	0	50	31.20	5	24	53.85	0.999 8328	15	59.81	12	03	06.46
	4	0	54	10.35	5	47	48.74	1.000 1262	15	59.52	12	02	49.14
	5	0	57	49.67	6	10	37.71	1.000 4189	15	59.24	12	02	32.02
	6	1	01	29.20	6	33	20.37	1.000 7104	15	58.96	12	02	15.11
	7	1	05	08.95	+6	55	56.37	1.001 0004	15	58.69	12	01	58.42
	8	1	08	48.92	7	18	25.32	1.001 2886	15	58.41	12	01	41.97
	9	1	12	29.14	7	40	46.86	1.001 5747	15	58.14	12	01	25.78
	10	1	16	09.63	8	03	00.63	1.001 8587	15	57.86	12	01	09.85
	11	1	19	50.39	8	25	06.25	1.002 1406	15	57.60	12	00	54.20
	12	1	23	31.44	8	47	03.35	1.002 4204	15	57.33	12	00	38.84
	13	1	27	12.79	+9	08	51.58	1.002 6984	15	57.06	12	00	23.79
	14	1	30	54.45	9	30	30.56	1.002 9748	15	56.80	12	00	09.05
	15	1	34	36.44	9	51	59.95	1.003 2498	15	56.54	11	59	54.64
	16	1	38	18.76	10	13	19.40	1.003 5235	15	56.28	11	59	40.59
	17	1	42	01.43	10	34	28.57	1.003 7961	15	56.02	11	59	26.89
	18	1	45	44.48	10	55	27.13	1.004 0679	15	55.76	11	59	13.57
	19	1	49	27.90	+11	16	14.77	1.004 3389	15	55.50	11	59	00.65
	20	1	53	11.72	11	36	51.15	1.004 6093	15	55.24	11	58	48.13
	21	1	56	55.96	11	57	15.98	1.004 8792	15	54.99	11	58	36.03
	22	2	00	40.63	12	17	28.95	1.005 1486	15	54.73	11	58	24.38
	23	2	04	25.75	12	37	29.74	1.005 4176	15	54.47	11	58	13.18
	24	2	08	11.33	12	57	18.07	1.005 6861	15	54.22	11	58	02.44
	25	2	11	57.39	+13	16	53.62	1.005 9542	15	53.96	11	57	52.19
	26	2	15	43.94	13	36	16.12	1.006 2218	15	53.71	11	57	42.43
	27	2	19	30.99	13	55	25.25	1.006 4887	15	53.46	11	57	33.18
	28	2	23	18.56	14	14	20.72	1.006 7547	15	53.21	11	57	24.45
	29	2	27	06.66	14	33	02.22	1.007 0197	15	52.96	11	57	16.26
	30	2	30	55.30	14	51	29.43	1.007 2832	15	52.71	11	57	08.61
May	1	2	34	44.49	+15	09	42.04	1.007 5451	15	52.46	11	57	01.51
	2	2	38	34.22	15	27	39.72	1.007 8048	15	52.21	11	56	54.97
	3	2	42	24.52	15	45	22.14	1.008 0621	15	51.97	11	56	49.00
	4	2	46	15.39	16	02	48.97	1.008 3164	15	51.73	11	56	43.60
	5	2	50	06.83	16	19	59.87	1.008 5674	15	51.49	11	56	38.78
	6	2	53	58.85	16	36	54.53	1.008 8148	15	51.26	11	56	34.54
	7	2	57	51.44	+16	53	32.60	1.009 0581	15	51.03	11	56	30.87
	8	3	01	44.62	17	09	53.78	1.009 2972	15	50.80	11	56	27.77
	9	3	05	38.37	17	25	57.75	1.009 5321	15	50.58	11	56	25.24
	10	3	09	32.69	17	41	44.18	1.009 7626	15	50.37	11	56	23.28
	11	3	13	27.58	17	57	12.75	1.009 9889	15	50.15	11	56	21.89
	12	3	17	23.03	18	12	23.17	1.010 2112	15	49.94	11	56	21.05
	13	3	21	19.03	+18	27	15.11	1.010 4296	15	49.74	11	56	20.77
	14	3	25	15.59	18	41	48.30	1.010 6443	15	49.54	11	56	21.04
	15	3	29	12.69	18	56	02.43	1.010 8555	15	49.34	11	56	21.86
	16	3	33	10.34	19	09	57.23	1.011 0634	15	49.14	11	56	23.23
	17	3	37	08.53	+19	23	32.44	1.011 2682	15	48.95	11	56	25.13

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra-tion	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
May	17	56	35	48.61	+0.11	56	35	23.53	20.27	-6.42	-4.86	+8.73	18.72
	18	57	33	36.60	0.00	57	33	11.45	20.26	6.28	4.94	8.74	18.72
	19	58	31	22.95	-0.11	58	30	57.71	20.26	6.14	5.03	8.72	18.71
	20	59	29	07.66	0.22	59	28	42.35	20.26	6.00	5.10	8.69	18.67
	21	60	26	50.87	0.36	60	26	25.51	20.25	5.86	5.15	8.64	18.62
	22	61	24	32.60	0.47	61	24	07.24	20.25	5.72	5.16	8.58	18.56
	23	62	22	12.91	-0.58	62	21	47.59	20.24	-5.58	-5.12	+8.52	18.50
	24	63	19	51.95	0.65	63	19	26.72	20.24	5.45	5.03	8.46	18.44
	25	64	17	29.68	0.72	64	17	04.60	20.24	5.31	4.89	8.42	18.40
	26	65	15	06.31	0.72	65	14	41.39	20.23	5.17	4.73	8.40	18.38
	27	66	12	41.85	0.72	66	12	17.10	20.23	5.03	4.57	8.40	18.38
	28	67	10	16.39	0.68	67	09	51.77	20.23	4.89	4.44	8.43	18.41
	29	68	07	50.03	-0.65	68	07	25.50	20.22	-4.75	-4.35	+8.48	18.45
	30	69	05	22.83	0.54	69	04	58.33	20.22	4.61	4.33	8.53	18.50
	31	70	02	54.83	0.43	70	02	30.30	20.22	4.47	4.36	8.56	18.53
June	1	71	00	26.07	0.32	71	00	01.48	20.21	4.33	4.42	8.57	18.54
	2	71	57	56.59	0.18	71	57	31.93	20.21	4.19	4.50	8.56	18.53
	3	72	55	26.34	-0.04	72	55	01.63	20.21	4.05	4.55	8.51	18.48
	4	73	52	55.34	+0.11	73	52	30.65	20.20	-3.91	-4.54	+8.45	18.41
	5	74	50	23.53	0.22	74	49	58.91	20.20	3.78	4.47	8.38	18.35
	6	75	47	50.90	0.29	75	47	26.41	20.20	3.64	4.33	8.32	18.29
	7	76	45	17.40	0.36	76	44	53.09	20.19	3.50	4.16	8.29	18.25
	8	77	42	43.00	0.40	77	42	18.86	20.19	3.36	3.98	8.28	18.24
	9	78	40	07.67	0.43	78	39	43.70	20.19	3.22	3.82	8.29	18.25
	10	79	37	31.38	+0.40	79	37	07.54	20.19	-3.08	-3.70	+8.33	18.29
	11	80	34	54.09	0.36	80	34	30.32	20.19	2.94	3.63	8.37	18.33
	12	81	32	15.81	0.29	81	31	52.07	20.18	2.80	3.61	8.42	18.37
	13	82	29	36.60	0.22	82	29	12.84	20.18	2.66	3.63	8.45	18.41
	14	83	26	56.42	+0.11	83	26	32.60	20.18	2.52	3.68	8.47	18.43
	15	84	24	15.31	0.00	84	23	51.43	20.18	2.38	3.74	8.48	18.43
	16	85	21	33.33	-0.14	85	21	09.40	20.18	-2.24	-3.80	+8.46	18.41
	17	86	18	50.47	0.25	86	18	26.50	20.17	2.11	3.84	8.43	18.38
	18	87	16	06.82	0.36	87	15	42.84	20.17	1.97	3.85	8.39	18.34
	19	88	13	22.43	0.47	88	12	58.50	20.17	1.83	3.81	8.34	18.29
	20	89	10	37.38	0.54	89	10	13.55	20.17	1.69	3.71	8.29	18.24
	21	90	07	51.71	0.61	90	07	28.02	20.17	1.55	3.57	8.26	18.20
	22	91	05	05.50	-0.65	91	04	41.99	20.17	-1.41	-3.39	+8.25	18.19
	23	92	02	18.89	0.65	92	01	55.56	20.17	1.27	3.21	8.26	18.20
	24	92	59	31.97	0.61	92	59	08.81	20.17	1.13	3.05	8.30	18.24
	25	93	56	44.82	0.54	93	56	21.77	20.16	0.99	2.93	8.36	18.30
	26	94	53	57.54	0.47	94	53	34.55	20.16	0.85	2.88	8.43	18.37
	27	95	51	10.23	0.36	95	50	47.22	20.16	0.71	2.89	8.48	18.42
	28	96	48	22.95	-0.22	96	47	59.89	20.16	-0.57	-2.94	+8.51	18.45
	29	97	45	35.73	-0.11	97	45	12.60	20.16	0.43	3.01	8.52	18.45
	30	98	42	48.66	+0.04	98	42	25.49	20.16	0.30	3.06	8.50	18.43
July	1	99	40	01.70	0.18	99	39	38.52	20.16	0.16	3.07	8.45	18.39
	2	100	37	14.93	+0.29	100	36	51.80	20.16	-0.02	-3.01	+8.40	18.33

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

SUN, 2024
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
May	17	3	37	08.53	+19	23	32.44	1.011 2682	15	48.95	11	56	25.13
	18	3	41	07.26	19	36	47.81	1.011 4701	15	48.76	11	56	27.58
	19	3	45	06.53	19	49	43.07	1.011 6692	15	48.58	11	56	30.56
	20	3	49	06.32	20	02	17.99	1.011 8656	15	48.39	11	56	34.06
	21	3	53	06.64	20	14	32.34	1.012 0595	15	48.21	11	56	38.09
	22	3	57	07.49	20	26	25.89	1.012 2510	15	48.03	11	56	42.64
	23	4	01	08.85	+20	37	58.43	1.012 4402	15	47.85	11	56	47.70
	24	4	05	10.73	20	49	09.74	1.012 6271	15	47.68	11	56	53.27
	25	4	09	13.11	20	59	59.61	1.012 8116	15	47.51	11	56	59.33
	26	4	13	15.99	21	10	27.83	1.012 9937	15	47.34	11	57	05.89
	27	4	17	19.36	21	20	34.19	1.013 1733	15	47.17	11	57	12.93
	28	4	21	23.20	21	30	18.49	1.013 3501	15	47.00	11	57	20.45
	29	4	25	27.51	+21	39	40.51	1.013 5239	15	46.84	11	57	28.43
	30	4	29	32.28	21	48	40.04	1.013 6944	15	46.68	11	57	36.86
	31	4	33	37.48	21	57	16.86	1.013 8611	15	46.52	11	57	45.73
June	1	4	37	43.12	22	05	30.78	1.014 0238	15	46.37	11	57	55.02
	2	4	41	49.16	22	13	21.61	1.014 1819	15	46.23	11	58	04.72
	3	4	45	55.61	22	20	49.15	1.014 3352	15	46.08	11	58	14.80
	4	4	50	02.43	+22	27	53.24	1.014 4832	15	45.94	11	58	25.25
	5	4	54	09.61	22	34	33.73	1.014 6259	15	45.81	11	58	36.04
	6	4	58	17.12	22	40	50.47	1.014 7629	15	45.68	11	58	47.14
	7	5	02	24.94	22	46	43.30	1.014 8941	15	45.56	11	58	58.54
	8	5	06	33.04	22	52	12.11	1.015 0197	15	45.44	11	59	10.20
	9	5	10	41.39	22	57	16.75	1.015 1396	15	45.33	11	59	22.11
	10	5	14	49.96	+23	01	57.11	1.015 2540	15	45.23	11	59	34.23
	11	5	18	58.74	23	06	13.09	1.015 3630	15	45.12	11	59	46.54
	12	5	23	07.69	23	10	04.59	1.015 4669	15	45.03	11	59	59.02
	13	5	27	16.80	23	13	31.53	1.015 5658	15	44.94	12	00	11.64
	14	5	31	26.04	23	16	33.83	1.015 6599	15	44.85	12	00	24.39
	15	5	35	35.38	23	19	11.46	1.015 7495	15	44.77	12	00	37.23
	16	5	39	44.82	+23	21	24.37	1.015 8348	15	44.69	12	00	50.15
	17	5	43	54.32	23	23	12.52	1.015 9159	15	44.61	12	01	03.12
	18	5	48	03.86	23	24	35.89	1.015 9931	15	44.54	12	01	16.13
	19	5	52	13.43	23	25	34.49	1.016 0666	15	44.47	12	01	29.14
	20	5	56	23.00	23	26	08.32	1.016 1365	15	44.41	12	01	42.14
	21	6	00	32.55	23	26	17.39	1.016 2030	15	44.34	12	01	55.12
	22	6	04	42.07	+23	26	01.72	1.016 2662	15	44.28	12	02	08.04
	23	6	08	51.52	23	25	21.34	1.016 3261	15	44.23	12	02	20.89
	24	6	13	00.90	23	24	16.26	1.016 3829	15	44.18	12	02	33.66
	25	6	17	10.17	23	22	46.52	1.016 4362	15	44.13	12	02	46.32
	26	6	21	19.33	23	20	52.14	1.016 4860	15	44.08	12	02	58.85
	27	6	25	28.34	23	18	33.15	1.016 5321	15	44.04	12	03	11.23
	28	6	29	37.20	+23	15	49.59	1.016 5740	15	44.00	12	03	23.45
	29	6	33	45.88	23	12	41.52	1.016 6116	15	43.96	12	03	35.49
	30	6	37	54.36	23	09	08.99	1.016 6443	15	43.93	12	03	47.31
July	1	6	42	02.62	23	05	12.10	1.016 6719	15	43.91	12	03	58.90
	2	6	46	10.65	+23	00	50.95	1.016 6941	15	43.89	12	04	10.23

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberration	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
July	1	99	40	01.70	+0.18	99	39	38.52	20.16	-0.16	-3.07	+8.45	18.39
	2	100	37	14.93	0.29	100	36	51.80	20.16	-0.02	3.01	8.40	18.33
	3	101	34	28.28	0.36	101	34	05.27	20.16	+0.12	2.90	8.36	18.29
	4	102	31	41.73	0.43	102	31	18.88	20.16	0.26	2.74	8.33	18.26
	5	103	28	55.27	0.50	103	28	32.59	20.16	0.40	2.57	8.33	18.26
	6	104	26	08.90	0.50	104	25	46.38	20.16	0.54	2.40	8.36	18.28
	7	105	23	22.55	+0.50	105	23	00.17	20.16	+0.68	-2.27	+8.40	18.33
	8	106	20	36.18	0.47	106	20	13.88	20.16	0.82	2.19	8.46	18.38
	9	107	17	49.83	0.40	107	17	27.56	20.16	0.96	2.15	8.52	18.44
	10	108	15	03.45	0.29	108	14	41.17	20.16	1.10	2.17	8.58	18.50
	11	109	12	17.00	0.22	109	11	54.67	20.16	1.24	2.22	8.62	18.54
	12	110	09	30.58	+0.07	110	09	08.17	20.16	1.37	2.29	8.64	18.56
	13	111	06	44.11	-0.04	111	06	21.64	20.16	+1.51	-2.36	+8.65	18.57
	14	112	03	57.64	0.14	112	03	35.10	20.16	1.65	2.42	8.64	18.56
	15	113	01	11.21	0.25	113	00	48.64	20.16	1.79	2.45	8.62	18.53
	16	113	58	24.81	0.36	113	58	02.24	20.16	1.93	2.44	8.58	18.50
	17	114	55	38.53	0.43	114	55	16.03	20.17	2.07	2.38	8.55	18.46
	18	115	52	52.43	0.50	115	52	30.04	20.17	2.21	2.27	8.53	18.44
	19	116	50	06.54	-0.54	116	49	44.29	20.17	+2.35	-2.12	+8.52	18.43
	20	117	47	20.91	0.54	117	46	58.84	20.17	2.49	1.95	8.54	18.45
	21	118	44	35.69	0.50	118	44	13.78	20.17	2.63	1.79	8.58	18.49
	22	119	41	50.95	0.47	119	41	29.15	20.17	2.77	1.67	8.65	18.56
	23	120	39	06.81	0.36	120	38	45.06	20.17	2.91	1.62	8.73	18.64
	24	121	36	23.34	0.25	121	36	01.58	20.18	3.04	1.63	8.81	18.71
	25	122	33	40.66	-0.14	122	33	18.83	20.18	+3.18	-1.70	+8.86	18.76
	26	123	30	58.86	0.00	123	30	36.94	20.18	3.32	1.79	8.89	18.79
	27	124	28	18.02	+0.14	124	27	56.02	20.18	3.46	1.87	8.88	18.78
	28	125	25	38.19	0.25	125	25	16.14	20.18	3.60	1.91	8.85	18.75
	29	126	22	59.38	0.40	126	22	37.34	20.19	3.74	1.90	8.81	18.71
	30	127	20	21.63	0.47	127	19	59.66	20.19	3.88	1.82	8.78	18.67
	31	128	17	44.95	+0.54	128	17	23.10	20.19	+4.02	-1.71	+8.76	18.65
Aug.	1	129	15	09.33	0.61	129	14	47.62	20.19	4.16	1.57	8.76	18.65
	2	130	12	34.76	0.61	130	12	13.18	20.20	4.30	1.43	8.79	18.68
	3	131	10	01.19	0.61	131	09	39.71	20.20	4.44	1.32	8.84	18.73
	4	132	07	28.59	0.58	132	07	07.18	20.20	4.58	1.26	8.90	18.79
	5	133	04	56.98	0.50	133	04	35.58	20.20	4.71	1.24	8.97	18.86
	6	134	02	26.29	+0.40	134	02	04.85	20.21	+4.85	-1.28	+9.03	18.92
	7	134	59	56.53	0.32	134	59	35.02	20.21	4.99	1.35	9.09	18.97
	8	135	57	27.67	0.18	135	57	06.05	20.21	5.13	1.45	9.13	19.01
	9	136	54	59.67	+0.07	136	54	37.94	20.22	5.27	1.56	9.14	19.03
	10	137	52	32.57	-0.04	137	52	10.74	20.22	5.41	1.66	9.15	19.03
	11	138	50	06.35	0.14	138	49	44.44	20.22	5.55	1.74	9.13	19.01
	12	139	47	41.03	-0.25	139	47	19.07	20.23	+5.69	-1.78	+9.11	18.98
	13	140	45	16.56	0.36	140	44	54.60	20.23	5.83	1.77	9.08	18.95
	14	141	42	53.05	0.43	141	42	31.14	20.23	5.97	1.72	9.05	18.93
	15	142	40	30.47	0.47	142	40	08.65	20.24	6.11	1.62	9.04	18.92
	16	143	38	08.87	-0.47	143	37	47.17	20.24	+6.25	-1.50	+9.05	18.93

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

SUN, 2024

FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
July	1	6	42	02.62	+23	05	12.10	1.016 6719	15	43.91	12	03	58.90
	2	6	46	10.65	23	00	50.95	1.016 6941	15	43.89	12	04	10.23
	3	6	50	18.41	22	56	05.64	1.016 7105	15	43.87	12	04	21.29
	4	6	54	25.87	22	50	56.32	1.016 7210	15	43.86	12	04	32.04
	5	6	58	33.03	22	45	23.10	1.016 7253	15	43.86	12	04	42.45
	6	7	02	39.83	22	39	26.14	1.016 7236	15	43.86	12	04	52.52
	7	7	06	46.27	+22	33	05.59	1.016 7157	15	43.87	12	05	02.20
	8	7	10	52.32	22	26	21.60	1.016 7017	15	43.88	12	05	11.49
	9	7	14	57.96	22	19	14.34	1.016 6817	15	43.90	12	05	20.35
	10	7	19	03.16	22	11	43.98	1.016 6559	15	43.92	12	05	28.77
	11	7	23	07.90	22	03	50.70	1.016 6245	15	43.95	12	05	36.73
	12	7	27	12.18	21	55	34.70	1.016 5876	15	43.99	12	05	44.22
	13	7	31	15.97	+21	46	56.17	1.016 5456	15	44.03	12	05	51.21
	14	7	35	19.27	21	37	55.34	1.016 4986	15	44.07	12	05	57.70
	15	7	39	22.05	21	28	32.40	1.016 4468	15	44.12	12	06	03.66
	16	7	43	24.31	21	18	47.60	1.016 3906	15	44.17	12	06	09.09
	17	7	47	26.03	21	08	41.15	1.016 3302	15	44.23	12	06	13.98
	18	7	51	27.21	20	58	13.31	1.016 2659	15	44.29	12	06	18.32
	19	7	55	27.84	+20	47	24.30	1.016 1978	15	44.35	12	06	22.11
	20	7	59	27.91	20	36	14.37	1.016 1264	15	44.41	12	06	25.32
	21	8	03	27.41	20	24	43.76	1.016 0516	15	44.48	12	06	27.97
	22	8	07	26.33	20	12	52.71	1.015 9738	15	44.56	12	06	30.04
	23	8	11	24.68	20	00	41.44	1.015 8929	15	44.63	12	06	31.54
	24	8	15	22.45	19	48	10.18	1.015 8088	15	44.71	12	06	32.46
	25	8	19	19.64	+19	35	19.14	1.015 7215	15	44.79	12	06	32.81
	26	8	23	16.24	19	22	08.56	1.015 6307	15	44.88	12	06	32.57
	27	8	27	12.27	19	08	38.67	1.015 5361	15	44.96	12	06	31.76
	28	8	31	07.72	18	54	49.73	1.015 4375	15	45.06	12	06	30.36
	29	8	35	02.59	18	40	42.01	1.015 3344	15	45.15	12	06	28.38
	30	8	38	56.88	18	26	15.78	1.015 2266	15	45.25	12	06	25.81
	31	8	42	50.58	+18	11	31.33	1.015 1139	15	45.36	12	06	22.65
Aug.	1	8	46	43.69	17	56	28.98	1.014 9959	15	45.47	12	06	18.89
	2	8	50	36.20	17	41	09.01	1.014 8726	15	45.58	12	06	14.54
	3	8	54	28.11	17	25	31.74	1.014 7437	15	45.70	12	06	09.59
	4	8	58	19.42	17	09	37.47	1.014 6094	15	45.83	12	06	04.03
	5	9	02	10.12	16	53	26.52	1.014 4695	15	45.96	12	05	57.88
	6	9	06	00.22	+16	36	59.19	1.014 3242	15	46.09	12	05	51.12
	7	9	09	49.71	16	20	15.80	1.014 1735	15	46.23	12	05	43.76
	8	9	13	38.61	16	03	16.67	1.014 0176	15	46.38	12	05	35.80
	9	9	17	26.90	15	46	02.11	1.013 8567	15	46.53	12	05	27.25
	10	9	21	14.60	15	28	32.44	1.013 6910	15	46.68	12	05	18.11
	11	9	25	01.72	15	10	47.98	1.013 5207	15	46.84	12	05	08.38
	12	9	28	48.26	+14	52	49.05	1.013 3461	15	47.01	12	04	58.08
	13	9	32	34.23	14	34	35.99	1.013 1674	15	47.17	12	04	47.20
	14	9	36	19.63	14	16	09.10	1.012 9850	15	47.34	12	04	35.77
	15	9	40	04.48	13	57	28.73	1.012 7991	15	47.52	12	04	23.79
	16	9	43	48.79	+13	38	35.18	1.012 6102	15	47.69	12	04	11.27

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FOR 0^h TERRESTRIAL TIME

Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra-tion	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Aug.	16	143	38	08.87	-0.47	143	37	47.17	20.24	+6.25	-1.50	+9.05	18.93
	17	144	35	48.31	0.47	144	35	26.74	20.24	6.39	1.37	9.09	18.96
	18	145	33	28.89	0.40	145	33	07.42	20.25	6.52	1.27	9.15	19.03
	19	146	31	10.60	0.32	146	30	49.18	20.25	6.66	1.22	9.23	19.10
	20	147	28	53.61	0.22	147	28	32.16	20.26	6.80	1.24	9.32	19.18
	21	148	26	38.02	-0.11	148	26	16.48	20.26	6.94	1.33	9.38	19.25
	22	149	24	23.90	+0.04	149	24	02.23	20.26	+7.08	-1.45	+9.42	19.28
	23	150	22	11.41	0.18	150	21	49.61	20.27	7.22	1.58	9.42	19.28
	24	151	20	00.54	0.32	151	19	38.64	20.27	7.36	1.67	9.39	19.25
	25	152	17	51.44	0.43	152	17	29.51	20.28	7.50	1.71	9.35	19.21
	26	153	15	44.13	0.54	153	15	22.21	20.28	7.64	1.68	9.31	19.17
	27	154	13	38.63	0.61	154	13	16.79	20.28	7.78	1.60	9.28	19.14
	28	155	11	34.95	+0.68	155	11	13.20	20.29	+7.92	-1.50	+9.27	19.13
	29	156	09	33.10	0.68	156	09	11.45	20.29	8.06	1.40	9.29	19.15
	30	157	07	33.07	0.68	157	07	11.50	20.30	8.19	1.32	9.33	19.18
	31	158	05	34.85	0.65	158	05	13.31	20.30	8.33	1.28	9.38	19.24
Sept.	1	159	03	38.40	0.58	159	03	16.85	20.31	8.47	1.29	9.45	19.30
	2	160	01	43.66	0.50	160	01	22.04	20.31	8.61	1.34	9.51	19.36
	3	160	59	50.65	+0.40	160	59	28.93	20.32	+8.75	-1.44	+9.56	19.41
	4	161	57	59.32	0.29	161	57	37.48	20.32	8.89	1.57	9.59	19.44
	5	162	56	09.64	0.14	162	55	47.64	20.33	9.03	1.71	9.61	19.46
	6	163	54	21.60	+0.04	163	53	59.46	20.33	9.17	1.85	9.61	19.45
	7	164	52	35.12	-0.11	164	52	12.86	20.34	9.31	1.97	9.59	19.43
	8	165	50	50.27	0.22	165	50	27.92	20.34	9.45	2.05	9.55	19.40
	9	166	49	06.93	-0.29	166	48	44.53	20.35	+9.59	-2.09	+9.52	19.36
	10	167	47	25.16	0.36	167	47	02.76	20.35	9.73	2.09	9.48	19.32
	11	168	45	44.93	0.43	168	45	22.57	20.36	9.87	2.04	9.46	19.30
	12	169	44	06.21	0.47	169	43	43.93	20.36	10.00	1.96	9.45	19.29
	13	170	42	29.07	0.43	170	42	06.88	20.37	10.14	1.87	9.46	19.30
	14	171	40	53.48	0.40	171	40	31.37	20.37	10.28	1.78	9.50	19.34
	15	172	39	19.52	-0.32	172	38	57.44	20.38	+10.42	-1.74	+9.56	19.40
	16	173	37	47.20	0.25	173	37	25.10	20.39	10.56	1.76	9.63	19.47
	17	174	36	16.57	-0.11	174	35	54.38	20.39	10.70	1.84	9.69	19.53
	18	175	34	47.79	0.00	175	34	25.46	20.40	10.84	1.97	9.73	19.56
	19	176	33	20.90	+0.14	176	32	58.42	20.40	10.98	2.13	9.73	19.56
	20	177	31	56.00	0.32	177	31	33.38	20.41	11.12	2.26	9.70	19.53
	21	178	30	33.21	+0.43	178	30	10.51	20.41	+11.26	-2.33	+9.64	19.47
	22	179	29	12.58	0.54	179	28	49.87	20.42	11.40	2.33	9.58	19.41
	23	180	27	54.16	0.65	180	27	31.50	20.42	11.54	2.28	9.53	19.36
	24	181	26	38.01	0.72	181	26	15.43	20.43	11.67	2.19	9.50	19.33
	25	182	25	24.12	0.72	182	25	01.63	20.44	11.81	2.09	9.50	19.32
	26	183	24	12.51	0.72	183	23	50.10	20.44	11.95	2.02	9.52	19.34
	27	184	23	03.18	+0.68	184	22	40.80	20.45	+12.09	-1.98	+9.55	19.37
	28	185	21	56.09	0.65	185	21	33.70	20.45	12.23	1.98	9.60	19.42
	29	186	20	51.20	0.54	186	20	28.75	20.46	12.37	2.04	9.64	19.46
	30	187	19	48.52	0.43	187	19	25.97	20.46	12.51	2.14	9.68	19.50
Oct.	1	188	18	48.00	+0.32	188	18	25.31	20.47	+12.65	-2.27	+9.70	19.52

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

SUN, 2024
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Aug.	16	9	43	48.79	+13	38	35.18	1.012 6102	15	47.69	12	04	11.27
	17	9	47	32.57	13	19	28.79	1.012 4185	15	47.87	12	03	58.22
	18	9	51	15.82	13	00	09.86	1.012 2243	15	48.06	12	03	44.66
	19	9	54	58.57	12	40	38.69	1.012 0279	15	48.24	12	03	30.60
	20	9	58	40.82	12	20	55.56	1.011 8295	15	48.43	12	03	16.07
	21	10	02	22.60	12	01	00.76	1.011 6292	15	48.61	12	03	01.07
	22	10	06	03.92	+11	40	54.55	1.011 4271	15	48.80	12	02	45.62
	23	10	09	44.81	11	20	37.20	1.011 2230	15	48.99	12	02	29.75
	24	10	13	25.28	11	00	08.99	1.011 0167	15	49.19	12	02	13.47
	25	10	17	05.35	10	39	30.20	1.010 8079	15	49.38	12	01	56.80
	26	10	20	45.04	10	18	41.15	1.010 5965	15	49.58	12	01	39.74
	27	10	24	24.36	9	57	42.15	1.010 3820	15	49.78	12	01	22.33
	28	10	28	03.33	+9	36	33.54	1.010 1642	15	49.99	12	01	04.56
	29	10	31	41.95	9	15	15.64	1.009 9430	15	50.20	12	00	46.46
	30	10	35	20.24	8	53	48.80	1.009 7181	15	50.41	12	00	28.04
	31	10	38	58.21	8	32	13.35	1.009 4894	15	50.62	12	00	09.30
Sept.	1	10	42	35.88	8	10	29.65	1.009 2568	15	50.84	11	59	50.28
	2	10	46	13.26	7	48	38.01	1.009 0203	15	51.07	11	59	30.97
	3	10	49	50.36	+7	26	38.80	1.008 7799	15	51.29	11	59	11.39
	4	10	53	27.20	7	04	32.35	1.008 5356	15	51.52	11	58	51.56
	5	10	57	03.80	6	42	18.99	1.008 2875	15	51.76	11	58	31.50
	6	11	00	40.16	6	19	59.08	1.008 0358	15	51.99	11	58	11.22
	7	11	04	16.32	5	57	32.95	1.007 7807	15	52.24	11	57	50.72
	8	11	07	52.27	5	35	00.95	1.007 5223	15	52.48	11	57	30.04
	9	11	11	28.05	+5	12	23.43	1.007 2609	15	52.73	11	57	09.19
	10	11	15	03.67	4	49	40.71	1.006 9967	15	52.98	11	56	48.19
	11	11	18	39.15	4	26	53.16	1.006 7301	15	53.23	11	56	27.05
	12	11	22	14.50	4	04	01.10	1.006 4614	15	53.48	11	56	05.79
	13	11	25	49.74	3	41	04.89	1.006 1909	15	53.74	11	55	44.43
	14	11	29	24.90	3	18	04.86	1.005 9191	15	54.00	11	55	22.99
	15	11	32	59.99	+2	55	01.34	1.005 6462	15	54.26	11	55	01.50
	16	11	36	35.02	2	31	54.64	1.005 3727	15	54.52	11	54	39.98
	17	11	40	10.04	2	08	45.09	1.005 0989	15	54.78	11	54	18.44
	18	11	43	45.05	1	45	32.97	1.004 8251	15	55.04	11	53	56.92
	19	11	47	20.08	1	22	18.55	1.004 5514	15	55.30	11	53	35.44
	20	11	50	55.18	0	59	02.12	1.004 2778	15	55.56	11	53	14.03
	21	11	54	30.35	+0	35	43.96	1.004 0044	15	55.82	11	52	52.70
	22	11	58	05.63	+0	12	24.37	1.003 7309	15	56.08	11	52	31.49
	23	12	01	41.03	-0	10	56.32	1.003 4571	15	56.34	11	52	10.41
	24	12	05	16.59	0	34	17.79	1.003 1828	15	56.60	11	51	49.49
	25	12	08	52.31	0	57	39.70	1.002 9076	15	56.86	11	51	28.75
	26	12	12	28.22	1	21	01.67	1.002 6315	15	57.13	11	51	08.20
	27	12	16	04.34	-1	44	23.37	1.002 3541	15	57.39	11	50	47.87
	28	12	19	40.67	2	07	44.41	1.002 0754	15	57.66	11	50	27.78
	29	12	23	17.25	2	31	04.44	1.001 7952	15	57.93	11	50	07.94
	30	12	26	54.09	2	54	23.09	1.001 5134	15	58.19	11	49	48.37
Oct.	1	12	30	31.21	-3	17	39.99	1.001 2300	15	58.47	11	49	29.09

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Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra- tion	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Oct.	1	188	18	48.00	+0.32	188	18	25.31	20.47	+12.65	-2.27	+9.70	19.52
	2	189	17	49.58	0.22	189	17	26.74	20.48	12.79	2.41	9.71	19.52
	3	190	16	53.25	+0.07	190	16	30.25	20.48	12.93	2.56	9.69	19.50
	4	191	15	58.91	-0.07	191	15	35.78	20.49	13.07	2.68	9.66	19.47
	5	192	15	06.56	0.18	192	14	43.33	20.49	13.21	2.78	9.61	19.42
	6	193	14	16.15	0.29	193	13	52.86	20.50	13.35	2.83	9.56	19.37
	7	194	13	27.63	-0.36	194	13	04.33	20.51	+13.48	-2.84	+9.50	19.31
	8	195	12	40.98	0.43	195	12	17.71	20.51	13.62	2.80	9.46	19.26
	9	196	11	56.13	0.47	196	11	32.93	20.52	13.76	2.73	9.43	19.23
	10	197	11	13.07	0.47	197	10	49.94	20.52	13.90	2.65	9.42	19.22
	11	198	10	31.77	0.43	198	10	08.72	20.53	14.04	2.56	9.43	19.24
	12	199	09	52.22	0.40	199	09	29.23	20.54	14.18	2.50	9.47	19.27
	13	200	09	14.42	-0.29	200	08	51.43	20.54	+14.32	-2.49	+9.52	19.31
	14	201	08	38.36	0.18	201	08	15.32	20.55	14.46	2.54	9.56	19.36
	15	202	08	04.09	-0.07	202	07	40.94	20.55	14.60	2.64	9.59	19.39
	16	203	07	31.69	+0.07	203	07	08.40	20.56	14.74	2.78	9.59	19.39
	17	204	07	01.19	0.22	204	06	37.76	20.57	14.88	2.91	9.56	19.35
	18	205	06	32.67	0.36	205	06	09.14	20.57	15.02	3.00	9.49	19.29
	19	206	06	06.19	+0.47	206	05	42.65	20.58	+15.16	-3.01	+9.42	19.21
	20	207	05	41.87	0.58	207	05	18.38	20.58	15.29	2.95	9.34	19.13
	21	208	05	19.74	0.65	208	04	56.35	20.59	15.43	2.84	9.28	19.07
	22	209	04	59.85	0.68	209	04	36.59	20.59	15.57	2.71	9.25	19.04
	23	210	04	42.24	0.68	210	04	19.09	20.60	15.71	2.59	9.25	19.04
	24	211	04	26.86	0.68	211	04	03.79	20.61	15.85	2.51	9.27	19.05
	25	212	04	13.76	+0.61	212	03	50.72	20.61	+15.99	-2.48	+9.30	19.08
	26	213	04	02.91	0.54	213	03	39.85	20.62	16.13	2.49	9.33	19.11
	27	214	03	54.27	0.43	214	03	31.14	20.62	16.27	2.55	9.36	19.14
	28	215	03	47.82	0.32	215	03	24.59	20.63	16.41	2.65	9.37	19.15
	29	216	03	43.47	0.18	216	03	20.12	20.63	16.55	2.76	9.37	19.15
	30	217	03	41.25	+0.07	217	03	17.78	20.64	16.69	2.88	9.34	19.12
	31	218	03	41.04	-0.07	218	03	17.46	20.64	+16.83	-2.98	+9.30	19.08
Nov.	1	219	03	42.77	0.18	219	03	19.12	20.65	16.96	3.05	9.25	19.02
	2	220	03	46.44	0.29	220	03	22.75	20.65	17.10	3.08	9.18	18.96
	3	221	03	51.94	0.40	221	03	28.26	20.66	17.24	3.06	9.12	18.89
	4	222	03	59.23	0.47	222	03	35.60	20.67	17.38	3.00	9.06	18.83
	5	223	04	08.24	0.50	223	03	44.71	20.67	17.52	2.91	9.01	18.78
	6	224	04	18.89	-0.50	224	03	55.48	20.68	+17.66	-2.79	+8.99	18.76
	7	225	04	31.12	0.50	225	04	07.82	20.68	17.80	2.67	8.99	18.76
	8	226	04	44.89	0.47	226	04	21.68	20.69	17.94	2.57	9.01	18.78
	9	227	05	00.14	0.40	227	04	36.98	20.69	18.08	2.51	9.04	18.81
	10	228	05	16.80	0.29	228	04	53.65	20.70	18.22	2.50	9.08	18.84
	11	229	05	34.93	0.18	229	05	11.72	20.70	18.36	2.55	9.11	18.87
	12	230	05	54.43	-0.04	230	05	31.13	20.71	+18.50	-2.64	+9.12	18.88
	13	231	06	15.34	+0.11	231	05	51.94	20.71	18.64	2.73	9.09	18.85
	14	232	06	37.73	0.25	232	06	14.26	20.72	18.77	2.80	9.03	18.79
	15	233	07	01.57	0.36	233	06	38.09	20.72	18.91	2.81	8.96	18.71
	16	234	07	27.00	+0.47	234	07	03.58	20.73	+19.05	-2.74	+8.87	18.63

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Oct.	1	12	30	31.21	-3	17	39.99	1.001 2300	15	58.47	11	49	29.09
	2	12	34	08.63	3	40	54.77	1.000 9450	15	58.74	11	49	10.12
	3	12	37	46.36	4	04	07.05	1.000 6585	15	59.01	11	48	51.47
	4	12	41	24.43	4	27	16.47	1.000 3704	15	59.29	11	48	33.16
	5	12	45	02.85	4	50	22.63	1.000 0809	15	59.57	11	48	15.22
	6	12	48	41.64	5	13	25.17	0.999 7902	15	59.85	11	47	57.65
	7	12	52	20.82	-5	36	23.70	0.999 4985	16	00.13	11	47	40.47
	8	12	56	00.40	5	59	17.84	0.999 2059	16	00.41	11	47	23.70
	9	12	59	40.41	6	22	07.20	0.998 9128	16	00.69	11	47	07.37
	10	13	03	20.85	6	44	51.40	0.998 6195	16	00.97	11	46	51.47
	11	13	07	01.75	7	07	30.06	0.998 3262	16	01.25	11	46	36.04
	12	13	10	43.12	7	30	02.78	0.998 0334	16	01.54	11	46	21.10
	13	13	14	24.98	-7	52	29.19	0.997 7414	16	01.82	11	46	06.65
	14	13	18	07.34	8	14	48.92	0.997 4508	16	02.10	11	45	52.72
	15	13	21	50.24	8	37	01.60	0.997 1618	16	02.38	11	45	39.33
	16	13	25	33.68	8	59	06.88	0.996 8749	16	02.65	11	45	26.51
	17	13	29	17.69	9	21	04.44	0.996 5903	16	02.93	11	45	14.26
	18	13	33	02.30	9	42	53.93	0.996 3083	16	03.20	11	45	02.63
	19	13	36	47.54	-10	04	35.03	0.996 0289	16	03.47	11	44	51.62
	20	13	40	33.41	10	26	07.40	0.995 7521	16	03.74	11	44	41.26
	21	13	44	19.95	10	47	30.66	0.995 4777	16	04.00	11	44	31.56
	22	13	48	07.17	11	08	44.45	0.995 2056	16	04.27	11	44	22.55
	23	13	51	55.08	11	29	48.36	0.994 9355	16	04.53	11	44	14.25
	24	13	55	43.70	11	50	41.99	0.994 6672	16	04.79	11	44	06.66
	25	13	59	33.04	-12	11	24.94	0.994 4005	16	05.05	11	43	59.80
	26	14	03	23.11	12	31	56.79	0.994 1352	16	05.31	11	43	53.69
	27	14	07	13.93	12	52	17.13	0.993 8712	16	05.56	11	43	48.33
	28	14	11	05.52	13	12	25.53	0.993 6084	16	05.82	11	43	43.74
	29	14	14	57.87	13	32	21.59	0.993 3465	16	06.07	11	43	39.92
	30	14	18	51.00	13	52	04.88	0.993 0856	16	06.33	11	43	36.89
	31	14	22	44.93	-14	11	34.98	0.992 8257	16	06.58	11	43	34.66
Nov.	1	14	26	39.65	14	30	51.48	0.992 5666	16	06.83	11	43	33.23
	2	14	30	35.19	14	49	53.95	0.992 3086	16	07.08	11	43	32.60
	3	14	34	31.53	15	08	41.97	0.992 0515	16	07.33	11	43	32.78
	4	14	38	28.69	15	27	15.12	0.991 7955	16	07.58	11	43	33.78
	5	14	42	26.67	15	45	32.97	0.991 5408	16	07.83	11	43	35.60
	6	14	46	25.47	-16	03	35.11	0.991 2876	16	08.08	11	43	38.24
	7	14	50	25.09	16	21	21.12	0.991 0362	16	08.32	11	43	41.70
	8	14	54	25.53	16	38	50.57	0.990 7867	16	08.57	11	43	45.99
	9	14	58	26.80	16	56	03.05	0.990 5396	16	08.81	11	43	51.10
	10	15	02	28.90	17	12	58.15	0.990 2952	16	09.05	11	43	57.04
	11	15	06	31.81	17	29	35.47	0.990 0539	16	09.29	11	44	03.81
	12	15	10	35.56	-17	45	54.61	0.989 8161	16	09.52	11	44	11.42
	13	15	14	40.13	18	01	55.21	0.989 5823	16	09.75	11	44	19.85
	14	15	18	45.55	18	17	36.90	0.989 3528	16	09.97	11	44	29.12
	15	15	22	51.80	18	32	59.34	0.989 1278	16	10.19	11	44	39.23
	16	15	26	58.89	-18	48	02.18	0.988 9077	16	10.41	11	44	50.18

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Date		Geometric Longitude* (Mean Equinox of date)			Latitude (Ecliptic of date)	Apparent Longitude (True equinox of date)			Aberra-tion	Prec. in Long. (J 2024.5 of date)	Nut. in Long.	Nut. in Obliquity	True Obliquity (23° 26')
		°	'	"	"	°	'	"	"	"	"	"	"
Nov.	16	234	07	27.00	+0.47	234	07	03.58	20.73	+19.05	-2.74	+8.87	18.63
	17	235	07	54.01	0.54	235	07	30.72	20.73	19.19	2.61	8.80	18.56
	18	236	08	22.71	0.58	236	07	59.59	20.73	19.33	2.43	8.76	18.51
	19	237	08	53.06	0.61	237	08	30.12	20.74	19.47	2.25	8.74	18.49
	20	238	09	25.17	0.58	238	09	02.38	20.74	19.61	2.10	8.75	18.50
	21	239	09	59.06	0.54	239	09	36.36	20.75	19.75	2.00	8.78	18.53
	22	240	10	34.65	+0.47	240	10	12.00	20.75	+19.89	-1.95	+8.82	18.56
	23	241	11	11.96	0.36	241	10	49.30	20.75	20.03	1.95	8.85	18.59
	24	242	11	50.99	0.25	242	11	28.28	20.76	20.17	1.99	8.87	18.61
	25	243	12	31.67	+0.14	243	12	08.89	20.76	20.31	2.06	8.87	18.61
	26	244	13	13.98	0.00	244	12	51.12	20.77	20.45	2.14	8.85	18.60
	27	245	13	57.82	-0.14	245	13	34.90	20.77	20.58	2.20	8.82	18.56
	28	246	14	43.19	-0.25	246	14	20.22	20.77	+20.72	-2.24	+8.77	18.51
	29	247	15	30.02	0.36	247	15	07.06	20.78	20.86	2.24	8.71	18.45
	30	248	16	18.19	0.47	248	15	55.26	20.78	21.00	2.19	8.65	18.39
Dec.	1	249	17	07.67	0.54	249	16	44.83	20.78	21.14	2.10	8.60	18.33
	2	250	17	58.33	0.58	250	17	35.63	20.79	21.28	1.96	8.56	18.29
	3	251	18	50.13	0.61	251	18	27.58	20.79	21.42	1.81	8.53	18.27
	4	252	19	42.96	-0.58	252	19	20.57	20.79	+21.56	-1.64	+8.54	18.27
	5	253	20	36.74	0.54	253	20	14.50	20.80	21.70	1.50	8.56	18.29
	6	254	21	31.36	0.47	254	21	09.22	20.80	21.84	1.39	8.60	18.33
	7	255	22	26.79	0.40	255	22	04.69	20.80	21.98	1.34	8.65	18.37
	8	256	23	22.92	0.29	256	23	00.82	20.81	22.12	1.34	8.69	18.41
	9	257	24	19.70	0.14	257	23	57.55	20.81	22.26	1.38	8.71	18.43
	10	258	25	17.11	-0.00	258	24	54.90	20.81	+22.39	-1.45	+8.70	18.43
	11	259	26	15.09	+0.11	259	25	52.82	20.81	22.53	1.49	8.67	18.39
	12	260	27	13.66	0.25	260	26	51.40	20.82	22.67	1.49	8.61	18.33
	13	261	28	12.82	0.32	261	27	50.62	20.82	22.81	1.43	8.54	18.26
	14	262	29	12.62	0.43	262	28	50.56	20.82	22.95	1.29	8.48	18.20
	15	263	30	13.06	0.47	263	29	51.18	20.82	23.09	1.10	8.44	18.16
	16	264	31	14.20	+0.50	264	30	52.52	20.83	+23.23	-0.89	+8.42	18.14
	17	265	32	16.07	0.47	265	31	54.59	20.83	23.37	0.70	8.44	18.16
	18	266	33	18.70	0.43	266	32	57.37	20.83	23.51	0.54	8.48	18.19
	19	267	34	22.14	0.36	267	34	00.91	20.83	23.65	0.44	8.53	18.24
	20	268	35	26.36	0.29	268	35	05.17	20.83	23.79	0.40	8.58	18.29
	21	269	36	31.35	0.18	269	36	10.15	20.83	23.93	0.41	8.62	18.33
	22	270	37	37.09	+0.04	270	37	15.85	20.84	+24.07	-0.45	+8.64	18.35
	23	271	38	43.60	-0.07	271	38	22.31	20.84	24.20	0.50	8.65	18.36
	24	272	39	50.79	0.22	272	39	29.45	20.84	24.34	0.55	8.64	18.35
	25	273	40	58.65	0.32	273	40	37.27	20.84	24.48	0.58	8.61	18.32
	26	274	42	07.12	0.43	274	41	45.74	20.84	24.62	0.58	8.58	18.28
	27	275	43	16.12	0.54	275	42	54.79	20.84	24.76	0.54	8.53	18.23
	28	276	44	25.58	-0.61	276	44	04.34	20.84	+24.90	-0.44	+8.49	18.19
	29	277	45	35.47	0.65	277	45	14.36	20.84	25.04	0.31	8.46	18.16
	30	278	46	45.68	0.68	278	46	24.74	20.84	25.18	-0.14	8.45	18.15
	31	279	47	56.10	0.68	279	47	35.34	20.84	25.32	+0.03	8.47	18.16
	32	280	49	06.68	-0.65	280	48	46.08	20.84	+25.46	+0.20	+8.50	18.20

*To obtain the geometric longitude referred to the mean equinox of J 2000.0, add -20' 32".121 and subtract precession from J 2024.5.

SUN, 2024
FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Semi Diameter		Ephemeris Transit		
		h	m	s	°	'	"		'	"	h	m	s
Nov.	16	15	26	58.89	-18	48	02.18	0.988 9077	16	10.41	11	44	50.18
	17	15	31	06.83	19	02	45.08	0.988 6924	16	10.62	11	45	01.96
	18	15	35	15.61	19	17	07.69	0.988 4820	16	10.83	11	45	14.59
	19	15	39	25.22	19	31	09.63	0.988 2764	16	11.03	11	45	28.05
	20	15	43	35.67	19	44	50.54	0.988 0753	16	11.23	11	45	42.34
	21	15	47	46.94	19	58	10.05	0.987 8787	16	11.42	11	45	57.45
	22	15	51	59.03	-20	11	07.77	0.987 6862	16	11.61	11	46	13.38
	23	15	56	11.92	20	23	43.34	0.987 4977	16	11.79	11	46	30.11
	24	16	00	25.60	20	35	56.40	0.987 3129	16	11.98	11	46	47.63
	25	16	04	40.07	20	47	46.58	0.987 1317	16	12.15	11	47	05.93
	26	16	08	55.31	20	59	13.55	0.986 9540	16	12.33	11	47	25.00
	27	16	13	11.30	21	10	16.96	0.986 7796	16	12.50	11	47	44.80
	28	16	17	28.03	-21	20	56.49	0.986 6083	16	12.67	11	48	05.33
	29	16	21	45.47	21	31	11.80	0.986 4400	16	12.84	11	48	26.57
	30	16	26	03.60	21	41	02.58	0.986 2748	16	13.00	11	48	48.48
Dec.	1	16	30	22.41	21	50	28.54	0.986 1125	16	13.16	11	49	11.05
	2	16	34	41.86	21	59	29.39	0.985 9532	16	13.32	11	49	34.26
	3	16	39	01.93	22	08	04.83	0.985 7968	16	13.47	11	49	58.06
	4	16	43	22.59	-22	16	14.60	0.985 6435	16	13.62	11	50	22.45
	5	16	47	43.82	22	23	58.43	0.985 4934	16	13.77	11	50	47.38
	6	16	52	05.57	22	31	16.07	0.985 3467	16	13.92	11	51	12.83
	7	16	56	27.82	22	38	07.29	0.985 2037	16	14.06	11	51	38.77
	8	17	00	50.54	22	44	31.86	0.985 0647	16	14.19	11	52	05.16
	9	17	05	13.70	22	50	29.57	0.984 9301	16	14.33	11	52	31.99
	10	17	09	37.28	-22	56	00.23	0.984 8001	16	14.46	11	52	59.22
	11	17	14	01.24	23	01	03.68	0.984 6752	16	14.58	11	53	26.82
	12	17	18	25.57	23	05	39.79	0.984 5558	16	14.70	11	53	54.76
	13	17	22	50.22	23	09	48.41	0.984 4422	16	14.81	11	54	23.02
	14	17	27	15.19	23	13	29.44	0.984 3346	16	14.92	11	54	51.57
	15	17	31	40.43	23	16	42.77	0.984 2332	16	15.02	11	55	20.39
	16	17	36	05.93	-23	19	28.32	0.984 1382	16	15.11	11	55	49.44
	17	17	40	31.65	23	21	45.98	0.984 0494	16	15.20	11	56	18.70
	18	17	44	57.55	23	23	35.65	0.983 9669	16	15.28	11	56	48.13
	19	17	49	23.62	23	24	57.27	0.983 8904	16	15.36	11	57	17.72
	20	17	53	49.81	23	25	50.74	0.983 8198	16	15.43	11	57	47.42
	21	17	58	16.10	23	26	16.02	0.983 7548	16	15.49	11	58	17.20
	22	18	02	42.46	-23	26	13.06	0.983 6952	16	15.55	11	58	47.04
	23	18	07	08.85	23	25	41.84	0.983 6409	16	15.60	11	59	16.89
	24	18	11	35.24	23	24	42.35	0.983 5915	16	15.65	11	59	46.73
	25	18	16	01.60	23	23	14.61	0.983 5469	16	15.70	12	00	16.51
	26	18	20	27.89	23	21	18.63	0.983 5069	16	15.74	12	00	46.21
	27	18	24	54.08	23	18	54.47	0.983 4713	16	15.77	12	01	15.79
	28	18	29	20.13	-23	16	02.20	0.983 4398	16	15.80	12	01	45.20
	29	18	33	46.01	23	12	41.88	0.983 4124	16	15.83	12	02	14.42
	30	18	38	11.67	23	08	53.63	0.983 3889	16	15.85	12	02	43.41
	31	18	42	37.09	23	04	37.56	0.983 3692	16	15.87	12	03	12.13
	32	18	47	02.21	-22	59	53.79	0.983 3532	16	15.89	12	03	40.54

SUN, 2024
EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date		$X_{2024.5}$	$X_{2000.0}$	$Y_{20243.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
Jan.	0	+0.149 5124	+0.148 5921	-0.891 8546	-0.891 8521	-0.386 2440	-0.386 6047
	1	0.166 7688	0.165 8513	0.889 2761	0.889 2737	0.385 0858	0.385 4875
	2	0.183 9747	0.183 0601	0.886 4215	0.886 4191	0.383 8080	0.384 2506
	3	0.201 1248	0.200 2135	0.883 2912	0.883 2888	0.382 4109	0.382 8944
	4	0.218 2137	0.217 3060	0.879 8860	0.879 8836	0.380 8949	0.381 4190
	5	0.235 2363	0.234 3324	0.876 2067	0.876 2043	0.379 2602	0.379 8249
	6	+0.252 1870	+0.251 2872	-0.872 2541	-0.872 2518	-0.377 5073	-0.378 1123
	7	0.269 0605	0.268 1652	0.868 0293	0.868 0269	0.375 6365	0.376 2816
	8	0.285 8514	0.284 9607	0.863 5332	0.863 5309	0.373 6482	0.374 3332
	9	0.302 5541	0.301 6684	0.858 7672	0.858 7649	0.371 5430	0.372 2678
	10	0.319 1631	0.318 2827	0.853 7324	0.853 7301	0.369 3214	0.370 0857
	11	0.335 6729	0.334 7979	0.848 4305	0.848 4282	0.366 9840	0.367 7876
	12	+0.352 0777	+0.351 2086	-0.842 8631	-0.842 8609	-0.364 5317	-0.365 3743
	13	0.368 3723	0.367 5092	0.837 0321	0.837 0299	0.361 9652	0.362 8466
	14	0.384 5510	0.383 6942	0.830 9396	0.830 9374	0.359 2854	0.360 2053
	15	0.400 6085	0.399 7584	0.824 5878	0.824 5856	0.356 4934	0.357 4515
	16	0.416 5398	0.415 6965	0.817 9791	0.817 9770	0.353 5903	0.354 5862
	17	0.432 3397	0.431 5036	0.811 1161	0.811 1140	0.350 5771	0.351 6106
	18	+0.448 0035	+0.447 1748	-0.804 0013	-0.803 9992	-0.347 4551	-0.348 5259
	19	0.463 5265	0.462 7054	0.796 6373	0.796 6353	0.344 2254	0.345 3331
	20	0.478 9041	0.478 0909	0.789 0268	0.789 0247	0.340 8892	0.342 0335
	21	0.494 1320	0.493 3269	0.781 1722	0.781 1702	0.337 4478	0.338 6282
	22	0.509 2057	0.508 4090	0.773 0764	0.773 0745	0.333 9022	0.335 1185
	23	0.524 1209	0.523 3329	0.764 7420	0.764 7401	0.330 2536	0.331 5054
	24	+0.538 8735	+0.538 0944	-0.756 1716	-0.756 1696	-0.326 5033	-0.327 7902
	25	0.553 4592	0.552 6892	0.747 3678	0.747 3659	0.322 6524	0.323 9739
	26	0.567 8739	0.567 1133	0.738 3334	0.738 3315	0.318 7021	0.320 0579
	27	0.582 1134	0.581 3624	0.729 0710	0.729 0692	0.314 6535	0.316 0431
	28	0.596 1735	0.595 4324	0.719 5834	0.719 5817	0.310 5079	0.311 9309
	29	0.610 0502	0.609 3191	0.709 8735	0.709 8717	0.306 2663	0.307 7224
	30	+0.623 7394	+0.623 0185	-0.699 9440	-0.699 9422	-0.301 9301	-0.303 4187
	31	0.637 2368	0.636 5265	0.689 7978	0.689 7961	0.297 5006	0.299 0212
Feb.	1	0.650 5385	0.649 8389	0.679 4378	0.679 4362	0.292 9788	0.294 5311
	2	0.663 6403	0.662 9517	0.668 8672	0.668 8656	0.288 3662	0.289 9496
	3	0.676 5382	0.675 8607	0.658 0891	0.658 0875	0.283 6641	0.285 2781
	4	0.689 2280	0.688 5619	0.647 1065	0.647 1049	0.278 8737	0.280 5179
	5	+0.701 7058	+0.701 0513	-0.635 9227	-0.635 9212	-0.273 9966	-0.275 6705
	6	0.713 9674	0.713 3247	0.624 5412	0.624 5397	0.269 0342	0.270 7371
	7	0.726 0089	0.725 3781	0.612 9653	0.612 9639	0.263 9879	0.265 7194
	8	0.737 8261	0.737 2075	0.601 1988	0.601 1975	0.258 8593	0.260 6189
	9	0.749 4151	0.748 8089	0.589 2455	0.589 2441	0.253 6500	0.255 4372
	10	0.760 7721	0.760 1784	0.577 1091	0.577 1078	0.248 3618	0.250 1760
	11	+0.771 8932	+0.771 3123	-0.564 7940	-0.564 7927	-0.242 9966	-0.244 8371
	12	0.782 7749	0.782 2070	0.552 3043	0.552 3030	0.237 5561	0.239 4224
	13	0.793 4139	0.792 8590	0.539 6443	0.539 6432	0.232 0423	0.233 9339
	14	0.803 8070	0.803 2654	0.526 8187	0.526 8175	0.226 4572	0.228 3735
	15	+0.813 9513	+0.813 4232	-0.513 8316	-0.513 8305	-0.220 8027	-0.222 7431

SUN, 2024

EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date		$X_{2024.5}$	$X_{2000.0}$	$Y_{2024.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
Feb.	15	+0.813 9513	+0.813 4232	-0.513 8316	-0.513 8305	-0.220 8027	-0.222 7431
	16	0.823 8442	0.823 3296	0.500 6876	0.500 6865	0.215 0809	0.217 0448
	17	0.833 4829	0.832 9821	0.487 3910	0.487 3900	0.209 2936	0.211 2804
	18	0.842 8651	0.842 3782	0.473 9461	0.473 9451	0.203 4428	0.205 4518
	19	0.851 9884	0.851 5155	0.460 3573	0.460 3563	0.197 5304	0.199 5610
	20	0.860 8505	0.860 3918	0.446 6287	0.446 6278	0.191 5581	0.193 6098
	21	+0.869 4492	+0.869 0049	-0.432 7647	-0.432 7639	-0.185 5279	-0.187 5999
	22	0.877 7823	0.877 3525	0.418 7695	0.418 7687	0.179 4415	0.181 5334
	23	0.885 8478	0.885 4325	0.404 6472	0.404 6464	0.173 3009	0.175 4119
	24	0.893 6435	0.893 2430	0.390 4021	0.390 4014	0.167 1078	0.169 2373
	25	0.901 1675	0.900 7818	0.376 0384	0.376 0377	0.160 8641	0.163 0114
	26	0.908 4178	0.908 0471	0.361 5603	0.361 5597	0.154 5715	0.156 7360
	27	+0.915 3923	+0.915 0367	-0.346 9721	-0.346 9715	-0.148 2319	-0.150 4129
	28	0.922 0893	0.921 7489	0.332 2779	0.332 2774	0.141 8470	0.144 0439
	29	0.928 5068	0.928 1817	0.317 4822	0.317 4817	0.135 4188	0.137 6308
Mar.	1	0.934 6430	0.934 3333	0.302 5892	0.302 5887	0.128 9490	0.131 1756
	2	0.940 4960	0.940 2018	0.287 6032	0.287 6028	0.122 4396	0.124 6800
	3	0.946 0641	0.945 7855	0.272 5287	0.272 5283	0.115 8923	0.118 1459
	4	+0.951 3456	+0.951 0825	-0.257 3701	-0.257 3698	-0.109 3092	-0.111 5753
	5	0.956 3386	0.956 0913	0.242 1320	0.242 1317	0.102 6921	0.104 9701
	6	0.961 0416	0.960 8101	0.226 8190	0.226 8188	0.096 0431	0.098 3322
	7	0.965 4529	0.965 2373	0.211 4358	0.211 4356	0.089 3642	0.091 6636
	8	0.969 5709	0.969 3713	0.195 9871	0.195 9870	0.082 6574	0.084 9666
	9	0.973 3944	0.973 2108	0.180 4780	0.180 4779	0.075 9250	0.078 2432
	10	+0.976 9220	+0.976 7545	-0.164 9135	-0.164 9135	-0.069 1691	-0.071 4956
	11	0.980 1526	0.980 0012	0.149 2988	0.149 2987	0.062 3920	0.064 7262
	12	0.983 0855	0.982 9503	0.133 6389	0.133 6390	0.055 5961	0.057 9371
	13	0.985 7201	0.985 6011	0.117 9392	0.117 9393	0.048 7836	0.051 1308
	14	0.988 0561	0.987 9534	0.102 2048	0.102 2049	0.041 9567	0.044 3094
	15	0.990 0933	0.990 0068	0.086 4407	0.086 4409	0.035 1179	0.037 4753
	16	+0.991 8316	+0.991 7615	-0.070 6519	-0.070 6521	-0.028 2691	-0.030 6306
	17	0.993 2713	0.993 2175	0.054 8432	0.054 8435	0.021 4125	0.023 7774
	18	0.994 4125	0.994 3750	0.039 0195	0.039 0198	0.014 5503	0.016 9178
	19	0.995 2554	0.995 2342	0.023 1855	0.023 1858	0.007 6845	0.010 0539
	20	0.995 8003	0.995 7956	-0.007 3457	-0.007 3461	-0.000 8171	-0.003 1877
	21	0.996 0477	0.996 0593	+0.008 4951	+0.008 4946	+0.006 0499	+0.003 6788
	22	+0.995 9979	+0.996 0259	+0.024 3324	+0.024 3319	+0.012 9146	+0.010 5437
	23	0.995 6514	0.995 6957	0.040 1617	0.040 1612	0.019 7750	0.017 4050
	24	0.995 0087	0.995 0693	0.055 9786	0.055 9780	0.026 6292	0.024 2608
	25	0.994 0703	0.994 1472	0.071 7785	0.071 7779	0.033 4752	0.031 1092
	26	0.992 8367	0.992 9299	0.087 5570	0.087 5564	0.040 3113	0.037 9483
	27	0.991 3086	0.991 4180	0.103 3098	0.103 3091	0.047 1355	0.044 7762
	28	+0.989 4865	+0.989 6122	+0.119 0324	+0.119 0316	+0.053 9459	+0.051 5910
	29	0.987 3712	0.987 5131	0.134 7203	0.134 7195	0.060 7407	0.058 3909
	30	0.984 9633	0.985 1213	0.150 3693	0.150 3684	0.067 5180	0.065 1740
	31	0.982 2635	0.982 4376	0.165 9748	0.165 9739	0.074 2759	0.071 9384
Apr.	1	+0.979 2726	+0.979 4627	+0.181 5324	+0.181 5314	+0.081 0125	+0.078 6822

SUN, 2024

EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date	$X_{2024.5}$	$X_{2000.0}$	$Y_{2024.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
Apr. 1	+0.979 2726	+0.979 4627	+0.181 5324	+0.181 5314	+0.081 0125	+0.078 6822
2	0.975 9913	0.976 1974	0.197 0376	0.197 0366	0.087 7258	0.085 4034
3	0.972 4204	0.972 6425	0.212 4859	0.212 4848	0.094 4139	0.092 1001
4	0.968 5610	0.968 7990	0.227 8726	0.227 8716	0.101 0748	0.098 7703
5	0.964 4140	0.964 6677	0.243 1932	0.243 1921	0.107 7065	0.105 4120
6	0.959 9805	0.960 2500	0.258 4428	0.258 4417	0.114 3070	0.112 0231
7	+0.955 2618	+0.955 5470	+0.273 6168	+0.273 6156	+0.120 8741	+0.118 6015
8	0.950 2594	0.950 5602	0.288 7102	0.288 7090	0.127 4057	0.125 1450
9	0.944 9751	0.945 2913	0.303 7183	0.303 7171	0.133 8996	0.131 6516
10	0.939 4108	0.939 7423	0.318 6363	0.318 6350	0.140 3538	0.138 1191
11	0.933 5685	0.933 9154	0.333 4596	0.333 4582	0.146 7662	0.144 5455
12	0.927 4506	0.927 8127	0.348 1835	0.348 1821	0.153 1348	0.150 9287
13	+0.921 0596	+0.921 4368	+0.362 8038	+0.362 8023	+0.159 4576	+0.157 2669
14	0.914 3980	0.914 7901	0.377 3161	0.377 3146	0.165 7329	0.163 5581
15	0.907 4682	0.907 8752	0.391 7163	0.391 7148	0.171 9587	0.169 8005
16	0.900 2730	0.900 6947	0.406 0004	0.405 9988	0.178 1335	0.175 9925
17	0.892 8149	0.893 2512	0.420 1644	0.420 1628	0.184 2554	0.182 1322
18	0.885 0966	0.885 5474	0.434 2045	0.434 2029	0.190 3229	0.188 2181
19	+0.877 1208	+0.877 5859	+0.448 1169	+0.448 1152	+0.196 3342	+0.194 2485
20	0.868 8901	0.869 3694	0.461 8978	0.461 8962	0.202 2879	0.200 2219
21	0.860 4072	0.860 9006	0.475 5437	0.475 5420	0.208 1823	0.206 1366
22	0.851 6749	0.852 1822	0.489 0508	0.489 0491	0.214 0160	0.211 9911
23	0.842 6960	0.843 2170	0.502 4157	0.502 4139	0.219 7874	0.217 7840
24	0.833 4731	0.834 0077	0.515 6348	0.515 6330	0.225 4951	0.223 5136
25	+0.824 0089	+0.824 5571	+0.528 7047	+0.528 7029	+0.231 1375	+0.229 1787
26	0.814 3064	0.814 8678	0.541 6219	0.541 6201	0.236 7133	0.234 7776
27	0.804 3681	0.804 9426	0.554 3830	0.554 3811	0.242 2209	0.240 3090
28	0.794 1968	0.794 7844	0.566 9845	0.566 9826	0.247 6590	0.245 7714
29	0.783 7955	0.784 3958	0.579 4231	0.579 4211	0.253 0260	0.251 1632
30	0.773 1668	0.773 7798	0.591 6952	0.591 6932	0.258 3205	0.256 4831
May 1	+0.762 3136	+0.762 9391	+0.603 7973	+0.603 7953	+0.263 5410	+0.261 7295
2	0.751 2389	0.751 8767	0.615 7261	0.615 7240	0.268 6859	0.266 9008
3	0.739 9457	0.740 5956	0.627 4778	0.627 4757	0.273 7538	0.271 9956
4	0.728 4372	0.729 0990	0.639 0490	0.639 0469	0.278 7429	0.277 0122
5	0.716 7167	0.717 3902	0.650 4361	0.650 4340	0.283 6519	0.281 9491
6	0.704 7876	0.705 4726	0.661 6355	0.661 6333	0.288 4790	0.286 8047
7	+0.692 6536	+0.693 3499	+0.672 6438	+0.672 6416	+0.293 2228	+0.291 5775
8	0.680 3185	0.681 0260	0.683 4574	0.683 4552	0.297 8818	0.296 2658
9	0.667 7864	0.668 5048	0.694 0733	0.694 0710	0.302 4543	0.300 8683
10	0.655 0613	0.655 7904	0.704 4881	0.704 4858	0.306 9392	0.305 3835
11	0.642 1475	0.642 8871	0.714 6990	0.714 6967	0.311 3351	0.309 8102
12	0.629 0492	0.629 7991	0.724 7032	0.724 7008	0.315 6408	0.314 1471
13	+0.615 7707	+0.616 5307	+0.734 4979	+0.734 4956	+0.319 8551	+0.318 3931
14	0.602 3162	0.603 0860	0.744 0807	0.744 0783	0.323 9770	0.322 5470
15	0.588 6899	0.589 4694	0.753 4491	0.753 4467	0.328 0053	0.326 6079
16	0.574 8962	0.575 6851	0.762 6008	0.762 5984	0.331 9392	0.330 5747
17	+0.560 9392	+0.561 7373	+0.771 5335	+0.771 5311	+0.335 7777	+0.334 4465

SUN, 2024

EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date	$X_{2024.5}$	$X_{2000.0}$	$Y_{2024.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
May 17	+0.560 9392	+0.561 7373	+0.771 5335	+0.771 5311	+0.335 7777	+0.334 4465
18	0.546 8231	0.547 6301	0.780 2451	0.780 2427	0.339 5199	0.338 2223
19	0.532 5521	0.533 3679	0.788 7335	0.788 7310	0.343 1649	0.341 9013
20	0.518 1305	0.518 9547	0.796 9966	0.796 9942	0.346 7119	0.345 4827
21	0.503 5622	0.504 3947	0.805 0326	0.805 0301	0.350 1601	0.348 9656
22	0.488 8516	0.489 6921	0.812 8394	0.812 8369	0.353 5087	0.352 3492
23	+0.474 0026	+0.474 8509	+0.820 4153	+0.820 4128	+0.356 7569	+0.355 6328
24	0.459 0194	0.459 8752	0.827 7584	0.827 7559	0.359 9039	0.358 8156
25	0.443 9059	0.444 7690	0.834 8669	0.834 8644	0.362 9491	0.361 8968
26	0.428 6663	0.429 5365	0.841 7391	0.841 7366	0.365 8917	0.364 8757
27	0.413 3045	0.414 1815	0.848 3731	0.848 3706	0.368 7310	0.367 7516
28	0.397 8247	0.398 7082	0.854 7672	0.854 7646	0.371 4661	0.370 5235
29	+0.382 2308	+0.383 1206	+0.860 9195	+0.860 9169	+0.374 0963	+0.373 1909
30	0.366 5270	0.367 4229	0.866 8282	0.866 8256	0.376 6207	0.375 7528
31	0.350 7176	0.351 6193	0.872 4914	0.872 4888	0.379 0387	0.378 2084
June 1	0.334 8069	0.335 7141	0.877 9073	0.877 9047	0.381 3492	0.380 5569
2	0.318 7994	0.319 7119	0.883 0742	0.883 0715	0.383 5517	0.382 7974
3	0.302 6997	0.303 6173	0.887 9902	0.887 9875	0.385 6451	0.384 9292
4	+0.286 5126	+0.287 4349	+0.892 6537	+0.892 6510	+0.387 6289	+0.386 9516
5	0.270 2429	0.271 1698	0.897 0632	0.897 0605	0.389 5023	0.388 8637
6	0.253 8957	0.254 8268	0.901 2172	0.901 2146	0.391 2647	0.390 6651
7	0.237 4759	0.238 4110	0.905 1147	0.905 1120	0.392 9156	0.392 3550
8	0.220 9887	0.221 9275	0.908 7545	0.908 7518	0.394 4544	0.393 9331
9	0.204 4392	0.205 3814	0.912 1356	0.912 1330	0.395 8808	0.395 3989
10	+0.187 8323	+0.188 7777	+0.915 2575	+0.915 2548	+0.397 1945	+0.396 7522
11	0.171 1732	0.172 1215	0.918 1193	0.918 1166	0.398 3952	0.397 9926
12	0.154 4667	0.155 4177	0.920 7207	0.920 7180	0.399 4828	0.399 1200
13	0.137 7179	0.138 6712	0.923 0611	0.923 0584	0.400 4571	0.400 1341
14	0.120 9316	0.121 8870	0.925 1403	0.925 1376	0.401 3179	0.401 0350
15	0.104 1126	0.105 0698	0.926 9580	0.926 9553	0.402 0653	0.401 8224
16	+0.087 2657	+0.088 2245	+0.928 5141	+0.928 5114	+0.402 6992	+0.402 4964
17	0.070 3956	0.071 3557	0.929 8084	0.929 8057	0.403 2195	0.403 0569
18	0.053 5071	0.054 4682	0.930 8409	0.930 8382	0.403 6264	0.403 5039
19	0.036 6046	0.037 5665	0.931 6116	0.931 6089	0.403 9198	0.403 8376
20	0.019 6928	0.020 6551	0.932 1206	0.932 1180	0.404 0999	0.404 0579
21	+0.002 7762	+0.003 7387	0.932 3680	0.932 3654	0.404 1666	0.404 1649
22	-0.014 1409	-0.013 1784	+0.932 3540	+0.932 3513	+0.404 1202	+0.404 1588
23	0.031 0539	0.030 0918	0.932 0785	0.932 0759	0.403 9606	0.404 0394
24	0.047 9587	0.046 9971	0.931 5418	0.931 5392	0.403 6879	0.403 8070
25	0.064 8507	0.063 8900	0.930 7439	0.930 7413	0.403 3022	0.403 4615
26	0.081 7256	0.080 7661	0.929 6849	0.929 6823	0.402 8036	0.403 0030
27	0.098 5790	0.097 6208	0.928 3649	0.928 3623	0.402 1919	0.402 4315
28	-0.115 4062	-0.114 4498	+0.926 7838	+0.926 7813	+0.401 4672	+0.401 7469
29	0.132 2028	0.131 2483	0.924 9419	0.924 9393	0.400 6296	0.400 9492
30	0.148 9638	0.148 0116	0.922 8392	0.922 8366	0.399 6790	0.400 0385
July 1	0.165 6846	0.164 7348	0.920 4760	0.920 4734	0.398 6156	0.399 0149
2	-0.182 3601	-0.181 4130	+0.917 8527	+0.917 8502	+0.397 4395	+0.397 8784

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date		$X_{2024.5}$	$X_{2000.0}$	$Y_{2024.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
July	1	-0.165 6846	-0.164 7348	+0.920 4760	+0.920 4734	+0.398 6156	+0.399 0149
	2	0.182 3601	0.181 4130	0.917 8527	0.917 8502	0.397 4395	0.397 8784
	3	0.198 9853	0.198 0413	0.914 9697	0.914 9672	0.396 1508	0.396 6293
	4	0.215 5553	0.214 6145	0.911 8278	0.911 8253	0.394 7499	0.395 2678
	5	0.232 0649	0.231 1277	0.908 4278	0.908 4253	0.393 2370	0.393 7943
	6	0.248 5091	0.247 5758	0.904 7705	0.904 7680	0.391 6127	0.392 2090
	7	-0.264 8830	-0.263 9537	+0.900 8571	+0.900 8546	+0.389 8773	+0.390 5126
	8	0.281 1815	0.280 2566	0.896 6888	0.896 6864	0.388 0315	0.388 7056
	9	0.297 3999	0.296 4796	0.892 2670	0.892 2646	0.386 0759	0.386 7886
	10	0.313 5333	0.312 6179	0.887 5931	0.887 5908	0.384 0111	0.384 7621
	11	0.329 5771	0.328 6668	0.882 6688	0.882 6664	0.381 8378	0.382 6270
	12	0.345 5265	0.344 6216	0.877 4955	0.877 4932	0.379 5568	0.380 3840
	13	-0.361 3772	-0.360 4779	+0.872 0751	+0.872 0728	+0.377 1689	+0.378 0338
	14	0.377 1246	0.376 2312	0.866 4093	0.866 4070	0.374 6748	0.375 5772
	15	0.392 7643	0.391 8771	0.860 4999	0.860 4977	0.372 0755	0.373 0150
	16	0.408 2922	0.407 4113	0.854 3488	0.854 3466	0.369 3717	0.370 3482
	17	0.423 7038	0.422 8297	0.847 9580	0.847 9558	0.366 5643	0.367 5775
	18	0.438 9953	0.438 1280	0.841 3293	0.841 3271	0.363 6543	0.364 7038
	19	-0.454 1625	-0.453 3023	+0.834 4648	+0.834 4626	+0.360 6424	+0.361 7280
	20	0.469 2014	0.468 3486	0.827 3665	0.827 3644	0.357 5297	0.358 6511
	21	0.484 1083	0.483 2631	0.820 0363	0.820 0342	0.354 3169	0.355 4737
	22	0.498 8793	0.498 0420	0.812 4762	0.812 4742	0.351 0050	0.352 1969
	23	0.513 5107	0.512 6814	0.804 6882	0.804 6861	0.347 5947	0.348 8214
	24	0.527 9985	0.527 1775	0.796 6740	0.796 6719	0.344 0869	0.345 3481
	25	-0.542 3389	-0.541 5265	+0.788 4355	+0.788 4335	+0.340 4823	+0.341 7776
	26	0.556 5279	0.555 7243	0.779 9747	0.779 9727	0.336 7817	0.338 1107
	27	0.570 5616	0.569 7670	0.771 2934	0.771 2914	0.332 9859	0.334 3483
	28	0.584 4358	0.583 6504	0.762 3936	0.762 3917	0.329 0958	0.330 4912
	29	0.598 1462	0.597 3703	0.753 2775	0.753 2757	0.325 1123	0.326 5402
	30	0.611 6888	0.610 9225	0.743 9474	0.743 9455	0.321 0362	0.322 4963
	31	-0.625 0592	-0.624 3027	+0.734 4055	+0.734 4037	+0.316 8686	+0.318 3605
Aug.	1	0.638 2531	0.637 5068	0.724 6545	0.724 6527	0.312 6107	0.314 1339
	2	0.651 2666	0.650 5306	0.714 6970	0.714 6952	0.308 2634	0.309 8176
	3	0.664 0953	0.663 3699	0.704 5358	0.704 5340	0.303 8282	0.305 4129
	4	0.676 7354	0.676 0207	0.694 1737	0.694 1720	0.299 3062	0.300 9209
	5	0.689 1828	0.688 4790	0.683 6139	0.683 6123	0.294 6989	0.296 3431
	6	-0.701 4338	-0.700 7411	+0.672 8595	+0.672 8579	+0.290 0075	+0.291 6808
	7	0.713 4845	0.712 8032	0.661 9136	0.661 9121	0.285 2335	0.286 9355
	8	0.725 3314	0.724 6616	0.650 7796	0.650 7781	0.280 3784	0.282 1085
	9	0.736 9709	0.736 3128	0.639 4608	0.639 4593	0.275 4436	0.277 2014
	10	0.748 3997	0.747 7536	0.627 9606	0.627 9592	0.270 4307	0.272 2156
	11	0.759 6145	0.758 9804	0.616 2824	0.616 2810	0.265 3412	0.267 1528
	12	-0.770 6121	-0.769 9903	+0.604 4298	+0.604 4284	+0.260 1766	+0.262 0143
	13	0.781 3895	0.780 7801	0.592 4061	0.592 4048	0.254 9385	0.256 8018
	14	0.791 9436	0.791 3469	0.580 2151	0.580 2138	0.249 6285	0.251 5169
	15	0.802 2717	0.801 6877	0.567 8601	0.567 8589	0.244 2481	0.246 1610
	16	-0.812 3709	-0.811 7999	+0.555 3449	+0.555 3436	+0.238 7990	+0.240 7358

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date		$X_{2024.5}$	$X_{2000.0}$	$Y_{2024.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
Aug.	16	-0.812 3709	-0.811 7999	+0.555 3449	+0.555 3436	+0.238 7990	+0.240 7358
	17	0.822 2388	0.821 6809	0.542 6728	0.542 6716	0.233 2825	0.235 2428
	18	0.831 8727	0.831 3281	0.529 8475	0.529 8463	0.227 7004	0.229 6835
	19	0.841 2702	0.840 7389	0.516 8723	0.516 8712	0.222 0540	0.224 0594
	20	0.850 4288	0.849 9111	0.503 7507	0.503 7496	0.216 3449	0.218 3720
	21	0.859 3461	0.858 8421	0.490 4860	0.490 4849	0.210 5744	0.212 6227
	22	-0.868 0196	-0.867 5295	+0.477 0815	+0.477 0805	+0.204 7439	+0.206 8128
	23	0.876 4467	0.875 9706	0.463 5406	0.463 5396	0.198 8550	0.200 9439
	24	0.884 6248	0.884 1628	0.449 8665	0.449 8656	0.192 9089	0.195 0172
	25	0.892 5511	0.892 1035	0.436 0629	0.436 0621	0.186 9071	0.189 0342
	26	0.900 2230	0.899 7898	0.422 1333	0.422 1324	0.180 8512	0.182 9965
	27	0.907 6378	0.907 2191	0.408 0813	0.408 0805	0.174 7428	0.176 9056
	28	-0.914 7927	-0.914 3886	+0.393 9109	+0.393 9101	+0.168 5835	+0.170 7633
	29	0.921 6851	0.921 2958	0.379 6259	0.379 6252	0.162 3749	0.164 5711
	30	0.928 3126	0.927 9381	0.365 2305	0.365 2298	0.156 1190	0.158 3309
	31	0.934 6726	0.934 3132	0.350 7288	0.350 7282	0.149 8175	0.152 0444
Sept.	1	0.940 7630	0.940 4186	0.336 1250	0.336 1245	0.143 4723	0.145 7136
	2	0.946 5815	0.946 2523	0.321 4236	0.321 4231	0.137 0852	0.139 3404
	3	-0.952 1260	-0.951 8122	+0.306 6289	+0.306 6285	+0.130 6583	+0.132 9265
	4	0.957 3947	0.957 0962	0.291 7454	0.291 7450	0.124 1935	0.126 4742
	5	0.962 3858	0.962 1028	0.276 7775	0.276 7771	0.117 6927	0.119 9852
	6	0.967 0975	0.966 8301	0.261 7298	0.261 7295	0.111 1579	0.113 4616
	7	0.971 5285	0.971 2767	0.246 6069	0.246 6066	0.104 5913	0.106 9054
	8	0.975 6773	0.975 4411	0.231 4132	0.231 4130	0.097 9947	0.100 3186
	9	-0.979 5426	-0.979 3222	+0.216 1535	+0.216 1533	+0.091 3702	+0.093 7032
	10	0.983 1233	0.982 9188	0.200 8321	0.200 8320	0.084 7198	0.087 0612
	11	0.986 4185	0.986 2298	0.185 4538	0.185 4537	0.078 0455	0.080 3947
	12	0.989 4271	0.989 2544	0.170 0231	0.170 0230	0.071 3493	0.073 7056
	13	0.992 1486	0.991 9918	0.154 5444	0.154 5444	0.064 6332	0.066 9959
	14	0.994 5822	0.994 4415	0.139 0223	0.139 0223	0.057 8991	0.060 2675
	15	-0.996 7273	-0.996 6027	+0.123 4612	+0.123 4612	+0.051 1489	+0.053 5224
	16	0.998 5837	0.998 4751	0.107 8653	0.107 8654	0.044 3845	0.046 7623
	17	1.000 1507	1.000 0583	0.092 2390	0.092 2391	0.037 6078	0.039 9892
	18	1.001 4280	1.001 3518	0.076 5864	0.076 5866	0.030 8204	0.033 2048
	19	1.002 4151	1.002 3551	0.060 9116	0.060 9119	0.024 0241	0.026 4108
	20	1.003 1115	1.003 0676	0.045 2188	0.045 2191	0.017 2207	0.019 6089
	21	-1.003 5165	-1.003 4889	+0.029 5121	+0.029 5124	+0.010 4119	+0.012 8010
	22	1.003 6296	1.003 6182	+0.013 7957	+0.013 7961	+0.003 5995	+0.005 9888
	23	1.003 4501	1.003 4549	-0.001 9260	-0.001 9255	-0.003 2146	-0.000 8258
	24	1.002 9774	1.002 9984	0.017 6485	0.017 6480	0.010 0286	0.007 6410
	25	1.002 2109	1.002 2482	0.033 3673	0.033 3668	0.016 8404	0.014 4547
	26	1.001 1503	1.001 2038	0.049 0778	0.049 0773	0.023 6481	0.021 2650
	27	-0.999 7954	-0.999 8650	-0.064 7753	-0.064 7747	-0.030 4495	-0.028 0698
	28	0.998 1458	0.998 2317	0.080 4548	0.080 4542	0.037 2427	0.034 8670
	29	0.996 2017	0.996 3037	0.096 1118	0.096 1111	0.044 0255	0.041 6545
	30	0.993 9632	0.994 0813	0.111 7411	0.111 7404	0.050 7958	0.048 4302
Oct.	1	-0.991 4305	-0.991 5647	-0.127 3381	-0.127 3374	-0.057 5514	-0.055 1919

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EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date		$X_{2024.5}$	$X_{2000.0}$	$Y_{2024.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
Oct.	1	-0.991 4305	-0.991 5647	-0.127 3381	-0.127 3374	-0.057 5514	-0.055 1919
	2	0.988 6040	0.988 7544	0.142 8978	0.142 8970	0.064 2901	0.061 9374
	3	0.985 4844	0.985 6507	0.158 4154	0.158 4145	0.071 0099	0.068 6648
	4	0.982 0723	0.982 2546	0.173 8858	0.173 8849	0.077 7086	0.075 3717
	5	0.978 3686	0.978 5668	0.189 3044	0.189 3034	0.084 3841	0.082 0560
	6	0.974 3742	0.974 5882	0.204 6661	0.204 6651	0.091 0342	0.088 7157
	7	-0.970 0903	-0.970 3201	-0.219 9663	-0.219 9653	-0.097 6567	-0.095 3485
	8	0.965 5182	0.965 7637	0.235 2001	0.235 1991	0.104 2498	0.101 9525
	9	0.960 6592	0.960 9204	0.250 3629	0.250 3618	0.110 8112	0.108 5256
	10	0.955 5149	0.955 7916	0.265 4500	0.265 4489	0.117 3389	0.115 0657
	11	0.950 0868	0.950 3791	0.280 4568	0.280 4556	0.123 8310	0.121 5708
	12	0.944 3768	0.944 6844	0.295 3788	0.295 3776	0.130 2856	0.128 0390
	13	-0.938 3867	-0.938 7096	-0.310 2117	-0.310 2104	-0.136 7006	-0.134 4684
	14	0.932 1183	0.932 4564	0.324 9511	0.324 9498	0.143 0744	0.140 8571
	15	0.925 5735	0.925 9267	0.339 5929	0.339 5916	0.149 4051	0.147 2035
	16	0.918 7544	0.919 1226	0.354 1330	0.354 1316	0.155 6910	0.153 5057
	17	0.911 6627	0.912 0458	0.368 5673	0.368 5659	0.161 9304	0.159 7620
	18	0.904 3003	0.904 6981	0.382 8920	0.382 8905	0.168 1216	0.165 9709
	19	-0.896 6689	-0.897 0814	-0.397 1030	-0.397 1015	-0.174 2630	-0.172 1305
	20	0.888 7703	0.889 1973	0.411 1963	0.411 1948	0.180 3529	0.178 2393
	21	0.880 6061	0.881 0475	0.425 1678	0.425 1662	0.186 3895	0.184 2954
	22	0.872 1783	0.872 6339	0.439 0133	0.439 0117	0.192 3710	0.190 2970
	23	0.863 4885	0.863 9583	0.452 7285	0.452 7268	0.198 2956	0.196 2424
	24	0.854 5390	0.855 0228	0.466 3090	0.466 3074	0.204 1613	0.202 1295
	25	-0.845 3318	-0.845 8294	-0.479 7507	-0.479 7489	-0.209 9664	-0.207 9566
	26	0.835 8692	0.836 3805	0.493 0490	0.493 0472	0.215 7089	0.213 7217
	27	0.826 1536	0.826 6785	0.506 1996	0.506 1979	0.221 3869	0.219 4229
	28	0.816 1877	0.816 7260	0.519 1983	0.519 1965	0.226 9985	0.225 0583
	29	0.805 9741	0.806 5257	0.532 0407	0.532 0388	0.232 5418	0.230 6260
	30	0.795 5158	0.796 0804	0.544 7225	0.544 7206	0.238 0150	0.236 1241
	31	-0.784 8156	-0.785 3931	-0.557 2395	-0.557 2376	-0.243 4161	-0.241 5507
Nov.	1	0.773 8767	0.774 4669	0.569 5876	0.569 5857	0.248 7434	0.246 9041
	2	0.762 7025	0.763 3052	0.581 7626	0.581 7606	0.253 9950	0.252 1824
	3	0.751 2961	0.751 9112	0.593 7605	0.593 7585	0.259 1693	0.257 3839
	4	0.739 6613	0.740 2886	0.605 5773	0.605 5753	0.264 2643	0.262 5067
	5	0.727 8016	0.728 4408	0.617 2092	0.617 2071	0.269 2786	0.267 5493
	6	-0.715 7207	-0.716 3717	-0.628 6524	-0.628 6503	-0.274 2103	-0.272 5098
	7	0.703 4225	0.704 0851	0.639 9032	0.639 9011	0.279 0580	0.277 3869
	8	0.690 9110	0.691 5849	0.650 9581	0.650 9560	0.283 8202	0.282 1788
	9	0.678 1900	0.678 8752	0.661 8137	0.661 8116	0.288 4953	0.286 8843
	10	0.665 2638	0.665 9599	0.672 4668	0.672 4646	0.293 0819	0.291 5018
	11	0.652 1364	0.652 8432	0.682 9141	0.682 9119	0.297 5788	0.296 0300
	12	-0.638 8118	-0.639 5291	-0.693 1527	-0.693 1505	-0.301 9847	-0.300 4676
	13	0.625 2941	0.626 0218	0.703 1797	0.703 1775	0.306 2984	0.304 8135
	14	0.611 5873	0.612 3250	0.712 9923	0.712 9901	0.310 5186	0.309 0665
	15	0.597 6953	0.598 4429	0.722 5878	0.722 5855	0.314 6444	0.313 2254
	16	-0.583 6219	-0.584 3792	-0.731 9634	-0.731 9610	-0.318 6746	-0.317 2891

SUN, 2024

EQUATORIAL RECTANGULAR CO-ORDINATES FOR 0^h TERRESTRIAL TIME
MEAN EQUATOR AND EQUINOX OF J 2024.5 AND J 2000.0

Date		$X_{2024.5}$	$X_{2000.0}$	$Y_{2024.5}$	$Y_{2000.0}$	$Z_{2024.5}$	$Z_{2000.0}$
Nov.	16	-0.583 6219	-0.584 3792	-0.731 9634	-0.731 9610	-0.318 6746	-0.317 2891
	17	0.569 3711	0.570 1378	0.741 1163	0.741 1140	0.322 6080	0.321 2564
	18	0.554 9465	0.555 7224	0.750 0439	0.750 0415	0.326 4434	0.325 1262
	19	0.540 3521	0.541 1369	0.758 7432	0.758 7408	0.330 1796	0.328 8973
	20	0.525 5918	0.526 3853	0.767 2114	0.767 2091	0.333 8154	0.332 5683
	21	0.510 6696	0.511 4716	0.775 4457	0.775 4433	0.337 3496	0.336 1380
	22	-0.495 5898	-0.496 4000	-0.783 4431	-0.783 4407	-0.340 7809	-0.339 6053
	23	0.480 3566	0.481 1748	0.791 2008	0.791 1984	0.344 1081	0.342 9687
	24	0.464 9745	0.465 8004	0.798 7161	0.798 7137	0.347 3298	0.346 2271
	25	0.449 4480	0.450 2813	0.805 9863	0.805 9838	0.350 4450	0.349 3794
	26	0.433 7817	0.434 6222	0.813 0086	0.813 0061	0.353 4525	0.352 4242
	27	0.417 9804	0.418 8279	0.819 7805	0.819 7780	0.356 3512	0.355 3605
	28	-0.402 0490	-0.402 9032	-0.826 2996	-0.826 2971	-0.359 1399	-0.358 1871
	29	0.385 9924	0.386 8530	0.832 5635	0.832 5609	0.361 8175	0.360 9031
	30	0.369 8157	0.370 6824	0.838 5698	0.838 5672	0.364 3832	0.363 5073
Dec.	1	0.353 5240	0.354 3967	0.844 3163	0.844 3138	0.366 8359	0.365 9988
	2	0.337 1226	0.338 0009	0.849 8011	0.849 7986	0.369 1747	0.368 3767
	3	0.320 6169	0.321 5005	0.855 0222	0.855 0197	0.371 3989	0.370 6401
	4	-0.304 0121	-0.304 9007	-0.859 9778	-0.859 9753	-0.373 5075	-0.372 7884
	5	0.287 3138	0.288 2072	0.864 6663	0.864 6637	0.375 5000	0.374 8206
	6	0.270 5274	0.271 4253	0.869 0861	0.869 0836	0.377 3757	0.376 7363
	7	0.253 6584	0.254 5606	0.873 2361	0.873 2335	0.379 1340	0.378 5348
	8	0.236 7123	0.237 6184	0.877 1149	0.877 1123	0.380 7746	0.380 2157
	9	0.219 6945	0.220 6044	0.880 7216	0.880 7190	0.382 2970	0.381 7786
	10	-0.202 6105	-0.203 5237	-0.884 0554	-0.884 0528	-0.383 7008	-0.383 2232
	11	0.185 4654	0.186 3818	0.887 1154	0.887 1128	0.384 9859	0.384 5490
	12	0.168 2646	0.169 1838	0.889 9011	0.889 8985	0.386 1519	0.385 7560
	13	0.151 0131	0.151 9348	0.892 4117	0.892 4091	0.387 1987	0.386 8439
	14	0.133 7160	0.134 6399	0.894 6468	0.894 6442	0.388 1260	0.387 8124
	15	0.116 3782	0.117 3041	0.896 6057	0.896 6031	0.388 9337	0.388 6614
	16	-0.099 0046	-0.099 9322	-0.898 2879	-0.898 2853	-0.389 6216	-0.389 3906
	17	0.081 6002	0.082 5292	0.899 6928	0.899 6902	0.390 1893	0.389 9998
	18	0.064 1700	0.065 1001	0.900 8197	0.900 8171	0.390 6366	0.390 4886
	19	0.046 7190	0.047 6500	0.901 6681	0.901 6655	0.390 9633	0.390 8568
	20	0.029 2525	0.030 1840	0.902 2374	0.902 2349	0.391 1691	0.391 1042
	21	-0.011 7755	-0.012 7073	0.902 5272	0.902 5246	0.391 2537	0.391 2305
	22	+0.005 7065	+0.004 7748	-0.902 5369	-0.902 5344	-0.391 2171	-0.391 2354
	23	0.023 1883	0.022 2569	0.902 2664	0.902 2638	0.391 0589	0.391 1189
	24	0.040 6644	0.039 7336	0.901 7152	0.901 7127	0.390 7792	0.390 8807
	25	0.058 1292	0.057 1993	0.900 8833	0.900 8808	0.390 3777	0.390 5209
	26	0.075 5773	0.074 6487	0.899 7707	0.899 7682	0.389 8545	0.390 0392
	27	0.093 0031	0.092 0759	0.898 3774	0.898 3749	0.389 2097	0.389 4358
	28	+0.110 4009	+0.109 4755	-0.896 7036	-0.896 7012	-0.388 4432	-0.388 7107
	29	0.127 7652	0.126 8418	0.894 7497	0.894 7472	0.387 5552	0.387 8641
	30	0.145 0901	0.144 1691	0.892 5160	0.892 5136	0.386 5459	0.386 8960
	31	0.162 3699	0.161 4515	0.890 0033	0.890 0008	0.385 4156	0.385 8068
	32	+0.179 5989	+0.178 6834	-0.887 2121	-0.887 2097	-0.384 1645	-0.384 5968

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Date		Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
		°	°	°
Jan.	0	+2.79	-2.82	240.59
	1	2.31	2.94	227.42
	2	1.83	3.06	214.24
	3	1.34	3.17	201.07
	4	0.86	3.29	187.90
	5	+0.37	3.40	174.73
	6	-0.11	-3.52	161.56
	7	0.59	3.63	148.39
	8	1.08	3.74	135.23
	9	1.56	3.85	122.06
	10	2.04	3.96	108.89
	11	2.52	4.06	95.72
	12	-2.99	-4.17	82.55
	13	3.47	4.28	69.38
	14	3.94	4.38	56.22
	15	4.41	4.48	43.05
	16	4.88	4.58	29.88
	17	5.34	4.68	16.72
	18	-5.81	-4.78	3.55
	19	6.27	4.87	350.38
	20	6.73	4.97	337.21
	21	7.18	5.06	324.05
	22	7.63	5.15	310.88
	23	8.08	5.24	297.71
	24	-8.52	-5.33	284.55
	25	8.96	5.42	271.38
	26	9.40	5.50	258.21
	27	9.83	5.59	245.04
	28	10.26	5.67	231.88
	29	10.69	5.75	218.71
	30	-11.11	-5.82	205.54
	31	11.52	5.90	192.38
Feb.	1	11.94	5.97	179.21
	2	12.34	6.05	166.05
	3	12.75	6.12	152.88
	4	13.15	6.18	139.71
	5	-13.54	-6.25	126.55
	6	13.93	6.31	113.38
	7	14.31	6.38	100.21
	8	14.69	6.44	87.05
	9	15.06	6.49	73.88
	10	15.43	6.55	60.72
	11	-15.80	-6.60	47.55
	12	16.15	6.66	34.38
	13	16.51	6.71	21.22
	14	16.85	6.75	8.05
	15	-17.20	-6.80	354.88

Date		Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
		°	°	°
Feb.	15	-17.20	-6.80	354.88
	16	17.53	6.84	341.71
	17	17.86	6.88	328.54
	18	18.19	6.92	315.38
	19	18.50	6.96	302.21
	20	18.82	7.00	289.04
	21	-19.12	-7.03	275.87
	22	19.43	7.06	262.70
	23	19.72	7.09	249.53
	24	20.01	7.11	236.36
	25	20.29	7.14	223.19
	26	20.57	7.16	210.02
	27	-20.84	-7.18	196.85
	28	21.11	7.19	183.67
Mar.	29	21.36	7.21	170.50
	1	21.62	7.22	157.33
	2	21.86	7.23	144.16
	3	22.10	7.24	130.98
	4	-22.34	-7.25	117.81
	5	22.56	7.25	104.63
	6	22.78	7.25	91.46
	7	23.00	7.25	78.28
	8	23.21	7.25	65.11
	9	23.41	7.24	51.93
	10	-23.60	-7.24	38.76
	11	23.79	7.23	25.58
	12	23.97	7.21	12.40
	13	24.14	7.20	359.22
	14	24.31	7.18	346.04
	15	24.47	7.17	332.86
	16	-24.63	-7.15	319.68
	17	24.77	7.12	306.50
	18	24.92	7.10	293.32
	19	25.05	7.07	280.14
	20	25.18	7.04	266.95
	21	25.30	7.01	253.77
	22	-25.41	-6.98	240.59
	23	25.52	6.94	227.40
	24	25.61	6.90	214.21
	25	25.71	6.87	201.03
	26	25.79	6.82	187.84
	27	25.87	6.78	174.65
	28	-25.94	-6.73	161.46
	29	26.01	6.69	148.27
	30	26.06	6.64	135.08
Apr.	31	26.11	6.59	121.89
	1	-26.15	-6.53	108.70

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Date		Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0	Date		Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
		°	°	°			°	°	°
Apr.	1	-26.15	-6.53	108.70	May	17	-20.27	-2.41	221.02
	2	26.19	6.48	95.50		18	19.97	2.30	207.79
	3	26.22	6.42	82.31		19	19.68	2.18	194.56
	4	26.24	6.36	69.12		20	19.37	2.07	181.33
	5	26.25	6.30	55.92		21	19.06	1.95	168.10
	6	26.26	6.24	42.72		22	18.74	1.83	154.87
	7	-26.26	-6.17	29.53		23	-18.42	-1.72	141.64
	8	26.25	6.11	16.33		24	18.09	1.60	128.41
	9	26.24	6.04	3.13		25	17.75	1.48	115.18
	10	26.21	5.97	349.93		26	17.41	1.36	101.95
	11	26.18	5.90	336.73		27	17.07	1.24	88.72
	12	26.15	5.82	323.53		28	16.72	1.12	75.49
	13	-26.10	-5.75	310.33		29	-16.36	-1.00	62.25
	14	26.05	5.67	297.13		30	16.00	0.88	49.02
	15	25.99	5.59	283.93		31	15.63	0.76	35.79
	16	25.92	5.52	270.72	June	1	15.26	0.64	22.56
	17	25.85	5.43	257.52		2	14.88	0.52	9.32
	18	25.77	5.35	244.31		3	14.50	0.40	356.09
	19	-25.68	-5.27	231.10		4	-14.11	-0.28	342.85
	20	25.58	5.18	217.90		5	13.72	0.16	329.62
	21	25.48	5.09	204.69		6	13.33	-0.04	316.39
	22	25.37	5.01	191.48		7	12.93	+0.08	303.15
	23	25.25	4.92	178.27		8	12.52	0.20	289.92
	24	25.12	4.82	165.06		9	12.12	0.33	276.68
	25	-24.99	-4.73	151.85		10	-11.71	+0.45	263.45
	26	24.85	4.64	138.63		11	11.29	0.57	250.21
	27	24.70	4.54	125.42		12	10.87	0.69	236.97
	28	24.55	4.45	112.21		13	10.45	0.81	223.74
	29	24.39	4.35	98.99		14	10.03	0.93	210.50
	30	24.22	4.25	85.78		15	9.60	1.05	197.26
May	1	-24.04	-4.15	72.56		16	-9.17	+1.17	184.03
	2	23.86	4.05	59.34		17	8.74	1.28	170.79
	3	23.67	3.95	46.13		18	8.30	1.40	157.55
	4	23.47	3.84	32.91		19	7.87	1.52	144.32
	5	23.26	3.74	19.69		20	7.43	1.64	131.08
	6	23.05	3.63	6.47		21	6.98	1.76	117.84
	7	-22.83	-3.53	353.25		22	-6.54	+1.87	104.61
	8	22.61	3.42	340.03		23	6.10	1.99	91.37
	9	22.37	3.31	326.81		24	5.65	2.10	78.13
	10	22.13	3.20	313.59		25	5.20	2.22	64.89
	11	21.89	3.09	300.36		26	4.75	2.33	51.66
	12	21.63	2.98	287.14		27	4.30	2.45	38.42
	13	-21.37	-2.87	273.92		28	-3.85	+2.56	25.18
	14	21.11	2.76	260.69		29	3.40	2.67	11.95
	15	20.83	2.64	247.47		30	2.94	2.78	358.71
	16	20.55	2.53	234.24	July	1	2.49	2.89	345.47
	17	-20.27	-2.41	221.02		2	-2.04	+3.00	332.24

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Date		Position Angle of Axis P	Heliographic Latitude B_0	Heliographic Longitude L_0
		°	°	°
July	1	-2.49	+2.89	345.47
	2	2.04	3.00	332.24
	3	1.58	3.11	319.00
	4	1.13	3.22	305.77
	5	0.68	3.33	292.53
	6	-0.22	3.44	279.30
	7	+0.23	+3.54	266.06
	8	0.68	3.65	252.83
	9	1.13	3.75	239.59
	10	1.58	3.85	226.36
	11	2.03	3.95	213.13
	12	2.48	4.06	199.89
	13	+2.92	+4.15	186.66
	14	3.37	4.25	173.42
	15	3.81	4.35	160.19
	16	4.25	4.45	146.96
	17	4.69	4.54	133.73
	18	5.13	4.63	120.49
	19	+5.56	+4.73	107.26
	20	6.00	4.82	94.03
	21	6.43	4.91	80.80
	22	6.86	5.00	67.57
	23	7.28	5.08	54.34
	24	7.70	5.17	41.11
	25	+8.12	+5.25	27.88
	26	8.54	5.33	14.65
	27	8.95	5.42	1.42
	28	9.36	5.49	348.19
	29	9.77	5.57	334.97
	30	10.18	5.65	321.74
	31	+10.58	+5.72	308.51
Aug.	1	10.98	5.80	295.29
	2	11.37	5.87	282.06
	3	11.76	5.94	268.84
	4	12.15	6.01	255.62
	5	12.53	6.08	242.39
	6	+12.91	+6.14	229.17
	7	13.28	6.21	215.95
	8	13.65	6.27	202.72
	9	14.02	6.33	189.50
	10	14.38	6.39	176.28
	11	14.74	6.44	163.06
	12	+15.09	+6.50	149.84
	13	15.44	6.55	136.62
	14	15.79	6.60	123.40
	15	16.13	6.65	110.18
	16	+16.46	+6.70	96.96
Aug.	16	+16.46	+6.70	96.96
	17	16.79	6.75	83.75
	18	17.12	6.79	70.53
	19	17.44	6.83	57.31
	20	17.75	6.87	44.09
	21	18.07	6.91	30.88
	22	+18.37	+6.95	17.66
	23	18.67	6.98	4.45
	24	18.97	7.01	351.23
	25	19.26	7.04	338.02
	26	19.55	7.07	324.81
	27	19.83	7.10	311.60
	28	+20.10	+7.12	298.38
	29	20.37	7.14	285.17
	30	20.64	7.16	271.96
	31	20.90	7.18	258.75
Sept.	1	21.15	7.20	245.54
	2	21.40	7.21	232.34
	3	+21.64	+7.22	219.13
	4	21.88	7.23	205.92
	5	22.11	7.24	192.71
	6	22.34	7.25	179.51
	7	22.56	7.25	166.30
	8	22.77	7.25	153.09
	9	+22.98	+7.25	139.89
	10	23.18	7.25	126.68
	11	23.38	7.24	113.48
	12	23.57	7.24	100.27
	13	23.75	7.23	87.07
	14	23.93	7.22	73.87
	15	+24.10	+7.20	60.66
	16	24.27	7.19	47.46
	17	24.43	7.17	34.26
	18	24.58	7.15	21.06
	19	24.72	7.13	7.86
	20	24.87	7.11	354.66
	21	+25.00	+7.08	341.46
	22	25.13	7.05	328.26
	23	25.25	7.02	315.06
	24	25.36	6.99	301.86
	25	25.47	6.96	288.66
	26	25.57	6.92	275.46
	27	+25.66	+6.88	262.27
	28	25.75	6.84	249.07
	29	25.83	6.80	235.87
	30	25.91	6.76	222.68
Oct.	1	+25.97	+6.71	209.48

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Date	Position Angle of Axis *P*	Heliographic Latitude B_0	Heliographic Longitude L_0	Date	Angle of Axis *P*	Heliographic Latitude B_0	Heliographic Longitude L_0
	°	°	°		°	°	°
Oct. 1	+25.97	+6.71	209.48	Nov. 16	+20.99	+2.71	322.80
2	26.03	6.66	196.29	17	20.70	2.59	309.62
3	26.09	6.61	183.09	18	20.40	2.47	296.44
4	26.13	6.56	169.90	19	20.10	2.35	283.26
5	26.17	6.51	156.70	20	19.79	2.23	270.07
6	26.20	6.45	143.51	21	19.47	2.11	256.89
7	+26.23	+6.39	130.31	22	+19.15	+1.98	243.71
8	26.25	6.33	117.12	23	18.81	1.86	230.53
9	26.26	6.27	103.93	24	18.48	1.74	217.35
10	26.26	6.21	90.74	25	18.13	1.61	204.17
11	26.25	6.14	77.54	26	17.78	1.49	190.99
12	26.24	6.07	64.35	27	17.42	1.36	177.81
13	+26.22	+6.00	51.16	28	+17.06	+1.24	164.63
14	26.20	5.93	37.97	29	16.68	1.11	151.45
15	26.16	5.86	24.78	30	16.31	0.98	138.27
16	26.12	5.78	11.59	Dec. 1	15.92	0.86	125.09
17	26.07	5.71	358.39	2	15.53	0.73	111.91
18	26.01	5.63	345.20	3	15.14	0.60	98.74
19	+25.95	+5.55	332.01	4	+14.74	+0.48	85.56
20	25.88	5.47	318.82	5	14.33	0.35	72.38
21	25.80	5.38	305.63	6	13.92	0.22	59.20
22	25.71	5.30	292.44	7	13.50	+0.09	46.03
23	25.62	5.21	279.26	8	13.08	-0.04	32.85
24	25.51	5.12	266.07	9	12.65	0.17	19.67
25	+25.40	+5.03	252.88	10	+12.22	-0.29	6.50
26	25.28	4.94	239.69	11	11.79	0.42	353.32
27	25.16	4.85	226.50	12	11.35	0.55	340.14
28	25.02	4.75	213.32	13	10.90	0.68	326.97
29	24.88	4.66	200.13	14	10.45	0.81	313.79
30	24.73	4.56	186.94	15	10.00	0.93	300.62
31	+24.57	+4.46	173.76	16	+9.55	-1.06	287.44
Nov. 1	24.41	4.36	160.57	17	9.09	1.19	274.27
2	24.23	4.26	147.38	18	8.63	1.31	261.09
3	24.05	4.16	134.20	19	8.16	1.44	247.92
4	23.86	4.05	121.01	20	7.70	1.57	234.74
5	23.67	3.95	107.83	21	7.23	1.69	221.57
6	+23.46	+3.84	94.64	22	+6.75	-1.82	208.40
7	23.25	3.73	81.46	23	6.28	1.94	195.22
8	23.03	3.62	68.27	24	5.80	2.06	182.05
9	22.80	3.51	55.09	25	5.32	2.19	168.88
10	22.56	3.40	41.91	26	4.84	2.31	155.71
11	22.32	3.29	28.72	27	4.36	2.43	142.53
12	+22.07	+3.17	15.54	28	+3.88	-2.55	129.36
13	21.81	3.06	2.35	29	3.40	2.67	116.19
14	21.54	2.94	349.17	30	2.91	2.79	103.02
15	21.27	2.82	335.99	31	2.43	2.91	89.85
16	+20.99	+2.71	322.80	32	+1.94	-3.03	76.68

MOON, 2024

UNIVERSAL TIME

PHASES OF THE MOON

Lunation	New Moon	d	h	m	First Quarter	d	h	m	Full Moon	d	h	m	Last Quarter	d	h	m
1250	Dec.	12	23	32	Dec.	19	18	39	Dec.	27	00	33	Jan.	4	03	30
1251	Jan.	11	11	57	Jan.	18	03	53	Jan.	25	17	54	Feb.	2	23	18
1252	Feb.	9	22	59	Feb.	16	15	01	Feb.	24	12	30	Mar.	3	15	23
1253	Mar.	10	09	00	Mar.	17	04	11	Mar.	25	07	00	Apr.	2	03	15
1254	Apr.	8	18	21	Apr.	15	19	13	April	23	23	49	May	1	11	27
1255	May	8	03	22	May	15	11	48	May	23	13	53	May	30	17	13
1256	June	6	12	38	June	14	05	18	June	22	01	08	June	28	21	53
1257	July	5	22	57	July	13	22	49	July	21	10	17	July	28	02	52
1258	Aug.	4	11	13	Aug.	12	15	19	Aug.	19	18	26	Aug.	26	09	26
1259	Sept.	3	01	56	Sept.	11	06	06	Sept.	18	02	34	Sept.	24	18	50
1260	Oct.	2	18	49	Oct.	10	18	55	Oct.	17	11	26	Oct.	24	08	03
1261	Nov.	1	12	47	Nov.	9	05	55	Nov.	15	21	28	Nov.	23	01	28
1262	Dec.	1	06	21	Dec.	8	15	27	Dec.	15	09	02	Dec	22	22	18
1263	Dec.	30	22	27	Jan.	6	23	56	Jan.	13	22	27	Jan	21	20	31

MOON AT PERIGEE

	d	h		d	h		d	h
Dec.	16	19	May	05	22	Sept.	18	13
Jan.	13	11	June	02	07	Oct.	17	01
Feb.	10	19	June	27	12	Nov.	14	11
Mar.	10	07	July	24	06	Dec	12	13
Apr.	07	18	Aug.	21	05	Jan.	08	00

MOON AT APOGEE

	d	h		d	h		d	h
Jan.	01	15	May	17	19	Oct.	02	20
Jan	29	08	Jun	14	14	Oct.	29	23
Feb.	25	15	July	12	08	Nov.	26	12
Mar.	23	16	Aug	09	02	Dec.	24	07
Apr.	20	02	Sept	05	15	Jan.	21	05

MOON, 2024
MEAN EQUATOR, ORBIT, LONGITUDE AND ELONGATION

Date		Mean Equator			Orbit Perigee			Node			Mean Longitude			Mean Elongation
		i	æ	q '	ũ'			q			☾			D
		°	°	°	°	'	"	°	'	"	°	'	"	°
Jan.	1	21.5391	202.179	358.590	339	51	36.8	20	52	42.4	171	1	11.5	235.855
	11	21.5203	201.613	358.629	300	18	43.3	20	20	56.1	302	47	1.7	357.763
	21	21.5014	201.048	358.668	301	25	33.8	19	49	9.7	194	32	52.0	119.670
	31	21.4824	200.482	358.707	302	32	24.3	19	17	23.4	206	18	42.3	241.578
Feb.	10	21.4633	199.916	358.747	303	39	14.8	18	45	37.1	338	4	32.6	3.485
	20	21.4441	199.350	358.787	304	46	5.4	18	13	50.7	229	50	22.8	125.393
Mar.	1	21.4249	198.783	358.827	305	52	55.9	17	42	4.4	241	36	13.1	247.300
	11	21.4056	198.216	358.868	306	59	46.4	17	10	18.1	13	22	3.4	9.207
	21	21.3862	197.649	358.909	308	6	36.9	16	38	31.7	265	7	53.7	131.115
Apr.	31	21.3667	197.081	358.950	309	13	27.4	16	6	45.4	276	53	43.9	253.022
	10	21.3471	196.514	358.991	310	20	18.0	15	34	59.1	48	39	34.2	14.930
	20	21.3274	195.946	359.033	311	27	8.5	15	3	12.7	300	25	24.5	136.837
May	30	21.3077	195.377	359.075	312	33	59.0	14	31	26.4	312	11	14.7	258.744
	10	21.2879	194.809	359.118	313	40	49.5	13	59	40.1	83	57	5.0	20.652
	20	21.268	194.240	359.160	314	47	40.1	13	27	53.7	335	42	55.3	142.559
	30	21.248	193.671	359.203	315	54	30.6	12	56	7.4	347	28	45.6	264.467
June	9	21.2279	193.102	359.247	317	1	21.1	12	24	21.1	119	14	35.8	26.374
	19	21.2078	192.532	359.290	318	8	11.6	11	52	34.7	11	0	26.1	148.281
	29	21.1876	191.962	359.334	319	15	2.1	11	20	48.4	22	46	16.4	270.189
July	9	21.1672	191.392	359.378	320	21	52.7	10	49	2.1	154	32	6.7	32.096
	19	21.1468	190.821	359.422	321	28	43.2	10	17	15.7	46	17	56.9	154.004
	29	21.1264	190.251	359.467	322	35	33.7	9	45	29.4	58	3	47.2	275.911
Aug.	8	21.1058	189.680	359.512	323	42	24.2	9	13	43.1	189	49	37.5	37.818
	18	21.0852	189.108	359.558	324	49	14.8	8	41	56.7	81	35	27.7	159.726
	28	21.0645	188.537	359.603	325	56	5.3	8	10	10.4	93	21	18.0	281.633
Sept.	7	21.0437	187.965	359.649	327	2	55.8	7	38	24.0	225	7	8.3	43.541
	17	21.0228	187.393	359.695	328	9	46.3	7	6	37.7	116	52	58.6	165.448
	27	21.0018	186.820	359.742	329	16	36.8	6	34	51.4	128	38	48.8	287.356
Oct.	7	20.9808	186.248	359.788	330	23	27.4	6	3	5.0	260	24	39.1	49.263
	17	20.9596	185.675	359.836	331	30	17.9	5	31	18.7	152	10	29.4	171.170
	27	20.9384	185.102	359.883	332	37	8.4	4	59	32.4	163	56	19.6	293.078
Nov.	6	20.9171	184.528	359.931	333	43	58.9	4	27	46.0	295	42	9.9	54.985
	16	20.8957	183.954	359.979	334	50	49.5	3	55	59.7	187	28	0.2	176.893
	26	20.8743	183.380	0.027	335	57	40.0	3	24	13.4	199	13	50.5	298.800
Dec.	6	20.8527	182.806	0.075	337	4	30.5	2	52	27.0	330	59	40.7	60.707
	16	20.8311	182.231	0.124	338	11	21.0	2	20	40.7	222	45	31.0	182.615
	26	20.8094	181.657	0.173	339	18	11.6	1	48	54.4	234	31	21.3	304.522
	36	20.7876	181.081	0.223	340	25	2.1	1	17	8.0	6	17	11.6	66.430
	46	20.7657	180.506	0.272	341	31	52.6	0	45	21.7	258	3	1.8	188.337

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Jan.	0.0	144	04	47.5	+4	13	16.8	2.6966	14	48.34
	0.5	150	02	46.2	3	54	55.6	2.7017	14	46.68
	1.0	155	58	57.8	3	34	05.3	2.7050	14	45.58
	1.5	161	53	51.3	3	10	59.5	2.7066	14	45.08
	2.0	167	47	59.2	2	45	52.2	2.7061	14	45.22
	2.5	173	41	56.8	2	18	57.5	2.7037	14	46.03
	3.0	179	36	21.8	+1	50	30.0	2.6991	14	47.53
	3.5	185	31	54.1	1	20	44.6	2.6924	14	49.74
	4.0	191	29	14.9	0	49	56.7	2.6836	14	52.66
	4.5	197	29	06.4	+0	18	22.5	2.6727	14	56.28
	5.0	203	32	10.9	-0	13	40.6	2.6600	15	00.58
	5.5	209	39	10.0	0	45	54.3	2.6454	15	05.54
	6.0	215	50	43.9	-1	17	58.5	2.6293	15	11.09
	6.5	222	07	29.9	1	49	31.4	2.6119	15	17.17
	7.0	228	30	01.9	2	20	09.7	2.5934	15	23.70
	7.5	234	58	48.3	2	49	27.7	2.5742	15	30.58
	8.0	241	34	11.2	3	16	58.5	2.5547	15	37.68
	8.5	248	16	24.8	3	42	13.5	2.5353	15	44.88
	9.0	255	05	33.9	-4	04	43.4	2.5163	15	52.02
	9.5	262	01	32.8	4	23	58.8	2.4981	15	58.94
	10.0	269	04	04.7	4	39	31.5	2.4812	16	05.49
	10.5	276	12	41.1	4	50	55.6	2.4658	16	11.49
	11.0	283	26	42.1	4	57	49.2	2.4524	16	16.80
	11.5	290	45	17.6	4	59	55.4	2.4412	16	21.29
	12.0	298	07	29.2	-4	57	03.8	2.4324	16	24.83
	12.5	305	32	12.1	4	49	11.4	2.4262	16	27.35
	13.0	312	58	18.5	4	36	23.2	2.4226	16	28.82
	13.5	320	24	40.7	4	18	52.0	2.4216	16	29.23
	14.0	327	50	13.8	3	56	58.2	2.4232	16	28.60
	14.5	335	13	58.6	3	31	08.7	2.4271	16	27.01
	15.0	342	35	04.0	-3	01	55.2	2.4331	16	24.54
	15.5	349	52	47.7	2	29	53.4	2.4411	16	21.32
	16.0	357	06	37.6	1	55	41.0	2.4508	16	17.45
	16.5	4	16	11.3	1	19	56.7	2.4618	16	13.09
	17.0	11	21	15.5	0	43	18.5	2.4738	16	08.34
	17.5	18	21	45.0	-0	06	23.2	2.4867	16	03.34
	18.0	25	17	41.4	+0	30	14.6	2.5001	15	58.18
	18.5	32	09	11.5	1	06	02.7	2.5138	15	52.96
	19.0	38	56	26.0	1	40	31.8	2.5276	15	47.76
	19.5	45	39	37.9	2	13	15.2	2.5413	15	42.64
	20.0	52	19	01.5	2	43	49.4	2.5549	15	37.64
	20.5	58	54	51.0	3	11	53.8	2.5681	15	32.79
	21.0	65	27	20.0	+3	37	10.3	2.5810	15	28.13
	21.5	71	56	41.0	3	59	24.1	2.5935	15	23.65
	22.0	78	23	04.4	4	18	22.6	2.6056	15	19.37
	22.5	84	46	39.1	4	33	56.4	2.6172	15	15.29
	23.0	91	07	31.9	+4	45	58.4	2.6284	15	11.41

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Jan.	23.0	91	07	31.9	+4	45	58.4	2.6284	15	11.41
	23.5	97	25	48.1	4	54	24.5	2.6391	15	07.72
	24.0	103	41	31.4	4	59	12.9	2.6492	15	04.23
	24.5	109	54	45.0	5	00	24.6	2.6589	15	00.95
	25.0	116	05	31.4	4	58	02.9	2.6680	14	57.87
	25.5	122	13	53.5	4	52	13.3	2.6765	14	55.01
	26.0	128	19	54.8	+4	43	03.5	2.6844	14	52.40
	26.5	134	23	40.5	4	30	43.1	2.6915	14	50.04
	27.0	140	25	17.2	4	15	23.3	2.6977	14	47.97
	27.5	146	24	54.1	3	57	16.6	2.7031	14	46.23
	28.0	152	22	43.1	3	36	36.7	2.7073	14	44.84
	28.5	158	18	58.8	3	13	38.2	2.7104	14	43.84
	29.0	164	13	59.1	+2	48	36.3	2.7121	14	43.27
	29.5	170	08	05.1	2	21	46.6	2.7124	14	43.18
	30.0	176	01	41.3	1	53	25.3	2.7111	14	43.60
	30.5	181	55	15.1	1	23	48.6	2.7081	14	44.57
	31.0	187	49	17.2	0	53	13.1	2.7034	14	46.13
	31.5	193	44	20.9	+0	21	55.7	2.6968	14	48.30
Feb.	1.0	199	41	02.1	-0	09	46.4	2.6883	14	51.10
	1.5	205	39	58.8	0	41	35.5	2.6779	14	54.56
	2.0	211	41	50.5	1	13	13.2	2.6656	14	58.68
	2.5	217	47	17.8	1	44	20.3	2.6515	15	03.46
	3.0	223	57	01.4	2	14	36.7	2.6357	15	08.87
	3.5	230	11	41.6	2	43	40.9	2.6184	15	14.89
	4.0	236	31	56.5	-3	11	10.3	2.5997	15	21.47
	4.5	242	58	21.6	3	36	40.8	2.5799	15	28.54
	5.0	249	31	27.7	3	59	47.4	2.5593	15	36.00
	5.5	256	11	39.6	4	20	03.7	2.5383	15	43.75
	6.0	262	59	14.4	4	37	03.4	2.5172	15	51.64
	6.5	269	54	19.4	4	50	20.0	2.4966	15	59.53
	7.0	276	56	51.3	-4	59	28.7	2.4767	16	07.24
	7.5	284	06	34.1	5	04	07.1	2.4580	16	14.57
	8.0	291	22	58.9	5	03	56.9	2.4411	16	21.34
	8.5	298	45	23.6	4	58	45.3	2.4262	16	27.35
	9.0	306	12	53.6	4	48	26.4	2.4138	16	32.41
	9.5	313	44	23.5	4	33	02.7	2.4042	16	36.38
	10.0	321	18	39.6	-4	12	45.4	2.3976	16	39.12
	10.5	328	54	23.4	3	47	54.6	2.3942	16	40.55
	11.0	336	30	14.6	3	18	58.9	2.3940	16	40.66
	11.5	344	04	55.3	2	46	34.0	2.3969	16	39.44
	12.0	351	37	13.1	2	11	21.2	2.4028	16	36.98
	12.5	359	06	03.9	1	34	05.2	2.4115	16	33.37
	13.0	6	30	34.1	-0	55	31.8	2.4227	16	28.78
	13.5	13	50	01.3	-0	16	26.7	2.4361	16	23.35
	14.0	21	03	54.9	+0	22	27.3	2.4512	16	17.27
	14.5	28	11	55.5	1	00	30.2	2.4678	16	10.73
	15.0	35	13	54.1	+1	37	06.8	2.4853	16	03.88

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Feb.	15.0	35	13	54.1	+1	37	06.8	2.4853	16	03.88
	15.5	42	09	50.5	2	11	46.3	2.5034	15	56.89
	16.0	48	59	51.9	2	44	02.6	2.5218	15	49.91
	16.5	55	44	11.3	3	13	34.3	2.5402	15	43.05
	17.0	62	23	06.0	3	40	03.9	2.5582	15	36.40
	17.5	68	56	56.2	4	03	18.1	2.5757	15	30.05
	18.0	75	26	04.0	+4	23	06.6	2.5924	15	24.06
	18.5	81	50	52.0	4	39	22.2	2.6082	15	18.46
	19.0	88	11	42.6	4	52	00.4	2.6230	15	13.27
	19.5	94	28	57.7	5	00	58.8	2.6367	15	08.52
	20.0	100	42	57.7	5	06	17.5	2.6493	15	04.20
	20.5	106	54	02.0	5	07	58.0	2.6608	15	00.30
	21.0	113	02	27.9	+5	06	04.1	2.6711	14	56.82
	21.5	119	08	31.5	5	00	40.9	2.6803	14	53.74
	22.0	125	12	27.3	4	51	55.4	2.6884	14	51.05
	22.5	131	14	28.5	4	39	56.2	2.6955	14	48.72
	23.0	137	14	47.5	4	24	53.2	2.7015	14	46.75
	23.5	143	13	36.0	4	06	57.9	2.7064	14	45.13
	24.0	149	11	05.3	+3	46	22.9	2.7104	14	43.84
	24.5	155	07	27.2	3	23	22.4	2.7133	14	42.89
	25.0	161	02	53.7	2	58	11.3	2.7152	14	42.27
	25.5	166	57	37.9	2	31	05.5	2.7160	14	42.01
	26.0	172	51	54.2	2	02	21.9	2.7157	14	42.10
	26.5	178	45	58.6	1	32	17.9	2.7143	14	42.57
	27.0	184	40	08.8	+1	01	11.3	2.7116	14	43.43
	27.5	190	34	44.8	+0	29	20.6	2.7077	14	44.71
	28.0	196	30	08.6	-0	02	55.8	2.7024	14	46.44
	28.5	202	26	44.5	0	35	18.7	2.6957	14	48.63
	29.0	208	24	59.1	1	07	29.2	2.6876	14	51.33
	29.5	214	25	21.0	1	39	07.7	2.6779	14	54.54
Mar.	1.0	220	28	20.8	-2	09	54.6	2.6668	14	58.29
	1.5	226	34	30.7	2	39	29.6	2.6541	15	02.59
	2.0	232	44	24.0	3	07	32.4	2.6398	15	07.45
	2.5	238	58	34.5	3	33	41.8	2.6242	15	12.86
	3.0	245	17	36.0	3	57	36.4	2.6072	15	18.80
	3.5	251	42	01.0	4	18	54.1	2.5891	15	25.24
	4.0	258	12	19.9	-4	37	12.6	2.5699	15	32.13
	4.5	264	48	59.7	4	52	09.5	2.5501	15	39.40
	5.0	271	32	22.4	5	03	22.6	2.5297	15	46.96
	5.5	278	22	43.7	5	10	30.9	2.5093	15	54.68
	6.0	285	20	11.3	5	13	15.1	2.4891	16	02.42
	6.5	292	24	43.3	5	11	18.6	2.4695	16	10.04
	7.0	299	36	07.1	-5	04	29.1	2.4511	16	17.34
	7.5	306	53	58.5	4	52	39.7	2.4342	16	24.12
	8.0	314	17	40.8	4	35	49.8	2.4192	16	30.20
	8.5	321	46	25.9	4	14	06.9	2.4066	16	35.38
	9.0	329	19	14.6	-3	47	47.1	2.3968	16	39.48

MOON, 2024
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude °	'	"	Apparent Latitude °	'	"	True Geocentric Distance (A. U.) (X 10^{-3})	Semi Diameter '	"
Mar.	9.0	329	19	14.6	-3	47	47.1	2.3968	16	39.48
	9.5	336	54	58.7	3	17	15.1	2.3899	16	42.35
	10.0	344	32	23.7	2	43	04.0	2.3863	16	43.87
	10.5	352	10	11.6	2	05	54.3	2.3860	16	44.00
	11.0	359	47	04.1	1	26	32.2	2.3890	16	42.72
	11.5	7	21	46.3	0	45	47.2	2.3953	16	40.08
	12.0	14	53	09.1	-0	04	30.1	2.4047	16	36.18
	12.5	22	20	11.8	+0	36	29.7	2.4169	16	31.15
	13.0	29	42	03.8	1	16	25.6	2.4316	16	25.17
	13.5	36	58	05.7	1	54	36.1	2.4484	16	18.42
	14.0	44	07	49.2	2	30	25.2	2.4668	16	11.12
	14.5	51	10	56.9	3	03	23.3	2.4864	16	03.45
	15.0	58	07	21.6	+3	33	07.0	2.5068	15	55.61
	15.5	64	57	05.2	3	59	18.7	2.5275	15	47.77
	16.0	71	40	16.9	4	21	46.3	2.5483	15	40.06
	16.5	78	17	12.6	4	40	22.3	2.5686	15	32.63
	17.0	84	48	12.7	4	55	03.0	2.5882	15	25.57
	17.5	91	13	41.5	5	05	48.1	2.6068	15	18.96
	18.0	97	34	05.9	+5	12	39.7	2.6242	15	12.85
	18.5	103	49	54.2	5	15	41.8	2.6403	15	07.30
	19.0	110	01	35.2	5	15	00.5	2.6549	15	02.32
	19.5	116	09	38.2	5	10	42.8	2.6679	14	57.92
	20.0	122	14	31.5	5	02	57.0	2.6793	14	54.10
	20.5	128	16	42.7	4	51	52.5	2.6890	14	50.85
	21.0	134	16	38.1	+4	37	39.5	2.6972	14	48.15
	21.5	140	14	42.7	4	20	29.2	2.7038	14	45.98
	22.0	146	11	19.8	4	00	33.6	2.7089	14	44.31
	22.5	152	06	51.3	3	38	05.8	2.7126	14	43.12
	23.0	158	01	37.7	3	13	19.7	2.7149	14	42.38
	23.5	163	55	57.9	2	46	30.4	2.7158	14	42.05
	24.0	169	50	09.9	+2	17	53.7	2.7156	14	42.12
	24.5	175	44	30.6	1	47	46.6	2.7143	14	42.57
	25.0	181	39	16.2	1	16	26.8	2.7118	14	43.37
	25.5	187	34	42.3	0	44	13.0	2.7083	14	44.51
	26.0	193	31	04.6	+0	11	24.4	2.7038	14	45.98
	26.5	199	28	38.6	-0	21	39.0	2.6983	14	47.78
	27.0	205	27	40.2	-0	54	36.8	2.6919	14	49.91
	27.5	211	28	25.8	1	27	08.1	2.6845	14	52.37
	28.0	217	31	12.6	1	58	52.0	2.6761	14	55.17
	28.5	223	36	18.6	2	29	27.3	2.6667	14	58.32
	29.0	229	44	02.8	2	58	32.9	2.6563	15	01.84
	29.5	235	54	45.0	3	25	47.7	2.6449	15	05.73
	30.0	242	08	46.1	-3	50	51.0	2.6324	15	10.00
	30.5	248	26	27.2	4	13	22.1	2.6190	15	14.66
	31.0	254	48	10.1	4	33	01.1	2.6047	15	19.70
	31.5	261	14	16.2	4	49	28.5	2.5894	15	25.12
Apr.	1.0	267	45	06.4	-5	02	25.5	2.5734	15	30.89

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Apr.	1.0	267	45	06.4	-5	02	25.5	2.5734	15	30.89
	1.5	274	21	00.0	5	11	34.6	2.5567	15	36.97
	2.0	281	02	14.0	5	16	39.7	2.5394	15	43.33
	2.5	287	49	02.2	5	17	26.5	2.5219	15	49.88
	3.0	294	41	34.2	5	13	43.4	2.5044	15	56.53
	3.5	301	39	53.9	5	05	22.2	2.4871	16	03.18
	4.0	308	43	58.7	-4	52	18.5	2.4704	16	09.70
	4.5	315	53	38.7	4	34	33.4	2.4546	16	15.94
	5.0	323	08	35.3	4	12	13.4	2.4401	16	21.74
	5.5	330	28	21.1	3	45	32.0	2.4272	16	26.94
	6.0	337	52	19.8	3	14	49.9	2.4164	16	31.36
	6.5	345	19	46.3	2	40	34.9	2.4079	16	34.85
	7.0	352	49	47.4	-2	03	21.9	2.4021	16	37.26
	7.5	0	21	23.9	1	23	52.3	2.3991	16	38.50
	8.0	7	53	31.6	0	42	51.8	2.3992	16	38.49
	8.5	15	25	04.2	-0	01	09.7	2.4023	16	37.19
	9.0	22	54	55.0	+0	40	24.0	2.4084	16	34.64
	9.5	30	22	00.4	1	21	00.4	2.4175	16	30.91
	10.0	37	45	21.0	+1	59	54.0	2.4293	16	26.09
	10.5	45	04	04.6	2	36	23.7	2.4436	16	20.34
	11.0	52	17	27.2	3	09	55.0	2.4599	16	13.81
	11.5	59	24	53.9	3	39	59.8	2.4780	16	06.71
	12.0	66	26	00.0	4	06	17.0	2.4974	15	59.21
	12.5	73	20	30.4	4	28	32.3	2.5176	15	51.50
	13.0	80	08	19.5	+4	46	37.3	2.5383	15	43.74
	13.5	86	49	30.1	5	00	28.9	2.5590	15	36.11
	14.0	93	24	13.1	5	10	08.3	2.5794	15	28.73
	14.5	99	52	45.6	5	15	40.1	2.5990	15	21.71
	15.0	106	15	30.2	5	17	11.9	2.6176	15	15.16
	15.5	112	32	53.9	5	14	52.8	2.6349	15	09.15
	16.0	118	45	26.8	+5	08	53.4	2.6507	15	03.73
	16.5	124	53	41.5	4	59	25.6	2.6648	14	58.94
	17.0	130	58	11.6	4	46	41.4	2.6771	14	54.81
	17.5	136	59	31.8	4	30	53.6	2.6876	14	51.33
	18.0	142	58	16.4	4	12	15.3	2.6961	14	48.52
	18.5	148	54	59.5	3	51	00.0	2.7027	14	46.35
	19.0	154	50	14.1	+3	27	21.5	2.7074	14	44.81
	19.5	160	44	32.0	3	01	34.1	2.7103	14	43.87
	20.0	166	38	23.5	2	33	52.9	2.7114	14	43.50
	20.5	172	32	16.7	2	04	33.4	2.7109	14	43.67
	21.0	178	26	38.3	1	33	52.0	2.7089	14	44.32
	21.5	184	21	52.6	1	02	06.2	2.7055	14	45.44
	22.0	190	18	21.8	+0	29	34.1	2.7008	14	46.96
	22.5	196	16	26.1	-0	03	25.1	2.6950	14	48.86
	23.0	202	16	23.5	0	36	31.1	2.6883	14	51.10
	23.5	208	18	29.9	1	09	23.2	2.6806	14	53.64
	24.0	214	22	59.3	-1	41	39.6	2.6723	14	56.44

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Apr.	24.0	214	22	59.3	-1	41	39.6	2.6723	14	56.44
	24.5	220	30	04.2	2	12	58.1	2.6632	14	59.49
	25.0	226	39	55.1	2	42	56.3	2.6536	15	02.76
	25.5	232	52	41.4	3	11	11.6	2.6434	15	06.22
	26.0	239	08	31.1	3	37	21.9	2.6328	15	09.87
	26.5	245	27	31.6	4	01	05.5	2.6218	15	13.69
	27.0	251	49	49.3	-4	22	01.4	2.6104	15	17.67
	27.5	258	15	30.2	4	39	50.1	2.5987	15	21.82
	28.0	264	44	40.0	4	54	13.5	2.5866	15	26.13
	28.5	271	17	23.9	5	04	55.3	2.5742	15	30.58
	29.0	277	53	47.1	5	11	41.2	2.5616	15	35.17
	29.5	284	33	54.4	5	14	19.4	2.5487	15	39.89
	30.0	291	17	50.0	-5	12	41.0	2.5357	15	44.70
	30.5	298	05	37.4	5	06	40.1	2.5227	15	49.59
May	1.0	304	57	18.6	4	56	14.3	2.5097	15	54.50
	1.5	311	52	54.2	4	41	24.8	2.4969	15	59.38
	2.0	318	52	22.2	4	22	17.6	2.4846	16	04.16
	2.5	325	55	37.7	3	59	02.7	2.4728	16	08.75
	3.0	333	02	31.7	-3	31	55.5	2.4619	16	13.06
	3.5	340	12	51.1	3	01	16.6	2.4520	16	16.97
	4.0	347	26	17.5	2	27	31.6	2.4435	16	20.38
	4.5	354	42	27.0	1	51	11.5	2.4365	16	23.17
	5.0	2	00	50.0	1	12	52.1	2.4315	16	25.23
	5.5	9	20	50.9	-0	33	13.2	2.4284	16	26.46
	6.0	16	41	48.9	+0	07	02.4	2.4276	16	26.78
	6.5	24	02	58.9	0	47	10.2	2.4292	16	26.14
	7.0	31	23	32.0	1	26	25.6	2.4332	16	24.50
	7.5	38	42	37.4	2	04	05.3	2.4397	16	21.89
	8.0	45	59	24.2	2	39	29.1	2.4486	16	18.33
	8.5	53	13	03.0	3	12	01.3	2.4597	16	13.91
	9.0	60	22	47.8	+3	41	11.8	2.4729	16	08.72
	9.5	67	27	57.7	4	06	36.6	2.4879	16	02.89
	10.0	74	27	58.3	4	27	58.4	2.5043	15	56.56
	10.5	81	22	22.8	4	45	06.0	2.5219	15	49.88
	11.0	88	10	52.3	4	57	54.6	2.5403	15	43.00
	11.5	94	53	16.7	5	06	24.3	2.5591	15	36.07
	12.0	101	29	33.9	+5	10	39.8	2.5780	15	29.24
	12.5	107	59	49.9	5	10	49.5	2.5964	15	22.62
	13.0	114	24	17.7	5	07	04.1	2.6142	15	16.33
	13.5	120	43	16.5	4	59	36.5	2.6311	15	10.48
	14.0	126	57	11.1	4	48	40.9	2.6466	15	05.14
	14.5	133	06	30.7	4	34	32.1	2.6606	15	00.37
	15.0	139	11	47.9	+4	17	25.3	2.6729	14	56.24
	15.5	145	13	38.0	3	57	36.0	2.6833	14	52.76
	16.0	151	12	38.0	3	35	19.4	2.6917	14	49.97
	16.5	157	09	26.1	3	10	50.9	2.6981	14	47.87
	17.0	163	04	40.9	+2	44	25.9	2.7023	14	46.47

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
May	17.0	163	04	40.9	+2	44	25.9	2.7023	14	46.47
	17.5	168	59	00.8	2	16	19.8	2.7045	14	45.75
	18.0	174	53	03.3	1	46	48.3	2.7047	14	45.70
	18.5	180	47	25.1	1	16	07.5	2.7029	14	46.28
	19.0	186	42	40.7	0	44	34.1	2.6993	14	47.46
	19.5	192	39	23.0	+0	12	25.6	2.6940	14	49.19
	20.0	198	38	02.2	-0	19	59.6	2.6873	14	51.44
	20.5	204	39	05.6	0	52	22.4	2.6791	14	54.15
	21.0	210	42	57.5	1	24	22.3	2.6698	14	57.25
	21.5	216	49	58.5	1	55	38.2	2.6596	15	00.70
	22.0	223	00	25.7	2	25	47.7	2.6487	15	04.43
	22.5	229	14	32.0	2	54	28.1	2.6372	15	08.37
	23.0	235	32	26.4	-3	21	16.3	2.6253	15	12.48
	23.5	241	54	13.9	3	45	48.9	2.6132	15	16.69
	24.0	248	19	55.5	4	07	43.4	2.6011	15	20.95
	24.5	254	49	28.5	4	26	37.9	2.5892	15	25.21
	25.0	261	22	47.0	4	42	12.3	2.5774	15	29.43
	25.5	267	59	42.1	4	54	08.4	2.5660	15	33.57
	26.0	274	40	02.9	-5	02	10.6	2.5549	15	37.60
	26.5	281	23	36.8	5	06	06.7	2.5443	15	41.51
	27.0	288	10	10.1	5	05	47.7	2.5342	15	45.27
	27.5	294	59	29.1	5	01	08.8	2.5246	15	48.87
	28.0	301	51	20.3	4	52	09.0	2.5155	15	52.30
	28.5	308	45	31.2	4	38	51.7	2.5070	15	55.55
	29.0	315	41	50.1	-4	21	24.9	2.4990	15	58.61
	29.5	322	40	06.8	4	00	00.4	2.4915	16	01.47
	30.0	329	40	12.0	3	34	54.5	2.4847	16	04.11
	30.5	336	41	57.5	3	06	27.7	2.4786	16	06.50
	31.0	343	45	15.2	2	35	04.1	2.4731	16	08.62
	31.5	350	49	56.8	2	01	11.4	2.4686	16	10.41
June	1.0	357	55	53.3	-1	25	20.6	2.4649	16	11.85
	1.5	5	02	53.7	0	48	05.5	2.4623	16	12.88
	2.0	12	10	44.7	-0	10	02.1	2.4609	16	13.45
	2.5	19	19	09.6	+0	28	12.1	2.4607	16	13.51
	3.0	26	27	48.6	1	05	58.9	2.4620	16	13.01
	3.5	33	36	18.0	1	42	40.3	2.4648	16	11.90
	4.0	40	44	10.2	+2	17	39.2	2.4692	16	10.18
	4.5	47	50	54.7	2	50	21.0	2.4752	16	07.82
	5.0	54	55	58.4	3	20	14.4	2.4828	16	04.83
	5.5	61	58	46.7	3	46	51.9	2.4921	16	01.24
	6.0	68	58	44.9	4	09	51.0	2.5030	15	57.08
	6.5	75	55	19.3	4	28	54.6	2.5152	15	52.43
	7.0	82	47	58.9	+4	43	50.9	2.5286	15	47.36
	7.5	89	36	16.8	4	54	33.8	2.5431	15	41.97
	8.0	96	19	50.8	5	01	02.1	2.5584	15	36.35
	8.5	102	58	24.8	5	03	19.5	2.5741	15	30.62
	9.0	109	31	49.2	+5	01	33.6	2.5901	15	24.89

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
June	9.0	109	31	49.2	+5	01	33.6	2.5901	15	24.89
	9.5	116	00	01.2	4	55	55.2	2.6060	15	19.25
	10.0	122	23	04.8	4	46	37.7	2.6214	15	13.82
	10.5	128	41	10.2	4	33	56.2	2.6362	15	08.70
	11.0	134	54	34.1	4	18	07.2	2.6500	15	03.97
	11.5	141	03	38.5	3	59	27.5	2.6626	14	59.70
	12.0	147	08	50.1	+3	38	14.5	2.6737	14	55.97
	12.5	153	10	39.7	3	14	45.5	2.6831	14	52.82
	13.0	159	09	41.7	2	49	17.3	2.6906	14	50.32
	13.5	165	06	32.7	2	22	06.9	2.6962	14	48.48
	14.0	171	01	51.6	1	53	30.8	2.6997	14	47.33
	14.5	176	56	18.5	1	23	45.3	2.7011	14	46.88
	15.0	182	50	34.2	+0	53	06.9	2.7003	14	47.14
	15.5	188	45	19.3	+0	21	52.1	2.6974	14	48.09
	16.0	194	41	14.3	-0	09	42.1	2.6924	14	49.72
	16.5	200	38	58.1	0	41	18.4	2.6856	14	52.00
	17.0	206	39	08.0	1	12	38.5	2.6769	14	54.88
	17.5	212	42	18.9	1	43	23.3	2.6666	14	58.33
	18.0	218	49	02.6	-2	13	12.8	2.6550	15	02.28
	18.5	224	59	47.1	2	41	45.9	2.6421	15	06.66
	19.0	231	14	55.8	3	08	40.6	2.6284	15	11.41
	19.5	237	34	47.2	3	33	34.3	2.6140	15	16.43
	20.0	243	59	33.9	3	56	04.0	2.5992	15	21.64
	20.5	250	29	22.4	4	15	46.6	2.5843	15	26.95
	21.0	257	04	12.6	-4	32	19.9	2.5696	15	32.25
	21.5	263	43	58.1	4	45	22.8	2.5553	15	37.47
	22.0	270	28	25.6	4	54	36.5	2.5417	15	42.49
	22.5	277	17	16.2	4	59	45.2	2.5289	15	47.26
	23.0	284	10	05.4	5	00	36.6	2.5172	15	51.68
	23.5	291	06	24.8	4	57	03.0	2.5066	15	55.69
	24.0	298	05	42.9	-4	49	01.7	2.4973	15	59.26
	24.5	305	07	26.6	4	36	35.3	2.4893	16	02.34
	25.0	312	11	02.7	4	19	51.7	2.4826	16	04.91
	25.5	319	15	59.2	3	59	04.4	2.4773	16	06.98
	26.0	326	21	46.4	3	34	32.0	2.4733	16	08.54
	26.5	333	27	57.8	3	06	37.3	2.4706	16	09.62
	27.0	340	34	10.7	-2	35	47.3	2.4690	16	10.24
	27.5	347	40	06.6	2	02	32.1	2.4685	16	10.43
	28.0	354	45	30.4	1	27	24.4	2.4691	16	10.22
	28.5	1	50	10.9	0	50	58.3	2.4705	16	09.63
	29.0	8	53	59.4	-0	13	49.1	2.4729	16	08.70
	29.5	15	56	49.2	+0	23	27.6	2.4761	16	07.45
	30.0	22	58	34.5	+1	00	16.6	2.4801	16	05.88
	30.5	29	59	09.7	1	36	03.7	2.4849	16	04.02
July	1.0	36	58	28.4	2	10	16.0	2.4905	16	01.86
	1.5	43	56	22.7	2	42	22.8	2.4969	15	59.41
	2.0	50	52	42.8	+3	11	56.0	2.5040	15	56.67

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
July	1.0	36	58	28.4	+2	10	16.0	2.4905	16	01.86
	1.5	43	56	22.7	2	42	22.8	2.4969	15	59.41
	2.0	50	52	42.8	3	11	56.0	2.5040	15	56.67
	2.5	57	47	16.6	3	38	30.4	2.5120	15	53.64
	3.0	64	39	49.8	4	01	44.4	2.5207	15	50.32
	3.5	71	30	06.3	4	21	20.4	2.5303	15	46.74
	4.0	78	17	48.3	+4	37	04.8	2.5406	15	42.89
	4.5	85	02	37.3	4	48	48.5	2.5516	15	38.82
	5.0	91	44	15.2	4	56	26.7	2.5633	15	34.54
	5.5	98	22	24.6	4	59	59.0	2.5755	15	30.11
	6.0	104	56	50.4	4	59	28.9	2.5882	15	25.56
	6.5	111	27	20.2	4	55	03.8	2.6011	15	20.97
	7.0	117	53	45.5	+4	46	54.0	2.6141	15	16.40
	7.5	124	16	01.8	4	35	12.7	2.6270	15	11.90
	8.0	130	34	09.5	4	20	15.0	2.6395	15	07.56
	8.5	136	48	14.0	4	02	17.8	2.6516	15	03.44
	9.0	142	58	25.4	3	41	38.8	2.6628	14	59.62
	9.5	149	04	59.0	3	18	36.4	2.6731	14	56.16
	10.0	155	08	14.6	+2	53	29.1	2.6822	14	53.14
	10.5	161	08	36.3	2	26	35.5	2.6898	14	50.60
	11.0	167	06	32.2	1	58	13.9	2.6958	14	48.60
	11.5	173	02	33.8	1	28	42.1	2.7001	14	47.19
	12.0	178	57	15.6	0	58	17.7	2.7025	14	46.41
	12.5	184	51	14.5	+0	27	18.0	2.7029	14	46.28
	13.0	190	45	09.5	-0	04	00.0	2.7012	14	46.84
	13.5	196	39	40.6	0	35	19.3	2.6974	14	48.10
	14.0	202	35	29.1	1	06	22.8	2.6914	14	50.05
	14.5	208	33	16.1	1	36	52.9	2.6835	14	52.70
	15.0	214	33	42.4	2	06	31.6	2.6735	14	56.02
	15.5	220	37	27.5	2	35	00.4	2.6617	14	59.98
	16.0	226	45	09.2	-3	01	59.7	2.6483	15	04.55
	16.5	232	57	22.1	3	27	09.2	2.6334	15	09.67
	17.0	239	14	37.1	3	50	07.9	2.6173	15	15.26
	17.5	245	37	20.2	4	10	34.1	2.6003	15	21.24
	18.0	252	05	51.7	4	28	05.8	2.5827	15	27.52
	18.5	258	40	24.9	4	42	21.2	2.5649	15	33.98
	19.0	265	21	05.4	-4	52	59.3	2.5471	15	40.50
	19.5	272	07	50.3	4	59	41.0	2.5297	15	46.95
	20.0	279	00	27.9	5	02	09.4	2.5131	15	53.20
	20.5	285	58	37.4	5	00	11.6	2.4977	15	59.11
	21.0	293	01	49.5	4	53	39.3	2.4836	16	04.54
	21.5	300	09	27.2	4	42	29.4	2.4712	16	09.39
	22.0	307	20	47.3	-4	26	45.5	2.4606	16	13.54
	22.5	314	35	01.6	4	06	37.8	2.4521	16	16.91
	23.0	321	51	19.8	3	42	22.9	2.4458	16	19.45
	23.5	329	08	50.8	3	14	24.3	2.4416	16	21.14
	24.0	336	26	45.0	-2	43	10.8	2.4396	16	21.95

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
July	24.0	336	26	45.0	-2	43	10.8	2.4396	16	21.95
	24.5	343	44	16.6	2	09	16.1	2.4396	16	21.94
	25.0	351	00	44.4	1	33	17.2	2.4416	16	21.13
	25.5	358	15	33.1	0	55	53.2	2.4454	16	19.60
	26.0	5	28	13.8	-0	17	44.2	2.4508	16	17.44
	26.5	12	38	23.9	+0	20	30.2	2.4576	16	14.73
	27.0	19	45	47.1	+0	58	11.7	2.4657	16	11.56
	27.5	26	50	12.1	1	34	44.4	2.4747	16	08.02
	28.0	33	51	32.4	2	09	34.9	2.4845	16	04.21
	28.5	40	49	44.8	2	42	13.4	2.4949	16	00.18
	29.0	47	44	48.7	3	12	13.3	2.5058	15	56.01
	29.5	54	36	44.9	3	39	11.8	2.5170	15	51.75
	30.0	61	25	34.9	+4	02	49.7	2.5284	15	47.44
	30.5	68	11	20.4	4	22	51.6	2.5400	15	43.12
	31.0	74	54	02.3	4	39	05.8	2.5517	15	38.81
	31.5	81	33	40.9	4	51	24.1	2.5634	15	34.52
Aug.	1.0	88	10	15.4	4	59	41.9	2.5751	15	30.28
	1.5	94	43	44.3	5	03	58.3	2.5867	15	26.09
	2.0	101	14	05.5	+5	04	15.2	2.5983	15	21.97
	2.5	107	41	16.3	5	00	38.1	2.6097	15	17.92
	3.0	114	05	14.6	4	53	15.1	2.6210	15	13.96
	3.5	120	25	58.6	4	42	17.0	2.6321	15	10.11
	4.0	126	43	27.9	4	27	56.9	2.6429	15	06.39
	4.5	132	57	43.9	4	10	29.8	2.6534	15	02.83
	5.0	139	08	49.7	+3	50	12.3	2.6633	14	59.46
	5.5	145	16	51.6	3	27	22.3	2.6726	14	56.31
	6.0	151	21	58.1	3	02	18.3	2.6813	14	53.43
	6.5	157	24	21.2	2	35	19.7	2.6890	14	50.86
	7.0	163	24	16.1	2	06	45.6	2.6957	14	48.64
	7.5	169	22	01.1	1	36	55.5	2.7012	14	46.82
	8.0	175	17	57.9	+1	06	08.6	2.7054	14	45.45
	8.5	181	12	31.1	0	34	43.5	2.7081	14	44.56
	9.0	187	06	08.6	+0	02	58.8	2.7092	14	44.21
	9.5	192	59	20.7	-0	28	47.6	2.7086	14	44.43
	10.0	198	52	40.5	1	00	17.8	2.7060	14	45.25
	10.5	204	46	42.9	1	31	14.4	2.7016	14	46.71
	11.0	210	42	05.0	-2	01	20.0	2.6952	14	48.82
	11.5	216	39	24.9	2	30	17.0	2.6868	14	51.61
	12.0	222	39	21.7	2	57	47.9	2.6764	14	55.07
	12.5	228	42	34.5	3	23	34.6	2.6641	14	59.20
	13.0	234	49	42.1	3	47	18.6	2.6500	15	03.98
	13.5	241	01	22.1	4	08	40.8	2.6342	15	09.39
	14.0	247	18	09.7	-4	27	22.0	2.6170	15	15.36
	14.5	253	40	36.8	4	43	02.3	2.5986	15	21.85
	15.0	260	09	11.0	4	55	21.9	2.5793	15	28.76
	15.5	266	44	14.0	5	04	01.4	2.5593	15	36.00
	16.0	273	26	00.8	-5	08	42.5	2.5392	15	43.44

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude °	'	"	Apparent Latitude °	'	"	True Geocentric Distance (A. U.) (X 10^{-3})	Semi Diameter '	"
Aug.	16.0	273	26	00.8	-5	08	42.5	2.5392	15	43.44
	16.5	280	14	38.2	5	09	08.8	2.5191	15	50.94
	17.0	287	10	03.4	5	05	06.7	2.4996	15	58.35
	17.5	294	12	04.1	4	56	26.5	2.4811	16	05.50
	18.0	301	20	17.2	4	43	03.9	2.4640	16	12.22
	18.5	308	34	09.2	4	25	00.3	2.4486	16	18.33
	19.0	315	52	57.1	-4	02	24.7	2.4353	16	23.67
	19.5	323	15	49.2	3	35	33.3	2.4244	16	28.09
	20.0	330	41	47.2	3	04	50.4	2.4161	16	31.47
	20.5	338	09	48.4	2	30	47.2	2.4106	16	33.73
	21.0	345	38	48.4	1	54	01.5	2.4080	16	34.82
	21.5	353	07	43.3	1	15	15.7	2.4082	16	34.73
	22.0	0	35	32.4	-0	35	15.6	2.4112	16	33.50
	22.5	8	01	20.1	+0	05	12.0	2.4168	16	31.20
	23.0	15	24	17.7	0	45	20.9	2.4247	16	27.95
	23.5	22	43	44.3	1	24	27.1	2.4348	16	23.87
	24.0	29	59	07.2	2	01	50.5	2.4467	16	19.11
	24.5	37	10	02.1	2	36	55.4	2.4600	16	13.80
	25.0	44	16	12.3	+3	09	11.3	2.4744	16	08.11
	25.5	51	17	28.5	3	38	13.1	2.4897	16	02.17
	26.0	58	13	47.2	4	03	40.9	2.5055	15	56.11
	26.5	65	05	10.4	4	25	19.8	2.5215	15	50.03
	27.0	71	51	43.8	4	42	59.7	2.5376	15	44.03
	27.5	78	33	36.4	4	56	34.3	2.5534	15	38.18
	28.0	85	10	59.2	+5	06	01.4	2.5688	15	32.54
	28.5	91	44	04.7	5	11	21.5	2.5838	15	27.15
	29.0	98	13	05.8	5	12	38.5	2.5981	15	22.04
	29.5	104	38	16.1	5	09	58.5	2.6117	15	17.23
	30.0	110	59	48.7	5	03	30.0	2.6246	15	12.72
	30.5	117	17	56.6	4	53	23.4	2.6367	15	08.53
	31.0	123	32	52.0	+4	39	51.0	2.6481	15	04.64
	31.5	129	44	47.0	4	23	06.5	2.6586	15	01.05
Sept.	1.0	135	53	53.2	4	03	25.2	2.6683	14	57.76
	1.5	142	00	22.1	3	41	03.7	2.6772	14	54.77
	2.0	148	04	25.2	3	16	19.2	2.6853	14	52.08
	2.5	154	06	14.4	2	49	30.3	2.6926	14	49.68
	3.0	160	06	02.0	+2	20	55.8	2.6989	14	47.58
	3.5	166	04	01.3	1	50	55.1	2.7043	14	45.81
	4.0	172	00	26.6	1	19	48.0	2.7088	14	44.36
	4.5	177	55	33.7	0	47	54.0	2.7121	14	43.26
	5.0	183	49	40.0	+0	15	32.8	2.7143	14	42.55
	5.5	189	43	04.5	-0	16	56.1	2.7153	14	42.23
	6.0	195	36	08.3	-0	49	13.7	2.7150	14	42.34
	6.5	201	29	14.2	1	21	01.2	2.7132	14	42.92
	7.0	207	22	47.2	1	52	00.3	2.7099	14	44.00
	7.5	213	17	14.4	2	21	52.9	2.7050	14	45.60
	8.0	219	13	04.5	-2	50	21.4	2.6984	14	47.75

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Sept.	8.0	219	13	04.5	-2	50	21.4	2.6984	14	47.75
	8.5	225	10	48.0	3	17	08.5	2.6901	14	50.49
	9.0	231	10	57.1	3	41	56.8	2.6801	14	53.82
	9.5	237	14	04.9	4	04	29.3	2.6683	14	57.77
	10.0	243	20	45.2	4	24	28.9	2.6548	15	02.34
	10.5	249	31	32.2	4	41	38.6	2.6396	15	07.52
	11.0	255	46	59.3	-4	55	41.6	2.6230	15	13.29
	11.5	262	07	38.9	5	06	21.0	2.6049	15	19.62
	12.0	268	34	01.0	5	13	20.6	2.5857	15	26.45
	12.5	275	06	32.0	5	16	25.1	2.5656	15	33.72
	13.0	281	45	34.2	5	15	20.3	2.5448	15	41.32
	13.5	288	31	23.8	5	09	54.2	2.5239	15	49.15
	14.0	295	24	09.8	-4	59	57.9	2.5030	15	57.07
	14.5	302	23	52.9	4	45	26.1	2.4826	16	04.91
	15.0	309	30	24.2	4	26	18.7	2.4633	16	12.50
	15.5	316	43	24.6	4	02	41.7	2.4453	16	19.65
	16.0	324	02	24.1	3	34	48.2	2.4292	16	26.15
	16.5	331	26	42.0	3	02	58.6	2.4153	16	31.82
	17.0	338	55	27.6	-2	27	41.5	2.4040	16	36.48
	17.5	346	27	41.5	1	49	32.9	2.3956	16	39.96
	18.0	354	02	17.6	1	09	15.4	2.3904	16	42.17
	18.5	1	38	05.2	-0	27	36.9	2.3883	16	43.01
	19.0	9	13	51.8	+0	14	31.8	2.3896	16	42.49
	19.5	16	48	26.2	0	56	19.2	2.3940	16	40.62
	20.0	24	20	40.6	+1	36	54.9	2.4016	16	37.49
	20.5	31	49	33.3	2	15	32.3	2.4119	16	33.22
	21.0	39	14	10.3	2	51	30.1	2.4247	16	27.97
	21.5	46	33	47.2	3	24	13.4	2.4397	16	21.91
	22.0	53	47	49.0	3	53	14.6	2.4563	16	15.24
	22.5	60	55	50.9	4	18	12.8	2.4744	16	08.14
	23.0	67	57	37.9	+4	38	54.4	2.4933	16	00.79
	23.5	74	53	03.6	4	55	11.7	2.5127	15	53.35
	24.0	81	42	09.8	5	07	02.4	2.5323	15	45.98
	24.5	88	25	05.0	5	14	28.9	2.5517	15	38.78
	25.0	95	02	03.1	5	17	36.9	2.5707	15	31.87
	25.5	101	33	22.5	5	16	35.2	2.5889	15	25.32
	26.0	107	59	24.8	+5	11	34.7	2.6061	15	19.18
	26.5	114	20	34.0	5	02	48.0	2.6223	15	13.51
	27.0	120	37	15.2	4	50	28.9	2.6373	15	08.32
	27.5	126	49	54.3	4	34	52.4	2.6510	15	03.62
	28.0	132	58	57.0	4	16	13.9	2.6634	14	59.42
	28.5	139	04	48.6	3	54	50.0	2.6744	14	55.71
	29.0	145	07	53.9	+3	30	57.3	2.6841	14	52.48
	29.5	151	08	36.2	3	04	53.3	2.6925	14	49.70
	30.0	157	07	17.9	2	36	55.9	2.6996	14	47.37
	30.5	163	04	20.2	2	07	23.3	2.7054	14	45.45
Oct.	1.0	169	00	03.0	+1	36	34.4	2.7101	14	43.93

MOON, 2024
FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Oct.	1.0	169	00	03.0	+1	36	34.4	2.7101	14	43.93
	1.5	174	54	45.4	1	04	48.2	2.7136	14	42.80
	2.0	180	48	45.2	+0	32	24.0	2.7159	14	42.03
	2.5	186	42	19.8	-0	00	18.6	2.7172	14	41.63
	3.0	192	35	46.0	0	33	00.0	2.7173	14	41.58
	3.5	198	29	20.3	1	05	20.6	2.7164	14	41.88
	4.0	204	23	19.4	-1	37	00.9	2.7143	14	42.55
	4.5	210	18	00.2	2	07	41.9	2.7111	14	43.58
	5.0	216	13	40.0	2	37	04.7	2.7068	14	45.00
	5.5	222	10	37.0	3	04	51.0	2.7013	14	46.82
	6.0	228	09	10.4	3	30	42.9	2.6945	14	49.05
	6.5	234	09	40.3	3	54	23.4	2.6864	14	51.72
	7.0	240	12	27.9	-4	15	35.7	2.6770	14	54.85
	7.5	246	17	55.9	4	34	04.1	2.6663	14	58.46
	8.0	252	26	27.8	4	49	33.3	2.6541	15	02.56
	8.5	258	38	28.1	5	01	49.0	2.6407	15	07.16
	9.0	264	54	21.9	5	10	37.7	2.6259	15	12.26
	9.5	271	14	34.6	5	15	46.8	2.6099	15	17.86
	10.0	277	39	31.3	-5	17	04.9	2.5928	15	23.92
	10.5	284	09	36.2	5	14	22.2	2.5747	15	30.42
	11.0	290	45	11.4	5	07	30.7	2.5558	15	37.30
	11.5	297	26	36.7	4	56	24.9	2.5363	15	44.49
	12.0	304	14	07.8	4	41	02.0	2.5166	15	51.88
	12.5	311	07	55.5	4	21	23.3	2.4970	15	59.36
	13.0	318	08	04.1	-3	57	34.3	2.4778	16	06.79
	13.5	325	14	30.8	3	29	46.2	2.4595	16	14.00
	14.0	332	27	03.8	2	58	15.9	2.4424	16	20.82
	14.5	339	45	22.1	2	23	27.1	2.4269	16	27.05
	15.0	347	08	54.3	1	45	50.3	2.4136	16	32.52
	15.5	354	36	59.0	1	06	02.9	2.4027	16	37.02
	16.0	2	08	44.9	-0	24	47.7	2.3946	16	40.41
	16.5	9	43	11.9	+0	17	07.2	2.3895	16	42.54
	17.0	17	19	12.9	0	58	51.2	2.3876	16	43.33
	17.5	24	55	35.9	1	39	32.9	2.3890	16	42.74
	18.0	32	31	06.8	2	18	22.3	2.3937	16	40.77
	18.5	40	04	32.3	2	54	33.4	2.4016	16	37.49
	19.0	47	34	42.6	+3	27	25.9	2.4124	16	33.00
	19.5	55	00	34.4	3	56	26.7	2.4259	16	27.47
	20.0	62	21	12.9	4	21	10.9	2.4418	16	21.06
	20.5	69	35	53.5	4	41	21.6	2.4596	16	13.96
	21.0	76	44	02.6	4	56	49.9	2.4788	16	06.39
	21.5	83	45	17.9	5	07	33.8	2.4992	15	58.54
	22.0	90	39	28.2	+5	13	37.4	2.5201	15	50.58
	22.5	97	26	32.6	5	15	09.6	2.5412	15	42.68
	23.0	104	06	39.3	5	12	22.9	2.5621	15	35.00
	23.5	110	40	04.1	5	05	32.6	2.5824	15	27.64
	24.0	117	07	09.3	+4	54	55.4	2.6018	15	20.71

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Oct.	24.0	117	07	09.3	+4	54	55.4	2.6018	15	20.71
	24.5	123	28	22.3	4	40	49.3	2.6201	15	14.28
	25.0	129	44	14.0	4	23	32.6	2.6371	15	08.40
	25.5	135	55	17.9	4	03	23.9	2.6525	15	03.13
	26.0	142	02	08.9	3	40	41.7	2.6663	14	58.46
	26.5	148	05	22.5	3	15	44.1	2.6783	14	54.42
	27.0	154	05	34.1	+2	48	49.5	2.6886	14	51.00
	27.5	160	03	18.0	2	20	15.7	2.6971	14	48.19
	28.0	165	59	07.7	1	50	20.7	2.7039	14	45.96
	28.5	171	53	34.7	1	19	22.6	2.7090	14	44.29
	29.0	177	47	08.7	0	47	39.4	2.7125	14	43.15
	29.5	183	40	17.3	+0	15	29.5	2.7145	14	42.50
	30.0	189	33	25.9	-0	16	48.6	2.7150	14	42.32
	30.5	195	26	57.4	0	48	56.0	2.7142	14	42.58
	31.0	201	21	12.6	1	20	33.7	2.7122	14	43.23
	31.5	207	16	30.2	1	51	22.5	2.7091	14	44.25
Nov.	1.0	213	13	06.5	2	21	03.1	2.7049	14	45.61
	1.5	219	11	16.4	2	49	16.6	2.6998	14	47.29
	2.0	225	11	12.7	-3	15	44.0	2.6938	14	49.29
	2.5	231	13	07.2	3	40	07.0	2.6869	14	51.57
	3.0	237	17	10.7	4	02	07.9	2.6791	14	54.14
	3.5	243	23	33.0	4	21	30.1	2.6706	14	56.99
	4.0	249	32	23.9	4	37	57.8	2.6613	15	00.13
	4.5	255	43	53.1	4	51	16.6	2.6512	15	03.56
	5.0	261	58	10.7	-5	01	13.7	2.6403	15	07.28
	5.5	268	15	27.4	5	07	37.9	2.6287	15	11.31
	6.0	274	35	54.6	5	10	19.7	2.6162	15	15.65
	6.5	280	59	44.6	5	09	11.7	2.6030	15	20.29
	7.0	287	27	10.7	5	04	08.4	2.5891	15	25.25
	7.5	293	58	26.6	4	55	07.1	2.5745	15	30.49
	8.0	300	33	46.8	-4	42	07.2	2.5593	15	36.01
	8.5	307	13	25.4	4	25	11.2	2.5436	15	41.77
	9.0	313	57	36.2	4	04	24.7	2.5277	15	47.72
	9.5	320	46	31.1	3	39	56.9	2.5116	15	53.78
	10.0	327	40	19.8	3	12	00.9	2.4956	15	59.88
	10.5	334	39	08.5	2	40	54.2	2.4801	16	05.91
	11.0	341	42	58.4	-2	06	58.7	2.4652	16	11.75
	11.5	348	51	45.0	1	30	41.7	2.4513	16	17.26
	12.0	356	05	16.4	0	52	34.9	2.4387	16	22.28
	12.5	3	23	12.7	-0	13	15.0	2.4279	16	26.68
	13.0	10	45	05.2	+0	26	37.2	2.4190	16	30.30
	13.5	18	10	15.6	1	06	17.7	2.4124	16	32.99
	14.0	25	37	56.9	+1	45	01.0	2.4084	16	34.64
	14.5	33	07	14.0	2	22	00.9	2.4072	16	35.16
	15.0	40	37	04.9	2	56	33.5	2.4088	16	34.49
	15.5	48	06	23.4	3	27	58.1	2.4133	16	32.62
	16.0	55	34	01.0	+3	55	39.7	2.4208	16	29.58

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Nov.	16.0	55	34	01.0	+3	55	39.7	2.4208	16	29.58
	16.5	62	58	50.4	4	19	09.8	2.4309	16	25.45
	17.0	70	19	48.0	4	38	07.8	2.4436	16	20.34
	17.5	77	35	56.7	4	52	21.0	2.4585	16	14.39
	18.0	84	46	28.0	5	01	44.7	2.4753	16	07.77
	18.5	91	50	43.6	5	06	21.2	2.4937	16	00.64
	19.0	98	48	16.5	+5	06	19.1	2.5131	15	53.20
	19.5	105	38	50.7	5	01	52.0	2.5333	15	45.62
	20.0	112	22	21.6	4	53	16.9	2.5537	15	38.06
	20.5	118	58	54.2	4	40	53.5	2.5740	15	30.66
	21.0	125	28	43.0	4	25	03.2	2.5938	15	23.57
	21.5	131	52	09.9	4	06	07.6	2.6127	15	16.89
	22.0	138	09	43.0	+3	44	28.6	2.6304	15	10.71
	22.5	144	21	55.6	3	20	27.6	2.6467	15	05.10
	23.0	150	29	24.2	2	54	25.3	2.6613	15	00.12
	23.5	156	32	48.1	2	26	41.7	2.6742	14	55.80
	24.0	162	32	47.8	1	57	35.9	2.6851	14	52.16
	24.5	168	30	04.6	1	27	26.5	2.6940	14	49.22
	25.0	174	25	19.2	+0	56	31.4	2.7008	14	46.97
	25.5	180	19	11.6	+0	25	08.2	2.7056	14	45.39
	26.0	186	12	20.5	-0	06	25.6	2.7084	14	44.47
	26.5	192	05	22.3	0	37	52.8	2.7094	14	44.17
	27.0	197	58	51.3	1	08	55.8	2.7085	14	44.46
	27.5	203	53	18.9	1	39	16.9	2.7059	14	45.30
	28.0	209	49	13.5	-2	08	38.2	2.7018	14	46.64
	28.5	215	47	00.1	2	36	41.3	2.6964	14	48.43
	29.0	221	47	00.4	3	03	07.9	2.6897	14	50.63
	29.5	227	49	32.2	3	27	39.6	2.6820	14	53.18
	30.0	233	54	49.7	3	49	58.1	2.6735	14	56.04
	30.5	240	03	03.7	4	09	45.5	2.6642	14	59.16
Dec.	1.0	246	14	21.2	-4	26	44.9	2.6544	15	02.48
	1.5	252	28	46.3	4	40	40.2	2.6441	15	05.98
	2.0	258	46	20.1	4	51	17.0	2.6335	15	09.62
	2.5	265	07	01.6	4	58	22.9	2.6228	15	13.36
	3.0	271	30	47.9	5	01	47.5	2.6118	15	17.19
	3.5	277	57	35.0	5	01	23.1	2.6008	15	21.08
	4.0	284	27	18.5	-4	57	04.9	2.5897	15	25.02
	4.5	290	59	54.2	4	48	51.1	2.5786	15	29.01
	5.0	297	35	18.5	4	36	43.3	2.5675	15	33.02
	5.5	304	13	29.3	4	20	46.3	2.5564	15	37.08
	6.0	310	54	25.7	4	01	08.3	2.5453	15	41.15
	6.5	317	38	08.7	3	38	00.8	2.5343	15	45.24
	7.0	324	24	40.6	-3	11	39.0	2.5234	15	49.34
	7.5	331	14	05.2	2	42	21.0	2.5126	15	53.41
	8.0	338	06	26.9	2	10	28.6	2.5020	15	57.43
	8.5	345	01	50.2	1	36	26.6	2.4918	16	01.36
	9.0	352	00	18.5	-1	00	43.0	2.4821	16	05.13

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Longitude			Apparent Latitude			True Geocentric Distance (A. U.)	Semi Diameter	
		°	'	"	°	'	"	(X 10^{-3})	'	"
Dec.	9.0	352	00	18.5	-1	00	43.0	2.4821	16	05.13
	9.5	359	01	53.4	-0	23	48.5	2.4729	16	08.70
	10.0	6	06	33.1	+0	13	43.4	2.4646	16	11.97
	10.5	13	14	11.6	0	51	16.8	2.4573	16	14.87
	11.0	20	24	37.2	1	28	14.4	2.4512	16	17.29
	11.5	27	37	32.1	2	03	57.9	2.4465	16	19.16
	12.0	34	52	31.1	+2	37	49.0	2.4435	16	20.37
	12.5	42	09	02.2	3	09	10.7	2.4423	16	20.85
	13.0	49	26	26.1	3	37	28.4	2.4431	16	20.53
	13.5	56	43	57.6	4	02	11.0	2.4460	16	19.37
	14.0	64	00	46.7	4	22	52.6	2.4510	16	17.35
	14.5	71	16	00.5	4	39	13.0	2.4583	16	14.48
	15.0	78	28	45.4	+4	50	58.5	2.4676	16	10.79
	15.5	85	38	09.4	4	58	02.5	2.4789	16	06.35
	16.0	92	43	24.6	5	00	25.0	2.4921	16	01.25
	16.5	99	43	48.9	4	58	12.4	2.5068	15	55.60
	17.0	106	38	48.0	4	51	36.7	2.5229	15	49.52
	17.5	113	27	56.0	4	40	54.4	2.5399	15	43.16
	18.0	120	10	56.9	+4	26	25.5	2.5575	15	36.65
	18.5	126	47	43.7	4	08	32.3	2.5755	15	30.13
	19.0	133	18	19.0	3	47	38.5	2.5933	15	23.72
	19.5	139	42	53.4	3	24	08.3	2.6108	15	17.55
	20.0	146	01	45.4	2	58	25.7	2.6274	15	11.73
	20.5	152	15	20.0	2	30	54.2	2.6430	15	06.36
	21.0	158	24	07.5	+2	01	55.9	2.6573	15	01.50
	21.5	164	28	42.6	1	31	52.2	2.6699	14	57.24
	22.0	170	29	43.4	1	01	03.1	2.6807	14	53.61
	22.5	176	27	50.3	+0	29	47.6	2.6896	14	50.67
	23.0	182	23	45.1	-0	01	36.3	2.6964	14	48.43
	23.5	188	18	10.5	0	32	51.2	2.7010	14	46.91
	24.0	194	11	49.2	-1	03	40.4	2.7034	14	46.12
	24.5	200	05	23.2	1	33	47.4	2.7037	14	46.03
	25.0	205	59	33.1	2	02	55.7	2.7018	14	46.64
	25.5	211	54	57.8	2	30	49.1	2.6979	14	47.91
	26.0	217	52	13.7	2	57	10.7	2.6922	14	49.82
	26.5	223	51	54.2	3	21	43.8	2.6847	14	52.30
	27.0	229	54	29.2	-3	44	11.4	2.6756	14	55.31
	27.5	236	00	24.5	4	04	16.2	2.6653	14	58.79
	28.0	242	10	01.3	4	21	41.1	2.6539	15	02.66
	28.5	248	23	36.0	4	36	09.6	2.6416	15	06.86
	29.0	254	41	19.7	4	47	25.6	2.6287	15	11.30
	29.5	261	03	18.1	4	55	14.5	2.6155	15	15.91
	30.0	267	29	31.5	-4	59	23.4	2.6021	15	20.60
	30.5	273	59	55.0	4	59	41.9	2.5889	15	25.31
	31.0	280	34	19.0	4	56	02.4	2.5760	15	29.95
	31.5	287	12	29.7	4	48	20.8	2.5636	15	34.46
	32.0	293	54	10.2	-4	36	37.0	2.5518	15	38.77

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	0.0	9	51	25.24	+17	28	22.14	54	21.30
	0.5	10	14	14.06	15	07	01.08	54	15.21
	1.0	10	36	26.32	12	37	53.65	54	11.16
	1.5	10	58	08.60	10	02	26.52	54	09.32
	2.0	11	19	28.08	7	21	58.61	54	09.83
	2.5	11	40	32.31	4	37	42.60	54	12.79
	3.0	12	01	29.13	+1	50	46.86	54	18.31
	3.5	12	22	26.63	-0	57	42.35	54	26.42
	4.0	12	43	33.13	3	46	38.29	54	37.14
	4.5	13	04	57.17	6	34	51.10	54	50.44
	5.0	13	26	47.45	9	21	04.84	55	06.25
	5.5	13	49	12.80	12	03	54.55	55	24.43
	6.0	14	12	22.05	-14	41	43.23	55	44.81
	6.5	14	36	23.76	17	12	39.19	56	07.14
	7.0	15	01	25.83	19	34	33.89	56	31.12
	7.5	15	27	34.94	21	45	01.00	56	56.37
	8.0	15	54	55.74	23	41	17.44	57	22.45
	8.5	16	23	29.96	25	20	27.01	57	48.88
	9.0	16	53	15.40	-26	39	27.82	58	15.10
	9.5	17	24	05.14	27	35	23.42	58	40.52
	10.0	17	55	47.28	28	05	37.34	59	04.55
	10.5	18	28	05.37	28	08	09.17	59	26.60
	11.0	19	00	39.85	27	41	49.13	59	46.09
	11.5	19	33	10.08	26	46	27.97	60	02.55
	12.0	20	05	16.80	-25	22	59.67	60	15.56
	12.5	20	36	44.14	23	33	16.46	60	24.83
	13.0	21	07	20.94	21	19	57.77	60	30.22
	13.5	21	37	01.18	18	46	15.90	60	31.70
	14.0	22	05	43.59	15	55	41.35	60	29.40
	14.5	22	33	30.87	12	51	50.27	60	23.55
	15.0	23	00	28.66	-9	38	14.82	60	14.50
	15.5	23	26	44.65	6	18	16.98	60	02.66
	16.0	23	52	27.72	-2	55	05.26	59	48.48
	16.5	0	17	47.37	+0	28	26.32	59	32.45
	17.0	0	42	53.26	3	49	37.49	59	15.03
	17.5	1	07	54.83	7	06	00.12	58	56.65
	18.0	1	33	01.03	+10	15	16.03	58	37.72
	18.5	1	58	20.05	13	15	14.85	58	18.56
	19.0	2	23	59.02	16	03	52.19	57	59.46
	19.5	2	50	03.65	18	39	08.66	57	40.64
	20.0	3	16	37.89	20	59	09.82	57	22.28
	20.5	3	43	43.54	23	02	07.46	57	04.50
	21.0	4	11	19.90	+24	46	22.15	56	47.37
	21.5	4	39	23.54	26	10	27.03	56	30.94
	22.0	5	07	48.34	27	13	12.41	56	15.23
	22.5	5	36	25.76	27	53	50.41	56	00.25
	23.0	6	05	05.46	+28	11	58.90	55	45.99

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Jan.	23.0	6	05	05.46	+28	11	58.90	55	45.99
	23.5	6	33	36.19	28	07	43.81	55	32.46
	24.0	7	01	46.85	27	41	39.21	55	19.65
	24.5	7	29	27.41	26	54	45.04	55	07.58
	25.0	7	56	29.76	25	48	22.84	54	56.28
	25.5	8	22	48.12	24	24	10.24	54	45.80
	26.0	8	48	19.28	+22	43	55.06	54	36.19
	26.5	9	13	02.42	20	49	29.75	54	27.54
	27.0	9	36	58.85	18	42	46.78	54	19.95
	27.5	10	00	11.64	16	25	35.24	54	13.54
	28.0	10	22	45.20	13	59	38.53	54	08.43
	28.5	10	44	44.97	11	26	33.26	54	04.77
	29.0	11	06	17.11	+8	47	48.94	54	02.70
	29.5	11	27	28.28	6	04	48.48	54	02.36
	30.0	11	48	25.56	3	18	49.14	54	03.90
	30.5	12	09	16.27	+0	31	03.95	54	07.47
	31.0	12	30	08.02	-2	17	16.54	54	13.17
	31.5	12	51	08.61	5	05	02.30	54	21.13
Feb.	1.0	13	12	26.06	-7	51	01.52	54	31.43
	1.5	13	34	08.57	10	33	58.22	54	44.13
	2.0	13	56	24.44	13	12	29.70	54	59.26
	2.5	14	19	21.97	15	45	03.89	55	16.80
	3.0	14	43	09.25	18	09	56.94	55	36.68
	3.5	15	07	53.78	20	25	11.08	55	58.79
	4.0	15	33	41.97	-22	28	33.57	56	22.94
	4.5	16	00	38.50	24	17	36.87	56	48.88
	5.0	16	28	45.45	25	49	41.26	57	16.28
	5.5	16	58	01.50	27	02	00.25	57	44.73
	6.0	17	28	21.12	27	51	49.45	58	13.72
	6.5	17	59	34.31	28	16	38.58	58	42.68
	7.0	18	31	26.83	-28	14	25.57	59	10.98
	7.5	19	03	41.31	27	43	50.40	59	37.91
	8.0	19	35	58.98	26	44	26.10	60	02.76
	8.5	20	08	01.79	25	16	44.44	60	24.81
	9.0	20	39	34.32	23	22	15.16	60	43.40
	9.5	21	10	25.18	21	03	19.27	60	57.96
	10.0	21	40	27.60	-18	22	58.30	61	08.02
	10.5	22	09	39.30	15	24	41.68	61	13.30
	11.0	22	38	01.93	12	12	14.44	61	13.67
	11.5	23	05	40.13	8	49	26.61	61	09.21
	12.0	23	32	40.71	5	20	04.84	61	00.16
	12.5	23	59	11.80	-1	47	46.46	60	46.93
	13.0	0	25	22.25	+1	44	04.20	60	30.05
	13.5	0	51	21.07	5	12	17.68	60	10.13
	14.0	1	17	17.02	8	33	59.82	59	47.82
	14.5	1	43	18.28	11	46	31.27	59	23.77
	15.0	2	09	32.05	+14	47	26.47	58	58.64

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Feb.	15.0	2	09	32.05	+14	47	26.47	58	58.64
	15.5	2	36	04.27	17	34	32.64	58	32.99
	16.0	3	02	59.22	20	05	49.17	58	07.35
	16.5	3	30	19.21	22	19	27.73	57	42.15
	17.0	3	58	04.25	24	13	53.26	57	17.75
	17.5	4	26	11.87	25	47	45.93	56	54.45
	18.0	4	54	37.10	+27	00	03.76	56	32.44
	18.5	5	23	12.74	27	50	05.54	56	11.87
	19.0	5	51	49.83	28	17	33.25	55	52.84
	19.5	6	20	18.43	28	22	33.54	55	35.39
	20.0	6	48	28.52	28	05	37.58	55	19.52
	20.5	7	16	10.83	27	27	39.22	55	05.22
	21.0	7	43	17.63	+26	29	51.72	54	52.44
	21.5	8	09	43.19	25	13	43.32	54	41.13
	22.0	8	35	24.01	23	40	52.55	54	31.24
	22.5	9	00	18.78	21	53	03.68	54	22.70
	23.0	9	24	28.18	19	52	02.86	54	15.46
	23.5	9	47	54.60	17	39	35.15	54	09.49
	24.0	10	10	41.71	+15	17	22.41	54	04.77
	24.5	10	32	54.26	12	47	02.11	54	01.28
	25.0	10	54	37.71	10	10	06.82	53	59.03
	25.5	11	15	58.05	7	28	04.27	53	58.05
	26.0	11	37	01.67	4	42	17.86	53	58.38
	26.5	11	57	55.22	+1	54	07.47	54	00.10
	27.0	12	18	45.58	-0	55	09.47	54	03.26
	27.5	12	39	39.77	3	44	16.69	54	07.97
	28.0	13	00	45.00	6	31	57.61	54	14.30
	28.5	13	22	08.58	9	16	53.75	54	22.37
	29.0	13	43	57.90	11	57	42.94	54	32.25
	29.5	14	06	20.34	14	32	57.54	54	44.05
Mar.	1.0	14	29	23.13	-17	01	02.66	54	57.82
	1.5	14	53	13.13	19	20	14.53	55	13.61
	2.0	15	17	56.47	21	28	39.37	55	31.45
	2.5	15	43	38.12	23	24	13.02	55	51.31
	3.0	16	10	21.29	25	04	41.80	56	13.13
	3.5	16	38	06.84	26	27	45.09	56	36.78
	4.0	17	06	52.59	-27	31	00.14	57	02.09
	4.5	17	36	32.96	28	12	09.12	57	28.78
	5.0	18	06	58.77	28	29	08.21	57	56.51
	5.5	18	37	57.70	28	20	17.88	58	24.85
	6.0	19	09	15.23	27	44	32.74	58	53.30
	6.5	19	40	36.01	26	41	29.38	59	21.25
	7.0	20	11	45.48	-25	11	30.75	59	48.05
	7.5	20	42	31.34	23	15	46.54	60	12.97
	8.0	21	12	44.52	20	56	09.69	60	35.29
	8.5	21	42	19.72	18	15	10.35	60	54.30
	9.0	22	11	15.32	-15	15	48.20	61	09.35

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
Mar.	9.0	22	11	15.32	-15	15	48.20	61	09.35
	9.5	22	39	33.00	12	01	24.63	61	19.87
	10.0	23	07	17.03	8	35	35.18	61	25.49
	10.5	23	34	33.62	5	02	02.85	61	25.96
	11.0	0	01	30.26	-1	24	32.31	61	21.26
	11.5	0	28	15.08	+2	13	14.99	61	11.57
	12.0	0	54	56.39	+5	47	44.80	60	57.23
	12.5	1	21	42.17	9	15	33.30	60	38.76
	13.0	1	48	39.67	12	33	29.48	60	16.80
	13.5	2	15	54.96	15	38	37.21	59	52.04
	14.0	2	43	32.52	18	28	16.82	59	25.22
	14.5	3	11	34.78	21	00	06.89	58	57.08
	15.0	3	40	01.82	+23	12	06.12	58	28.29
	15.5	4	08	51.09	25	02	35.58	57	59.48
	16.0	4	37	57.39	26	30	21.17	57	31.20
	16.5	5	07	13.13	27	34	35.77	57	03.91
	17.0	5	36	28.88	28	15	00.72	56	37.98
	17.5	6	05	34.19	28	31	46.01	56	13.71
	18.0	6	34	18.56	+28	25	28.70	55	51.30
	18.5	7	02	32.36	27	57	09.69	55	30.91
	19.0	7	30	07.64	27	08	09.13	55	12.62
	19.5	7	56	58.61	26	00	01.06	54	56.46
	20.0	8	23	01.83	24	34	28.09	54	42.44
	20.5	8	48	16.18	22	53	16.63	54	30.50
	21.0	9	12	42.59	+20	58	13.11	54	20.60
	21.5	9	36	23.67	18	51	01.34	54	12.63
	22.0	9	59	23.37	16	33	20.90	54	06.51
	22.5	10	21	46.61	14	06	46.51	54	02.14
	23.0	10	43	39.01	11	32	48.05	53	59.41
	23.5	11	05	06.65	8	52	51.10	53	58.21
	24.0	11	26	15.93	+6	08	17.78	53	58.47
	24.5	11	47	13.44	3	20	27.83	54	00.10
	25.0	12	08	05.92	+0	30	39.77	54	03.04
	25.5	12	29	00.17	-2	19	47.86	54	07.22
	26.0	12	50	03.09	5	09	35.26	54	12.63
	26.5	13	11	21.59	7	57	20.10	54	19.24
	27.0	13	33	02.58	-10	41	36.28	54	27.05
	27.5	13	55	12.86	13	20	52.70	54	36.09
	28.0	14	17	59.03	15	53	32.23	54	46.37
	28.5	14	41	27.26	18	17	50.84	54	57.95
	29.0	15	05	43.02	20	31	57.16	55	10.86
	29.5	15	30	50.70	22	33	52.67	55	25.13
	30.0	15	56	53.18	-24	21	32.83	55	40.82
	30.5	16	23	51.31	25	52	49.49	55	57.92
Apr.	31.0	16	51	43.42	27	05	34.65	56	16.43
	31.5	17	20	25.00	27	57	45.93	56	36.32
	1.0	17	49	48.59	-28	27	33.16	56	57.51

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	1.0	17	49	48.59	-28	27	33.16	56	57.51
	1.5	18	19	44.05	28	33	25.77	57	19.86
	2.0	18	49	59.29	28	14	19.73	57	43.18
	2.5	19	20	21.30	27	29	43.17	58	07.22
	3.0	19	50	37.43	26	19	39.63	58	31.65
	3.5	20	20	36.61	24	44	48.62	58	56.07
	4.0	20	50	10.27	-22	46	23.63	59	20.01
	4.5	21	19	12.90	20	26	08.50	59	42.92
	5.0	21	47	42.20	17	46	12.88	60	04.22
	5.5	22	15	38.88	14	49	07.71	60	23.30
	6.0	22	43	06.20	11	37	41.15	60	39.53
	6.5	23	10	09.47	8	14	55.27	60	52.34
	7.0	23	36	55.48	-4	44	03.15	61	01.21
	7.5	0	03	31.99	-1	08	26.29	61	05.75
	8.0	0	30	07.27	+2	28	27.87	61	05.70
	8.5	0	56	49.62	6	03	08.81	61	00.96
	9.0	1	23	46.94	9	32	05.97	60	51.60
	9.5	1	51	06.24	12	51	52.34	60	37.87
	10.0	2	18	53.17	+15	59	08.45	60	20.19
	10.5	2	47	11.41	18	50	46.88	59	59.06
	11.0	3	16	02.17	21	23	57.25	59	35.12
	11.5	3	45	23.75	23	36	11.66	59	09.03
	12.0	4	15	11.24	25	25	30.12	58	41.49
	12.5	4	45	16.63	26	50	25.65	58	13.18
	13.0	5	15	29.31	+27	50	07.99	57	44.71
	13.5	5	45	36.88	28	24	25.32	57	16.68
	14.0	6	15	26.44	28	33	43.20	56	49.57
	14.5	6	44	45.75	28	19	00.55	56	23.82
	15.0	7	13	24.43	27	41	43.40	55	59.77
	15.5	7	41	14.65	26	43	37.11	55	37.70
	16.0	8	08	11.53	+25	26	38.44	55	17.80
	16.5	8	34	13.07	23	52	48.47	55	00.22
	17.0	8	59	19.84	22	04	06.97	54	45.03
	17.5	9	23	34.55	20	02	28.59	54	32.28
	18.0	9	47	01.50	17	49	40.67	54	21.94
	18.5	10	09	46.17	15	27	22.48	54	13.99
	19.0	10	31	54.78	+12	57	05.50	54	08.33
	19.5	10	53	34.07	10	20	14.48	54	04.89
	20.0	11	14	51.05	7	38	08.85	54	03.53
	20.5	11	35	52.86	4	52	04.44	54	04.13
	21.0	11	56	46.74	+2	03	15.31	54	06.55
	21.5	12	17	39.94	-0	47	04.46	54	10.63
	22.0	12	38	39.72	-3	37	38.94	54	16.24
	22.5	12	59	53.29	6	27	08.76	54	23.22
	23.0	13	21	27.83	9	14	09.43	54	31.43
	23.5	13	43	30.36	11	57	10.09	54	40.75
	24.0	14	06	07.62	-14	34	32.28	54	51.05

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Apr.	24.0	14	06	07.62	-14	34	32.28	54	51.05
	24.5	14	29	25.92	17	04	29.30	55	02.24
	25.0	14	53	30.83	19	25	05.99	55	14.23
	25.5	15	18	26.80	21	34	19.33	55	26.94
	26.0	15	44	16.74	23	30	00.09	55	40.33
	26.5	16	11	01.49	25	09	55.82	55	54.36
	27.0	16	38	39.35	-26	31	55.23	56	09.00
	27.5	17	07	05.71	27	33	54.07	56	24.23
	28.0	17	36	13.01	28	14	02.14	56	40.02
	28.5	18	05	50.96	28	30	50.55	56	56.37
	29.0	18	35	47.28	28	23	18.31	57	13.23
	29.5	19	05	48.79	27	50	57.10	57	30.55
	30.0	19	35	42.66	-26	53	53.29	57	48.24
	30.5	20	05	17.59	25	32	47.11	58	06.18
May	1.0	20	34	24.86	23	48	49.14	58	24.22
	1.5	21	02	58.78	21	43	35.38	58	42.14
	2.0	21	30	56.91	19	19	01.71	58	59.67
	2.5	21	58	19.80	16	37	18.91	59	16.52
	3.0	22	25	10.63	-13	40	48.84	59	32.33
	3.5	22	51	34.65	10	32	01.82	59	46.70
	4.0	23	17	38.70	7	13	35.41	59	59.21
	4.5	23	43	30.73	3	48	13.92	60	09.45
	5.0	0	09	19.35	-0	18	48.55	60	17.01
	5.5	0	35	13.51	+3	11	42.46	60	21.53
	6.0	1	01	22.06	+6	40	14.01	60	22.71
	6.5	1	27	53.40	10	03	34.98	60	20.36
	7.0	1	54	55.02	13	18	30.09	60	14.36
	7.5	2	22	32.92	16	21	43.00	60	04.77
	8.0	2	50	51.00	19	10	00.97	59	51.71
	8.5	3	19	50.41	21	40	20.90	59	35.47
	9.0	3	49	28.98	+23	49	56.95	59	16.42
	9.5	4	19	40.81	25	36	28.91	58	55.01
	10.0	4	50	16.33	26	58	10.54	58	31.76
	10.5	5	21	02.85	27	53	56.51	58	07.23
	11.0	5	51	45.65	28	23	26.40	57	41.98
	11.5	6	22	09.42	28	27	04.74	57	16.54
	12.0	6	51	59.91	+28	05	56.75	56	51.44
	12.5	7	21	05.16	27	21	40.47	56	27.15
	13.0	7	49	16.50	26	16	16.85	56	04.08
	13.5	8	16	28.77	24	51	59.50	55	42.58
	14.0	8	42	40.27	23	11	05.58	55	22.97
	14.5	9	07	52.21	21	15	48.80	55	05.48
	15.0	9	32	08.15	+19	08	14.75	54	50.28
	15.5	9	55	33.34	16	50	18.50	54	37.52
	16.0	10	18	14.21	14	23	43.86	54	27.27
	16.5	10	40	17.91	11	50	04.00	54	19.58
	17.0	11	01	52.03	+9	10	42.96	54	14.43

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
May	17.0	11	01	52.03	+9	10	42.96	54	14.43
	17.5	11	23	04.34	6	26	57.60	54	11.79
	18.0	11	44	02.74	3	39	59.83	54	11.59
	18.5	12	04	55.14	+0	50	59.05	54	13.72
	19.0	12	25	49.42	-1	58	55.52	54	18.05
	19.5	12	46	53.47	4	48	32.42	54	24.43
	20.0	13	08	15.11	-7	36	35.71	54	32.68
	20.5	13	30	02.07	10	21	42.86	54	42.61
	21.0	13	52	21.88	13	02	22.82	54	54.01
	21.5	14	15	21.75	15	36	54.50	55	06.67
	22.0	14	39	08.22	18	03	25.84	55	20.36
	22.5	15	03	46.90	20	19	53.66	55	34.85
	23.0	15	29	21.92	-22	24	04.72	55	49.93
	23.5	15	55	55.41	24	13	38.36	56	05.39
	24.0	16	23	26.85	25	46	10.96	56	21.03
	24.5	16	51	52.59	26	59	22.47	56	36.67
	25.0	17	21	05.56	27	51	04.57	56	52.15
	25.5	17	50	55.33	28	19	29.90	57	07.36
	26.0	18	21	08.81	-28	23	20.80	57	22.17
	26.5	18	51	31.29	28	01	56.29	57	36.51
	27.0	19	21	47.91	27	15	15.64	57	50.31
	27.5	19	51	45.13	26	03	58.05	58	03.53
	28.0	20	21	12.00	24	29	18.54	58	16.12
	28.5	20	50	00.93	22	33	01.26	58	28.06
	29.0	21	18	07.97	-20	17	11.65	58	39.30
	29.5	21	45	32.62	17	44	08.96	58	49.80
	30.0	22	12	17.38	14	56	20.11	58	59.48
	30.5	22	38	27.19	11	56	15.42	59	08.26
	31.0	23	04	08.79	8	46	26.14	59	16.03
	31.5	23	29	30.20	5	29	23.65	59	22.63
June	1.0	23	54	40.28	-2	07	39.83	59	27.92
	1.5	0	19	48.35	+1	16	11.83	59	31.70
	2.0	0	45	03.87	4	39	34.78	59	33.79
	2.5	1	10	36.13	7	59	48.05	59	33.99
	3.0	1	36	33.88	11	14	05.41	59	32.15
	3.5	2	03	04.95	14	19	35.41	59	28.11
	4.0	2	30	15.69	+17	13	22.73	59	21.77
	4.5	2	58	10.35	19	52	31.25	59	13.11
	5.0	3	26	50.41	22	14	09.10	59	02.13
	5.5	3	56	13.95	24	15	35.69	58	48.93
	6.0	4	26	15.18	25	54	30.49	58	33.68
	6.5	4	56	44.45	27	09	02.40	58	16.61
	7.0	5	27	28.70	+27	57	58.43	57	58.00
	7.5	5	58	12.59	28	20	49.79	57	38.20
	8.0	6	28	39.99	28	17	53.86	57	17.58
	8.5	6	58	35.69	27	50	11.40	56	56.53
	9.0	7	27	46.86	+26	59	19.41	56	35.47

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
June	9.0	7	27	46.86	+26	59	19.41	56	35.47
	9.5	7	56	04.03	25	47	21.22	56	14.79
	10.0	8	23	21.47	24	16	35.57	55	54.86
	10.5	8	49	37.11	22	29	26.65	55	36.05
	11.0	9	14	51.98	20	28	16.06	55	18.66
	11.5	9	39	09.63	18	15	17.29	55	03.00
	12.0	10	02	35.42	+15	52	32.59	54	49.29
	12.5	10	25	15.95	13	21	51.79	54	37.76
	13.0	10	47	18.62	10	44	52.65	54	28.55
	13.5	11	08	51.27	8	03	02.17	54	21.80
	14.0	11	30	01.99	5	17	38.57	54	17.58
	14.5	11	50	58.98	+2	29	53.63	54	15.94
	15.0	12	11	50.48	-0	19	04.77	54	16.88
	15.5	12	32	44.78	3	08	10.02	54	20.38
	16.0	12	53	50.14	5	56	14.12	54	26.36
	16.5	13	15	14.83	8	42	05.04	54	34.72
	17.0	13	37	07.06	11	24	24.15	54	45.31
	17.5	13	59	34.86	14	01	43.81	54	57.97
	18.0	14	22	45.94	-16	32	25.33	55	12.47
	18.5	14	46	47.37	18	54	37.40	55	28.57
	19.0	15	11	45.17	21	06	15.54	55	45.99
	19.5	15	37	43.76	23	05	02.84	56	04.43
	20.0	16	04	45.26	24	48	32.64	56	23.56
	20.5	16	32	48.86	26	14	13.53	56	43.04
	21.0	17	01	50.12	-27	19	36.92	57	02.52
	21.5	17	31	40.76	28	02	26.93	57	21.66
	22.0	18	02	08.73	28	20	51.51	57	40.12
	22.5	18	32	59.08	28	13	33.22	57	57.61
	23.0	19	03	55.31	27	39	57.54	58	13.84
	23.5	19	34	41.05	26	40	16.96	58	28.58
	24.0	20	05	01.78	-25	15	30.04	58	41.67
	24.5	20	34	46.16	23	27	15.87	58	52.97
	25.0	21	03	46.75	21	17	45.31	59	02.43
	25.5	21	32	00.16	18	49	31.20	59	10.01
	26.0	21	59	26.72	16	05	18.93	59	15.75
	26.5	22	26	09.83	13	07	58.86	59	19.71
	27.0	22	52	15.26	-10	00	20.89	59	21.99
	27.5	23	17	50.49	6	45	11.25	59	22.68
	28.0	23	43	04.13	3	25	11.17	59	21.91
	28.5	0	08	05.45	-0	02	56.99	59	19.77
	29.0	0	33	04.01	+3	18	58.79	59	16.36
	29.5	0	58	09.36	6	38	05.85	59	11.75
	30.0	1	23	30.75	+9	51	54.40	59	06.00
	30.5	1	49	16.77	12	57	53.67	58	59.16
July	1.0	2	15	34.96	15	53	31.26	58	51.23
	1.5	2	42	31.34	18	36	13.48	58	42.23
	2.0	3	10	09.81	+21	03	27.25	58	32.16

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
July	1.0	2	15	34.96	+15	53	31.26	58	51.23
	1.5	2	42	31.34	18	36	13.48	58	42.23
	2.0	3	10	09.81	21	03	27.25	58	32.16
	2.5	3	38	31.55	23	12	43.90	58	21.04
	3.0	4	07	34.45	25	01	44.87	58	08.87
	3.5	4	37	12.77	26	28	29.13	57	55.70
	4.0	5	07	17.16	+27	31	21.37	57	41.59
	4.5	5	37	35.14	28	09	19.88	57	26.62
	5.0	6	07	52.18	28	22	02.26	57	10.92
	5.5	6	37	53.11	28	09	47.70	56	54.64
	6.0	7	07	23.63	27	33	35.13	56	37.96
	6.5	7	36	11.67	26	34	57.37	56	21.10
	7.0	8	04	08.28	+25	15	52.72	56	04.30
	7.5	8	31	07.99	23	38	35.30	55	47.80
	8.0	8	57	08.75	21	45	25.99	55	31.86
	8.5	9	22	11.43	19	38	44.86	55	16.74
	9.0	9	46	19.30	17	20	45.67	55	02.71
	9.5	10	09	37.39	14	53	32.50	54	50.02
	10.0	10	32	11.97	+12	18	58.14	54	38.90
	10.5	10	54	10.09	9	38	43.93	54	29.58
	11.0	11	15	39.30	6	54	20.62	54	22.24
	11.5	11	36	47.44	4	07	09.90	54	17.06
	12.0	11	57	42.50	+1	18	26.40	54	14.19
	12.5	12	18	32.57	-1	30	40.03	54	13.74
	13.0	12	39	25.79	-4	19	01.94	54	15.80
	13.5	13	00	30.37	7	05	31.66	54	20.40
	14.0	13	21	54.54	9	48	58.73	54	27.57
	14.5	13	43	46.52	12	28	07.30	54	37.29
	15.0	14	06	14.42	15	01	33.58	54	49.48
	15.5	14	29	26.05	17	27	43.51	55	04.04
	16.0	14	53	28.66	-19	44	50.92	55	20.81
	16.5	15	18	28.50	21	50	56.44	55	39.59
	17.0	15	44	30.26	23	43	47.73	56	00.12
	17.5	16	11	36.42	25	21	01.48	56	22.08
	18.0	16	39	46.47	26	40	07.87	56	45.13
	18.5	17	08	56.32	27	38	37.76	57	08.85
	19.0	17	38	57.88	-28	14	12.42	57	32.79
	19.5	18	09	39.23	28	24	55.14	57	56.49
	20.0	18	40	45.38	28	09	22.93	58	19.42
	20.5	19	11	59.59	27	26	56.18	58	41.11
	21.0	19	43	05.19	26	17	44.42	59	01.07
	21.5	20	13	47.25	24	42	46.77	59	18.86
	22.0	20	43	54.08	-22	43	47.49	59	34.10
	22.5	21	13	17.94	20	23	07.73	59	46.49
	23.0	21	41	55.24	17	43	35.40	59	55.83
	23.5	22	09	46.19	14	48	15.07	60	02.00
	24.0	22	36	54.13	-11	40	19.13	60	05.00

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
July	24.0	22	36	54.13	-11	40	19.13	60	05.00
	24.5	23	03	24.85	8	23	00.89	60	04.93
	25.0	23	29	25.81	4	59	29.90	60	01.97
	25.5	23	55	05.58	-1	32	49.10	59	56.37
	26.0	0	20	33.29	+1	54	06.36	59	48.43
	26.5	0	45	58.30	5	18	29.08	59	38.47
	27.0	1	11	29.79	+8	37	38.69	59	26.84
	27.5	1	37	16.44	11	49	00.68	59	13.86
	28.0	2	03	26.09	14	50	05.37	58	59.84
	28.5	2	30	05.33	17	38	27.31	58	45.06
	29.0	2	57	18.99	20	11	45.61	58	29.74
	29.5	3	25	09.67	22	27	45.59	58	14.10
	30.0	3	53	37.20	+24	24	21.86	57	58.28
	30.5	4	22	38.28	25	59	42.98	57	42.41
	31.0	4	52	06.36	27	12	17.26	57	26.58
	31.5	5	21	51.84	28	00	58.86	57	10.85
Aug.	1.0	5	51	42.75	28	25	13.24	56	55.28
	1.5	6	21	25.82	28	25	00.48	56	39.90
	2.0	6	50	47.74	+28	00	55.85	56	24.76
	2.5	7	19	36.44	27	14	07.11	56	09.89
	3.0	7	47	42.10	26	06	09.12	55	55.36
	3.5	8	14	57.76	24	38	56.67	55	41.22
	4.0	8	41	19.50	22	54	36.83	55	27.57
	4.5	9	06	46.32	20	55	21.83	55	14.49
	5.0	9	31	19.65	+18	43	23.26	55	02.11
	5.5	9	55	02.95	16	20	47.76	54	50.56
	6.0	10	18	01.09	13	49	34.37	54	39.99
	6.5	10	40	20.02	11	11	33.13	54	30.54
	7.0	11	02	06.35	8	28	24.82	54	22.40
	7.5	11	23	27.12	5	41	41.48	54	15.72
	8.0	11	44	29.65	+2	52	47.49	54	10.67
	8.5	12	05	21.39	+0	03	01.02	54	07.42
	9.0	12	26	09.90	-2	46	24.19	54	06.13
	9.5	12	47	02.84	5	34	16.90	54	06.93
	10.0	13	08	07.87	8	19	26.29	54	09.95
	10.5	13	29	32.73	11	00	39.76	54	15.30
	11.0	13	51	25.12	-13	36	40.73	54	23.06
	11.5	14	13	52.60	16	06	06.38	54	33.29
	12.0	14	37	02.45	18	27	25.66	54	45.99
	12.5	15	01	01.38	20	38	57.58	55	01.16
	13.0	15	25	55.15	22	38	50.20	55	18.72
	13.5	15	51	48.07	24	25	00.67	55	38.56
	14.0	16	18	42.37	-25	55	16.81	56	00.51
	14.5	16	46	37.62	27	07	20.72	56	24.32
	15.0	17	15	30.12	27	58	54.72	56	49.70
	15.5	17	45	12.61	28	27	49.57	57	16.27
	16.0	18	15	34.40	-28	32	14.43	57	43.58

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Aug.	16.0	18	15	34.40	-28	32	14.43	57	43.58
	16.5	18	46	22.03	28	10	47.19	58	11.13
	17.0	19	17	20.44	27	22	43.64	58	38.34
	17.5	19	48	14.48	26	08	03.69	59	04.60
	18.0	20	18	50.49	24	27	33.53	59	29.26
	18.5	20	48	57.58	22	22	43.73	59	51.70
	19.0	21	18	28.40	-19	55	43.76	60	11.31
	19.5	21	47	19.37	17	09	14.47	60	27.54
	20.0	22	15	30.45	14	06	19.77	60	39.96
	20.5	22	43	04.61	10	50	18.60	60	48.24
	21.0	23	10	07.16	7	24	37.93	60	52.23
	21.5	23	36	45.10	3	52	46.99	60	51.89
	22.0	0	03	06.53	-0	18	12.89	60	47.38
	22.5	0	29	20.08	+3	15	42.64	60	38.96
	23.0	0	55	34.51	6	45	45.33	60	27.02
	23.5	1	21	58.28	10	08	49.73	60	12.04
	24.0	1	48	39.13	13	21	59.96	59	54.54
	24.5	2	15	43.68	16	22	30.31	59	35.08
	25.0	2	43	16.92	+19	07	46.08	59	14.19
	25.5	3	11	21.77	21	35	24.95	58	52.38
	26.0	3	39	58.57	23	43	19.26	58	30.12
	26.5	4	09	04.77	25	29	39.31	58	07.80
	27.0	4	38	34.75	26	52	57.41	57	45.77
	27.5	5	08	20.06	27	52	12.14	57	24.29
	28.0	5	38	09.95	+28	26	52.08	57	03.58
	28.5	6	07	52.32	28	36	57.99	56	43.79
	29.0	6	37	14.82	28	23	02.72	56	25.03
	29.5	7	06	06.08	27	46	08.66	56	07.36
	30.0	7	34	16.62	26	47	42.96	55	50.82
	30.5	8	01	39.47	25	29	31.43	55	35.41
	31.0	8	28	10.49	+23	53	31.89	55	21.13
	31.5	8	53	48.20	22	01	48.08	55	07.96
Sept.	1.0	9	18	33.49	19	56	24.59	54	55.89
	1.5	9	42	29.20	17	39	23.03	54	44.91
	2.0	10	05	39.62	15	12	39.66	54	35.01
	2.5	10	28	10.10	12	38	03.98	54	26.21
	3.0	10	50	06.70	+9	57	18.38	54	18.52
	3.5	11	11	35.92	7	11	58.31	54	11.99
	4.0	11	32	44.54	4	23	32.98	54	06.68
	4.5	11	53	39.49	+1	33	26.36	54	02.66
	5.0	12	14	27.76	-1	17	01.65	54	00.02
	5.5	12	35	16.40	-4	06	33.87	53	58.85
	6.0	12	56	12.48	-6	53	54.42	53	59.28
	6.5	13	17	23.02	9	37	47.15	54	01.40
	7.0	13	38	55.04	12	16	54.11	54	05.35
	7.5	14	00	55.41	14	49	53.94	54	11.22
	8.0	14	23	30.75	-17	15	20.38	54	19.13

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Sept.	8.0	14	23	30.75	-17	15	20.38	54	19.13
	8.5	14	46	47.28	19	31	40.96	54	29.18
	9.0	15	10	50.49	21	37	15.99	54	41.42
	9.5	15	35	44.84	23	30	18.32	54	55.92
	10.0	16	01	33.30	25	08	53.84	55	12.69
	10.5	16	28	16.85	26	31	03.40	55	31.70
	11.0	16	55	54.06	-27	34	46.14	55	52.89
	11.5	17	24	20.70	28	18	04.51	56	16.13
	12.0	17	53	29.68	28	39	10.78	56	41.21
	12.5	18	23	11.28	28	36	34.47	57	07.89
	13.0	18	53	13.83	28	09	09.76	57	35.82
	13.5	19	23	24.71	27	16	21.85	58	04.58
	14.0	19	53	31.62	-25	58	11.27	58	33.64
	14.5	20	23	23.68	24	15	15.59	59	02.44
	15.0	20	52	52.46	22	08	48.54	59	30.30
	15.5	21	21	52.52	19	40	37.13	59	56.54
	16.0	21	50	21.56	16	52	57.49	60	20.42
	16.5	22	18	20.25	13	48	30.21	60	41.23
	17.0	22	45	51.84	-10	30	15.71	60	58.32
	17.5	23	13	01.61	7	01	29.81	61	11.12
	18.0	23	39	56.37	-3	25	39.61	61	19.21
	18.5	0	06	43.91	+0	13	40.36	61	22.33
	19.0	0	33	32.51	3	52	51.95	61	20.39
	19.5	1	00	30.46	7	28	16.99	61	13.53
	20.0	1	27	45.62	+10	56	20.90	61	02.03
	20.5	1	55	24.85	14	13	36.30	60	46.36
	21.0	2	23	33.55	17	16	46.64	60	27.08
	21.5	2	52	14.99	20	02	50.16	60	04.85
	22.0	3	21	29.80	22	29	04.19	59	40.35
	22.5	3	51	15.53	24	33	09.95	59	14.28
	23.0	4	21	26.41	+26	13	17.50	58	47.29
	23.5	4	51	53.54	27	28	10.39	58	19.99
	24.0	5	22	25.43	28	17	09.17	57	52.91
	24.5	5	52	49.07	28	40	12.74	57	26.50
	25.0	6	22	51.18	28	37	57.05	57	01.12
	25.5	6	52	19.47	28	11	30.89	56	37.06
	26.0	7	21	03.78	+27	22	29.45	56	14.54
	26.5	7	48	56.75	26	12	46.54	55	53.70
	27.0	8	15	54.03	24	44	26.86	55	34.65
	27.5	8	41	54.23	22	59	39.05	55	17.41
	28.0	9	06	58.44	21	00	30.43	55	01.99
	28.5	9	31	09.81	18	49	03.31	54	48.37
	29.0	9	54	32.97	+16	27	12.97	54	36.49
	29.5	10	17	13.60	13	56	46.90	54	26.30
	30.0	10	39	18.03	11	19	24.92	54	17.72
	30.5	11	00	52.98	8	36	40.04	54	10.68
Oct.	1.0	11	22	05.37	+5	49	59.51	54	05.11

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Oct.	1.0	11	22	05.37	+5	49	59.51	54	05.11
	1.5	11	43	02.21	3	00	46.24	54	00.94
	2.0	12	03	50.47	+0	10	20.10	53	58.13
	2.5	12	24	37.10	-2	40	00.67	53	56.65
	3.0	12	45	28.98	5	28	58.11	53	56.46
	3.5	13	06	32.89	8	15	13.29	53	57.59
	4.0	13	27	55.48	-10	57	25.11	54	00.03
	4.5	13	49	43.20	13	34	09.20	54	03.83
	5.0	14	12	02.20	16	03	57.01	54	09.03
	5.5	14	34	58.16	18	25	15.07	54	15.70
	6.0	14	58	36.06	20	36	24.67	54	23.90
	6.5	15	22	59.90	22	35	42.02	54	33.71
	7.0	15	48	12.33	-24	21	19.13	54	45.21
	7.5	16	14	14.29	25	51	25.61	54	58.45
	8.0	16	41	04.62	27	04	11.56	55	13.50
	8.5	17	08	39.79	27	57	51.55	55	30.39
	9.0	17	36	53.85	28	30	49.50	55	49.13
	9.5	18	05	38.65	28	41	44.08	56	09.67
	10.0	18	34	44.29	-28	29	33.99	56	31.94
	10.5	19	03	59.99	27	53	42.34	56	55.81
	11.0	19	33	15.01	26	53	59.50	57	21.07
	11.5	20	02	19.68	25	30	44.14	57	47.44
	12.0	20	31	06.21	23	44	42.53	58	14.58
	12.5	20	59	29.27	21	37	06.54	58	42.04
	13.0	21	27	26.24	-19	09	31.02	59	09.31
	13.5	21	54	57.18	16	23	51.15	59	35.79
	14.0	22	22	04.57	13	22	20.30	60	00.83
	14.5	22	48	52.98	10	07	28.37	60	23.72
	15.0	23	15	28.59	6	42	00.81	60	43.78
	15.5	23	41	58.85	-3	08	57.72	61	00.32
	16.0	0	08	31.96	+0	28	26.99	61	12.76
	16.5	0	35	16.57	4	06	46.98	61	20.59
	17.0	1	02	21.22	7	42	25.68	61	23.49
	17.5	1	29	53.93	11	11	39.37	61	21.31
	18.0	1	58	01.57	14	30	41.60	61	14.08
	18.5	2	26	49.18	17	35	48.86	61	02.03
	19.0	2	56	19.24	+20	23	27.66	60	45.57
	19.5	3	26	30.90	22	50	22.74	60	25.24
	20.0	3	57	19.48	24	53	46.25	60	01.70
	20.5	4	28	36.22	26	31	26.85	59	35.67
	21.0	5	00	08.71	27	41	57.62	59	07.87
	21.5	5	31	41.81	28	24	41.10	58	39.02
	22.0	6	02	59.19	+28	39	50.30	58	09.80
	22.5	6	33	45.06	28	28	24.83	57	40.82
	23.0	7	03	45.79	27	52	02.99	57	12.60
	23.5	7	32	51.02	26	52	50.96	56	45.58
	24.0	8	00	54.18	+25	33	11.39	56	20.13

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension h	m	s	Apparent Declination °	'	"	Horizontal Parallax '	"
Oct.	24.0	8	00	54.18	+25	33	11.39	56	20.13
	24.5	8	27	52.48	23	55	32.95	55	56.52
	25.0	8	53	46.44	22	02	22.10	55	34.96
	25.5	9	18	39.17	19	55	57.52	55	15.58
	26.0	9	42	35.73	17	38	27.06	54	58.46
	26.5	10	05	42.47	15	11	46.63	54	43.63
	27.0	10	28	06.51	+12	37	40.66	54	31.07
	27.5	10	49	55.40	9	57	43.36	54	20.73
	28.0	11	11	16.85	7	13	20.67	54	12.55
	28.5	11	32	18.57	4	25	52.25	54	06.42
	29.0	11	53	08.20	+1	36	33.73	54	02.23
	29.5	12	13	53.23	-1	13	21.33	53	59.87
	30.0	12	34	41.04	-4	02	39.43	53	59.21
	30.5	12	55	38.82	6	50	05.38	54	00.13
	31.0	13	16	53.56	9	34	20.72	54	02.52
	31.5	13	38	32.01	12	14	02.42	54	06.26
Nov.	1.0	14	00	40.56	14	47	41.80	54	11.27
	1.5	14	23	25.09	17	13	43.92	54	17.45
	2.0	14	46	50.73	-19	30	27.34	54	24.76
	2.5	15	11	01.58	21	36	04.71	54	33.15
	3.0	15	36	00.35	23	28	44.04	54	42.59
	3.5	16	01	47.97	25	06	31.08	54	53.06
	4.0	16	28	23.20	26	27	32.79	55	04.58
	4.5	16	55	42.40	27	30	01.87	55	17.17
	5.0	17	23	39.41	-28	12	22.03	55	30.84
	5.5	17	52	05.81	28	33	13.68	55	45.63
	6.0	18	20	51.42	28	31	38.98	56	01.55
	6.5	18	49	45.15	28	07	05.74	56	18.61
	7.0	19	18	35.97	27	19	29.37	56	36.79
	7.5	19	47	13.92	26	09	12.63	56	56.06
	8.0	20	15	30.96	-24	37	03.49	57	16.33
	8.5	20	43	21.57	22	44	11.66	57	37.48
	9.0	21	10	42.93	20	32	04.55	57	59.31
	9.5	21	37	34.94	18	02	23.56	58	21.58
	10.0	22	03	59.94	15	17	01.21	58	43.97
	10.5	22	30	02.36	12	17	59.45	59	06.11
	11.0	22	55	48.37	-9	07	29.11	59	27.53
	11.5	23	21	25.41	5	47	50.33	59	47.75
	12.0	23	47	01.92	-2	21	33.81	60	06.22
	12.5	0	12	46.97	+1	08	37.87	60	22.36
	13.0	0	38	49.95	4	39	48.84	60	35.64
	13.5	1	05	20.17	8	08	49.35	60	45.52
	14.0	1	32	26.42	+11	32	16.16	60	51.58
	14.5	2	00	16.39	14	46	34.65	60	53.48
	15.0	2	28	55.89	17	48	03.00	60	51.02
	15.5	2	58	28.01	20	32	58.89	60	44.15
	16.0	3	28	52.18	+22	57	48.97	60	33.00

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Nov.	16.0	3	28	52.18	+22	57	48.97	60	33.00
	16.5	4	00	03.39	24	59	20.55	60	17.84
	17.0	4	31	51.84	26	34	54.79	59	59.07
	17.5	5	04	03.20	27	42	39.17	59	37.23
	18.0	5	36	19.74	28	21	36.99	59	12.91
	18.5	6	08	22.16	28	31	51.47	58	46.76
	19.0	6	39	51.72	+28	14	23.00	58	19.44
	19.5	7	10	32.35	27	31	00.20	57	51.60
	20.0	7	40	11.97	26	24	06.53	57	23.83
	20.5	8	08	43.17	24	56	25.57	56	56.69
	21.0	8	36	03.02	23	10	47.49	56	30.65
	21.5	9	02	12.48	21	09	58.45	56	06.11
	22.0	9	27	15.47	+18	56	33.48	55	43.42
	22.5	9	51	18.01	16	32	52.82	55	22.83
	23.0	10	14	27.47	14	01	00.67	55	04.54
	23.5	10	36	51.98	11	22	46.02	54	48.68
	24.0	10	58	40.02	8	39	44.41	54	35.33
	24.5	11	20	00.14	5	53	20.44	54	24.52
	25.0	11	41	00.83	+3	04	50.55	54	16.25
	25.5	12	01	50.44	+0	15	25.71	54	10.46
	26.0	12	22	37.13	-2	33	45.77	54	07.07
	26.5	12	43	28.90	5	21	35.80	54	05.98
	27.0	13	04	33.53	8	06	54.04	54	07.04
	27.5	13	25	58.55	10	48	25.88	54	10.12
	28.0	13	47	51.22	-13	24	50.50	54	15.04
	28.5	14	10	18.32	15	54	39.49	54	21.63
	29.0	14	33	26.01	18	16	15.88	54	29.70
	29.5	14	57	19.51	20	27	53.94	54	39.07
	30.0	15	22	02.71	22	27	39.96	54	49.57
	30.5	15	47	37.74	24	13	34.22	55	01.00
Dec.	1.0	16	14	04.49	-25	43	34.48	55	13.22
	1.5	16	41	20.23	26	55	40.92	55	26.07
	2.0	17	09	19.33	27	48	02.50	55	39.42
	2.5	17	37	53.36	28	19	04.04	55	53.17
	3.0	18	06	51.54	28	27	33.29	56	07.22
	3.5	18	36	01.51	28	12	46.72	56	21.50
	4.0	19	05	10.51	-27	34	32.99	56	35.97
	4.5	19	34	06.54	26	33	13.65	56	50.60
	5.0	20	02	39.50	25	09	40.75	57	05.36
	5.5	20	30	41.89	23	25	12.26	57	20.23
	6.0	20	58	09.29	21	21	26.25	57	35.19
	6.5	21	25	00.32	19	00	14.93	57	50.21
	7.0	21	51	16.39	-16	23	39.50	58	05.24
	7.5	22	17	01.33	13	33	46.32	58	20.20
	8.0	22	42	20.88	10	32	44.65	58	34.96
	8.5	23	07	22.26	7	22	45.91	58	49.37
	9.0	23	32	13.81	-4	06	04.14	59	03.25

MOON, 2024

FOR 0^h AND 12^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			Horizontal Parallax	
		h	m	s	°	'	"	'	"
Dec.	9.0	23	32	13.81	-4	06	04.14	59	03.25
	9.5	23	57	04.62	-0	44	57.40	59	16.33
	10.0	0	22	04.28	+2	38	10.21	59	28.35
	10.5	0	47	22.62	6	00	46.36	59	38.98
	11.0	1	13	09.33	9	20	08.45	59	47.89
	11.5	1	39	33.65	12	33	22.31	59	54.73
	12.0	2	06	43.77	+15	37	22.06	59	59.19
	12.5	2	34	46.18	18	28	51.87	60	00.95
	13.0	3	03	44.78	21	04	30.25	59	59.78
	13.5	3	33	39.96	23	20	57.29	59	55.53
	14.0	4	04	27.73	25	15	05.15	59	48.11
	14.5	4	35	59.18	26	44	10.98	59	37.55
	15.0	5	08	00.57	+27	46	10.72	59	24.01
	15.5	5	40	14.25	28	19	51.30	59	07.70
	16.0	6	12	20.43	28	24	58.14	58	48.98
	16.5	6	43	59.35	28	02	16.07	58	28.23
	17.0	7	14	53.54	27	13	23.01	58	05.94
	17.5	7	44	49.40	26	00	38.03	57	42.58
	18.0	8	13	38.10	+24	26	46.50	57	18.67
	18.5	8	41	15.58	22	34	45.41	56	54.72
	19.0	9	07	41.91	20	27	31.18	56	31.20
	19.5	9	33	00.50	18	07	50.78	56	08.55
	20.0	9	57	17.10	15	38	16.53	55	47.19
	20.5	10	20	39.00	13	01	03.86	55	27.44
	21.0	10	43	14.40	+10	18	11.27	55	09.62
	21.5	11	05	11.95	7	31	21.79	54	53.96
	22.0	11	26	40.42	4	42	05.29	54	40.65
	22.5	11	47	48.57	+1	51	41.26	54	29.85
	23.0	12	08	45.06	-0	58	38.27	54	21.63
	23.5	12	29	38.38	3	47	45.80	54	16.06
	24.0	12	50	36.87	-6	34	35.48	54	13.13
	24.5	13	11	48.68	9	18	00.41	54	12.82
	25.0	13	33	21.76	11	56	50.07	54	15.05
	25.5	13	55	23.79	14	29	48.03	54	19.73
	26.0	14	18	01.98	16	55	29.96	54	26.71
	26.5	14	41	22.94	19	12	22.25	54	35.83
	27.0	15	05	32.25	-21	18	41.24	54	46.88
	27.5	15	30	34.13	23	12	33.65	54	59.65
	28.0	15	56	30.86	24	51	58.35	55	13.87
	28.5	16	23	22.30	26	14	49.87	55	29.27
	29.0	16	51	05.36	27	19	03.93	55	45.59
	29.5	17	19	33.80	28	02	44.57	56	02.51
	30.0	17	48	38.26	-28	24	12.57	56	19.75
	30.5	18	18	06.77	28	22	13.90	56	37.02
	31.0	18	47	45.76	27	56	06.87	56	54.06
	31.5	19	17	21.29	27	05	46.58	57	10.61
	32.0	19	46	40.48	-25	51	45.94	57	26.46

MOON, 2024
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit d	h	m	Geocentric Declination °	'
		d		d	h	m	°	'
Jan.	0	18.02	L	0	15	41.9	+14	21.8
	1	19.02	U	1	04	02.6	11	46.2
	1		L	1	16	22.7	9	04.4
	2	20.02	U	2	04	42.5	6	17.9
	2		L	2	17	02.1	3	27.9
	3	21.02	U	3	05	21.5	+0	35.4
	3		L	3	17	41.1	-2	18.1
	4	22.02	U	4	06	00.9	5	11.4
	4		L	4	18	21.1	8	03.5
	5	23.02	U	5	06	41.8	10	52.8
	5		L	5	19	03.3	13	37.7
	6	24.02	U	6	07	25.7	16	16.4
	6		L	6	19	49.1	-18	46.5
	7	25.02	U	7	08	13.7	21	05.6
	7		L	7	20	39.7	23	10.7
	8	26.02	U	8	09	06.9	24	58.4
	8		L	8	21	35.5	26	25.5
	9	27.02	U	9	10	05.3	27	28.1
	9		L	9	22	36.2	-28	03.5
	10	28.02	U	10	11	07.7	28	08.8
	10		L	10	23	39.7	27	42.9
	11	29.02	U	11	12	11.5	26	45.2
	12	0.5	L	12	00	43.0	25	17.0
	12		U	12	13	13.7	23	20.5
	13	1.5	L	13	01	43.4	-20	58.8
	13		U	13	14	12.1	18	15.9
	14	2.5	L	14	02	39.7	15	15.6
	14		U	14	15	06.3	12	02.3
	15	3.5	L	15	03	32.0	8	39.6
	15		U	15	15	56.9	5	11.3
	16	4.5	L	16	04	21.3	-1	40.8
	16		U	16	16	45.4	+1	49.0
	17	5.5	L	17	05	09.2	5	15.0
	17		U	17	17	33.0	8	34.9
	18	6.5	L	18	05	57.0	11	46.1
	18		U	18	18	21.3	14	46.4
	19	7.5	L	19	06	46.1	+17	33.5
	19		U	19	19	11.3	20	05.2
	20	8.5	L	20	07	37.1	22	19.5
	20		U	20	20	03.4	24	14.4
	21	9.5	L	21	08	30.4	25	48.2
	21		U	21	20	57.7	26	59.5
	22	10.5	L	22	09	25.3	+27	47.0
	22		U	22	21	53.1	28	10.4
	23	11.5	L	23	10	20.7	28	09.6
	23		U	23	22	47.9	+27	45.2

Date		Age (at 0^h)		Ephemeris Transit d	h	m	Geocentric Declination °	'
		d		d	h	m	°	'
Jan.	23		U	23	22	47.9	+27	45.2
	24	12.50	L	24	11	14.6	26	58.2
	24		U	24	23	40.6	25	50.3
	25	13.50	L	25	12	05.8	24	23.3
	26	14.50	U	26	00	30.2	22	39.2
	26		L	26	12	53.6	20	40.3
	27	15.50	U	27	01	16.2	+18	28.5
	27		L	27	13	38.0	16	06.0
	28	16.50	U	28	01	59.1	13	34.5
	28		L	28	14	19.6	10	55.9
	29	17.50	U	29	02	39.6	8	11.7
	29		L	29	14	59.3	5	23.4
	30	18.50	U	30	03	18.8	+2	32.3
	30		L	30	15	38.1	-0	20.2
	31	19.50	U	31	03	57.6	3	13.0
	31		L	31	16	17.2	6	04.9
Feb.	1	20.50	U	1	04	37.2	8	54.5
	1		L	1	16	57.7	11	40.4
	2	21.50	U	2	05	18.9	-14	21.2
	2		L	2	17	40.9	16	55.0
	3	22.50	U	3	06	03.9	19	19.9
	3		L	3	18	28.0	21	33.5
	4	23.50	U	4	06	53.3	23	33.2
	4		L	4	19	19.9	25	16.2
	5	24.50	U	5	07	47.8	-26	39.2
	5		L	5	20	17.0	27	39.0
	6	25.50	U	6	08	47.1	28	12.5
	6		L	6	21	18.2	28	17.3
	7	26.50	U	7	09	49.7	27	51.4
	7		L	7	22	21.3	26	54.1
	8	27.50	U	8	10	52.8	-25	26.0
	8		L	8	23	23.6	23	28.4
	9	28.50	U	9	11	53.8	21	04.4
	10	0.04	L	10	00	23.0	18	17.2
	10		U	10	12	51.3	15	11.1
	11	1.04	L	11	01	18.7	11	50.2
	11		U	11	13	45.2	-8	18.9
	12	2.04	L	12	02	11.1	4	41.2
	12		U	12	14	36.4	-1	01.2
	13	3.04	L	13	03	01.4	+2	37.4
	13		U	13	15	26.2	6	11.2
	14	4.04	L	14	03	51.0	9	37.2
	14		U	14	16	16.0	+12	52.6
	15	5.04	L	15	04	41.2	15	54.7
	15		U	15	17	06.7	18	41.3
	16	6.04	L	16	05	32.8	+21	10.1

MOON, 2024

AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Feb.	16	6.04	L	16	05	32.8	+21	10.1
	16		U	16	17	59.3	23	19.2
	17	7.04	L	17	06	26.2	25	07.0
	17		U	17	18	53.5	26	32.1
	18	8.04	L	18	07	21.1	27	33.5
	18		U	18	19	48.7	28	10.6
	19	9.04	L	19	08	16.3	+28	23.4
	19		U	19	20	43.6	28	12.3
	20	10.04	L	20	09	10.5	27	38.4
	20		U	20	21	36.7	26	42.8
	21	11.04	L	21	10	02.1	25	27.3
	21		U	21	22	26.8	23	53.6
	22	12.04	L	22	10	50.6	+22	03.9
	22		U	22	23	13.5	20	00.0
	23	13.04	L	23	11	35.7	17	44.0
	23		U	23	23	57.1	15	17.7
	24	14.04	L	24	12	18.0	12	42.9
	25	15.04	U	25	00	38.3	10	01.3
	25		L	25	12	58.1	+7	14.5
	26	16.04	U	26	01	17.7	4	23.9
	26		L	26	13	37.1	+1	31.0
	27	17.04	U	27	01	56.5	-1	22.9
	27		L	27	14	16.0	4	16.4
	28	18.04	U	28	02	35.7	7	08.2
	28		L	28	14	55.8	-9	56.9
	29	19.04	U	29	03	16.3	12	40.9
	29		L	29	15	37.5	15	18.8
Mar.	1	20.04	U	1	03	59.5	17	48.7
	1		L	1	16	22.3	20	08.6
	2	21.04	U	2	04	46.2	22	16.4
	2		L	2	17	11.2	-24	09.8
	3	22.04	U	3	05	37.3	25	46.0
	3		L	3	18	04.6	27	02.5
	4	23.04	U	4	06	32.9	27	56.4
	4		L	4	19	02.2	28	25.1
	5	24.04	U	5	07	32.2	28	26.6
	5		L	5	20	02.7	-27	59.2
	6	25.04	U	6	08	33.3	27	02.3
	6		L	6	21	03.8	25	35.8
	7	26.04	U	7	09	33.9	23	41.1
	7		L	7	22	03.4	21	20.0
	8	27.04	U	8	10	32.3	18	35.6
	8		L	8	23	00.4	-15	31.0
	9	28.04	U	9	11	27.8	12	10.1
	9		L	9	23	54.5	8	36.8
	10	29.04	U	10	12	20.8	-4	55.5

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Mar.	10		U	10	12	20.8	-4	55.5
	11	0.63	L	11	00	46.6	-1	10.0
	11		U	11	13	12.3	+2	35.3
	12	1.63	L	12	01	37.9	6	16.8
	12		U	12	14	03.6	9	50.6
	13	2.63	L	13	02	29.5	13	13.4
	13		U	13	14	55.8	+16	21.9
	14	3.63	L	14	03	22.5	19	13.1
	14		U	14	15	49.7	21	44.7
	15	4.63	L	15	04	17.3	23	54.3
	15		U	15	16	45.3	25	40.3
	16	5.63	L	16	05	13.5	27	01.4
	16		U	16	17	41.9	+27	56.8
	17	6.63	L	17	06	10.2	28	26.6
	17		U	17	18	38.2	28	31.1
	18	7.63	L	18	07	05.7	28	11.3
	18		U	18	19	32.6	27	28.6
	19	8.63	L	19	07	58.6	26	24.8
	19		U	19	20	23.8	+25	01.7
	20	9.63	L	20	08	48.1	23	21.5
	20		U	20	21	11.5	21	26.1
	21	10.63	L	21	09	34.1	19	17.5
	21		U	21	21	55.9	16	57.5
	22	11.63	L	22	10	17.0	14	28.0
	22		U	22	22	37.5	+11	50.5
	23	12.63	L	23	10	57.6	9	06.6
	23		U	23	23	17.3	6	17.9
	24	13.63	L	24	11	36.8	3	25.6
	24		U	24	23	56.3	+0	31.3
	25	14.63	L	25	12	15.7	-2	23.8
	26	15.63	U	26	00	35.3	-5	18.2
	26		L	26	12	55.2	8	10.4
	27	16.63	U	27	01	15.5	10	58.9
	27		L	27	13	36.4	13	42.0
	28	17.63	U	28	01	57.9	16	18.0
	28		L	28	14	20.2	18	45.1
	29	18.63	U	29	02	43.4	-21	01.0
	29		L	29	15	07.6	23	03.6
	30	19.63	U	30	03	32.7	24	50.5
	30		L	30	15	59.0	26	19.2
	31	20.63	U	31	04	26.1	27	27.4
	31		L	31	16	54.2	28	12.8
Apr.	1	21.63	U	1	05	22.9	-28	33.2
	1		L	1	17	52.2	28	27.2
	2	22.63	U	2	06	21.7	27	53.8
	2		L	2	18	51.2	-26	52.7

MOON, 2024
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination		Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'			d		d	h	m	°	'
Apr.	1	21.63	U	1	05	22.9	-28	33.2	Apr.	24	15.24	L	24	12	18.0	-17	08.4
	1		L	1	17	52.2	28	27.2		25	16.24	U	25	00	40.8	19	33.0
	2	22.63	U	2	06	21.7	27	53.8		25		L	25	13	04.6	21	45.5
	2		L	2	18	51.2	26	52.7		26	17.24	U	26	01	29.4	23	43.5
	3	23.63	U	3	07	20.5	25	24.3		26		L	26	13	55.2	25	24.4
	3		L	3	19	49.4	-23	30.0		27	18.24	U	27	02	22.0	26	45.9
	4	24.63	U	4	08	17.8	-21	11.4		27		L	27	14	49.6	-27	45.4
	4		L	4	20	45.5	18	31.0		28	19.24	U	28	03	18.0	28	21.1
	5	25.63	U	5	09	12.6	15	31.4		28		L	28	15	46.9	28	31.1
	5		L	5	21	39.1	12	15.8		29	20.24	U	29	04	16.0	28	14.6
	6	26.63	U	6	10	05.2	8	47.5		29		L	29	16	45.1	27	31.2
	6		L	6	22	30.9	-5	10.1		30	21.24	U	30	05	14.1	26	21.3
	7	27.63	U	7	10	56.5	-1	27.2		30		L	30	17	42.6	-24	45.9
	7		L	7	23	22.0	+2	17.4	May	1	22.24	U	1	06	10.5	22	46.7
	8	28.63	U	8	11	47.6	5	59.8		1		L	1	18	37.8	20	25.7
	9	0.24	L	9	00	13.5	9	36.3		2	23.24	U	2	07	04.4	17	45.4
	9		U	9	12	39.7	13	02.9		2		L	2	19	30.4	14	48.2
	10	1.24	L	10	01	06.5	16	16.0		3	24.24	U	3	07	55.9	11	36.9
	10		U	10	13	33.9	+19	12.1		3		L	3	20	20.9	-8	14.5
	11	2.24	L	11	02	01.9	21	48.1		4	25.24	U	4	08	45.7	4	43.8
	11		U	11	14	30.4	24	01.2		4		L	4	21	10.4	-1	08.0
	12	3.24	L	12	02	59.4	25	49.1		5	26.24	U	5	09	35.1	+2	29.8
	12		U	12	15	28.7	27	10.5		5		L	5	22	00.1	6	06.1
	13	4.24	L	13	03	58.1	28	04.3		6	27.24	U	6	10	25.4	9	37.6
	13		U	13	16	27.3	+28	30.8		6		L	6	22	51.3	+13	00.7
	14	5.24	L	14	04	56.1	28	30.5		7	28.24	U	7	11	17.8	16	11.6
	14		U	14	17	24.2	28	04.9		7		L	7	23	45.1	19	07.0
	15	6.24	L	15	05	51.5	27	15.8		8	29.24	U	8	12	13.2	21	43.1
	15		U	15	18	17.9	26	05.3		9	0.86	L	9	00	42.0	23	57.0
	16	7.24	L	16	06	43.3	24	35.9		9		U	9	13	11.3	25	45.8
	16		U	16	19	07.6	+22	49.8		10	1.86	L	10	01	41.1	+27	07.7
	17	8.24	L	17	07	31.0	20	49.1		10		U	10	14	11.1	28	01.3
	17		U	17	19	53.4	18	36.1		11	2.86	L	11	02	41.0	28	26.5
	18	9.24	L	18	08	15.0	16	12.5		11		U	11	15	10.5	28	23.9
	18		U	18	20	36.0	13	40.1		12	3.86	L	12	03	39.2	27	54.8
	19	10.24	L	19	08	56.3	11	00.5		12		U	12	16	07.2	27	01.4
	19		U	19	21	16.3	+8	15.1		13	4.86	L	13	04	34.0	+25	46.2
	20	11.24	L	20	09	35.9	5	25.3		13		U	13	16	59.8	24	11.7
	20		U	20	21	55.3	+2	32.3		14	5.86	L	14	05	24.4	22	20.6
	21	12.24	L	21	10	14.7	-0	22.4		14		U	14	17	47.9	20	15.4
	21		U	21	22	34.3	3	17.7		15	6.86	L	15	06	10.5	17	58.2
	22	13.24	L	22	10	54.0	6	12.0		15		U	15	18	32.2	15	31.2
	22		U	22	23	14.1	-9	03.9		16	7.86	L	16	06	53.1	+12	56.1
	23	14.24	L	23	11	34.8	11	51.8		16		U	16	19	13.5	10	14.4
	23		U	23	23	56.0	14	33.9		17	8.86	L	17	07	33.4	7	27.7
	24	15.24	L	24	12	18.0	-17	08.4		17		U	17	19	52.9	+4	37.3

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Date	Age (at 0^h)	Ephemeris Transit			Geocentric Declination		Date	Age (at 0^h)	Ephemeris Transit			Geocentric Declination	
	d	d	h	m	°	'		d	d	h	m	°	'
May 17	8.86 U	17	19	52.9	+4	37.3	June 10	3.47 L	10	03	14.6	+23	49.0
18	9.86 L	18	08	12.4	+1	44.3	10	U	10	15	39.5	21	53.7
18	U	18	20	31.8	-1	10.1	11	4.47 L	11	04	03.2	19	44.3
19	10.86 L	19	08	51.3	4	04.5	11	U	11	16	26.0	17	23.4
19	U	19	21	11.2	6	57.7	12	5.47 L	12	04	47.8	14	52.9
20	11.86 L	20	09	31.4	9	48.2	12	U	12	17	08.8	12	14.9
20	U	20	21	52.3	-12	34.6	13	6.47 L	13	05	29.2	+9	31.1
21	12.86 L	21	10	13.8	15	14.8	13	U	13	17	49.1	6	42.9
21	U	21	22	36.2	17	47.1	14	7.47 L	14	06	08.7	3	51.7
22	13.86 L	22	10	59.5	20	09.1	14	U	14	18	28.2	+0	58.6
22	U	22	23	23.8	22	18.4	15	8.47 L	15	06	47.6	-1	55.2
23	14.86 L	23	11	49.3	24	12.3	15	U	15	19	07.1	4	48.4
24	15.86 U	24	00	15.7	-25	48.1	16	9.47 L	16	07	26.9	-7	39.8
24	L	24	12	43.3	27	03.2	16	U	16	19	47.2	10	28.2
25	16.86 U	25	01	11.6	27	55.0	17	10.47 L	17	08	08.1	13	12.0
25	L	25	13	40.6	28	21.5	17	U	17	20	29.7	15	49.5
26	17.86 U	26	02	10.1	28	21.3	18	11.47 L	18	08	52.2	18	18.7
26	L	26	14	39.6	27	53.7	18	U	18	21	15.6	20	37.5
27	18.86 U	27	03	09.0	-26	58.8	19	12.47 L	19	09	40.3	-22	43.3
27	L	27	15	38.0	25	37.6	19	U	19	22	06.0	24	33.4
28	19.86 U	28	04	06.4	23	51.7	20	13.47 L	20	10	32.9	26	05.0
28	L	28	16	34.0	21	43.3	20	U	20	23	00.9	27	15.2
29	20.86 U	29	05	00.8	19	15.0	21	14.47 L	21	11	29.9	28	01.1
29	L	29	17	26.9	16	29.4	21	U	21	23	59.5	28	20.9
30	21.86 U	30	05	52.3	-13	29.3	22	15.47 L	22	12	29.6	-28	12.6
30	L	30	18	17.0	10	17.6	23	16.47 U	23	00	59.7	27	35.9
31	22.86 U	31	06	41.4	6	57.0	23	L	23	13	29.7	26	31.0
31	L	31	19	05.4	-3	30.3	24	17.47 U	24	01	59.1	24	59.0
June 1	23.86 U	1	07	29.3	+0	00.2	24	L	24	14	27.9	23	02.2
1	L	1	19	53.4	3	30.5	25	18.47 U	25	02	55.8	20	43.0
2	24.86 U	2	08	17.6	+6	58.8	25	L	25	15	22.8	-18	04.5
2	L	2	20	42.3	10	21.8	26	19.47 U	26	03	49.0	15	09.9
3	25.86 U	3	09	07.5	13	36.4	26	L	26	16	14.4	12	02.4
3	L	3	21	33.5	16	39.4	27	20.47 U	27	04	39.1	8	45.1
4	26.86 U	4	10	00.2	19	27.4	27	L	27	17	03.4	5	21.0
4	L	4	22	27.8	21	57.3	28	21.47 U	28	05	27.3	-1	53.0
5	27.86 U	5	10	56.2	+24	05.8	28	L	28	17	51.1	+1	36.1
5	L	5	23	25.3	25	50.4	29	22.47 U	29	06	14.9	5	03.5
6	28.86 U	6	11	54.9	27	08.7	29	L	29	18	38.9	8	26.6
7	0.47 L	7	00	24.9	27	59.3	30	23.47 U	30	07	03.3	11	42.7
7	U	7	12	54.8	28	21.5	30	L	30	19	28.3	14	48.9
8	1.47 L	8	01	24.4	28	15.9	July 1	24.47 U	1	07	53.9	17	42.5
8	U	8	13	53.4	+27	43.6	1	L	1	20	20.2	+20	20.5
9	2.47 L	9	02	21.5	26	46.7	2	25.47 U	2	08	47.4	22	40.2
9	U	9	14	48.7	25	27.6	2	L	2	21	15.3	24	38.9
10	3.47 L	10	03	14.6	+23	49.0	3	26.47 U	3	09	43.9	+26	14.0

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
July	1	24.47	U	1	07	53.9	+17	42.5
	1		L	1	20	20.2	20	20.5
	2	25.47	U	2	08	47.4	22	40.2
	2		L	2	21	15.3	24	38.9
	3	26.47	U	3	09	43.9	26	14.0
	3		L	3	22	13.1	27	23.7
	4	27.47	U	4	10	42.5	+28	06.5
	4		L	4	23	12.0	28	22.0
	5	28.47	U	5	11	41.2	28	10.4
	6	0.04	L	6	00	09.8	27	32.9
	6		U	6	12	37.7	26	31.2
	7	1.04	L	7	01	04.6	25	07.7
	7		U	7	13	30.4	+23	25.1
	8	2.04	L	8	01	55.2	21	25.8
	8		U	8	14	18.9	19	12.7
	9	3.04	L	9	02	41.5	16	48.2
	9		U	9	15	03.3	14	14.5
	10	4.04	L	10	03	24.4	11	33.7
	10		U	10	15	44.8	+8	47.5
	11	5.04	L	11	04	04.7	5	57.5
	11		U	11	16	24.3	3	05.0
	12	6.04	L	12	04	43.7	+0	11.5
	12		U	12	17	03.1	-2	42.0
	13	7.04	L	13	05	22.6	5	34.2
	13		U	13	17	42.4	-8	24.0
	14	8.04	L	14	06	02.5	11	10.0
	14		U	14	18	23.3	13	50.9
	15	9.04	L	15	06	44.8	16	25.0
	15		U	15	19	07.2	18	50.5
	16	10.04	L	16	07	30.6	21	05.4
	16		U	16	19	55.0	-23	07.2
	17	11.04	L	17	08	20.7	24	53.3
	17		U	17	20	47.5	26	21.0
	18	12.04	L	18	09	15.6	27	27.2
	18		U	18	21	44.5	28	09.4
	19	13.04	L	19	10	14.3	28	24.9
	19		U	19	22	44.7	-28	12.2
	20	14.04	L	20	11	15.2	27	30.3
	20		U	20	23	45.5	26	19.2
	21	15.04	L	21	12	15.4	24	40.3
	22	16.04	U	22	00	44.7	22	35.4
	22		L	22	13	13.1	20	07.5
	23	17.04	U	23	01	40.7	-17	19.7
	23		L	23	14	07.4	14	15.5
	24	18.04	U	24	02	33.4	10	58.6
	24		L	24	14	58.7	-7	32.6
July	24	18.04	L	24	14	58.7	-7	32.6
	25	19.04	U	25	03	23.4	4	00.9
	25		L	25	15	47.9	-0	26.9
	26	20.04	U	26	04	12.1	+3	06.5
	26		L	26	16	36.4	6	36.0
	27	21.04	U	27	05	00.8	9	59.0
	27		L	27	17	25.6	+13	12.6
	28	22.04	U	28	05	50.9	16	14.2
	28		L	28	18	16.7	19	01.0
	29	23.04	U	29	06	43.2	21	30.4
	29		L	29	19	10.5	23	40.1
	30	24.04	U	30	07	38.3	25	27.8
	30		L	30	20	06.7	+26	51.4
	31	25.04	U	31	08	35.5	27	49.7
	31		L	31	21	04.5	28	21.6
Aug.	1	26.04	U	1	09	33.4	28	27.0
	1		L	1	22	01.9	28	06.4
	2	27.04	U	2	10	29.9	27	21.1
	2		L	2	22	57.1	+26	12.8
	3	28.04	U	3	11	23.5	24	43.7
	3		L	3	23	48.7	22	56.2
	4	29.04	U	4	12	13.0	20	52.9
	5	0.53	L	5	00	36.3	18	36.2
	5		U	5	12	58.7	16	08.5
	6	1.53	L	6	01	20.3	+13	32.0
	6		U	6	13	41.2	10	48.6
	7	2.53	L	7	02	01.5	8	00.2
	7		U	7	14	21.3	5	08.4
	8	3.53	L	8	02	40.8	+2	14.6
	8		U	8	15	00.2	-0	39.8
	9	4.53	L	9	03	19.6	-3	33.4
	9		U	9	15	39.0	6	25.2
	10	5.53	L	10	03	58.8	9	13.7
	10		U	10	16	18.9	11	57.7
	11	6.53	L	11	04	39.6	14	35.8
	11		U	11	17	01.0	17	06.5
	12	7.53	L	12	05	23.2	-19	28.0
	12		U	12	17	46.3	21	38.4
	13	8.53	L	13	06	10.5	23	35.5
	13		U	13	18	35.8	25	16.9
	14	9.53	L	14	07	02.3	26	40.0
	14		U	14	19	29.8	27	42.2
	15	10.53	L	15	07	58.3	-28	20.8
	15		U	15	20	27.6	28	33.5
	16	11.53	L	16	08	57.5	28	18.6
	16		U	16	21	27.7	-27	35.0

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Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Aug.	16	11.53	U	16	21	27.7	-27	35.0
	17	12.53	L	17	09	57.9	26	22.4
	17		U	17	22	27.8	24	41.6
	18	13.53	L	18	10	57.2	22	34.4
	18		U	18	23	25.9	20	02.9
	19	14.53	L	19	11	53.8	17	10.5
	20	15.53	U	20	00	21.0	-14	00.4
	20		L	20	12	47.5	10	36.7
	21	16.53	U	21	01	13.5	7	02.9
	21		L	21	13	39.0	-3	23.0
	22	17.53	U	22	02	04.2	+0	19.2
	22		L	22	14	29.3	4	00.0
	23	18.53	U	23	02	54.4	+7	36.1
	23		L	23	15	19.8	11	03.9
	24	19.53	U	24	03	45.5	14	20.3
	24		L	24	16	11.7	17	22.4
	25	20.53	U	25	04	38.4	20	07.3
	25		L	25	17	05.7	22	32.5
	26	21.53	U	26	05	33.6	+24	35.5
	26		L	26	18	02.0	26	14.6
	27	22.53	U	27	06	30.7	27	28.2
	27		L	27	18	59.7	28	15.5
	28	23.53	U	28	07	28.6	28	36.0
	28		L	28	19	57.2	28	30.3
	29	24.53	U	29	08	25.4	+27	59.4
	29		L	29	20	52.8	27	04.8
	30	25.53	U	30	09	19.4	25	48.5
	30		L	30	21	45.0	24	12.6
	31	26.53	U	31	10	09.6	22	19.7
	31		L	31	22	33.3	20	11.9
Sept.	1	27.53	U	1	10	56.1	+17	51.7
	1		L	1	23	18.0	15	21.2
	2	28.53	U	2	11	39.1	12	42.4
	2		L	2	23	59.7	9	57.1
	3	29.53	U	3	12	19.8	7	07.1
	4	0.92	L	4	00	39.4	4	14.0
	4		U	4	12	58.9	+1	19.2
	5	1.92	L	5	01	18.2	-1	35.8
	5		U	5	13	37.6	4	29.7
	6	2.92	L	6	01	57.1	7	21.1
	6		U	6	14	16.9	10	08.7
	7	3.92	L	7	02	37.1	12	51.1
	7		U	7	14	57.8	-15	26.8
	8	4.92	L	8	03	19.2	17	54.3
	8		U	8	15	41.4	20	11.8
	9	5.92	L	9	04	04.5	-22	17.3

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Sept.	9	5.92	L	9	04	04.5	-22	17.3
	9		U	9	16	28.5	24	09.0
	10	6.92	L	10	04	53.5	25	44.6
	10		U	10	17	19.6	27	01.8
	11	7.92	L	11	05	46.6	27	58.3
	11		U	11	18	14.4	28	31.9
	12	8.92	L	12	06	43.0	-28	40.7
	12		U	12	19	12.0	28	23.1
	13	9.92	L	13	07	41.4	27	38.2
	13		U	13	20	10.7	26	25.7
	14	10.92	L	14	08	39.8	24	46.1
	14		U	14	21	08.6	22	40.7
	15	11.92	L	15	09	36.8	-20	11.5
	15		U	15	22	04.4	17	20.8
	16	12.92	L	16	10	31.5	14	11.7
	16		U	16	22	58.1	10	47.4
	17	13.92	L	17	11	24.2	7	11.7
	17		U	17	23	50.0	-3	28.3
	18	14.92	L	18	12	15.7	+0	18.8
	19	15.92	U	19	00	41.5	4	05.8
	19		L	19	13	07.4	7	48.5
	20	16.92	U	20	01	33.6	11	23.0
	20		L	20	14	00.3	14	45.6
	21	17.92	U	21	02	27.6	17	52.6
	21		L	21	14	55.5	+20	40.6
	22	18.92	U	22	03	24.0	23	06.8
	22		L	22	15	53.0	25	08.4
	23	19.92	U	23	04	22.5	26	43.7
	23		L	23	16	52.2	27	51.3
	24	20.92	U	24	05	21.9	28	30.7
	24		L	24	17	51.3	+28	42.2
	25	21.92	U	25	06	20.2	28	26.9
	25		L	25	18	48.4	27	46.3
	26	22.92	U	26	07	15.7	26	42.6
	26		L	26	19	41.9	25	18.0
	27	23.92	U	27	08	07.2	23	35.0
	27		L	27	20	31.4	+21	36.2
	28	24.92	U	28	08	54.6	19	23.8
	28		L	28	21	16.8	16	59.9
	29	25.92	U	29	09	38.3	14	26.7
	29		L	29	21	59.1	11	46.0
	30	26.92	U	30	10	19.3	8	59.4
	30		L	30	22	39.2	+6	08.6
Oct.	1	27.92	U	1	10	58.7	3	14.9
	1		L	1	23	18.0	+0	20.0
	2	28.92	U	2	11	37.3	-2	35.0

MOON, 2024
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Oct.	1	27.92	U	1	10	58.7	+3	14.9
	1		L	1	23	18.0	+0	20.0
	2	28.92	U	2	11	37.3	-2	35.0
	2		L	2	23	56.7	5	28.5
	3	0.22	U	3	12	16.3	8	19.2
	4	1.22	L	4	00	36.3	11	05.7
	4		U	4	12	56.7	-13	46.5
	5	2.22	L	5	01	17.7	16	19.9
	5		U	5	13	39.4	18	44.2
	6	3.22	L	6	02	01.8	20	57.7
	6		U	6	14	25.1	22	58.3
	7	4.22	L	7	02	49.3	24	44.1
	7		U	7	15	14.4	-26	13.0
	8	5.22	L	8	03	40.4	27	22.8
	8		U	8	16	07.2	28	11.6
	9	6.22	L	9	04	34.6	28	37.7
	9		U	9	17	02.6	28	39.4
	10	7.22	L	10	05	30.9	28	16.0
	10		U	10	17	59.3	-27	26.8
	11	8.22	L	11	06	27.5	26	11.9
	11		U	11	18	55.6	24	32.1
	12	9.22	L	12	07	23.2	22	28.4
	12		U	12	19	50.3	20	02.6
	13	10.22	L	13	08	17.0	17	16.7
	13		U	13	20	43.2	-14	13.1
	14	11.22	L	14	09	09.0	10	54.5
	14		U	14	21	34.5	7	23.9
	15	12.22	L	15	09	59.9	-3	44.5
	15		U	15	22	25.3	+0	00.1
	16	13.22	L	16	10	51.0	3	46.3
	16		U	16	23	16.9	+7	30.0
	17	14.22	L	17	11	43.4	11	07.3
	18	15.22	U	18	00	10.6	14	33.9
	18		L	18	12	38.5	17	45.5
	19	16.22	U	19	01	07.1	20	38.3
	19		L	19	13	36.6	23	08.5
	20	17.22	U	20	02	06.7	+25	13.0
	20		L	20	14	37.3	26	49.3
	21	18.22	U	21	03	08.2	27	55.9
	21		L	21	15	38.9	28	32.2
	22	19.22	U	22	04	09.4	28	38.8
	22		L	22	16	39.0	28	17.2
	23	20.22	U	23	05	07.9	+27	29.3
	23		L	23	17	35.5	26	18.0
	24	21.22	U	24	06	02.1	24	46.0
	24		L	24	18	27.4	+22	56.3

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Oct.	24	21.22	L	24	18	27.4	+22	56.3
	25	22.22	U	25	06	51.5	20	51.4
	25		L	25	19	14.6	18	33.9
	26	23.22	U	26	07	36.7	16	06.1
	26		L	26	19	58.0	13	29.9
	27	24.22	U	27	08	18.6	10	47.2
	27		L	27	20	38.7	+7	59.4
	28	25.22	U	28	08	58.3	5	08.1
	28		L	28	21	17.7	+2	14.5
	29	26.22	U	29	09	37.0	-0	39.9
	29		L	29	21	56.3	3	34.0
	30	27.22	U	30	10	15.8	6	26.3
	30		L	30	22	35.6	-9	15.6
	31	28.22	U	31	10	55.7	12	00.3
	31		L	31	23	16.4	14	38.9
Nov.	1	29.22	U	1	11	37.8	17	09.6
	1		L	1	23	59.9	19	30.7
	2	0.47	U	2	12	22.8	21	40.0
	3	1.47	L	3	00	46.6	-23	35.7
	3		U	3	13	11.3	25	15.4
	4	2.47	L	4	01	36.9	26	37.2
	4		U	4	14	03.2	27	38.8
	5	3.47	L	5	02	30.3	28	18.6
	5		U	5	14	57.8	28	34.9
	6	4.47	L	6	03	25.7	-28	27.0
	6		U	6	15	53.7	27	54.1
	7	5.47	L	7	04	21.5	26	56.4
	7		U	7	16	49.1	25	34.6
	8	6.47	L	8	05	16.2	23	49.8
	8		U	8	17	42.9	21	43.4
	9	7.47	L	9	06	08.9	-19	17.2
	9		U	9	18	34.5	16	33.3
	10	8.47	L	10	06	59.5	13	33.9
	10		U	10	19	24.3	10	21.3
	11	9.47	L	11	07	48.8	6	58.0
	11		U	11	20	13.2	-3	26.7
	12	10.47	L	12	08	37.7	+0	09.7
	12		U	12	21	02.5	3	48.2
	13	11.47	L	13	09	27.8	7	25.3
	13		U	13	21	53.7	10	57.5
	14	12.47	L	14	10	20.4	14	20.7
	14		U	14	22	48.0	17	30.9
	15	13.47	L	15	11	16.6	+20	23.8
	15		U	15	23	46.1	22	55.5
	16	14.47	L	16	12	16.6	25	02.0
	17	15.47	U	17	00	47.7	+26	40.4

MOON, 2024
AT EPHEMERIS TRANSIT

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Nov.	17	15.47	U	17	00	47.7	+26	40.4
	17		L	17	13	19.3	27	48.4
	18	16.47	U	18	01	50.9	28	25.1
	18		L	18	14	22.1	28	30.6
	19	17.47	U	19	02	52.8	28	06.2
	19		L	19	15	22.4	27	14.4
	20	18.47	U	20	03	50.9	+25	58.0
	20		L	20	16	18.0	24	20.4
	21	19.47	U	21	04	43.8	22	24.6
	21		L	21	17	08.3	20	14.0
	22	20.47	U	22	05	31.7	17	51.3
	22		L	22	17	54.0	15	18.8
	23	21.47	U	23	06	15.4	+12	38.9
	23		L	23	18	36.1	9	53.3
	24	22.47	U	24	06	56.2	7	03.6
	24		L	24	19	15.9	4	11.2
	25	23.47	U	25	07	35.3	+1	17.4
	25		L	25	19	54.6	-1	36.5
	26	24.47	U	26	08	14.0	-4	29.4
	26		L	26	20	33.5	7	20.1
	27	25.47	U	27	08	53.4	10	07.3
	27		L	27	21	13.8	12	49.5
	28	26.47	U	28	09	34.7	15	25.3
	28		L	28	21	56.4	17	52.8
	29	27.47	U	29	10	18.8	-20	10.3
	29		L	29	22	42.2	22	15.6
	30	28.47	U	30	11	06.5	24	06.4
	30		L	30	23	31.8	25	40.5
Dec.	1	29.47	U	1	11	57.9	26	55.6
	2	0.74	L	2	00	24.9	27	49.5
	2		U	2	12	52.5	-28	20.5
	3	1.74	L	3	01	20.6	28	27.1
	3		U	3	13	48.9	28	08.4
	4	2.74	L	4	02	17.1	27	24.5
	4		U	4	14	45.0	26	15.9
	5	3.74	L	5	03	12.5	24	43.6
	5		U	5	15	39.4	-22	49.3
	6	4.74	L	6	04	05.6	20	34.9
	6		U	6	16	31.2	18	02.7
	7	5.74	L	7	04	56.1	15	15.0
	7		U	7	17	20.5	12	14.1
	8	6.47	L	8	05	44.5	9	02.5
	8		U	8	18	08.2	-5	42.5
	9	7.47	L	9	06	31.9	-2	16.7
	9		U	9	18	55.6	+1	12.6
	10	8.47	L	10	07	19.5	+4	42.4

Date		Age (at 0^h)		Ephemeris Transit			Geocentric Declination	
		d		d	h	m	°	'
Dec.	10	8.47	L	10	07	19.5	+4	42.4
	10		U	10	19	43.9	8	10.1
	11	9.47	L	11	08	09.0	11	32.6
	11		U	11	20	34.8	14	46.4
	12	10.47	L	12	09	01.6	17	48.0
	12		U	12	21	29.4	20	33.7
	13	11.47	L	13	09	58.3	+22	59.5
	13		U	13	22	28.2	25	02.0
	14	12.47	L	14	10	58.9	26	37.7
	14		U	14	23	30.2	27	44.3
	15	13.47	L	15	12	01.8	28	19.9
	16	14.47	U	16	00	33.3	28	24.5
	16		L	16	13	04.1	+27	58.9
	17	15.47	U	17	01	34.2	27	05.1
	17		L	17	14	03.1	25	45.9
	18	16.47	U	18	02	30.7	24	04.6
	18		L	18	14	57.0	22	04.6
	19	17.47	U	19	03	22.1	19	49.2
	19		L	19	15	45.8	+17	21.6
	20	18.47	U	20	04	08.5	14	44.5
	20		L	20	16	30.3	12	00.2
	21	19.47	U	21	04	51.2	9	10.8
	21		L	21	17	11.6	6	18.0
	22	20.47	U	22	05	31.4	3	23.4
	22		L	22	17	51.0	+0	28.3
	23	21.47	U	23	06	10.4	-2	26.2
	23		L	23	18	29.9	5	18.8
	24	22.47	U	24	06	49.5	8	08.3
	24		L	24	19	09.5	10	53.7
	25	23.47	U	25	07	29.9	13	33.5
	25		L	25	19	51.0	-16	06.3
	26	24.47	U	26	08	12.7	18	30.5
	26		L	26	20	35.4	20	44.2
	27	25.47	U	27	08	58.9	22	45.4
	27		L	27	21	23.5	24	31.9
	28	26.47	U	28	09	49.0	26	01.2
	28		L	28	22	15.6	-27	11.1
	29	27.70	U	29	10	42.9	27	59.1
	29		L	29	23	11.1	28	23.5
	30	28.47	U	30	11	39.6	28	22.6
	31	0.06	L	31	00	08.4	27	55.6
	31		U	31	12	37.1	27	02.4
	32	1.06	L	32	01	05.5	-25	43.7
	32		U	1	13	33.4	24	01.0
	33	2.06	L	2	02	00.6	21	56.0
	33		U	2	14	27.1	-19	31.2

MOON, 2024
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Jan.	0	+1.309	-5.517	133.72	-1.53	19	106	0.853
	1	+0.041	4.661	145.86	1.54	21	109	0.780
	2	-1.326	3.609	158.00	1.54	22	112	0.698
	3	2.717	2.402	170.15	1.54	22	113	0.609
	4	4.041	-1.084	182.30	1.55	21	113	0.515
	5	5.202	+0.302	194.47	1.55	20	112	0.419
	6	-6.102	+1.702	206.63	-1.55	18	109	0.324
	7	6.650	3.056	218.81	1.54	15	105	0.234
	8	6.771	4.295	230.98	1.54	11	99	0.151
	9	6.421	5.337	243.17	1.54	6	90	0.083
	10	5.602	6.097	255.35	1.54	360	78	0.032
	11	4.367	6.498	267.54	1.54	354	48	0.005
	12	-2.823	+6.484	279.73	-1.53	348	294	0.005
	13	-1.118	6.034	291.92	1.53	344	265	0.034
	14	+0.592	5.176	304.11	1.52	340	255	0.090
	15	2.164	3.977	316.29	1.52	339	250	0.168
	16	3.495	2.535	328.47	1.52	338	248	0.265
	17	4.530	+0.959	340.64	1.52	339	247	0.372
	18	+5.257	-0.643	352.80	-1.51	340	249	0.483
	19	5.694	2.174	4.96	1.51	343	252	0.593
	20	5.871	3.555	17.11	1.51	346	256	0.696
	21	5.826	4.721	29.25	1.51	351	262	0.787
	22	5.587	5.623	41.39	1.51	356	269	0.865
	23	5.174	6.229	53.53	1.51	1	278	0.926
	24	+4.594	-6.523	65.66	-1.51	6	290	0.969
	25	3.850	6.502	77.79	1.50	11	312	0.993
	26	2.942	6.180	89.92	1.50	15	47	0.998
	27	1.875	5.582	102.05	1.49	18	92	0.984
	28	+0.662	4.742	114.19	1.48	20	104	0.953
	29	-0.666	3.701	126.32	1.47	22	109	0.906
	30	-2.067	-2.504	138.46	-1.46	22	112	0.845
	31	3.478	-1.197	150.61	1.45	22	113	0.772
Feb.	1	4.825	+0.172	162.76	1.44	21	112	0.688
	2	6.022	1.552	174.91	1.43	19	111	0.596
	3	6.973	2.889	187.07	1.41	16	108	0.499
	4	7.584	4.123	199.24	1.40	12	103	0.398
	5	-7.769	+5.187	211.41	-1.38	8	97	0.299
	6	7.467	6.006	223.59	1.37	2	90	0.206
	7	6.653	6.504	235.78	1.35	357	81	0.123
	8	5.354	6.611	247.97	1.34	351	71	0.058
	9	3.660	6.285	260.16	1.32	346	56	0.016
	10	-1.714	5.519	272.36	1.31	342	333	0.001
	11	+0.310	+4.359	284.56	-1.29	339	260	0.017
	12	2.236	2.897	296.75	1.27	338	251	0.063
	13	3.918	+1.256	308.95	1.25	338	248	0.133
	14	5.259	-0.435	321.13	1.23	339	248	0.223
	15	+6.213	-2.056	333.31	-1.22	342	250	0.326

MOON, 2024
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Feb.	15	+6.213	-2.056	333.31	-1.22	342	250	0.326
	16	6.778	3.512	345.49	1.20	345	253	0.434
	17	6.981	4.734	357.66	1.19	349	259	0.541
	18	6.861	5.676	9.82	1.17	354	265	0.644
	19	6.467	6.312	21.98	1.15	360	272	0.738
	20	5.842	6.632	34.13	1.14	5	279	0.820
	21	+5.024	-6.637	46.28	-1.12	10	286	0.889
	22	4.044	6.339	58.43	1.10	14	294	0.942
	23	2.927	5.761	70.57	1.08	17	303	0.978
	24	1.698	4.934	82.71	1.06	20	324	0.996
	25	+0.380	3.896	94.85	1.04	21	83	0.997
	26	-0.998	2.693	107.00	1.02	22	106	0.980
	27	-2.398	-1.372	119.14	-1.00	22	111	0.947
	28	3.775	+0.013	131.29	0.98	21	113	0.897
	29	5.072	1.409	143.44	0.95	19	112	0.832
Mar.	1	6.221	2.762	155.60	0.93	17	110	0.754
	2	7.149	4.013	167.76	0.91	14	106	0.665
	3	7.776	5.102	179.93	0.88	10	101	0.567
	4	-8.029	+5.967	192.11	-0.86	4	95	0.464
	5	7.845	6.543	204.29	0.84	359	88	0.359
	6	7.187	6.767	216.48	0.81	353	80	0.256
	7	6.058	6.589	228.68	0.79	348	73	0.163
	8	4.509	5.979	240.88	0.76	343	66	0.085
	9	2.644	4.950	253.08	0.74	340	59	0.030
	10	-0.608	+3.559	265.29	-0.71	338	40	0.003
	11	+1.434	1.912	277.50	0.69	338	256	0.006
	12	3.321	+0.145	289.71	0.66	339	247	0.040
	13	4.920	-1.601	301.92	0.63	341	248	0.100
	14	6.144	3.200	314.12	0.60	344	250	0.181
	15	6.947	4.558	326.32	0.58	348	255	0.276
	16	+7.324	-5.615	338.51	-0.55	353	261	0.379
	17	7.300	6.340	350.70	0.53	358	267	0.483
	18	6.920	6.727	2.88	0.50	4	274	0.585
	19	6.236	6.785	15.06	0.47	9	281	0.681
	20	5.307	6.530	27.23	0.45	13	287	0.768
	21	4.189	5.989	39.40	0.42	17	292	0.843
	22	+2.936	-5.193	51.56	-0.39	19	296	0.906
	23	1.595	4.178	63.72	0.37	21	299	0.953
	24	+0.212	2.986	75.88	0.34	22	302	0.985
	25	-1.173	1.664	88.04	0.31	22	315	0.999
	26	2.520	-0.264	100.20	0.28	21	111	0.996
	27	3.788	+1.158	112.36	0.25	20	114	0.974
	28	-4.936	+2.543	124.52	-0.23	18	113	0.934
	29	5.920	3.831	136.69	0.20	15	109	0.878
	30	6.691	4.961	148.86	0.17	11	105	0.805
	31	7.202	5.873	161.03	0.14	6	99	0.719
Apr.	1	-7.406	+6.511	173.21	-0.12	1	92	0.622

MOON, 2024
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT	The Earth's Selenographic		The Sun's Selenographic		Position Angle of		Fraction Illuminated
	Long.	Lat.	Colong.	Lat.	Axis	Bright Limb	
	°	°	°	°	°	°	
Apr. 1	-7.406	+6.511	173.21	-0.12	1	92	0.622
2	7.262	6.822	185.40	0.09	355	85	0.516
3	6.744	6.761	197.59	0.07	350	78	0.406
4	5.845	6.302	209.80	0.04	345	72	0.298
5	4.590	5.440	222.00	-0.02	341	67	0.198
6	3.036	4.205	234.22	+0.01	339	64	0.111
7	-1.273	+2.667	246.44	+0.04	338	62	0.047
8	+0.578	+0.934	258.66	0.07	338	63	0.009
9	2.384	-0.857	270.89	0.10	340	237	0.001
10	4.014	2.569	283.11	0.13	342	244	0.023
11	5.352	4.077	295.34	0.15	346	250	0.071
12	6.318	5.292	307.56	0.18	351	256	0.141
13	+6.864	-6.162	319.78	+0.21	356	262	0.226
14	6.983	6.668	331.99	0.24	2	270	0.322
15	6.697	6.820	344.20	0.27	7	276	0.421
16	6.054	6.639	356.40	0.30	12	282	0.521
17	5.116	6.159	8.60	0.33	16	287	0.618
18	3.956	5.414	20.79	0.36	19	291	0.708
19	+2.646	-4.445	32.97	+0.39	20	294	0.790
20	+1.259	3.290	45.16	0.41	22	296	0.861
21	-0.138	1.996	57.34	0.44	22	296	0.920
22	1.484	-0.610	69.51	0.47	22	294	0.964
23	2.729	+0.814	81.69	0.50	20	289	0.991
24	3.827	2.217	93.86	0.53	18	197	1.000
25	-4.744	+3.537	106.03	+0.55	15	120	0.990
26	5.453	4.710	118.21	0.58	12	111	0.960
27	5.935	5.672	130.39	0.60	7	104	0.911
28	6.176	6.364	142.57	0.62	2	97	0.843
29	6.168	6.737	154.76	0.64	356	90	0.759
30	5.906	6.755	166.95	0.66	351	82	0.662
May 1	-5.389	+6.394	179.15	+0.68	346	76	0.555
2	4.623	5.655	191.36	0.70	342	71	0.442
3	3.624	4.563	203.57	0.72	340	67	0.330
4	2.417	3.168	215.79	0.75	338	65	0.226
5	-1.047	+1.554	228.02	0.77	338	65	0.135
6	+0.422	-0.172	240.25	0.79	339	68	0.064
7	+1.904	-1.885	252.49	+0.81	341	75	0.019
8	3.299	3.460	264.73	0.84	344	127	0.001
9	4.505	4.790	276.97	0.86	349	240	0.011
10	5.427	5.796	289.21	0.89	354	254	0.047
11	5.993	6.438	301.45	0.91	360	263	0.105
12	6.164	6.708	313.68	0.94	5	271	0.179
13	+5.935	-6.623	325.91	+0.96	10	278	0.265
14	5.336	6.219	338.13	0.99	14	284	0.358
15	4.422	5.536	350.35	1.01	18	288	0.454
16	3.263	4.619	2.57	1.04	20	291	0.550
17	+1.945	-3.513	14.77	+1.06	21	293	0.643

MOON, 2024
EPHEMERIS FOR PHYSICAL OBSERVATIONS
FOR 0^h TERRESTRIAL TIME

Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
May	17	+1.945	-3.513	14.77	+1.06	21	293	0.643
	18	+0.553	2.263	26.98	1.08	22	294	0.731
	19	-0.827	-0.915	39.18	1.11	22	294	0.810
	20	2.115	+0.483	51.37	1.13	21	292	0.879
	21	3.241	1.875	63.56	1.15	19	288	0.934
	22	4.151	3.204	75.75	1.17	16	281	0.974
	23	-4.806	+4.403	87.93	+1.19	13	258	0.996
	24	5.188	5.406	100.12	1.20	8	139	0.997
	25	5.297	6.149	112.30	1.22	3	109	0.976
	26	5.155	6.576	124.49	1.23	358	97	0.934
	27	4.792	6.648	136.68	1.24	352	88	0.871
	28	4.246	6.345	148.88	1.25	347	80	0.789
	29	-3.556	+5.670	161.08	+1.26	343	74	0.691
	30	2.750	4.654	173.29	1.27	340	70	0.583
	31	1.852	3.350	185.50	1.28	339	67	0.469
June	1	-0.876	1.834	197.73	1.29	338	66	0.356
	2	+0.159	+0.198	209.95	1.30	339	67	0.249
	3	1.231	-1.451	222.19	1.31	340	70	0.156
	4	+2.299	-3.005	234.43	+1.32	343	75	0.082
	5	3.307	4.362	246.68	1.34	347	85	0.031
	6	4.184	5.436	258.93	1.35	352	112	0.005
	7	4.851	6.170	271.18	1.37	357	229	0.005
	8	5.239	6.539	283.42	1.38	3	258	0.028
	9	5.299	6.545	295.67	1.40	8	270	0.073
	10	+5.008	-6.214	307.92	+1.41	13	278	0.135
	11	4.378	5.589	320.16	1.43	17	284	0.210
	12	3.446	4.717	332.39	1.44	19	289	0.295
	13	2.277	3.650	344.63	1.46	21	292	0.386
	14	+0.951	2.435	356.85	1.47	22	293	0.480
	15	-0.442	-1.121	9.07	1.48	22	294	0.575
	16	-1.806	+0.245	21.28	+1.50	21	293	0.667
	17	3.050	1.614	33.49	1.51	20	291	0.754
	18	4.087	2.930	45.70	1.52	17	287	0.832
	19	4.846	4.136	57.90	1.53	14	281	0.899
	20	5.278	5.167	70.09	1.54	10	273	0.952
	21	5.361	5.956	82.28	1.54	5	257	0.986
	22	-5.105	+6.440	94.47	+1.55	359	187	0.998
	23	4.549	6.569	106.66	1.55	354	106	0.987
	24	3.762	6.315	118.86	1.54	348	88	0.951
	25	2.822	5.677	131.05	1.54	344	79	0.892
	26	1.808	4.688	143.25	1.53	341	73	0.812
	27	-0.785	3.407	155.45	1.53	339	69	0.714
	28	+0.203	+1.917	167.66	+1.52	338	67	0.605
	29	1.134	+0.314	179.88	1.52	338	67	0.491
	30	1.998	-1.299	192.11	1.51	340	68	0.378
July	1	2.791	2.823	204.34	1.51	342	72	0.272
	2	+3.505	-4.167	216.58	+1.51	346	77	0.178

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Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
July	1	+2.791	-2.823	204.34	+1.51	342	72	0.272
	2	3.505	4.167	216.58	1.51	346	77	0.178
	3	4.117	5.254	228.82	1.51	350	85	0.102
	4	4.593	6.025	241.07	1.51	355	95	0.046
	5	4.889	6.449	253.32	1.51	1	113	0.012
	6	4.958	6.516	265.57	1.51	7	193	0.002
	7	+4.763	-6.243	277.82	+1.52	11	261	0.014
	8	4.284	5.664	290.08	1.52	15	277	0.046
	9	3.522	4.824	302.32	1.52	18	284	0.095
	10	2.504	3.776	314.57	1.53	20	289	0.159
	11	+1.282	2.574	326.81	1.53	22	292	0.235
	12	-0.076	-1.271	339.05	1.53	22	293	0.320
	13	-1.486	+0.084	351.28	+1.53	22	293	0.411
	14	2.856	1.441	3.50	1.53	20	292	0.506
	15	4.089	2.751	15.72	1.54	18	289	0.601
	16	5.091	3.961	27.93	1.53	16	286	0.694
	17	5.780	5.012	40.14	1.53	12	280	0.782
	18	6.090	5.843	52.34	1.53	7	273	0.861
	19	-5.985	+6.391	64.54	+1.52	2	264	0.925
	20	5.469	6.597	76.73	1.51	356	251	0.972
	21	4.585	6.418	88.92	1.50	350	220	0.996
	22	3.414	5.838	101.11	1.48	346	105	0.994
	23	2.066	4.878	113.29	1.46	342	80	0.965
	24	-0.657	3.594	125.49	1.44	339	72	0.910
	25	+0.711	+2.077	137.68	+1.42	338	68	0.832
	26	1.958	+0.437	149.88	1.40	338	67	0.736
	27	3.038	-1.214	162.09	1.38	339	68	0.628
	28	3.927	2.767	174.30	1.36	341	70	0.515
	29	4.623	4.133	186.52	1.35	345	74	0.403
	30	5.128	5.239	198.75	1.33	349	80	0.297
	31	+5.444	-6.034	210.98	+1.32	354	87	0.204
Aug.	1	5.568	6.489	223.22	1.30	359	95	0.125
	2	5.491	6.596	235.47	1.29	5	104	0.065
	3	5.201	6.364	247.71	1.28	10	116	0.024
	4	4.686	5.820	259.96	1.27	14	144	0.004
	5	3.945	5.006	272.21	1.26	18	256	0.004
	6	+2.985	-3.971	284.46	+1.25	20	281	0.023
	7	1.831	2.770	296.70	1.24	21	289	0.061
	8	+0.523	1.458	308.95	1.23	22	292	0.114
	9	-0.883	-0.090	321.18	1.23	22	293	0.181
	10	2.317	+1.281	333.42	1.22	21	293	0.259
	11	3.699	2.606	345.65	1.21	19	291	0.346
	12	-4.940	+3.833	357.87	+1.20	17	288	0.439
	13	5.950	4.912	10.08	1.19	13	284	0.537
	14	6.643	5.787	22.29	1.17	9	279	0.635
	15	6.946	6.402	34.50	1.16	4	272	0.731
	16	-6.808	+6.700	46.69	+1.14	358	264	0.820

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Date 0^h TT		The Earth's Selenographic Long.	The Earth's Selenographic Lat.	The Sun's Selenographic Colong.	The Sun's Selenographic Lat.	Position Angle of Axis	Position Angle of Bright Limb	Fraction Illuminated
		°	°	°	°	°	°	
Aug.	16	-6.808	+6.700	46.69	+1.14	358	264	0.820
	17	6.211	6.632	58.88	1.12	353	256	0.896
	18	5.183	6.163	71.07	1.10	347	247	0.955
	19	3.793	5.290	83.25	1.07	343	232	0.990
	20	2.154	4.051	95.43	1.04	340	113	0.998
	21	-0.399	2.524	107.61	1.01	339	73	0.977
	22	+1.336	+0.824	119.79	+0.98	338	68	0.928
	23	2.933	-0.918	131.98	0.95	339	67	0.854
	24	4.304	2.574	144.17	0.92	341	68	0.761
	25	5.393	4.034	156.37	0.88	344	71	0.656
	26	6.175	5.219	168.57	0.85	348	76	0.545
	27	6.648	6.076	180.78	0.83	353	83	0.435
	28	+6.822	-6.582	192.99	+0.80	358	90	0.331
	29	6.717	6.732	205.22	0.78	4	97	0.237
	30	6.354	6.541	217.44	0.75	9	104	0.155
	31	5.755	6.036	229.68	0.73	13	111	0.090
Sept.	1	4.943	5.253	241.91	0.71	17	117	0.042
	2	3.942	4.240	254.15	0.69	19	126	0.012
	3	+2.778	-3.047	266.39	+0.67	21	182	0.000
	4	1.483	1.730	278.62	0.65	22	286	0.008
	5	+0.094	-0.346	290.86	0.64	22	293	0.033
	6	-1.342	+1.051	303.09	0.62	21	294	0.075
	7	2.772	2.406	315.32	0.60	20	293	0.132
	8	4.132	3.666	327.55	0.59	17	291	0.203
	9	-5.353	+4.782	339.77	+0.57	14	287	0.285
	10	6.361	5.704	351.98	0.55	10	283	0.377
	11	7.080	6.382	4.19	0.53	6	277	0.475
	12	7.442	6.768	16.39	0.51	0	270	0.578
	13	7.388	6.815	28.58	0.49	355	263	0.680
	14	6.885	6.488	40.77	0.47	350	256	0.777
	15	-5.931	+5.766	52.95	+0.44	345	249	0.864
	16	4.566	4.658	65.12	0.41	341	244	0.934
	17	2.869	3.215	77.29	0.37	339	239	0.981
	18	-0.962	+1.527	89.46	0.34	338	210	1.000
	19	+1.014	-0.276	101.63	0.30	338	66	0.988
	20	2.913	-2.049	113.79	0.26	340	65	0.946
	21	+4.603	-3.656	125.96	+0.22	342	68	0.879
	22	5.982	4.988	138.14	0.18	346	72	0.792
	23	6.982	5.973	150.32	0.15	351	79	0.692
	24	7.577	6.581	162.51	0.11	357	85	0.585
	25	7.769	6.810	174.70	0.08	2	93	0.479
	26	7.584	6.680	186.90	0.05	8	99	0.376
	27	+7.068	-6.225	199.10	+0.02	12	105	0.281
	28	6.269	5.486	211.31	-0.01	16	110	0.196
	29	5.244	4.510	223.53	0.04	19	114	0.125
	30	4.045	3.346	235.75	0.06	21	116	0.069
Oct.	1	+2.724	-2.046	247.97	-0.08	22	118	0.028

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Date 0^h TT		The Earth's Selenographic		The Sun's Selenographic		Position Angle of		Fraction Illuminated
		Long.	Lat.	Colong.	Lat.	Axis	Bright Limb	
		°	°	°	°	°	°	
Oct.	1	+2.724	-2.046	247.97	-0.08	22	118	0.028
	2	+1.327	-0.665	260.19	0.11	22	117	0.006
	3	-0.101	+0.743	272.41	0.13	21	306	0.000
	4	1.517	2.121	284.63	0.15	20	299	0.013
	5	2.878	3.413	296.85	0.17	18	295	0.044
	6	4.142	4.568	309.07	0.19	15	291	0.091
	7	-5.261	+5.533	321.28	-0.20	12	287	0.154
	8	6.188	6.264	333.49	0.22	7	281	0.231
	9	6.872	6.715	345.69	0.24	2	274	0.320
	10	7.260	6.851	357.89	0.26	357	267	0.419
	11	7.306	6.641	10.08	0.28	351	261	0.524
	12	6.972	6.066	22.26	0.31	347	255	0.631
	13	-6.235	+5.124	34.43	-0.33	343	250	0.735
	14	5.099	3.843	46.60	0.36	340	246	0.830
	15	3.602	2.280	58.76	0.39	338	245	0.910
	16	-1.818	+0.533	70.91	0.43	338	246	0.967
	17	+0.140	-1.268	83.06	0.46	339	256	0.996
	18	2.130	-2.979	95.21	0.50	341	53	0.995
	19	+3.999	-4.464	107.36	-0.54	344	65	0.965
	20	5.605	5.618	119.52	0.57	349	72	0.907
	21	6.834	6.381	131.67	0.61	355	80	0.830
	22	7.618	6.737	143.83	0.64	0	87	0.738
	23	7.932	6.702	156.00	0.67	6	95	0.638
	24	7.796	6.318	168.17	0.70	11	101	0.536
	25	+7.257	-5.633	180.35	-0.73	15	107	0.435
	26	6.384	4.702	192.54	0.76	18	110	0.339
	27	5.255	3.578	204.73	0.79	20	113	0.251
	28	3.949	2.312	216.92	0.81	21	114	0.173
	29	2.542	-0.957	229.12	0.83	22	114	0.108
	30	+1.102	+0.434	241.33	0.86	22	113	0.057
	31	-0.311	+1.810	253.53	-0.87	21	108	0.021
Nov.	1	1.648	3.113	265.74	0.89	19	88	0.003
	2	2.870	4.291	277.95	0.91	16	320	0.003
	3	3.948	5.289	290.15	0.93	13	297	0.021
	4	4.857	6.058	302.35	0.94	8	288	0.058
	5	5.578	6.555	314.55	0.95	3	280	0.113
	6	-6.092	+6.744	326.75	-0.97	358	272	0.184
	7	6.379	6.601	338.94	0.98	353	265	0.270
	8	6.417	6.115	351.12	0.99	348	258	0.368
	9	6.180	5.290	3.30	1.01	344	253	0.474
	10	5.645	4.149	15.47	1.03	341	249	0.584
	11	4.795	2.736	27.63	1.04	339	247	0.693
	12	-3.632	+1.122	39.78	-1.07	338	246	0.795
	13	2.184	-0.592	51.92	1.09	338	247	0.882
	14	-0.514	2.288	64.07	1.11	340	252	0.948
	15	+1.273	3.833	76.20	1.14	343	265	0.988
	16	+3.045	-5.107	88.34	-1.17	347	6	0.999

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		Long.	Lat.	Colong.	Lat.	Axis	Bright Limb	
		°	°	°	°	°	°	
Nov.	16	+3.045	-5.107	88.34	-1.17	347	6	0.999
	17	4.650	6.020	100.47	1.19	352	65	0.981
	18	5.952	6.523	112.61	1.22	358	79	0.937
	19	6.844	6.612	124.75	1.24	4	88	0.873
	20	7.270	6.320	136.89	1.26	9	96	0.792
	21	7.223	5.698	149.04	1.29	14	103	0.701
	22	+6.738	-4.810	161.20	-1.31	17	107	0.605
	23	5.883	3.718	173.36	1.33	20	111	0.507
	24	4.743	2.481	185.52	1.34	21	113	0.411
	25	3.413	-1.154	197.70	1.36	22	114	0.320
	26	1.987	+0.213	209.88	1.38	22	113	0.236
	27	+0.553	1.568	222.06	1.39	21	111	0.161
	28	-0.811	+2.863	234.25	-1.40	19	108	0.098
	29	2.040	4.044	246.44	1.42	17	102	0.049
	30	3.089	5.058	258.63	1.42	14	90	0.017
Dec.	1	3.929	5.853	270.82	1.43	10	45	0.002
	2	4.548	6.382	283.02	1.44	5	305	0.007
	3	4.951	6.605	295.21	1.44	359	283	0.033
	4	-5.152	+6.496	307.40	-1.44	354	271	0.079
	5	5.166	6.047	319.59	1.45	349	263	0.144
	6	5.006	5.267	331.77	1.45	345	256	0.226
	7	4.678	4.186	343.94	1.45	341	252	0.323
	8	4.173	2.851	356.11	1.45	339	248	0.429
	9	3.482	+1.331	8.27	1.46	338	247	0.541
	10	-2.591	-0.289	20.42	-1.46	338	247	0.653
	11	1.501	1.909	32.56	1.47	339	249	0.758
	12	-0.237	3.422	44.70	1.48	341	253	0.850
	13	+1.145	4.720	56.84	1.49	345	260	0.923
	14	2.553	5.706	68.96	1.49	350	272	0.973
	15	3.872	6.316	81.09	1.50	355	309	0.996
	16	+4.978	-6.519	93.22	-1.51	1	60	0.993
	17	5.761	6.324	105.34	1.52	7	85	0.965
	18	6.147	5.772	117.47	1.53	12	96	0.915
	19	6.106	4.925	129.60	1.54	16	103	0.849
	20	5.650	3.851	141.74	1.54	19	108	0.770
	21	4.828	2.620	153.89	1.55	21	111	0.682
	22	+3.717	-1.294	166.03	-1.55	22	113	0.589
	23	2.408	+0.070	178.19	1.56	22	113	0.495
	24	+1.000	1.421	190.35	1.56	21	113	0.401
	25	-0.408	2.711	202.52	1.57	20	111	0.311
	26	1.725	3.893	214.69	1.57	18	107	0.228
	27	2.868	4.918	226.87	1.57	15	102	0.153
	28	-3.777	+5.737	239.05	-1.57	11	96	0.090
	29	4.409	6.300	251.24	1.56	6	86	0.042
	30	4.751	6.563	263.42	1.56	1	68	0.012
	31	4.812	6.493	275.61	1.55	355	346	0.002
	32	-4.628	+6.072	287.80	-1.54	350	279	0.015

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"	
Jan.	0	138	59	14.8	+7	00	19.1	0.337 2733
	1	144	13	20.0	6	58	20.2	0.342 4827
	2	149	17	44.3	6	53	07.0	0.347 9005
	3	154	12	31.8	6	45	00.1	0.353 4788
	4	158	57	52.8	6	34	20.0	0.359 1731
	5	163	34	02.5	6	21	26.0	0.364 9414
	6	168	01	20.4	+6	06	36.6	0.370 7452
	7	172	20	08.5	5	50	08.9	0.376 5492
	8	176	30	50.9	5	32	18.3	0.382 3212
	9	180	33	52.8	5	13	18.7	0.388 0321
	10	184	29	40.1	4	53	22.6	0.393 6556
	11	188	18	38.7	4	32	40.9	0.399 1681
	12	192	01	14.3	+4	11	23.4	0.404 5485
	13	195	37	52.1	3	49	38.3	0.409 7779
	14	199	08	56.6	3	27	33.1	0.414 8396
	15	202	34	51.4	3	05	14.2	0.419 7185
	16	205	55	59.3	2	42	46.9	0.424 4016
	17	209	12	42.2	2	20	16.1	0.428 8770
	18	212	25	20.8	+1	57	45.9	0.433 1344
	19	215	34	15.3	1	35	19.7	0.437 1647
	20	218	39	44.5	1	13	00.5	0.440 9598
	21	221	42	06.8	0	50	51.1	0.444 5126
	22	224	41	39.5	0	28	53.6	0.447 8168
	23	227	38	39.1	+0	07	10.0	0.450 8672
	24	230	33	21.7	-0	14	17.9	0.453 6589
	25	233	26	02.6	0	35	28.7	0.456 1878
	26	236	16	56.5	0	56	20.8	0.458 4504
	27	239	06	17.6	1	16	53.2	0.460 4437
	28	241	54	19.7	1	37	04.6	0.462 1650
	29	244	41	16.2	1	56	53.9	0.463 6123
	30	247	27	20.1	-2	16	20.2	0.464 7839
	31	250	12	44.1	2	35	22.4	0.465 6782
Feb.	1	252	57	41.0	2	53	59.4	0.466 2944
	2	255	42	23.0	3	12	10.2	0.466 6317
	3	258	27	02.3	3	29	53.7	0.466 6898
	4	261	11	51.3	3	47	08.7	0.466 4685
	5	263	57	02.1	-4	03	54.0	0.465 9681
	6	266	42	46.9	4	20	08.2	0.465 1892
	7	269	29	18.0	4	35	49.9	0.464 1327
	8	272	16	48.0	4	50	57.5	0.462 7998
	9	275	05	29.4	5	05	29.3	0.461 1920
	10	277	55	35.3	5	19	23.1	0.459 3114
	11	280	47	18.7	-5	32	37.1	0.457 1603
	12	283	40	53.3	5	45	08.7	0.454 7416
	13	286	36	32.9	5	56	55.5	0.452 0585
	14	289	34	31.9	6	07	54.5	0.449 1150
	15	292	35	05.1	-6	18	02.7	0.445 9155

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"	
Feb.	15	292	35	05.1	-6	18	02.7	0.445 9155
	16	295	38	28.0	6	27	16.5	0.442 4651
	17	298	44	56.6	6	35	32.1	0.438 7698
	18	301	54	47.4	6	42	45.3	0.434 8361
	19	305	08	17.8	6	48	51.5	0.430 6719
	20	308	25	45.5	6	53	45.8	0.426 2856
	21	311	47	29.4	-6	57	22.6	0.421 6872
	22	315	13	48.7	6	59	36.0	0.416 8879
	23	318	45	03.6	7	00	19.5	0.411 9002
	24	322	21	34.7	6	59	26.3	0.406 7382
	25	326	03	43.5	6	56	49.1	0.401 4181
	26	329	51	51.8	6	52	19.9	0.395 9578
	27	333	46	22.0	-6	45	50.7	0.390 3773
	28	337	47	36.6	6	37	13.0	0.384 6994
	29	341	55	58.0	6	26	18.2	0.378 9491
Mar.	1	346	11	48.4	6	12	57.7	0.373 1543
	2	350	35	29.3	5	57	03.4	0.367 3460
	3	355	07	20.9	5	38	27.4	0.361 5581
	4	359	47	41.5	-5	17	03.2	0.355 8279
	5	4	36	46.8	4	52	45.7	0.350 1958
	6	9	34	49.5	4	25	31.8	0.344 7054
	7	14	41	57.4	3	55	21.3	0.339 4033
	8	19	58	13.3	3	22	17.3	0.334 3384
	9	25	23	33.6	2	46	27.2	0.329 5617
	10	30	57	46.5	-2	08	03.4	0.325 1253
	11	36	40	32.2	1	27	23.6	0.321 0815
	12	42	31	20.7	-0	44	51.2	0.317 4814
	13	48	29	32.0	+0	00	55.6	0.314 3732
	14	54	34	15.2	0	43	48.5	0.311 8013
	15	60	44	29.0	1	28	42.0	0.309 8040
	16	66	59	02.4	+2	13	02.2	0.308 4123
	17	73	16	35.7	2	56	05.4	0.307 6483
	18	79	35	42.9	3	37	08.2	0.307 5245
	19	85	54	54.2	4	15	30.0	0.308 0429
	20	92	12	38.2	4	50	35.0	0.309 1951
	21	98	27	25.8	5	21	53.7	0.310 9625
	22	104	37	52.6	+5	49	03.8	0.313 3173
	23	110	42	41.2	6	11	51.1	0.316 2240
	24	116	40	44.2	6	30	09.4	0.319 6403
	25	122	31	04.4	6	43	59.7	0.323 5192
	26	128	12	56.5	6	53	29.1	0.327 8106
	27	133	45	46.6	6	58	50.0	0.332 4624
	28	139	09	12.0	+7	00	18.5	0.337 4225
	29	144	23	00.1	6	58	13.3	0.342 6392
	30	149	27	07.3	6	52	54.5	0.348 0627
	31	154	21	37.8	6	44	42.6	0.353 6456
Apr.	1	159	06	42.1	+6	33	57.9	0.359 3430

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Apr.	1	159	06	42.1	+6	33	57.9	0.359 3430	May	17	305	14	31.1	-6	49	01.8	0.430 5414
	2	163	42	35.7	6	21	00.1	0.365 1132		18	308	32	06.4	6	53	53.7	0.426 1484
	3	168	09	38.1	6	06	07.5	0.370 9179		19	311	53	58.3	6	57	28.0	0.421 5436
	4	172	28	11.3	5	49	36.9	0.376 7217		20	315	20	26.4	6	59	38.8	0.416 7381
	5	176	38	39.5	5	31	44.0	0.382 4926		21	318	51	50.5	7	00	19.4	0.411 7447
	6	180	41	28.0	5	12	42.4	0.388 2016		22	322	28	31.7	6	59	23.1	0.406 5775
	7	184	37	02.7	+4	52	44.7	0.393 8224		23	326	10	51.1	-6	56	42.5	0.401 2526
	8	188	25	49.3	4	32	01.7	0.399 3315		24	329	59	10.8	6	52	09.8	0.395 7881
	9	192	08	13.7	4	10	43.2	0.404 7079		25	333	53	53.1	6	45	36.8	0.390 2041
	10	195	44	41.1	3	48	57.3	0.409 9327		26	337	55	20.4	6	36	55.0	0.384 5234
	11	199	15	35.9	3	26	51.6	0.414 9894		27	342	03	55.2	6	25	55.8	0.378 7711
	12	202	41	21.6	3	04	32.3	0.419 8629		28	346	19	59.9	6	12	30.7	0.372 9752
	13	206	02	21.2	+2	42	04.9	0.424 5401		29	350	43	55.6	-5	56	31.5	0.367 1668
	14	209	18	56.3	2	19	34.0	0.429 0093		30	355	16	02.5	5	37	50.4	0.361 3798
	15	212	31	27.8	1	57	03.8	0.433 2602		31	359	56	39.1	5	16	21.0	0.355 6518
	16	215	40	15.6	1	34	37.8	0.437 2836	June	1	4	46	00.9	4	51	58.0	0.350 0232
	17	218	45	38.9	1	12	18.9	0.441 0716		2	9	44	20.3	4	24	38.7	0.344 5377
	18	221	47	55.7	0	50	09.8	0.444 6171		3	14	51	45.2	3	54	22.7	0.339 2419
	19	224	47	23.4	+0	28	12.7	0.447 9140		4	20	08	18.2	-3	21	13.4	0.334 1848
	20	227	44	18.5	+0	06	29.6	0.450 9567		5	25	33	55.2	2	45	18.5	0.329 4176
	21	230	38	57.2	-0	14	57.8	0.453 7406		6	31	08	24.5	2	06	50.1	0.324 9924
	22	233	31	34.5	0	36	08.0	0.456 2616		7	36	51	25.8	1	26	06.4	0.320 9613
	23	236	22	25.2	0	56	59.5	0.458 5161		8	42	42	29.0	-0	43	30.9	0.317 3754
	24	239	11	43.6	1	17	31.3	0.460 5012		9	48	40	53.5	+0	00	26.8	0.314 2829
	25	241	59	43.5	-1	37	42.0	0.462 2144		10	54	45	48.2	+0	45	11.9	0.311 7280
	26	244	46	38.0	1	57	30.7	0.463 6534		11	60	56	11.5	1	30	04.9	0.309 7489
	27	247	32	40.4	2	16	56.2	0.464 8165		12	67	10	52.0	2	14	23.5	0.308 3761
	28	250	18	03.4	2	35	57.6	0.465 7025		13	73	28	30.0	2	57	23.6	0.307 6317
	29	253	02	59.5	2	54	33.8	0.466 3102		14	79	47	39.1	3	38	22.1	0.307 5277
	30	255	47	41.1	3	12	43.8	0.466 6390		15	86	06	49.4	4	16	38.4	0.308 0659
May	1	258	32	20.5	-3	30	26.4	0.466 6886		16	92	24	29.8	+4	51	36.9	0.309 2374
	2	261	17	09.9	3	47	40.5	0.466 4588		17	98	39	11.0	5	22	48.1	0.311 0235
	3	264	02	21.4	4	04	24.8	0.465 9499		18	104	49	28.8	5	49	50.3	0.313 3961
	4	266	48	07.4	4	20	38.1	0.465 1625		19	110	54	06.3	6	12	29.4	0.316 3193
	5	269	34	40.0	4	36	18.7	0.464 0975		20	116	51	56.0	6	30	39.3	0.319 7508
	6	272	22	11.9	4	51	25.2	0.462 7561		21	122	42	01.5	6	44	21.3	0.323 6435
	7	275	10	55.7	-5	05	55.8	0.461 1399		22	128	23	37.5	+6	53	42.8	0.327 9470
	8	278	01	04.2	5	19	48.4	0.459 2509		23	133	56	10.7	6	58	56.2	0.332 6094
	9	280	52	50.7	5	33	01.1	0.457 0916		24	139	19	18.5	7	00	17.8	0.337 5784
	10	283	46	28.8	5	45	31.4	0.454 6646		25	144	32	48.8	6	58	06.2	0.342 8025
	11	286	42	12.4	5	57	16.7	0.451 9735		26	149	36	38.2	6	52	41.7	0.348 2319
	12	289	40	15.8	6	08	14.2	0.449 0220		27	154	30	51.1	6	44	24.7	0.353 8192
	13	292	40	53.9	-6	18	20.7	0.445 8146		28	159	15	38.2	+6	33	35.6	0.359 5197
	14	295	44	22.2	6	27	32.8	0.442 3566		29	163	51	15.1	6	20	33.9	0.365 2918
	15	298	50	56.7	6	35	46.5	0.438 6537		30	168	18	01.3	6	05	38.0	0.371 0972
	16	302	00	53.9	6	42	57.7	0.434 7128	July	1	172	36	19.2	5	49	04.6	0.376 9006
	17	305	14	31.1	-6	49	01.8	0.430 5414		2	176	46	32.8	+5	31	09.3	0.382 6703

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MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	172	36	19.2	+5	49	04.6	0.376 9006	Aug.	16	315	27	09.0	-6	59	41.4	0.416 5851
	2	176	46	32.8	5	31	09.3	0.382 6703		17	318	58	42.7	7	00	19.1	0.411 5860
	3	180	49	07.4	5	12	05.8	0.388 3770		18	322	35	34.1	6	59	19.7	0.406 4137
	4	184	44	29.0	4	52	06.5	0.393 9949		19	326	18	04.5	6	56	35.7	0.401 0842
	5	188	33	03.4	4	31	22.3	0.399 5003		20	330	06	35.8	6	51	59.4	0.395 6157
	6	192	15	16.3	4	10	02.7	0.404 8724		21	334	01	30.3	6	45	22.4	0.390 0284
	7	195	51	32.9	+3	48	16.2	0.410 0925		22	338	03	10.7	-6	36	36.5	0.384 3451
	8	199	22	17.6	3	26	09.9	0.415 1437		23	342	11	59.3	6	25	32.9	0.378 5911
	9	202	47	54.1	3	03	50.3	0.420 0114		24	346	28	18.2	6	12	03.1	0.372 7944
	10	206	08	45.0	2	41	22.6	0.424 6824		25	350	52	29.0	5	55	58.9	0.366 9862
	11	209	25	12.2	2	18	51.8	0.429 1451		26	355	24	51.5	5	37	12.7	0.361 2006
	12	212	37	36.4	1	56	21.6	0.433 3891		27	360	05	44.2	5	15	37.8	0.355 4751
	13	215	46	17.6	+1	33	55.8	0.437 4055		28	4	55	22.6	-4	51	09.4	0.349 8504
	14	218	51	34.7	1	11	37.2	0.441 1861		29	9	53	58.8	4	23	44.6	0.344 3702
	15	221	53	46.0	0	49	28.4	0.444 7240		30	15	01	40.8	3	53	23.1	0.339 0812
	16	224	53	08.6	0	27	31.7	0.448 0130		31	20	18	30.8	3	20	08.6	0.334 0325
	17	227	49	59.2	+0	05	49.1	0.451 0478	Sept.	1	25	44	24.5	2	44	08.6	0.329 2753
	18	230	44	33.8	-0	15	37.8	0.453 8236		2	31	19	10.0	2	05	35.7	0.324 8617
	19	233	37	07.5	-0	36	47.4	0.456 3363		3	37	02	26.7	-1	24	48.1	0.320 8438
	20	236	27	55.1	0	57	38.4	0.458 5825		4	42	53	44.1	-0	42	09.7	0.317 2726
	21	239	17	10.8	1	18	09.4	0.460 5592		5	48	52	21.5	+0	01	50.0	0.314 1964
	22	242	05	08.4	1	38	19.5	0.462 2638		6	54	57	27.2	0	46	36.0	0.311 6590
	23	244	52	01.1	1	58	07.5	0.463 6943		7	61	07	59.5	1	31	28.6	0.309 6983
	24	247	38	02.1	2	17	32.2	0.464 8488		8	67	22	46.5	2	15	45.4	0.308 3449
	25	250	23	24.0	-2	36	32.9	0.465 7261		9	73	40	28.4	+2	58	42.3	0.307 6204
	26	253	08	19.4	2	55	08.2	0.466 3251		10	79	59	38.8	3	39	36.3	0.307 5365
	27	255	53	00.7	3	13	17.4	0.466 6452		11	86	18	47.5	4	17	46.9	0.308 0945
	28	258	37	40.2	3	30	59.1	0.466 6860		12	92	36	23.4	4	52	38.7	0.309 2855
	29	261	22	30.1	3	48	12.3	0.466 4474		13	98	50	57.4	5	23	42.5	0.311 0903
	30	264	07	42.5	4	04	55.7	0.465 9298		14	105	01	05.5	5	50	36.6	0.313 4805
	31	266	53	29.7	-4	21	07.9	0.465 1337		15	111	05	31.1	+6	13	07.3	0.316 4201
Aug.	1	269	40	04.0	4	36	47.6	0.464 0600		16	117	03	07.0	6	31	08.9	0.319 8666
	2	272	27	37.9	4	51	52.9	0.462 7100		17	122	52	57.1	6	44	42.7	0.323 7727
	3	275	16	24.1	5	06	22.3	0.461 0852		18	128	34	16.5	6	53	56.2	0.328 0880
	4	278	06	35.5	5	20	13.8	0.459 1878		19	134	06	32.3	6	59	02.1	0.332 7606
	5	280	58	25.3	5	33	25.2	0.457 0200		20	139	29	22.2	7	00	16.8	0.337 7382
	6	283	52	07.1	-5	45	54.1	0.454 5847		21	144	42	34.4	+6	57	59.0	0.342 9693
	7	286	47	54.8	5	57	38.0	0.451 8854		22	149	46	05.7	6	52	28.7	0.348 4042
	8	289	46	02.8	6	08	33.9	0.448 9258		23	154	40	00.8	6	44	06.7	0.353 9955
	9	292	46	46.0	6	18	38.8	0.445 7105		24	159	24	30.4	6	33	13.2	0.359 6987
	10	295	50	19.9	6	27	49.1	0.442 2447		25	163	59	50.5	6	20	07.7	0.365 4723
	11	298	57	00.4	6	36	00.9	0.438 5343		26	168	26	20.6	6	05	08.5	0.371 2780
	12	302	07	04.3	-6	43	10.1	0.434 5860		27	172	44	23.0	+5	48	32.4	0.377 0808
	13	305	20	48.7	6	49	12.1	0.430 4076		28	176	54	22.0	5	30	34.7	0.382 8488
	14	308	38	31.7	6	54	01.6	0.426 0078		29	180	56	42.8	5	11	29.3	0.388 5530
	15	312	00	32.0	6	57	33.4	0.421 3966		30	184	51	51.3	4	51	28.5	0.394 1676
	16	315	27	09.0	-6	59	41.4	0.416 5851	Oct.	1	188	40	13.5	+4	30	43.0	0.399 6692

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME

MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector	Date	Heliocentric Longitude ° ' "	Heliocentric Latitude ° ' "	Radius Vector
Oct. 1	188 40 13.5	+4 30 43.0	0.399 6692	Nov. 16	330 13 59.6	-6 51 48.8	0.395 4452
2	192 22 15.0	4 09 22.5	0.405 0367	17	334 09 06.4	6 45 08.0	0.389 8548
3	195 58 21.0	3 47 35.2	0.410 2517	18	338 10 59.5	6 36 17.9	0.384 1691
4	199 28 55.9	3 25 28.5	0.415 2974	19	342 20 01.7	6 25 09.9	0.378 4135
5	202 54 23.2	3 03 08.5	0.420 1591	20	346 36 34.9	6 11 35.4	0.372 6161
6	206 15 05.7	2 40 40.7	0.424 8237	21	351 01 00.4	5 55 26.3	0.366 8083
7	209 31 25.0	+2 18 09.8	0.429 2797	22	355 33 38.5	-5 36 34.9	0.361 0242
8	212 43 42.1	1 55 39.8	0.433 5167	23	360 14 47.0	5 14 54.8	0.355 3014
9	215 52 16.7	1 33 14.0	0.437 5258	24	5 04 41.7	4 50 21.0	0.349 6807
10	218 57 27.8	1 10 55.7	0.441 2989	25	10 03 34.6	4 22 50.6	0.344 2058
11	221 59 33.6	0 48 47.3	0.444 8292	26	15 11 33.3	3 52 23.8	0.338 9237
12	224 58 51.3	0 26 51.0	0.448 1104	27	20 28 39.9	3 19 03.9	0.333 8834
13	227 55 37.5	+0 05 08.8	0.451 1371	28	25 54 50.0	-2 42 59.0	0.329 1362
14	230 50 08.2	-0 16 17.6	0.453 9048	29	31 29 51.4	2 04 21.7	0.324 7342
15	233 42 38.4	0 37 26.6	0.456 4093	30	37 13 23.1	1 23 30.4	0.320 7295
16	236 33 23.0	0 58 17.0	0.458 6472	Dec. 1	43 04 54.4	-0 40 49.0	0.317 1730
17	239 22 36.2	1 18 47.4	0.460 6154	2	49 03 44.2	+0 03 12.7	0.314 1129
18	242 10 31.6	1 38 56.8	0.462 3116	3	55 09 00.6	0 47 59.4	0.311 5928
19	244 57 22.5	-1 58 44.1	0.463 7334	4	61 19 41.5	+1 32 51.5	0.309 6506
20	247 43 22.1	2 18 08.1	0.464 8794	5	67 34 34.8	2 17 06.4	0.308 3163
21	250 28 43.1	2 37 08.0	0.465 7481	6	73 52 20.3	3 00 00.1	0.307 6114
22	253 13 38.0	2 55 42.6	0.466 3384	7	80 11 31.5	3 40 49.6	0.307 5472
23	255 58 19.1	3 13 50.9	0.466 6499	8	86 30 38.3	4 18 54.6	0.308 1249
24	258 42 58.8	3 31 31.8	0.466 6820	9	92 48 09.5	4 53 39.7	0.309 3351
25	261 27 49.2	-3 48 44.0	0.466 4348	10	99 02 36.2	+5 24 36.0	0.311 1582
26	264 13 02.5	4 05 26.5	0.465 9086	11	105 12 34.5	5 51 22.2	0.313 5658
27	266 58 51.0	4 21 37.7	0.465 1039	12	111 16 48.1	6 13 44.6	0.316 5215
28	269 45 27.1	4 37 16.3	0.464 0216	13	117 14 10.2	6 31 37.9	0.319 9827
29	272 33 03.1	4 52 20.6	0.462 6631	14	123 03 44.9	6 45 03.5	0.323 9020
30	275 21 51.8	5 06 48.9	0.461 0299	15	128 44 47.8	6 54 09.2	0.328 2289
31	278 12 06.0	-5 20 39.1	0.459 1241	16	134 16 46.2	+6 59 07.8	0.332 9114
Nov. 1	281 03 59.2	5 33 49.2	0.456 9480	17	139 39 18.4	7 00 15.6	0.337 8973
2	283 57 44.7	5 46 16.7	0.454 5046	18	144 52 12.5	6 57 51.6	0.343 1352
3	286 53 36.5	5 57 59.2	0.451 7972	19	149 55 25.9	6 52 15.7	0.348 5754
4	289 51 49.2	6 08 53.6	0.448 8296	20	154 49 03.3	6 43 48.8	0.354 1706
5	292 52 37.5	6 18 56.8	0.445 6066	21	159 33 15.8	6 32 51.0	0.359 8763
6	295 56 17.0	-6 28 05.3	0.442 1332	22	164 08 19.2	+6 19 41.7	0.365 6512
7	299 03 03.6	6 36 15.3	0.438 4154	23	168 34 33.4	6 04 39.3	0.371 4571
8	302 13 14.0	6 43 22.4	0.434 4600	24	172 52 20.6	5 48 00.4	0.377 2591
9	305 27 05.6	6 49 22.2	0.430 2747	25	177 02 05.1	5 30 00.5	0.383 0254
10	308 44 56.3	6 54 09.4	0.425 8683	26	181 04 12.2	5 10 53.2	0.388 7271
11	312 07 04.9	6 57 38.7	0.421 2508	27	184 59 07.9	4 50 50.8	0.394 3384
12	315 33 50.7	-6 59 44.0	0.416 4334	28	188 47 18.1	+4 30 04.2	0.399 8359
13	319 05 34.0	7 00 18.8	0.411 4288	29	192 29 08.3	4 08 42.7	0.405 1989
14	322 42 35.6	6 59 16.2	0.406 2515	30	196 05 03.9	3 46 54.8	0.410 4087
15	326 25 16.8	6 56 28.8	0.400 9176	31	199 35 29.0	3 24 47.5	0.415 4489
16	330 13 59.6	-6 51 48.8	0.395 4452	32	203 00 47.3	+3 02 27.2	0.420 3046

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
Jan.	0	262	32	46.3	+3	06	25.4
	1	262	16	54.7	3	03	54.1
	2	262	10	56.7	2	59	58.4
	3	262	14	16.0	2	54	51.7
	4	262	26	11.0	2	48	45.8
	5	262	45	58.3	2	41	51.5
	6	263	12	54.5	+2	34	18.1
	7	263	46	17.8	2	26	13.5
	8	264	25	29.1	2	17	44.6
	9	265	09	52.1	2	08	57.2
	10	265	58	53.9	1	59	56.2
	11	266	52	04.7	1	50	45.8
	12	267	48	58.0	+1	41	29.5
	13	268	49	10.1	1	32	10.1
	14	269	52	20.1	1	22	50.1
	15	270	58	09.6	1	13	31.7
	16	272	06	22.7	1	04	16.6
	17	273	16	45.1	0	55	06.3
	18	274	29	04.5	+0	46	02.1
	19	275	43	10.3	0	37	05.2
	20	276	58	53.0	0	28	16.4
	21	278	16	04.6	0	19	36.8
	22	279	34	38.0	0	11	06.9
	23	280	54	27.0	+0	02	47.5
	24	282	15	26.4	-0	05	20.8
	25	283	37	31.7	0	13	17.5
	26	285	00	38.9	0	21	02.0
	27	286	24	44.7	0	28	33.8
	28	287	49	46.5	0	35	52.6
	29	289	15	41.8	0	42	57.7
	30	290	42	28.7	-0	49	48.9
	31	292	10	05.7	0	56	25.7
Feb.	1	293	38	31.5	1	02	47.6
	2	295	07	45.1	1	08	54.4
	3	296	37	45.8	1	14	45.4
	4	298	08	33.1	1	20	20.4
	5	299	40	06.7	-1	25	38.9
	6	301	12	26.5	1	30	40.4
	7	302	45	32.4	1	35	24.5
	8	304	19	24.6	1	39	50.7
	9	305	54	03.3	1	43	58.6
	10	307	29	28.9	1	47	47.6
	11	309	05	41.9	-1	51	17.2
	12	310	42	42.9	1	54	27.0
	13	312	20	32.5	1	57	16.2
	14	313	59	11.6	1	59	44.4
	15	315	38	41.0	-2	01	50.9

Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
Feb.	15	315	38	41.0	-2	01	50.9
	16	317	19	01.5	2	03	35.2
	17	319	00	14.1	2	04	56.5
	18	320	42	19.6	2	05	54.2
	19	322	25	18.8	2	06	27.6
	20	324	09	12.5	2	06	35.9
	21	325	54	01.6	-2	06	18.3
	22	327	39	46.5	2	05	34.2
	23	329	26	27.8	2	04	22.7
	24	331	14	05.8	2	02	43.0
	25	333	02	40.5	2	00	34.2
	26	334	52	11.8	1	57	55.6
	27	336	42	39.0	-1	54	46.3
	28	338	34	01.1	1	51	05.4
	29	340	26	16.4	1	46	52.2
Mar.	1	342	19	22.6	1	42	06.0
	2	344	13	16.5	1	36	46.0
	3	346	07	54.3	1	30	51.6
	4	348	03	10.6	-1	24	22.5
	5	349	58	59.0	1	17	18.1
	6	351	55	11.6	1	09	38.5
	7	353	51	38.9	1	01	23.6
	8	355	48	09.5	0	52	33.8
	9	357	44	30.0	0	43	09.7
	10	359	40	24.9	-0	33	12.6
	11	1	35	36.5	0	22	43.7
	12	3	29	45.0	0	11	45.2
	13	5	22	28.3	-0	00	19.5
	14	7	13	22.3	+0	11	30.5
	15	9	02	01.0	0	23	40.9
	16	10	47	57.1	+0	36	07.9
	17	12	30	42.3	0	48	46.7
	18	14	09	47.7	1	01	32.1
	19	15	44	44.6	1	14	18.7
	20	17	15	04.6	1	27	00.6
	21	18	40	20.8	1	39	31.6
	22	20	00	07.6	+1	51	45.4
	23	21	14	01.4	2	03	35.6
	24	22	21	40.6	2	14	55.6
	25	23	22	46.3	2	25	38.9
	26	24	17	02.2	2	35	39.0
	27	25	04	14.5	2	44	49.5
	28	25	44	12.6	+2	53	04.0
	29	26	16	48.9	3	00	16.3
	30	26	41	59.1	3	06	20.3
	31	26	59	42.5	3	11	10.3
Apr.	1	27	10	02.3	+3	14	40.7

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Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"	Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
Apr.	1	27	10	02.3	+3	14	40.7	May	17	31	38	01.8	-3	06	00.1
	2	27	13	05.9	3	16	46.5		18	32	57	03.5	3	02	59.2
	3	27	09	05.5	3	17	23.3		19	34	18	33.1	2	59	22.2
	4	26	58	18.2	3	16	27.5		20	35	42	28.4	2	55	10.2
	5	26	41	06.3	3	13	56.4		21	37	08	47.5	2	50	23.9
	6	26	17	57.6	3	09	48.4		22	38	37	29.1	2	45	04.2
	7	25	49	25.1	+3	04	03.5		23	40	08	31.9	-2	39	12.2
	8	25	16	07.3	2	56	42.8		24	41	41	55.1	2	32	48.8
	9	24	38	47.1	2	47	49.4		25	43	17	38.0	2	25	55.0
	10	23	58	11.5	2	37	27.9		26	44	55	40.2	2	18	32.0
	11	23	15	10.4	2	25	44.5		27	46	36	01.4	2	10	41.0
	12	22	30	35.6	2	12	47.1		28	48	18	41.3	2	02	23.2
	13	21	45	19.3	+1	58	44.6		29	50	03	39.5	-1	53	40.2
	14	21	00	13.3	1	43	47.3		30	51	50	55.5	1	44	33.5
	15	20	16	07.0	1	28	05.9		31	53	40	28.5	1	35	04.8
	16	19	33	46.7	1	11	51.6	June	1	55	32	17.5	1	25	16.1
	17	18	53	54.5	0	55	15.5		2	57	26	20.6	1	15	09.6
	18	18	17	07.7	0	38	28.4		3	59	22	35.6	1	04	47.6
	19	17	43	58.2	+0	21	40.6		4	61	20	59.0	-0	54	12.9
	20	17	14	52.4	+0	05	01.5		5	63	21	26.4	0	43	28.2
	21	16	50	11.0	-0	11	20.7		6	65	23	52.2	0	32	36.8
	22	16	30	09.9	0	27	18.4		7	67	28	09.3	0	21	42.2
	23	16	14	59.9	0	42	45.4		8	69	34	09.3	-0	10	47.9
	24	16	04	47.6	0	57	36.6		9	71	41	41.8	+0	00	02.0
	25	15	59	35.8	-1	11	47.6		10	73	50	35.4	+0	10	43.5
	26	15	59	24.2	1	25	15.2		11	76	00	37.0	0	21	12.3
	27	16	04	09.8	1	37	56.8		12	78	11	32.0	0	31	24.3
	28	16	13	47.6	1	49	50.6		13	80	23	05.0	0	41	15.3
	29	16	28	11.0	2	00	55.5		14	82	34	59.9	0	50	41.3
	30	16	47	12.0	2	11	10.7		15	84	47	00.1	0	59	38.4
May	1	17	10	42.0	-2	20	35.9		16	86	58	49.0	+1	08	03.0
	2	17	38	31.9	2	29	11.3		17	89	10	10.5	1	15	52.3
	3	18	10	32.0	2	36	57.0		18	91	20	49.4	1	23	03.4
	4	18	46	33.1	2	43	53.6		19	93	30	31.3	1	29	34.1
	5	19	26	25.7	2	50	01.8		20	95	39	03.4	1	35	22.8
	6	20	10	00.7	2	55	22.3		21	97	46	14.1	1	40	28.1
	7	20	57	09.3	-2	59	56.0		22	99	51	53.7	+1	44	49.1
	8	21	47	43.1	3	03	43.8		23	101	55	53.5	1	48	25.4
	9	22	41	34.4	3	06	46.6		24	103	58	06.7	1	51	16.9
	10	23	38	35.8	3	09	05.3		25	105	58	27.5	1	53	23.8
	11	24	38	40.3	3	10	40.9		26	107	56	51.6	1	54	46.5
	12	25	41	41.8	3	11	34.4		27	109	53	15.5	1	55	25.6
	13	26	47	34.5	-3	11	46.5		28	111	47	36.8	+1	55	21.9
	14	27	56	13.1	3	11	18.2		29	113	39	53.6	1	54	36.4
	15	29	07	33.2	3	10	10.5		30	115	30	04.8	1	53	10.1
	16	30	21	30.6	3	08	24.2	July	1	117	18	09.6	1	51	04.0
	17	31	38	01.8	-3	06	00.1		2	119	04	07.3	+1	48	19.3

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	117	18	09.6	+1	51	04.0	Aug.	16	149	12	35.6	-4	47	03.1
	2	119	04	07.3	1	48	19.3		17	148	22	33.6	4	43	35.4
	3	120	47	57.8	1	44	57.2		18	147	31	19.2	4	38	14.1
	4	122	29	40.6	1	40	58.8		19	146	39	50.3	4	30	59.5
	5	124	09	15.7	1	36	25.2		20	145	49	07.5	4	21	54.5
	6	125	46	42.6	1	31	17.7		21	145	00	13.1	4	11	04.1
	7	127	22	00.9	+1	25	37.3		22	144	14	09.2	-3	58	35.7
	8	128	55	10.0	1	19	25.3		23	143	31	55.5	3	44	38.9
	9	130	26	09.3	1	12	42.7		24	142	54	28.2	3	29	24.4
	10	131	54	57.7	1	05	30.6		25	142	22	38.0	3	13	04.5
	11	133	21	33.8	0	57	50.1		26	141	57	09.5	2	55	52.0
	12	134	45	56.2	0	49	42.3		27	141	38	40.5	2	37	59.9
	13	136	08	03.0	+0	41	08.2		28	141	27	41.2	-2	19	41.2
	14	137	27	51.8	0	32	09.0		29	141	24	34.8	2	01	08.5
	15	138	45	20.0	0	22	45.6		30	141	29	37.3	1	42	33.6
	16	140	00	24.5	0	12	59.2		31	141	42	57.8	1	24	07.5
	17	141	13	01.8	+0	02	50.8	Sept.	1	142	04	39.3	1	06	00.4
	18	142	23	07.9	-0	07	38.5		2	142	34	38.7	0	48	21.2
	19	143	30	38.3	-0	18	27.5		3	143	12	47.8	-0	31	18.1
	20	144	35	28.0	0	29	35.0		4	143	58	53.4	-0	14	58.1
	21	145	37	31.5	0	40	59.8		5	144	52	37.8	+0	00	32.7
	22	146	36	42.6	0	52	40.6		6	145	53	39.5	0	15	09.2
	23	147	32	54.9	1	04	35.9		7	147	01	33.6	0	28	47.2
	24	148	26	01.1	1	16	44.2		8	148	15	52.2	0	41	23.3
	25	149	15	53.6	-1	29	03.9		9	149	36	04.9	+0	52	55.3
	26	150	02	24.0	1	41	33.1		10	151	01	39.7	1	03	21.6
	27	150	45	23.4	1	54	09.8		11	152	32	03.6	1	12	41.4
	28	151	24	42.6	2	06	51.8		12	154	06	43.1	1	20	54.7
	29	152	00	11.4	2	19	36.5		13	155	45	04.9	1	28	02.5
	30	152	31	39.6	2	32	21.1		14	157	26	36.7	1	34	05.9
	31	152	58	56.3	-2	45	02.6		15	159	10	47.8	+1	39	06.9
Aug.	1	153	21	50.6	2	57	37.2		16	160	57	09.0	1	43	07.9
	2	153	40	11.6	3	10	01.1		17	162	45	13.8	1	46	11.6
	3	153	53	48.4	3	22	09.7		18	164	34	37.9	1	48	21.0
	4	154	02	30.9	3	33	58.0		19	166	24	59.7	1	49	39.1
	5	154	06	09.9	3	45	20.3		20	168	16	00.2	1	50	09.2
	6	154	04	37.5	-3	56	10.5		21	170	07	22.8	+1	49	54.6
	7	153	57	47.8	4	06	21.8		22	171	58	53.0	1	48	58.4
	8	153	45	37.5	4	15	46.9		23	173	50	18.9	1	47	23.7
	9	153	28	06.4	4	24	17.8		24	175	41	30.1	1	45	13.7
	10	153	05	18.4	4	31	46.3		25	177	32	18.2	1	42	31.1
	11	152	37	22.2	4	38	03.8		26	179	22	36.3	1	39	18.7
	12	152	04	31.9	-4	43	01.9		27	181	12	18.8	+1	35	39.2
	13	151	27	07.8	4	46	32.1		28	183	01	21.4	1	31	34.8
	14	150	45	36.6	4	48	26.7		29	184	49	40.7	1	27	08.1
	15	150	00	32.4	4	48	38.9		30	186	37	14.2	1	22	20.9
	16	149	12	35.6	-4	47	03.1	Oct.	1	188	24	00.1	+1	17	15.5

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Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	188	24	00.1	+1	17	15.5	Nov.	16	256	31	03.2	-2	38	28.5
	2	190	09	57.2	1	11	53.4		17	257	31	06.7	2	36	53.6
	3	191	55	04.7	1	06	16.6		18	258	27	33.2	2	34	31.0
	4	193	39	22.4	1	00	26.6		19	259	19	54.5	2	31	16.3
	5	195	22	50.4	0	54	25.0		20	260	07	38.8	2	27	05.2
	6	197	05	28.9	0	48	13.1		21	260	50	10.7	2	21	52.8
	7	198	47	18.6	+0	41	52.2		22	261	26	51.1	-2	15	34.0
	8	200	28	19.9	0	35	23.5		23	261	56	57.7	2	08	03.8
	9	202	08	33.8	0	28	48.2		24	262	19	45.2	1	59	17.1
	10	203	48	01.2	0	22	07.4		25	262	34	26.6	1	49	09.0
	11	205	26	42.9	0	15	22.1		26	262	40	14.5	1	37	35.7
	12	207	04	40.1	0	08	33.3		27	262	36	24.3	1	24	34.1
	13	208	41	53.6	+0	01	41.8		28	262	22	16.5	-1	10	03.4
	14	210	18	24.5	-0	05	11.5		29	261	57	22.0	0	54	05.2
	15	211	54	13.8	0	12	05.7		30	261	21	26.9	0	36	44.6
	16	213	29	22.7	0	19	00.1	Dec.	1	260	34	38.3	-0	18	11.2
	17	215	03	52.0	0	25	53.8		2	259	37	29.8	+0	01	20.5
	18	216	37	42.8	0	32	46.2		3	258	31	06.0	0	21	30.7
	19	218	10	55.9	-0	39	36.4		4	257	17	04.2	+0	41	54.9
	20	219	43	32.1	0	46	23.8		5	255	57	32.4	1	02	04.8
	21	221	15	32.0	0	53	07.7		6	254	35	02.8	1	21	30.5
	22	222	46	56.2	0	59	47.2		7	253	12	22.2	1	39	43.2
	23	224	17	44.9	1	06	21.8		8	251	52	18.8	1	56	17.2
	24	225	47	58.4	1	12	50.7		9	250	37	29.3	2	10	52.2
	25	227	17	36.7	-1	19	13.2		10	249	30	07.9	+2	23	15.1
	26	228	46	39.8	1	25	28.4		11	248	31	58.9	2	33	19.2
	27	230	15	07.2	1	31	35.7		12	247	44	13.6	2	41	04.7
	28	231	42	58.5	1	37	34.2		13	247	07	31.5	2	46	36.7
	29	233	10	12.7	1	43	23.2		14	246	42	04.0	2	50	04.1
	30	234	36	48.8	1	49	01.7		15	246	27	39.7	2	51	38.1
	31	236	02	45.4	-1	54	28.8		16	246	23	50.5	+2	51	31.1
Nov.	1	237	28	00.6	1	59	43.7		17	246	29	57.1	2	49	55.4
	2	238	52	32.2	2	04	45.2		18	246	45	13.6	2	47	03.2
	3	240	16	17.5	2	09	32.3		19	247	08	51.4	2	43	05.5
	4	241	39	13.2	2	14	03.9		20	247	40	01.5	2	38	12.5
	5	243	01	15.5	2	18	18.6		21	248	17	56.7	2	32	33.2
	6	244	22	19.7	-2	22	15.2		22	249	01	52.8	+2	26	15.4
	7	245	42	20.6	2	25	52.1		23	249	51	08.9	2	19	26.1
	8	247	01	11.9	2	29	07.9		24	250	45	08.0	2	12	11.0
	9	248	18	46.3	2	32	00.8		25	251	43	16.9	2	04	35.4
	10	249	34	55.5	2	34	29.0		26	252	45	06.0	1	56	43.5
	11	250	49	29.8	2	36	30.3		27	253	50	09.2	1	48	39.2
	12	252	02	17.9	-2	38	02.6		28	254	58	03.6	+1	40	25.7
	13	253	13	07.2	2	39	03.4		29	256	08	29.2	1	32	05.7
	14	254	21	42.8	2	39	30.0		30	257	21	08.3	1	23	41.6
	15	255	27	47.9	2	39	19.4		31	258	35	45.7	1	15	15.4
	16	256	31	03.2	-2	38	28.5		32	259	52	08.2	+1	06	49.0

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	17	28	16.84	-20	07	35.0	0.759 000	11.59	4.43	10	49	14
	1	17	27	08.86	20	09	13.0	0.777 640	11.31	4.32	10	44	30
	2	17	26	42.56	20	12	47.8	0.797 160	11.03	4.21	10	40	25
	3	17	26	55.42	20	18	05.5	0.817 322	10.76	4.11	10	36	59
	4	17	27	44.65	20	24	51.2	0.837 918	10.50	4.01	10	34	07
	5	17	29	07.31	20	32	49.7	0.858 769	10.24	3.91	10	31	47
	6	17	31	00.48	-20	41	46.3	0.879 721	10.00	3.82	10	29	56
	7	17	33	21.36	20	51	26.7	0.900 647	9.76	3.73	10	28	32
	8	17	36	07.30	21	01	38.0	0.921 439	9.54	3.65	10	27	31
	9	17	39	15.87	21	12	07.9	0.942 011	9.34	3.57	10	26	53
	10	17	42	44.83	21	22	45.4	0.962 291	9.14	3.49	10	26	33
	11	17	46	32.15	21	33	20.6	0.982 223	8.95	3.42	10	26	31
	12	17	50	36.00	-21	43	44.6	1.001 760	8.78	3.35	10	26	45
	13	17	54	54.75	21	53	49.5	1.020 869	8.61	3.29	10	27	14
	14	17	59	26.93	22	03	28.0	1.039 522	8.46	3.23	10	27	55
	15	18	04	11.23	22	12	34.1	1.057 699	8.31	3.18	10	28	47
	16	18	09	06.50	22	21	02.0	1.075 386	8.18	3.12	10	29	51
	17	18	14	11.69	22	28	46.8	1.092 573	8.05	3.08	10	31	03
	18	18	19	25.89	-22	35	44.2	1.109 255	7.93	3.03	10	32	25
	19	18	24	48.26	22	41	50.4	1.125 428	7.81	2.99	10	33	54
	20	18	30	18.08	22	47	01.8	1.141 092	7.71	2.94	10	35	30
	21	18	35	54.66	22	51	15.4	1.156 247	7.61	2.91	10	37	13
	22	18	41	37.43	22	54	28.5	1.170 897	7.51	2.87	10	39	02
	23	18	47	25.83	22	56	38.7	1.185 045	7.42	2.84	10	40	57
	24	18	53	19.39	-22	57	43.7	1.198 696	7.34	2.80	10	42	56
	25	18	59	17.66	22	57	41.7	1.211 853	7.26	2.77	10	44	60
	26	19	05	20.25	22	56	30.9	1.224 523	7.18	2.74	10	47	08
	27	19	11	26.79	22	54	09.6	1.236 711	7.11	2.72	10	49	20
	28	19	17	36.96	22	50	36.4	1.248 421	7.04	2.69	10	51	35
	29	19	23	50.46	22	45	50.2	1.259 659	6.98	2.67	10	53	54
	30	19	30	07.01	-22	39	49.6	1.270 430	6.92	2.64	10	56	15
	31	19	36	26.37	22	32	33.8	1.280 737	6.87	2.62	10	58	40
Feb.	1	19	42	48.30	22	24	01.6	1.290 585	6.81	2.60	11	01	06
	2	19	49	12.61	22	14	12.2	1.299 978	6.76	2.58	11	03	35
	3	19	55	39.09	22	03	05.0	1.308 918	6.72	2.57	11	06	06
	4	20	02	07.59	21	50	39.1	1.317 407	6.68	2.55	11	08	40
	5	20	08	37.93	-21	36	54.0	1.325 446	6.63	2.53	11	11	14
	6	20	15	09.97	21	21	49.1	1.333 037	6.60	2.52	11	13	51
	7	20	21	43.58	21	05	23.8	1.340 179	6.56	2.51	11	16	29
	8	20	28	18.65	20	47	37.8	1.346 871	6.53	2.49	11	19	08
	9	20	34	55.05	20	28	30.6	1.353 111	6.50	2.48	11	21	49
	10	20	41	32.71	20	08	01.8	1.358 895	6.47	2.47	11	24	31
	11	20	48	11.52	-19	46	11.1	1.364 220	6.45	2.46	11	27	14
	12	20	54	51.43	19	22	58.2	1.369 081	6.42	2.45	11	29	58
	13	21	01	32.37	18	58	22.9	1.373 470	6.40	2.45	11	32	44
	14	21	08	14.29	18	32	25.0	1.377 380	6.38	2.44	11	35	30
	15	21	14	57.16	-18	05	04.1	1.380 802	6.37	2.43	11	38	17

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	21	14	57.16	-18	05	04.1	1.380 802	6.37	2.43	11	38	17
	16	21	21	40.95	17	36	20.4	1.383 725	6.36	2.43	11	41	05
	17	21	28	25.64	17	06	13.6	1.386 135	6.34	2.42	11	43	54
	18	21	35	11.22	16	34	43.7	1.388 020	6.34	2.42	11	46	43
	19	21	41	57.67	16	01	50.7	1.389 361	6.33	2.42	11	49	34
	20	21	48	44.99	15	27	34.8	1.390 141	6.33	2.42	11	52	26
	21	21	55	33.18	-14	51	56.0	1.390 338	6.33	2.42	11	55	18
	22	22	02	22.25	14	14	54.8	1.389 930	6.33	2.42	11	58	11
	23	22	09	12.20	13	36	31.3	1.388 890	6.33	2.42	12	01	06
	24	22	16	03.04	12	56	46.2	1.387 191	6.34	2.42	12	04	01
	25	22	22	54.76	12	15	40.1	1.384 801	6.35	2.43	12	06	57
	26	22	29	47.35	11	33	13.9	1.381 688	6.36	2.43	12	09	53
	27	22	36	40.81	-10	49	28.7	1.377 815	6.38	2.44	12	12	51
	28	22	43	35.08	10	04	25.8	1.373 143	6.40	2.45	12	15	50
	29	22	50	30.13	9	18	07.0	1.367 631	6.43	2.46	12	18	49
Mar.	1	22	57	25.86	8	30	34.4	1.361 236	6.46	2.47	12	21	49
	2	23	04	22.16	7	41	50.7	1.353 913	6.50	2.48	12	24	49
	3	23	11	18.88	6	51	59.0	1.345 614	6.54	2.50	12	27	50
	4	23	18	15.79	-6	01	03.0	1.336 293	6.58	2.51	12	30	50
	5	23	25	12.65	5	09	07.4	1.325 903	6.63	2.53	12	33	51
	6	23	32	09.10	4	16	17.4	1.314 399	6.69	2.56	12	36	51
	7	23	39	04.73	3	22	39.4	1.301 738	6.76	2.58	12	39	50
	8	23	45	59.01	2	28	20.6	1.287 883	6.83	2.61	12	42	47
	9	23	52	51.33	1	33	29.5	1.272 803	6.91	2.64	12	45	42
	10	23	59	40.96	-0	38	15.6	1.256 476	7.00	2.67	12	48	33
	11	0	06	27.04	+0	17	10.3	1.238 893	7.10	2.71	12	51	21
	12	0	13	08.60	1	12	36.1	1.220 057	7.21	2.75	12	54	03
	13	0	19	44.52	2	07	48.8	1.199 988	7.33	2.80	12	56	39
	14	0	26	13.57	3	02	34.1	1.178 724	7.46	2.85	12	59	08
	15	0	32	34.40	3	56	36.9	1.156 324	7.61	2.91	13	01	27
	16	0	38	45.56	+4	49	41.4	1.132 866	7.76	2.97	13	03	36
	17	0	44	45.52	5	41	31.3	1.108 447	7.93	3.03	13	05	33
	18	0	50	32.69	6	31	50.3	1.083 185	8.12	3.10	13	07	16
	19	0	56	05.45	7	20	22.0	1.057 212	8.32	3.18	13	08	44
	20	1	01	22.19	8	06	50.7	1.030 677	8.53	3.26	13	09	54
	21	1	06	21.33	8	51	01.1	1.003 737	8.76	3.35	13	10	47
	22	1	11	01.34	+9	32	39.0	0.976 557	9.01	3.44	13	11	19
	23	1	15	20.80	10	11	30.9	0.949 303	9.26	3.54	13	11	30
	24	1	19	18.37	10	47	24.7	0.922 142	9.54	3.64	13	11	19
	25	1	22	52.85	11	20	09.3	0.895 234	9.82	3.75	13	10	43
	26	1	26	03.20	11	49	34.6	0.868 737	10.12	3.87	13	09	44
	27	1	28	48.54	12	15	31.7	0.842 796	10.43	3.99	13	08	19
	28	1	31	08.17	+12	37	52.8	0.817 549	10.76	4.11	13	06	28
	29	1	33	01.61	12	56	31.2	0.793 123	11.09	4.24	13	04	10
	30	1	34	28.57	13	11	21.1	0.769 634	11.43	4.37	13	01	27
	31	1	35	29.05	13	22	18.3	0.747 188	11.77	4.50	12	58	17
Apr.	1	1	36	03.30	+13	29	19.5	0.725 880	12.12	4.63	12	54	41

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	1	36	03.30	+13	29	19.5	0.725 880	12.12	4.63	12	54	41
	2	1	36	11.87	13	32	23.4	0.705 793	12.46	4.76	12	50	40
	3	1	35	55.63	13	31	30.4	0.687 004	12.80	4.89	12	46	16
	4	1	35	15.76	13	26	43.1	0.669 576	13.13	5.02	12	41	28
	5	1	34	13.80	13	18	06.5	0.653 564	13.46	5.14	12	36	20
	6	1	32	51.64	13	05	48.7	0.639 013	13.76	5.26	12	30	53
	7	1	31	11.46	+12	50	00.8	0.625 958	14.05	5.37	12	25	09
	8	1	29	15.77	12	30	57.1	0.614 422	14.31	5.47	12	19	11
	9	1	27	07.31	12	08	55.5	0.604 421	14.55	5.56	12	13	02
	10	1	24	49.02	11	44	16.8	0.595 956	14.76	5.64	12	06	45
	11	1	22	23.97	11	17	24.7	0.589 021	14.93	5.70	12	00	23
	12	1	19	55.28	10	48	45.5	0.583 599	15.07	5.76	11	53	59
	13	1	17	26.03	+10	18	47.1	0.579 660	15.17	5.80	11	47	36
	14	1	14	59.21	9	47	58.3	0.577 169	15.24	5.82	11	41	16
	15	1	12	37.64	9	16	48.0	0.576 079	15.27	5.83	11	35	03
	16	1	10	23.88	8	45	44.6	0.576 338	15.26	5.83	11	28	59
	17	1	08	20.23	8	15	14.9	0.577 886	15.22	5.81	11	23	06
	18	1	06	28.68	7	45	43.6	0.580 659	15.15	5.79	11	17	25
	19	1	04	50.87	+7	17	32.9	0.584 591	15.04	5.75	11	11	59
	20	1	03	28.16	6	51	02.2	0.589 611	14.92	5.70	11	06	48
	21	1	02	21.55	6	26	27.8	0.595 651	14.76	5.64	11	01	54
	22	1	01	31.77	6	04	02.8	0.602 642	14.59	5.58	10	57	16
	23	1	00	59.29	5	43	57.6	0.610 515	14.40	5.50	10	52	56
	24	1	00	44.33	5	26	19.7	0.619 207	14.20	5.43	10	48	53
	25	1	00	46.94	+5	11	14.2	0.628 654	13.99	5.34	10	45	08
	26	1	01	06.97	4	58	44.0	0.638 798	13.77	5.26	10	41	39
	27	1	01	44.17	4	48	50.2	0.649 584	13.54	5.17	10	38	28
	28	1	02	38.16	4	41	32.3	0.660 961	13.31	5.08	10	35	33
	29	1	03	48.50	4	36	48.6	0.672 881	13.07	4.99	10	32	54
	30	1	05	14.70	4	34	36.1	0.685 300	12.83	4.90	10	30	31
May	1	1	06	56.23	+4	34	51.4	0.698 179	12.60	4.81	10	28	22
	2	1	08	52.53	4	37	30.1	0.711 482	12.36	4.72	10	26	29
	3	1	11	03.06	4	42	27.8	0.725 175	12.13	4.63	10	24	49
	4	1	13	27.28	4	49	39.4	0.739 229	11.90	4.55	10	23	22
	5	1	16	04.66	4	58	59.9	0.753 616	11.67	4.46	10	22	09
	6	1	18	54.71	5	10	24.1	0.768 311	11.45	4.37	10	21	08
	7	1	21	56.96	+5	23	46.8	0.783 293	11.23	4.29	10	20	18
	8	1	25	10.99	5	39	02.7	0.798 542	11.01	4.21	10	19	41
	9	1	28	36.38	5	56	06.9	0.814 038	10.80	4.13	10	19	14
	10	1	32	12.79	6	14	54.2	0.829 766	10.60	4.05	10	18	59
	11	1	35	59.91	6	35	19.8	0.845 710	10.40	3.97	10	18	54
	12	1	39	57.44	6	57	18.7	0.861 853	10.20	3.90	10	18	59
	13	1	44	05.16	+7	20	46.4	0.878 183	10.01	3.83	10	19	15
	14	1	48	22.89	7	45	38.2	0.894 686	9.83	3.76	10	19	40
	15	1	52	50.46	8	11	49.6	0.911 346	9.65	3.69	10	20	16
	16	1	57	27.77	8	39	16.1	0.928 150	9.47	3.62	10	21	00
	17	2	02	14.75	+9	07	53.4	0.945 082	9.31	3.56	10	21	55

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

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		h	m	s	°	'	"		"	"	h	m	s
May	17	2	02	14.75	+9	07	53.4	0.945 082	9.31	3.56	10	21	55
	18	2	07	11.37	9	37	37.1	0.962 127	9.14	3.49	10	22	59
	19	2	12	17.63	10	08	22.9	0.979 267	8.98	3.43	10	24	13
	20	2	17	33.57	10	40	06.4	0.996 484	8.83	3.37	10	25	37
	21	2	22	59.28	11	12	43.1	1.013 756	8.67	3.31	10	27	11
	22	2	28	34.86	11	46	08.5	1.031 060	8.53	3.26	10	28	54
	23	2	34	20.44	+12	20	18.0	1.048 371	8.39	3.20	10	30	48
	24	2	40	16.20	12	55	06.8	1.065 660	8.25	3.15	10	32	52
	25	2	46	22.31	13	30	29.7	1.082 892	8.12	3.10	10	35	06
	26	2	52	39.00	14	06	21.5	1.100 032	7.99	3.05	10	37	31
	27	2	59	06.49	14	42	36.4	1.117 038	7.87	3.01	10	40	07
	28	3	05	45.01	15	19	08.6	1.133 863	7.76	2.96	10	42	54
	29	3	12	34.80	+15	55	51.4	1.150 454	7.64	2.92	10	45	53
	30	3	19	36.08	16	32	37.9	1.166 755	7.54	2.88	10	49	04
	31	3	26	49.08	17	09	20.7	1.182 701	7.44	2.84	10	52	26
June	1	3	34	13.98	17	45	51.6	1.198 221	7.34	2.80	10	56	00
	2	3	41	50.93	18	22	01.9	1.213 240	7.25	2.77	10	59	47
	3	3	49	40.00	18	57	42.3	1.227 674	7.16	2.74	11	03	45
	4	3	57	41.20	+19	32	42.8	1.241 437	7.08	2.71	11	07	56
	5	4	05	54.44	20	06	52.7	1.254 437	7.01	2.68	11	12	19
	6	4	14	19.50	20	40	00.8	1.266 578	6.94	2.65	11	16	54
	7	4	22	56.03	21	11	55.4	1.277 764	6.88	2.63	11	21	40
	8	4	31	43.54	21	42	24.6	1.287 902	6.83	2.61	11	26	37
	9	4	40	41.35	22	11	16.2	1.296 899	6.78	2.59	11	31	44
	10	4	49	48.61	+22	38	18.1	1.304 672	6.74	2.58	11	37	00
	11	4	59	04.32	23	03	18.6	1.311 146	6.71	2.56	11	42	24
	12	5	08	27.29	23	26	06.8	1.316 259	6.68	2.55	11	47	55
	13	5	17	56.17	23	46	32.6	1.319 964	6.66	2.55	11	53	31
	14	5	27	29.53	24	04	27.4	1.322 232	6.65	2.54	11	59	11
	15	5	37	05.81	24	19	43.8	1.323 052	6.65	2.54	12	04	53
	16	5	46	43.40	+24	32	16.2	1.322 432	6.65	2.54	12	10	35
	17	5	56	20.68	24	42	01.2	1.320 398	6.66	2.54	12	16	16
	18	6	05	56.08	24	48	56.7	1.316 994	6.68	2.55	12	21	55
	19	6	15	28.08	24	53	02.9	1.312 278	6.70	2.56	12	27	29
	20	6	24	55.23	24	54	21.4	1.306 319	6.73	2.57	12	32	58
	21	6	34	16.25	24	52	55.4	1.299 198	6.77	2.59	12	38	20
	22	6	43	29.96	+24	48	49.5	1.291 000	6.81	2.60	12	43	34
	23	6	52	35.34	24	42	09.2	1.281 814	6.86	2.62	12	48	39
	24	7	01	31.51	24	33	01.3	1.271 729	6.92	2.64	12	53	35
	25	7	10	17.73	24	21	32.7	1.260 835	6.97	2.66	12	58	20
	26	7	18	53.42	24	07	51.3	1.249 217	7.04	2.69	13	02	54
	27	7	27	18.10	23	52	04.8	1.236 957	7.11	2.72	13	07	17
	28	7	35	31.41	+23	34	21.3	1.224 132	7.18	2.74	13	11	28
	29	7	43	33.09	23	14	48.8	1.210 814	7.26	2.77	13	15	27
	30	7	51	22.95	22	53	35.5	1.197 067	7.35	2.81	13	19	14
July	1	7	59	00.90	22	30	49.2	1.182 951	7.43	2.84	13	22	50
	2	8	06	26.87	+22	06	37.5	1.168 521	7.53	2.88	13	26	13

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	7	59	00.90	+22	30	49.2	1.182 951	7.43	2.84	13	22	50
	2	8	06	26.87	22	06	37.5	1.168 521	7.53	2.88	13	26	13
	3	8	13	40.86	21	41	07.9	1.153 826	7.62	2.91	13	29	24
	4	8	20	42.88	21	14	27.6	1.138 908	7.72	2.95	13	32	23
	5	8	27	32.99	20	46	43.6	1.123 807	7.83	2.99	13	35	10
	6	8	34	11.25	20	18	02.6	1.108 558	7.93	3.03	13	37	45
	7	8	40	37.73	+19	48	31.0	1.093 192	8.04	3.07	13	40	09
	8	8	46	52.51	19	18	15.2	1.077 735	8.16	3.12	13	42	21
	9	8	52	55.66	18	47	21.1	1.062 213	8.28	3.16	13	44	21
	10	8	58	47.27	18	15	54.5	1.046 646	8.40	3.21	13	46	10
	11	9	04	27.39	17	44	01.2	1.031 053	8.53	3.26	13	47	47
	12	9	09	56.07	17	11	46.5	1.015 453	8.66	3.31	13	49	12
	13	9	15	13.33	+16	39	15.9	0.999 860	8.80	3.36	13	50	26
	14	9	20	19.20	16	06	34.7	0.984 289	8.93	3.41	13	51	29
	15	9	25	13.64	15	33	48.1	0.968 753	9.08	3.47	13	52	21
	16	9	29	56.63	15	01	01.2	0.953 263	9.23	3.52	13	53	00
	17	9	34	28.10	14	28	19.2	0.937 832	9.38	3.58	13	53	29
	18	9	38	47.94	13	55	47.3	0.922 470	9.53	3.64	13	53	45
	19	9	42	56.03	+13	23	30.7	0.907 190	9.69	3.70	13	53	50
	20	9	46	52.21	12	51	34.7	0.892 002	9.86	3.77	13	53	42
	21	9	50	36.28	12	20	04.6	0.876 918	10.03	3.83	13	53	23
	22	9	54	08.01	11	49	06.0	0.861 952	10.20	3.90	13	52	51
	23	9	57	27.13	11	18	44.4	0.847 115	10.38	3.97	13	52	06
	24	10	00	33.34	10	49	05.7	0.832 424	10.56	4.04	13	51	08
	25	10	03	26.30	+10	20	15.8	0.817 893	10.75	4.11	13	49	57
	26	10	06	05.65	9	52	21.1	0.803 541	10.94	4.18	13	48	31
	27	10	08	30.96	9	25	28.0	0.789 386	11.14	4.26	13	46	52
	28	10	10	41.81	8	59	43.4	0.775 450	11.34	4.33	13	44	58
	29	10	12	37.71	8	35	14.4	0.761 758	11.54	4.41	13	42	49
	30	10	14	18.18	8	12	08.4	0.748 337	11.75	4.49	13	40	24
	31	10	15	42.68	+7	50	33.3	0.735 217	11.96	4.57	13	37	43
Aug.	1	10	16	50.71	7	30	37.1	0.722 432	12.17	4.65	13	34	45
	2	10	17	41.74	7	12	28.2	0.710 022	12.39	4.73	13	31	30
	3	10	18	15.26	6	56	15.1	0.698 027	12.60	4.81	13	27	58
	4	10	18	30.81	6	42	06.6	0.686 496	12.81	4.89	13	24	07
	5	10	18	28.00	6	30	11.3	0.675 482	13.02	4.97	13	19	58
	6	10	18	06.53	+6	20	38.0	0.665 041	13.22	5.05	13	15	30
	7	10	17	26.20	6	13	34.6	0.655 236	13.42	5.13	13	10	44
	8	10	16	27.01	6	09	08.9	0.646 135	13.61	5.20	13	05	39
	9	10	15	09.12	6	07	27.6	0.637 813	13.79	5.27	13	00	16
	10	10	13	32.97	6	08	36.0	0.630 347	13.95	5.33	12	54	35
	11	10	11	39.26	6	12	38.0	0.623 819	14.10	5.39	12	48	37
	12	10	09	29.02	+6	19	35.4	0.618 316	14.22	5.43	12	42	24
	13	10	07	03.65	6	29	27.3	0.613 925	14.32	5.47	12	35	56
	14	10	04	24.93	6	42	10.2	0.610 737	14.40	5.50	12	29	17
	15	10	01	35.04	6	57	37.3	0.608 840	14.44	5.52	12	22	28
	16	9	58	36.55	+7	15	38.4	0.608 319	14.46	5.52	12	15	31

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	9	58	36.55	+7	15	38.4	0.608 319	14.46	5.52	12	15	31
	17	9	55	32.41	7	35	59.9	0.609 258	14.43	5.51	12	08	31
	18	9	52	25.90	7	58	24.7	0.611 730	14.38	5.49	12	01	30
	19	9	49	20.55	8	22	32.7	0.615 802	14.28	5.46	11	54	32
	20	9	46	20.08	8	48	01.0	0.621 529	14.15	5.41	11	47	41
	21	9	43	28.29	9	14	24.8	0.628 954	13.98	5.34	11	41	00
	22	9	40	48.95	+9	41	18.0	0.638 104	13.78	5.27	11	34	33
	23	9	38	25.70	10	08	13.7	0.648 995	13.55	5.18	11	28	24
	24	9	36	21.96	10	34	45.2	0.661 621	13.29	5.08	11	22	35
	25	9	34	40.83	11	00	26.7	0.675 966	13.01	4.97	11	17	11
	26	9	33	25.04	11	24	53.7	0.691 992	12.71	4.86	11	12	12
	27	9	32	36.87	11	47	43.2	0.709 649	12.39	4.73	11	07	42
	28	9	32	18.17	+12	08	34.4	0.728 869	12.07	4.61	11	03	41
	29	9	32	30.29	12	27	08.6	0.749 568	11.73	4.48	11	00	12
	30	9	33	14.14	12	43	09.0	0.771 647	11.40	4.35	10	57	14
	31	9	34	30.16	12	56	21.1	0.794 993	11.06	4.23	10	54	48
Sept.	1	9	36	18.37	13	06	32.6	0.819 476	10.73	4.10	10	52	55
	2	9	38	38.39	13	13	33.2	0.844 954	10.41	3.98	10	51	32
	3	9	41	29.44	+13	17	14.5	0.871 273	10.09	3.86	10	50	41
	4	9	44	50.42	13	17	30.2	0.898 263	9.79	3.74	10	50	18
	5	9	48	39.91	13	14	16.3	0.925 751	9.50	3.63	10	50	23
	6	9	52	56.21	13	07	30.6	0.953 550	9.22	3.52	10	50	55
	7	9	57	37.41	12	57	13.3	0.981 474	8.96	3.42	10	51	50
	8	10	02	41.40	12	43	26.7	1.009 335	8.71	3.33	10	53	07
	9	10	08	05.93	+12	26	15.2	1.036 948	8.48	3.24	10	54	44
	10	10	13	48.68	12	05	45.4	1.064 138	8.26	3.16	10	56	37
	11	10	19	47.29	11	42	05.7	1.090 740	8.06	3.08	10	58	46
	12	10	25	59.42	11	15	26.2	1.116 604	7.88	3.01	11	01	07
	13	10	32	22.83	10	45	58.5	1.141 602	7.70	2.94	11	03	39
	14	10	38	55.37	10	13	55.2	1.165 622	7.54	2.88	11	06	19
	15	10	45	35.04	+9	39	29.6	1.188 576	7.40	2.83	11	09	05
	16	10	52	20.03	9	02	55.4	1.210 396	7.27	2.78	11	11	56
	17	10	59	08.72	8	24	26.5	1.231 035	7.14	2.73	11	14	49
	18	11	05	59.71	7	44	16.5	1.250 463	7.03	2.69	11	17	45
	19	11	12	51.77	7	02	38.5	1.268 668	6.93	2.65	11	20	41
	20	11	19	43.88	6	19	45.1	1.285 652	6.84	2.61	11	23	36
	21	11	26	35.21	+5	35	47.8	1.301 429	6.76	2.58	11	26	31
	22	11	33	25.06	4	50	57.9	1.316 020	6.68	2.55	11	29	24
	23	11	40	12.90	4	05	25.2	1.329 457	6.61	2.53	11	32	14
	24	11	46	58.33	3	19	19.2	1.341 774	6.55	2.50	11	35	02
	25	11	53	41.04	2	32	48.0	1.353 009	6.50	2.48	11	37	47
	26	12	00	20.82	1	45	59.4	1.363 204	6.45	2.46	11	40	29
	27	12	06	57.56	+0	59	00.0	1.372 400	6.41	2.45	11	43	08
	28	12	13	31.20	+0	11	56.1	1.380 638	6.37	2.43	11	45	44
	29	12	20	01.72	-0	35	07.0	1.387 959	6.34	2.42	11	48	17
	30	12	26	29.18	1	22	04.4	1.394 403	6.31	2.41	11	50	46
Oct.	1	12	32	53.64	-2	08	51.7	1.400 008	6.28	2.40	11	53	13

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	12	32	53.64	-2	08	51.7	1.400 008	6.28	2.40	11	53	13
	2	12	39	15.20	2	55	25.1	1.404 809	6.26	2.39	11	55	37
	3	12	45	34.00	3	41	41.2	1.408 840	6.24	2.38	11	57	58
	4	12	51	50.16	4	27	36.6	1.412 133	6.23	2.38	12	00	17
	5	12	58	03.84	5	13	08.8	1.414 716	6.22	2.38	12	02	33
	6	13	04	15.19	5	58	15.2	1.416 617	6.21	2.37	12	04	47
	7	13	10	24.39	-6	42	53.4	1.417 860	6.20	2.37	12	06	59
	8	13	16	31.57	7	27	01.4	1.418 468	6.20	2.37	12	09	09
	9	13	22	36.92	8	10	37.3	1.418 462	6.20	2.37	12	11	17
	10	13	28	40.59	8	53	39.3	1.417 860	6.20	2.37	12	13	23
	11	13	34	42.73	9	36	05.9	1.416 679	6.21	2.37	12	15	28
	12	13	40	43.50	10	17	55.4	1.414 933	6.22	2.37	12	17	32
	13	13	46	43.04	-10	59	06.4	1.412 636	6.23	2.38	12	19	34
	14	13	52	41.49	11	39	37.6	1.409 800	6.24	2.38	12	21	36
	15	13	58	38.99	12	19	27.6	1.406 435	6.25	2.39	12	23	37
	16	14	04	35.66	12	58	35.3	1.402 549	6.27	2.40	12	25	37
	17	14	10	31.63	13	36	59.3	1.398 150	6.29	2.40	12	27	36
	18	14	16	27.01	14	14	38.6	1.393 243	6.31	2.41	12	29	35
	19	14	22	21.90	-14	51	32.0	1.387 834	6.34	2.42	12	31	33
	20	14	28	16.39	15	27	38.3	1.381 925	6.36	2.43	12	33	31
	21	14	34	10.54	16	02	56.4	1.375 518	6.39	2.44	12	35	28
	22	14	40	04.43	16	37	25.0	1.368 616	6.43	2.46	12	37	26
	23	14	45	58.08	17	11	03.0	1.361 217	6.46	2.47	12	39	23
	24	14	51	51.54	17	43	49.1	1.353 322	6.50	2.48	12	41	20
	25	14	57	44.81	-18	15	42.0	1.344 928	6.54	2.50	12	43	17
	26	15	03	37.89	18	46	40.5	1.336 032	6.58	2.51	12	45	13
	27	15	09	30.74	19	16	43.1	1.326 633	6.63	2.53	12	47	10
	28	15	15	23.32	19	45	48.7	1.316 726	6.68	2.55	12	49	06
	29	15	21	15.55	20	13	55.7	1.306 306	6.73	2.57	12	51	01
	30	15	27	07.33	20	41	02.8	1.295 369	6.79	2.59	12	52	56
	31	15	32	58.52	-21	07	08.5	1.283 908	6.85	2.62	12	54	51
Nov.	1	15	38	48.95	21	32	11.2	1.271 920	6.91	2.64	12	56	44
	2	15	44	38.43	21	56	09.5	1.259 397	6.98	2.67	12	58	37
	3	15	50	26.70	22	19	01.6	1.246 332	7.06	2.70	13	00	28
	4	15	56	13.46	22	40	46.1	1.232 721	7.13	2.73	13	02	17
	5	16	01	58.37	23	01	21.3	1.218 557	7.22	2.76	13	04	04
	6	16	07	41.02	-23	20	45.3	1.203 834	7.31	2.79	13	05	49
	7	16	13	20.94	23	38	56.6	1.188 547	7.40	2.83	13	07	31
	8	16	18	57.58	23	55	53.2	1.172 693	7.50	2.87	13	09	09
	9	16	24	30.30	24	11	33.5	1.156 267	7.61	2.91	13	10	43
	10	16	29	58.40	24	25	55.5	1.139 268	7.72	2.95	13	12	12
	11	16	35	21.04	24	38	57.4	1.121 698	7.84	3.00	13	13	34
	12	16	40	37.29	-24	50	37.4	1.103 558	7.97	3.04	13	14	50
	13	16	45	46.08	25	00	53.5	1.084 857	8.11	3.10	13	15	58
	14	16	50	46.19	25	09	43.9	1.065 604	8.25	3.15	13	16	56
	15	16	55	36.25	25	17	06.7	1.045 816	8.41	3.21	13	17	43
	16	17	00	14.70	-25	22	59.8	1.025 514	8.58	3.28	13	18	18

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	17	00	14.70	-25	22	59.8	1.025 514	8.58	3.28	13	18	18
	17	17	04	39.79	25	27	21.5	1.004 727	8.75	3.34	13	18	38
	18	17	08	49.54	25	30	09.6	0.983 495	8.94	3.42	13	18	42
	19	17	12	41.75	25	31	22.0	0.961 868	9.14	3.49	13	18	27
	20	17	16	13.95	25	30	56.6	0.939 908	9.36	3.57	13	17	50
	21	17	19	23.45	25	28	50.8	0.917 694	9.58	3.66	13	16	49
	22	17	22	07.30	-25	25	02.1	0.895 324	9.82	3.75	13	15	21
	23	17	24	22.34	25	19	27.6	0.872 915	10.07	3.85	13	13	23
	24	17	26	05.23	25	12	04.0	0.850 611	10.34	3.95	13	10	50
	25	17	27	12.57	25	02	47.8	0.828 581	10.61	4.06	13	07	40
	26	17	27	40.97	24	51	35.1	0.807 025	10.90	4.16	13	03	50
	27	17	27	27.32	24	38	21.9	0.786 173	11.19	4.27	12	59	17
	28	17	26	28.97	-24	23	04.1	0.766 286	11.48	4.38	12	53	58
	29	17	24	44.08	24	05	38.6	0.747 651	11.76	4.49	12	47	53
	30	17	22	12.02	23	46	04.0	0.730 583	12.04	4.60	12	41	02
Dec.	1	17	18	53.71	23	24	21.7	0.715 406	12.29	4.70	12	33	26
	2	17	14	52.03	23	00	38.2	0.702 449	12.52	4.78	12	25	10
	3	17	10	12.06	22	35	06.2	0.692 021	12.71	4.86	12	16	20
	4	17	05	01.14	-22	08	06.6	0.684 398	12.85	4.91	12	07	04
	5	16	59	28.61	21	40	09.5	0.679 798	12.94	4.94	11	57	32
	6	16	53	45.37	21	11	53.0	0.678 364	12.96	4.95	11	47	55
	7	16	48	03.03	20	44	02.1	0.680 151	12.93	4.94	11	38	25
	8	16	42	33.10	20	17	24.6	0.685 119	12.84	4.90	11	29	12
	9	16	37	26.04	19	52	46.8	0.693 138	12.69	4.85	11	20	25
	10	16	32	50.66	-19	30	50.0	0.704 001	12.49	4.77	11	12	13
	11	16	28	53.62	19	12	06.5	0.717 436	12.26	4.68	11	04	41
	12	16	25	39.35	18	56	58.1	0.733 131	12.00	4.58	10	57	53
	13	16	23	10.20	18	45	35.6	0.750 755	11.71	4.48	10	51	49
	14	16	21	26.69	18	37	59.7	0.769 971	11.42	4.36	10	46	31
	15	16	20	27.92	18	34	03.0	0.790 456	11.13	4.25	10	41	56
	16	16	20	11.97	-18	33	31.5	0.811 910	10.83	4.14	10	38	02
	17	16	20	36.23	18	36	07.2	0.834 058	10.54	4.03	10	34	47
	18	16	21	37.72	18	41	29.6	0.856 659	10.27	3.92	10	32	08
	19	16	23	13.31	18	49	16.9	0.879 504	10.00	3.82	10	30	01
	20	16	25	19.89	18	59	07.8	0.902 414	9.75	3.72	10	28	23
	21	16	27	54.44	19	10	41.6	0.925 238	9.50	3.63	10	27	13
	22	16	30	54.16	-19	23	38.7	0.947 854	9.28	3.54	10	26	26
	23	16	34	16.47	19	37	41.2	0.970 159	9.06	3.46	10	26	01
	24	16	37	59.00	19	52	32.9	0.992 073	8.86	3.39	10	25	55
	25	16	41	59.65	20	07	58.9	1.013 531	8.68	3.32	10	26	07
	26	16	46	16.53	20	23	46.3	1.034 483	8.50	3.25	10	26	33
	27	16	50	47.95	20	39	43.2	1.054 891	8.34	3.19	10	27	14
	28	16	55	32.44	-20	55	39.4	1.074 727	8.18	3.13	10	28	07
	29	17	00	28.68	21	11	25.6	1.093 971	8.04	3.07	10	29	12
	30	17	05	35.50	21	26	53.9	1.112 609	7.90	3.02	10	30	26
	31	17	10	51.89	21	41	56.9	1.130 634	7.78	2.97	10	31	50
	32	17	16	16.93	-21	56	28.4	1.148 042	7.66	2.93	10	33	22

VENUS, 2024
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	′	″	°	′	″				°	′	″	°	′	″	
Jan.	1	186	26	47.4	+3	11	58.3	0.720 4535	Apr.	2	332	53	30.3	-3	17	38.9	0.727 8904
	3	189	40	46.5	3	07	49.7	0.720 6792		4	336	03	41.4	3	20	04.0	0.727 7868
	5	192	54	36.6	3	03	05.6	0.720 9131		6	339	13	56.7	3	21	52.5	0.727 6694
	7	196	08	17.2	2	57	46.9	0.721 1545		8	342	24	16.5	3	23	04.0	0.727 5386
	9	199	21	48.0	2	51	54.6	0.721 4028		10	345	34	41.0	3	23	38.2	0.727 3948
	11	202	35	08.7	2	45	30.0	0.721 6569		12	348	45	10.2	3	23	35.1	0.727 2383
	13	205	48	18.8	+2	38	34.3	0.721 9163		14	351	55	44.5	-3	22	54.5	0.727 0697
	15	209	01	18.4	2	31	09.0	0.722 1800		16	355	06	23.8	3	21	36.6	0.726 8895
	17	212	14	07.3	2	23	15.5	0.722 4472		18	358	17	08.4	3	19	41.4	0.726 6982
	19	215	26	45.2	2	14	55.5	0.722 7170		20	1	27	58.4	3	17	09.4	0.726 4964
	21	218	39	12.2	2	06	10.4	0.722 9887		22	4	38	53.7	3	14	00.9	0.726 2847
	23	221	51	28.3	1	57	02.0	0.723 2614		24	7	49	54.6	3	10	16.5	0.726 0638
	25	225	03	33.6	+1	47	32.2	0.723 5342		26	11	01	01.1	-3	05	56.7	0.725 8343
	27	228	15	28.2	1	37	42.7	0.723 8062		28	14	12	13.4	3	01	02.4	0.725 5970
	29	231	27	12.3	1	27	35.4	0.724 0767		30	17	23	31.4	2	55	34.3	0.725 3526
	31	234	38	46.1	1	17	12.2	0.724 3447	May	2	20	34	55.3	2	49	33.3	0.725 1018
Feb.	2	237	50	09.9	1	06	35.2	0.724 6095		4	23	46	25.2	2	43	00.7	0.724 8454
	4	241	01	23.9	0	55	46.2	0.724 8702		6	26	58	01.1	2	35	57.4	0.724 5843
	6	244	12	28.6	+0	44	47.4	0.725 1260		8	30	09	43.2	-2	28	24.7	0.724 3191
	8	247	23	24.3	0	33	40.7	0.725 3762		10	33	21	31.5	2	20	24.1	0.724 0508
	10	250	34	11.5	0	22	28.3	0.725 6199		12	36	33	26.1	2	11	56.9	0.723 7801
	12	253	44	50.6	0	11	12.1	0.725 8564		14	39	45	27.2	2	03	04.6	0.723 5080
	14	256	55	22.2	+0	00	05.7	0.726 0850		16	42	57	34.8	1	53	49.0	0.723 2352
	16	260	05	46.7	-0	11	23.0	0.726 3050		18	46	09	48.9	1	44	11.5	0.722 9627
	18	263	16	04.6	-0	22	37.8	0.726 5157		20	49	22	09.8	-1	34	14.1	0.722 6912
	20	266	26	16.6	0	33	48.2	0.726 7165		22	52	34	37.4	1	23	58.6	0.722 4217
	22	269	36	23.2	0	44	51.9	0.726 9067		24	55	47	12.0	1	13	26.7	0.722 1549
	24	272	46	25.0	0	55	47.1	0.727 0858		26	58	59	53.4	1	02	40.6	0.721 8918
	26	275	56	22.4	1	06	31.7	0.727 2533		28	62	12	41.9	0	51	42.2	0.721 6331
	28	279	06	16.2	1	17	03.9	0.727 4086		30	65	25	37.5	0	40	33.6	0.721 3796
Mar.	1	282	16	06.8	-1	27	21.8	0.727 5512	June	1	68	38	40.2	-0	29	16.8	0.721 1323
	3	285	25	54.9	1	37	23.4	0.727 6808		3	71	51	50.2	0	17	54.0	0.720 8918
	5	288	35	41.0	1	47	07.1	0.727 7969		5	75	05	07.3	-0	06	27.4	0.720 6590
	7	291	45	25.6	1	56	31.0	0.727 8991		7	78	18	31.7	+0	05	00.8	0.720 4345
	9	294	55	09.4	2	05	33.5	0.727 9873		9	81	32	03.2	0	16	28.6	0.720 2191
	11	298	04	52.7	2	14	12.9	0.728 0610		11	84	45	41.9	0	27	53.6	0.720 0134
	13	301	14	36.2	-2	22	27.8	0.728 1202		13	87	59	27.8	+0	39	13.7	0.719 8182
	15	304	24	20.2	2	30	16.6	0.728 1645		15	91	13	20.6	0	50	26.6	0.719 6341
	17	307	34	05.3	2	37	38.0	0.728 1939		17	94	27	20.3	1	01	30.3	0.719 4616
	19	310	43	51.8	2	44	30.5	0.728 2083		19	97	41	26.6	1	12	22.5	0.719 3013
	21	313	53	40.3	2	50	53.0	0.728 2076		21	100	55	39.5	1	23	01.1	0.719 1537
	23	317	03	31.0	2	56	44.3	0.728 1918		23	104	09	58.7	1	33	24.1	0.719 0193
	25	320	13	24.3	-3	02	03.3	0.728 1611		25	107	24	24.0	+1	43	29.4	0.718 8986
	27	323	23	20.6	3	06	49.2	0.728 1154		27	110	38	54.9	1	53	15.1	0.718 7918
	29	326	33	20.2	3	11	00.9	0.728 0549		29	113	53	31.2	2	02	39.1	0.718 6994
	31	329	43	23.4	3	14	37.7	0.727 9798	July	1	117	08	12.5	2	11	39.7	0.718 6217
Apr.	2	332	53	30.3	-3	17	38.9	0.727 8904		3	120	22	58.4	+2	20	15.2	0.718 5588

VENUS, 2024
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	117	08	12.5	+2	11	39.7	0.718 6217	Oct.	1	265	20	07.7	-0	29	54.2	0.726 6446
	3	120	22	58.4	2	20	15.2	0.718 5588		3	268	30	16.3	0	41	00.4	0.726 8381
	5	123	37	48.4	2	28	23.6	0.718 5111		5	271	40	19.7	0	51	58.9	0.727 0208
	7	126	52	42.1	2	36	03.7	0.718 4786		7	274	50	18.8	1	02	47.4	0.727 1920
	9	130	07	38.8	2	43	13.6	0.718 4615		9	278	00	13.9	1	13	24.2	0.727 3512
	11	133	22	38.0	2	49	52.2	0.718 4599		11	281	10	05.7	1	23	47.3	0.727 4979
	13	136	37	39.2	+2	55	58.0	0.718 4736		13	284	19	54.8	-1	33	54.8	0.727 6318
	15	139	52	41.7	3	01	29.9	0.718 5027		15	287	29	41.7	1	43	45.0	0.727 7523
	17	143	07	44.9	3	06	26.7	0.718 5471		17	290	39	26.9	1	53	16.0	0.727 8591
	19	146	22	48.2	3	10	47.6	0.718 6067		19	293	49	11.1	2	02	26.2	0.727 9520
	21	149	37	50.7	3	14	31.7	0.718 6811		21	296	58	54.7	2	11	13.9	0.728 0305
	23	152	52	52.0	3	17	38.2	0.718 7703		23	300	08	38.3	2	19	37.6	0.728 0945
	25	156	07	51.2	+3	20	06.7	0.718 8739		25	303	18	22.3	-2	27	35.7	0.728 1438
	27	159	22	47.6	3	21	56.6	0.718 9916		27	306	28	07.2	2	35	06.8	0.728 1783
	29	162	37	40.6	3	23	07.6	0.719 1230		29	309	37	53.4	2	42	09.6	0.728 1977
	31	165	52	29.4	3	23	39.5	0.719 2676		31	312	47	41.3	2	48	42.7	0.728 2022
Aug.	2	169	07	13.5	3	23	32.3	0.719 4250	Nov.	2	315	57	31.4	2	54	45.1	0.728 1916
	4	172	21	52.0	3	22	46.1	0.719 5947		4	319	07	24.1	3	00	15.5	0.728 1659
	6	175	36	24.4	+3	21	21.0	0.719 7762		6	322	17	19.5	-3	05	13.1	0.728 1253
	8	178	50	50.0	3	19	17.4	0.719 9689		8	325	27	18.1	3	09	36.8	0.728 0699
	10	182	05	08.3	3	16	35.8	0.720 1720		10	328	37	20.3	3	13	25.9	0.727 9999
	12	185	19	18.7	3	13	16.7	0.720 3851		12	331	47	26.1	3	16	39.7	0.727 9153
	14	188	33	20.6	3	09	20.9	0.720 6074		14	334	57	35.9	3	19	17.5	0.727 8166
	16	191	47	13.7	3	04	49.1	0.720 8382		16	338	07	49.9	3	21	18.8	0.727 7040
	18	195	00	57.4	+2	59	42.3	0.721 0767		18	341	18	08.4	-3	22	43.3	0.727 5778
	20	198	14	31.5	2	54	01.7	0.721 3223		20	344	28	31.4	3	23	30.6	0.727 4385
	22	201	27	55.5	2	47	48.2	0.721 5741		22	347	38	59.2	3	23	40.5	0.727 2863
	24	204	41	09.1	2	41	03.3	0.721 8313		24	350	49	31.9	3	23	13.0	0.727 1219
	26	207	54	12.3	2	33	48.2	0.722 0931		26	354	00	09.7	3	22	08.1	0.726 9457
	28	211	07	04.7	2	26	04.4	0.722 3588		28	357	10	52.7	3	20	26.0	0.726 7581
	30	214	19	46.3	+2	17	53.4	0.722 6273		30	0	21	41.0	-3	18	06.8	0.726 5599
Sept.	1	217	32	17.0	2	09	16.9	0.722 8980	Dec.	2	3	32	34.6	3	15	11.0	0.726 3516
	3	220	44	36.8	2	00	16.6	0.723 1699		4	6	43	33.8	3	11	39.1	0.726 1339
	5	223	56	45.7	1	50	54.0	0.723 4423		6	9	54	38.6	3	07	31.6	0.725 9073
	7	227	08	44.0	1	41	11.2	0.723 7142		8	13	05	49.0	3	02	49.2	0.725 6726
	9	230	20	31.6	1	31	09.9	0.723 9848		10	16	17	05.2	2	57	32.8	0.725 4306
	11	233	32	08.9	+1	20	52.1	0.724 2532		12	19	28	27.2	-2	51	43.2	0.725 1819
	13	236	43	36.1	1	10	19.6	0.724 5188		14	22	39	55.2	2	45	21.5	0.724 9273
	15	239	54	53.4	0	59	34.6	0.724 7805		16	25	51	29.3	2	38	28.7	0.724 6677
	17	243	06	01.3	0	48	39.0	0.725 0376		18	29	03	09.4	2	31	06.2	0.724 4037
	19	246	17	00.1	0	37	34.8	0.725 2893		20	32	14	55.8	2	23	15.2	0.724 1363
	21	249	27	50.3	0	26	24.2	0.725 5349		22	35	26	48.4	2	14	57.1	0.723 8663
	23	252	38	32.2	+0	15	09.1	0.725 7735		24	38	38	47.4	-2	06	13.4	0.723 5945
	25	255	49	06.4	+0	03	51.7	0.726 0045		26	41	50	52.9	1	57	05.7	0.723 3218
	27	258	59	33.4	-0	07	26.1	0.726 2271		28	45	03	05.0	1	47	35.6	0.723 0489
	29	262	09	53.7	0	18	42.0	0.726 4407		30	48	15	23.7	1	37	45.0	0.722 7769
Oct.	1	265	20	07.7	-0	29	54.2	0.726 6446		32	51	27	49.2	-1	27	35.5	0.722 5065

VENUS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	241	23	45.0	+1	58	43.7	Feb.	15	297	55	59.9	-0	02	53.0
	1	242	36	40.8	1	56	59.4		16	299	10	12.0	0	05	43.2
	2	243	49	40.2	1	55	10.9		17	300	24	24.5	0	08	32.0
	3	245	02	43.0	1	53	18.1		18	301	38	37.3	0	11	19.3
	4	246	15	49.3	1	51	21.4		19	302	52	50.4	0	14	05.1
	5	247	28	58.8	1	49	20.8		20	304	07	03.8	0	16	49.1
	6	248	42	11.5	+1	47	16.4		21	305	21	17.4	-0	19	31.3
	7	249	55	27.2	1	45	08.3		22	306	35	31.2	0	22	11.7
	8	251	08	45.9	1	42	56.8		23	307	49	45.3	0	24	50.0
	9	252	22	07.3	1	40	41.9		24	309	03	59.6	0	27	26.3
	10	253	35	31.4	1	38	23.7		25	310	18	14.2	0	30	00.4
	11	254	48	57.9	1	36	02.5		26	311	32	29.1	0	32	32.2
	12	256	02	26.7	+1	33	38.2		27	312	46	44.2	-0	35	01.6
	13	257	15	57.6	1	31	11.1		28	314	00	59.6	0	37	28.6
	14	258	29	30.4	1	28	41.2		29	315	15	15.3	0	39	53.1
	15	259	43	05.2	1	26	08.7	Mar.	1	316	29	31.3	0	42	14.9
	16	260	56	41.7	1	23	33.7		2	317	43	47.6	0	44	33.9
	17	262	10	20.0	1	20	56.4		3	318	58	04.2	0	46	50.2
	18	263	24	00.0	+1	18	16.7		4	320	12	21.1	-0	49	03.6
	19	264	37	41.8	1	15	35.0		5	321	26	38.1	0	51	14.0
	20	265	51	25.2	1	12	51.2		6	322	40	55.3	0	53	21.4
	21	267	05	10.3	1	10	05.6		7	323	55	12.6	0	55	25.8
	22	268	18	57.1	1	07	18.2		8	325	09	29.8	0	57	26.9
	23	269	32	45.4	1	04	29.2		9	326	23	47.0	0	59	24.8
	24	270	46	35.3	+1	01	38.7		10	327	38	04.0	-1	01	19.5
	25	272	00	26.7	0	58	46.8		11	328	52	20.7	1	03	10.7
	26	273	14	19.6	0	55	53.6		12	330	06	37.2	1	04	58.6
	27	274	28	13.9	0	52	59.4		13	331	20	53.5	1	06	43.1
	28	275	42	09.6	0	50	04.1		14	332	35	09.5	1	08	24.0
	29	276	56	06.6	0	47	08.0		15	333	49	25.1	1	10	01.5
	30	278	10	05.1	+0	44	11.2		16	335	03	40.5	-1	11	35.3
	31	279	24	04.8	0	41	13.8		17	336	17	55.4	1	13	05.5
Feb.	1	280	38	05.8	0	38	15.9		18	337	32	10.0	1	14	32.0
	2	281	52	08.1	0	35	17.7		19	338	46	24.1	1	15	54.9
	3	283	06	11.6	0	32	19.3		20	340	00	37.9	1	17	13.9
	4	284	20	16.3	0	29	20.9		21	341	14	51.2	1	18	29.2
	5	285	34	22.1	+0	26	22.4		22	342	29	04.1	-1	19	40.7
	6	286	48	28.9	0	23	24.2		23	343	43	16.6	1	20	48.3
	7	288	02	36.7	0	20	26.2		24	344	57	28.8	1	21	52.0
	8	289	16	45.2	0	17	28.7		25	346	11	40.6	1	22	51.8
	9	290	30	54.5	0	14	31.6		26	347	25	52.1	1	23	47.6
	10	291	45	04.4	0	11	35.3		27	348	40	03.4	1	24	39.5
	11	292	59	14.7	+0	08	39.7		28	349	54	14.4	-1	25	27.4
	12	294	13	25.4	0	05	44.9		29	351	08	25.2	1	26	11.3
	13	295	27	36.6	+0	02	51.2		30	352	22	35.8	1	26	51.1
	14	296	41	48.0	-0	00	01.5		31	353	36	46.2	1	27	26.9
	15	297	55	59.9	-0	02	53.0	Apr.	1	354	50	56.4	-1	27	58.7

VENUS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Apr.	1	354	50	56.4	-1	27	58.7
	2	356	05	06.4	1	28	26.4
	3	357	19	16.1	1	28	50.1
	4	358	33	25.4	1	29	09.6
	5	359	47	34.4	1	29	25.2
	6	1	01	43.0	1	29	36.7
	7	2	15	51.2	-1	29	44.1
	8	3	29	58.9	1	29	47.5
	9	4	44	06.2	1	29	47.0
	10	5	58	12.9	1	29	42.4
	11	7	12	19.1	1	29	33.9
	12	8	26	24.8	1	29	21.4
	13	9	40	29.8	-1	29	05.0
	14	10	54	34.2	1	28	44.7
	15	12	08	37.9	1	28	20.6
	16	13	22	41.0	1	27	52.6
	17	14	36	43.3	1	27	20.8
	18	15	50	44.9	1	26	45.2
	19	17	04	45.9	-1	26	05.9
	20	18	18	46.2	1	25	22.8
	21	19	32	45.9	1	24	36.1
	22	20	46	45.0	1	23	45.7
	23	22	00	43.7	1	22	51.8
	24	23	14	41.8	1	21	54.3
	25	24	28	39.5	-1	20	53.2
	26	25	42	36.9	1	19	48.7
	27	26	56	33.8	1	18	40.8
	28	28	10	30.4	1	17	29.5
	29	29	24	26.7	1	16	14.9
	30	30	38	22.7	1	14	57.1
May	1	31	52	18.2	-1	13	36.1
	2	33	06	13.5	1	12	11.9
	3	34	20	08.4	1	10	44.7
	4	35	34	02.9	1	09	14.5
	5	36	47	57.0	1	07	41.3
	6	38	01	50.8	1	06	05.4
	7	39	15	44.3	-1	04	26.6
	8	40	29	37.4	1	02	45.1
	9	41	43	30.1	1	01	01.1
	10	42	57	22.4	0	59	14.5
	11	44	11	14.3	0	57	25.4
	12	45	25	05.6	0	55	33.9
	13	46	38	56.3	-0	53	40.2
	14	47	52	46.5	0	51	44.2
	15	49	06	36.0	0	49	46.0
	16	50	20	25.1	0	47	45.9
	17	51	34	13.5	-0	45	43.7

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
May	17	51	34	13.5	-0	45	43.7
	18	52	48	01.5	0	43	39.6
	19	54	01	49.0	0	41	33.7
	20	55	15	36.1	0	39	26.1
	21	56	29	22.8	0	37	16.8
	22	57	43	09.2	0	35	06.0
	23	58	56	55.3	-0	32	53.7
	24	60	10	41.1	0	30	40.0
	25	61	24	26.8	0	28	25.0
	26	62	38	12.3	0	26	08.9
	27	63	51	57.6	0	23	51.6
	28	65	05	42.7	0	21	33.3
	29	66	19	27.8	-0	19	14.1
	30	67	33	12.7	0	16	54.0
	31	68	46	57.5	0	14	33.3
June	1	70	00	42.3	0	12	11.9
	2	71	14	27.0	0	09	50.0
	3	72	28	11.7	0	07	27.8
	4	73	41	56.0	-0	05	05.5
	5	74	55	43.4	0	02	43.0
	6	76	09	27.1	-0	00	19.3
	7	77	23	11.7	+0	02	03.7
	8	78	36	56.2	0	04	26.6
	9	79	50	40.7	0	06	49.3
	10	81	04	24.9	+0	09	11.6
	11	82	18	09.0	0	11	33.6
	12	83	31	52.8	0	13	55.1
	13	84	45	36.3	0	16	16.1
	14	85	59	19.7	0	18	36.4
	15	87	13	02.8	0	20	55.9
	16	88	26	45.8	+0	23	14.5
	17	89	40	28.6	0	25	32.2
	18	90	54	11.3	0	27	48.8
	19	92	07	53.9	0	30	04.3
	20	93	21	36.5	0	32	18.5
	21	94	35	19.0	0	34	31.5
	22	95	49	01.5	+0	36	43.0
	23	97	02	44.0	0	38	53.0
	24	98	16	26.6	0	41	01.4
	25	99	30	09.1	0	43	08.1
	26	100	43	51.7	0	45	13.0
	27	101	57	34.4	0	47	16.0
	28	103	11	17.2	+0	49	17.1
	29	104	25	00.3	0	51	16.1
	30	105	38	43.5	0	53	13.0
July	1	106	52	27.0	0	55	07.6
	2	108	06	10.8	+0	56	59.8

VENUS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
July	1	106	52	27.0	+0	55	07.6
	2	108	06	10.8	0	56	59.8
	3	109	19	54.8	0	58	49.7
	4	110	33	39.0	1	00	37.1
	5	111	47	23.3	1	02	21.9
	6	113	01	07.7	1	04	04.0
	7	114	14	52.2	+1	05	43.4
	8	115	28	36.6	1	07	20.0
	9	116	42	20.9	1	08	53.7
	10	117	56	05.1	1	10	24.4
	11	119	09	49.3	1	11	52.2
	12	120	23	33.3	1	13	16.8
	13	121	37	17.2	+1	14	38.3
	14	122	51	00.9	1	15	56.6
	15	124	04	44.5	1	17	11.6
	16	125	18	28.0	1	18	23.3
	17	126	32	11.4	1	19	31.6
	18	127	45	54.6	1	20	36.4
	19	128	59	37.7	+1	21	37.8
	20	130	13	20.7	1	22	35.6
	21	131	27	03.5	1	23	29.8
	22	132	40	46.1	1	24	20.3
	23	133	54	28.5	1	25	07.2
	24	135	08	10.8	1	25	50.3
	25	136	21	53.0	+1	26	29.6
	26	137	35	35.2	1	27	05.1
	27	138	49	17.4	1	27	36.7
	28	140	02	59.7	1	28	04.4
	29	141	16	42.0	1	28	28.1
	30	142	30	24.4	1	28	47.8
	31	143	44	06.9	+1	29	03.5
Aug.	1	144	57	49.3	1	29	15.2
	2	146	11	31.6	1	29	22.8
	3	147	25	13.9	1	29	26.3
	4	148	38	55.9	1	29	25.7
	5	149	52	37.7	1	29	21.0
	6	151	06	19.2	+1	29	12.2
	7	152	20	00.3	1	28	59.2
	8	153	33	41.1	1	28	42.1
	9	154	47	21.6	1	28	20.8
	10	156	01	01.6	1	27	55.4
	11	157	14	41.1	1	27	25.8
	12	158	28	20.3	+1	26	52.1
	13	159	41	58.9	1	26	14.3
	14	160	55	37.0	1	25	32.3
	15	162	09	14.6	1	24	46.3
	16	163	22	51.6	+1	23	56.1

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Aug.	16	163	22	51.6	+1	23	56.1
	17	164	36	27.9	1	23	01.8
	18	165	50	03.6	1	22	03.5
	19	167	03	38.6	1	21	01.2
	20	168	17	13.0	1	19	54.8
	21	169	30	46.6	1	18	44.5
	22	170	44	19.7	+1	17	30.1
	23	171	57	52.2	1	16	11.8
	24	173	11	24.3	1	14	49.6
	25	174	24	56.0	1	13	23.5
	26	175	38	27.2	1	11	53.6
	27	176	51	58.0	1	10	19.8
	28	178	05	28.4	+1	08	42.2
	29	179	18	58.3	1	07	01.0
	30	180	32	27.7	1	05	16.0
	31	181	45	56.5	1	03	27.5
Sept.	1	182	59	24.7	1	01	35.3
	2	184	12	52.3	0	59	39.7
	3	185	26	19.1	+0	57	40.6
	4	186	39	45.3	0	55	38.1
	5	187	53	10.7	0	53	32.3
	6	189	06	35.3	0	51	23.3
	7	190	19	59.1	0	49	11.1
	8	191	33	22.1	0	46	55.8
	9	192	46	44.1	+0	44	37.5
	10	194	00	05.3	0	42	16.3
	11	195	13	25.5	0	39	52.2
	12	196	26	44.7	0	37	25.3
	13	197	40	02.8	0	34	55.7
	14	198	53	19.8	0	32	23.5
	15	200	06	35.6	+0	29	48.8
	16	201	19	50.2	0	27	11.7
	17	202	33	03.5	0	24	32.2
	18	203	46	15.7	0	21	50.4
	19	204	59	26.7	0	19	06.5
	20	206	12	36.7	0	16	20.5
	21	207	25	45.6	+0	13	32.4
	22	208	38	53.6	0	10	42.5
	23	209	52	00.7	0	07	50.8
	24	211	05	06.9	0	04	57.4
	25	212	18	12.1	+0	02	02.4
	26	213	31	16.3	-0	00	54.1
	27	214	44	19.6	-0	03	51.9
	28	215	57	21.8	0	06	51.1
	29	217	10	23.1	0	09	51.4
	30	218	23	23.2	0	12	52.7
Oct.	1	219	36	22.3	-0	15	55.0

VENUS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	219	36	22.3	-0	15	55.0	Nov.	16	275	02	16.3	-2	15	58.5
	2	220	49	20.2	0	18	58.0		17	276	13	32.4	2	17	21.0
	3	222	02	17.0	0	22	01.7		18	277	24	44.4	2	18	38.3
	4	223	15	12.7	0	25	06.0		19	278	35	52.2	2	19	50.3
	5	224	28	07.2	0	28	10.8		20	279	46	55.8	2	20	56.9
	6	225	41	00.4	0	31	15.8		21	280	57	55.0	2	21	58.0
	7	226	53	52.3	-0	34	21.0		22	282	08	49.7	-2	22	53.5
	8	228	06	42.9	0	37	26.3		23	283	19	39.9	2	23	43.2
	9	229	19	32.0	0	40	31.5		24	284	30	25.4	2	24	27.1
	10	230	32	19.6	0	43	36.6		25	285	41	06.0	2	25	05.0
	11	231	45	05.6	0	46	41.3		26	286	51	41.8	2	25	36.8
	12	232	57	49.9	0	49	45.6		27	288	02	12.5	2	26	02.4
	13	234	10	32.5	-0	52	49.3		28	289	12	38.0	-2	26	21.7
	14	235	23	13.2	0	55	52.3		29	290	22	58.1	2	26	34.6
	15	236	35	52.1	0	58	54.5		30	291	33	12.6	2	26	41.0
	16	237	48	29.1	1	01	55.7	Dec.	1	292	43	21.3	2	26	40.8
	17	239	01	04.2	1	04	55.9		2	293	53	24.0	2	26	33.9
	18	240	13	37.6	1	07	54.9		3	295	03	20.4	2	26	20.2
	19	241	26	09.2	-1	10	52.5		4	296	13	10.2	-2	25	59.5
	20	242	38	39.0	1	13	48.8		5	297	22	53.2	2	25	31.8
	21	243	51	07.1	1	16	43.4		6	298	32	29.0	2	24	57.1
	22	245	03	33.4	1	19	36.4		7	299	41	57.2	2	24	15.2
	23	246	15	58.0	1	22	27.5		8	300	51	17.7	2	23	26.0
	24	247	28	20.7	1	25	16.7		9	302	00	30.0	2	22	29.5
	25	248	40	41.5	-1	28	03.7		10	303	09	33.9	-2	21	25.5
	26	249	53	00.5	1	30	48.6		11	304	18	29.0	2	20	14.1
	27	251	05	17.6	1	33	31.0		12	305	27	15.1	2	18	55.0
	28	252	17	32.7	1	36	11.0		13	306	35	51.8	2	17	28.4
	29	253	29	45.8	1	38	48.3		14	307	44	18.9	2	15	54.0
	30	254	41	56.9	1	41	22.9		15	308	52	36.1	2	14	11.8
	31	255	54	05.9	-1	43	54.6		16	310	00	43.0	-2	12	21.8
Nov.	1	257	06	12.7	1	46	23.2		17	311	08	39.3	2	10	23.9
	2	258	18	17.3	1	48	48.6		18	312	16	24.7	2	08	17.9
	3	259	30	19.5	1	51	10.8		19	313	23	58.9	2	06	03.9
	4	260	42	19.3	1	53	29.4		20	314	31	21.6	2	03	41.8
	5	261	54	16.6	1	55	44.6		21	315	38	32.4	2	01	11.4
	6	263	06	11.1	-1	57	56.0		22	316	45	31.1	-1	58	32.8
	7	264	18	02.8	2	00	03.5		23	317	52	17.3	1	55	45.9
	8	265	29	51.5	2	02	07.2		24	318	58	50.6	1	52	50.5
	9	266	41	37.0	2	04	06.7		25	320	05	10.7	1	49	46.7
	10	267	53	19.2	2	06	02.0		26	321	11	17.0	1	46	34.4
	11	269	04	58.0	2	07	53.0		27	322	17	09.2	1	43	13.6
	12	270	16	33.2	-2	09	39.5		28	323	22	46.8	-1	39	44.1
	13	271	28	04.7	2	11	21.4		29	324	28	09.4	1	36	06.0
	14	272	39	32.4	2	12	58.6		30	325	33	16.2	1	32	19.2
	15	273	50	56.3	2	14	31.0		31	326	38	06.8	1	28	23.6
	16	275	02	16.3	-2	15	58.5		32	327	42	40.5	-1	24	19.2

VENUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	15	58	47.70	-18	30	04.6	1.175 717	7.48	7.09	9	22	33
	1	16	03	47.90	18	46	08.6	1.182 018	7.44	7.06	9	23	37
	2	16	08	49.28	19	01	44.4	1.188 290	7.40	7.02	9	24	42
	3	16	13	51.84	19	16	51.2	1.194 533	7.36	6.98	9	25	49
	4	16	18	55.54	19	31	28.2	1.200 747	7.32	6.95	9	26	56
	5	16	24	00.38	19	45	34.9	1.206 931	7.29	6.91	9	28	05
	6	16	29	06.32	-19	59	10.5	1.213 086	7.25	6.88	9	29	15
	7	16	34	13.35	20	12	14.5	1.219 210	7.21	6.84	9	30	26
	8	16	39	21.43	20	24	46.0	1.225 303	7.18	6.81	9	31	38
	9	16	44	30.53	20	36	44.6	1.231 366	7.14	6.77	9	32	51
	10	16	49	40.62	20	48	09.6	1.237 397	7.11	6.74	9	34	05
	11	16	54	51.65	20	59	00.4	1.243 398	7.07	6.71	9	35	20
	12	17	00	03.59	-21	09	16.5	1.249 367	7.04	6.68	9	36	36
	13	17	05	16.38	21	18	57.3	1.255 305	7.01	6.64	9	37	52
	14	17	10	30.00	21	28	02.4	1.261 213	6.97	6.61	9	39	10
	15	17	15	44.38	21	36	31.1	1.267 090	6.94	6.58	9	40	28
	16	17	20	59.51	21	44	23.2	1.272 936	6.91	6.55	9	41	47
	17	17	26	15.32	21	51	38.0	1.278 753	6.88	6.52	9	43	06
	18	17	31	31.78	-21	58	15.3	1.284 539	6.85	6.49	9	44	27
	19	17	36	48.84	22	04	14.6	1.290 296	6.82	6.46	9	45	47
	20	17	42	06.46	22	09	35.7	1.296 023	6.79	6.44	9	47	09
	21	17	47	24.60	22	14	18.2	1.301 721	6.76	6.41	9	48	31
	22	17	52	43.19	22	18	21.9	1.307 389	6.73	6.38	9	49	53
	23	17	58	02.19	22	21	46.4	1.313 028	6.70	6.35	9	51	16
	24	18	03	21.55	-22	24	31.6	1.318 637	6.67	6.32	9	52	39
	25	18	08	41.21	22	26	37.2	1.324 217	6.64	6.30	9	54	02
	26	18	14	01.12	22	28	03.1	1.329 766	6.61	6.27	9	55	25
	27	18	19	21.23	22	28	49.1	1.335 286	6.59	6.25	9	56	49
	28	18	24	41.47	22	28	55.0	1.340 775	6.56	6.22	9	58	13
	29	18	30	01.81	22	28	20.7	1.346 233	6.53	6.20	9	59	37
	30	18	35	22.18	-22	27	06.2	1.351 661	6.51	6.17	10	01	01
	31	18	40	42.52	22	25	11.5	1.357 057	6.48	6.15	10	02	25
Feb.	1	18	46	02.79	22	22	36.5	1.362 422	6.45	6.12	10	03	48
	2	18	51	22.93	22	19	21.3	1.367 755	6.43	6.10	10	05	12
	3	18	56	42.88	22	15	26.0	1.373 056	6.40	6.07	10	06	35
	4	19	02	02.59	22	10	50.6	1.378 325	6.38	6.05	10	07	58
	5	19	07	22.01	-22	05	35.2	1.383 561	6.36	6.03	10	09	21
	6	19	12	41.07	21	59	40.1	1.388 765	6.33	6.01	10	10	44
	7	19	17	59.73	21	53	05.5	1.393 935	6.31	5.98	10	12	06
	8	19	23	17.93	21	45	51.5	1.399 072	6.29	5.96	10	13	27
	9	19	28	35.61	21	37	58.5	1.404 175	6.26	5.94	10	14	48
	10	19	33	52.72	21	29	26.7	1.409 245	6.24	5.92	10	16	08
	11	19	39	09.22	-21	20	16.4	1.414 282	6.22	5.90	10	17	28
	12	19	44	25.04	21	10	27.9	1.419 284	6.20	5.88	10	18	47
	13	19	49	40.17	21	00	01.7	1.424 254	6.17	5.86	10	20	06
	14	19	54	54.54	20	48	58.1	1.429 191	6.15	5.84	10	21	23
	15	20	00	08.14	-20	37	17.5	1.434 095	6.13	5.82	10	22	40

VENUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	20	00	08.14	-20	37	17.5	1.434 095	6.13	5.82	10	22	40
	16	20	05	20.92	20	25	00.4	1.438 967	6.11	5.80	10	23	56
	17	20	10	32.85	20	12	07.2	1.443 807	6.09	5.78	10	25	11
	18	20	15	43.90	19	58	38.5	1.448 615	6.07	5.76	10	26	25
	19	20	20	54.05	19	44	34.7	1.453 391	6.05	5.74	10	27	38
	20	20	26	03.27	19	29	56.3	1.458 135	6.03	5.72	10	28	51
	21	20	31	11.53	-19	14	43.9	1.462 847	6.01	5.70	10	30	02
	22	20	36	18.81	18	58	58.0	1.467 528	5.99	5.68	10	31	12
	23	20	41	25.10	18	42	39.1	1.472 176	5.97	5.67	10	32	22
	24	20	46	30.38	18	25	47.9	1.476 792	5.95	5.65	10	33	30
	25	20	51	34.63	18	08	24.8	1.481 376	5.94	5.63	10	34	37
	26	20	56	37.84	17	50	30.5	1.485 928	5.92	5.61	10	35	43
	27	21	01	40.02	-17	32	05.6	1.490 446	5.90	5.60	10	36	49
	28	21	06	41.14	17	13	10.6	1.494 932	5.88	5.58	10	37	53
	29	21	11	41.21	16	53	46.3	1.499 384	5.87	5.56	10	38	56
Mar.	1	21	16	40.22	16	33	53.3	1.503 803	5.85	5.55	10	39	58
	2	21	21	38.18	16	13	32.1	1.508 187	5.83	5.53	10	40	59
	3	21	26	35.08	15	52	43.5	1.512 537	5.81	5.51	10	41	59
	4	21	31	30.93	-15	31	28.2	1.516 853	5.80	5.50	10	42	58
	5	21	36	25.73	15	09	46.8	1.521 133	5.78	5.48	10	43	56
	6	21	41	19.48	14	47	40.0	1.525 378	5.77	5.47	10	44	52
	7	21	46	12.19	14	25	08.6	1.529 586	5.75	5.45	10	45	48
	8	21	51	03.86	14	02	13.3	1.533 758	5.73	5.44	10	46	43
	9	21	55	54.50	13	38	54.7	1.537 894	5.72	5.42	10	47	36
	10	22	00	44.13	-13	15	13.7	1.541 993	5.70	5.41	10	48	29
	11	22	05	32.75	12	51	10.8	1.546 054	5.69	5.39	10	49	21
	12	22	10	20.38	12	26	46.9	1.550 079	5.67	5.38	10	50	11
	13	22	15	07.05	12	02	02.6	1.554 067	5.66	5.37	10	51	01
	14	22	19	52.77	11	36	58.8	1.558 018	5.64	5.35	10	51	50
	15	22	24	37.56	11	11	36.0	1.561 932	5.63	5.34	10	52	38
	16	22	29	21.46	-10	45	55.1	1.565 810	5.62	5.33	10	53	25
	17	22	34	04.47	10	19	56.8	1.569 651	5.60	5.31	10	54	11
	18	22	38	46.63	9	53	41.8	1.573 456	5.59	5.30	10	54	56
	19	22	43	27.97	9	27	10.8	1.577 225	5.58	5.29	10	55	40
	20	22	48	08.50	9	00	24.6	1.580 957	5.56	5.28	10	56	24
	21	22	52	48.27	8	33	23.8	1.584 653	5.55	5.26	10	57	07
	22	22	57	27.31	-8	06	09.1	1.588 312	5.54	5.25	10	57	49
	23	23	02	05.64	7	38	41.3	1.591 934	5.52	5.24	10	58	31
	24	23	06	43.31	7	11	01.0	1.595 520	5.51	5.23	10	59	11
	25	23	11	20.34	6	43	08.9	1.599 068	5.50	5.22	10	59	52
	26	23	15	56.78	6	15	05.8	1.602 579	5.49	5.20	11	00	31
	27	23	20	32.66	5	46	52.3	1.606 052	5.48	5.19	11	01	10
	28	23	25	08.02	-5	18	29.1	1.609 487	5.46	5.18	11	01	49
	29	23	29	42.90	4	49	57.0	1.612 884	5.45	5.17	11	02	27
	30	23	34	17.33	4	21	16.5	1.616 241	5.44	5.16	11	03	05
	31	23	38	51.36	3	52	28.4	1.619 559	5.43	5.15	11	03	42
Apr.	1	23	43	25.02	-3	23	33.4	1.622 838	5.42	5.14	11	04	19

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	23	43	25.02	-3	23	33.4	1.622 838	5.42	5.14	11	04	19
	2	23	47	58.35	2	54	32.3	1.626 076	5.41	5.13	11	04	56
	3	23	52	31.38	2	25	25.7	1.629 273	5.40	5.12	11	05	32
	4	23	57	04.15	1	56	14.3	1.632 428	5.39	5.11	11	06	08
	5	0	01	36.70	1	26	58.9	1.635 541	5.38	5.10	11	06	44
	6	0	06	09.07	0	57	40.2	1.638 612	5.37	5.09	11	07	20
	7	0	10	41.29	-0	28	19.0	1.641 639	5.36	5.08	11	07	56
	8	0	15	13.40	+0	01	04.2	1.644 623	5.35	5.07	11	08	31
	9	0	19	45.45	0	30	28.5	1.647 563	5.34	5.06	11	09	07
	10	0	24	17.47	0	59	53.3	1.650 459	5.33	5.05	11	09	42
	11	0	28	49.50	1	29	17.8	1.653 310	5.32	5.04	11	10	18
	12	0	33	21.57	1	58	41.3	1.656 118	5.31	5.04	11	10	53
	13	0	37	53.74	+2	28	03.1	1.658 881	5.30	5.03	11	11	29
	14	0	42	26.03	2	57	22.5	1.661 600	5.29	5.02	11	12	05
	15	0	46	58.48	3	26	38.7	1.664 274	5.28	5.01	11	12	41
	16	0	51	31.14	3	55	51.1	1.666 905	5.28	5.00	11	13	17
	17	0	56	04.03	4	24	59.0	1.669 490	5.27	5.00	11	13	53
	18	1	00	37.21	4	54	01.6	1.672 032	5.26	4.99	11	14	30
	19	1	05	10.71	+5	22	58.3	1.674 529	5.25	4.98	11	15	07
	20	1	09	44.57	5	51	48.3	1.676 980	5.24	4.97	11	15	45
	21	1	14	18.84	6	20	31.0	1.679 387	5.24	4.97	11	16	23
	22	1	18	53.55	6	49	05.7	1.681 749	5.23	4.96	11	17	01
	23	1	23	28.74	7	17	31.6	1.684 065	5.22	4.95	11	17	40
	24	1	28	04.46	7	45	48.1	1.686 336	5.21	4.95	11	18	20
	25	1	32	40.74	+8	13	54.6	1.688 560	5.21	4.94	11	18	60
	26	1	37	17.62	8	41	50.2	1.690 738	5.20	4.93	11	19	40
	27	1	41	55.15	9	09	34.2	1.692 869	5.19	4.93	11	20	21
	28	1	46	33.34	9	37	06.1	1.694 953	5.19	4.92	11	21	03
	29	1	51	12.25	10	04	25.0	1.696 989	5.18	4.91	11	21	46
	30	1	55	51.89	10	31	30.3	1.698 976	5.18	4.91	11	22	30
May	1	2	00	32.31	+10	58	21.1	1.700 914	5.17	4.90	11	23	14
	2	2	05	13.53	11	24	56.8	1.702 803	5.16	4.90	11	23	59
	3	2	09	55.58	11	51	16.6	1.704 642	5.16	4.89	11	24	45
	4	2	14	38.49	12	17	19.8	1.706 430	5.15	4.89	11	25	32
	5	2	19	22.30	12	43	05.6	1.708 166	5.15	4.88	11	26	19
	6	2	24	07.02	13	08	33.3	1.709 850	5.14	4.88	11	27	08
	7	2	28	52.69	+13	33	42.1	1.711 482	5.14	4.87	11	27	58
	8	2	33	39.32	13	58	31.4	1.713 061	5.13	4.87	11	28	48
	9	2	38	26.93	14	23	00.3	1.714 587	5.13	4.86	11	29	40
	10	2	43	15.56	14	47	08.1	1.716 059	5.12	4.86	11	30	32
	11	2	48	05.20	15	10	54.1	1.717 478	5.12	4.86	11	31	26
	12	2	52	55.87	15	34	17.6	1.718 844	5.12	4.85	11	32	21
	13	2	57	47.59	+15	57	17.7	1.720 155	5.11	4.85	11	33	16
	14	3	02	40.38	16	19	53.8	1.721 413	5.11	4.84	11	34	13
	15	3	07	34.23	16	42	05.1	1.722 618	5.11	4.84	11	35	11
	16	3	12	29.17	17	03	50.9	1.723 769	5.10	4.84	11	36	10
	17	3	17	25.20	+17	25	10.5	1.724 866	5.10	4.84	11	37	10

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	3	17	25.20	+17	25	10.5	1.724 866	5.10	4.84	11	37	10
	18	3	22	22.33	17	46	03.2	1.725 909	5.10	4.83	11	38	11
	19	3	27	20.58	18	06	28.2	1.726 898	5.09	4.83	11	39	13
	20	3	32	19.93	18	26	25.0	1.727 834	5.09	4.83	11	40	17
	21	3	37	20.40	18	45	52.8	1.728 715	5.09	4.82	11	41	21
	22	3	42	21.99	19	04	50.9	1.729 542	5.08	4.82	11	42	27
	23	3	47	24.69	+19	23	18.7	1.730 315	5.08	4.82	11	43	34
	24	3	52	28.50	19	41	15.4	1.731 033	5.08	4.82	11	44	42
	25	3	57	33.42	19	58	40.6	1.731 697	5.08	4.82	11	45	50
	26	4	02	39.42	20	15	33.5	1.732 306	5.08	4.81	11	47	00
	27	4	07	46.51	20	31	53.4	1.732 859	5.07	4.81	11	48	12
	28	4	12	54.66	20	47	39.8	1.733 357	5.07	4.81	11	49	24
	29	4	18	03.85	+21	02	52.0	1.733 799	5.07	4.81	11	50	37
	30	4	23	14.07	21	17	29.4	1.734 184	5.07	4.81	11	51	51
	31	4	28	25.30	21	31	31.4	1.734 512	5.07	4.81	11	53	06
June	1	4	33	37.50	21	44	57.5	1.734 782	5.07	4.81	11	54	23
	2	4	38	50.64	21	57	46.9	1.734 995	5.07	4.81	11	55	40
	3	4	44	04.71	22	09	59.3	1.735 149	5.07	4.81	11	56	58
	4	4	49	19.64	+22	21	33.7	1.735 244	5.07	4.81	11	58	17
	5	4	54	35.64	22	32	30.3	1.735 280	5.07	4.81	11	59	37
	6	4	59	52.18	22	42	49.0	1.735 257	5.07	4.81	12	00	57
	7	5	05	09.56	22	52	28.1	1.735 173	5.07	4.81	12	02	18
	8	5	10	27.66	23	01	27.7	1.735 030	5.07	4.81	12	03	40
	9	5	15	46.44	23	09	47.4	1.734 827	5.07	4.81	12	05	03
	10	5	21	05.84	+23	17	26.9	1.734 564	5.07	4.81	12	06	26
	11	5	26	25.80	23	24	25.7	1.734 242	5.07	4.81	12	07	50
	12	5	31	46.28	23	30	43.6	1.733 860	5.07	4.81	12	09	14
	13	5	37	07.23	23	36	20.2	1.733 418	5.07	4.81	12	10	39
	14	5	42	28.59	23	41	15.3	1.732 917	5.07	4.81	12	12	04
	15	5	47	50.31	23	45	28.6	1.732 357	5.08	4.81	12	13	29
	16	5	53	12.34	+23	48	59.9	1.731 738	5.08	4.82	12	14	55
	17	5	58	34.61	23	51	49.1	1.731 060	5.08	4.82	12	16	21
	18	6	03	57.08	23	53	56.0	1.730 324	5.08	4.82	12	17	47
	19	6	09	19.68	23	55	20.5	1.729 529	5.08	4.82	12	19	13
	20	6	14	42.36	23	56	02.5	1.728 676	5.09	4.82	12	20	39
	21	6	20	05.06	23	56	01.9	1.727 765	5.09	4.83	12	22	06
	22	6	25	27.73	+23	55	18.8	1.726 796	5.09	4.83	12	23	32
	23	6	30	50.30	23	53	53.1	1.725 769	5.10	4.83	12	24	58
	24	6	36	12.72	23	51	44.9	1.724 684	5.10	4.84	12	26	24
	25	6	41	34.92	23	48	54.3	1.723 542	5.10	4.84	12	27	49
	26	6	46	56.86	23	45	21.2	1.722 341	5.11	4.84	12	29	14
	27	6	52	18.48	23	41	05.9	1.721 083	5.11	4.85	12	30	39
	28	6	57	39.71	+23	36	08.5	1.719 767	5.11	4.85	12	32	04
	29	7	03	00.52	23	30	29.0	1.718 392	5.12	4.85	12	33	28
	30	7	08	20.84	23	24	07.8	1.716 959	5.12	4.86	12	34	52
July	1	7	13	40.63	23	17	05.0	1.715 467	5.13	4.86	12	36	15
	2	7	18	59.84	+23	09	20.9	1.713 915	5.13	4.87	12	37	37

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	7	13	40.63	+23	17	05.0	1.715 467	5.13	4.86	12	36	15
	2	7	18	59.84	23	09	20.9	1.713 915	5.13	4.87	12	37	37
	3	7	24	18.40	23	00	56.0	1.712 305	5.14	4.87	12	38	59
	4	7	29	36.28	22	51	50.4	1.710 635	5.14	4.88	12	40	20
	5	7	34	53.42	22	42	04.5	1.708 906	5.15	4.88	12	41	40
	6	7	40	09.77	22	31	38.8	1.707 118	5.15	4.89	12	42	59
	7	7	45	25.28	+22	20	33.6	1.705 270	5.16	4.89	12	44	18
	8	7	50	39.92	22	08	49.4	1.703 364	5.16	4.90	12	45	36
	9	7	55	53.63	21	56	26.6	1.701 398	5.17	4.90	12	46	52
	10	8	01	06.38	21	43	25.7	1.699 375	5.17	4.91	12	48	08
	11	8	06	18.14	21	29	47.3	1.697 293	5.18	4.91	12	49	23
	12	8	11	28.88	21	15	31.7	1.695 153	5.19	4.92	12	50	36
	13	8	16	38.56	+21	00	39.6	1.692 956	5.19	4.93	12	51	49
	14	8	21	47.16	20	45	11.5	1.690 703	5.20	4.93	12	53	01
	15	8	26	54.65	20	29	08.0	1.688 392	5.21	4.94	12	54	11
	16	8	32	01.02	20	12	29.7	1.686 026	5.22	4.95	12	55	20
	17	8	37	06.25	19	55	17.2	1.683 604	5.22	4.95	12	56	28
	18	8	42	10.32	19	37	31.1	1.681 127	5.23	4.96	12	57	35
	19	8	47	13.22	+19	19	12.1	1.678 595	5.24	4.97	12	58	41
	20	8	52	14.93	19	00	20.7	1.676 010	5.25	4.98	12	59	46
	21	8	57	15.45	18	40	57.7	1.673 370	5.26	4.98	13	00	49
	22	9	02	14.76	18	21	03.7	1.670 678	5.26	4.99	13	01	51
	23	9	07	12.88	18	00	39.4	1.667 933	5.27	5.00	13	02	52
	24	9	12	09.79	17	39	45.4	1.665 136	5.28	5.01	13	03	52
	25	9	17	05.50	+17	18	22.4	1.662 286	5.29	5.02	13	04	50
	26	9	22	00.02	16	56	31.0	1.659 385	5.30	5.03	13	05	48
	27	9	26	53.36	16	34	11.9	1.656 431	5.31	5.03	13	06	44
	28	9	31	45.52	16	11	25.8	1.653 426	5.32	5.04	13	07	39
	29	9	36	36.52	15	48	13.4	1.650 369	5.33	5.05	13	08	33
	30	9	41	26.37	15	24	35.5	1.647 260	5.34	5.06	13	09	25
	31	9	46	15.08	+15	00	32.6	1.644 099	5.35	5.07	13	10	17
Aug.	1	9	51	02.66	14	36	05.6	1.640 886	5.36	5.08	13	11	07
	2	9	55	49.12	14	11	15.3	1.637 622	5.37	5.09	13	11	57
	3	10	00	34.49	13	46	02.3	1.634 306	5.38	5.10	13	12	45
	4	10	05	18.77	13	20	27.3	1.630 939	5.39	5.11	13	13	32
	5	10	10	01.99	12	54	31.2	1.627 521	5.40	5.12	13	14	18
	6	10	14	44.17	+12	28	14.6	1.624 052	5.41	5.14	13	15	03
	7	10	19	25.33	12	01	38.3	1.620 533	5.43	5.15	13	15	47
	8	10	24	05.50	11	34	43.0	1.616 964	5.44	5.16	13	16	30
	9	10	28	44.69	11	07	29.5	1.613 346	5.45	5.17	13	17	13
	10	10	33	22.95	10	39	58.5	1.609 679	5.46	5.18	13	17	54
	11	10	38	00.29	10	12	10.7	1.605 963	5.48	5.19	13	18	34
	12	10	42	36.76	+9	44	06.9	1.602 199	5.49	5.21	13	19	14
	13	10	47	12.38	9	15	47.8	1.598 388	5.50	5.22	13	19	52
	14	10	51	47.18	8	47	14.1	1.594 531	5.52	5.23	13	20	30
	15	10	56	21.19	8	18	26.6	1.590 627	5.53	5.24	13	21	07
	16	11	00	54.46	+7	49	26.0	1.586 678	5.54	5.26	13	21	43

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	11	00	54.46	+7	49	26.0	1.586 678	5.54	5.26	13	21	43
	17	11	05	27.01	7	20	13.0	1.582 684	5.56	5.27	13	22	19
	18	11	09	58.88	6	50	48.4	1.578 646	5.57	5.28	13	22	54
	19	11	14	30.10	6	21	12.9	1.574 564	5.59	5.30	13	23	28
	20	11	19	00.72	5	51	27.1	1.570 440	5.60	5.31	13	24	02
	21	11	23	30.77	5	21	31.8	1.566 274	5.61	5.32	13	24	35
	22	11	28	00.30	+4	51	27.7	1.562 066	5.63	5.34	13	25	08
	23	11	32	29.35	4	21	15.4	1.557 816	5.65	5.35	13	25	40
	24	11	36	57.97	3	50	55.6	1.553 526	5.66	5.37	13	26	12
	25	11	41	26.20	3	20	28.9	1.549 195	5.68	5.38	13	26	44
	26	11	45	54.09	2	49	56.2	1.544 823	5.69	5.40	13	27	15
	27	11	50	21.67	2	19	18.0	1.540 411	5.71	5.41	13	27	46
	28	11	54	48.98	+1	48	35.2	1.535 959	5.73	5.43	13	28	16
	29	11	59	16.07	1	17	48.3	1.531 466	5.74	5.45	13	28	47
	30	12	03	42.98	0	46	58.2	1.526 932	5.76	5.46	13	29	17
	31	12	08	09.74	+0	16	05.5	1.522 359	5.78	5.48	13	29	47
Sept.	1	12	12	36.40	-0	14	49.0	1.517 746	5.79	5.49	13	30	17
	2	12	17	03.00	0	45	44.6	1.513 093	5.81	5.51	13	30	47
	3	12	21	29.58	-1	16	40.7	1.508 401	5.83	5.53	13	31	17
	4	12	25	56.18	1	47	36.4	1.503 669	5.85	5.55	13	31	47
	5	12	30	22.84	2	18	31.0	1.498 899	5.87	5.56	13	32	18
	6	12	34	49.60	2	49	23.9	1.494 091	5.89	5.58	13	32	48
	7	12	39	16.51	3	20	14.3	1.489 244	5.91	5.60	13	33	18
	8	12	43	43.61	3	51	01.5	1.484 360	5.92	5.62	13	33	49
	9	12	48	10.93	-4	21	44.7	1.479 438	5.94	5.64	13	34	20
	10	12	52	38.53	4	52	23.3	1.474 480	5.96	5.66	13	34	51
	11	12	57	06.43	5	22	56.5	1.469 485	5.98	5.68	13	35	23
	12	13	01	34.67	5	53	23.6	1.464 455	6.01	5.69	13	35	55
	13	13	06	03.30	6	23	43.9	1.459 389	6.03	5.71	13	36	27
	14	13	10	32.35	6	53	56.5	1.454 289	6.05	5.73	13	36	60
	15	13	15	01.86	-7	24	00.8	1.449 156	6.07	5.76	13	37	33
	16	13	19	31.87	7	53	56.0	1.443 989	6.09	5.78	13	38	07
	17	13	24	02.42	8	23	41.5	1.438 789	6.11	5.80	13	38	41
	18	13	28	33.55	8	53	16.4	1.433 558	6.13	5.82	13	39	16
	19	13	33	05.29	9	22	40.1	1.428 296	6.16	5.84	13	39	52
	20	13	37	37.70	9	51	51.9	1.423 003	6.18	5.86	13	40	28
	21	13	42	10.81	-10	20	51.1	1.417 679	6.20	5.88	13	41	05
	22	13	46	44.67	10	49	37.0	1.412 326	6.23	5.91	13	41	43
	23	13	51	19.30	11	18	08.8	1.406 942	6.25	5.93	13	42	21
	24	13	55	54.75	11	46	25.9	1.401 529	6.27	5.95	13	43	01
	25	14	00	31.05	12	14	27.4	1.396 086	6.30	5.97	13	43	41
	26	14	05	08.23	12	42	12.6	1.390 613	6.32	6.00	13	44	22
	27	14	09	46.32	-13	09	40.8	1.385 110	6.35	6.02	13	45	04
	28	14	14	25.34	13	36	51.2	1.379 578	6.37	6.05	13	45	47
	29	14	19	05.33	14	03	43.0	1.374 016	6.40	6.07	13	46	31
	30	14	23	46.31	14	30	15.5	1.368 425	6.43	6.09	13	47	16
Oct.	1	14	28	28.31	-14	56	27.8	1.362 804	6.45	6.12	13	48	02

VENUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	14	28	28.31	-14	56	27.8	1.362 804	6.45	6.12	13	48	02
	2	14	33	11.35	15	22	19.3	1.357 154	6.48	6.15	13	48	49
	3	14	37	55.45	15	47	49.0	1.351 475	6.51	6.17	13	49	38
	4	14	42	40.63	16	12	56.4	1.345 767	6.53	6.20	13	50	27
	5	14	47	26.91	16	37	40.5	1.340 029	6.56	6.22	13	51	17
	6	14	52	14.30	17	02	00.7	1.334 264	6.59	6.25	13	52	09
	7	14	57	02.82	-17	25	56.1	1.328 469	6.62	6.28	13	53	01
	8	15	01	52.48	17	49	26.0	1.322 647	6.65	6.31	13	53	55
	9	15	06	43.28	18	12	29.6	1.316 797	6.68	6.33	13	54	50
	10	15	11	35.22	18	35	06.2	1.310 919	6.71	6.36	13	55	46
	11	15	16	28.32	18	57	14.9	1.305 014	6.74	6.39	13	56	43
	12	15	21	22.56	19	18	55.1	1.299 082	6.77	6.42	13	57	42
	13	15	26	17.95	-19	40	06.0	1.293 124	6.80	6.45	13	58	41
	14	15	31	14.48	20	00	46.8	1.287 141	6.83	6.48	13	59	42
	15	15	36	12.15	20	20	56.8	1.281 132	6.86	6.51	14	00	44
	16	15	41	10.95	20	40	35.3	1.275 099	6.90	6.54	14	01	47
	17	15	46	10.88	20	59	41.6	1.269 042	6.93	6.57	14	02	51
	18	15	51	11.92	21	18	15.1	1.262 961	6.96	6.60	14	03	56
	19	15	56	14.08	-21	36	15.0	1.256 858	7.00	6.64	14	05	02
	20	16	01	17.33	21	53	40.8	1.250 731	7.03	6.67	14	06	10
	21	16	06	21.66	22	10	31.7	1.244 583	7.07	6.70	14	07	18
	22	16	11	27.04	22	26	47.2	1.238 412	7.10	6.73	14	08	28
	23	16	16	33.46	22	42	26.7	1.232 218	7.14	6.77	14	09	38
	24	16	21	40.87	22	57	29.4	1.226 003	7.17	6.80	14	10	50
	25	16	26	49.26	-23	11	54.9	1.219 765	7.21	6.84	14	12	02
	26	16	31	58.59	23	25	42.5	1.213 504	7.25	6.87	14	13	16
	27	16	37	08.81	23	38	51.6	1.207 221	7.28	6.91	14	14	30
	28	16	42	19.90	23	51	21.7	1.200 916	7.32	6.94	14	15	45
	29	16	47	31.81	24	03	12.2	1.194 588	7.36	6.98	14	17	01
	30	16	52	44.49	24	14	22.7	1.188 238	7.40	7.02	14	18	17
	31	16	57	57.89	-24	24	52.7	1.181 865	7.44	7.06	14	19	35
Nov.	1	17	03	11.97	24	34	41.7	1.175 470	7.48	7.10	14	20	53
	2	17	08	26.66	24	43	49.3	1.169 052	7.52	7.13	14	22	11
	3	17	13	41.92	24	52	15.1	1.162 612	7.56	7.17	14	23	30
	4	17	18	57.67	24	59	58.8	1.156 149	7.61	7.21	14	24	50
	5	17	24	13.85	25	06	60.0	1.149 663	7.65	7.25	14	26	10
	6	17	29	30.41	-25	13	18.4	1.143 155	7.69	7.30	14	27	30
	7	17	34	47.25	25	18	53.7	1.136 626	7.74	7.34	14	28	51
	8	17	40	04.32	25	23	45.8	1.130 074	7.78	7.38	14	30	11
	9	17	45	21.54	25	27	54.3	1.123 500	7.83	7.42	14	31	32
	10	17	50	38.84	25	31	19.2	1.116 906	7.87	7.47	14	32	53
	11	17	55	56.14	25	34	00.2	1.110 290	7.92	7.51	14	34	14
	12	18	01	13.37	-25	35	57.3	1.103 654	7.97	7.56	14	35	34
	13	18	06	30.45	25	37	10.4	1.096 998	8.02	7.60	14	36	55
	14	18	11	47.32	25	37	39.5	1.090 322	8.07	7.65	14	38	15
	15	18	17	03.90	25	37	24.6	1.083 627	8.12	7.70	14	39	35
	16	18	22	20.13	-25	36	25.8	1.076 914	8.17	7.74	14	40	54

VENUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	18	22	20.13	-25	36	25.8	1.076 914	8.17	7.74	14	40	54
	17	18	27	35.93	25	34	43.2	1.070 183	8.22	7.79	14	42	13
	18	18	32	51.24	25	32	16.9	1.063 435	8.27	7.84	14	43	32
	19	18	38	05.97	25	29	07.0	1.056 668	8.32	7.89	14	44	50
	20	18	43	20.07	25	25	13.7	1.049 885	8.38	7.94	14	46	07
	21	18	48	33.46	25	20	37.3	1.043 084	8.43	8.00	14	47	23
	22	18	53	46.07	-25	15	17.9	1.036 267	8.49	8.05	14	48	39
	23	18	58	57.84	25	09	15.9	1.029 432	8.54	8.10	14	49	54
	24	19	04	08.70	25	02	31.4	1.022 580	8.60	8.16	14	51	08
	25	19	09	18.59	24	55	04.8	1.015 710	8.66	8.21	14	52	20
	26	19	14	27.45	24	46	56.6	1.008 824	8.72	8.27	14	53	32
	27	19	19	35.20	24	38	07.0	1.001 920	8.78	8.32	14	54	43
	28	19	24	41.80	-24	28	36.5	0.994 999	8.84	8.38	14	55	52
	29	19	29	47.18	24	18	25.6	0.988 061	8.90	8.44	14	56	60
	30	19	34	51.28	24	07	34.7	0.981 105	8.96	8.50	14	58	07
Dec.	1	19	39	54.04	23	56	04.3	0.974 132	9.03	8.56	14	59	12
	2	19	44	55.41	23	43	55.1	0.967 142	9.09	8.62	15	00	16
	3	19	49	55.33	23	31	07.5	0.960 134	9.16	8.69	15	01	19
	4	19	54	53.75	-23	17	42.2	0.953 108	9.23	8.75	15	02	19
	5	19	59	50.62	23	03	39.8	0.946 066	9.30	8.82	15	03	19
	6	20	04	45.87	22	49	00.9	0.939 006	9.37	8.88	15	04	17
	7	20	09	39.47	22	33	46.2	0.931 930	9.44	8.95	15	05	13
	8	20	14	31.36	22	17	56.3	0.924 837	9.51	9.02	15	06	07
	9	20	19	21.51	22	01	32.1	0.917 728	9.58	9.09	15	06	59
	10	20	24	09.88	-21	44	34.1	0.910 603	9.66	9.16	15	07	50
	11	20	28	56.42	21	27	03.1	0.903 463	9.73	9.23	15	08	39
	12	20	33	41.11	21	08	59.9	0.896 308	9.81	9.30	15	09	26
	13	20	38	23.92	20	50	25.2	0.889 139	9.89	9.38	15	10	11
	14	20	43	04.81	20	31	19.9	0.881 956	9.97	9.46	15	10	54
	15	20	47	43.77	20	11	44.6	0.874 760	10.05	9.53	15	11	35
	16	20	52	20.78	-19	51	40.2	0.867 553	10.14	9.61	15	12	14
	17	20	56	55.80	19	31	07.4	0.860 333	10.22	9.69	15	12	52
	18	21	01	28.82	19	10	07.1	0.853 102	10.31	9.78	15	13	27
	19	21	05	59.83	18	48	40.0	0.845 860	10.40	9.86	15	13	60
	20	21	10	28.81	18	26	46.9	0.838 607	10.49	9.95	15	14	31
	21	21	14	55.75	18	04	28.5	0.831 344	10.58	10.03	15	15	00
	22	21	19	20.64	-17	41	45.7	0.824 071	10.67	10.12	15	15	27
	23	21	23	43.47	17	18	39.3	0.816 787	10.77	10.21	15	15	52
	24	21	28	04.22	16	55	10.1	0.809 494	10.86	10.30	15	16	15
	25	21	32	22.90	16	31	18.8	0.802 191	10.96	10.40	15	16	36
	26	21	36	39.49	16	07	06.3	0.794 879	11.06	10.49	15	16	55
	27	21	40	53.98	15	42	33.4	0.787 558	11.17	10.59	15	17	11
	28	21	45	06.36	-15	17	40.9	0.780 227	11.27	10.69	15	17	26
	29	21	49	16.62	14	52	29.7	0.772 888	11.38	10.79	15	17	38
	30	21	53	24.75	14	27	00.6	0.765 539	11.49	10.89	15	17	48
	31	21	57	30.74	14	01	14.5	0.758 183	11.60	11.00	15	17	56
	32	22	01	34.57	-13	35	12.3	0.750 818	11.71	11.11	15	18	02

MARS, 2024
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	′	″	°	′	″				°	′	″	°	′	″	
Jan.	1	258	54	23.1	-0	54	05.5	1.480 6608	Apr.	2	313	28	45.8	-1	50	19.1	1.390 9569
	3	260	00	47.2	0	55	57.1	1.478 1160		4	314	43	59.3	1	50	33.4	1.389 9622
	5	261	07	25.2	0	57	48.0	1.475 5830		6	315	59	19.1	1	50	44.6	1.389 0205
	7	262	14	16.9	0	59	37.9	1.473 0629		8	317	14	44.9	1	50	52.6	1.388 1324
	9	263	21	22.4	1	01	26.8	1.470 5567		10	318	30	16.3	1	50	57.3	1.387 2983
	11	264	28	41.7	1	03	14.7	1.468 0652		12	319	45	53.0	1	50	58.9	1.386 5188
	13	265	36	14.7	-1	05	01.5	1.465 5897		14	321	01	34.6	-1	50	57.3	1.385 7943
	15	266	44	01.5	1	06	47.1	1.463 1310		16	322	17	20.7	1	50	52.4	1.385 1252
	17	267	52	02.1	1	08	31.6	1.460 6901		18	323	33	11.1	1	50	44.2	1.384 5118
	19	269	00	16.3	1	10	14.7	1.458 2682		20	324	49	05.3	1	50	32.9	1.383 9545
	21	270	08	44.1	1	11	56.5	1.455 8662		22	326	05	03.0	1	50	18.3	1.383 4537
	23	271	17	25.5	1	13	37.0	1.453 4850		24	327	21	03.8	1	50	00.4	1.383 0096
	25	272	26	20.5	-1	15	16.0	1.451 1259		26	328	37	07.2	-1	49	39.4	1.382 6224
	27	273	35	29.0	1	16	53.5	1.448 7897		28	329	53	13.0	1	49	15.0	1.382 2925
	29	274	44	50.9	1	18	29.4	1.446 4775		30	331	09	20.8	1	48	47.5	1.382 0199
	31	275	54	26.2	1	20	03.8	1.444 1903	May	2	332	25	30.1	1	48	16.7	1.381 8048
Feb.	2	277	04	14.7	1	21	36.4	1.441 9291		4	333	41	40.6	1	47	42.8	1.381 6474
	4	278	14	16.3	1	23	07.3	1.439 6949		6	334	57	52.0	1	47	05.7	1.381 5478
	6	279	24	31.1	-1	24	36.4	1.437 4888		8	336	14	03.7	-1	46	25.4	1.381 5059
	8	280	34	58.8	1	26	03.6	1.435 3117		10	337	30	15.4	1	45	42.0	1.381 5219
	10	281	45	39.3	1	27	29.0	1.433 1647		12	338	46	26.8	1	44	55.4	1.381 5957
	12	282	56	32.5	1	28	52.3	1.431 0488		14	340	02	37.5	1	44	05.8	1.381 7273
	14	284	07	38.4	1	30	13.7	1.428 9649		16	341	18	47.0	1	43	13.2	1.381 9166
	16	285	18	56.7	1	31	32.9	1.426 9140		18	342	34	55.1	1	42	17.5	1.382 1635
	18	286	30	27.2	-1	32	50.0	1.424 8971		20	343	51	01.2	-1	41	18.8	1.382 4678
	20	287	42	10.0	1	34	04.9	1.422 9152		22	345	07	05.0	1	40	17.2	1.382 8294
	22	288	54	04.7	1	35	17.5	1.420 9692		24	346	23	06.2	1	39	12.7	1.383 2481
	24	290	06	11.2	1	36	27.8	1.419 0601		26	347	39	04.4	1	38	05.3	1.383 7236
	26	291	18	29.3	1	37	35.8	1.417 1889		28	348	54	59.1	1	36	55.1	1.384 2556
	28	292	30	58.9	1	38	41.3	1.415 3564		30	350	10	50.1	1	35	42.1	1.384 8440
Mar.	1	293	43	39.6	-1	39	44.4	1.413 5635	June	1	351	26	37.0	-1	34	26.4	1.385 4882
	3	294	56	31.4	1	40	44.9	1.411 8112		3	352	42	19.3	1	33	08.1	1.386 1881
	5	296	09	34.0	1	41	42.9	1.410 1004		5	353	57	56.8	1	31	47.1	1.386 9430
	7	297	22	47.3	1	42	38.2	1.408 4318		7	355	13	29.1	1	30	23.5	1.387 7528
	9	298	36	10.8	1	43	30.8	1.406 8065		9	356	28	55.8	1	28	57.4	1.388 6168
	11	299	49	44.5	1	44	20.8	1.405 2252		11	357	44	16.6	1	27	28.9	1.389 5346
	13	301	03	28.0	-1	45	08.0	1.403 6887		13	358	59	31.1	-1	25	58.0	1.390 5058
	15	302	17	21.2	1	45	52.3	1.402 1978		15	360	14	39.2	1	24	24.7	1.391 5297
	17	303	31	23.7	1	46	33.9	1.400 7534		17	1	29	40.3	1	22	49.2	1.392 6058
	19	304	45	35.2	1	47	12.5	1.399 3562		19	2	44	34.1	1	21	11.4	1.393 7335
	21	305	59	55.6	1	47	48.2	1.398 0069		21	3	59	20.5	1	19	31.5	1.394 9122
	23	307	14	24.4	1	48	21.0	1.396 7063		23	5	13	59.0	1	17	49.6	1.396 1412
	25	308	29	01.5	-1	48	50.7	1.395 4551		25	6	28	29.4	-1	16	05.6	1.397 4199
	27	309	43	46.5	1	49	17.4	1.394 2539		27	7	42	51.3	1	14	19.7	1.398 7476
	29	310	58	39.1	1	49	41.1	1.393 1034		29	8	57	04.6	1	12	31.9	1.400 1236
	31	312	13	39.0	1	50	01.7	1.392 0042	July	1	10	11	08.8	1	10	42.3	1.401 5472
Apr.	2	313	28	45.8	-1	50	19.1	1.390 9569		3	11	25	03.8	-1	08	51.0	1.403 0175

MARS, 2024

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	10	11	08.8	-1	10	42.3	1.401 5472	Oct.	1	63	24	25.8	+0	26	12.2	1.502 8062
	3	11	25	03.8	1	08	51.0	1.403 0175		3	64	28	39.5	0	28	12.9	1.505 4170
	5	12	38	49.3	1	06	58.0	1.404 5338		5	65	32	39.8	0	30	12.5	1.508 0295
	7	13	52	25.0	1	05	03.4	1.406 0954		7	66	36	26.8	0	32	11.1	1.510 6430
	9	15	05	50.6	1	03	07.3	1.407 7014		9	67	40	00.7	0	34	08.6	1.513 2564
	11	16	19	06.0	1	01	09.7	1.409 3509		11	68	43	21.5	0	36	05.0	1.515 8690
	13	17	32	10.9	-0	59	10.7	1.411 0432		13	69	46	29.3	+0	38	00.3	1.518 4798
	15	18	45	05.1	0	57	10.5	1.412 7773		15	70	49	24.1	0	39	54.4	1.521 0879
	17	19	57	48.3	0	55	09.0	1.414 5525		17	71	52	06.0	0	41	47.4	1.523 6925
	19	21	10	20.4	0	53	06.3	1.416 3677		19	72	54	35.2	0	43	39.1	1.526 2927
	21	22	22	41.2	0	51	02.5	1.418 2221		21	73	56	51.6	0	45	29.5	1.528 8878
	23	23	34	50.4	0	48	57.7	1.420 1147		23	74	58	55.5	0	47	18.8	1.531 4768
	25	24	46	48.0	-0	46	52.0	1.422 0447		25	76	00	46.9	+0	49	06.7	1.534 0589
	27	25	58	33.6	0	44	45.4	1.424 0111		27	77	02	25.9	0	50	53.3	1.536 6334
	29	27	10	07.2	0	42	37.9	1.426 0129		29	78	03	52.6	0	52	38.6	1.539 1993
	31	28	21	28.6	0	40	29.8	1.428 0491		31	79	05	07.1	0	54	22.5	1.541 7560
Aug.	2	29	32	37.7	0	38	20.9	1.430 1189	Nov.	2	80	06	09.5	0	56	05.1	1.544 3027
	4	30	43	34.3	0	36	11.5	1.432 2211		4	81	06	59.9	0	57	46.2	1.546 8385
	6	31	54	18.2	-0	34	01.4	1.434 3549		6	82	07	38.5	+0	59	26.0	1.549 3628
	8	33	04	49.4	0	31	51.0	1.436 5192		8	83	08	05.4	1	01	04.3	1.551 8747
	10	34	15	07.7	0	29	40.1	1.438 7131		10	84	08	20.5	1	02	41.2	1.554 3736
	12	35	25	13.0	0	27	28.9	1.440 9354		12	85	08	24.2	1	04	16.6	1.556 8586
	14	36	35	05.3	0	25	17.4	1.443 1853		14	86	08	16.5	1	05	50.6	1.559 3292
	16	37	44	44.4	0	23	05.7	1.445 4617		16	87	07	57.6	1	07	23.0	1.561 7846
	18	38	54	10.3	-0	20	53.8	1.447 7636		18	88	07	27.4	+1	08	54.0	1.564 2241
	20	40	03	22.9	0	18	41.9	1.450 0900		20	89	06	46.3	1	10	23.4	1.566 6469
	22	41	12	22.0	0	16	29.9	1.452 4398		22	90	05	54.2	1	11	51.3	1.569 0526
	24	42	21	07.8	0	14	18.0	1.454 8121		24	91	04	51.4	1	13	17.7	1.571 4403
	26	43	29	40.0	0	12	06.2	1.457 2057		26	92	03	38.0	1	14	42.5	1.573 8095
	28	44	37	58.6	0	09	54.4	1.459 6198		28	93	02	14.1	1	16	05.8	1.576 1594
	30	45	46	03.6	-0	07	43.0	1.462 0533		30	94	00	39.8	+1	17	27.5	1.578 4896
Sept.	1	46	53	55.0	0	05	31.7	1.464 5051	Dec.	2	94	58	55.3	1	18	47.6	1.580 7993
	3	48	01	32.7	0	03	20.8	1.466 9743		4	95	57	00.7	1	20	06.1	1.583 0879
	5	49	08	56.8	-0	01	10.3	1.469 4598		6	96	54	56.1	1	21	23.1	1.585 3550
	7	50	16	07.2	+0	00	59.9	1.471 9606		8	97	52	41.7	1	22	38.4	1.587 5998
	9	51	23	03.8	0	03	09.6	1.474 4758		10	98	50	17.7	1	23	52.2	1.589 8218
	11	52	29	46.7	+0	05	18.8	1.477 0043		12	99	47	44.1	+1	25	04.3	1.592 0204
	13	53	36	16.0	0	07	27.4	1.479 5451		14	100	45	01.1	1	26	14.8	1.594 1952
	15	54	42	31.5	0	09	35.4	1.482 0973		16	101	42	08.8	1	27	23.7	1.596 3455
	17	55	48	33.4	0	11	42.7	1.484 6598		18	102	39	07.4	1	28	31.0	1.598 4708
	19	56	54	21.6	0	13	49.3	1.487 2317		20	103	35	57.1	1	29	36.6	1.600 5706
	21	57	59	56.2	0	15	55.2	1.489 8120		22	104	32	37.9	1	30	40.7	1.602 6444
	23	59	05	17.2	+0	18	00.4	1.492 3998		24	105	29	10.1	+1	31	43.0	1.604 6918
	25	60	10	24.5	0	20	04.7	1.494 9940		26	106	25	33.7	1	32	43.8	1.606 7121
	27	61	15	18.4	0	22	08.1	1.497 5938		28	107	21	48.9	1	33	42.8	1.608 7050
	29	62	19	58.9	0	24	10.6	1.500 1982		30	108	17	55.9	1	34	40.3	1.610 6699
Oct.	1	63	24	25.8	+0	26	12.2	1.502 8062		32	109	13	54.7	+1	35	36.1	1.612 6065

MARS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	266	34	00.2	-0	32	26.7	Feb.	15	301	20	29.1	-0	57	14.2
	1	267	18	27.9	0	33	01.8		16	302	06	37.6	0	57	42.3
	2	268	02	58.4	0	33	36.8		17	302	52	47.6	0	58	10.1
	3	268	47	31.6	0	34	11.8		18	303	38	59.0	0	58	37.6
	4	269	32	07.5	0	34	46.7		19	304	25	11.8	0	59	04.9
	5	270	16	46.2	0	35	21.5		20	305	11	25.9	0	59	32.0
	6	271	01	27.6	-0	35	56.2		21	305	57	41.5	-0	59	58.8
	7	271	46	11.8	0	36	30.9		22	306	43	58.3	1	00	25.3
	8	272	30	58.6	0	37	05.4		23	307	30	16.5	1	00	51.6
	9	273	15	48.1	0	37	39.8		24	308	16	35.9	1	01	17.6
	10	274	00	40.2	0	38	14.2		25	309	02	56.7	1	01	43.3
	11	274	45	34.8	0	38	48.4		26	309	49	18.7	1	02	08.8
	12	275	30	31.9	-0	39	22.5		27	310	35	42.0	-1	02	33.9
	13	276	15	31.4	0	39	56.5		28	311	22	06.6	1	02	58.8
	14	277	00	33.1	0	40	30.4		29	312	08	32.4	1	03	23.3
	15	277	45	37.1	0	41	04.2	Mar.	1	312	54	59.5	1	03	47.5
	16	278	30	43.3	0	41	37.8		2	313	41	27.9	1	04	11.4
	17	279	15	51.8	0	42	11.3		3	314	27	57.4	1	04	35.0
	18	280	01	02.5	-0	42	44.7		4	315	14	28.1	-1	04	58.3
	19	280	46	15.5	0	43	17.9		5	316	01	00.0	1	05	21.2
	20	281	31	30.7	0	43	51.0		6	316	47	32.8	1	05	43.8
	21	282	16	48.2	0	44	24.0		7	317	34	06.6	1	06	06.0
	22	283	02	07.9	0	44	56.9		8	318	20	41.2	1	06	27.9
	23	283	47	29.8	0	45	29.6		9	319	07	16.6	1	06	49.4
	24	284	32	53.9	-0	46	02.2		10	319	53	52.6	-1	07	10.5
	25	285	18	20.2	0	46	34.6		11	320	40	29.3	1	07	31.3
	26	286	03	48.6	0	47	06.9		12	321	27	06.5	1	07	51.8
	27	286	49	19.2	0	47	39.1		13	322	13	44.3	1	08	11.9
	28	287	34	52.0	0	48	11.1		14	323	00	22.6	1	08	31.6
	29	288	20	26.9	0	48	43.0		15	323	47	01.3	1	08	50.9
	30	289	06	04.0	-0	49	14.6		16	324	33	40.5	-1	09	09.9
	31	289	51	43.2	0	49	46.1		17	325	20	20.0	1	09	28.5
Feb.	1	290	37	24.6	0	50	17.5		18	326	06	59.9	1	09	46.8
	2	291	23	08.1	0	50	48.6		19	326	53	40.0	1	10	04.6
	3	292	08	53.7	0	51	19.6		20	327	40	20.3	1	10	22.1
	4	292	54	41.5	0	51	50.3		21	328	27	00.9	1	10	39.2
	5	293	40	31.4	-0	52	20.9		22	329	13	41.6	-1	10	55.9
	6	294	26	23.3	0	52	51.2		23	330	00	22.5	1	11	12.2
	7	295	12	17.1	0	53	21.4		24	330	47	03.5	1	11	28.1
	8	295	58	12.9	0	53	51.3		25	331	33	44.7	1	11	43.6
	9	296	44	10.4	0	54	21.0		26	332	20	26.1	1	11	58.7
	10	297	30	09.6	0	54	50.4		27	333	07	07.6	1	12	13.4
	11	298	16	10.4	-0	55	19.7		28	333	53	49.2	-1	12	27.6
	12	299	02	12.8	0	55	48.7		29	334	40	30.9	1	12	41.4
	13	299	48	16.7	0	56	17.4		30	335	27	12.8	1	12	54.7
	14	300	34	22.2	0	56	45.9		31	336	13	54.7	1	13	07.7
	15	301	20	29.1	-0	57	14.2	Apr.	1	337	00	36.6	-1	13	20.1

MARS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	337	00	36.6	-1	13	20.1	May	17	12	32	06.7	-1	14	06.4
	2	337	47	18.4	1	13	32.1		18	13	17	47.1	1	13	55.3
	3	338	34	00.0	1	13	43.6		19	14	03	25.1	1	13	43.6
	4	339	20	41.4	1	13	54.7		20	14	49	00.6	1	13	31.5
	5	340	07	22.5	1	14	05.3		21	15	34	33.6	1	13	18.8
	6	340	54	03.2	1	14	15.4		22	16	20	04.2	1	13	05.5
	7	341	40	43.4	-1	14	25.1		23	17	05	32.3	-1	12	51.7
	8	342	27	23.0	1	14	34.3		24	17	50	57.9	1	12	37.4
	9	343	14	02.1	1	14	43.0		25	18	36	21.0	1	12	22.5
	10	344	00	40.5	1	14	51.3		26	19	21	41.6	1	12	07.0
	11	344	47	18.2	1	14	59.1		27	20	06	59.5	1	11	51.0
	12	345	33	55.1	1	15	06.4		28	20	52	14.8	1	11	34.5
	13	346	20	31.3	-1	15	13.3		29	21	37	27.3	-1	11	17.4
	14	347	07	06.5	1	15	19.7		30	22	22	37.0	1	10	59.7
	15	347	53	40.7	1	15	25.6		31	23	07	43.8	1	10	41.5
	16	348	40	13.9	1	15	31.1	June	1	23	52	47.8	1	10	22.8
	17	349	26	46.0	1	15	36.1		2	24	37	48.8	1	10	03.5
	18	350	13	17.1	1	15	40.5		3	25	22	46.7	1	09	43.7
	19	350	59	47.0	-1	15	44.5		4	26	07	41.6	-1	09	23.4
	20	351	46	15.8	1	15	48.1		5	26	52	33.4	1	09	02.6
	21	352	32	43.5	1	15	51.1		6	27	37	21.9	1	08	41.2
	22	353	19	10.0	1	15	53.6		7	28	22	07.1	1	08	19.4
	23	354	05	35.4	1	15	55.6		8	29	06	48.9	1	07	57.0
	24	354	51	59.7	1	15	57.1		9	29	51	27.2	1	07	34.1
	25	355	38	22.8	-1	15	58.1		10	30	36	01.8	-1	07	10.7
	26	356	24	44.7	1	15	58.6		11	31	20	32.8	1	06	46.8
	27	357	11	05.4	1	15	58.5		12	32	05	00.2	1	06	22.4
	28	357	57	24.8	1	15	57.9		13	32	49	23.8	1	05	57.5
	29	358	43	43.0	1	15	56.8		14	33	33	43.8	1	05	32.0
	30	359	29	59.8	1	15	55.1		15	34	17	59.9	1	05	06.1
May	1	0	16	15.1	-1	15	52.9		16	35	02	12.4	-1	04	39.6
	2	1	02	28.9	1	15	50.2		17	35	46	21.1	1	04	12.6
	3	1	48	41.1	1	15	46.9		18	36	30	26.1	1	03	45.1
	4	2	34	51.6	1	15	43.2		19	37	14	27.3	1	03	17.0
	5	3	21	00.4	1	15	38.8		20	37	58	24.8	1	02	48.4
	6	4	07	07.4	1	15	34.0		21	38	42	18.5	1	02	19.3
	7	4	53	12.6	-1	15	28.6		22	39	26	08.5	-1	01	49.7
	8	5	39	15.8	1	15	22.7		23	40	09	54.6	1	01	19.5
	9	6	25	17.1	1	15	16.3		24	40	53	36.8	1	00	48.8
	10	7	11	16.3	1	15	09.4		25	41	37	15.1	1	00	17.6
	11	7	57	13.3	1	15	01.9		26	42	20	49.5	0	59	45.9
	12	8	43	08.1	1	14	54.0		27	43	04	19.8	0	59	13.6
	13	9	29	00.6	-1	14	45.5		28	43	47	46.0	-0	58	40.8
	14	10	14	50.8	1	14	36.5		29	44	31	08.2	0	58	07.5
	15	11	00	38.5	1	14	27.0		30	45	14	26.2	0	57	33.7
	16	11	46	23.8	1	14	16.9	July	1	45	57	40.0	0	56	59.5
	17	12	32	06.7	-1	14	06.4		2	46	40	49.5	-0	56	24.7

MARS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	45	57	40.0	-0	56	59.5	Aug.	16	77	33	27.4	-0	21	57.7
	2	46	40	49.5	0	56	24.7		17	78	12	17.8	0	21	00.5
	3	47	23	54.6	0	55	49.4		18	78	51	01.2	0	20	02.8
	4	48	06	55.3	0	55	13.7		19	79	29	37.4	0	19	04.6
	5	48	49	51.4	0	54	37.5		20	80	08	06.5	0	18	05.8
	6	49	32	42.9	0	54	00.8		21	80	46	28.4	0	17	06.5
	7	50	15	29.5	-0	53	23.6		22	81	24	43.1	-0	16	06.6
	8	50	58	11.3	0	52	46.0		23	82	02	50.4	0	15	06.2
	9	51	40	48.2	0	52	07.8		24	82	40	50.4	0	14	05.4
	10	52	23	20.2	0	51	29.2		25	83	18	42.8	0	13	04.0
	11	53	05	47.2	0	50	50.1		26	83	56	27.7	0	12	02.0
	12	53	48	09.1	0	50	10.6		27	84	34	04.8	0	10	59.6
	13	54	30	26.1	-0	49	30.5		28	85	11	33.9	-0	09	56.7
	14	55	12	38.0	0	48	50.0		29	85	48	55.0	0	08	53.2
	15	55	54	44.8	0	48	08.9		30	86	26	07.7	0	07	49.2
	16	56	36	46.6	0	47	27.4		31	87	03	12.0	0	06	44.6
	17	57	18	43.3	0	46	45.4	Sept.	1	87	40	07.7	0	05	39.6
	18	58	00	34.9	0	46	02.8		2	88	16	54.7	0	04	34.0
	19	58	42	21.5	-0	45	19.8		3	88	53	32.7	-0	03	27.8
	20	59	24	02.8	0	44	36.2		4	89	30	01.8	0	02	21.1
	21	60	05	39.0	0	43	52.2		5	90	06	21.8	0	01	13.8
	22	60	47	10.0	0	43	07.7		6	90	42	32.5	-0	00	05.9
	23	61	28	35.7	0	42	22.6		7	91	18	33.9	+0	01	02.6
	24	62	09	56.0	0	41	37.1		8	91	54	25.8	0	02	11.6
	25	62	51	11.0	-0	40	51.0		9	92	30	08.2	+0	03	21.3
	26	63	32	20.6	0	40	04.5		10	93	05	41.0	0	04	31.6
	27	64	13	24.8	0	39	17.5		11	93	41	03.9	0	05	42.6
	28	64	54	23.5	0	38	30.0		12	94	16	17.0	0	06	54.2
	29	65	35	16.7	0	37	42.0		13	94	51	20.1	0	08	06.4
	30	66	16	04.1	0	36	53.6		14	95	26	13.0	0	09	19.3
	31	66	56	45.8	-0	36	04.7		15	96	00	55.7	+0	10	32.8
Aug.	1	67	37	21.6	0	35	15.4		16	96	35	28.0	0	11	47.1
	2	68	17	51.3	0	34	25.6		17	97	09	49.8	0	13	02.0
	3	68	58	14.9	0	33	35.3		18	97	44	01.0	0	14	17.6
	4	69	38	32.3	0	32	44.5		19	98	18	01.5	0	15	33.8
	5	70	18	43.2	0	31	53.3		20	98	51	51.2	0	16	50.8
	6	70	58	47.7	-0	31	01.6		21	99	25	29.8	+0	18	08.4
	7	71	38	45.8	0	30	09.5		22	99	58	57.3	0	19	26.8
	8	72	18	37.2	0	29	16.8		23	100	32	13.4	0	20	45.8
	9	72	58	22.1	0	28	23.7		24	101	05	17.8	0	22	05.5
	10	73	38	00.2	0	27	30.1		25	101	38	10.3	0	23	26.0
	11	74	17	31.7	0	26	36.0		26	102	10	50.4	0	24	47.2
	12	74	56	56.5	-0	25	41.3		27	102	43	18.1	+0	26	09.1
	13	75	36	14.5	0	24	46.2		28	103	15	33.0	0	27	31.7
	14	76	15	25.7	0	23	50.6		29	103	47	34.8	0	28	55.1
	15	76	54	30.0	0	22	54.4		30	104	19	23.2	0	30	19.3
	16	77	33	27.4	-0	21	57.7	Oct.	1	104	50	58.2	+0	31	44.3

MARS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	104	50	58.2	+0	31	44.3	Nov.	16	123	28	29.0	+1	55	42.9
	2	105	22	19.3	0	33	10.1		17	123	42	44.9	1	58	02.7
	3	105	53	26.3	0	34	36.7		18	123	56	26.5	2	00	24.0
	4	106	24	19.1	0	36	04.2		19	124	09	32.8	2	02	46.7
	5	106	54	57.3	0	37	32.5		20	124	22	03.0	2	05	10.8
	6	107	25	20.7	0	39	01.7		21	124	33	56.3	2	07	36.3
	7	107	55	29.0	+0	40	31.8		22	124	45	11.9	+2	10	03.3
	8	108	25	22.1	0	42	02.9		23	124	55	49.1	2	12	31.7
	9	108	54	59.6	0	43	34.8		24	125	05	47.0	2	15	01.5
	10	109	24	21.2	0	45	07.7		25	125	15	04.9	2	17	32.6
	11	109	53	26.7	0	46	41.5		26	125	23	41.9	2	20	05.1
	12	110	22	15.9	0	48	16.4		27	125	31	37.4	2	22	39.0
	13	110	50	48.4	+0	49	52.2		28	125	38	50.7	+2	25	14.2
	14	111	19	03.9	0	51	29.0		29	125	45	20.9	2	27	50.6
	15	111	47	02.3	0	53	06.9		30	125	51	07.5	2	30	28.3
	16	112	14	43.2	0	54	45.7	Dec.	1	125	56	09.6	2	33	07.2
	17	112	42	06.4	0	56	25.6		2	126	00	26.7	2	35	47.2
	18	113	09	11.7	0	58	06.6		3	126	03	58.1	2	38	28.3
	19	113	35	58.5	+0	59	48.6		4	126	06	43.3	+2	41	10.3
	20	114	02	26.6	1	01	31.6		5	126	08	41.7	2	43	53.4
	21	114	28	35.6	1	03	15.8		6	126	09	52.6	2	46	37.2
	22	114	54	24.8	1	05	01.0		7	126	10	15.8	2	49	21.9
	23	115	19	53.8	1	06	47.3		8	126	09	50.8	2	52	07.2
	24	115	45	02.2	1	08	34.8		9	126	08	37.2	2	54	53.0
	25	116	09	49.4	+1	10	23.4		10	126	06	34.7	+2	57	39.3
	26	116	34	14.9	1	12	13.2		11	126	03	43.1	3	00	25.8
	27	116	58	18.2	1	14	04.2		12	126	00	02.1	3	03	12.5
	28	117	21	58.8	1	15	56.4		13	125	55	31.5	3	05	59.3
	29	117	45	16.2	1	17	49.8		14	125	50	11.1	3	08	45.9
	30	118	08	09.9	1	19	44.5		15	125	44	00.7	3	11	32.3
	31	118	30	39.4	+1	21	40.4		16	125	37	00.2	+3	14	18.2
Nov.	1	118	52	44.3	1	23	37.6		17	125	29	09.4	3	17	03.5
	2	119	14	23.9	1	25	36.2		18	125	20	28.2	3	19	48.0
	3	119	35	37.7	1	27	36.1		19	125	10	56.8	3	22	31.6
	4	119	56	25.3	1	29	37.4		20	125	00	35.3	3	25	14.0
	5	120	16	46.1	1	31	40.0		21	124	49	24.0	3	27	55.1
	6	120	36	39.6	+1	33	44.0		22	124	37	23.3	+3	30	34.6
	7	120	56	05.1	1	35	49.5		23	124	24	33.8	3	33	12.3
	8	121	15	02.2	1	37	56.3		24	124	10	56.1	3	35	48.0
	9	121	33	30.3	1	40	04.6		25	123	56	31.0	3	38	21.4
	10	121	51	28.8	1	42	14.3		26	123	41	19.5	3	40	52.4
	11	122	08	57.3	1	44	25.5		27	123	25	22.6	3	43	20.7
	12	122	25	55.1	+1	46	38.1		28	123	08	41.5	+3	45	46.0
	13	122	42	21.7	1	48	52.1		29	122	51	17.7	3	48	08.1
	14	122	58	16.7	1	51	07.6		30	122	33	12.6	3	50	26.7
	15	123	13	39.3	1	53	24.5		31	122	14	28.0	3	52	41.6
	16	123	28	29.0	+1	55	42.9		32	121	55	05.5	+3	54	52.6

MARS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	17	44	58.43	-23	56	03.8	2.426 847	3.62	1.93	11	07	59
	1	17	48	12.91	23	57	40.9	2.423 821	3.63	1.93	11	07	17
	2	17	51	27.66	23	59	03.1	2.420 769	3.63	1.93	11	06	36
	3	17	54	42.68	24	00	10.1	2.417 692	3.64	1.94	11	05	54
	4	17	57	57.94	24	01	02.0	2.414 590	3.64	1.94	11	05	13
	5	18	01	13.44	24	01	38.7	2.411 463	3.65	1.94	11	04	32
	6	18	04	29.17	-24	02	00.1	2.408 311	3.65	1.94	11	03	51
	7	18	07	45.10	24	02	06.2	2.405 134	3.66	1.95	11	03	11
	8	18	11	01.23	24	01	57.0	2.401 933	3.66	1.95	11	02	31
	9	18	14	17.54	24	01	32.3	2.398 708	3.67	1.95	11	01	50
	10	18	17	34.01	24	00	52.3	2.395 459	3.67	1.95	11	01	10
	11	18	20	50.63	23	59	56.8	2.392 186	3.68	1.96	11	00	30
	12	18	24	07.37	-23	58	45.9	2.388 890	3.68	1.96	10	59	51
	13	18	27	24.21	23	57	19.5	2.385 571	3.69	1.96	10	59	11
	14	18	30	41.15	23	55	37.5	2.382 231	3.69	1.96	10	58	31
	15	18	33	58.15	23	53	40.1	2.378 869	3.70	1.97	10	57	52
	16	18	37	15.21	23	51	27.1	2.375 486	3.70	1.97	10	57	13
	17	18	40	32.32	23	48	58.6	2.372 084	3.71	1.97	10	56	33
	18	18	43	49.46	-23	46	14.5	2.368 663	3.71	1.98	10	55	54
	19	18	47	06.62	23	43	15.0	2.365 224	3.72	1.98	10	55	14
	20	18	50	23.78	23	39	59.9	2.361 768	3.72	1.98	10	54	35
	21	18	53	40.94	23	36	29.4	2.358 295	3.73	1.98	10	53	56
	22	18	56	58.09	23	32	43.5	2.354 806	3.73	1.99	10	53	16
	23	19	00	15.19	23	28	42.2	2.351 302	3.74	1.99	10	52	37
	24	19	03	32.26	-23	24	25.5	2.347 783	3.75	1.99	10	51	57
	25	19	06	49.26	23	19	53.6	2.344 249	3.75	2.00	10	51	18
	26	19	10	06.19	23	15	06.3	2.340 701	3.76	2.00	10	50	38
	27	19	13	23.04	23	10	03.8	2.337 139	3.76	2.00	10	49	58
	28	19	16	39.79	23	04	46.1	2.333 564	3.77	2.01	10	49	18
	29	19	19	56.43	22	59	13.2	2.329 975	3.77	2.01	10	48	38
	30	19	23	12.96	-22	53	25.3	2.326 374	3.78	2.01	10	47	58
	31	19	26	29.35	22	47	22.2	2.322 759	3.79	2.01	10	47	18
Feb.	1	19	29	45.61	22	41	04.2	2.319 132	3.79	2.02	10	46	38
	2	19	33	01.71	22	34	31.2	2.315 493	3.80	2.02	10	45	57
	3	19	36	17.66	22	27	43.3	2.311 841	3.80	2.02	10	45	17
	4	19	39	33.43	22	20	40.7	2.308 177	3.81	2.03	10	44	36
	5	19	42	49.02	-22	13	23.4	2.304 501	3.82	2.03	10	43	55
	6	19	46	04.41	22	05	51.6	2.300 813	3.82	2.03	10	43	14
	7	19	49	19.60	21	58	05.2	2.297 113	3.83	2.04	10	42	32
	8	19	52	34.55	21	50	04.5	2.293 401	3.83	2.04	10	41	50
	9	19	55	49.27	21	41	49.5	2.289 679	3.84	2.04	10	41	09
	10	19	59	03.74	21	33	20.4	2.285 945	3.85	2.05	10	40	26
	11	20	02	17.94	-21	24	37.2	2.282 200	3.85	2.05	10	39	44
	12	20	05	31.86	21	15	40.0	2.278 446	3.86	2.05	10	39	01
	13	20	08	45.49	21	06	29.1	2.274 683	3.87	2.06	10	38	18
	14	20	11	58.83	20	57	04.4	2.270 911	3.87	2.06	10	37	35
	15	20	15	11.87	-20	47	26.1	2.267 131	3.88	2.06	10	36	51

MARS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	20	15	11.87	-20	47	26.1	2.267 131	3.88	2.06	10	36	51
	16	20	18	24.61	20	37	34.5	2.263 344	3.89	2.07	10	36	07
	17	20	21	37.03	20	27	29.5	2.259 551	3.89	2.07	10	35	23
	18	20	24	49.14	20	17	11.4	2.255 752	3.90	2.07	10	34	38
	19	20	28	00.92	20	06	40.2	2.251 948	3.91	2.08	10	33	53
	20	20	31	12.36	19	55	56.3	2.248 139	3.91	2.08	10	33	08
	21	20	34	23.47	-19	44	59.5	2.244 326	3.92	2.09	10	32	23
	22	20	37	34.23	19	33	50.3	2.240 509	3.93	2.09	10	31	37
	23	20	40	44.64	19	22	28.5	2.236 689	3.93	2.09	10	30	50
	24	20	43	54.71	19	10	54.5	2.232 865	3.94	2.10	10	30	04
	25	20	47	04.41	18	59	08.2	2.229 039	3.95	2.10	10	29	17
	26	20	50	13.76	18	47	10.0	2.225 209	3.95	2.10	10	28	30
	27	20	53	22.76	-18	34	59.9	2.221 377	3.96	2.11	10	27	42
	28	20	56	31.39	18	22	38.0	2.217 543	3.97	2.11	10	26	54
	29	20	59	39.66	18	10	04.6	2.213 705	3.97	2.11	10	26	05
Mar.	1	21	02	47.57	17	57	19.7	2.209 866	3.98	2.12	10	25	17
	2	21	05	55.11	17	44	23.5	2.206 024	3.99	2.12	10	24	28
	3	21	09	02.29	17	31	16.3	2.202 179	3.99	2.13	10	23	38
	4	21	12	09.09	-17	17	58.2	2.198 332	4.00	2.13	10	22	48
	5	21	15	15.53	17	04	29.3	2.194 483	4.01	2.13	10	21	58
	6	21	18	21.59	16	50	49.9	2.190 631	4.01	2.14	10	21	07
	7	21	21	27.27	16	37	00.1	2.186 776	4.02	2.14	10	20	16
	8	21	24	32.56	16	23	00.1	2.182 919	4.03	2.14	10	19	25
	9	21	27	37.47	16	08	50.2	2.179 059	4.04	2.15	10	18	33
	10	21	30	41.98	-15	54	30.4	2.175 197	4.04	2.15	10	17	41
	11	21	33	46.10	15	40	01.1	2.171 334	4.05	2.16	10	16	48
	12	21	36	49.83	15	25	22.3	2.167 469	4.06	2.16	10	15	55
	13	21	39	53.17	15	10	34.2	2.163 603	4.06	2.16	10	15	02
	14	21	42	56.12	14	55	37.1	2.159 736	4.07	2.17	10	14	08
	15	21	45	58.68	14	40	31.2	2.155 870	4.08	2.17	10	13	14
	16	21	49	00.85	-14	25	16.6	2.152 004	4.09	2.17	10	12	20
	17	21	52	02.64	14	09	53.6	2.148 140	4.09	2.18	10	11	25
	18	21	55	04.05	13	54	22.4	2.144 278	4.10	2.18	10	10	29
	19	21	58	05.08	13	38	43.0	2.140 417	4.11	2.19	10	09	34
	20	22	01	05.73	13	22	55.8	2.136 559	4.12	2.19	10	08	38
	21	22	04	06.00	13	07	00.9	2.132 703	4.12	2.19	10	07	41
	22	22	07	05.91	-12	50	58.5	2.128 850	4.13	2.20	10	06	45
	23	22	10	05.45	12	34	48.7	2.125 001	4.14	2.20	10	05	47
	24	22	13	04.63	12	18	31.8	2.121 154	4.15	2.21	10	04	50
	25	22	16	03.46	12	02	07.9	2.117 310	4.15	2.21	10	03	52
	26	22	19	01.94	11	45	37.2	2.113 469	4.16	2.21	10	02	54
	27	22	22	00.08	11	28	59.8	2.109 632	4.17	2.22	10	01	55
	28	22	24	57.89	-11	12	16.1	2.105 797	4.18	2.22	10	00	57
	29	22	27	55.37	10	55	26.0	2.101 965	4.18	2.23	9	59	57
	30	22	30	52.53	10	38	29.9	2.098 136	4.19	2.23	9	58	58
	31	22	33	49.37	10	21	27.9	2.094 309	4.20	2.23	9	57	58
Apr.	1	22	36	45.90	-10	04	20.2	2.090 485	4.21	2.24	9	56	58

MARS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date	Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
	h	m	s	°	'	"		"	"	h	m	s
Apr. 1	22	36	45.90	-10	04	20.2	2.090 485	4.21	2.24	9	56	58
2	22	39	42.12	9	47	07.1	2.086 662	4.21	2.24	9	55	58
3	22	42	38.03	9	29	48.6	2.082 841	4.22	2.25	9	54	57
4	22	45	33.65	9	12	25.2	2.079 022	4.23	2.25	9	53	56
5	22	48	28.96	8	54	56.8	2.075 204	4.24	2.26	9	52	55
6	22	51	23.97	8	37	23.9	2.071 387	4.25	2.26	9	51	53
7	22	54	18.69	-8	19	46.4	2.067 571	4.25	2.26	9	50	51
8	22	57	13.12	8	02	04.8	2.063 756	4.26	2.27	9	49	49
9	23	00	07.27	7	44	19.1	2.059 942	4.27	2.27	9	48	46
10	23	03	01.15	7	26	29.6	2.056 129	4.28	2.28	9	47	44
11	23	05	54.75	7	08	36.4	2.052 318	4.28	2.28	9	46	41
12	23	08	48.09	6	50	39.9	2.048 509	4.29	2.28	9	45	37
13	23	11	41.17	-6	32	40.1	2.044 703	4.30	2.29	9	44	34
14	23	14	34.00	6	14	37.3	2.040 899	4.31	2.29	9	43	30
15	23	17	26.57	5	56	31.8	2.037 098	4.32	2.30	9	42	26
16	23	20	18.90	5	38	23.6	2.033 300	4.33	2.30	9	41	22
17	23	23	11.00	5	20	13.0	2.029 505	4.33	2.31	9	40	17
18	23	26	02.87	5	02	00.2	2.025 714	4.34	2.31	9	39	12
19	23	28	54.52	-4	43	45.3	2.021 926	4.35	2.31	9	38	08
20	23	31	45.95	4	25	28.5	2.018 142	4.36	2.32	9	37	02
21	23	34	37.19	4	07	10.0	2.014 361	4.37	2.32	9	35	57
22	23	37	28.23	3	48	50.0	2.010 583	4.37	2.33	9	34	52
23	23	40	19.09	3	30	28.6	2.006 808	4.38	2.33	9	33	46
24	23	43	09.77	3	12	06.0	2.003 036	4.39	2.34	9	32	40
25	23	46	00.29	-2	53	42.4	1.999 267	4.40	2.34	9	31	34
26	23	48	50.66	2	35	17.9	1.995 500	4.41	2.35	9	30	28
27	23	51	40.87	2	16	52.8	1.991 735	4.42	2.35	9	29	21
28	23	54	30.95	1	58	27.2	1.987 972	4.42	2.35	9	28	15
29	23	57	20.89	1	40	01.3	1.984 210	4.43	2.36	9	27	08
30	0	00	10.70	1	21	35.3	1.980 449	4.44	2.36	9	26	01
May 1	0	03	00.39	-1	03	09.4	1.976 688	4.45	2.37	9	24	55
2	0	05	49.96	0	44	43.8	1.972 927	4.46	2.37	9	23	48
3	0	08	39.41	0	26	18.6	1.969 165	4.47	2.38	9	22	41
4	0	11	28.75	-0	07	54.2	1.965 401	4.47	2.38	9	21	33
5	0	14	18.00	+0	10	29.3	1.961 637	4.48	2.39	9	20	26
6	0	17	07.14	0	28	51.8	1.957 871	4.49	2.39	9	19	19
7	0	19	56.20	+0	47	13.0	1.954 102	4.50	2.39	9	18	11
8	0	22	45.17	1	05	32.8	1.950 332	4.51	2.40	9	17	04
9	0	25	34.07	1	23	50.9	1.946 560	4.52	2.40	9	15	56
10	0	28	22.89	1	42	07.2	1.942 787	4.53	2.41	9	14	48
11	0	31	11.63	2	00	21.4	1.939 011	4.54	2.41	9	13	40
12	0	34	00.32	2	18	33.4	1.935 234	4.54	2.42	9	12	33
13	0	36	48.94	+2	36	43.0	1.931 456	4.55	2.42	9	11	25
14	0	39	37.50	2	54	50.0	1.927 676	4.56	2.43	9	10	17
15	0	42	26.01	3	12	54.3	1.923 895	4.57	2.43	9	09	09
16	0	45	14.49	3	30	55.6	1.920 112	4.58	2.44	9	08	01
17	0	48	02.92	+3	48	53.8	1.916 328	4.59	2.44	9	06	53

MARS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	0	48	02.92	+3	48	53.8	1.916 328	4.59	2.44	9	06	53
	18	0	50	51.33	4	06	48.8	1.912 543	4.60	2.45	9	05	45
	19	0	53	39.73	4	24	40.4	1.908 755	4.61	2.45	9	04	36
	20	0	56	28.11	4	42	28.4	1.904 966	4.62	2.46	9	03	28
	21	0	59	16.49	5	00	12.8	1.901 174	4.63	2.46	9	02	20
	22	1	02	04.87	5	17	53.3	1.897 380	4.63	2.47	9	01	12
	23	1	04	53.27	+5	35	29.8	1.893 583	4.64	2.47	9	00	04
	24	1	07	41.69	5	53	02.1	1.889 783	4.65	2.48	8	58	56
	25	1	10	30.14	6	10	30.2	1.885 979	4.66	2.48	8	57	48
	26	1	13	18.62	6	27	53.8	1.882 171	4.67	2.49	8	56	40
	27	1	16	07.13	6	45	12.7	1.878 357	4.68	2.49	8	55	32
	28	1	18	55.69	7	02	26.9	1.874 539	4.69	2.50	8	54	24
	29	1	21	44.28	+7	19	36.1	1.870 714	4.70	2.50	8	53	16
	30	1	24	32.93	7	36	40.2	1.866 882	4.71	2.51	8	52	08
	31	1	27	21.62	7	53	38.9	1.863 043	4.72	2.51	8	51	00
June	1	1	30	10.37	8	10	32.2	1.859 196	4.73	2.52	8	49	53
	2	1	32	59.17	8	27	19.8	1.855 341	4.74	2.52	8	48	45
	3	1	35	48.04	8	44	01.7	1.851 476	4.75	2.53	8	47	37
	4	1	38	36.97	+9	00	37.5	1.847 603	4.76	2.53	8	46	30
	5	1	41	25.97	9	17	07.2	1.843 719	4.77	2.54	8	45	22
	6	1	44	15.03	9	33	30.7	1.839 826	4.78	2.54	8	44	15
	7	1	47	04.16	9	49	47.6	1.835 924	4.79	2.55	8	43	08
	8	1	49	53.35	10	05	58.0	1.832 011	4.80	2.55	8	42	00
	9	1	52	42.61	10	22	01.5	1.828 088	4.81	2.56	8	40	53
	10	1	55	31.93	+10	37	58.1	1.824 156	4.82	2.57	8	39	46
	11	1	58	21.32	10	53	47.7	1.820 213	4.83	2.57	8	38	39
	12	2	01	10.78	11	09	30.0	1.816 261	4.84	2.58	8	37	32
	13	2	04	00.31	11	25	04.9	1.812 298	4.85	2.58	8	36	25
	14	2	06	49.92	11	40	32.4	1.808 325	4.86	2.59	8	35	18
	15	2	09	39.60	11	55	52.2	1.804 342	4.87	2.59	8	34	11
	16	2	12	29.37	+12	11	04.3	1.800 348	4.88	2.60	8	33	04
	17	2	15	19.22	12	26	08.5	1.796 343	4.90	2.61	8	31	58
	18	2	18	09.17	12	41	04.8	1.792 328	4.91	2.61	8	30	51
	19	2	20	59.21	12	55	53.0	1.788 300	4.92	2.62	8	29	45
	20	2	23	49.34	13	10	33.0	1.784 261	4.93	2.62	8	28	39
	21	2	26	39.57	13	25	04.7	1.780 210	4.94	2.63	8	27	32
	22	2	29	29.90	+13	39	28.1	1.776 146	4.95	2.63	8	26	26
	23	2	32	20.32	13	53	42.9	1.772 069	4.96	2.64	8	25	20
	24	2	35	10.84	14	07	49.0	1.767 978	4.97	2.65	8	24	14
	25	2	38	01.46	14	21	46.4	1.763 872	4.99	2.65	8	23	08
	26	2	40	52.18	14	35	34.9	1.759 751	5.00	2.66	8	22	02
	27	2	43	42.98	14	49	14.3	1.755 614	5.01	2.67	8	20	57
	28	2	46	33.88	+15	02	44.6	1.751 460	5.02	2.67	8	19	51
	29	2	49	24.87	15	16	05.6	1.747 289	5.03	2.68	8	18	46
	30	2	52	15.95	15	29	17.2	1.743 100	5.05	2.68	8	17	40
July	1	2	55	07.11	15	42	19.4	1.738 892	5.06	2.69	8	16	35
	2	2	57	58.36	+15	55	11.9	1.734 665	5.07	2.70	8	15	30

MARS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	2	55	07.11	+15	42	19.4	1.738 892	5.06	2.69	8	16	35
	2	2	57	58.36	15	55	11.9	1.734 665	5.07	2.70	8	15	30
	3	3	00	49.68	16	07	54.7	1.730 419	5.08	2.70	8	14	25
	4	3	03	41.07	16	20	27.6	1.726 154	5.09	2.71	8	13	20
	5	3	06	32.52	16	32	50.7	1.721 868	5.11	2.72	8	12	15
	6	3	09	24.02	16	45	03.7	1.717 563	5.12	2.72	8	11	10
	7	3	12	15.57	+16	57	06.5	1.713 238	5.13	2.73	8	10	05
	8	3	15	07.16	17	08	59.1	1.708 892	5.15	2.74	8	08	60
	9	3	17	58.78	17	20	41.3	1.704 527	5.16	2.75	8	07	55
	10	3	20	50.43	17	32	13.2	1.700 141	5.17	2.75	8	06	50
	11	3	23	42.11	17	43	34.5	1.695 736	5.19	2.76	8	05	45
	12	3	26	33.80	17	54	45.3	1.691 309	5.20	2.77	8	04	40
	13	3	29	25.52	+18	05	45.4	1.686 863	5.21	2.77	8	03	36
	14	3	32	17.25	18	16	34.8	1.682 395	5.23	2.78	8	02	31
	15	3	35	08.99	18	27	13.5	1.677 907	5.24	2.79	8	01	26
	16	3	38	00.73	18	37	41.4	1.673 398	5.26	2.80	8	00	21
	17	3	40	52.48	18	47	58.5	1.668 868	5.27	2.80	7	59	16
	18	3	43	44.23	18	58	04.6	1.664 316	5.28	2.81	7	58	12
	19	3	46	35.96	+19	07	59.9	1.659 742	5.30	2.82	7	57	07
	20	3	49	27.68	19	17	44.2	1.655 146	5.31	2.83	7	56	02
	21	3	52	19.39	19	27	17.5	1.650 527	5.33	2.84	7	54	57
	22	3	55	11.06	19	36	39.7	1.645 885	5.34	2.84	7	53	52
	23	3	58	02.69	19	45	50.8	1.641 220	5.36	2.85	7	52	48
	24	4	00	54.29	19	54	50.8	1.636 529	5.37	2.86	7	51	43
	25	4	03	45.83	+20	03	39.5	1.631 813	5.39	2.87	7	50	38
	26	4	06	37.31	20	12	17.0	1.627 072	5.40	2.88	7	49	33
	27	4	09	28.73	20	20	43.1	1.622 303	5.42	2.88	7	48	27
	28	4	12	20.07	20	28	57.9	1.617 508	5.44	2.89	7	47	22
	29	4	15	11.32	20	37	01.4	1.612 684	5.45	2.90	7	46	17
	30	4	18	02.48	20	44	53.4	1.607 833	5.47	2.91	7	45	12
	31	4	20	53.52	+20	52	34.1	1.602 953	5.49	2.92	7	44	06
Aug.	1	4	23	44.43	21	00	03.4	1.598 044	5.50	2.93	7	43	00
	2	4	26	35.19	21	07	21.2	1.593 107	5.52	2.94	7	41	55
	3	4	29	25.80	21	14	27.5	1.588 140	5.54	2.95	7	40	49
	4	4	32	16.23	21	21	22.4	1.583 145	5.55	2.96	7	39	43
	5	4	35	06.48	21	28	05.8	1.578 121	5.57	2.97	7	38	36
	6	4	37	56.53	+21	34	37.7	1.573 067	5.59	2.98	7	37	30
	7	4	40	46.36	21	40	58.2	1.567 985	5.61	2.98	7	36	23
	8	4	43	35.97	21	47	07.2	1.562 873	5.63	2.99	7	35	16
	9	4	46	25.35	21	53	04.8	1.557 733	5.65	3.00	7	34	09
	10	4	49	14.48	21	58	51.0	1.552 564	5.66	3.01	7	33	01
	11	4	52	03.36	22	04	25.8	1.547 366	5.68	3.02	7	31	54
	12	4	54	51.98	+22	09	49.3	1.542 139	5.70	3.03	7	30	46
	13	4	57	40.32	22	15	01.6	1.536 883	5.72	3.05	7	29	37
	14	5	00	28.38	22	20	02.6	1.531 598	5.74	3.06	7	28	29
	15	5	03	16.13	22	24	52.4	1.526 284	5.76	3.07	7	27	20
	16	5	06	03.59	+22	29	31.2	1.520 940	5.78	3.08	7	26	11

MARS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	5	06	03.59	+22	29	31.2	1.520 940	5.78	3.08	7	26	11
	17	5	08	50.72	22	33	58.9	1.515 567	5.80	3.09	7	25	01
	18	5	11	37.52	22	38	15.5	1.510 165	5.82	3.10	7	23	52
	19	5	14	23.97	22	42	21.2	1.504 732	5.84	3.11	7	22	42
	20	5	17	10.07	22	46	16.0	1.499 269	5.87	3.12	7	21	31
	21	5	19	55.81	22	49	60.0	1.493 775	5.89	3.13	7	20	20
	22	5	22	41.17	+22	53	33.1	1.488 250	5.91	3.14	7	19	09
	23	5	25	26.13	22	56	55.4	1.482 692	5.93	3.16	7	17	57
	24	5	28	10.70	23	00	07.1	1.477 102	5.95	3.17	7	16	45
	25	5	30	54.85	23	03	08.1	1.471 478	5.98	3.18	7	15	33
	26	5	33	38.57	23	05	58.6	1.465 821	6.00	3.19	7	14	20
	27	5	36	21.83	23	08	38.7	1.460 131	6.02	3.21	7	13	06
	28	5	39	04.63	+23	11	08.4	1.454 406	6.05	3.22	7	11	53
	29	5	41	46.93	23	13	27.9	1.448 648	6.07	3.23	7	10	38
	30	5	44	28.72	23	15	37.2	1.442 855	6.09	3.24	7	09	23
	31	5	47	09.98	23	17	36.5	1.437 029	6.12	3.26	7	08	08
Sept.	1	5	49	50.70	23	19	25.8	1.431 169	6.14	3.27	7	06	52
	2	5	52	30.84	23	21	05.2	1.425 275	6.17	3.28	7	05	36
	3	5	55	10.41	+23	22	34.9	1.419 348	6.20	3.30	7	04	18
	4	5	57	49.38	23	23	55.0	1.413 387	6.22	3.31	7	03	01
	5	6	00	27.74	23	25	05.5	1.407 394	6.25	3.33	7	01	42
	6	6	03	05.47	23	26	06.7	1.401 368	6.28	3.34	7	00	24
	7	6	05	42.55	23	26	58.7	1.395 310	6.30	3.35	6	59	04
	8	6	08	18.99	23	27	41.5	1.389 219	6.33	3.37	6	57	44
	9	6	10	54.76	+23	28	15.4	1.383 097	6.36	3.38	6	56	23
	10	6	13	29.84	23	28	40.5	1.376 943	6.39	3.40	6	55	01
	11	6	16	04.23	23	28	56.9	1.370 758	6.42	3.41	6	53	39
	12	6	18	37.91	23	29	04.9	1.364 542	6.44	3.43	6	52	16
	13	6	21	10.87	23	29	04.5	1.358 294	6.47	3.45	6	50	52
	14	6	23	43.09	23	28	56.0	1.352 016	6.50	3.46	6	49	28
	15	6	26	14.56	+23	28	39.4	1.345 708	6.53	3.48	6	48	03
	16	6	28	45.26	23	28	15.0	1.339 368	6.57	3.49	6	46	37
	17	6	31	15.19	23	27	42.8	1.332 998	6.60	3.51	6	45	10
	18	6	33	44.33	23	27	03.0	1.326 597	6.63	3.53	6	43	42
	19	6	36	12.66	23	26	15.7	1.320 165	6.66	3.55	6	42	14
	20	6	38	40.18	23	25	21.2	1.313 701	6.69	3.56	6	40	45
	21	6	41	06.88	+23	24	19.5	1.307 206	6.73	3.58	6	39	15
	22	6	43	32.72	23	23	11.0	1.300 679	6.76	3.60	6	37	44
	23	6	45	57.70	23	21	55.6	1.294 120	6.80	3.62	6	36	12
	24	6	48	21.79	23	20	33.8	1.287 529	6.83	3.63	6	34	40
	25	6	50	44.97	23	19	05.6	1.280 907	6.87	3.65	6	33	06
	26	6	53	07.21	23	17	31.3	1.274 253	6.90	3.67	6	31	32
	27	6	55	28.50	+23	15	51.1	1.267 568	6.94	3.69	6	29	56
	28	6	57	48.80	23	14	05.1	1.260 852	6.97	3.71	6	28	20
	29	7	00	08.10	23	12	13.6	1.254 107	7.01	3.73	6	26	42
	30	7	02	26.39	23	10	16.7	1.247 331	7.05	3.75	6	25	04
Oct.	1	7	04	43.63	+23	08	14.8	1.240 527	7.09	3.77	6	23	24

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	7	04	43.63	+23	08	14.8	1.240 527	7.09	3.77	6	23	24
	2	7	06	59.82	23	06	08.0	1.233 695	7.13	3.79	6	21	44
	3	7	09	14.92	23	03	56.5	1.226 834	7.17	3.81	6	20	02
	4	7	11	28.93	23	01	40.5	1.219 947	7.21	3.84	6	18	20
	5	7	13	41.83	22	59	20.4	1.213 033	7.25	3.86	6	16	36
	6	7	15	53.60	22	56	56.3	1.206 095	7.29	3.88	6	14	51
	7	7	18	04.21	+22	54	28.5	1.199 131	7.33	3.90	6	13	05
	8	7	20	13.66	22	51	57.2	1.192 143	7.38	3.93	6	11	17
	9	7	22	21.92	22	49	22.7	1.185 133	7.42	3.95	6	09	29
	10	7	24	28.97	22	46	45.1	1.178 100	7.46	3.97	6	07	39
	11	7	26	34.81	22	44	04.9	1.171 045	7.51	4.00	6	05	48
	12	7	28	39.39	22	41	22.1	1.163 969	7.56	4.02	6	03	56
	13	7	30	42.72	+22	38	37.0	1.156 874	7.60	4.05	6	02	03
	14	7	32	44.77	22	35	49.9	1.149 758	7.65	4.07	6	00	08
	15	7	34	45.52	22	33	01.0	1.142 624	7.70	4.10	5	58	12
	16	7	36	44.96	22	30	10.5	1.135 471	7.74	4.12	5	56	15
	17	7	38	43.07	22	27	18.7	1.128 299	7.79	4.15	5	54	16
	18	7	40	39.83	22	24	25.7	1.121 110	7.84	4.17	5	52	16
	19	7	42	35.22	+22	21	31.9	1.113 903	7.89	4.20	5	50	15
	20	7	44	29.22	22	18	37.6	1.106 680	7.95	4.23	5	48	12
	21	7	46	21.78	22	15	43.0	1.099 440	8.00	4.26	5	46	08
	22	7	48	12.90	22	12	48.4	1.092 184	8.05	4.28	5	44	02
	23	7	50	02.52	22	09	54.2	1.084 913	8.11	4.31	5	41	55
	24	7	51	50.61	22	07	00.6	1.077 628	8.16	4.34	5	39	47
	25	7	53	37.16	+22	04	07.9	1.070 330	8.22	4.37	5	37	36
	26	7	55	22.11	22	01	16.5	1.063 021	8.27	4.40	5	35	25
	27	7	57	05.45	21	58	26.5	1.055 701	8.33	4.43	5	33	11
	28	7	58	47.14	21	55	38.4	1.048 371	8.39	4.46	5	30	56
	29	8	00	27.14	21	52	52.5	1.041 034	8.45	4.50	5	28	40
	30	8	02	05.44	21	50	08.9	1.033 691	8.51	4.53	5	26	21
	31	8	03	41.99	+21	47	28.2	1.026 343	8.57	4.56	5	24	01
Nov.	1	8	05	16.76	21	44	50.5	1.018 992	8.63	4.59	5	21	39
	2	8	06	49.73	21	42	16.2	1.011 639	8.69	4.63	5	19	15
	3	8	08	20.86	21	39	45.6	1.004 287	8.76	4.66	5	16	50
	4	8	09	50.11	21	37	19.1	0.996 937	8.82	4.69	5	14	22
	5	8	11	17.47	21	34	56.9	0.989 590	8.89	4.73	5	11	53
	6	8	12	42.88	+21	32	39.4	0.982 249	8.95	4.76	5	09	22
	7	8	14	06.32	21	30	26.9	0.974 915	9.02	4.80	5	06	48
	8	8	15	27.75	21	28	19.8	0.967 591	9.09	4.84	5	04	13
	9	8	16	47.15	21	26	18.2	0.960 278	9.16	4.87	5	01	36
	10	8	18	04.47	21	24	22.5	0.952 977	9.23	4.91	4	58	56
	11	8	19	19.68	21	22	33.0	0.945 692	9.30	4.95	4	56	15
	12	8	20	32.75	+21	20	50.0	0.938 422	9.37	4.99	4	53	31
	13	8	21	43.65	21	19	13.7	0.931 171	9.44	5.03	4	50	45
	14	8	22	52.33	21	17	44.5	0.923 940	9.52	5.07	4	47	57
	15	8	23	58.77	21	16	22.6	0.916 730	9.59	5.11	4	45	07
	16	8	25	02.93	+21	15	08.5	0.909 543	9.67	5.15	4	42	15

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	8	25	02.93	+21	15	08.5	0.909 543	9.67	5.15	4	42	15
	17	8	26	04.75	21	14	02.3	0.902 381	9.75	5.19	4	39	20
	18	8	27	04.19	21	13	04.4	0.895 245	9.82	5.23	4	36	23
	19	8	28	01.19	21	12	15.2	0.888 139	9.90	5.27	4	33	23
	20	8	28	55.70	21	11	35.1	0.881 064	9.98	5.31	4	30	21
	21	8	29	47.68	21	11	04.2	0.874 022	10.06	5.35	4	27	16
	22	8	30	37.06	+21	10	43.0	0.867 017	10.14	5.40	4	24	09
	23	8	31	23.79	21	10	31.8	0.860 050	10.23	5.44	4	20	59
	24	8	32	07.83	21	10	30.8	0.853 126	10.31	5.49	4	17	46
	25	8	32	49.11	21	10	40.3	0.846 246	10.39	5.53	4	14	31
	26	8	33	27.60	21	11	00.7	0.839 414	10.48	5.58	4	11	13
	27	8	34	03.24	21	11	32.2	0.832 633	10.56	5.62	4	07	52
	28	8	34	35.97	+21	12	15.0	0.825 906	10.65	5.67	4	04	28
	29	8	35	05.76	21	13	09.4	0.819 238	10.73	5.71	4	01	01
	30	8	35	32.55	21	14	15.6	0.812 631	10.82	5.76	3	57	32
Dec.	1	8	35	56.30	21	15	33.8	0.806 088	10.91	5.81	3	53	59
	2	8	36	16.96	21	17	04.3	0.799 615	11.00	5.85	3	50	23
	3	8	36	34.48	21	18	47.1	0.793 214	11.09	5.90	3	46	44
	4	8	36	48.83	+21	20	42.5	0.786 889	11.18	5.95	3	43	02
	5	8	36	59.95	21	22	50.5	0.780 645	11.27	6.00	3	39	17
	6	8	37	07.83	21	25	11.3	0.774 484	11.35	6.04	3	35	28
	7	8	37	12.41	21	27	44.8	0.768 411	11.44	6.09	3	31	36
	8	8	37	13.66	21	30	31.1	0.762 429	11.53	6.14	3	27	41
	9	8	37	11.56	21	33	30.1	0.756 543	11.62	6.19	3	23	42
	10	8	37	06.08	+21	36	41.8	0.750 756	11.71	6.23	3	19	41
	11	8	36	57.19	21	40	06.2	0.745 072	11.80	6.28	3	15	35
	12	8	36	44.88	21	43	43.1	0.739 494	11.89	6.33	3	11	27
	13	8	36	29.12	21	47	32.4	0.734 027	11.98	6.38	3	07	15
	14	8	36	09.89	21	51	33.9	0.728 673	12.07	6.42	3	02	59
	15	8	35	47.16	21	55	47.6	0.723 438	12.16	6.47	2	58	40
	16	8	35	20.92	+22	00	13.3	0.718 325	12.24	6.52	2	54	18
	17	8	34	51.15	22	04	50.7	0.713 338	12.33	6.56	2	49	52
	18	8	34	17.83	22	09	39.5	0.708 481	12.41	6.61	2	45	23
	19	8	33	40.96	22	14	39.5	0.703 759	12.50	6.65	2	40	50
	20	8	33	00.54	22	19	50.2	0.699 176	12.58	6.69	2	36	13
	21	8	32	16.58	22	25	11.3	0.694 738	12.66	6.74	2	31	33
	22	8	31	29.09	+22	30	42.3	0.690 447	12.74	6.78	2	26	50
	23	8	30	38.09	22	36	22.7	0.686 310	12.81	6.82	2	22	03
	24	8	29	43.63	22	42	12.0	0.682 331	12.89	6.86	2	17	12
	25	8	28	45.75	22	48	09.4	0.678 515	12.96	6.90	2	12	19
	26	8	27	44.49	22	54	14.5	0.674 866	13.03	6.93	2	07	21
	27	8	26	39.91	23	00	26.5	0.671 389	13.10	6.97	2	02	21
	28	8	25	32.10	+23	06	44.6	0.668 088	13.16	7.01	1	57	18
	29	8	24	21.13	23	13	08.1	0.664 968	13.22	7.04	1	52	11
	30	8	23	07.09	23	19	36.1	0.662 034	13.28	7.07	1	47	01
	31	8	21	50.09	23	26	07.9	0.659 288	13.34	7.10	1	41	48
	32	8	20	30.25	+23	32	42.5	0.656 737	13.39	7.13	1	36	33

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector	Date	Heliocentric Longitude	Heliocentric Latitude	Radius Vector
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
Jan. 1	45 50 17.8	-1 03 56.4	4.984 8970	Apr. 2	54 07 40.6	-0 56 47.5	5.004 4420
3	46 01 09.0	1 03 47.8	4.985 2792	4	54 18 26.7	0 56 37.4	5.004 9098
5	46 12 00.1	1 03 39.2	4.985 6633	6	54 29 12.6	0 56 27.2	5.005 3794
7	46 22 51.1	1 03 30.7	4.986 0494	8	54 39 58.4	0 56 17.1	5.005 8507
9	46 33 42.0	1 03 22.0	4.986 4375	10	54 50 44.1	0 56 06.8	5.006 3237
11	46 44 32.7	1 03 13.3	4.986 8275	12	55 01 29.7	0 55 56.6	5.006 7985
13	46 55 23.4	-1 03 04.6	4.987 2195	14	55 12 15.1	-0 55 46.4	5.007 2750
15	47 06 14.0	1 02 55.9	4.987 6134	16	55 23 00.4	0 55 36.0	5.007 7533
17	47 17 04.5	1 02 47.0	4.988 0092	18	55 33 45.6	0 55 25.7	5.008 2333
19	47 27 54.8	1 02 38.2	4.988 4070	20	55 44 30.7	0 55 15.4	5.008 7149
21	47 38 45.1	1 02 29.4	4.988 8067	22	55 55 15.6	0 55 05.0	5.009 1983
23	47 49 35.2	1 02 20.5	4.989 2083	24	56 06 00.5	0 54 54.6	5.009 6834
25	48 00 25.3	-1 02 11.6	4.989 6118	26	56 16 45.2	-0 54 44.1	5.010 1702
27	48 11 15.3	1 02 02.6	4.990 0173	28	56 27 29.7	0 54 33.6	5.010 6587
29	48 22 05.1	1 01 53.6	4.990 4246	30	56 38 14.2	0 54 23.1	5.011 1489
31	48 32 54.8	1 01 44.5	4.990 8339	May 2	56 48 58.5	0 54 12.6	5.011 6407
Feb. 2	48 43 44.4	1 01 35.5	4.991 2451	4	56 59 42.6	0 54 02.0	5.012 1343
4	48 54 33.9	1 01 26.4	4.991 6581	6	57 10 26.7	0 53 51.4	5.012 6295
6	49 05 23.3	-1 01 17.2	4.992 0731	8	57 21 10.6	-0 53 40.8	5.013 1263
8	49 16 12.6	1 01 08.0	4.992 4900	10	57 31 54.4	0 53 30.2	5.013 6249
10	49 27 01.8	1 00 58.8	4.992 9087	12	57 42 38.1	0 53 19.5	5.014 1250
12	49 37 50.9	1 00 49.6	4.993 3293	14	57 53 21.6	0 53 08.8	5.014 6269
14	49 48 39.8	1 00 40.3	4.993 7518	16	58 04 05.0	0 52 58.0	5.015 1304
16	49 59 28.7	1 00 31.0	4.994 1762	18	58 14 48.3	0 52 47.3	5.015 6355
18	50 10 17.4	-1 00 21.6	4.994 6024	20	58 25 31.5	-0 52 36.5	5.016 1423
20	50 21 06.1	1 00 12.3	4.995 0305	22	58 36 14.5	0 52 25.7	5.016 6506
22	50 31 54.6	1 00 02.8	4.995 4605	24	58 46 57.4	0 52 14.8	5.017 1607
24	50 42 43.0	0 59 53.4	4.995 8923	26	58 57 40.1	0 52 03.9	5.017 6723
26	50 53 31.3	0 59 43.9	4.996 3259	28	59 08 22.8	0 51 53.0	5.018 1855
28	51 04 19.5	0 59 34.4	4.996 7614	30	59 19 05.3	0 51 42.1	5.018 7004
Mar. 1	51 15 07.5	-0 59 24.8	4.997 1987	June 1	59 29 47.6	-0 51 31.1	5.019 2168
3	51 25 55.5	0 59 15.2	4.997 6379	3	59 40 29.8	0 51 20.1	5.019 7349
5	51 36 43.3	0 59 05.6	4.998 0789	5	59 51 11.9	0 51 09.1	5.020 2545
7	51 47 31.0	0 58 55.9	4.998 5217	7	60 01 53.9	0 50 58.0	5.020 7757
9	51 58 18.6	0 58 46.3	4.998 9664	9	60 12 35.7	0 50 47.0	5.021 2985
11	52 09 06.1	0 58 36.5	4.999 4128	11	60 23 17.4	0 50 35.9	5.021 8229
13	52 19 53.5	-0 58 26.8	4.999 8611	13	60 33 58.9	-0 50 24.7	5.022 3489
15	52 30 40.7	0 58 17.0	5.000 3111	15	60 44 40.3	0 50 13.6	5.022 8764
17	52 41 27.8	0 58 07.2	5.000 7630	17	60 55 21.6	0 50 02.4	5.023 4054
19	52 52 14.9	0 57 57.3	5.001 2166	19	61 06 02.8	0 49 51.1	5.023 9361
21	53 03 01.8	0 57 47.5	5.001 6721	21	61 16 43.8	0 49 39.9	5.024 4682
23	53 13 48.5	0 57 37.5	5.002 1293	23	61 27 24.6	0 49 28.6	5.025 0019
25	53 24 35.2	-0 57 27.6	5.002 5883	25	61 38 05.4	-0 49 17.4	5.025 5372
27	53 35 21.7	0 57 17.6	5.003 0490	27	61 48 46.0	0 49 06.0	5.026 0740
29	53 46 08.2	0 57 07.6	5.003 5116	29	61 59 26.4	0 48 54.7	5.026 6123
31	53 56 54.5	0 56 57.5	5.003 9759	July 1	62 10 06.7	0 48 43.3	5.027 1521
Apr. 2	54 07 40.6	-0 56 47.5	5.004 4420	3	62 20 47.0	-0 48 31.9	5.027 6935

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HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	62	10	06.7	-0	48	43.3	5.027 1521	Oct.	1	70	18	26.3	-0	39	34.8	5.053 5357
	3	62	20	47.0	0	48	31.9	5.027 6935		3	70	28	59.8	0	39	22.4	5.054 1408
	5	62	31	27.0	0	48	20.5	5.028 2363		5	70	39	33.1	0	39	09.9	5.054 7472
	7	62	42	06.9	0	48	09.1	5.028 7807		7	70	50	06.3	0	38	57.5	5.055 3548
	9	62	52	46.7	0	47	57.6	5.029 3266		9	71	00	39.3	0	38	45.0	5.055 9636
	11	63	03	26.3	0	47	46.1	5.029 8739		11	71	11	12.1	0	38	32.5	5.056 5737
	13	63	14	05.7	-0	47	34.6	5.030 4228		13	71	21	44.8	-0	38	20.0	5.057 1850
	15	63	24	45.1	0	47	23.0	5.030 9731		15	71	32	17.4	0	38	07.4	5.057 7976
	17	63	35	24.3	0	47	11.5	5.031 5249		17	71	42	49.8	0	37	54.9	5.058 4113
	19	63	46	03.4	0	46	59.9	5.032 0782		19	71	53	22.0	0	37	42.3	5.059 0263
	21	63	56	42.3	0	46	48.3	5.032 6330		21	72	03	54.1	0	37	29.7	5.059 6424
	23	64	07	21.0	0	46	36.6	5.033 1892		23	72	14	26.0	0	37	17.1	5.060 2598
	25	64	17	59.7	-0	46	25.0	5.033 7469		25	72	24	57.8	-0	37	04.4	5.060 8783
	27	64	28	38.1	0	46	13.3	5.034 3061		27	72	35	29.4	0	36	51.8	5.061 4980
	29	64	39	16.5	0	46	01.5	5.034 8667		29	72	46	00.9	0	36	39.1	5.062 1189
	31	64	49	54.7	0	45	49.8	5.035 4287		31	72	56	32.2	0	36	26.4	5.062 7410
Aug.	2	65	00	32.8	0	45	38.0	5.035 9922	Nov.	2	73	07	03.3	0	36	13.7	5.063 3642
	4	65	11	10.7	0	45	26.3	5.036 5571		4	73	17	34.3	0	36	01.0	5.063 9886
	6	65	21	48.4	-0	45	14.5	5.037 1234		6	73	28	05.2	-0	35	48.3	5.064 6141
	8	65	32	26.1	0	45	02.6	5.037 6911		8	73	38	35.9	0	35	35.5	5.065 2408
	10	65	43	03.6	0	44	50.8	5.038 2603		10	73	49	06.4	0	35	22.7	5.065 8686
	12	65	53	40.9	0	44	38.9	5.038 8309		12	73	59	36.8	0	35	10.0	5.066 4975
	14	66	04	18.1	0	44	27.0	5.039 4028		14	74	10	07.0	0	34	57.2	5.067 1276
	16	66	14	55.1	0	44	15.1	5.039 9762		16	74	20	37.0	0	34	44.3	5.067 7588
	18	66	25	32.0	-0	44	03.1	5.040 5509		18	74	31	06.9	-0	34	31.5	5.068 3910
	20	66	36	08.8	0	43	51.1	5.041 1271		20	74	41	36.7	0	34	18.6	5.069 0244
	22	66	46	45.4	0	43	39.1	5.041 7046		22	74	52	06.3	0	34	05.8	5.069 6589
	24	66	57	21.9	0	43	27.1	5.042 2835		24	75	02	35.7	0	33	52.9	5.070 2945
	26	67	07	58.2	0	43	15.1	5.042 8638		26	75	13	05.0	0	33	40.0	5.070 9311
	28	67	18	34.3	0	43	03.0	5.043 4454		28	75	23	34.1	0	33	27.1	5.071 5689
	30	67	29	10.4	-0	42	50.9	5.044 0284		30	75	34	03.0	-0	33	14.2	5.072 2077
Sept.	1	67	39	46.2	0	42	38.8	5.044 6127	Dec.	2	75	44	31.8	0	33	01.2	5.072 8476
	3	67	50	21.9	0	42	26.7	5.045 1984		4	75	55	00.5	0	32	48.2	5.073 4885
	5	68	00	57.5	0	42	14.6	5.045 7854		6	76	05	28.9	0	32	35.3	5.074 1305
	7	68	11	32.9	0	42	02.4	5.046 3738		8	76	15	57.2	0	32	22.3	5.074 7735
	9	68	22	08.2	0	41	50.2	5.046 9634		10	76	26	25.4	0	32	09.2	5.075 4175
	11	68	32	43.3	-0	41	38.0	5.047 5544		12	76	36	53.4	-0	31	56.2	5.076 0626
	13	68	43	18.3	0	41	25.8	5.048 1467		14	76	47	21.2	0	31	43.2	5.076 7087
	15	68	53	53.1	0	41	13.5	5.048 7403		16	76	57	48.9	0	31	30.2	5.077 3559
	17	69	04	27.8	0	41	01.3	5.049 3353		18	77	08	16.4	0	31	17.1	5.078 0040
	19	69	15	02.4	0	40	49.0	5.049 9315		20	77	18	43.8	0	31	04.0	5.078 6531
	21	69	25	36.7	0	40	36.7	5.050 5290		22	77	29	10.9	0	30	50.9	5.079 3033
	23	69	36	10.9	-0	40	24.3	5.051 1278		24	77	39	38.0	-0	30	37.8	5.079 9544
	25	69	46	45.0	0	40	12.0	5.051 7278		26	77	50	04.9	0	30	24.7	5.080 6066
	27	69	57	18.9	0	39	59.6	5.052 3292		28	78	00	31.6	0	30	11.6	5.081 2597
	29	70	07	52.7	0	39	47.2	5.052 9318		30	78	10	58.1	0	29	58.4	5.081 9138
Oct.	1	70	18	26.3	-0	39	34.8	5.053 5357		32	78	21	24.5	-0	29	45.2	5.082 5688

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GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Jan.	0	35	34	51.8	-1	11	26.2
	1	35	34	56.7	1	11	07.7
	2	35	35	13.9	1	10	49.3
	3	35	35	43.7	1	10	30.9
	4	35	36	25.8	1	10	12.5
	5	35	37	20.5	1	09	54.1
	6	35	38	27.5	-1	09	35.7
	7	35	39	47.1	1	09	17.3
	8	35	41	19.0	1	08	59.0
	9	35	43	03.3	1	08	40.7
	10	35	45	00.0	1	08	22.4
	11	35	47	08.9	1	08	04.2
	12	35	49	30.0	-1	07	46.0
	13	35	52	03.1	1	07	27.8
	14	35	54	48.3	1	07	09.7
	15	35	57	45.3	1	06	51.7
	16	36	00	54.2	1	06	33.7
	17	36	04	14.9	1	06	15.8
	18	36	07	47.3	-1	05	57.9
	19	36	11	31.4	1	05	40.2
	20	36	15	27.0	1	05	22.5
	21	36	19	34.0	1	05	04.9
	22	36	23	52.3	1	04	47.4
	23	36	28	21.7	1	04	30.0
	24	36	33	02.2	-1	04	12.7
	25	36	37	53.7	1	03	55.5
	26	36	42	55.9	1	03	38.4
	27	36	48	08.8	1	03	21.4
	28	36	53	32.3	1	03	04.5
	29	36	59	06.3	1	02	47.7
	30	37	04	50.6	-1	02	31.0
	31	37	10	45.3	1	02	14.4
Feb.	1	37	16	50.2	1	01	58.0
	2	37	23	05.2	1	01	41.6
	3	37	29	30.3	1	01	25.4
	4	37	36	05.4	1	01	09.2
	5	37	42	50.3	-1	00	53.2
	6	37	49	44.9	1	00	37.3
	7	37	56	49.2	1	00	21.5
	8	38	04	03.0	1	00	05.8
	9	38	11	26.1	0	59	50.3
	10	38	18	58.4	0	59	34.8
	11	38	26	39.8	-0	59	19.5
	12	38	34	30.1	0	59	04.2
	13	38	42	29.3	0	58	49.1
	14	38	50	37.3	0	58	34.2
	15	38	58	53.9	-0	58	19.3

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Feb.	15	38	58	53.9	-0	58	19.3
	16	39	07	19.1	0	58	04.6
	17	39	15	52.6	0	57	50.0
	18	39	24	34.4	0	57	35.6
	19	39	33	24.3	0	57	21.3
	20	39	42	22.2	0	57	07.1
	21	39	51	27.9	-0	56	53.0
	22	40	00	41.2	0	56	39.1
	23	40	10	02.1	0	56	25.3
	24	40	19	30.4	0	56	11.7
	25	40	29	06.0	0	55	58.1
	26	40	38	48.9	0	55	44.7
	27	40	48	38.8	-0	55	31.5
	28	40	58	35.8	0	55	18.3
	29	41	08	39.8	0	55	05.3
Mar.	1	41	18	50.6	0	54	52.5
	2	41	29	08.2	0	54	39.7
	3	41	39	32.4	0	54	27.1
	4	41	50	03.2	-0	54	14.5
	5	42	00	40.5	0	54	02.2
	6	42	11	24.1	0	53	49.9
	7	42	22	13.9	0	53	37.7
	8	42	33	09.7	0	53	25.7
	9	42	44	11.5	0	53	13.8
	10	42	55	19.1	-0	53	02.0
	11	43	06	32.5	0	52	50.3
	12	43	17	51.5	0	52	38.8
	13	43	29	16.0	0	52	27.3
	14	43	40	46.1	0	52	16.0
	15	43	52	21.5	0	52	04.9
	16	44	04	02.2	-0	51	53.8
	17	44	15	47.9	0	51	42.9
	18	44	27	38.6	0	51	32.1
	19	44	39	34.2	0	51	21.4
	20	44	51	34.4	0	51	10.9
	21	45	03	39.2	0	51	00.4
	22	45	15	48.5	-0	50	50.1
	23	45	28	02.3	0	50	40.0
	24	45	40	20.3	0	50	29.9
	25	45	52	42.6	0	50	20.0
	26	46	05	09.0	0	50	10.1
	27	46	17	39.6	0	50	00.4
	28	46	30	14.1	-0	49	50.8
	29	46	42	52.7	0	49	41.3
	30	46	55	35.1	0	49	32.0
	31	47	08	21.3	0	49	22.7
Apr.	1	47	21	11.2	-0	49	13.5

JUPITER, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	47	21	11.2	-0	49	13.5	May	17	57	53	09.7	-0	44	00.7
	2	47	34	04.7	0	49	04.5		18	58	07	19.2	0	43	56.3
	3	47	47	01.8	0	48	55.5		19	58	21	28.1	0	43	51.9
	4	48	00	02.2	0	48	46.7		20	58	35	37.1	0	43	47.1
	5	48	13	05.9	0	48	37.9		21	58	49	46.1	0	43	42.6
	6	48	26	12.8	0	48	29.3		22	59	03	54.9	0	43	38.2
	7	48	39	22.8	-0	48	20.7		23	59	18	03.2	-0	43	34.0
	8	48	52	35.8	0	48	12.3		24	59	32	11.3	0	43	29.8
	9	49	05	51.9	0	48	04.0		25	59	46	18.8	0	43	25.7
	10	49	19	10.9	0	47	55.8		26	60	00	25.9	0	43	21.6
	11	49	32	32.7	0	47	47.6		27	60	14	32.4	0	43	17.7
	12	49	45	57.3	0	47	39.6		28	60	28	38.2	0	43	13.8
	13	49	59	24.5	-0	47	31.7		29	60	42	43.3	-0	43	10.0
	14	50	12	54.2	0	47	23.9		30	60	56	47.5	0	43	06.3
	15	50	26	26.3	0	47	16.3		31	61	10	50.9	0	43	02.6
	16	50	40	00.7	0	47	08.7	June	1	61	24	53.3	0	42	59.0
	17	50	53	37.2	0	47	01.2		2	61	38	54.7	0	42	55.5
	18	51	07	15.9	0	46	53.9		3	61	52	55.1	0	42	52.1
	19	51	20	56.6	-0	46	46.6		4	62	06	54.4	-0	42	48.7
	20	51	34	39.2	0	46	39.4		5	62	20	52.6	0	42	45.4
	21	51	48	23.7	0	46	32.4		6	62	34	49.6	0	42	42.2
	22	52	02	10.1	0	46	25.4		7	62	48	45.2	0	42	39.1
	23	52	15	58.2	0	46	18.6		8	63	02	39.4	0	42	36.0
	24	52	29	48.1	0	46	11.8		9	63	16	32.1	0	42	33.0
	25	52	43	39.7	-0	46	05.1		10	63	30	23.1	-0	42	30.1
	26	52	57	32.9	0	45	58.5		11	63	44	12.3	0	42	27.3
	27	53	11	27.6	0	45	52.0		12	63	57	59.8	0	42	24.6
	28	53	25	23.8	0	45	45.6		13	64	11	45.3	0	42	21.9
	29	53	39	21.4	0	45	39.3		14	64	25	29.0	0	42	19.3
	30	53	53	20.3	0	45	33.1		15	64	39	10.7	0	42	16.8
May	1	54	07	20.4	-0	45	26.9		16	64	52	50.3	-0	42	14.3
	2	54	21	21.7	0	45	20.9		17	65	06	27.9	0	42	11.9
	3	54	35	24.0	0	45	14.9		18	65	20	03.3	0	42	09.6
	4	54	49	27.3	0	45	09.0		19	65	33	36.5	0	42	07.3
	5	55	03	31.6	0	45	03.2		20	65	47	07.6	0	42	05.1
	6	55	17	36.7	0	44	57.5		21	66	00	36.3	0	42	03.0
	7	55	31	42.6	-0	44	51.9		22	66	14	02.6	-0	42	00.9
	8	55	45	49.4	0	44	46.3		23	66	27	26.5	0	41	58.9
	9	55	59	56.9	0	44	40.9		24	66	40	47.9	0	41	57.0
	10	56	14	04.9	0	44	35.5		25	66	54	06.6	0	41	55.1
	11	56	28	13.5	0	44	30.3		26	67	07	22.6	0	41	53.3
	12	56	42	22.4	0	44	25.1		27	67	20	35.8	0	41	51.5
	13	56	56	31.6	-0	44	20.0		28	67	33	46.2	-0	41	49.8
	14	57	10	41.0	0	44	15.0		29	67	46	53.6	0	41	48.2
	15	57	24	50.6	0	44	10.2		30	67	59	58.2	0	41	46.6
	16	57	39	00.1	0	44	05.4	July	1	68	12	59.8	0	41	45.1
	17	57	53	09.7	-0	44	00.7		2	68	25	58.3	-0	41	43.7

JUPITER, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	68	12	59.8	-0	41	45.1	Aug.	16	76	52	55.6	-0	41	39.8
	2	68	25	58.3	0	41	43.7		17	77	01	56.5	0	41	40.9
	3	68	38	53.6	0	41	42.3		18	77	10	50.1	0	41	42.0
	4	68	51	45.7	0	41	41.0		19	77	19	36.2	0	41	43.1
	5	69	04	34.4	0	41	39.8		20	77	28	14.6	0	41	44.2
	6	69	17	19.7	0	41	38.6		21	77	36	45.3	0	41	45.4
	7	69	30	01.3	-0	41	37.5		22	77	45	08.3	-0	41	46.7
	8	69	42	39.2	0	41	36.5		23	77	53	23.4	0	41	47.9
	9	69	55	13.3	0	41	35.5		24	78	01	30.5	0	41	49.2
	10	70	07	43.6	0	41	34.6		25	78	09	29.6	0	41	50.5
	11	70	20	09.9	0	41	33.8		26	78	17	20.6	0	41	51.9
	12	70	32	32.2	0	41	33.0		27	78	25	03.2	0	41	53.3
	13	70	44	50.4	-0	41	32.3		28	78	32	37.5	-0	41	54.7
	14	70	57	04.4	0	41	31.6		29	78	40	03.2	0	41	56.2
	15	71	09	14.3	0	41	31.0		30	78	47	20.1	0	41	57.7
	16	71	21	19.9	0	41	30.5		31	78	54	28.2	0	41	59.3
	17	71	33	21.2	0	41	30.0	Sept.	1	79	01	27.3	0	42	00.8
	18	71	45	18.1	0	41	29.6		2	79	08	17.3	0	42	02.4
	19	71	57	10.5	-0	41	29.2		3	79	14	58.1	-0	42	04.1
	20	72	08	58.3	0	41	28.9		4	79	21	29.5	0	42	05.7
	21	72	20	41.4	0	41	28.6		5	79	27	51.6	0	42	07.4
	22	72	32	19.7	0	41	28.4		6	79	34	04.2	0	42	09.1
	23	72	43	53.2	0	41	28.2		7	79	40	07.2	0	42	10.8
	24	72	55	21.7	0	41	28.1		8	79	46	00.5	0	42	12.5
	25	73	06	45.1	-0	41	28.0		9	79	51	44.1	-0	42	14.2
	26	73	18	03.4	0	41	28.0		10	79	57	17.9	0	42	15.9
	27	73	29	16.6	0	41	28.0		11	80	02	41.7	0	42	17.7
	28	73	40	24.6	0	41	28.1		12	80	07	55.4	0	42	19.4
	29	73	51	27.2	0	41	28.2		13	80	12	59.1	0	42	21.2
	30	74	02	24.4	0	41	28.4		14	80	17	52.4	0	42	22.9
	31	74	13	16.0	-0	41	28.7		15	80	22	35.4	-0	42	24.6
Aug.	1	74	24	02.0	0	41	29.0		16	80	27	08.0	0	42	26.3
	2	74	34	42.2	0	41	29.4		17	80	31	29.9	0	42	28.1
	3	74	45	16.4	0	41	29.8		18	80	35	41.2	0	42	29.8
	4	74	55	44.6	0	41	30.3		19	80	39	41.9	0	42	31.5
	5	75	06	06.6	0	41	30.8		20	80	43	31.8	0	42	33.2
	6	75	16	22.4	-0	41	31.4		21	80	47	10.8	-0	42	34.8
	7	75	26	31.7	0	41	32.0		22	80	50	39.0	0	42	36.5
	8	75	36	34.6	0	41	32.7		23	80	53	56.2	0	42	38.2
	9	75	46	31.0	0	41	33.5		24	80	57	02.2	0	42	39.8
	10	75	56	20.8	0	41	34.2		25	80	59	57.0	0	42	41.5
	11	76	06	03.8	0	41	35.1		26	81	02	40.4	0	42	43.1
	12	76	15	40.1	-0	41	35.9		27	81	05	12.2	-0	42	44.7
	13	76	25	09.5	0	41	36.9		28	81	07	32.6	0	42	46.3
	14	76	34	31.9	0	41	37.8		29	81	09	41.2	0	42	47.9
	15	76	43	47.3	0	41	38.8		30	81	11	38.1	0	42	49.4
	16	76	52	55.6	-0	41	39.8	Oct.	1	81	13	23.2	-0	42	50.9

JUPITER, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	81	13	23.2	-0	42	50.9	Nov.	16	79	03	55.8	-0	42	22.9
	2	81	14	56.5	0	42	52.4		17	78	57	06.7	0	42	18.9
	3	81	16	17.9	0	42	53.8		18	78	50	10.4	0	42	14.7
	4	81	17	27.4	0	42	55.2		19	78	43	07.3	0	42	10.4
	5	81	18	24.9	0	42	56.5		20	78	35	57.4	0	42	05.8
	6	81	19	10.5	0	42	57.8		21	78	28	41.1	0	42	01.1
	7	81	19	44.2	-0	42	59.0		22	78	21	18.8	-0	41	56.2
	8	81	20	05.8	0	43	00.2		23	78	13	50.6	0	41	51.1
	9	81	20	15.4	0	43	01.3		24	78	06	17.0	0	41	45.8
	10	81	20	12.9	0	43	02.3		25	77	58	38.3	0	41	40.3
	11	81	19	58.4	0	43	03.2		26	77	50	54.8	0	41	34.6
	12	81	19	31.7	0	43	04.1		27	77	43	07.0	0	41	28.7
	13	81	18	53.0	-0	43	04.9		28	77	35	15.1	-0	41	22.6
	14	81	18	02.1	0	43	05.6		29	77	27	19.6	0	41	16.3
	15	81	16	59.2	0	43	06.2		30	77	19	20.9	0	41	09.8
	16	81	15	44.2	0	43	06.7	Dec.	1	77	11	19.4	0	41	03.1
	17	81	14	17.2	0	43	07.2		2	77	03	15.3	0	40	56.1
	18	81	12	38.3	0	43	07.5		3	76	55	09.2	0	40	49.0
	19	81	10	47.6	-0	43	07.8		4	76	47	01.3	-0	40	41.7
	20	81	08	44.9	0	43	08.0		5	76	38	52.1	0	40	34.1
	21	81	06	30.4	0	43	08.0		6	76	30	41.9	0	40	26.4
	22	81	04	04.1	0	43	08.0		7	76	22	31.1	0	40	18.5
	23	81	01	25.9	0	43	07.9		8	76	14	20.0	0	40	10.3
	24	80	58	35.9	0	43	07.6		9	76	06	09.2	0	40	02.0
	25	80	55	34.1	-0	43	07.3		10	75	57	59.0	-0	39	53.5
	26	80	52	20.6	0	43	06.8		11	75	49	49.8	0	39	44.8
	27	80	48	55.5	0	43	06.3		12	75	41	42.1	0	39	35.9
	28	80	45	19.0	0	43	05.6		13	75	33	36.1	0	39	26.8
	29	80	41	31.0	0	43	04.7		14	75	25	32.3	0	39	17.6
	30	80	37	31.8	0	43	03.8		15	75	17	31.0	0	39	08.2
	31	80	33	21.5	-0	43	02.7		16	75	09	32.6	-0	38	58.7
Nov.	1	80	29	00.3	0	43	01.4		17	75	01	37.2	0	38	48.9
	2	80	24	28.3	0	43	00.0		18	74	53	45.4	0	38	39.1
	3	80	19	45.6	0	42	58.5		19	74	45	57.3	0	38	29.0
	4	80	14	52.6	0	42	56.8		20	74	38	13.3	0	38	18.8
	5	80	09	49.3	0	42	54.9		21	74	30	33.8	0	38	08.5
	6	80	04	35.9	-0	42	52.9		22	74	22	59.2	-0	37	58.0
	7	79	59	12.7	0	42	50.7		23	74	15	29.8	0	37	47.4
	8	79	53	39.8	0	42	48.3		24	74	08	05.9	0	37	36.6
	9	79	47	57.4	0	42	45.8		25	74	00	48.0	0	37	25.7
	10	79	42	05.7	0	42	43.0		26	73	53	36.4	0	37	14.6
	11	79	36	05.0	0	42	40.1		27	73	46	31.3	0	37	03.4
	12	79	29	55.6	-0	42	37.0		28	73	39	33.2	-0	36	52.1
	13	79	23	37.7	0	42	33.8		29	73	32	42.3	0	36	40.7
	14	79	17	11.5	0	42	30.3		30	73	25	59.0	0	36	29.1
	15	79	10	37.5	0	42	26.7		31	73	19	23.4	0	36	17.4
	16	79	03	55.8	-0	42	22.9		32	73	12	56.0	-0	36	05.6

JUPITER, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	2	14	44.63	+12	15	31.3	4.466 953	1.97	20.61	19	34	52
	1	2	14	44.52	12	15	50.3	4.481 460	1.96	20.54	19	30	56
	2	2	14	45.22	12	16	13.4	4.496 087	1.96	20.48	19	27	02
	3	2	14	46.72	12	16	40.7	4.510 831	1.95	20.41	19	23	08
	4	2	14	49.02	12	17	12.0	4.525 687	1.94	20.34	19	19	15
	5	2	14	52.12	12	17	47.4	4.540 649	1.94	20.27	19	15	23
	6	2	14	56.02	+12	18	27.0	4.555 715	1.93	20.21	19	11	31
	7	2	15	00.73	12	19	10.6	4.570 877	1.92	20.14	19	07	41
	8	2	15	06.23	12	19	58.3	4.586 133	1.92	20.07	19	03	51
	9	2	15	12.54	12	20	50.0	4.601 477	1.91	20.01	19	00	02
	10	2	15	19.64	12	21	45.8	4.616 903	1.90	19.94	18	56	14
	11	2	15	27.53	12	22	45.6	4.632 408	1.90	19.87	18	52	26
	12	2	15	36.20	+12	23	49.4	4.647 986	1.89	19.81	18	48	40
	13	2	15	45.66	12	24	57.1	4.663 631	1.89	19.74	18	44	54
	14	2	15	55.89	12	26	08.8	4.679 340	1.88	19.67	18	41	09
	15	2	16	06.89	12	27	24.2	4.695 106	1.87	19.61	18	37	24
	16	2	16	18.66	12	28	43.5	4.710 925	1.87	19.54	18	33	41
	17	2	16	31.20	12	30	06.5	4.726 791	1.86	19.48	18	29	58
	18	2	16	44.49	+12	31	33.3	4.742 701	1.85	19.41	18	26	16
	19	2	16	58.54	12	33	03.7	4.758 649	1.85	19.35	18	22	34
	20	2	17	13.34	12	34	37.8	4.774 632	1.84	19.28	18	18	54
	21	2	17	28.87	12	36	15.5	4.790 644	1.84	19.22	18	15	14
	22	2	17	45.15	12	37	56.8	4.806 682	1.83	19.15	18	11	35
	23	2	18	02.15	12	39	41.6	4.822 741	1.82	19.09	18	07	56
	24	2	18	19.87	+12	41	29.9	4.838 818	1.82	19.03	18	04	18
	25	2	18	38.30	12	43	21.6	4.854 908	1.81	18.96	18	00	41
	26	2	18	57.43	12	45	16.6	4.871 007	1.81	18.90	17	57	05
	27	2	19	17.26	12	47	15.0	4.887 113	1.80	18.84	17	53	29
	28	2	19	37.78	12	49	16.5	4.903 220	1.79	18.78	17	49	54
	29	2	19	58.99	12	51	21.3	4.919 325	1.79	18.71	17	46	20
	30	2	20	20.88	+12	53	29.3	4.935 425	1.78	18.65	17	42	46
	31	2	20	43.45	12	55	40.3	4.951 515	1.78	18.59	17	39	13
Feb.	1	2	21	06.68	12	57	54.5	4.967 591	1.77	18.53	17	35	41
	2	2	21	30.59	13	00	11.6	4.983 651	1.76	18.47	17	32	09
	3	2	21	55.15	13	02	31.8	4.999 689	1.76	18.41	17	28	39
	4	2	22	20.37	13	04	54.9	5.015 703	1.75	18.35	17	25	08
	5	2	22	46.24	+13	07	20.9	5.031 688	1.75	18.30	17	21	38
	6	2	23	12.75	13	09	49.9	5.047 641	1.74	18.24	17	18	09
	7	2	23	39.90	13	12	21.6	5.063 557	1.74	18.18	17	14	41
	8	2	24	07.67	13	14	56.1	5.079 434	1.73	18.12	17	11	13
	9	2	24	36.06	13	17	33.3	5.095 265	1.73	18.07	17	07	46
	10	2	25	05.06	13	20	13.2	5.111 049	1.72	18.01	17	04	19
	11	2	25	34.67	+13	22	55.6	5.126 780	1.72	17.96	17	00	53
	12	2	26	04.87	13	25	40.5	5.142 455	1.71	17.90	16	57	28
	13	2	26	35.66	13	28	27.9	5.158 070	1.70	17.85	16	54	03
	14	2	27	07.04	13	31	17.7	5.173 622	1.70	17.79	16	50	39
	15	2	27	38.99	+13	34	09.8	5.189 106	1.69	17.74	16	47	15

JUPITER, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	2	27	38.99	+13	34	09.8	5.189 106	1.69	17.74	16	47	15
	16	2	28	11.52	13	37	04.3	5.204 520	1.69	17.69	16	43	52
	17	2	28	44.61	13	40	01.0	5.219 860	1.68	17.64	16	40	29
	18	2	29	18.25	13	42	59.9	5.235 124	1.68	17.59	16	37	07
	19	2	29	52.44	13	46	00.9	5.250 307	1.67	17.53	16	33	45
	20	2	30	27.16	13	49	04.0	5.265 409	1.67	17.48	16	30	24
	21	2	31	02.42	+13	52	09.1	5.280 425	1.67	17.43	16	27	04
	22	2	31	38.19	13	55	16.2	5.295 354	1.66	17.39	16	23	44
	23	2	32	14.47	13	58	25.2	5.310 192	1.66	17.34	16	20	25
	24	2	32	51.26	14	01	36.0	5.324 936	1.65	17.29	16	17	06
	25	2	33	28.54	14	04	48.6	5.339 585	1.65	17.24	16	13	47
	26	2	34	06.32	14	08	02.9	5.354 136	1.64	17.19	16	10	29
	27	2	34	44.59	+14	11	18.9	5.368 586	1.64	17.15	16	07	12
	28	2	35	23.33	14	14	36.6	5.382 933	1.63	17.10	16	03	55
	29	2	36	02.56	14	17	55.8	5.397 174	1.63	17.06	16	00	38
Mar.	1	2	36	42.25	14	21	16.6	5.411 307	1.63	17.01	15	57	22
	2	2	37	22.42	14	24	38.9	5.425 328	1.62	16.97	15	54	06
	3	2	38	03.04	14	28	02.7	5.439 237	1.62	16.93	15	50	51
	4	2	38	44.11	+14	31	28.0	5.453 029	1.61	16.88	15	47	36
	5	2	39	25.64	14	34	54.6	5.466 703	1.61	16.84	15	44	22
	6	2	40	07.60	14	38	22.5	5.480 255	1.60	16.80	15	41	08
	7	2	40	50.00	14	41	51.8	5.493 684	1.60	16.76	15	37	55
	8	2	41	32.82	14	45	22.3	5.506 986	1.60	16.72	15	34	42
	9	2	42	16.05	14	48	53.9	5.520 159	1.59	16.68	15	31	29
	10	2	42	59.70	+14	52	26.7	5.533 199	1.59	16.64	15	28	17
	11	2	43	43.75	14	56	00.4	5.546 105	1.59	16.60	15	25	05
	12	2	44	28.20	14	59	35.2	5.558 875	1.58	16.56	15	21	54
	13	2	45	13.05	15	03	10.9	5.571 504	1.58	16.52	15	18	43
	14	2	45	58.29	15	06	47.6	5.583 992	1.57	16.49	15	15	32
	15	2	46	43.91	15	10	25.1	5.596 336	1.57	16.45	15	12	22
	16	2	47	29.90	+15	14	03.5	5.608 534	1.57	16.41	15	09	12
	17	2	48	16.26	15	17	42.6	5.620 585	1.56	16.38	15	06	02
	18	2	49	02.98	15	21	22.5	5.632 487	1.56	16.34	15	02	53
	19	2	49	50.04	15	25	03.0	5.644 238	1.56	16.31	14	59	44
	20	2	50	37.45	15	28	44.1	5.655 837	1.55	16.28	14	56	36
	21	2	51	25.20	15	32	25.8	5.667 283	1.55	16.24	14	53	27
	22	2	52	13.27	+15	36	08.0	5.678 573	1.55	16.21	14	50	20
	23	2	53	01.67	15	39	50.7	5.689 707	1.55	16.18	14	47	12
	24	2	53	50.38	15	43	33.8	5.700 683	1.54	16.15	14	44	05
	25	2	54	39.42	15	47	17.3	5.711 500	1.54	16.12	14	40	58
	26	2	55	28.76	15	51	01.1	5.722 156	1.54	16.09	14	37	51
	27	2	56	18.40	15	54	45.2	5.732 650	1.53	16.06	14	34	45
	28	2	57	08.35	+15	58	29.6	5.742 981	1.53	16.03	14	31	39
	29	2	57	58.60	16	02	14.3	5.753 147	1.53	16.00	14	28	33
	30	2	58	49.14	16	05	59.2	5.763 146	1.53	15.97	14	25	28
	31	2	59	39.96	16	09	44.3	5.772 979	1.52	15.95	14	22	23
Apr.	1	3	00	31.07	+16	13	29.5	5.782 642	1.52	15.92	14	19	18

JUPITER, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	3	00	31.07	+16	13	29.5	5.782 642	1.52	15.92	14	19	18
	2	3	01	22.46	16	17	14.9	5.792 135	1.52	15.89	14	16	13
	3	3	02	14.11	16	21	00.3	5.801 455	1.52	15.87	14	13	09
	4	3	03	06.02	16	24	45.8	5.810 603	1.51	15.84	14	10	05
	5	3	03	58.19	16	28	31.2	5.819 574	1.51	15.82	14	07	01
	6	3	04	50.61	16	32	16.6	5.828 370	1.51	15.80	14	03	57
	7	3	05	43.28	+16	36	01.8	5.836 986	1.51	15.77	14	00	54
	8	3	06	36.19	16	39	46.9	5.845 423	1.50	15.75	13	57	51
	9	3	07	29.33	16	43	31.8	5.853 678	1.50	15.73	13	54	48
	10	3	08	22.71	16	47	16.5	5.861 751	1.50	15.71	13	51	45
	11	3	09	16.32	16	51	00.9	5.869 640	1.50	15.68	13	48	43
	12	3	10	10.16	16	54	45.1	5.877 344	1.50	15.66	13	45	41
	13	3	11	04.20	+16	58	28.9	5.884 862	1.49	15.64	13	42	39
	14	3	11	58.46	17	02	12.4	5.892 194	1.49	15.62	13	39	37
	15	3	12	52.91	17	05	55.5	5.899 339	1.49	15.61	13	36	35
	16	3	13	47.55	17	09	38.2	5.906 296	1.49	15.59	13	33	34
	17	3	14	42.38	17	13	20.4	5.913 066	1.49	15.57	13	30	32
	18	3	15	37.39	17	17	02.0	5.919 646	1.49	15.55	13	27	31
	19	3	16	32.58	+17	20	43.2	5.926 038	1.48	15.53	13	24	30
	20	3	17	27.94	17	24	23.7	5.932 240	1.48	15.52	13	21	30
	21	3	18	23.46	17	28	03.6	5.938 252	1.48	15.50	13	18	29
	22	3	19	19.15	17	31	42.8	5.944 074	1.48	15.49	13	15	29
	23	3	20	15.00	17	35	21.4	5.949 705	1.48	15.47	13	12	29
	24	3	21	11.01	17	38	59.3	5.955 145	1.48	15.46	13	09	28
	25	3	22	07.17	+17	42	36.5	5.960 393	1.48	15.45	13	06	29
	26	3	23	03.49	17	46	12.9	5.965 449	1.47	15.43	13	03	29
	27	3	23	59.94	17	49	48.7	5.970 313	1.47	15.42	13	00	29
	28	3	24	56.54	17	53	23.6	5.974 983	1.47	15.41	12	57	30
	29	3	25	53.27	17	56	57.8	5.979 459	1.47	15.40	12	54	30
	30	3	26	50.14	18	00	31.2	5.983 741	1.47	15.39	12	51	31
May	1	3	27	47.12	+18	04	03.7	5.987 828	1.47	15.37	12	48	32
	2	3	28	44.22	18	07	35.3	5.991 719	1.47	15.36	12	45	33
	3	3	29	41.44	18	11	06.0	5.995 414	1.47	15.36	12	42	34
	4	3	30	38.76	18	14	35.7	5.998 912	1.47	15.35	12	39	35
	5	3	31	36.18	18	18	04.5	6.002 211	1.47	15.34	12	36	36
	6	3	32	33.71	18	21	32.2	6.005 312	1.46	15.33	12	33	38
	7	3	33	31.34	+18	24	58.9	6.008 214	1.46	15.32	12	30	39
	8	3	34	29.06	18	28	24.5	6.010 916	1.46	15.32	12	27	41
	9	3	35	26.87	18	31	49.1	6.013 418	1.46	15.31	12	24	43
	10	3	36	24.76	18	35	12.7	6.015 720	1.46	15.30	12	21	44
	11	3	37	22.73	18	38	35.1	6.017 821	1.46	15.30	12	18	46
	12	3	38	20.76	18	41	56.3	6.019 723	1.46	15.29	12	15	48
	13	3	39	18.85	+18	45	16.4	6.021 425	1.46	15.29	12	12	50
	14	3	40	17.00	18	48	35.4	6.022 927	1.46	15.28	12	09	52
	15	3	41	15.19	18	51	53.0	6.024 230	1.46	15.28	12	06	54
	16	3	42	13.43	18	55	09.4	6.025 334	1.46	15.28	12	03	56
	17	3	43	11.71	+18	58	24.5	6.026 239	1.46	15.28	12	00	58

JUPITER, 2024
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	3	43	11.71	+18	58	24.5	6.026 239	1.46	15.28	12	00	58
	18	3	44	10.02	19	01	38.2	6.026 946	1.46	15.27	11	58	00
	19	3	45	08.34	19	04	50.5	6.027 454	1.46	15.27	11	55	02
	20	3	46	06.69	19	08	02.0	6.027 765	1.46	15.27	11	52	05
	21	3	47	05.09	19	11	12.0	6.027 878	1.46	15.27	11	49	07
	22	3	48	03.50	19	14	20.6	6.027 795	1.46	15.27	11	46	09
	23	3	49	01.94	+19	17	27.8	6.027 514	1.46	15.27	11	43	11
	24	3	50	00.38	19	20	33.7	6.027 036	1.46	15.27	11	40	13
	25	3	50	58.84	19	23	38.2	6.026 363	1.46	15.28	11	37	16
	26	3	51	57.29	19	26	41.3	6.025 493	1.46	15.28	11	34	18
	27	3	52	55.75	19	29	43.1	6.024 427	1.46	15.28	11	31	20
	28	3	53	54.20	19	32	43.4	6.023 165	1.46	15.28	11	28	22
	29	3	54	52.63	+19	35	42.3	6.021 707	1.46	15.29	11	25	25
	30	3	55	51.04	19	38	39.8	6.020 053	1.46	15.29	11	22	27
	31	3	56	49.43	19	41	35.7	6.018 203	1.46	15.30	11	19	29
June	1	3	57	47.79	19	44	30.2	6.016 157	1.46	15.30	11	16	31
	2	3	58	46.12	19	47	23.1	6.013 914	1.46	15.31	11	13	33
	3	3	59	44.42	19	50	14.5	6.011 476	1.46	15.31	11	10	36
	4	4	00	42.68	+19	53	04.4	6.008 842	1.46	15.32	11	07	38
	5	4	01	40.89	19	55	52.8	6.006 012	1.46	15.33	11	04	40
	6	4	02	39.06	19	58	39.6	6.002 987	1.46	15.34	11	01	42
	7	4	03	37.17	20	01	24.9	5.999 768	1.47	15.34	10	58	43
	8	4	04	35.21	20	04	08.6	5.996 354	1.47	15.35	10	55	45
	9	4	05	33.18	20	06	50.8	5.992 748	1.47	15.36	10	52	47
	10	4	06	31.07	+20	09	31.3	5.988 949	1.47	15.37	10	49	49
	11	4	07	28.87	20	12	10.2	5.984 958	1.47	15.38	10	46	50
	12	4	08	26.59	20	14	47.5	5.980 778	1.47	15.39	10	43	52
	13	4	09	24.20	20	17	23.2	5.976 407	1.47	15.40	10	40	53
	14	4	10	21.71	20	19	57.2	5.971 849	1.47	15.42	10	37	54
	15	4	11	19.12	20	22	29.5	5.967 102	1.47	15.43	10	34	56
	16	4	12	16.42	+20	25	00.2	5.962 169	1.47	15.44	10	31	57
	17	4	13	13.61	20	27	29.2	5.957 051	1.48	15.45	10	28	58
	18	4	14	10.68	20	29	56.6	5.951 748	1.48	15.47	10	25	58
	19	4	15	07.63	20	32	22.2	5.946 262	1.48	15.48	10	22	59
	20	4	16	04.45	20	34	46.3	5.940 593	1.48	15.50	10	19	60
	21	4	17	01.15	20	37	08.7	5.934 742	1.48	15.51	10	17	00
	22	4	17	57.70	+20	39	29.4	5.928 711	1.48	15.53	10	14	00
	23	4	18	54.12	20	41	48.5	5.922 499	1.48	15.54	10	11	01
	24	4	19	50.38	20	44	06.0	5.916 109	1.49	15.56	10	08	01
	25	4	20	46.49	20	46	21.8	5.909 540	1.49	15.58	10	05	00
	26	4	21	42.44	20	48	35.9	5.902 793	1.49	15.60	10	02	00
	27	4	22	38.22	20	50	48.3	5.895 869	1.49	15.61	9	58	60
	28	4	23	33.83	+20	52	59.0	5.888 769	1.49	15.63	9	55	59
	29	4	24	29.26	20	55	08.0	5.881 492	1.50	15.65	9	52	58
	30	4	25	24.52	20	57	15.2	5.874 040	1.50	15.67	9	49	57
July	1	4	26	19.59	20	59	20.8	5.866 414	1.50	15.69	9	46	56
	2	4	27	14.47	+21	01	24.7	5.858 614	1.50	15.71	9	43	55

JUPITER, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	4	26	19.59	+20	59	20.8	5.866 414	1.50	15.69	9	46	56
	2	4	27	14.47	21	01	24.7	5.858 614	1.50	15.71	9	43	55
	3	4	28	09.16	21	03	26.9	5.850 642	1.50	15.74	9	40	53
	4	4	29	03.64	21	05	27.4	5.842 499	1.51	15.76	9	37	51
	5	4	29	57.91	21	07	26.2	5.834 185	1.51	15.78	9	34	49
	6	4	30	51.96	21	09	23.4	5.825 702	1.51	15.80	9	31	47
	7	4	31	45.78	+21	11	18.8	5.817 052	1.51	15.83	9	28	45
	8	4	32	39.35	21	13	12.6	5.808 237	1.51	15.85	9	25	42
	9	4	33	32.69	21	15	04.6	5.799 257	1.52	15.87	9	22	39
	10	4	34	25.77	21	16	54.9	5.790 114	1.52	15.90	9	19	36
	11	4	35	18.60	21	18	43.6	5.780 811	1.52	15.93	9	16	32
	12	4	36	11.17	21	20	30.5	5.771 349	1.52	15.95	9	13	29
	13	4	37	03.46	+21	22	15.7	5.761 729	1.53	15.98	9	10	25
	14	4	37	55.49	21	23	59.2	5.751 953	1.53	16.00	9	07	21
	15	4	38	47.24	21	25	41.0	5.742 024	1.53	16.03	9	04	16
	16	4	39	38.71	21	27	21.1	5.731 942	1.53	16.06	9	01	11
	17	4	40	29.90	21	28	59.6	5.721 710	1.54	16.09	8	58	06
	18	4	41	20.79	21	30	36.5	5.711 329	1.54	16.12	8	55	01
	19	4	42	11.38	+21	32	11.7	5.700 800	1.54	16.15	8	51	55
	20	4	43	01.66	21	33	45.3	5.690 126	1.55	16.18	8	48	49
	21	4	43	51.63	21	35	17.3	5.679 309	1.55	16.21	8	45	43
	22	4	44	41.28	21	36	47.7	5.668 348	1.55	16.24	8	42	36
	23	4	45	30.60	21	38	16.5	5.657 247	1.55	16.27	8	39	29
	24	4	46	19.58	21	39	43.7	5.646 006	1.56	16.31	8	36	22
	25	4	47	08.22	+21	41	09.3	5.634 627	1.56	16.34	8	33	14
	26	4	47	56.51	21	42	33.2	5.623 110	1.56	16.37	8	30	06
	27	4	48	44.45	21	43	55.5	5.611 459	1.57	16.41	8	26	58
	28	4	49	32.04	21	45	16.3	5.599 673	1.57	16.44	8	23	49
	29	4	50	19.26	21	46	35.4	5.587 755	1.57	16.48	8	20	40
	30	4	51	06.11	21	47	53.0	5.575 706	1.58	16.51	8	17	31
	31	4	51	52.58	+21	49	09.1	5.563 529	1.58	16.55	8	14	21
Aug.	1	4	52	38.66	21	50	23.6	5.551 224	1.58	16.58	8	11	11
	2	4	53	24.34	21	51	36.6	5.538 796	1.59	16.62	8	08	00
	3	4	54	09.60	21	52	48.1	5.526 245	1.59	16.66	8	04	49
	4	4	54	54.45	21	53	58.1	5.513 573	1.59	16.70	8	01	38
	5	4	55	38.87	21	55	06.6	5.500 784	1.60	16.74	7	58	26
	6	4	56	22.86	+21	56	13.6	5.487 880	1.60	16.78	7	55	14
	7	4	57	06.40	21	57	19.0	5.474 864	1.61	16.82	7	52	01
	8	4	57	49.49	21	58	23.0	5.461 737	1.61	16.86	7	48	48
	9	4	58	32.13	21	59	25.5	5.448 503	1.61	16.90	7	45	34
	10	4	59	14.30	22	00	26.6	5.435 163	1.62	16.94	7	42	20
	11	4	59	56.00	22	01	26.1	5.421 722	1.62	16.98	7	39	05
	12	5	00	37.23	+22	02	24.3	5.408 181	1.63	17.02	7	35	50
	13	5	01	17.98	22	03	21.1	5.394 543	1.63	17.07	7	32	35
	14	5	01	58.24	22	04	16.5	5.380 810	1.63	17.11	7	29	19
	15	5	02	38.01	22	05	10.5	5.366 986	1.64	17.15	7	26	02
	16	5	03	17.27	+22	06	03.2	5.353 073	1.64	17.20	7	22	45

JUPITER, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	5	03	17.27	+22	06	03.2	5.353 073	1.64	17.20	7	22	45
	17	5	03	56.01	22	06	54.6	5.339 073	1.65	17.24	7	19	28
	18	5	04	34.24	22	07	44.7	5.324 989	1.65	17.29	7	16	10
	19	5	05	11.94	22	08	33.5	5.310 823	1.66	17.33	7	12	51
	20	5	05	49.09	22	09	21.0	5.296 579	1.66	17.38	7	09	32
	21	5	06	25.70	22	10	07.2	5.282 258	1.66	17.43	7	06	12
	22	5	07	01.76	+22	10	52.1	5.267 862	1.67	17.48	7	02	52
	23	5	07	37.27	22	11	35.7	5.253 394	1.67	17.52	6	59	32
	24	5	08	12.21	22	12	18.0	5.238 856	1.68	17.57	6	56	10
	25	5	08	46.58	22	12	59.2	5.224 251	1.68	17.62	6	52	48
	26	5	09	20.37	22	13	39.1	5.209 582	1.69	17.67	6	49	26
	27	5	09	53.58	22	14	17.8	5.194 852	1.69	17.72	6	46	03
	28	5	10	26.18	+22	14	55.3	5.180 062	1.70	17.77	6	42	39
	29	5	10	58.17	22	15	31.7	5.165 218	1.70	17.82	6	39	15
	30	5	11	29.54	22	16	06.9	5.150 321	1.71	17.87	6	35	50
	31	5	12	00.28	22	16	41.0	5.135 375	1.71	17.93	6	32	25
Sept.	1	5	12	30.38	22	17	14.0	5.120 384	1.72	17.98	6	28	58
	2	5	12	59.83	22	17	45.8	5.105 351	1.72	18.03	6	25	32
	3	5	13	28.62	+22	18	16.6	5.090 280	1.73	18.09	6	22	04
	4	5	13	56.75	22	18	46.2	5.075 174	1.73	18.14	6	18	36
	5	5	14	24.21	22	19	14.7	5.060 037	1.74	18.19	6	15	07
	6	5	14	50.98	22	19	42.2	5.044 873	1.74	18.25	6	11	38
	7	5	15	17.07	22	20	08.6	5.029 685	1.75	18.30	6	08	08
	8	5	15	42.47	22	20	34.0	5.014 478	1.75	18.36	6	04	37
	9	5	16	07.18	+22	20	58.4	4.999 255	1.76	18.41	6	01	05
	10	5	16	31.17	22	21	21.7	4.984 019	1.76	18.47	5	57	33
	11	5	16	54.46	22	21	44.2	4.968 776	1.77	18.53	5	54	00
	12	5	17	17.02	22	22	05.7	4.953 527	1.78	18.58	5	50	27
	13	5	17	38.86	22	22	26.2	4.938 278	1.78	18.64	5	46	52
	14	5	17	59.96	22	22	45.9	4.923 032	1.79	18.70	5	43	17
	15	5	18	20.32	+22	23	04.6	4.907 793	1.79	18.76	5	39	41
	16	5	18	39.92	22	23	22.5	4.892 564	1.80	18.82	5	36	05
	17	5	18	58.77	22	23	39.5	4.877 349	1.80	18.88	5	32	27
	18	5	19	16.85	22	23	55.5	4.862 151	1.81	18.93	5	28	49
	19	5	19	34.17	22	24	10.7	4.846 973	1.81	18.99	5	25	11
	20	5	19	50.72	22	24	25.0	4.831 821	1.82	19.05	5	21	31
	21	5	20	06.48	+22	24	38.4	4.816 696	1.83	19.11	5	17	51
	22	5	20	21.47	22	24	50.9	4.801 603	1.83	19.17	5	14	09
	23	5	20	35.66	22	25	02.7	4.786 546	1.84	19.23	5	10	27
	24	5	20	49.05	22	25	13.6	4.771 529	1.84	19.29	5	06	45
	25	5	21	01.64	22	25	23.8	4.756 556	1.85	19.35	5	03	01
	26	5	21	13.40	22	25	33.1	4.741 631	1.85	19.42	4	59	17
	27	5	21	24.34	+22	25	41.7	4.726 759	1.86	19.48	4	55	31
	28	5	21	34.44	22	25	49.5	4.711 945	1.87	19.54	4	51	45
	29	5	21	43.70	22	25	56.5	4.697 193	1.87	19.60	4	47	59
	30	5	21	52.12	22	26	02.7	4.682 508	1.88	19.66	4	44	11
Oct.	1	5	21	59.69	+22	26	08.2	4.667 894	1.88	19.72	4	40	22

JUPITER, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	5	21	59.69	+22	26	08.2	4.667 894	1.88	19.72	4	40	22
	2	5	22	06.41	22	26	12.8	4.653 357	1.89	19.78	4	36	33
	3	5	22	12.28	22	26	16.7	4.638 901	1.90	19.85	4	32	43
	4	5	22	17.29	22	26	19.8	4.624 531	1.90	19.91	4	28	52
	5	5	22	21.44	22	26	22.2	4.610 251	1.91	19.97	4	24	60
	6	5	22	24.72	22	26	23.8	4.596 068	1.91	20.03	4	21	07
	7	5	22	27.15	+22	26	24.7	4.581 984	1.92	20.09	4	17	13
	8	5	22	28.71	22	26	24.9	4.568 007	1.93	20.15	4	13	19
	9	5	22	29.41	22	26	24.4	4.554 139	1.93	20.21	4	09	23
	10	5	22	29.23	22	26	23.2	4.540 386	1.94	20.28	4	05	27
	11	5	22	28.19	22	26	21.4	4.526 753	1.94	20.34	4	01	30
	12	5	22	26.28	22	26	18.8	4.513 244	1.95	20.40	3	57	32
	13	5	22	23.49	+22	26	15.6	4.499 863	1.95	20.46	3	53	33
	14	5	22	19.84	22	26	11.6	4.486 616	1.96	20.52	3	49	34
	15	5	22	15.31	22	26	06.9	4.473 506	1.97	20.58	3	45	33
	16	5	22	09.92	22	26	01.5	4.460 538	1.97	20.64	3	41	32
	17	5	22	03.66	22	25	55.3	4.447 716	1.98	20.70	3	37	29
	18	5	21	56.55	22	25	48.4	4.435 044	1.98	20.76	3	33	26
	19	5	21	48.58	+22	25	40.8	4.422 528	1.99	20.82	3	29	22
	20	5	21	39.75	22	25	32.4	4.410 170	1.99	20.87	3	25	18
	21	5	21	30.08	22	25	23.4	4.397 976	2.00	20.93	3	21	12
	22	5	21	19.54	22	25	13.6	4.385 951	2.01	20.99	3	17	05
	23	5	21	08.16	22	25	03.2	4.374 099	2.01	21.05	3	12	58
	24	5	20	55.93	22	24	52.0	4.362 425	2.02	21.10	3	08	50
	25	5	20	42.85	+22	24	40.0	4.350 934	2.02	21.16	3	04	41
	26	5	20	28.93	22	24	27.3	4.339 631	2.03	21.21	3	00	31
	27	5	20	14.17	22	24	13.9	4.328 521	2.03	21.27	2	56	20
	28	5	19	58.59	22	23	59.7	4.317 609	2.04	21.32	2	52	09
	29	5	19	42.19	22	23	44.7	4.306 900	2.04	21.38	2	47	56
	30	5	19	24.98	22	23	28.9	4.296 399	2.05	21.43	2	43	43
	31	5	19	06.97	+22	23	12.4	4.286 110	2.05	21.48	2	39	29
Nov.	1	5	18	48.18	22	22	55.1	4.276 038	2.06	21.53	2	35	15
	2	5	18	28.62	22	22	37.0	4.266 188	2.06	21.58	2	30	59
	3	5	18	08.29	22	22	18.1	4.256 565	2.07	21.63	2	26	43
	4	5	17	47.21	22	21	58.5	4.247 172	2.07	21.68	2	22	26
	5	5	17	25.40	22	21	38.1	4.238 016	2.08	21.72	2	18	09
	6	5	17	02.86	+22	21	17.0	4.229 098	2.08	21.77	2	13	50
	7	5	16	39.62	22	20	55.1	4.220 425	2.08	21.81	2	09	31
	8	5	16	15.68	22	20	32.5	4.211 999	2.09	21.86	2	05	11
	9	5	15	51.06	22	20	09.1	4.203 825	2.09	21.90	2	00	51
	10	5	15	25.77	22	19	45.0	4.195 905	2.10	21.94	1	56	30
	11	5	14	59.84	22	19	20.1	4.188 245	2.10	21.98	1	52	08
	12	5	14	33.28	+22	18	54.3	4.180 846	2.10	22.02	1	47	46
	13	5	14	06.12	22	18	27.8	4.173 713	2.11	22.06	1	43	23
	14	5	13	38.36	22	18	00.5	4.166 848	2.11	22.09	1	38	59
	15	5	13	10.04	22	17	32.4	4.160 254	2.11	22.13	1	34	35
	16	5	12	41.18	+22	17	03.5	4.153 934	2.12	22.16	1	30	10

JUPITER, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	5	12	41.18	+22	17	03.5	4.153 934	2.12	22.16	1	30	10
	17	5	12	11.78	22	16	33.9	4.147 892	2.12	22.19	1	25	45
	18	5	11	41.88	22	16	03.5	4.142 130	2.12	22.23	1	21	20
	19	5	11	11.47	22	15	32.5	4.136 651	2.13	22.25	1	16	53
	20	5	10	40.60	22	15	00.7	4.131 458	2.13	22.28	1	12	27
	21	5	10	09.26	22	14	28.2	4.126 555	2.13	22.31	1	07	60
	22	5	09	37.49	+22	13	54.9	4.121 944	2.13	22.33	1	03	32
	23	5	09	05.31	22	13	21.0	4.117 628	2.14	22.36	0	59	04
	24	5	08	32.74	22	12	46.3	4.113 610	2.14	22.38	0	54	36
	25	5	07	59.80	22	12	10.9	4.109 893	2.14	22.40	0	50	07
	26	5	07	26.53	22	11	34.9	4.106 478	2.14	22.42	0	45	38
	27	5	06	52.95	22	10	58.2	4.103 368	2.14	22.44	0	41	09
	28	5	06	19.09	+22	10	20.9	4.100 566	2.14	22.45	0	36	39
	29	5	05	44.97	22	09	43.0	4.098 072	2.15	22.46	0	32	09
	30	5	05	10.62	22	09	04.5	4.095 890	2.15	22.48	0	27	39
Dec.	1	5	04	36.07	22	08	25.5	4.094 020	2.15	22.49	0	23	09
	2	5	04	01.35	22	07	46.1	4.092 464	2.15	22.50	0	18	39
	3	5	03	26.48	22	07	06.1	4.091 223	2.15	22.50	0	14	08
	4	5	02	51.49	+22	06	25.8	4.090 298	2.15	22.51	0	09	37
	5	5	02	16.41	22	05	45.1	4.089 689	2.15	22.51	0	05	07
	6	5	01	41.27	22	05	04.0	4.089 398	2.15	22.51	0	00	36
	7	5	01	06.08	22	04	22.5	4.089 423	2.15	22.51	23	51	34
	8	5	00	30.88	22	03	40.8	4.089 766	2.15	22.51	23	47	03
	9	4	59	55.71	22	02	58.7	4.090 425	2.15	22.51	23	42	32
	10	4	59	20.58	+22	02	16.4	4.091 401	2.15	22.50	23	38	02
	11	4	58	45.53	22	01	33.9	4.092 693	2.15	22.49	23	33	31
	12	4	58	10.58	22	00	51.2	4.094 299	2.15	22.48	23	29	00
	13	4	57	35.77	22	00	08.4	4.096 220	2.15	22.47	23	24	30
	14	4	57	01.12	21	59	25.5	4.098 454	2.15	22.46	23	19	60
	15	4	56	26.65	21	58	42.7	4.101 000	2.14	22.45	23	15	30
	16	4	55	52.39	+21	57	59.8	4.103 858	2.14	22.43	23	11	00
	17	4	55	18.35	21	57	17.0	4.107 025	2.14	22.42	23	06	31
	18	4	54	44.57	21	56	34.4	4.110 502	2.14	22.40	23	02	01
	19	4	54	11.06	21	55	51.9	4.114 287	2.14	22.38	22	57	32
	20	4	53	37.85	21	55	09.6	4.118 379	2.14	22.35	22	53	04
	21	4	53	04.96	21	54	27.5	4.122 776	2.13	22.33	22	48	35
	22	4	52	32.43	+21	53	45.7	4.127 477	2.13	22.30	22	44	08
	23	4	52	00.27	21	53	04.2	4.132 479	2.13	22.28	22	39	40
	24	4	51	28.52	21	52	23.1	4.137 783	2.13	22.25	22	35	13
	25	4	50	57.19	21	51	42.4	4.143 384	2.12	22.22	22	30	46
	26	4	50	26.31	21	51	02.2	4.149 281	2.12	22.19	22	26	20
	27	4	49	55.90	21	50	22.5	4.155 472	2.12	22.15	22	21	54
	28	4	49	25.99	+21	49	43.5	4.161 954	2.11	22.12	22	17	29
	29	4	48	56.61	21	49	05.1	4.168 724	2.11	22.08	22	13	05
	30	4	48	27.76	21	48	27.5	4.175 780	2.11	22.05	22	08	41
	31	4	47	59.47	21	47	50.6	4.183 118	2.10	22.01	22	04	17
	32	4	47	31.77	+21	47	14.6	4.190 735	2.10	21.97	21	59	54

SATURN, 2024
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Jan.	1	337	53	25.8	-1	43	39.1	9.737 8262	Apr.	2	340	51	21.1	-1	49	03.4	9.711 5456
	3	337	57	17.3	1	43	46.4	9.737 2609		4	340	55	13.8	1	49	10.2	9.710 9682
	5	338	01	08.8	1	43	53.6	9.736 6953		6	340	59	06.5	1	49	17.1	9.710 3905
	7	338	05	00.3	1	44	00.8	9.736 1294		8	341	02	59.3	1	49	24.0	9.709 8126
	9	338	08	51.9	1	44	07.9	9.735 5633		10	341	06	52.1	1	49	30.8	9.709 2345
	11	338	12	43.4	1	44	15.1	9.734 9969		12	341	10	44.9	1	49	37.7	9.708 6561
	13	338	16	35.0	-1	44	22.3	9.734 4302		14	341	14	37.8	-1	49	44.5	9.708 0775
	15	338	20	26.7	1	44	29.5	9.733 8633		16	341	18	30.7	1	49	51.3	9.707 4986
	17	338	24	18.3	1	44	36.6	9.733 2960		18	341	22	23.6	1	49	58.1	9.706 9194
	19	338	28	10.0	1	44	43.8	9.732 7285		20	341	26	16.5	1	50	05.0	9.706 3401
	21	338	32	01.7	1	44	50.9	9.732 1608		22	341	30	09.4	1	50	11.8	9.705 7604
	23	338	35	53.4	1	44	58.1	9.731 5927		24	341	34	02.4	1	50	18.6	9.705 1806
	25	338	39	45.2	-1	45	05.2	9.731 0244		26	341	37	55.4	-1	50	25.4	9.704 6005
	27	338	43	37.0	1	45	12.3	9.730 4559		28	341	41	48.5	1	50	32.1	9.704 0201
	29	338	47	28.8	1	45	19.4	9.729 8870		30	341	45	41.5	1	50	38.9	9.703 4395
	31	338	51	20.6	1	45	26.5	9.729 3179	May	2	341	49	34.6	1	50	45.7	9.702 8587
Feb.	2	338	55	12.5	1	45	33.7	9.728 7486		4	341	53	27.8	1	50	52.5	9.702 2776
	4	338	59	04.4	1	45	40.7	9.728 1789		6	341	57	20.9	1	50	59.2	9.701 6963
	6	339	02	56.3	-1	45	47.9	9.727 6090		8	342	01	14.1	-1	51	05.9	9.701 1147
	8	339	06	48.2	1	45	54.9	9.727 0389		10	342	05	07.3	1	51	12.7	9.700 5330
	10	339	10	40.2	1	46	02.0	9.726 4684		12	342	09	00.5	1	51	19.4	9.699 9509
	12	339	14	32.2	1	46	09.1	9.725 8977		14	342	12	53.8	1	51	26.1	9.699 3687
	14	339	18	24.3	1	46	16.1	9.725 3268		16	342	16	47.1	1	51	32.9	9.698 7862
	16	339	22	16.3	1	46	23.2	9.724 7555		18	342	20	40.4	1	51	39.6	9.698 2034
	18	339	26	08.4	-1	46	30.2	9.724 1841		20	342	24	33.8	-1	51	46.3	9.697 6205
	20	339	30	00.5	1	46	37.3	9.723 6123		22	342	28	27.1	1	51	53.0	9.697 0373
	22	339	33	52.6	1	46	44.3	9.723 0403		24	342	32	20.5	1	51	59.6	9.696 4538
	24	339	37	44.8	1	46	51.3	9.722 4680		26	342	36	14.0	1	52	06.3	9.695 8702
	26	339	41	37.0	1	46	58.3	9.721 8955		28	342	40	07.4	1	52	13.0	9.695 2863
	28	339	45	29.2	1	47	05.3	9.721 3227		30	342	44	00.9	1	52	19.7	9.694 7022
Mar.	1	339	49	21.5	-1	47	12.4	9.720 7496	June	1	342	47	54.4	-1	52	26.3	9.694 1178
	3	339	53	13.7	1	47	19.3	9.720 1763		3	342	51	47.9	1	52	32.9	9.693 5332
	5	339	57	06.0	1	47	26.3	9.719 6027		5	342	55	41.5	1	52	39.6	9.692 9484
	7	340	00	58.4	1	47	33.3	9.719 0289		7	342	59	35.1	1	52	46.2	9.692 3634
	9	340	04	50.7	1	47	40.3	9.718 4548		9	343	03	28.7	1	52	52.9	9.691 7781
	11	340	08	43.1	1	47	47.2	9.717 8804		11	343	07	22.4	1	52	59.5	9.691 1926
	13	340	12	35.5	-1	47	54.2	9.717 3058		13	343	11	16.0	-1	53	06.1	9.690 6069
	15	340	16	27.9	1	48	01.2	9.716 7309		15	343	15	09.7	1	53	12.7	9.690 0210
	17	340	20	20.4	1	48	08.1	9.716 1558		17	343	19	03.5	1	53	19.3	9.689 4348
	19	340	24	12.9	1	48	15.0	9.715 5804		19	343	22	57.2	1	53	25.8	9.688 8485
	21	340	28	05.4	1	48	21.9	9.715 0047		21	343	26	51.0	1	53	32.4	9.688 2619
	23	340	31	58.0	1	48	28.9	9.714 4288		23	343	30	44.8	1	53	39.0	9.687 6751
	25	340	35	50.5	-1	48	35.8	9.713 8527		25	343	34	38.7	-1	53	45.5	9.687 0881
	27	340	39	43.2	1	48	42.7	9.713 2763		27	343	38	32.5	1	53	52.1	9.686 5009
	29	340	43	35.8	1	48	49.6	9.712 6996		29	343	42	26.5	1	53	58.6	9.685 9134
	31	340	47	28.4	1	48	56.5	9.712 1227	July	1	343	46	20.4	1	54	05.2	9.685 3258
Apr.	2	340	51	21.1	-1	49	03.4	9.711 5456		3	343	50	14.3	-1	54	11.7	9.684 7379

SATURN, 2024

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME

MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	343	46	20.4	-1	54	05.2	9.685 3258	Oct.	1	346	46	11.7	-1	58	56.9	9.658 0756
	3	343	50	14.3	1	54	11.7	9.684 7379		3	346	50	06.9	1	59	03.1	9.657 4787
	5	343	54	08.3	1	54	18.2	9.684 1498		5	346	54	02.2	1	59	09.2	9.656 8816
	7	343	58	02.3	1	54	24.7	9.683 5615		7	346	57	57.5	1	59	15.3	9.656 2843
	9	344	01	56.4	1	54	31.2	9.682 9730		9	347	01	52.9	1	59	21.5	9.655 6868
	11	344	05	50.4	1	54	37.7	9.682 3843		11	347	05	48.3	1	59	27.6	9.655 0892
	13	344	09	44.5	-1	54	44.2	9.681 7954		13	347	09	43.7	-1	59	33.7	9.654 4914
	15	344	13	38.7	1	54	50.7	9.681 2063		15	347	13	39.1	1	59	39.8	9.653 8934
	17	344	17	32.8	1	54	57.1	9.680 6170		17	347	17	34.6	1	59	45.9	9.653 2952
	19	344	21	27.0	1	55	03.6	9.680 0275		19	347	21	30.1	1	59	51.9	9.652 6969
	21	344	25	21.2	1	55	10.0	9.679 4377		21	347	25	25.6	1	59	58.0	9.652 0983
	23	344	29	15.4	1	55	16.5	9.678 8478		23	347	29	21.1	2	00	04.1	9.651 4996
	25	344	33	09.7	-1	55	22.9	9.678 2576		25	347	33	16.7	-2	00	10.1	9.650 9007
	27	344	37	04.0	1	55	29.4	9.677 6673		27	347	37	12.4	2	00	16.2	9.650 3016
	29	344	40	58.3	1	55	35.8	9.677 0767		29	347	41	08.0	2	00	22.2	9.649 7024
	31	344	44	52.7	1	55	42.2	9.676 4860		31	347	45	03.6	2	00	28.2	9.649 1030
Aug.	2	344	48	47.1	1	55	48.6	9.675 8950	Nov.	2	347	48	59.4	2	00	34.3	9.648 5034
	4	344	52	41.4	1	55	55.0	9.675 3039		4	347	52	55.1	2	00	40.3	9.647 9036
	6	344	56	35.9	-1	56	01.4	9.674 7125		6	347	56	50.8	-2	00	46.3	9.647 3037
	8	345	00	30.4	1	56	07.8	9.674 1210		8	348	00	46.6	2	00	52.2	9.646 7035
	10	345	04	24.9	1	56	14.1	9.673 5292		10	348	04	42.4	2	00	58.2	9.646 1032
	12	345	08	19.4	1	56	20.5	9.672 9373		12	348	08	38.3	2	01	04.2	9.645 5028
	14	345	12	13.9	1	56	26.9	9.672 3451		14	348	12	34.1	2	01	10.2	9.644 9021
	16	345	16	08.5	1	56	33.2	9.671 7528		16	348	16	30.0	2	01	16.1	9.644 3013
	18	345	20	03.1	-1	56	39.5	9.671 1602		18	348	20	26.0	-2	01	22.1	9.643 7004
	20	345	23	57.7	1	56	45.9	9.670 5675		20	348	24	21.9	2	01	28.0	9.643 0992
	22	345	27	52.4	1	56	52.2	9.669 9745		22	348	28	17.9	2	01	34.0	9.642 4979
	24	345	31	47.1	1	56	58.5	9.669 3814		24	348	32	13.9	2	01	39.9	9.641 8964
	26	345	35	41.8	1	57	04.8	9.668 7881		26	348	36	10.0	2	01	45.8	9.641 2948
	28	345	39	36.6	1	57	11.1	9.668 1946		28	348	40	06.0	2	01	51.7	9.640 6929
	30	345	43	31.3	-1	57	17.4	9.667 6008		30	348	44	02.2	-2	01	57.6	9.640 0910
Sept.	1	345	47	26.1	1	57	23.7	9.667 0069	Dec.	2	348	47	58.3	2	02	03.5	9.639 4888
	3	345	51	21.0	1	57	30.0	9.666 4128		4	348	51	54.5	2	02	09.3	9.638 8865
	5	345	55	15.8	1	57	36.2	9.665 8185		6	348	55	50.6	2	02	15.2	9.638 2840
	7	345	59	10.7	1	57	42.5	9.665 2240		8	348	59	46.9	2	02	21.1	9.637 6814
	9	346	03	05.7	1	57	48.7	9.664 6294		10	349	03	43.1	2	02	26.9	9.637 0786
	11	346	07	00.6	-1	57	55.0	9.664 0345		12	349	07	39.4	-2	02	32.8	9.636 4757
	13	346	10	55.6	1	58	01.2	9.663 4394		14	349	11	35.7	2	02	38.6	9.635 8726
	15	346	14	50.6	1	58	07.5	9.662 8442		16	349	15	32.0	2	02	44.4	9.635 2693
	17	346	18	45.6	1	58	13.7	9.662 2488		18	349	19	28.4	2	02	50.2	9.634 6659
	19	346	22	40.7	1	58	19.9	9.661 6531		20	349	23	24.8	2	02	56.0	9.634 0623
	21	346	26	35.8	1	58	26.1	9.661 0573		22	349	27	21.2	2	03	01.9	9.633 4586
	23	346	30	30.9	-1	58	32.3	9.660 4614		24	349	31	17.6	-2	03	07.6	9.632 8548
	25	346	34	26.1	1	58	38.4	9.659 8652		26	349	35	14.1	2	03	13.4	9.632 2508
	27	346	38	21.2	1	58	44.6	9.659 2688		28	349	39	10.6	2	03	19.2	9.631 6466
	29	346	42	16.4	1	58	50.8	9.658 6723		30	349	43	07.2	2	03	24.9	9.631 0423
Oct.	1	346	46	11.7	-1	58	56.9	9.658 0756		32	349	47	03.7	-2	03	30.7	9.630 4378

SATURN, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Jan.	0	333	09	20.1	-1	38	07.3
	1	333	14	36.6	1	38	02.9
	2	333	19	57.1	1	37	58.6
	3	333	25	21.6	1	37	54.4
	4	333	30	50.1	1	37	50.3
	5	333	36	22.5	1	37	46.3
	6	333	41	58.8	-1	37	42.5
	7	333	47	38.9	1	37	38.7
	8	333	53	22.8	1	37	35.1
	9	333	59	10.4	1	37	31.5
	10	334	05	01.6	1	37	28.1
	11	334	10	56.4	1	37	24.7
	12	334	16	54.6	-1	37	21.5
	13	334	22	56.1	1	37	18.4
	14	334	29	00.8	1	37	15.4
	15	334	35	08.7	1	37	12.5
	16	334	41	19.7	1	37	09.8
	17	334	47	33.7	1	37	07.1
	18	334	53	50.7	-1	37	04.6
	19	335	00	10.7	1	37	02.2
	20	335	06	33.6	1	36	59.9
	21	335	12	59.2	1	36	57.8
	22	335	19	27.6	1	36	55.7
	23	335	25	58.7	1	36	53.8
	24	335	32	32.3	-1	36	52.0
	25	335	39	08.4	1	36	50.4
	26	335	45	46.8	1	36	48.8
	27	335	52	27.6	1	36	47.4
	28	335	59	10.6	1	36	46.1
	29	336	05	55.8	1	36	45.0
	30	336	12	43.2	-1	36	43.9
	31	336	19	32.6	1	36	43.0
Feb.	1	336	26	24.1	1	36	42.3
	2	336	33	17.6	1	36	41.6
	3	336	40	13.1	1	36	41.1
	4	336	47	10.4	1	36	40.7
	5	336	54	09.6	-1	36	40.5
	6	337	01	10.5	1	36	40.4
	7	337	08	13.0	1	36	40.4
	8	337	15	17.2	1	36	40.5
	9	337	22	22.7	1	36	40.7
	10	337	29	29.6	1	36	41.1
	11	337	36	37.8	-1	36	41.6
	12	337	43	47.1	1	36	42.3
	13	337	50	57.6	1	36	43.1
	14	337	58	09.2	1	36	44.0
	15	338	05	21.9	-1	36	45.1
Feb.	15	338	05	21.9	-1	36	45.1
	16	338	12	35.5	1	36	46.2
	17	338	19	50.1	1	36	47.6
	18	338	27	05.5	1	36	49.0
	19	338	34	21.7	1	36	50.6
	20	338	41	38.5	1	36	52.4
	21	338	48	55.9	-1	36	54.3
	22	338	56	13.8	1	36	56.3
	23	339	03	32.1	1	36	58.4
	24	339	10	50.7	1	37	00.7
	25	339	18	09.7	1	37	03.2
	26	339	25	28.9	1	37	05.8
	27	339	32	48.4	-1	37	08.5
	28	339	40	07.9	1	37	11.5
	29	339	47	27.4	1	37	14.5
Mar.	1	339	54	47.1	1	37	17.5
	2	340	02	06.8	1	37	20.7
	3	340	09	26.5	1	37	24.0
	4	340	16	46.0	-1	37	27.5
	5	340	24	05.4	1	37	31.2
	6	340	31	24.5	1	37	35.0
	7	340	38	43.1	1	37	38.9
	8	340	46	01.3	1	37	43.0
	9	340	53	18.8	1	37	47.2
	10	341	00	35.7	-1	37	51.5
	11	341	07	51.9	1	37	56.0
	12	341	15	07.3	1	38	00.6
	13	341	22	21.9	1	38	05.3
	14	341	29	35.7	1	38	10.2
	15	341	36	48.6	1	38	15.3
	16	341	44	00.4	-1	38	20.4
	17	341	51	11.2	1	38	25.7
	18	341	58	20.8	1	38	31.2
	19	342	05	29.2	1	38	36.8
	20	342	12	36.2	1	38	42.5
	21	342	19	41.9	1	38	48.4
	22	342	26	46.0	-1	38	54.4
	23	342	33	48.7	1	39	00.6
	24	342	40	49.8	1	39	06.9
	25	342	47	49.2	1	39	13.3
	26	342	54	47.1	1	39	19.9
	27	343	01	43.2	1	39	26.6
	28	343	08	37.6	-1	39	33.4
	29	343	15	30.1	1	39	40.4
	30	343	22	20.9	1	39	47.5
	31	343	29	09.7	1	39	54.8
Apr.	1	343	35	56.6	-1	40	02.2

SATURN, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Apr.	1	343	35	56.6	-1	40	02.2
	2	343	42	41.4	1	40	09.7
	3	343	49	24.0	1	40	17.3
	4	343	56	04.3	1	40	25.1
	5	344	02	42.4	1	40	33.0
	6	344	09	18.0	1	40	41.1
	7	344	15	51.1	-1	40	49.2
	8	344	22	21.7	1	40	57.6
	9	344	28	49.8	1	41	06.0
	10	344	35	15.2	1	41	14.6
	11	344	41	38.1	1	41	23.3
	12	344	47	58.2	1	41	32.2
	13	344	54	15.5	-1	41	41.1
	14	345	00	29.9	1	41	50.3
	15	345	06	41.4	1	41	59.5
	16	345	12	49.8	1	42	08.9
	17	345	18	55.1	1	42	18.4
	18	345	24	57.2	1	42	28.1
	19	345	30	56.1	-1	42	37.9
	20	345	36	51.7	1	42	47.8
	21	345	42	44.0	1	42	57.8
	22	345	48	33.0	1	43	08.0
	23	345	54	18.5	1	43	18.3
	24	346	00	00.7	1	43	28.7
	25	346	05	39.4	-1	43	39.2
	26	346	11	14.6	1	43	49.9
	27	346	16	46.2	1	44	00.7
	28	346	22	14.1	1	44	11.6
	29	346	27	38.4	1	44	22.6
	30	346	32	58.9	1	44	33.8
May	1	346	38	15.5	-1	44	45.0
	2	346	43	28.1	1	44	56.4
	3	346	48	36.7	1	45	07.9
	4	346	53	41.2	1	45	19.5
	5	346	58	41.5	1	45	31.2
	6	347	03	37.7	1	45	43.1
	7	347	08	29.8	-1	45	55.0
	8	347	13	17.5	1	46	07.1
	9	347	18	01.0	1	46	19.3
	10	347	22	40.2	1	46	31.6
	11	347	27	14.9	1	46	44.0
	12	347	31	45.1	1	46	56.5
	13	347	36	10.7	-1	47	09.2
	14	347	40	31.6	1	47	21.9
	15	347	44	47.9	1	47	34.7
	16	347	48	59.4	1	47	47.7
	17	347	53	06.1	-1	48	00.7

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
May	17	347	53	06.1	-1	48	00.7
	18	347	57	08.0	1	48	13.9
	19	348	01	05.0	1	48	27.1
	20	348	04	57.2	1	48	40.5
	21	348	08	44.5	1	48	53.9
	22	348	12	26.9	1	49	07.4
	23	348	16	04.3	-1	49	21.1
	24	348	19	36.7	1	49	34.8
	25	348	23	04.1	1	49	48.6
	26	348	26	26.4	1	50	02.4
	27	348	29	43.6	1	50	16.4
	28	348	32	55.4	1	50	30.4
	29	348	36	02.0	-1	50	44.5
	30	348	39	03.2	1	50	58.7
	31	348	41	59.0	1	51	13.0
June	1	348	44	49.4	1	51	27.3
	2	348	47	34.3	1	51	41.7
	3	348	50	13.7	1	51	56.2
	4	348	52	47.6	-1	52	10.7
	5	348	55	16.0	1	52	25.3
	6	348	57	38.9	1	52	40.0
	7	348	59	56.1	1	52	54.7
	8	349	02	07.7	1	53	09.5
	9	349	04	13.5	1	53	24.4
	10	349	06	13.6	-1	53	39.3
	11	349	08	07.8	1	53	54.2
	12	349	09	56.2	1	54	09.2
	13	349	11	38.7	1	54	24.3
	14	349	13	15.4	1	54	39.3
	15	349	14	46.2	1	54	54.5
	16	349	16	11.2	-1	55	09.6
	17	349	17	30.3	1	55	24.8
	18	349	18	43.6	1	55	40.0
	19	349	19	51.0	1	55	55.2
	20	349	20	52.6	1	56	10.4
	21	349	21	48.3	1	56	25.7
	22	349	22	38.1	-1	56	41.0
	23	349	23	22.0	1	56	56.2
	24	349	23	59.9	1	57	11.5
	25	349	24	31.8	1	57	26.8
	26	349	24	57.7	1	57	42.1
	27	349	25	17.5	1	57	57.3
	28	349	25	31.3	-1	58	12.6
	29	349	25	39.1	1	58	27.8
	30	349	25	40.9	1	58	43.0
July	1	349	25	36.7	1	58	58.2
	2	349	25	26.5	-1	59	13.4

SATURN, 2024
GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	349	25	36.7	-1	58	58.2	Aug.	16	347	43	19.0	-2	08	59.5
	2	349	25	26.5	1	59	13.4		17	347	39	19.8	2	09	08.7
	3	349	25	10.4	1	59	28.6		18	347	35	17.5	2	09	17.7
	4	349	24	48.3	1	59	43.7		19	347	31	12.3	2	09	26.4
	5	349	24	20.3	1	59	58.8		20	347	27	04.2	2	09	34.9
	6	349	23	46.2	2	00	13.9		21	347	22	53.5	2	09	43.2
	7	349	23	06.2	-2	00	28.9		22	347	18	40.1	-2	09	51.2
	8	349	22	20.1	2	00	43.8		23	347	14	24.3	2	09	58.9
	9	349	21	28.1	2	00	58.8		24	347	10	06.3	2	10	06.4
	10	349	20	30.2	2	01	13.6		25	347	05	46.1	2	10	13.7
	11	349	19	26.4	2	01	28.4		26	347	01	23.9	2	10	20.7
	12	349	18	16.7	2	01	43.1		27	346	56	59.9	2	10	27.4
	13	349	17	01.3	-2	01	57.8		28	346	52	34.1	-2	10	33.9
	14	349	15	40.1	2	02	12.4		29	346	48	06.6	2	10	40.1
	15	349	14	13.2	2	02	26.9		30	346	43	37.6	2	10	46.1
	16	349	12	40.8	2	02	41.3		31	346	39	07.3	2	10	51.8
	17	349	11	02.7	2	02	55.6	Sept.	1	346	34	35.6	2	10	57.2
	18	349	09	19.2	2	03	09.8		2	346	30	02.8	2	11	02.4
	19	349	07	30.2	-2	03	23.9		3	346	25	29.1	-2	11	07.3
	20	349	05	35.7	2	03	37.9		4	346	20	54.6	2	11	11.9
	21	349	03	35.8	2	03	51.8		5	346	16	19.4	2	11	16.2
	22	349	01	30.4	2	04	05.6		6	346	11	43.8	2	11	20.3
	23	348	59	19.7	2	04	19.2		7	346	07	07.9	2	11	24.0
	24	348	57	03.7	2	04	32.7		8	346	02	31.8	2	11	27.5
	25	348	54	42.3	-2	04	46.1		9	345	57	55.8	-2	11	30.8
	26	348	52	15.8	2	04	59.4		10	345	53	20.0	2	11	33.7
	27	348	49	44.1	2	05	12.5		11	345	48	44.5	2	11	36.3
	28	348	47	07.5	2	05	25.5		12	345	44	09.5	2	11	38.7
	29	348	44	25.8	2	05	38.4		13	345	39	35.1	2	11	40.8
	30	348	41	39.3	2	05	51.1		14	345	35	01.4	2	11	42.6
	31	348	38	48.0	-2	06	03.6		15	345	30	28.5	-2	11	44.1
Aug.	1	348	35	52.0	2	06	16.0		16	345	25	56.6	2	11	45.3
	2	348	32	51.2	2	06	28.2		17	345	21	25.8	2	11	46.3
	3	348	29	45.8	2	06	40.3		18	345	16	56.2	2	11	47.0
	4	348	26	35.8	2	06	52.2		19	345	12	28.0	2	11	47.4
	5	348	23	21.3	2	07	03.9		20	345	08	01.4	2	11	47.5
	6	348	20	02.5	-2	07	15.4		21	345	03	36.5	-2	11	47.4
	7	348	16	39.3	2	07	26.7		22	344	59	13.5	2	11	47.0
	8	348	13	12.1	2	07	37.9		23	344	54	52.5	2	11	46.3
	9	348	09	40.8	2	07	48.8		24	344	50	33.6	2	11	45.3
	10	348	06	05.5	2	07	59.6		25	344	46	17.0	2	11	44.1
	11	348	02	26.5	2	08	10.1		26	344	42	02.7	2	11	42.7
	12	347	58	43.9	-2	08	20.4		27	344	37	50.8	-2	11	40.9
	13	347	54	57.7	2	08	30.5		28	344	33	41.6	2	11	38.9
	14	347	51	08.1	2	08	40.4		29	344	29	35.1	2	11	36.7
	15	347	47	15.1	2	08	50.1		30	344	25	31.5	2	11	34.2
	16	347	43	19.0	-2	08	59.5	Oct.	1	344	21	30.8	-2	11	31.4

SATURN, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	344	21	30.8	-2	11	31.4	Nov.	16	342	41	33.9	-2	05	59.2
	2	344	17	33.4	2	11	28.4		17	342	41	39.7	2	05	49.2
	3	344	13	39.3	2	11	25.2		18	342	41	51.8	2	05	39.2
	4	344	09	48.7	2	11	21.7		19	342	42	10.3	2	05	29.2
	5	344	06	01.7	2	11	18.0		20	342	42	35.1	2	05	19.1
	6	344	02	18.4	2	11	14.0		21	342	43	06.1	2	05	09.0
	7	343	58	39.0	-2	11	09.8		22	342	43	43.5	-2	04	58.9
	8	343	55	03.6	2	11	05.3		23	342	44	27.2	2	04	48.8
	9	343	51	32.3	2	11	00.7		24	342	45	17.1	2	04	38.7
	10	343	48	05.2	2	10	55.8		25	342	46	13.4	2	04	28.5
	11	343	44	42.3	2	10	50.7		26	342	47	16.1	2	04	18.4
	12	343	41	23.8	2	10	45.3		27	342	48	25.1	2	04	08.2
	13	343	38	09.7	-2	10	39.8		28	342	49	40.4	-2	03	58.1
	14	343	35	00.2	2	10	34.0		29	342	51	02.1	2	03	47.9
	15	343	31	55.2	2	10	28.1		30	342	52	30.2	2	03	37.8
	16	343	28	55.0	2	10	21.9	Dec.	1	342	54	04.5	2	03	27.7
	17	343	25	59.5	2	10	15.6		2	342	55	45.2	2	03	17.5
	18	343	23	09.1	2	10	09.0		3	342	57	32.2	2	03	07.5
	19	343	20	23.6	-2	10	02.3		4	342	59	25.4	-2	02	57.4
	20	343	17	43.3	2	09	55.4		5	343	01	24.7	2	02	47.3
	21	343	15	08.2	2	09	48.4		6	343	03	30.2	2	02	37.3
	22	343	12	38.4	2	09	41.1		7	343	05	41.7	2	02	27.4
	23	343	10	13.8	2	09	33.8		8	343	07	59.2	2	02	17.4
	24	343	07	54.6	2	09	26.2		9	343	10	22.7	2	02	07.5
	25	343	05	40.7	-2	09	18.5		10	343	12	52.2	-2	01	57.7
	26	343	03	32.4	2	09	10.7		11	343	15	27.6	2	01	47.9
	27	343	01	29.6	2	09	02.7		12	343	18	09.0	2	01	38.1
	28	342	59	32.5	2	08	54.5		13	343	20	56.3	2	01	28.5
	29	342	57	41.0	2	08	46.2		14	343	23	49.5	2	01	18.8
	30	342	55	55.4	2	08	37.8		15	343	26	48.4	2	01	09.3
	31	342	54	15.7	-2	08	29.3		16	343	29	53.1	-2	00	59.8
Nov.	1	342	52	41.9	2	08	20.6		17	343	33	03.5	2	00	50.4
	2	342	51	14.1	2	08	11.9		18	343	36	19.4	2	00	41.1
	3	342	49	52.4	2	08	03.0		19	343	39	40.9	2	00	31.8
	4	342	48	36.8	2	07	54.0		20	343	43	07.8	2	00	22.6
	5	342	47	27.4	2	07	44.8		21	343	46	40.2	2	00	13.5
	6	342	46	24.1	-2	07	35.6		22	343	50	18.0	-2	00	04.5
	7	342	45	27.0	2	07	26.3		23	343	54	01.2	1	59	55.6
	8	342	44	36.1	2	07	16.9		24	343	57	49.8	1	59	46.7
	9	342	43	51.4	2	07	07.5		25	344	01	43.7	1	59	37.9
	10	342	43	13.0	2	06	57.9		26	344	05	42.9	1	59	29.3
	11	342	42	40.7	2	06	48.3		27	344	09	47.4	1	59	20.7
	12	342	42	14.7	-2	06	38.6		28	344	13	57.0	-1	59	12.2
	13	342	41	55.0	2	06	28.8		29	344	18	11.9	1	59	03.8
	14	342	41	41.6	2	06	19.0		30	344	22	31.8	1	58	55.5
	15	342	41	34.6	2	06	09.1		31	344	26	56.6	1	58	47.3
	16	342	41	33.9	-2	05	59.2		32	344	31	26.5	-1	58	39.2

SATURN, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	22	22	46.81	-11	52	19.6	10.281 301	0.86	7.18	15	43	45
	1	22	23	06.78	11	50	20.8	10.294 649	0.85	7.17	15	40	09
	2	22	23	27.00	11	48	20.5	10.307 836	0.85	7.16	15	36	34
	3	22	23	47.48	11	46	18.8	10.320 860	0.85	7.15	15	32	58
	4	22	24	08.21	11	44	15.6	10.333 716	0.85	7.14	15	29	23
	5	22	24	29.19	11	42	11.1	10.346 403	0.85	7.13	15	25	48
	6	22	24	50.40	-11	40	05.1	10.358 915	0.85	7.13	15	22	14
	7	22	25	11.86	11	37	57.7	10.371 251	0.85	7.12	15	18	39
	8	22	25	33.56	11	35	49.0	10.383 407	0.85	7.11	15	15	05
	9	22	25	55.49	11	33	39.0	10.395 379	0.85	7.10	15	11	31
	10	22	26	17.64	11	31	27.6	10.407 164	0.85	7.09	15	07	57
	11	22	26	40.02	11	29	15.0	10.418 758	0.84	7.09	15	04	24
	12	22	27	02.61	-11	27	01.2	10.430 160	0.84	7.08	15	00	50
	13	22	27	25.41	11	24	46.1	10.441 365	0.84	7.07	14	57	17
	14	22	27	48.41	11	22	29.9	10.452 370	0.84	7.06	14	53	44
	15	22	28	11.61	11	20	12.6	10.463 174	0.84	7.06	14	50	12
	16	22	28	35.00	11	17	54.1	10.473 773	0.84	7.05	14	46	39
	17	22	28	58.57	11	15	34.5	10.484 165	0.84	7.04	14	43	07
	18	22	29	22.34	-11	13	13.8	10.494 347	0.84	7.03	14	39	35
	19	22	29	46.29	11	10	52.0	10.504 319	0.84	7.03	14	36	03
	20	22	30	10.41	11	08	29.2	10.514 077	0.84	7.02	14	32	31
	21	22	30	34.72	11	06	05.3	10.523 620	0.84	7.01	14	28	59
	22	22	30	59.19	11	03	40.5	10.532 947	0.83	7.01	14	25	28
	23	22	31	23.82	11	01	14.7	10.542 054	0.83	7.00	14	21	56
	24	22	31	48.62	-10	58	48.0	10.550 941	0.83	7.00	14	18	25
	25	22	32	13.56	10	56	20.4	10.559 606	0.83	6.99	14	14	54
	26	22	32	38.66	10	53	51.9	10.568 046	0.83	6.99	14	11	23
	27	22	33	03.90	10	51	22.6	10.576 261	0.83	6.98	14	07	53
	28	22	33	29.27	10	48	52.5	10.584 249	0.83	6.97	14	04	22
	29	22	33	54.78	10	46	21.5	10.592 007	0.83	6.97	14	00	52
	30	22	34	20.42	-10	43	49.8	10.599 534	0.83	6.96	13	57	21
	31	22	34	46.19	10	41	17.3	10.606 828	0.83	6.96	13	53	51
Feb.	1	22	35	12.09	10	38	44.0	10.613 888	0.83	6.96	13	50	21
	2	22	35	38.11	10	36	10.0	10.620 712	0.83	6.95	13	46	51
	3	22	36	04.24	10	33	35.3	10.627 298	0.83	6.95	13	43	21
	4	22	36	30.49	10	30	59.9	10.633 645	0.83	6.94	13	39	52
	5	22	36	56.86	-10	28	23.8	10.639 750	0.83	6.94	13	36	22
	6	22	37	23.33	10	25	47.1	10.645 613	0.83	6.93	13	32	52
	7	22	37	49.90	10	23	09.8	10.651 231	0.83	6.93	13	29	23
	8	22	38	16.56	10	20	31.9	10.656 603	0.83	6.93	13	25	54
	9	22	38	43.32	10	17	53.4	10.661 728	0.82	6.92	13	22	24
	10	22	39	10.15	10	15	14.5	10.666 603	0.82	6.92	13	18	55
	11	22	39	37.06	-10	12	35.2	10.671 229	0.82	6.92	13	15	26
	12	22	40	04.04	10	09	55.4	10.675 604	0.82	6.91	13	11	57
	13	22	40	31.09	10	07	15.1	10.679 726	0.82	6.91	13	08	28
	14	22	40	58.20	10	04	34.4	10.683 596	0.82	6.91	13	04	59
	15	22	41	25.37	-10	01	53.4	10.687 214	0.82	6.91	13	01	30

SATURN, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	22	41	25.37	-10	01	53.4	10.687 214	0.82	6.91	13	01	30
	16	22	41	52.61	9	59	12.0	10.690 577	0.82	6.91	12	58	02
	17	22	42	19.90	9	56	30.2	10.693 688	0.82	6.90	12	54	33
	18	22	42	47.24	9	53	48.2	10.696 544	0.82	6.90	12	51	04
	19	22	43	14.62	9	51	05.9	10.699 147	0.82	6.90	12	47	36
	20	22	43	42.04	9	48	23.3	10.701 495	0.82	6.90	12	44	07
	21	22	44	09.49	-9	45	40.6	10.703 590	0.82	6.90	12	40	38
	22	22	44	36.97	9	42	57.7	10.705 430	0.82	6.90	12	37	10
	23	22	45	04.48	9	40	14.7	10.707 015	0.82	6.89	12	33	41
	24	22	45	32.00	9	37	31.5	10.708 347	0.82	6.89	12	30	13
	25	22	45	59.54	9	34	48.3	10.709 423	0.82	6.89	12	26	44
	26	22	46	27.10	9	32	05.0	10.710 245	0.82	6.89	12	23	16
	27	22	46	54.66	-9	29	21.6	10.710 813	0.82	6.89	12	19	47
	28	22	47	22.22	9	26	38.2	10.711 125	0.82	6.89	12	16	19
	29	22	47	49.79	9	23	54.8	10.711 183	0.82	6.89	12	12	50
Mar.	1	22	48	17.35	9	21	11.3	10.710 986	0.82	6.89	12	09	22
	2	22	48	44.91	9	18	27.8	10.710 533	0.82	6.89	12	05	53
	3	22	49	12.48	9	15	44.3	10.709 826	0.82	6.89	12	02	25
	4	22	49	40.03	-9	13	00.9	10.708 863	0.82	6.89	11	58	56
	5	22	50	07.56	9	10	17.6	10.707 646	0.82	6.89	11	55	28
	6	22	50	35.07	9	07	34.5	10.706 173	0.82	6.90	11	51	59
	7	22	51	02.56	9	04	51.6	10.704 446	0.82	6.90	11	48	31
	8	22	51	30.01	9	02	08.8	10.702 463	0.82	6.90	11	45	02
	9	22	51	57.43	8	59	26.3	10.700 227	0.82	6.90	11	41	33
	10	22	52	24.79	-8	56	44.1	10.697 736	0.82	6.90	11	38	05
	11	22	52	52.11	8	54	02.2	10.694 991	0.82	6.90	11	34	36
	12	22	53	19.38	8	51	20.6	10.691 994	0.82	6.90	11	31	07
	13	22	53	46.60	8	48	39.4	10.688 746	0.82	6.91	11	27	38
	14	22	54	13.76	8	45	58.4	10.685 247	0.82	6.91	11	24	09
	15	22	54	40.87	8	43	17.9	10.681 498	0.82	6.91	11	20	40
	16	22	55	07.91	-8	40	37.8	10.677 502	0.82	6.91	11	17	11
	17	22	55	34.88	8	37	58.1	10.673 260	0.82	6.92	11	13	42
	18	22	56	01.77	8	35	18.9	10.668 773	0.82	6.92	11	10	13
	19	22	56	28.59	8	32	40.2	10.664 042	0.82	6.92	11	06	44
	20	22	56	55.32	8	30	02.1	10.659 069	0.83	6.93	11	03	14
	21	22	57	21.96	8	27	24.6	10.653 855	0.83	6.93	10	59	45
	22	22	57	48.51	-8	24	47.6	10.648 402	0.83	6.93	10	56	15
	23	22	58	14.96	8	22	11.3	10.642 711	0.83	6.94	10	52	46
	24	22	58	41.32	8	19	35.7	10.636 784	0.83	6.94	10	49	16
	25	22	59	07.57	8	17	00.6	10.630 621	0.83	6.94	10	45	46
	26	22	59	33.71	8	14	26.3	10.624 225	0.83	6.95	10	42	16
	27	22	59	59.75	8	11	52.6	10.617 596	0.83	6.95	10	38	46
	28	23	00	25.68	-8	09	19.7	10.610 737	0.83	6.96	10	35	16
	29	23	00	51.50	8	06	47.5	10.603 647	0.83	6.96	10	31	46
	30	23	01	17.20	8	04	16.0	10.596 330	0.83	6.97	10	28	15
	31	23	01	42.78	8	01	45.3	10.588 786	0.83	6.97	10	24	45
Apr.	1	23	02	08.24	-7	59	15.5	10.581 017	0.83	6.98	10	21	14

SATURN, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	23	02	08.24	-7	59	15.5	10.581 017	0.83	6.98	10	21	14
	2	23	02	33.57	7	56	46.5	10.573 024	0.83	6.98	10	17	43
	3	23	02	58.76	7	54	18.4	10.564 808	0.83	6.99	10	14	13
	4	23	03	23.81	7	51	51.2	10.556 372	0.83	6.99	10	10	42
	5	23	03	48.72	7	49	24.9	10.547 716	0.83	7.00	10	07	10
	6	23	04	13.47	7	46	59.7	10.538 843	0.83	7.00	10	03	39
	7	23	04	38.07	-7	44	35.4	10.529 755	0.84	7.01	10	00	08
	8	23	05	02.52	7	42	12.2	10.520 453	0.84	7.02	9	56	36
	9	23	05	26.80	7	39	50.0	10.510 939	0.84	7.02	9	53	04
	10	23	05	50.92	7	37	28.9	10.501 217	0.84	7.03	9	49	32
	11	23	06	14.88	7	35	08.8	10.491 289	0.84	7.04	9	45	60
	12	23	06	38.67	7	32	49.9	10.481 157	0.84	7.04	9	42	28
	13	23	07	02.29	-7	30	32.1	10.470 824	0.84	7.05	9	38	55
	14	23	07	25.72	7	28	15.5	10.460 294	0.84	7.06	9	35	22
	15	23	07	48.98	7	26	00.1	10.449 568	0.84	7.06	9	31	50
	16	23	08	12.04	7	23	46.0	10.438 649	0.84	7.07	9	28	17
	17	23	08	34.91	7	21	33.1	10.427 541	0.84	7.08	9	24	43
	18	23	08	57.59	7	19	21.6	10.416 245	0.84	7.09	9	21	10
	19	23	09	20.07	-7	17	11.3	10.404 765	0.85	7.09	9	17	36
	20	23	09	42.34	7	15	02.4	10.393 104	0.85	7.10	9	14	02
	21	23	10	04.41	7	12	54.9	10.381 263	0.85	7.11	9	10	28
	22	23	10	26.27	7	10	48.7	10.369 246	0.85	7.12	9	06	54
	23	23	10	47.92	7	08	43.9	10.357 055	0.85	7.13	9	03	20
	24	23	11	09.36	7	06	40.5	10.344 693	0.85	7.14	8	59	45
	25	23	11	30.59	-7	04	38.5	10.332 162	0.85	7.14	8	56	10
	26	23	11	51.60	7	02	37.9	10.319 466	0.85	7.15	8	52	35
	27	23	12	12.39	7	00	38.8	10.306 606	0.85	7.16	8	48	60
	28	23	12	32.95	6	58	41.2	10.293 585	0.85	7.17	8	45	24
	29	23	12	53.29	6	56	45.1	10.280 407	0.86	7.18	8	41	48
	30	23	13	13.39	6	54	50.6	10.267 073	0.86	7.19	8	38	12
May	1	23	13	33.26	-6	52	57.6	10.253 586	0.86	7.20	8	34	36
	2	23	13	52.88	6	51	06.3	10.239 949	0.86	7.21	8	30	60
	3	23	14	12.25	6	49	16.6	10.226 166	0.86	7.22	8	27	23
	4	23	14	31.37	6	47	28.6	10.212 238	0.86	7.23	8	23	46
	5	23	14	50.24	6	45	42.2	10.198 169	0.86	7.24	8	20	09
	6	23	15	08.85	6	43	57.6	10.183 963	0.86	7.25	8	16	31
	7	23	15	27.20	-6	42	14.6	10.169 622	0.86	7.26	8	12	54
	8	23	15	45.29	6	40	33.4	10.155 151	0.87	7.27	8	09	16
	9	23	16	03.11	6	38	53.9	10.140 554	0.87	7.28	8	05	37
	10	23	16	20.67	6	37	16.2	10.125 833	0.87	7.29	8	01	59
	11	23	16	37.96	6	35	40.3	10.110 993	0.87	7.30	7	58	20
	12	23	16	54.97	6	34	06.3	10.096 037	0.87	7.31	7	54	41
	13	23	17	11.70	-6	32	34.1	10.080 970	0.87	7.32	7	51	02
	14	23	17	28.14	6	31	03.8	10.065 796	0.87	7.33	7	47	22
	15	23	17	44.29	6	29	35.5	10.050 518	0.87	7.34	7	43	42
	16	23	18	00.16	6	28	09.0	10.035 139	0.88	7.36	7	40	02
	17	23	18	15.72	-6	26	44.5	10.019 665	0.88	7.37	7	36	21

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	23	18	15.72	-6	26	44.5	10.019 665	0.88	7.37	7	36	21
	18	23	18	30.99	6	25	22.0	10.004 097	0.88	7.38	7	32	40
	19	23	18	45.97	6	24	01.4	9.988 441	0.88	7.39	7	28	59
	20	23	19	00.64	6	22	42.8	9.972 700	0.88	7.40	7	25	18
	21	23	19	15.02	6	21	26.2	9.956 876	0.88	7.41	7	21	36
	22	23	19	29.09	6	20	11.6	9.940 975	0.88	7.43	7	17	54
	23	23	19	42.86	-6	18	59.0	9.925 000	0.89	7.44	7	14	12
	24	23	19	56.32	6	17	48.4	9.908 953	0.89	7.45	7	10	29
	25	23	20	09.47	6	16	39.8	9.892 840	0.89	7.46	7	06	46
	26	23	20	22.31	6	15	33.3	9.876 662	0.89	7.47	7	03	03
	27	23	20	34.84	6	14	28.9	9.860 425	0.89	7.49	6	59	20
	28	23	20	47.04	6	13	26.6	9.844 131	0.89	7.50	6	55	36
	29	23	20	58.91	-6	12	26.5	9.827 784	0.89	7.51	6	51	51
	30	23	21	10.46	6	11	28.5	9.811 387	0.90	7.52	6	48	07
	31	23	21	21.67	6	10	32.7	9.794 946	0.90	7.54	6	44	22
June	1	23	21	32.55	6	09	39.1	9.778 463	0.90	7.55	6	40	37
	2	23	21	43.09	6	08	47.6	9.761 943	0.90	7.56	6	36	51
	3	23	21	53.30	6	07	58.4	9.745 391	0.90	7.57	6	33	06
	4	23	22	03.17	-6	07	11.4	9.728 809	0.90	7.59	6	29	19
	5	23	22	12.70	6	06	26.6	9.712 204	0.91	7.60	6	25	33
	6	23	22	21.89	6	05	44.0	9.695 579	0.91	7.61	6	21	46
	7	23	22	30.74	6	05	03.7	9.678 939	0.91	7.63	6	17	59
	8	23	22	39.23	6	04	25.6	9.662 289	0.91	7.64	6	14	11
	9	23	22	47.38	6	03	49.9	9.645 634	0.91	7.65	6	10	23
	10	23	22	55.17	-6	03	16.5	9.628 978	0.91	7.67	6	06	35
	11	23	23	02.60	6	02	45.4	9.612 325	0.91	7.68	6	02	46
	12	23	23	09.67	6	02	16.6	9.595 681	0.92	7.69	5	58	57
	13	23	23	16.39	6	01	50.2	9.579 049	0.92	7.71	5	55	08
	14	23	23	22.74	6	01	26.1	9.562 434	0.92	7.72	5	51	18
	15	23	23	28.74	6	01	04.3	9.545 841	0.92	7.73	5	47	28
	16	23	23	34.37	-6	00	44.9	9.529 274	0.92	7.75	5	43	38
	17	23	23	39.65	6	00	27.8	9.512 737	0.92	7.76	5	39	47
	18	23	23	44.56	6	00	13.0	9.496 234	0.93	7.77	5	35	56
	19	23	23	49.11	6	00	00.5	9.479 770	0.93	7.79	5	32	05
	20	23	23	53.31	5	59	50.3	9.463 348	0.93	7.80	5	28	13
	21	23	23	57.14	5	59	42.4	9.446 974	0.93	7.81	5	24	21
	22	23	24	00.61	-5	59	36.9	9.430 651	0.93	7.83	5	20	28
	23	23	24	03.72	5	59	33.7	9.414 383	0.93	7.84	5	16	35
	24	23	24	06.46	5	59	32.8	9.398 174	0.94	7.85	5	12	42
	25	23	24	08.82	5	59	34.4	9.382 028	0.94	7.87	5	08	48
	26	23	24	10.82	5	59	38.2	9.365 950	0.94	7.88	5	04	54
	27	23	24	12.45	5	59	44.5	9.349 944	0.94	7.90	5	00	60
	28	23	24	13.70	-5	59	53.1	9.334 014	0.94	7.91	4	57	05
	29	23	24	14.58	6	00	04.1	9.318 165	0.94	7.92	4	53	10
	30	23	24	15.09	6	00	17.4	9.302 401	0.95	7.94	4	49	15
July	1	23	24	15.23	6	00	33.0	9.286 726	0.95	7.95	4	45	19
	2	23	24	15.00	-6	00	50.9	9.271 147	0.95	7.96	4	41	23

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	23	24	15.23	-6	00	33.0	9.286 726	0.95	7.95	4	45	19
	2	23	24	15.00	6	00	50.9	9.271 147	0.95	7.96	4	41	23
	3	23	24	14.41	6	01	11.2	9.255 667	0.95	7.98	4	37	26
	4	23	24	13.45	6	01	33.8	9.240 291	0.95	7.99	4	33	29
	5	23	24	12.12	6	01	58.7	9.225 025	0.95	8.00	4	29	32
	6	23	24	10.42	6	02	25.9	9.209 873	0.95	8.02	4	25	34
	7	23	24	08.35	-6	02	55.5	9.194 840	0.96	8.03	4	21	36
	8	23	24	05.91	6	03	27.3	9.179 931	0.96	8.04	4	17	38
	9	23	24	03.10	6	04	01.5	9.165 150	0.96	8.05	4	13	39
	10	23	23	59.92	6	04	37.9	9.150 502	0.96	8.07	4	09	40
	11	23	23	56.38	6	05	16.6	9.135 992	0.96	8.08	4	05	40
	12	23	23	52.47	6	05	57.5	9.121 623	0.96	8.09	4	01	40
	13	23	23	48.21	-6	06	40.6	9.107 401	0.97	8.11	3	57	40
	14	23	23	43.59	6	07	25.9	9.093 329	0.97	8.12	3	53	40
	15	23	23	38.62	6	08	13.3	9.079 412	0.97	8.13	3	49	39
	16	23	23	33.31	6	09	02.9	9.065 654	0.97	8.14	3	45	37
	17	23	23	27.64	6	09	54.5	9.052 059	0.97	8.16	3	41	36
	18	23	23	21.64	6	10	48.3	9.038 631	0.97	8.17	3	37	34
	19	23	23	15.29	-6	11	44.1	9.025 373	0.97	8.18	3	33	32
	20	23	23	08.60	6	12	41.9	9.012 290	0.98	8.19	3	29	29
	21	23	23	01.58	6	13	41.7	8.999 385	0.98	8.20	3	25	26
	22	23	22	54.22	6	14	43.6	8.986 663	0.98	8.21	3	21	23
	23	23	22	46.52	6	15	47.5	8.974 125	0.98	8.23	3	17	19
	24	23	22	38.49	6	16	53.4	8.961 778	0.98	8.24	3	13	15
	25	23	22	30.13	-6	18	01.2	8.949 624	0.98	8.25	3	09	11
	26	23	22	21.45	6	19	10.9	8.937 667	0.98	8.26	3	05	06
	27	23	22	12.45	6	20	22.5	8.925 911	0.99	8.27	3	01	02
	28	23	22	03.13	6	21	35.9	8.914 361	0.99	8.28	2	56	56
	29	23	21	53.50	6	22	51.1	8.903 020	0.99	8.29	2	52	51
	30	23	21	43.57	6	24	08.1	8.891 893	0.99	8.30	2	48	45
	31	23	21	33.34	-6	25	26.8	8.880 984	0.99	8.31	2	44	39
Aug.	1	23	21	22.81	6	26	47.2	8.870 296	0.99	8.32	2	40	32
	2	23	21	11.98	6	28	09.4	8.859 835	0.99	8.33	2	36	26
	3	23	21	00.86	6	29	33.1	8.849 603	0.99	8.34	2	32	19
	4	23	20	49.46	6	30	58.6	8.839 604	0.99	8.35	2	28	11
	5	23	20	37.77	6	32	25.6	8.829 843	1.00	8.36	2	24	04
	6	23	20	25.81	-6	33	54.1	8.820 322	1.00	8.37	2	19	56
	7	23	20	13.57	6	35	24.1	8.811 045	1.00	8.38	2	15	48
	8	23	20	01.08	6	36	55.6	8.802 016	1.00	8.39	2	11	40
	9	23	19	48.33	6	38	28.4	8.793 238	1.00	8.40	2	07	31
	10	23	19	35.33	6	40	02.6	8.784 713	1.00	8.40	2	03	22
	11	23	19	22.09	6	41	38.0	8.776 445	1.00	8.41	1	59	13
	12	23	19	08.62	-6	43	14.7	8.768 436	1.00	8.42	1	55	04
	13	23	18	54.93	6	44	52.5	8.760 689	1.00	8.43	1	50	54
	14	23	18	41.01	6	46	31.5	8.753 206	1.00	8.43	1	46	44
	15	23	18	26.89	6	48	11.5	8.745 991	1.01	8.44	1	42	34
	16	23	18	12.56	-6	49	52.6	8.739 044	1.01	8.45	1	38	24

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		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	23	18	12.56	-6	49	52.6	8.739 044	1.01	8.45	1	38	24
	17	23	17	58.03	6	51	34.6	8.732 369	1.01	8.45	1	34	14
	18	23	17	43.30	6	53	17.7	8.725 967	1.01	8.46	1	30	03
	19	23	17	28.39	6	55	01.6	8.719 841	1.01	8.47	1	25	53
	20	23	17	13.29	6	56	46.4	8.713 991	1.01	8.47	1	21	42
	21	23	16	58.02	6	58	32.0	8.708 421	1.01	8.48	1	17	31
	22	23	16	42.58	-7	00	18.3	8.703 133	1.01	8.48	1	13	19
	23	23	16	26.98	7	02	05.4	8.698 127	1.01	8.49	1	09	08
	24	23	16	11.23	7	03	53.1	8.693 408	1.01	8.49	1	04	56
	25	23	15	55.35	7	05	41.3	8.688 975	1.01	8.50	1	00	45
	26	23	15	39.33	7	07	30.1	8.684 832	1.01	8.50	0	56	33
	27	23	15	23.19	7	09	19.4	8.680 981	1.01	8.50	0	52	21
	28	23	15	06.93	-7	11	09.1	8.677 424	1.01	8.51	0	48	09
	29	23	14	50.55	7	12	59.1	8.674 162	1.01	8.51	0	43	56
	30	23	14	34.08	7	14	49.5	8.671 197	1.01	8.51	0	39	44
	31	23	14	17.51	7	16	40.2	8.668 530	1.01	8.52	0	35	32
Sept.	1	23	14	00.85	7	18	31.1	8.666 163	1.01	8.52	0	31	19
	2	23	13	44.12	7	20	22.2	8.664 098	1.02	8.52	0	27	07
	3	23	13	27.32	-7	22	13.4	8.662 334	1.02	8.52	0	22	54
	4	23	13	10.46	7	24	04.6	8.660 873	1.02	8.52	0	18	41
	5	23	12	53.54	7	25	55.7	8.659 716	1.02	8.52	0	14	29
	6	23	12	36.60	7	27	46.8	8.658 863	1.02	8.53	0	10	16
	7	23	12	19.62	7	29	37.7	8.658 314	1.02	8.53	0	06	03
	8	23	12	02.63	7	31	28.3	8.658 069	1.02	8.53	0	01	50
	9	23	11	45.63	-7	33	18.6	8.658 129	1.02	8.53	23	53	25
	10	23	11	28.63	7	35	08.6	8.658 494	1.02	8.53	23	49	12
	11	23	11	11.64	7	36	58.1	8.659 162	1.02	8.53	23	44	59
	12	23	10	54.68	7	38	47.2	8.660 135	1.02	8.52	23	40	46
	13	23	10	37.74	7	40	35.8	8.661 410	1.02	8.52	23	36	34
	14	23	10	20.84	7	42	23.8	8.662 987	1.02	8.52	23	32	21
	15	23	10	03.98	-7	44	11.2	8.664 866	1.01	8.52	23	28	08
	16	23	09	47.16	7	45	57.9	8.667 046	1.01	8.52	23	23	56
	17	23	09	30.41	7	47	43.9	8.669 525	1.01	8.51	23	19	43
	18	23	09	13.73	7	49	29.2	8.672 302	1.01	8.51	23	15	31
	19	23	08	57.12	7	51	13.6	8.675 378	1.01	8.51	23	11	19
	20	23	08	40.59	7	52	57.2	8.678 751	1.01	8.51	23	07	06
	21	23	08	24.17	-7	54	39.7	8.682 419	1.01	8.50	23	02	54
	22	23	08	07.86	7	56	21.3	8.686 383	1.01	8.50	22	58	42
	23	23	07	51.65	7	58	01.8	8.690 641	1.01	8.49	22	54	30
	24	23	07	35.58	7	59	41.3	8.695 193	1.01	8.49	22	50	19
	25	23	07	19.63	8	01	19.6	8.700 037	1.01	8.49	22	46	07
	26	23	07	03.82	8	02	56.7	8.705 171	1.01	8.48	22	41	55
	27	23	06	48.15	-8	04	32.6	8.710 595	1.01	8.47	22	37	44
	28	23	06	32.64	8	06	07.3	8.716 307	1.01	8.47	22	33	33
	29	23	06	17.29	8	07	40.6	8.722 304	1.01	8.46	22	29	22
	30	23	06	02.11	8	09	12.5	8.728 586	1.01	8.46	22	25	11
Oct.	1	23	05	47.10	-8	10	43.1	8.735 150	1.01	8.45	22	21	00

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		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	23	05	47.10	-8	10	43.1	8.735 150	1.01	8.45	22	21	00
	2	23	05	32.29	8	12	12.1	8.741 993	1.01	8.44	22	16	50
	3	23	05	17.68	8	13	39.6	8.749 113	1.01	8.44	22	12	40
	4	23	05	03.27	8	15	05.5	8.756 508	1.00	8.43	22	08	30
	5	23	04	49.08	8	16	29.7	8.764 174	1.00	8.42	22	04	20
	6	23	04	35.11	8	17	52.3	8.772 109	1.00	8.42	22	00	10
	7	23	04	21.38	-8	19	13.1	8.780 310	1.00	8.41	21	56	01
	8	23	04	07.88	8	20	32.2	8.788 774	1.00	8.40	21	51	52
	9	23	03	54.64	8	21	49.4	8.797 497	1.00	8.39	21	47	43
	10	23	03	41.65	8	23	04.8	8.806 476	1.00	8.38	21	43	34
	11	23	03	28.91	8	24	18.4	8.815 707	1.00	8.37	21	39	26
	12	23	03	16.44	8	25	30.0	8.825 187	1.00	8.36	21	35	18
	13	23	03	04.24	-8	26	39.7	8.834 913	1.00	8.36	21	31	10
	14	23	02	52.31	8	27	47.5	8.844 880	0.99	8.35	21	27	03
	15	23	02	40.66	8	28	53.3	8.855 084	0.99	8.34	21	22	55
	16	23	02	29.30	8	29	57.1	8.865 524	0.99	8.33	21	18	48
	17	23	02	18.23	8	30	58.8	8.876 193	0.99	8.32	21	14	42
	18	23	02	07.47	8	31	58.4	8.887 091	0.99	8.31	21	10	35
	19	23	01	57.01	-8	32	55.9	8.898 212	0.99	8.30	21	06	29
	20	23	01	46.86	8	33	51.3	8.909 553	0.99	8.29	21	02	24
	21	23	01	37.04	8	34	44.5	8.921 111	0.99	8.27	20	58	18
	22	23	01	27.53	8	35	35.5	8.932 883	0.98	8.26	20	54	13
	23	23	01	18.35	8	36	24.3	8.944 864	0.98	8.25	20	50	08
	24	23	01	09.49	8	37	10.9	8.957 052	0.98	8.24	20	46	04
	25	23	01	00.97	-8	37	55.3	8.969 441	0.98	8.23	20	41	60
	26	23	00	52.79	8	38	37.4	8.982 029	0.98	8.22	20	37	56
	27	23	00	44.94	8	39	17.2	8.994 810	0.98	8.21	20	33	53
	28	23	00	37.45	8	39	54.8	9.007 781	0.98	8.20	20	29	50
	29	23	00	30.30	8	40	30.0	9.020 937	0.97	8.18	20	25	47
	30	23	00	23.51	8	41	02.8	9.034 274	0.97	8.17	20	21	45
	31	23	00	17.08	-8	41	33.3	9.047 787	0.97	8.16	20	17	43
Nov.	1	23	00	11.02	8	42	01.3	9.061 471	0.97	8.15	20	13	41
	2	23	00	05.33	8	42	26.9	9.075 322	0.97	8.13	20	09	40
	3	23	00	00.02	8	42	50.1	9.089 335	0.97	8.12	20	05	39
	4	22	59	55.08	8	43	10.8	9.103 504	0.97	8.11	20	01	38
	5	22	59	50.52	8	43	29.0	9.117 825	0.96	8.10	19	57	38
	6	22	59	46.35	-8	43	44.8	9.132 293	0.96	8.08	19	53	38
	7	22	59	42.56	8	43	58.2	9.146 902	0.96	8.07	19	49	39
	8	22	59	39.15	8	44	09.0	9.161 648	0.96	8.06	19	45	40
	9	22	59	36.12	8	44	17.5	9.176 525	0.96	8.04	19	41	41
	10	22	59	33.48	8	44	23.4	9.191 528	0.96	8.03	19	37	43
	11	22	59	31.22	8	44	26.9	9.206 652	0.96	8.02	19	33	45
	12	22	59	29.35	-8	44	27.9	9.221 892	0.95	8.00	19	29	48
	13	22	59	27.87	8	44	26.5	9.237 244	0.95	7.99	19	25	51
	14	22	59	26.78	8	44	22.6	9.252 702	0.95	7.98	19	21	54
	15	22	59	26.09	8	44	16.1	9.268 262	0.95	7.96	19	17	58
	16	22	59	25.79	-8	44	07.2	9.283 918	0.95	7.95	19	14	02

SATURN, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	22	59	25.79	-8	44	07.2	9.283 918	0.95	7.95	19	14	02
	17	22	59	25.89	8	43	55.7	9.299 668	0.95	7.94	19	10	07
	18	22	59	26.39	8	43	41.8	9.315 505	0.94	7.92	19	06	11
	19	22	59	27.28	8	43	25.5	9.331 426	0.94	7.91	19	02	17
	20	22	59	28.56	8	43	06.7	9.347 426	0.94	7.90	18	58	22
	21	22	59	30.23	8	42	45.5	9.363 501	0.94	7.88	18	54	28
	22	22	59	32.29	-8	42	21.8	9.379 644	0.94	7.87	18	50	35
	23	22	59	34.75	8	41	55.7	9.395 852	0.94	7.86	18	46	42
	24	22	59	37.59	8	41	27.1	9.412 120	0.93	7.84	18	42	49
	25	22	59	40.83	8	40	56.2	9.428 442	0.93	7.83	18	38	57
	26	22	59	44.47	8	40	22.7	9.444 814	0.93	7.82	18	35	05
	27	22	59	48.50	8	39	46.8	9.461 230	0.93	7.80	18	31	13
	28	22	59	52.92	-8	39	08.5	9.477 686	0.93	7.79	18	27	22
	29	22	59	57.74	8	38	27.7	9.494 175	0.93	7.78	18	23	31
	30	23	00	02.95	8	37	44.5	9.510 694	0.92	7.76	18	19	41
Dec.	1	23	00	08.56	8	36	58.9	9.527 236	0.92	7.75	18	15	51
	2	23	00	14.56	8	36	10.9	9.543 796	0.92	7.73	18	12	01
	3	23	00	20.95	8	35	20.4	9.560 370	0.92	7.72	18	08	12
	4	23	00	27.73	-8	34	27.6	9.576 951	0.92	7.71	18	04	23
	5	23	00	34.89	8	33	32.5	9.593 535	0.92	7.69	18	00	34
	6	23	00	42.43	8	32	35.0	9.610 116	0.92	7.68	17	56	46
	7	23	00	50.35	8	31	35.2	9.626 690	0.91	7.67	17	52	58
	8	23	00	58.65	8	30	33.2	9.643 251	0.91	7.66	17	49	11
	9	23	01	07.31	8	29	28.8	9.659 794	0.91	7.64	17	45	24
	10	23	01	16.35	-8	28	22.2	9.676 314	0.91	7.63	17	41	37
	11	23	01	25.76	8	27	13.4	9.692 808	0.91	7.62	17	37	51
	12	23	01	35.54	8	26	02.3	9.709 270	0.91	7.60	17	34	05
	13	23	01	45.68	8	24	48.9	9.725 695	0.90	7.59	17	30	20
	14	23	01	56.20	8	23	33.4	9.742 081	0.90	7.58	17	26	34
	15	23	02	07.07	8	22	15.6	9.758 421	0.90	7.56	17	22	49
	16	23	02	18.30	-8	20	55.7	9.774 713	0.90	7.55	17	19	05
	17	23	02	29.88	8	19	33.7	9.790 953	0.90	7.54	17	15	21
	18	23	02	41.81	8	18	09.6	9.807 135	0.90	7.53	17	11	37
	19	23	02	54.09	8	16	43.4	9.823 256	0.90	7.51	17	07	54
	20	23	03	06.70	8	15	15.2	9.839 311	0.89	7.50	17	04	10
	21	23	03	19.66	8	13	44.9	9.855 296	0.89	7.49	17	00	28
	22	23	03	32.95	-8	12	12.6	9.871 208	0.89	7.48	16	56	45
	23	23	03	46.58	8	10	38.2	9.887 040	0.89	7.47	16	53	03
	24	23	04	00.54	8	09	01.8	9.902 790	0.89	7.45	16	49	21
	25	23	04	14.83	8	07	23.4	9.918 452	0.89	7.44	16	45	40
	26	23	04	29.45	8	05	43.1	9.934 022	0.89	7.43	16	41	59
	27	23	04	44.40	8	04	00.7	9.949 496	0.88	7.42	16	38	18
	28	23	04	59.68	-8	02	16.5	9.964 870	0.88	7.41	16	34	37
	29	23	05	15.27	8	00	30.2	9.980 139	0.88	7.40	16	30	57
	30	23	05	31.18	7	58	42.1	9.995 298	0.88	7.39	16	27	17
	31	23	05	47.40	7	56	52.2	10.010 343	0.88	7.37	16	23	38
	32	23	06	03.92	-7	55	00.4	10.025 271	0.88	7.36	16	19	58

URANUS, 2024

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Jan.	1	51	36	19.3	-0	17	46.1	19.613 4274	Apr.	2	52	38	39.0	-0	16	59.4	19.598 6251
	3	51	37	40.5	0	17	45.1	19.613 1079		4	52	40	00.4	0	16	58.4	19.598 3009
	5	51	39	01.8	0	17	44.0	19.612 7883		6	52	41	21.7	0	16	57.4	19.597 9766
	7	51	40	23.0	0	17	43.0	19.612 4686		8	52	42	43.1	0	16	56.3	19.597 6522
	9	51	41	44.3	0	17	42.0	19.612 1488		10	52	44	04.5	0	16	55.3	19.597 3277
	11	51	43	05.5	0	17	41.0	19.611 8289		12	52	45	25.9	0	16	54.3	19.597 0031
	13	51	44	26.8	-0	17	40.0	19.611 5089		14	52	46	47.2	-0	16	53.3	19.596 6784
	15	51	45	48.0	0	17	39.0	19.611 1888		16	52	48	08.6	0	16	52.3	19.596 3535
	17	51	47	09.3	0	17	38.0	19.610 8685		18	52	49	30.0	0	16	51.2	19.596 0286
	19	51	48	30.6	0	17	37.0	19.610 5482		20	52	50	51.4	0	16	50.2	19.595 7036
	21	51	49	51.8	0	17	35.9	19.610 2278		22	52	52	12.8	0	16	49.2	19.595 3785
	23	51	51	13.1	0	17	34.9	19.609 9073		24	52	53	34.2	0	16	48.2	19.595 0533
	25	51	52	34.4	-0	17	33.9	19.609 5866		26	52	54	55.5	-0	16	47.2	19.594 7279
	27	51	53	55.6	0	17	32.9	19.609 2659		28	52	56	16.9	0	16	46.1	19.594 4025
	29	51	55	16.9	0	17	31.9	19.608 9451		30	52	57	38.3	0	16	45.1	19.594 0770
	31	51	56	38.1	0	17	30.9	19.608 6242	May	2	52	58	59.7	0	16	44.1	19.593 7513
Feb.	2	51	57	59.4	0	17	29.9	19.608 3031		4	53	00	21.1	0	16	43.1	19.593 4256
	4	51	59	20.7	0	17	28.9	19.607 9820		6	53	01	42.5	0	16	42.0	19.593 0997
	6	52	00	42.0	-0	17	27.8	19.607 6608		8	53	03	03.9	-0	16	41.0	19.592 7738
	8	52	02	03.3	0	17	26.8	19.607 3394		10	53	04	25.4	0	16	40.0	19.592 4477
	10	52	03	24.6	0	17	25.8	19.607 0180		12	53	05	46.8	0	16	39.0	19.592 1215
	12	52	04	45.9	0	17	24.8	19.606 6965		14	53	07	08.2	0	16	37.9	19.591 7953
	14	52	06	07.1	0	17	23.8	19.606 3748		16	53	08	29.6	0	16	36.9	19.591 4689
	16	52	07	28.5	0	17	22.8	19.606 0531		18	53	09	51.0	0	16	35.9	19.591 1424
	18	52	08	49.8	-0	17	21.8	19.605 7313		20	53	11	12.5	-0	16	34.9	19.590 8158
	20	52	10	11.0	0	17	20.8	19.605 4093		22	53	12	33.9	0	16	33.8	19.590 4891
	22	52	11	32.4	0	17	19.7	19.605 0873		24	53	13	55.3	0	16	32.8	19.590 1623
	24	52	12	53.7	0	17	18.7	19.604 7651		26	53	15	16.8	0	16	31.8	19.589 8354
	26	52	14	15.0	0	17	17.7	19.604 4429		28	53	16	38.2	0	16	30.8	19.589 5084
	28	52	15	36.3	0	17	16.7	19.604 1206		30	53	17	59.6	0	16	29.8	19.589 1813
Mar.	1	52	16	57.6	-0	17	15.7	19.603 7981	June	1	53	19	21.1	-0	16	28.7	19.588 8541
	3	52	18	18.9	0	17	14.7	19.603 4756		3	53	20	42.5	0	16	27.7	19.588 5268
	5	52	19	40.3	0	17	13.6	19.603 1529		5	53	22	03.9	0	16	26.7	19.588 1993
	7	52	21	01.6	0	17	12.6	19.602 8302		7	53	23	25.4	0	16	25.6	19.587 8718
	9	52	22	22.9	0	17	11.6	19.602 5073		9	53	24	46.8	0	16	24.6	19.587 5441
	11	52	23	44.2	0	17	10.6	19.602 1844		11	53	26	08.3	0	16	23.6	19.587 2164
	13	52	25	05.5	-0	17	09.6	19.601 8613		13	53	27	29.7	-0	16	22.6	19.586 8885
	15	52	26	26.9	0	17	08.6	19.601 5382		15	53	28	51.2	0	16	21.6	19.586 5606
	17	52	27	48.2	0	17	07.6	19.601 2149		17	53	30	12.7	0	16	20.5	19.586 2325
	19	52	29	09.6	0	17	06.5	19.600 8915		19	53	31	34.1	0	16	19.5	19.585 9043
	21	52	30	30.9	0	17	05.5	19.600 5681		21	53	32	55.6	0	16	18.5	19.585 5760
	23	52	31	52.2	0	17	04.5	19.600 2445		23	53	34	17.1	0	16	17.4	19.585 2476
	25	52	33	13.6	-0	17	03.5	19.599 9208		25	53	35	38.6	-0	16	16.4	19.584 9191
	27	52	34	35.0	0	17	02.5	19.599 5970		27	53	37	00.0	0	16	15.4	19.584 5905
	29	52	35	56.3	0	17	01.4	19.599 2731		29	53	38	21.5	0	16	14.4	19.584 2619
	31	52	37	17.7	0	17	00.4	19.598 9491	July	1	53	39	43.0	0	16	13.3	19.583 9331
Apr.	2	52	38	39.0	-0	16	59.4	19.598 6251		3	53	41	04.5	-0	16	12.3	19.583 6042

URANUS, 2024

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	53	39	43.0	-0	16	13.3	19.583 9331	Oct.	1	54	42	14.0	-0	15	25.8	19.568 7021
	3	53	41	04.5	0	16	12.3	19.583 6042		3	54	43	35.6	0	15	24.8	19.568 3688
	5	53	42	25.9	0	16	11.3	19.583 2752		5	54	44	57.2	0	15	23.8	19.568 0353
	7	53	43	47.4	0	16	10.2	19.582 9461		7	54	46	18.8	0	15	22.7	19.567 7017
	9	53	45	08.9	0	16	09.2	19.582 6169		9	54	47	40.4	0	15	21.7	19.567 3681
	11	53	46	30.4	0	16	08.2	19.582 2875		11	54	49	02.0	0	15	20.7	19.567 0343
	13	53	47	51.9	-0	16	07.2	19.581 9581		13	54	50	23.7	-0	15	19.6	19.566 7004
	15	53	49	13.4	0	16	06.1	19.581 6286		15	54	51	45.3	0	15	18.6	19.566 3665
	17	53	50	34.9	0	16	05.1	19.581 2990		17	54	53	06.9	0	15	17.6	19.566 0324
	19	53	51	56.4	0	16	04.1	19.580 9693		19	54	54	28.5	0	15	16.5	19.565 6983
	21	53	53	17.9	0	16	03.0	19.580 6395		21	54	55	50.2	0	15	15.5	19.565 3640
	23	53	54	39.4	0	16	02.0	19.580 3096		23	54	57	11.8	0	15	14.4	19.565 0297
	25	53	56	01.0	-0	16	01.0	19.579 9796		25	54	58	33.4	-0	15	13.4	19.564 6953
	27	53	57	22.5	0	15	59.9	19.579 6496		27	54	59	55.1	0	15	12.3	19.564 3607
	29	53	58	44.0	0	15	58.9	19.579 3194		29	55	01	16.7	0	15	11.3	19.564 0261
	31	54	00	05.5	0	15	57.9	19.578 9891		31	55	02	38.4	0	15	10.2	19.563 6914
Aug.	2	54	01	27.0	0	15	56.9	19.578 6587	Nov.	2	55	04	00.0	0	15	09.2	19.563 3565
	4	54	02	48.6	0	15	55.8	19.578 3282		4	55	05	21.7	0	15	08.2	19.563 0216
	6	54	04	10.1	-0	15	54.8	19.577 9976		6	55	06	43.3	-0	15	07.1	19.562 6866
	8	54	05	31.6	0	15	53.7	19.577 6669		8	55	08	05.0	0	15	06.1	19.562 3514
	10	54	06	53.1	0	15	52.7	19.577 3362		10	55	09	26.6	0	15	05.1	19.562 0162
	12	54	08	14.7	0	15	51.7	19.577 0053		12	55	10	48.3	0	15	04.0	19.561 6809
	14	54	09	36.2	0	15	50.7	19.576 6743		14	55	12	09.9	0	15	03.0	19.561 3454
	16	54	10	57.8	0	15	49.6	19.576 3433		16	55	13	31.6	0	15	01.9	19.561 0099
	18	54	12	19.3	-0	15	48.6	19.576 0121		18	55	14	53.3	-0	15	00.9	19.560 6743
	20	54	13	40.8	0	15	47.6	19.575 6808		20	55	16	15.0	0	14	59.9	19.560 3385
	22	54	15	02.4	0	15	46.5	19.575 3495		22	55	17	36.6	0	14	58.8	19.560 0027
	24	54	16	24.0	0	15	45.5	19.575 0180		24	55	18	58.3	0	14	57.8	19.559 6668
	26	54	17	45.5	0	15	44.5	19.574 6865		26	55	20	20.0	0	14	56.7	19.559 3307
	28	54	19	07.1	0	15	43.4	19.574 3549		28	55	21	41.7	0	14	55.7	19.558 9946
	30	54	20	28.6	-0	15	42.4	19.574 0231		30	55	23	03.4	-0	14	54.7	19.558 6583
Sept.	1	54	21	50.2	0	15	41.4	19.573 6913	Dec.	2	55	24	25.1	0	14	53.6	19.558 3219
	3	54	23	11.8	0	15	40.3	19.573 3594		4	55	25	46.8	0	14	52.6	19.557 9855
	5	54	24	33.3	0	15	39.3	19.573 0273		6	55	27	08.4	0	14	51.5	19.557 6489
	7	54	25	54.9	0	15	38.3	19.572 6952		8	55	28	30.1	0	14	50.5	19.557 3123
	9	54	27	16.5	0	15	37.2	19.572 3630		10	55	29	51.9	0	14	49.5	19.556 9755
	11	54	28	38.0	-0	15	36.2	19.572 0307		12	55	31	13.6	-0	14	48.4	19.556 6386
	13	54	29	59.6	0	15	35.2	19.571 6982		14	55	32	35.2	0	14	47.4	19.556 3016
	15	54	31	21.2	0	15	34.1	19.571 3657		16	55	33	56.9	0	14	46.3	19.555 9645
	17	54	32	42.8	0	15	33.1	19.571 0331		18	55	35	18.7	0	14	45.3	19.555 6273
	19	54	34	04.4	0	15	32.0	19.570 7004		20	55	36	40.4	0	14	44.2	19.555 2900
	21	54	35	26.0	0	15	31.0	19.570 3676		22	55	38	02.1	0	14	43.2	19.554 9526
	23	54	36	47.6	-0	15	30.0	19.570 0347		24	55	39	23.8	-0	14	42.1	19.554 6151
	25	54	38	09.2	0	15	28.9	19.569 7017		26	55	40	45.5	0	14	41.1	19.554 2775
	27	54	39	30.8	0	15	27.9	19.569 3686		28	55	42	07.3	0	14	40.1	19.553 9398
	29	54	40	52.4	0	15	26.9	19.569 0354		30	55	43	29.0	0	14	39.0	19.553 6020
Oct.	1	54	42	14.0	-0	15	25.8	19.568 7021		32	55	44	50.7	-0	14	38.0	19.553 2641

URANUS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	0	49	24	22.5	-0	18	23.3	Feb.	15	49	14	30.5	-0	17	18.8
	1	49	23	02.3	0	18	22.0		16	49	15	30.9	0	17	17.4
	2	49	21	44.8	0	18	20.7		17	49	16	34.3	0	17	16.0
	3	49	20	30.0	0	18	19.4		18	49	17	40.8	0	17	14.6
	4	49	19	17.9	0	18	18.1		19	49	18	50.3	0	17	13.2
	5	49	18	08.6	0	18	16.8		20	49	20	02.8	0	17	11.8
	6	49	17	02.1	-0	18	15.5		21	49	21	18.2	-0	17	10.4
	7	49	15	58.5	0	18	14.1		22	49	22	36.5	0	17	09.0
	8	49	14	57.8	0	18	12.8		23	49	23	57.7	0	17	07.7
	9	49	14	00.1	0	18	11.4		24	49	25	21.8	0	17	06.3
	10	49	13	05.3	0	18	10.0		25	49	26	48.6	0	17	04.9
	11	49	12	13.5	0	18	08.7		26	49	28	18.3	0	17	03.6
	12	49	11	24.6	-0	18	07.3		27	49	29	50.8	-0	17	02.3
	13	49	10	38.7	0	18	05.9		28	49	31	26.2	0	17	00.9
	14	49	09	55.8	0	18	04.5		29	49	33	04.3	0	16	59.6
	15	49	09	15.8	0	18	03.1	Mar.	1	49	34	45.2	0	16	58.3
	16	49	08	38.9	0	18	01.7		2	49	36	28.9	0	16	57.0
	17	49	08	05.0	0	18	00.3		3	49	38	15.4	0	16	55.7
	18	49	07	34.2	-0	17	58.9		4	49	40	04.7	-0	16	54.4
	19	49	07	06.6	0	17	57.4		5	49	41	56.6	0	16	53.1
	20	49	06	42.1	0	17	56.0		6	49	43	51.2	0	16	51.8
	21	49	06	20.8	0	17	54.6		7	49	45	48.3	0	16	50.5
	22	49	06	02.6	0	17	53.1		8	49	47	48.1	0	16	49.2
	23	49	05	47.6	0	17	51.7		9	49	49	50.3	0	16	48.0
	24	49	05	35.7	-0	17	50.3		10	49	51	55.0	-0	16	46.7
	25	49	05	27.0	0	17	48.8		11	49	54	02.1	0	16	45.5
	26	49	05	21.3	0	17	47.4		12	49	56	11.7	0	16	44.2
	27	49	05	18.8	0	17	46.0		13	49	58	23.8	0	16	43.0
	28	49	05	19.4	0	17	44.5		14	50	00	38.3	0	16	41.8
	29	49	05	23.1	0	17	43.1		15	50	02	55.2	0	16	40.6
	30	49	05	29.9	-0	17	41.7		16	50	05	14.6	-0	16	39.4
	31	49	05	39.9	0	17	40.2		17	50	07	36.2	0	16	38.2
Feb.	1	49	05	53.1	0	17	38.8		18	50	10	00.1	0	16	37.0
	2	49	06	09.4	0	17	37.4		19	50	12	26.1	0	16	35.8
	3	49	06	29.0	0	17	35.9		20	50	14	54.3	0	16	34.7
	4	49	06	51.8	0	17	34.5		21	50	17	24.6	0	16	33.5
	5	49	07	17.8	-0	17	33.1		22	50	19	57.0	-0	16	32.4
	6	49	07	47.0	0	17	31.6		23	50	22	31.4	0	16	31.3
	7	49	08	19.4	0	17	30.2		24	50	25	07.8	0	16	30.2
	8	49	08	55.0	0	17	28.8		25	50	27	46.2	0	16	29.1
	9	49	09	33.7	0	17	27.3		26	50	30	26.5	0	16	28.0
	10	49	10	15.4	0	17	25.9		27	50	33	08.8	0	16	26.9
	11	49	11	00.3	-0	17	24.5		28	50	35	53.0	-0	16	25.8
	12	49	11	48.2	0	17	23.0		29	50	38	39.1	0	16	24.8
	13	49	12	39.2	0	17	21.6		30	50	41	27.1	0	16	23.7
	14	49	13	33.3	0	17	20.2		31	50	44	17.0	0	16	22.7
	15	49	14	30.5	-0	17	18.8	Apr.	1	50	47	08.6	-0	16	21.7

URANUS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Apr.	1	50	47	08.6	-0	16	21.7
	2	50	50	01.9	0	16	20.7
	3	50	52	57.0	0	16	19.7
	4	50	55	53.6	0	16	18.7
	5	50	58	51.8	0	16	17.7
	6	51	01	51.6	0	16	16.7
	7	51	04	52.8	-0	16	15.8
	8	51	07	55.4	0	16	14.8
	9	51	10	59.6	0	16	13.9
	10	51	14	05.2	0	16	13.0
	11	51	17	12.2	0	16	12.0
	12	51	20	20.7	0	16	11.1
	13	51	23	30.4	-0	16	10.3
	14	51	26	41.4	0	16	09.4
	15	51	29	53.6	0	16	08.5
	16	51	33	06.8	0	16	07.7
	17	51	36	21.2	0	16	06.8
	18	51	39	36.5	0	16	06.0
	19	51	42	52.9	-0	16	05.2
	20	51	46	10.1	0	16	04.4
	21	51	49	28.4	0	16	03.6
	22	51	52	47.5	0	16	02.9
	23	51	56	07.5	0	16	02.1
	24	51	59	28.3	0	16	01.4
	25	52	02	50.0	-0	16	00.7
	26	52	06	12.5	0	15	59.9
	27	52	09	35.8	0	15	59.2
	28	52	12	59.7	0	15	58.5
	29	52	16	24.4	0	15	57.9
	30	52	19	49.6	0	15	57.2
May	1	52	23	15.3	-0	15	56.5
	2	52	26	41.6	0	15	55.9
	3	52	30	08.2	0	15	55.2
	4	52	33	35.3	0	15	54.6
	5	52	37	02.7	0	15	54.0
	6	52	40	30.5	0	15	53.4
	7	52	43	58.7	-0	15	52.8
	8	52	47	27.2	0	15	52.2
	9	52	50	55.9	0	15	51.7
	10	52	54	25.0	0	15	51.1
	11	52	57	54.2	0	15	50.6
	12	53	01	23.6	0	15	50.1
	13	53	04	53.3	-0	15	50.1
	14	53	08	21.1	0	15	49.3
	15	53	11	50.6	0	15	48.6
	16	53	15	19.8	0	15	48.1
	17	53	18	48.7	-0	15	47.6

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
May	17	53	18	48.7	-0	15	47.6
	18	53	22	17.4	0	15	47.2
	19	53	25	45.9	0	15	46.8
	20	53	29	14.2	0	15	46.3
	21	53	32	42.2	0	15	45.9
	22	53	36	10.0	0	15	45.5
	23	53	39	37.5	-0	15	45.2
	24	53	43	04.6	0	15	44.8
	25	53	46	31.4	0	15	44.4
	26	53	49	57.7	0	15	44.1
	27	53	53	23.6	0	15	43.7
	28	53	56	48.8	0	15	43.4
	29	54	00	13.5	-0	15	43.1
	30	54	03	37.5	0	15	42.8
	31	54	07	00.9	0	15	42.5
June	1	54	10	23.5	0	15	42.2
	2	54	13	45.3	0	15	41.9
	3	54	17	06.5	0	15	41.7
	4	54	20	26.9	-0	15	41.4
	5	54	23	46.5	0	15	41.2
	6	54	27	05.3	0	15	40.9
	7	54	30	23.1	0	15	40.7
	8	54	33	40.1	0	15	40.5
	9	54	36	56.0	0	15	40.3
	10	54	40	10.8	-0	15	40.2
	11	54	43	24.4	0	15	40.0
	12	54	46	36.9	0	15	39.8
	13	54	49	48.1	0	15	39.7
	14	54	52	58.2	0	15	39.6
	15	54	56	06.9	0	15	39.4
	16	54	59	14.4	-0	15	39.3
	17	55	02	20.7	0	15	39.2
	18	55	05	25.6	0	15	39.2
	19	55	08	29.1	0	15	39.1
	20	55	11	31.3	0	15	39.0
	21	55	14	32.1	0	15	38.9
	22	55	17	31.5	-0	15	38.9
	23	55	20	29.4	0	15	38.9
	24	55	23	25.7	0	15	38.8
	25	55	26	20.4	0	15	38.8
	26	55	29	13.4	0	15	38.8
	27	55	32	04.7	0	15	38.8
	28	55	34	54.3	-0	15	38.8
	29	55	37	42.2	0	15	38.8
	30	55	40	28.4	0	15	38.8
July	1	55	43	12.8	0	15	38.8
	2	55	45	55.4	-0	15	38.9

URANUS, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude °	'	"	Apparent Geocentric Latitude °	'	"
July	1	55	43	12.8	-0	15	38.8
	2	55	45	55.4	0	15	38.9
	3	55	48	36.3	0	15	38.9
	4	55	51	15.3	0	15	39.0
	5	55	53	52.4	0	15	39.0
	6	55	56	27.5	0	15	39.1
	7	55	59	00.6	-0	15	39.2
	8	56	01	31.6	0	15	39.3
	9	56	04	00.5	0	15	39.4
	10	56	06	27.3	0	15	39.5
	11	56	08	51.9	0	15	39.6
	12	56	11	14.3	0	15	39.8
	13	56	13	34.5	-0	15	39.9
	14	56	15	52.5	0	15	40.1
	15	56	18	08.3	0	15	40.2
	16	56	20	21.9	0	15	40.4
	17	56	22	33.2	0	15	40.5
	18	56	24	42.3	0	15	40.7
	19	56	26	49.1	-0	15	40.9
	20	56	28	53.5	0	15	41.1
	21	56	30	55.5	0	15	41.3
	22	56	32	55.0	0	15	41.5
	23	56	34	52.1	0	15	41.7
	24	56	36	46.6	0	15	41.9
	25	56	38	38.6	-0	15	42.1
	26	56	40	28.1	0	15	42.3
	27	56	42	15.0	0	15	42.5
	28	56	43	59.4	0	15	42.7
	29	56	45	41.3	0	15	43.0
	30	56	47	20.5	0	15	43.2
	31	56	48	57.2	-0	15	43.4
Aug.	1	56	50	31.3	0	15	43.7
	2	56	52	02.6	0	15	43.9
	3	56	53	31.2	0	15	44.2
	4	56	54	57.0	0	15	44.4
	5	56	56	20.0	0	15	44.7
	6	56	57	40.1	-0	15	45.0
	7	56	58	57.4	0	15	45.3
	8	57	00	11.8	0	15	45.6
	9	57	01	23.4	0	15	45.8
	10	57	02	32.2	0	15	46.1
	11	57	03	38.1	0	15	46.4
	12	57	04	41.1	-0	15	46.7
	13	57	05	41.3	0	15	47.0
	14	57	06	38.7	0	15	47.3
	15	57	07	33.2	0	15	47.6
	16	57	08	24.8	-0	15	47.9
Aug.	16	57	08	24.8	-0	15	47.9
	17	57	09	13.4	0	15	48.2
	18	57	09	59.1	0	15	48.5
	19	57	10	41.8	0	15	48.8
	20	57	11	21.4	0	15	49.1
	21	57	11	58.1	0	15	49.4
	22	57	12	31.7	-0	15	49.6
	23	57	13	02.3	0	15	49.9
	24	57	13	30.0	0	15	50.2
	25	57	13	54.7	0	15	50.5
	26	57	14	16.5	0	15	50.8
	27	57	14	35.3	0	15	51.1
	28	57	14	51.1	-0	15	51.4
	29	57	15	03.9	0	15	51.7
	30	57	15	13.6	0	15	52.0
	31	57	15	20.2	0	15	52.3
Sept.	1	57	15	23.7	0	15	52.6
	2	57	15	24.1	0	15	52.9
	3	57	15	21.5	-0	15	53.1
	4	57	15	15.7	0	15	53.4
	5	57	15	07.0	0	15	53.7
	6	57	14	55.2	0	15	54.0
	7	57	14	40.4	0	15	54.3
	8	57	14	22.6	0	15	54.5
	9	57	14	01.8	-0	15	54.8
	10	57	13	38.1	0	15	55.1
	11	57	13	11.5	0	15	55.3
	12	57	12	41.9	0	15	55.6
	13	57	12	09.4	0	15	55.8
	14	57	11	34.0	0	15	56.1
	15	57	10	55.6	-0	15	56.3
	16	57	10	14.3	0	15	56.5
	17	57	09	30.0	0	15	56.7
	18	57	08	42.7	0	15	56.9
	19	57	07	52.7	0	15	57.1
	20	57	06	59.8	0	15	57.3
	21	57	06	04.1	-0	15	57.5
	22	57	05	05.8	0	15	57.7
	23	57	04	04.7	0	15	57.8
	24	57	03	00.8	0	15	58.0
	25	57	01	54.3	0	15	58.2
	26	57	00	45.0	0	15	58.3
	27	56	59	32.9	-0	15	58.5
	28	56	58	18.2	0	15	58.6
	29	56	57	00.7	0	15	58.7
	30	56	55	40.6	0	15	58.9
Oct.	1	56	54	17.9	-0	15	59.0

URANUS, 2024
GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	56	54	17.9	-0	15	59.0	Nov.	16	55	17	16.0	-0	15	50.0
	2	56	52	52.6	0	15	59.1		17	55	14	46.0	0	15	49.4
	3	56	51	24.8	0	15	59.2		18	55	12	16.1	0	15	48.9
	4	56	49	54.6	0	15	59.2		19	55	09	46.2	0	15	48.3
	5	56	48	21.9	0	15	59.3		20	55	07	16.4	0	15	47.7
	6	56	46	46.9	0	15	59.4		21	55	04	46.7	0	15	47.1
	7	56	45	09.5	-0	15	59.4		22	55	02	17.2	-0	15	46.5
	8	56	43	29.9	0	15	59.5		23	54	59	47.9	0	15	45.8
	9	56	41	48.1	0	15	59.5		24	54	57	19.0	0	15	45.2
	10	56	40	04.0	0	15	59.5		25	54	54	50.4	0	15	44.5
	11	56	38	17.8	0	15	59.5		26	54	52	22.4	0	15	43.8
	12	56	36	29.3	0	15	59.5		27	54	49	55.0	0	15	43.1
	13	56	34	38.8	-0	15	59.4		28	54	47	28.2	-0	15	42.4
	14	56	32	46.1	0	15	59.4		29	54	45	02.2	0	15	41.7
	15	56	30	51.4	0	15	59.3		30	54	42	37.0	0	15	40.9
	16	56	28	54.7	0	15	59.3	Dec.	1	54	40	12.7	0	15	40.2
	17	56	26	56.1	0	15	59.2		2	54	37	49.3	0	15	39.4
	18	56	24	55.6	0	15	59.1		3	54	35	27.0	0	15	38.6
	19	56	22	53.4	-0	15	59.0		4	54	33	05.7	-0	15	37.8
	20	56	20	49.6	0	15	58.8		5	54	30	45.5	0	15	37.0
	21	56	18	44.0	0	15	58.7		6	54	28	26.4	0	15	36.1
	22	56	16	36.8	0	15	58.5		7	54	26	08.6	0	15	35.3
	23	56	14	27.9	0	15	58.4		8	54	23	52.0	0	15	34.4
	24	56	12	17.5	0	15	58.2		9	54	21	36.7	0	15	33.5
	25	56	10	05.4	-0	15	58.0		10	54	19	22.8	-0	15	32.6
	26	56	07	51.9	0	15	57.8		11	54	17	10.5	0	15	31.7
	27	56	05	36.8	0	15	57.6		12	54	14	59.7	0	15	30.8
	28	56	03	20.4	0	15	57.4		13	54	12	50.6	0	15	29.8
	29	56	01	02.7	0	15	57.1		14	54	10	43.2	0	15	28.9
	30	55	58	43.7	0	15	56.9		15	54	08	37.6	0	15	27.9
	31	55	56	23.6	-0	15	56.6		16	54	06	33.7	-0	15	26.9
Nov.	1	55	54	02.3	0	15	56.3		17	54	04	31.6	0	15	25.9
	2	55	51	40.1	0	15	56.0		18	54	02	31.3	0	15	24.9
	3	55	49	16.9	0	15	55.7		19	54	00	32.9	0	15	23.9
	4	55	46	52.9	0	15	55.4		20	53	58	36.4	0	15	22.9
	5	55	44	28.0	0	15	55.0		21	53	56	41.8	0	15	21.9
	6	55	42	02.4	-0	15	54.6		22	53	54	49.3	-0	15	20.8
	7	55	39	36.0	0	15	54.3		23	53	52	58.9	0	15	19.8
	8	55	37	09.0	0	15	53.8		24	53	51	10.6	0	15	18.7
	9	55	34	41.3	0	15	53.4		25	53	49	24.6	0	15	17.6
	10	55	32	13.1	0	15	53.0		26	53	47	40.8	0	15	16.6
	11	55	29	44.3	0	15	52.5		27	53	45	59.4	0	15	15.5
	12	55	27	15.1	-0	15	52.0		28	53	44	20.4	-0	15	14.4
	13	55	24	45.6	0	15	51.6		29	53	42	43.9	0	15	13.2
	14	55	22	15.9	0	15	51.1		30	53	41	09.8	0	15	12.1
	15	55	19	46.0	0	15	50.5		31	53	39	38.3	0	15	11.0
	16	55	17	16.0	-0	15	50.0		32	53	38	09.2	-0	15	09.8

URANUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	3	08	10.16	+17	17	06.2	18.962 247	0.46	1.85	20	28	04
	1	3	08	04.75	17	16	45.8	18.975 371	0.46	1.85	20	24	03
	2	3	07	59.51	17	16	26.1	18.988 692	0.46	1.84	20	20	02
	3	3	07	54.46	17	16	07.0	19.002 205	0.46	1.84	20	16	01
	4	3	07	49.59	17	15	48.7	19.015 905	0.46	1.84	20	12	01
	5	3	07	44.91	17	15	31.2	19.029 790	0.46	1.84	20	08	00
	6	3	07	40.42	+17	15	14.4	19.043 853	0.46	1.84	20	03	60
	7	3	07	36.12	17	14	58.3	19.058 090	0.46	1.84	19	59	60
	8	3	07	32.02	17	14	43.1	19.072 498	0.46	1.84	19	56	00
	9	3	07	28.11	17	14	28.7	19.087 070	0.46	1.83	19	52	00
	10	3	07	24.41	17	14	15.1	19.101 802	0.46	1.83	19	48	01
	11	3	07	20.90	17	14	02.3	19.116 689	0.46	1.83	19	44	02
	12	3	07	17.59	+17	13	50.4	19.131 725	0.46	1.83	19	40	03
	13	3	07	14.48	17	13	39.3	19.146 906	0.46	1.83	19	36	04
	14	3	07	11.57	17	13	29.0	19.162 225	0.46	1.83	19	32	05
	15	3	07	08.86	17	13	19.5	19.177 678	0.46	1.83	19	28	07
	16	3	07	06.35	17	13	10.9	19.193 258	0.46	1.82	19	24	09
	17	3	07	04.05	17	13	03.0	19.208 960	0.46	1.82	19	20	11
	18	3	07	01.95	+17	12	56.0	19.224 779	0.46	1.82	19	16	13
	19	3	07	00.07	17	12	49.8	19.240 709	0.46	1.82	19	12	15
	20	3	06	58.40	17	12	44.5	19.256 745	0.46	1.82	19	08	18
	21	3	06	56.94	17	12	40.0	19.272 883	0.46	1.82	19	04	20
	22	3	06	55.70	17	12	36.4	19.289 115	0.46	1.82	19	00	24
	23	3	06	54.66	17	12	33.7	19.305 439	0.46	1.81	18	56	27
	24	3	06	53.84	+17	12	31.9	19.321 848	0.46	1.81	18	52	30
	25	3	06	53.22	17	12	30.9	19.338 338	0.45	1.81	18	48	34
	26	3	06	52.82	17	12	30.8	19.354 903	0.45	1.81	18	44	38
	27	3	06	52.62	17	12	31.5	19.371 539	0.45	1.81	18	40	42
	28	3	06	52.63	17	12	33.1	19.388 240	0.45	1.81	18	36	46
	29	3	06	52.85	17	12	35.5	19.405 003	0.45	1.80	18	32	50
	30	3	06	53.28	+17	12	38.8	19.421 821	0.45	1.80	18	28	55
	31	3	06	53.92	17	12	42.9	19.438 689	0.45	1.80	18	25	00
Feb.	1	3	06	54.78	17	12	47.9	19.455 603	0.45	1.80	18	21	05
	2	3	06	55.85	17	12	53.7	19.472 557	0.45	1.80	18	17	10
	3	3	06	57.14	17	13	00.4	19.489 547	0.45	1.80	18	13	16
	4	3	06	58.64	17	13	08.0	19.506 567	0.45	1.80	18	09	22
	5	3	07	00.36	+17	13	16.4	19.523 611	0.45	1.79	18	05	28
	6	3	07	02.29	17	13	25.8	19.540 675	0.45	1.79	18	01	34
	7	3	07	04.44	17	13	36.0	19.557 753	0.45	1.79	17	57	40
	8	3	07	06.80	17	13	47.1	19.574 840	0.45	1.79	17	53	47
	9	3	07	09.37	17	13	59.1	19.591 930	0.45	1.79	17	49	54
	10	3	07	12.15	17	14	11.9	19.609 017	0.45	1.79	17	46	01
	11	3	07	15.13	+17	14	25.5	19.626 096	0.45	1.78	17	42	08
	12	3	07	18.32	17	14	40.0	19.643 161	0.45	1.78	17	38	15
	13	3	07	21.72	17	14	55.3	19.660 207	0.45	1.78	17	34	23
	14	3	07	25.33	17	15	11.3	19.677 228	0.45	1.78	17	30	31
	15	3	07	29.15	+17	15	28.3	19.694 218	0.45	1.78	17	26	39

URANUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	3	07	29.15	+17	15	28.3	19.694 218	0.45	1.78	17	26	39
	16	3	07	33.17	17	15	46.0	19.711 173	0.45	1.78	17	22	47
	17	3	07	37.41	17	16	04.6	19.728 087	0.45	1.78	17	18	55
	18	3	07	41.85	17	16	24.0	19.744 957	0.45	1.77	17	15	04
	19	3	07	46.50	17	16	44.2	19.761 775	0.45	1.77	17	11	13
	20	3	07	51.34	17	17	05.2	19.778 539	0.44	1.77	17	07	22
	21	3	07	56.38	+17	17	27.1	19.795 244	0.44	1.77	17	03	31
	22	3	08	01.62	17	17	49.7	19.811 884	0.44	1.77	16	59	41
	23	3	08	07.05	17	18	13.1	19.828 456	0.44	1.77	16	55	50
	24	3	08	12.67	17	18	37.2	19.844 954	0.44	1.76	16	52	00
	25	3	08	18.48	17	19	02.1	19.861 375	0.44	1.76	16	48	10
	26	3	08	24.49	17	19	27.7	19.877 714	0.44	1.76	16	44	20
	27	3	08	30.68	+17	19	54.0	19.893 966	0.44	1.76	16	40	31
	28	3	08	37.06	17	20	21.1	19.910 128	0.44	1.76	16	36	41
	29	3	08	43.64	17	20	48.9	19.926 195	0.44	1.76	16	32	52
Mar.	1	3	08	50.40	17	21	17.4	19.942 162	0.44	1.76	16	29	03
	2	3	08	57.35	17	21	46.7	19.958 025	0.44	1.75	16	25	14
	3	3	09	04.49	17	22	16.7	19.973 780	0.44	1.75	16	21	25
	4	3	09	11.81	+17	22	47.4	19.989 423	0.44	1.75	16	17	37
	5	3	09	19.32	17	23	18.8	20.004 948	0.44	1.75	16	13	49
	6	3	09	27.00	17	23	50.9	20.020 352	0.44	1.75	16	10	00
	7	3	09	34.86	17	24	23.8	20.035 629	0.44	1.75	16	06	12
	8	3	09	42.89	17	24	57.3	20.050 776	0.44	1.75	16	02	25
	9	3	09	51.09	17	25	31.4	20.065 788	0.44	1.75	15	58	37
	10	3	09	59.46	+17	26	06.2	20.080 660	0.44	1.74	15	54	50
	11	3	10	07.99	17	26	41.6	20.095 388	0.44	1.74	15	51	02
	12	3	10	16.69	17	27	17.6	20.109 967	0.44	1.74	15	47	15
	13	3	10	25.56	17	27	54.1	20.124 393	0.44	1.74	15	43	28
	14	3	10	34.60	17	28	31.4	20.138 663	0.44	1.74	15	39	41
	15	3	10	43.80	17	29	09.2	20.152 772	0.44	1.74	15	35	55
	16	3	10	53.16	+17	29	47.6	20.166 716	0.44	1.74	15	32	08
	17	3	11	02.67	17	30	26.6	20.180 492	0.44	1.74	15	28	22
	18	3	11	12.34	17	31	06.2	20.194 098	0.44	1.73	15	24	36
	19	3	11	22.16	17	31	46.3	20.207 528	0.44	1.73	15	20	50
	20	3	11	32.13	17	32	27.0	20.220 781	0.43	1.73	15	17	04
	21	3	11	42.23	17	33	08.3	20.233 853	0.43	1.73	15	13	18
	22	3	11	52.48	+17	33	50.0	20.246 741	0.43	1.73	15	09	32
	23	3	12	02.87	17	34	32.2	20.259 441	0.43	1.73	15	05	47
	24	3	12	13.39	17	35	14.9	20.271 952	0.43	1.73	15	02	01
	25	3	12	24.05	17	35	58.0	20.284 270	0.43	1.73	14	58	16
	26	3	12	34.84	17	36	41.6	20.296 392	0.43	1.73	14	54	31
	27	3	12	45.76	17	37	25.7	20.308 316	0.43	1.72	14	50	46
	28	3	12	56.82	+17	38	10.2	20.320 039	0.43	1.72	14	47	01
	29	3	13	08.01	17	38	55.2	20.331 557	0.43	1.72	14	43	17
	30	3	13	19.32	17	39	40.6	20.342 868	0.43	1.72	14	39	32
	31	3	13	30.76	17	40	26.4	20.353 969	0.43	1.72	14	35	48
Apr.	1	3	13	42.33	+17	41	12.7	20.364 858	0.43	1.72	14	32	03

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	3	13	42.33	+17	41	12.7	20.364 858	0.43	1.72	14	32	03
	2	3	13	54.01	17	41	59.4	20.375 531	0.43	1.72	14	28	19
	3	3	14	05.81	17	42	46.6	20.385 986	0.43	1.72	14	24	35
	4	3	14	17.72	17	43	34.1	20.396 220	0.43	1.72	14	20	51
	5	3	14	29.73	17	44	21.9	20.406 230	0.43	1.72	14	17	07
	6	3	14	41.85	17	45	10.1	20.416 013	0.43	1.72	14	13	23
	7	3	14	54.07	+17	45	58.7	20.425 567	0.43	1.71	14	09	40
	8	3	15	06.39	17	46	47.5	20.434 888	0.43	1.71	14	05	56
	9	3	15	18.82	17	47	36.6	20.443 974	0.43	1.71	14	02	13
	10	3	15	31.35	17	48	26.0	20.452 823	0.43	1.71	13	58	29
	11	3	15	43.97	17	49	15.7	20.461 432	0.43	1.71	13	54	46
	12	3	15	56.70	17	50	05.8	20.469 800	0.43	1.71	13	51	03
	13	3	16	09.51	+17	50	56.1	20.477 924	0.43	1.71	13	47	19
	14	3	16	22.41	17	51	46.7	20.485 804	0.43	1.71	13	43	36
	15	3	16	35.39	17	52	37.6	20.493 436	0.43	1.71	13	39	53
	16	3	16	48.44	17	53	28.6	20.500 821	0.43	1.71	13	36	11
	17	3	17	01.58	17	54	19.9	20.507 956	0.43	1.71	13	32	28
	18	3	17	14.78	17	55	11.4	20.514 840	0.43	1.71	13	28	45
	19	3	17	28.05	+17	56	03.1	20.521 472	0.43	1.71	13	25	02
	20	3	17	41.39	17	56	55.0	20.527 852	0.43	1.71	13	21	20
	21	3	17	54.79	17	57	47.0	20.533 976	0.43	1.71	13	17	37
	22	3	18	08.26	17	58	39.1	20.539 846	0.43	1.70	13	13	55
	23	3	18	21.79	17	59	31.4	20.545 459	0.43	1.70	13	10	12
	24	3	18	35.38	18	00	23.9	20.550 814	0.43	1.70	13	06	30
	25	3	18	49.03	+18	01	16.4	20.555 911	0.43	1.70	13	02	48
	26	3	19	02.74	18	02	09.1	20.560 748	0.43	1.70	12	59	05
	27	3	19	16.50	18	03	02.0	20.565 325	0.43	1.70	12	55	23
	28	3	19	30.31	18	03	54.9	20.569 641	0.43	1.70	12	51	41
	29	3	19	44.17	18	04	48.0	20.573 694	0.43	1.70	12	47	59
	30	3	19	58.07	18	05	41.2	20.577 483	0.43	1.70	12	44	17
May	1	3	20	12.01	+18	06	34.4	20.581 008	0.43	1.70	12	40	35
	2	3	20	25.99	18	07	27.7	20.584 267	0.43	1.70	12	36	53
	3	3	20	39.99	18	08	21.1	20.587 260	0.43	1.70	12	33	11
	4	3	20	54.03	18	09	14.4	20.589 985	0.43	1.70	12	29	29
	5	3	21	08.09	18	10	07.8	20.592 441	0.43	1.70	12	25	47
	6	3	21	22.19	18	11	01.1	20.594 628	0.43	1.70	12	22	05
	7	3	21	36.30	+18	11	54.4	20.596 545	0.43	1.70	12	18	23
	8	3	21	50.45	18	12	47.7	20.598 191	0.43	1.70	12	14	42
	9	3	22	04.62	18	13	41.1	20.599 566	0.43	1.70	12	10	60
	10	3	22	18.80	18	14	34.4	20.600 670	0.43	1.70	12	07	18
	11	3	22	33.01	18	15	27.7	20.601 503	0.43	1.70	12	03	36
	12	3	22	47.22	18	16	20.9	20.602 065	0.43	1.70	11	59	54
	13	3	23	01.47	+18	17	13.7	20.602 357	0.43	1.70	11	56	13
	14	3	23	15.58	18	18	06.8	20.602 378	0.43	1.70	11	52	31
	15	3	23	29.81	18	19	00.1	20.602 130	0.43	1.70	11	48	49
	16	3	23	44.02	18	19	53.1	20.601 612	0.43	1.70	11	45	07
	17	3	23	58.21	+18	20	45.9	20.600 826	0.43	1.70	11	41	25

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	3	23	58.21	+18	20	45.9	20.600 826	0.43	1.70	11	41	25
	18	3	24	12.40	18	21	38.5	20.599 772	0.43	1.70	11	37	44
	19	3	24	26.57	18	22	31.0	20.598 450	0.43	1.70	11	34	02
	20	3	24	40.74	18	23	23.4	20.596 861	0.43	1.70	11	30	20
	21	3	24	54.88	18	24	15.6	20.595 007	0.43	1.70	11	26	38
	22	3	25	09.02	18	25	07.7	20.592 887	0.43	1.70	11	22	56
	23	3	25	23.13	+18	25	59.6	20.590 503	0.43	1.70	11	19	14
	24	3	25	37.23	18	26	51.3	20.587 854	0.43	1.70	11	15	33
	25	3	25	51.30	18	27	42.9	20.584 943	0.43	1.70	11	11	51
	26	3	26	05.34	18	28	34.3	20.581 770	0.43	1.70	11	08	09
	27	3	26	19.36	18	29	25.6	20.578 334	0.43	1.70	11	04	27
	28	3	26	33.34	18	30	16.6	20.574 638	0.43	1.70	11	00	45
	29	3	26	47.27	+18	31	07.4	20.570 681	0.43	1.70	10	57	03
	30	3	27	01.17	18	31	58.0	20.566 464	0.43	1.70	10	53	20
	31	3	27	15.02	18	32	48.4	20.561 989	0.43	1.70	10	49	38
June	1	3	27	28.83	18	33	38.5	20.557 255	0.43	1.70	10	45	56
	2	3	27	42.59	18	34	28.3	20.552 263	0.43	1.70	10	42	14
	3	3	27	56.30	18	35	17.8	20.547 015	0.43	1.70	10	38	32
	4	3	28	09.96	+18	36	07.1	20.541 512	0.43	1.70	10	34	49
	5	3	28	23.57	18	36	56.0	20.535 754	0.43	1.71	10	31	07
	6	3	28	37.13	18	37	44.8	20.529 744	0.43	1.71	10	27	24
	7	3	28	50.63	18	38	33.2	20.523 482	0.43	1.71	10	23	42
	8	3	29	04.06	18	39	21.3	20.516 971	0.43	1.71	10	19	59
	9	3	29	17.43	18	40	09.2	20.510 212	0.43	1.71	10	16	17
	10	3	29	30.72	+18	40	56.7	20.503 208	0.43	1.71	10	12	34
	11	3	29	43.94	18	41	43.9	20.495 960	0.43	1.71	10	08	51
	12	3	29	57.08	18	42	30.7	20.488 470	0.43	1.71	10	05	08
	13	3	30	10.14	18	43	17.2	20.480 742	0.43	1.71	10	01	25
	14	3	30	23.12	18	44	03.3	20.472 776	0.43	1.71	9	57	42
	15	3	30	36.01	18	44	49.0	20.464 575	0.43	1.71	9	53	59
	16	3	30	48.82	+18	45	34.3	20.456 142	0.43	1.71	9	50	16
	17	3	31	01.54	18	46	19.2	20.447 479	0.43	1.71	9	46	33
	18	3	31	14.18	18	47	03.7	20.438 587	0.43	1.71	9	42	49
	19	3	31	26.73	18	47	47.9	20.429 470	0.43	1.71	9	39	06
	20	3	31	39.18	18	48	31.7	20.420 129	0.43	1.71	9	35	22
	21	3	31	51.55	18	49	15.0	20.410 567	0.43	1.72	9	31	39
	22	3	32	03.81	+18	49	58.0	20.400 787	0.43	1.72	9	27	55
	23	3	32	15.98	18	50	40.6	20.390 790	0.43	1.72	9	24	11
	24	3	32	28.04	18	51	22.8	20.380 578	0.43	1.72	9	20	27
	25	3	32	39.99	18	52	04.5	20.370 154	0.43	1.72	9	16	43
	26	3	32	51.82	18	52	45.8	20.359 520	0.43	1.72	9	12	59
	27	3	33	03.55	18	53	26.7	20.348 678	0.43	1.72	9	09	14
	28	3	33	15.15	+18	54	07.0	20.337 631	0.43	1.72	9	05	30
	29	3	33	26.65	18	54	46.9	20.326 379	0.43	1.72	9	01	46
	30	3	33	38.02	18	55	26.3	20.314 927	0.43	1.72	8	58	01
July	1	3	33	49.28	18	56	05.2	20.303 276	0.43	1.72	8	54	16
	2	3	34	00.42	+18	56	43.6	20.291 430	0.43	1.73	8	50	31

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	3	33	49.28	+18	56	05.2	20.303 276	0.43	1.72	8	54	16
	2	3	34	00.42	18	56	43.6	20.291 430	0.43	1.73	8	50	31
	3	3	34	11.44	18	57	21.6	20.279 390	0.43	1.73	8	46	46
	4	3	34	22.33	18	57	59.0	20.267 160	0.43	1.73	8	43	01
	5	3	34	33.10	18	58	36.0	20.254 743	0.43	1.73	8	39	16
	6	3	34	43.72	18	59	12.5	20.242 143	0.43	1.73	8	35	30
	7	3	34	54.22	+18	59	48.5	20.229 362	0.43	1.73	8	31	45
	8	3	35	04.57	19	00	24.0	20.216 405	0.44	1.73	8	27	59
	9	3	35	14.77	19	00	58.9	20.203 274	0.44	1.73	8	24	13
	10	3	35	24.83	19	01	33.3	20.189 973	0.44	1.73	8	20	28
	11	3	35	34.74	19	02	07.1	20.176 506	0.44	1.74	8	16	41
	12	3	35	44.51	19	02	40.4	20.162 876	0.44	1.74	8	12	55
	13	3	35	54.13	+19	03	13.1	20.149 087	0.44	1.74	8	09	09
	14	3	36	03.59	19	03	45.2	20.135 143	0.44	1.74	8	05	22
	15	3	36	12.91	19	04	16.8	20.121 047	0.44	1.74	8	01	36
	16	3	36	22.08	19	04	47.7	20.106 804	0.44	1.74	7	57	49
	17	3	36	31.09	19	05	18.2	20.092 416	0.44	1.74	7	54	02
	18	3	36	39.95	19	05	48.1	20.077 887	0.44	1.74	7	50	15
	19	3	36	48.65	+19	06	17.4	20.063 221	0.44	1.75	7	46	27
	20	3	36	57.19	19	06	46.2	20.048 421	0.44	1.75	7	42	40
	21	3	37	05.56	19	07	14.4	20.033 492	0.44	1.75	7	38	52
	22	3	37	13.77	19	07	42.0	20.018 435	0.44	1.75	7	35	04
	23	3	37	21.81	19	08	09.0	20.003 256	0.44	1.75	7	31	16
	24	3	37	29.67	19	08	35.4	19.987 957	0.44	1.75	7	27	28
	25	3	37	37.36	+19	09	01.2	19.972 541	0.44	1.75	7	23	40
	26	3	37	44.88	19	09	26.3	19.957 013	0.44	1.75	7	19	51
	27	3	37	52.23	19	09	50.9	19.941 375	0.44	1.76	7	16	03
	28	3	37	59.40	19	10	14.7	19.925 632	0.44	1.76	7	12	14
	29	3	38	06.40	19	10	38.0	19.909 787	0.44	1.76	7	08	25
	30	3	38	13.22	19	11	00.7	19.893 845	0.44	1.76	7	04	36
	31	3	38	19.87	+19	11	22.7	19.877 808	0.44	1.76	7	00	46
Aug.	1	3	38	26.33	19	11	44.1	19.861 682	0.44	1.76	6	56	57
	2	3	38	32.61	19	12	04.9	19.845 472	0.44	1.76	6	53	07
	3	3	38	38.70	19	12	25.1	19.829 180	0.44	1.77	6	49	17
	4	3	38	44.60	19	12	44.6	19.812 813	0.44	1.77	6	45	27
	5	3	38	50.30	19	13	03.5	19.796 374	0.44	1.77	6	41	37
	6	3	38	55.81	+19	13	21.7	19.779 868	0.44	1.77	6	37	46
	7	3	39	01.13	19	13	39.2	19.763 301	0.44	1.77	6	33	56
	8	3	39	06.25	19	13	56.1	19.746 675	0.45	1.77	6	30	05
	9	3	39	11.17	19	14	12.2	19.729 997	0.45	1.77	6	26	14
	10	3	39	15.90	19	14	27.7	19.713 271	0.45	1.78	6	22	22
	11	3	39	20.43	19	14	42.5	19.696 502	0.45	1.78	6	18	31
	12	3	39	24.77	+19	14	56.6	19.679 693	0.45	1.78	6	14	39
	13	3	39	28.92	19	15	10.1	19.662 851	0.45	1.78	6	10	48
	14	3	39	32.86	19	15	22.9	19.645 979	0.45	1.78	6	06	56
	15	3	39	36.61	19	15	35.1	19.629 082	0.45	1.78	6	03	03
	16	3	39	40.17	+19	15	46.6	19.612 165	0.45	1.79	5	59	11

URANUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	3	39	40.17	+19	15	46.6	19.612 165	0.45	1.79	5	59	11
	17	3	39	43.51	19	15	57.5	19.595 232	0.45	1.79	5	55	18
	18	3	39	46.66	19	16	07.7	19.578 287	0.45	1.79	5	51	25
	19	3	39	49.60	19	16	17.2	19.561 335	0.45	1.79	5	47	32
	20	3	39	52.33	19	16	26.0	19.544 380	0.45	1.79	5	43	39
	21	3	39	54.85	19	16	34.2	19.527 426	0.45	1.79	5	39	46
	22	3	39	57.17	+19	16	41.6	19.510 478	0.45	1.79	5	35	52
	23	3	39	59.28	19	16	48.3	19.493 539	0.45	1.80	5	31	58
	24	3	40	01.19	19	16	54.3	19.476 615	0.45	1.80	5	28	04
	25	3	40	02.89	19	16	59.6	19.459 709	0.45	1.80	5	24	10
	26	3	40	04.40	19	17	04.3	19.442 826	0.45	1.80	5	20	15
	27	3	40	05.69	19	17	08.3	19.425 972	0.45	1.80	5	16	21
	28	3	40	06.78	+19	17	11.6	19.409 150	0.45	1.80	5	12	26
	29	3	40	07.67	19	17	14.2	19.392 367	0.45	1.81	5	08	31
	30	3	40	08.34	19	17	16.2	19.375 626	0.45	1.81	5	04	35
	31	3	40	08.80	19	17	17.4	19.358 934	0.45	1.81	5	00	40
Sept.	1	3	40	09.04	19	17	18.0	19.342 294	0.45	1.81	4	56	44
	2	3	40	09.08	19	17	17.9	19.325 713	0.46	1.81	4	52	48
	3	3	40	08.90	+19	17	17.0	19.309 196	0.46	1.81	4	48	52
	4	3	40	08.51	19	17	15.5	19.292 747	0.46	1.82	4	44	56
	5	3	40	07.91	19	17	13.2	19.276 372	0.46	1.82	4	40	59
	6	3	40	07.10	19	17	10.2	19.260 075	0.46	1.82	4	37	03
	7	3	40	06.09	19	17	06.6	19.243 863	0.46	1.82	4	33	06
	8	3	40	04.87	19	17	02.2	19.227 740	0.46	1.82	4	29	09
	9	3	40	03.45	+19	16	57.2	19.211 710	0.46	1.82	4	25	11
	10	3	40	01.82	19	16	51.5	19.195 779	0.46	1.82	4	21	14
	11	3	39	60.00	19	16	45.2	19.179 951	0.46	1.83	4	17	16
	12	3	39	57.97	19	16	38.2	19.164 232	0.46	1.83	4	13	18
	13	3	39	55.74	19	16	30.5	19.148 626	0.46	1.83	4	09	20
	14	3	39	53.30	19	16	22.2	19.133 137	0.46	1.83	4	05	21
	15	3	39	50.67	+19	16	13.3	19.117 771	0.46	1.83	4	01	23
	16	3	39	47.83	19	16	03.7	19.102 530	0.46	1.83	3	57	24
	17	3	39	44.78	19	15	53.4	19.087 420	0.46	1.83	3	53	25
	18	3	39	41.54	19	15	42.4	19.072 445	0.46	1.84	3	49	26
	19	3	39	38.10	19	15	30.8	19.057 609	0.46	1.84	3	45	27
	20	3	39	34.47	19	15	18.5	19.042 917	0.46	1.84	3	41	27
	21	3	39	30.65	+19	15	05.5	19.028 371	0.46	1.84	3	37	27
	22	3	39	26.64	19	14	51.9	19.013 978	0.46	1.84	3	33	27
	23	3	39	22.44	19	14	37.7	18.999 741	0.46	1.84	3	29	27
	24	3	39	18.06	19	14	22.9	18.985 665	0.46	1.84	3	25	27
	25	3	39	13.48	19	14	07.5	18.971 755	0.46	1.85	3	21	26
	26	3	39	08.72	19	13	51.5	18.958 015	0.46	1.85	3	17	26
	27	3	39	03.78	+19	13	34.9	18.944 450	0.46	1.85	3	13	25
	28	3	38	58.64	19	13	17.6	18.931 065	0.46	1.85	3	09	24
	29	3	38	53.32	19	12	59.7	18.917 865	0.46	1.85	3	05	23
	30	3	38	47.82	19	12	41.2	18.904 854	0.47	1.85	3	01	21
Oct.	1	3	38	42.14	+19	12	22.1	18.892 036	0.47	1.85	2	57	20

URANUS, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	3	38	42.14	+19	12	22.1	18.892 036	0.47	1.85	2	57	20
	2	3	38	36.28	19	12	02.4	18.879 416	0.47	1.85	2	53	18
	3	3	38	30.25	19	11	42.1	18.867 000	0.47	1.86	2	49	16
	4	3	38	24.05	19	11	21.2	18.854 790	0.47	1.86	2	45	14
	5	3	38	17.69	19	10	59.7	18.842 791	0.47	1.86	2	41	12
	6	3	38	11.16	19	10	37.7	18.831 007	0.47	1.86	2	37	09
	7	3	38	04.48	+19	10	15.1	18.819 443	0.47	1.86	2	33	07
	8	3	37	57.64	19	09	52.1	18.808 103	0.47	1.86	2	29	04
	9	3	37	50.65	19	09	28.5	18.796 989	0.47	1.86	2	25	01
	10	3	37	43.50	19	09	04.4	18.786 107	0.47	1.86	2	20	58
	11	3	37	36.21	19	08	39.8	18.775 458	0.47	1.87	2	16	55
	12	3	37	28.76	19	08	14.7	18.765 048	0.47	1.87	2	12	51
	13	3	37	21.17	+19	07	49.2	18.754 878	0.47	1.87	2	08	48
	14	3	37	13.44	19	07	23.1	18.744 953	0.47	1.87	2	04	44
	15	3	37	05.57	19	06	56.6	18.735 275	0.47	1.87	2	00	41
	16	3	36	57.55	19	06	29.5	18.725 847	0.47	1.87	1	56	37
	17	3	36	49.41	19	06	02.0	18.716 672	0.47	1.87	1	52	33
	18	3	36	41.15	19	05	34.0	18.707 753	0.47	1.87	1	48	29
	19	3	36	32.77	+19	05	05.6	18.699 092	0.47	1.87	1	44	24
	20	3	36	24.27	19	04	36.8	18.690 693	0.47	1.87	1	40	20
	21	3	36	15.66	19	04	07.6	18.682 559	0.47	1.87	1	36	16
	22	3	36	06.93	19	03	38.0	18.674 693	0.47	1.88	1	32	11
	23	3	35	58.09	19	03	08.0	18.667 097	0.47	1.88	1	28	06
	24	3	35	49.14	19	02	37.7	18.659 775	0.47	1.88	1	24	01
	25	3	35	40.08	+19	02	06.9	18.652 730	0.47	1.88	1	19	56
	26	3	35	30.92	19	01	35.9	18.645 964	0.47	1.88	1	15	51
	27	3	35	21.66	19	01	04.4	18.639 482	0.47	1.88	1	11	46
	28	3	35	12.31	19	00	32.6	18.633 284	0.47	1.88	1	07	41
	29	3	35	02.87	19	00	00.5	18.627 374	0.47	1.88	1	03	36
	30	3	34	53.34	18	59	28.0	18.621 754	0.47	1.88	0	59	30
	31	3	34	43.73	+18	58	55.2	18.616 428	0.47	1.88	0	55	25
Nov.	1	3	34	34.05	18	58	22.2	18.611 395	0.47	1.88	0	51	19
	2	3	34	24.31	18	57	48.9	18.606 660	0.47	1.88	0	47	14
	3	3	34	14.49	18	57	15.3	18.602 224	0.47	1.88	0	43	08
	4	3	34	04.62	18	56	41.5	18.598 088	0.47	1.88	0	39	02
	5	3	33	54.70	18	56	07.6	18.594 254	0.47	1.88	0	34	57
	6	3	33	44.72	+18	55	33.4	18.590 723	0.47	1.88	0	30	51
	7	3	33	34.69	18	54	59.1	18.587 498	0.47	1.88	0	26	45
	8	3	33	24.62	18	54	24.6	18.584 578	0.47	1.88	0	22	39
	9	3	33	14.50	18	53	50.0	18.581 965	0.47	1.88	0	18	33
	10	3	33	04.35	18	53	15.2	18.579 659	0.47	1.88	0	14	27
	11	3	32	54.16	18	52	40.3	18.577 661	0.47	1.89	0	10	21
	12	3	32	43.95	+18	52	05.2	18.575 972	0.47	1.89	0	06	15
	13	3	32	33.71	18	51	30.0	18.574 591	0.47	1.89	0	02	09
	14	3	32	23.46	18	50	54.7	18.573 520	0.47	1.89	23	53	57
	15	3	32	13.20	18	50	19.3	18.572 757	0.47	1.89	23	49	50
	16	3	32	02.93	+18	49	43.9	18.572 305	0.47	1.89	23	45	44

URANUS, 2024
RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	3	32	02.93	+18	49	43.9	18.572 305	0.47	1.89	23	45	44
	17	3	31	52.67	18	49	08.4	18.572 161	0.47	1.89	23	41	38
	18	3	31	42.41	18	48	33.0	18.572 328	0.47	1.89	23	37	32
	19	3	31	32.15	18	47	57.6	18.572 805	0.47	1.89	23	33	26
	20	3	31	21.90	18	47	22.2	18.573 593	0.47	1.89	23	29	20
	21	3	31	11.65	18	46	46.8	18.574 692	0.47	1.89	23	25	14
	22	3	31	01.42	+18	46	11.5	18.576 101	0.47	1.89	23	21	08
	23	3	30	51.21	18	45	36.2	18.577 821	0.47	1.89	23	17	02
	24	3	30	41.03	18	45	00.9	18.579 852	0.47	1.88	23	12	56
	25	3	30	30.87	18	44	25.7	18.582 194	0.47	1.88	23	08	50
	26	3	30	20.74	18	43	50.6	18.584 845	0.47	1.88	23	04	44
	27	3	30	10.66	18	43	15.6	18.587 806	0.47	1.88	23	00	38
	28	3	30	00.63	+18	42	40.8	18.591 076	0.47	1.88	22	56	32
	29	3	29	50.64	18	42	06.1	18.594 654	0.47	1.88	22	52	26
	30	3	29	40.72	18	41	31.5	18.598 538	0.47	1.88	22	48	21
Dec.	1	3	29	30.85	18	40	57.2	18.602 728	0.47	1.88	22	44	15
	2	3	29	21.05	18	40	23.1	18.607 223	0.47	1.88	22	40	09
	3	3	29	11.32	18	39	49.2	18.612 020	0.47	1.88	22	36	04
	4	3	29	01.67	+18	39	15.6	18.617 117	0.47	1.88	22	31	58
	5	3	28	52.09	18	38	42.3	18.622 514	0.47	1.88	22	27	53
	6	3	28	42.58	18	38	09.3	18.628 208	0.47	1.88	22	23	48
	7	3	28	33.16	18	37	36.5	18.634 196	0.47	1.88	22	19	42
	8	3	28	23.83	18	37	04.0	18.640 477	0.47	1.88	22	15	37
	9	3	28	14.59	18	36	31.8	18.647 047	0.47	1.88	22	11	32
	10	3	28	05.44	+18	35	59.9	18.653 904	0.47	1.88	22	07	27
	11	3	27	56.40	18	35	28.4	18.661 045	0.47	1.88	22	03	23
	12	3	27	47.47	18	34	57.2	18.668 468	0.47	1.88	21	59	18
	13	3	27	38.65	18	34	26.4	18.676 170	0.47	1.88	21	55	13
	14	3	27	29.95	18	33	56.0	18.684 147	0.47	1.87	21	51	09
	15	3	27	21.37	18	33	26.0	18.692 399	0.47	1.87	21	47	05
	16	3	27	12.91	+18	32	56.5	18.700 920	0.47	1.87	21	43	00
	17	3	27	04.57	18	32	27.4	18.709 710	0.47	1.87	21	38	56
	18	3	26	56.35	18	31	58.8	18.718 765	0.47	1.87	21	34	52
	19	3	26	48.27	18	31	30.6	18.728 083	0.47	1.87	21	30	48
	20	3	26	40.31	18	31	02.9	18.737 660	0.47	1.87	21	26	45
	21	3	26	32.49	18	30	35.7	18.747 494	0.47	1.87	21	22	41
	22	3	26	24.80	+18	30	08.9	18.757 581	0.47	1.87	21	18	38
	23	3	26	17.26	18	29	42.7	18.767 919	0.47	1.87	21	14	34
	24	3	26	09.87	18	29	16.9	18.778 505	0.47	1.86	21	10	31
	25	3	26	02.63	18	28	51.7	18.789 333	0.47	1.86	21	06	28
	26	3	25	55.54	18	28	27.0	18.800 403	0.47	1.86	21	02	26
	27	3	25	48.62	18	28	02.9	18.811 708	0.47	1.86	20	58	23
	28	3	25	41.86	+18	27	39.4	18.823 247	0.47	1.86	20	54	20
	29	3	25	35.27	18	27	16.5	18.835 013	0.47	1.86	20	50	18
	30	3	25	28.85	18	26	54.2	18.847 005	0.47	1.86	20	46	16
	31	3	25	22.59	18	26	32.6	18.859 217	0.47	1.86	20	42	14
	32	3	25	16.51	+18	26	11.6	18.871 645	0.47	1.86	20	38	12

NEPTUNE, 2024
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Jan.	1	356	54	03.7	-1	14	49.3	29.903 7894	Apr.	2	357	27	44.1	-1	15	32.9	29.901 4510
	3	356	54	47.6	1	14	50.2	29.903 7388		4	357	28	28.0	1	15	33.8	29.901 3998
	5	356	55	31.6	1	14	51.2	29.903 6883		6	357	29	12.0	1	15	34.8	29.901 3486
	7	356	56	15.5	1	14	52.1	29.903 6378		8	357	29	55.9	1	15	35.7	29.901 2974
	9	356	56	59.4	1	14	53.1	29.903 5872		10	357	30	39.8	1	15	36.7	29.901 2461
	11	356	57	43.3	1	14	54.0	29.903 5366		12	357	31	23.7	1	15	37.7	29.901 1949
	13	356	58	27.3	-1	14	55.0	29.903 4860		14	357	32	07.6	-1	15	38.6	29.901 1436
	15	356	59	11.2	1	14	55.9	29.903 4354		16	357	32	51.6	1	15	39.5	29.901 0923
	17	356	59	55.1	1	14	56.9	29.903 3848		18	357	33	35.5	1	15	40.5	29.901 0410
	19	357	00	39.0	1	14	57.8	29.903 3342		20	357	34	19.4	1	15	41.4	29.900 9896
	21	357	01	22.9	1	14	58.8	29.903 2836		22	357	35	03.3	1	15	42.4	29.900 9383
	23	357	02	06.9	1	14	59.7	29.903 2329		24	357	35	47.2	1	15	43.3	29.900 8869
	25	357	02	50.8	-1	15	00.7	29.903 1823		26	357	36	31.1	-1	15	44.2	29.900 8355
	27	357	03	34.7	1	15	01.6	29.903 1316		28	357	37	15.1	1	15	45.2	29.900 7841
	29	357	04	18.6	1	15	02.6	29.903 0809		30	357	37	59.0	1	15	46.1	29.900 7327
	31	357	05	02.5	1	15	03.5	29.903 0302	May	2	357	38	42.9	1	15	47.1	29.900 6813
Feb.	2	357	05	46.5	1	15	04.5	29.902 9795		4	357	39	26.8	1	15	48.0	29.900 6298
	4	357	06	30.4	1	15	05.4	29.902 9288		6	357	40	10.7	1	15	48.9	29.900 5783
	6	357	07	14.3	-1	15	06.4	29.902 8780		8	357	40	54.7	-1	15	49.9	29.900 5268
	8	357	07	58.2	1	15	07.3	29.902 8273		10	357	41	38.6	1	15	50.8	29.900 4753
	10	357	08	42.1	1	15	08.3	29.902 7765		12	357	42	22.5	1	15	51.8	29.900 4238
	12	357	09	26.1	1	15	09.3	29.902 7258		14	357	43	06.4	1	15	52.7	29.900 3723
	14	357	10	10.0	1	15	10.2	29.902 6750		16	357	43	50.3	1	15	53.6	29.900 3207
	16	357	10	53.9	1	15	11.2	29.902 6241		18	357	44	34.3	1	15	54.6	29.900 2692
	18	357	11	37.8	-1	15	12.1	29.902 5733		20	357	45	18.2	-1	15	55.5	29.900 2176
	20	357	12	21.8	1	15	13.1	29.902 5225		22	357	46	02.1	1	15	56.5	29.900 1660
	22	357	13	05.7	1	15	14.0	29.902 4716		24	357	46	46.0	1	15	57.4	29.900 1143
	24	357	13	49.6	1	15	14.9	29.902 4208		26	357	47	29.9	1	15	58.3	29.900 0627
	26	357	14	33.5	1	15	15.9	29.902 3699		28	357	48	13.8	1	15	59.3	29.900 0111
	28	357	15	17.5	1	15	16.8	29.902 3190		30	357	48	57.7	1	16	00.2	29.899 9594
Mar.	1	357	16	01.4	-1	15	17.8	29.902 2681	June	1	357	49	41.7	-1	16	01.2	29.899 9077
	3	357	16	45.3	1	15	18.7	29.902 2171		3	357	50	25.6	1	16	02.1	29.899 8560
	5	357	17	29.2	1	15	19.7	29.902 1662		5	357	51	09.5	1	16	03.0	29.899 8043
	7	357	18	13.1	1	15	20.6	29.902 1152		7	357	51	53.4	1	16	04.0	29.899 7526
	9	357	18	57.1	1	15	21.6	29.902 0642		9	357	52	37.4	1	16	04.9	29.899 7008
	11	357	19	41.0	1	15	22.5	29.902 0132		11	357	53	21.3	1	16	05.8	29.899 6491
	13	357	20	24.9	-1	15	23.5	29.901 9622		13	357	54	05.2	-1	16	06.8	29.899 5973
	15	357	21	08.8	1	15	24.4	29.901 9112		15	357	54	49.1	1	16	07.7	29.899 5455
	17	357	21	52.7	1	15	25.4	29.901 8601		17	357	55	33.0	1	16	08.6	29.899 4937
	19	357	22	36.7	1	15	26.3	29.901 8090		19	357	56	16.9	1	16	09.6	29.899 4419
	21	357	23	20.6	1	15	27.2	29.901 7579		21	357	57	00.8	1	16	10.5	29.899 3901
	23	357	24	04.5	1	15	28.2	29.901 7068		23	357	57	44.8	1	16	11.5	29.899 3383
	25	357	24	48.4	-1	15	29.1	29.901 6557		25	357	58	28.7	-1	16	12.4	29.899 2865
	27	357	25	32.3	1	15	30.1	29.901 6046		27	357	59	12.6	1	16	13.3	29.899 2346
	29	357	26	16.3	1	15	31.0	29.901 5534		29	357	59	56.5	1	16	14.3	29.899 1828
	31	357	27	00.2	1	15	32.0	29.901 5022	July	1	358	00	40.4	1	16	15.2	29.899 1309
Apr.	2	357	27	44.1	-1	15	32.9	29.901 4510		3	358	01	24.4	-1	16	16.1	29.899 0791

NEPTUNE, 2024

HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
July	1	358	00	40.4	-1	16	15.2	29.899 1309	Oct.	1	358	34	20.4	-1	16	58.0	29.896 7377
	3	358	01	24.4	1	16	16.1	29.899 0791		3	358	35	04.3	1	16	58.9	29.896 6855
	5	358	02	08.3	1	16	17.1	29.899 0272		5	358	35	48.3	1	16	59.8	29.896 6333
	7	358	02	52.2	1	16	18.0	29.898 9753		7	358	36	32.2	1	17	00.8	29.896 5811
	9	358	03	36.1	1	16	18.9	29.898 9234		9	358	37	16.1	1	17	01.7	29.896 5289
	11	358	04	20.0	1	16	19.9	29.898 8715		11	358	37	60.0	1	17	02.6	29.896 4766
	13	358	05	03.9	-1	16	20.8	29.898 8196		13	358	38	43.9	-1	17	03.5	29.896 4244
	15	358	05	47.8	1	16	21.7	29.898 7677		15	358	39	27.8	1	17	04.5	29.896 3721
	17	358	06	31.7	1	16	22.7	29.898 7158		17	358	40	11.7	1	17	05.4	29.896 3199
	19	358	07	15.6	1	16	23.6	29.898 6639		19	358	40	55.6	1	17	06.3	29.896 2676
	21	358	07	59.6	1	16	24.5	29.898 6119		21	358	41	39.5	1	17	07.2	29.896 2153
	23	358	08	43.5	1	16	25.5	29.898 5600		23	358	42	23.5	1	17	08.2	29.896 1630
	25	358	09	27.4	-1	16	26.4	29.898 5081		25	358	43	07.4	-1	17	09.1	29.896 1107
	27	358	10	11.3	1	16	27.3	29.898 4561		27	358	43	51.3	1	17	10.0	29.896 0584
	29	358	10	55.2	1	16	28.3	29.898 4042		29	358	44	35.2	1	17	10.9	29.896 0060
	31	358	11	39.1	1	16	29.2	29.898 3522		31	358	45	19.1	1	17	11.9	29.895 9537
Aug.	2	358	12	23.1	1	16	30.1	29.898 3002	Nov.	2	358	46	03.0	1	17	12.8	29.895 9013
	4	358	13	07.0	1	16	31.1	29.898 2482		4	358	46	46.9	1	17	13.7	29.895 8490
	6	358	13	50.9	-1	16	32.0	29.898 1963		6	358	47	30.8	-1	17	14.6	29.895 7966
	8	358	14	34.8	1	16	32.9	29.898 1443		8	358	48	14.7	1	17	15.6	29.895 7442
	10	358	15	18.7	1	16	33.9	29.898 0923		10	358	48	58.6	1	17	16.5	29.895 6918
	12	358	16	02.6	1	16	34.8	29.898 0403		12	358	49	42.5	1	17	17.4	29.895 6394
	14	358	16	46.6	1	16	35.7	29.897 9883		14	358	50	26.4	1	17	18.3	29.895 5870
	16	358	17	30.5	1	16	36.6	29.897 9363		16	358	51	10.3	1	17	19.2	29.895 5345
	18	358	18	14.4	-1	16	37.6	29.897 8842		18	358	51	54.3	-1	17	20.1	29.895 4821
	20	358	18	58.3	1	16	38.5	29.897 8322		20	358	52	38.2	1	17	21.1	29.895 4296
	22	358	19	42.2	1	16	39.4	29.897 7802		22	358	53	22.1	1	17	22.0	29.895 3772
	24	358	20	26.1	1	16	40.4	29.897 7281		24	358	54	06.0	1	17	22.9	29.895 3247
	26	358	21	10.0	1	16	41.3	29.897 6761		26	358	54	49.9	1	17	23.8	29.895 2722
	28	358	21	53.9	1	16	42.2	29.897 6240		28	358	55	33.8	1	17	24.7	29.895 2197
	30	358	22	37.8	-1	16	43.2	29.897 5719		30	358	56	17.7	-1	17	25.7	29.895 1672
Sept.	1	358	23	21.8	1	16	44.1	29.897 5199	Dec.	2	358	57	01.6	1	17	26.6	29.895 1146
	3	358	24	05.7	1	16	45.0	29.897 4678		4	358	57	45.5	1	17	27.5	29.895 0621
	5	358	24	49.6	1	16	45.9	29.897 4157		6	358	58	29.4	1	17	28.4	29.895 0095
	7	358	25	33.5	1	16	46.9	29.897 3636		8	358	59	13.3	1	17	29.3	29.894 9570
	9	358	26	17.4	1	16	47.8	29.897 3115		10	358	59	57.2	1	17	30.3	29.894 9044
	11	358	27	01.3	-1	16	48.7	29.897 2593		12	359	00	41.1	-1	17	31.2	29.894 8518
	13	358	27	45.2	1	16	49.7	29.897 2072		14	359	01	25.1	1	17	32.1	29.894 7993
	15	358	28	29.1	1	16	50.6	29.897 1551		16	359	02	09.0	1	17	33.0	29.894 7467
	17	358	29	13.1	1	16	51.5	29.897 1029		18	359	02	52.9	1	17	33.9	29.894 6941
	19	358	29	57.0	1	16	52.4	29.897 0508		20	359	03	36.8	1	17	34.9	29.894 6415
	21	358	30	40.9	1	16	53.4	29.896 9986		22	359	04	20.7	1	17	35.8	29.894 5889
	23	358	31	24.8	-1	16	54.3	29.896 9465		24	359	05	04.6	-1	17	36.7	29.894 5363
	25	358	32	08.7	1	16	55.2	29.896 8943		26	359	05	48.5	1	17	37.6	29.894 4836
	27	358	32	52.6	1	16	56.1	29.896 8421		28	359	06	32.4	1	17	38.5	29.894 4310
	29	358	33	36.5	1	16	57.1	29.896 7899		30	359	07	16.3	1	17	39.4	29.894 3784
Oct.	1	358	34	20.4	-1	16	58.0	29.896 7377		32	359	08	00.2	-1	17	40.4	29.894 3258

NEPTUNE, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Jan.	0	355	03	42.5	-1	14	16.0
	1	355	04	34.0	1	14	14.0
	2	355	05	27.3	1	14	12.0
	3	355	06	22.6	1	14	10.0
	4	355	07	19.8	1	14	08.1
	5	355	08	19.0	1	14	06.1
	6	355	09	20.1	-1	14	04.2
	7	355	10	23.2	1	14	02.3
	8	355	11	28.2	1	14	00.4
	9	355	12	35.2	1	13	58.5
	10	355	13	44.0	1	13	56.6
	11	355	14	54.7	1	13	54.7
	12	355	16	07.2	-1	13	52.9
	13	355	17	21.5	1	13	51.1
	14	355	18	37.5	1	13	49.3
	15	355	19	55.2	1	13	47.5
	16	355	21	14.6	1	13	45.8
	17	355	22	35.7	1	13	44.1
	18	355	23	58.5	-1	13	42.4
	19	355	25	23.0	1	13	40.7
	20	355	26	49.3	1	13	39.0
	21	355	28	17.2	1	13	37.4
	22	355	29	46.7	1	13	35.8
	23	355	31	17.9	1	13	34.2
	24	355	32	50.6	-1	13	32.7
	25	355	34	24.9	1	13	31.2
	26	355	36	00.6	1	13	29.7
	27	355	37	37.7	1	13	28.2
	28	355	39	16.3	1	13	26.8
	29	355	40	56.3	1	13	25.4
	30	355	42	37.7	-1	13	24.1
	31	355	44	20.5	1	13	22.7
Feb.	1	355	46	04.7	1	13	21.4
	2	355	47	50.2	1	13	20.1
	3	355	49	37.2	1	13	18.9
	4	355	51	25.5	1	13	17.7
	5	355	53	15.1	-1	13	16.5
	6	355	55	06.0	1	13	15.4
	7	355	56	58.2	1	13	14.2
	8	355	58	51.6	1	13	13.2
	9	356	00	46.1	1	13	12.1
	10	356	02	41.7	1	13	11.1
	11	356	04	38.4	-1	13	10.1
	12	356	06	36.1	1	13	09.2
	13	356	08	34.8	1	13	08.2
	14	356	10	34.5	1	13	07.4
	15	356	12	35.3	-1	13	06.5

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"
Feb.	15	356	12	35.3	-1	13	06.5
	16	356	14	37.0	1	13	05.7
	17	356	16	39.8	1	13	05.0
	18	356	18	43.5	1	13	04.2
	19	356	20	48.1	1	13	03.5
	20	356	22	53.5	1	13	02.9
	21	356	24	59.7	-1	13	02.3
	22	356	27	06.7	1	13	01.7
	23	356	29	14.3	1	13	01.1
	24	356	31	22.6	1	13	00.6
	25	356	33	31.6	1	13	00.2
	26	356	35	41.2	1	12	59.8
	27	356	37	51.5	-1	12	59.4
	28	356	40	02.3	1	12	59.0
	29	356	42	13.8	1	12	58.7
Mar.	1	356	44	25.8	1	12	58.5
	2	356	46	38.4	1	12	58.2
	3	356	48	51.5	1	12	58.1
	4	356	51	05.2	-1	12	57.9
	5	356	53	19.3	1	12	57.8
	6	356	55	33.8	1	12	57.7
	7	356	57	48.7	1	12	57.7
	8	357	00	03.9	1	12	57.7
	9	357	02	19.3	1	12	57.7
	10	357	04	34.9	-1	12	57.8
	11	357	06	50.7	1	12	58.0
	12	357	09	06.7	1	12	58.1
	13	357	11	22.9	1	12	58.3
	14	357	13	39.3	1	12	58.6
	15	357	15	55.9	1	12	58.9
	16	357	18	12.6	-1	12	59.3
	17	357	20	29.3	1	12	59.9
	18	357	22	45.8	1	13	00.3
	19	357	25	02.5	1	13	00.6
	20	357	27	19.1	1	13	01.0
	21	357	29	35.6	1	13	01.5
	22	357	31	52.0	-1	13	02.1
	23	357	34	08.2	1	13	02.7
	24	357	36	24.1	1	13	03.3
	25	357	38	39.9	1	13	04.0
	26	357	40	55.4	1	13	04.7
	27	357	43	10.7	1	13	05.5
	28	357	45	25.7	-1	13	06.3
	29	357	47	40.5	1	13	07.2
	30	357	49	55.0	1	13	08.1
	31	357	52	09.1	1	13	09.0
Apr.	1	357	54	22.9	-1	13	10.0

NEPTUNE, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Apr.	1	357	54	22.9	-1	13	10.0	May	17	359	21	40.5	-1	14	33.6
	2	357	56	36.3	1	13	11.0		18	359	23	05.1	1	14	36.1
	3	357	58	49.3	1	13	12.1		19	359	24	28.0	1	14	38.7
	4	358	01	01.7	1	13	13.2		20	359	25	49.4	1	14	41.3
	5	358	03	13.5	1	13	14.3		21	359	27	09.2	1	14	43.9
	6	358	05	24.7	1	13	15.4		22	359	28	27.3	1	14	46.5
	7	358	07	35.3	-1	13	16.6		23	359	29	43.9	-1	14	49.2
	8	358	09	45.3	1	13	17.9		24	359	30	58.9	1	14	51.9
	9	358	11	54.6	1	13	19.2		25	359	32	12.2	1	14	54.6
	10	358	14	03.4	1	13	20.5		26	359	33	23.9	1	14	57.3
	11	358	16	11.5	1	13	21.8		27	359	34	33.9	1	15	00.0
	12	358	18	18.9	1	13	23.2		28	359	35	42.1	1	15	02.8
	13	358	20	25.6	-1	13	24.7		29	359	36	48.5	-1	15	05.6
	14	358	22	31.5	1	13	26.1		30	359	37	53.2	1	15	08.4
	15	358	24	36.6	1	13	27.6		31	359	38	56.0	1	15	11.2
	16	358	26	40.9	1	13	29.2	June	1	359	39	57.0	1	15	14.0
	17	358	28	44.2	1	13	30.8		2	359	40	56.1	1	15	16.9
	18	358	30	46.5	1	13	32.4		3	359	41	53.5	1	15	19.7
	19	358	32	48.0	-1	13	34.0		4	359	42	49.2	-1	15	22.6
	20	358	34	48.4	1	13	35.7		5	359	43	43.0	1	15	25.5
	21	358	36	47.8	1	13	37.5		6	359	44	35.1	1	15	28.4
	22	358	38	46.3	1	13	39.2		7	359	45	25.3	1	15	31.3
	23	358	40	43.8	1	13	41.0		8	359	46	13.7	1	15	34.2
	24	358	42	40.2	1	13	42.9		9	359	47	00.2	1	15	37.2
	25	358	44	35.7	-1	13	44.7		10	359	47	44.7	-1	15	40.1
	26	358	46	30.1	1	13	46.6		11	359	48	27.3	1	15	43.1
	27	358	48	23.4	1	13	48.6		12	359	49	07.9	1	15	46.1
	28	358	50	15.7	1	13	50.5		13	359	49	46.6	1	15	49.1
	29	358	52	06.8	1	13	52.5		14	359	50	23.3	1	15	52.1
	30	358	53	56.7	1	13	54.5		15	359	50	58.1	1	15	55.1
May	1	358	55	45.4	-1	13	56.6		16	359	51	31.0	-1	15	58.1
	2	358	57	32.9	1	13	58.7		17	359	52	02.0	1	16	01.1
	3	358	59	19.0	1	14	00.8		18	359	52	31.0	1	16	04.2
	4	359	01	03.8	1	14	03.0		19	359	52	58.2	1	16	07.2
	5	359	02	47.2	1	14	05.1		20	359	53	23.5	1	16	10.3
	6	359	04	29.4	1	14	07.4		21	359	53	46.9	1	16	13.3
	7	359	06	10.2	-1	14	09.6		22	359	54	08.3	-1	16	16.3
	8	359	07	49.7	1	14	11.9		23	359	54	27.9	1	16	19.4
	9	359	09	27.9	1	14	14.2		24	359	54	45.5	1	16	22.4
	10	359	11	04.7	1	14	16.5		25	359	55	01.0	1	16	25.5
	11	359	12	40.1	1	14	18.8		26	359	55	14.6	1	16	28.5
	12	359	14	14.1	1	14	21.2		27	359	55	26.2	1	16	31.6
	13	359	15	46.5	-1	14	23.6		28	359	55	35.7	-1	16	34.6
	14	359	17	17.4	1	14	26.1		29	359	55	43.3	1	16	37.7
	15	359	18	46.7	1	14	28.6		30	359	55	48.9	1	16	40.7
	16	359	20	14.4	1	14	31.1	July	1	359	55	52.6	1	16	43.7
	17	359	21	40.5	-1	14	33.6		2	359	55	54.4	-1	16	46.8

NEPTUNE, 2024
GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
July	1	359	55	52.6	-1	16	43.7	Aug.	16	359	25	48.6	-1	18	47.1
	2	359	55	54.4	1	16	46.8		17	359	24	32.3	1	18	49.2
	3	359	55	54.3	1	16	49.8		18	359	23	14.8	1	18	51.2
	4	359	55	52.3	1	16	52.8		19	359	21	56.1	1	18	53.1
	5	359	55	48.3	1	16	55.8		20	359	20	36.1	1	18	55.1
	6	359	55	42.4	1	16	58.9		21	359	19	15.0	1	18	56.9
	7	359	55	34.5	-1	17	01.9		22	359	17	52.7	-1	18	58.8
	8	359	55	24.6	1	17	04.9		23	359	16	29.3	1	19	00.6
	9	359	55	12.7	1	17	07.9		24	359	15	04.9	1	19	02.4
	10	359	54	58.8	1	17	10.8		25	359	13	39.6	1	19	04.1
	11	359	54	43.0	1	17	13.8		26	359	12	13.3	1	19	05.8
	12	359	54	25.2	1	17	16.8		27	359	10	46.1	1	19	07.4
	13	359	54	05.6	-1	17	19.7		28	359	09	18.0	-1	19	09.0
	14	359	53	44.0	1	17	22.6		29	359	07	49.0	1	19	10.6
	15	359	53	20.7	1	17	25.6		30	359	06	19.1	1	19	12.1
	16	359	52	55.5	1	17	28.5		31	359	04	48.4	1	19	13.6
	17	359	52	28.5	1	17	31.4	Sept.	1	359	03	16.8	1	19	15.0
	18	359	51	59.7	1	17	34.2		2	359	01	44.4	1	19	16.4
	19	359	51	29.1	-1	17	37.1		3	359	00	11.2	-1	19	17.7
	20	359	50	56.7	1	17	39.9		4	358	58	37.4	1	19	19.0
	21	359	50	22.5	1	17	42.7		5	358	57	02.8	1	19	20.2
	22	359	49	46.5	1	17	45.5		6	358	55	27.7	1	19	21.4
	23	359	49	08.6	1	17	48.3		7	358	53	52.0	1	19	22.6
	24	359	48	28.9	1	17	51.1		8	358	52	15.8	1	19	23.7
	25	359	47	47.5	-1	17	53.8		9	358	50	39.2	-1	19	24.8
	26	359	47	04.2	1	17	56.5		10	358	49	02.2	1	19	25.8
	27	359	46	19.2	1	17	59.2		11	358	47	24.8	1	19	26.7
	28	359	45	32.6	1	18	01.9		12	358	45	47.0	1	19	27.6
	29	359	44	44.3	1	18	04.5		13	358	44	08.9	1	19	28.5
	30	359	43	54.4	1	18	07.1		14	358	42	30.5	1	19	29.3
	31	359	43	02.9	-1	18	09.7		15	358	40	51.9	-1	19	30.1
Aug.	1	359	42	09.7	1	18	12.3		16	358	39	12.9	1	19	30.8
	2	359	41	15.0	1	18	14.8		17	358	37	33.6	1	19	31.4
	3	359	40	18.6	1	18	17.3		18	358	35	54.2	1	19	32.0
	4	359	39	20.5	1	18	19.8		19	358	34	14.6	1	19	32.6
	5	359	38	20.9	1	18	22.2		20	358	32	35.0	1	19	33.1
	6	359	37	19.6	-1	18	24.7		21	358	30	55.4	-1	19	33.6
	7	359	36	16.9	1	18	27.1		22	358	29	15.8	1	19	34.0
	8	359	35	12.6	1	18	29.4		23	358	27	36.3	1	19	34.4
	9	359	34	06.8	1	18	31.8		24	358	25	56.9	1	19	34.7
	10	359	32	59.6	1	18	34.1		25	358	24	17.6	1	19	34.9
	11	359	31	51.0	1	18	36.3		26	358	22	38.5	1	19	35.2
	12	359	30	41.1	-1	18	38.6		27	358	20	59.4	-1	19	35.3
	13	359	29	29.9	1	18	40.8		28	358	19	20.6	1	19	35.4
	14	359	28	17.3	1	18	42.9		29	358	17	41.9	1	19	35.5
	15	359	27	03.6	1	18	45.0		30	358	16	03.6	1	19	35.5
	16	359	25	48.6	-1	18	47.1	Oct.	1	358	14	25.5	-1	19	35.5

NEPTUNE, 2024
GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Oct.	1	358	14	25.5	-1	19	35.5	Nov.	16	357	15	59.6	-1	18	46.8
	2	358	12	47.8	1	19	35.5		17	357	15	17.2	1	18	44.9
	3	358	11	10.5	1	19	35.3		18	357	14	36.6	1	18	43.0
	4	358	09	33.7	1	19	35.2		19	357	13	57.9	1	18	41.1
	5	358	07	57.4	1	19	34.9		20	357	13	21.0	1	18	39.1
	6	358	06	21.7	1	19	34.7		21	357	12	45.9	1	18	37.1
	7	358	04	46.7	-1	19	34.4		22	357	12	12.7	-1	18	35.1
	8	358	03	12.3	1	19	34.0		23	357	11	41.3	1	18	33.1
	9	358	01	38.6	1	19	33.6		24	357	11	11.9	1	18	31.1
	10	358	00	05.6	1	19	33.1		25	357	10	44.3	1	18	29.0
	11	357	58	33.4	1	19	32.6		26	357	10	18.7	1	18	26.9
	12	357	57	01.9	1	19	32.0		27	357	09	55.2	1	18	24.9
	13	357	55	31.2	-1	19	31.4		28	357	09	33.6	-1	18	22.7
	14	357	54	01.2	1	19	30.8		29	357	09	14.1	1	18	20.6
	15	357	52	32.1	1	19	30.1		30	357	08	56.6	1	18	18.5
	16	357	51	03.9	1	19	29.3	Dec.	1	357	08	41.3	1	18	16.3
	17	357	49	36.6	1	19	28.5		2	357	08	28.0	1	18	14.2
	18	357	48	10.3	1	19	27.7		3	357	08	16.8	1	18	12.0
	19	357	46	45.1	-1	19	26.8		4	357	08	07.7	-1	18	09.8
	20	357	45	21.1	1	19	25.9		5	357	08	00.6	1	18	07.6
	21	357	43	58.1	1	19	24.9		6	357	07	55.5	1	18	05.4
	22	357	42	36.3	1	19	23.9		7	357	07	52.5	1	18	03.2
	23	357	41	15.6	1	19	22.9		8	357	07	51.5	1	18	00.9
	24	357	39	56.0	1	19	21.8		9	357	07	52.6	1	17	58.7
	25	357	38	37.6	-1	19	20.7		10	357	07	55.7	-1	17	56.5
	26	357	37	20.4	1	19	19.5		11	357	08	00.9	1	17	54.2
	27	357	36	04.4	1	19	18.3		12	357	08	08.2	1	17	52.0
	28	357	34	49.7	1	19	17.1		13	357	08	17.7	1	17	49.7
	29	357	33	36.3	1	19	15.8		14	357	08	29.4	1	17	47.5
	30	357	32	24.3	1	19	14.5		15	357	08	43.1	1	17	45.2
	31	357	31	13.7	-1	19	13.1		16	357	08	59.0	-1	17	43.0
Nov.	1	357	30	04.5	1	19	11.7		17	357	09	17.0	1	17	40.7
	2	357	28	56.9	1	19	10.3		18	357	09	37.0	1	17	38.5
	3	357	27	50.8	1	19	08.8		19	357	09	59.0	1	17	36.2
	4	357	26	46.3	1	19	07.3		20	357	10	23.0	1	17	34.0
	5	357	25	43.3	1	19	05.8		21	357	10	49.0	1	17	31.7
	6	357	24	42.0	-1	19	04.2		22	357	11	17.1	-1	17	29.5
	7	357	23	42.3	1	19	02.6		23	357	11	47.2	1	17	27.3
	8	357	22	44.2	1	19	01.0		24	357	12	19.5	1	17	25.0
	9	357	21	47.7	1	18	59.3		25	357	12	53.7	1	17	22.8
	10	357	20	52.8	1	18	57.6		26	357	13	30.1	1	17	20.6
	11	357	19	59.6	1	18	55.9		27	357	14	08.6	1	17	18.4
	12	357	19	08.0	-1	18	54.1		28	357	14	49.1	-1	17	16.2
	13	357	18	18.2	1	18	52.3		29	357	15	31.8	1	17	14.0
	14	357	17	30.2	1	18	50.5		30	357	16	16.5	1	17	11.9
	15	357	16	44.0	1	18	48.7		31	357	17	03.2	1	17	09.7
	16	357	15	59.6	-1	18	46.8		32	357	17	51.9	-1	17	07.5

NEPTUNE, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Jan.	0	23	43	50.16	-3	05	54.3	30.125 765	0.29	1.11	17	04	24
	1	23	43	53.26	3	05	32.1	30.142 563	0.29	1.11	17	00	32
	2	23	43	56.47	3	05	09.1	30.159 286	0.29	1.11	16	56	39
	3	23	43	59.81	3	04	45.3	30.175 928	0.29	1.11	16	52	46
	4	23	44	03.26	3	04	20.8	30.192 484	0.29	1.11	16	48	54
	5	23	44	06.83	3	03	55.5	30.208 949	0.29	1.11	16	45	02
	6	23	44	10.53	-3	03	29.5	30.225 318	0.29	1.11	16	41	10
	7	23	44	14.34	3	03	02.7	30.241 586	0.29	1.11	16	37	18
	8	23	44	18.27	3	02	35.1	30.257 749	0.29	1.11	16	33	26
	9	23	44	22.32	3	02	06.8	30.273 800	0.29	1.11	16	29	34
	10	23	44	26.49	3	01	37.8	30.289 735	0.29	1.11	16	25	42
	11	23	44	30.77	3	01	08.0	30.305 548	0.29	1.11	16	21	51
	12	23	44	35.17	-3	00	37.6	30.321 235	0.29	1.10	16	17	59
	13	23	44	39.67	3	00	06.4	30.336 791	0.29	1.10	16	14	08
	14	23	44	44.28	2	59	34.6	30.352 210	0.29	1.10	16	10	16
	15	23	44	48.99	2	59	02.2	30.367 488	0.29	1.10	16	06	25
	16	23	44	53.81	2	58	29.1	30.382 620	0.29	1.10	16	02	34
	17	23	44	58.73	2	57	55.3	30.397 602	0.29	1.10	15	58	43
	18	23	45	03.76	-2	57	20.9	30.412 429	0.29	1.10	15	54	53
	19	23	45	08.89	2	56	45.8	30.427 098	0.29	1.10	15	51	02
	20	23	45	14.13	2	56	10.0	30.441 604	0.29	1.10	15	47	11
	21	23	45	19.47	2	55	33.6	30.455 943	0.29	1.10	15	43	21
	22	23	45	24.92	2	54	56.6	30.470 113	0.29	1.10	15	39	30
	23	23	45	30.46	2	54	19.0	30.484 108	0.29	1.10	15	35	40
	24	23	45	36.10	-2	53	40.8	30.497 926	0.29	1.10	15	31	50
	25	23	45	41.83	2	53	02.0	30.511 562	0.29	1.10	15	27	59
	26	23	45	47.65	2	52	22.6	30.525 013	0.29	1.10	15	24	09
	27	23	45	53.56	2	51	42.7	30.538 276	0.29	1.10	15	20	19
	28	23	45	59.56	2	51	02.3	30.551 347	0.29	1.10	15	16	29
	29	23	46	05.65	2	50	21.3	30.564 223	0.29	1.10	15	12	40
	30	23	46	11.82	-2	49	39.8	30.576 899	0.29	1.10	15	08	50
	31	23	46	18.08	2	48	57.7	30.589 373	0.29	1.10	15	05	00
Feb.	1	23	46	24.43	2	48	15.2	30.601 641	0.29	1.09	15	01	11
	2	23	46	30.86	2	47	32.1	30.613 698	0.29	1.09	14	57	21
	3	23	46	37.38	2	46	48.5	30.625 543	0.29	1.09	14	53	32
	4	23	46	43.98	2	46	04.4	30.637 172	0.29	1.09	14	49	43
	5	23	46	50.66	-2	45	19.7	30.648 580	0.29	1.09	14	45	53
	6	23	46	57.42	2	44	34.6	30.659 764	0.29	1.09	14	42	04
	7	23	47	04.26	2	43	49.1	30.670 722	0.29	1.09	14	38	15
	8	23	47	11.18	2	43	03.0	30.681 449	0.29	1.09	14	34	26
	9	23	47	18.16	2	42	16.6	30.691 943	0.29	1.09	14	30	37
	10	23	47	25.22	2	41	29.7	30.702 200	0.29	1.09	14	26	48
	11	23	47	32.33	-2	40	42.5	30.712 216	0.29	1.09	14	22	60
	12	23	47	39.51	2	39	54.9	30.721 990	0.29	1.09	14	19	11
	13	23	47	46.76	2	39	06.9	30.731 517	0.29	1.09	14	15	22
	14	23	47	54.07	2	38	18.6	30.740 797	0.29	1.09	14	11	34
	15	23	48	01.44	-2	37	29.8	30.749 826	0.29	1.09	14	07	45

NEPTUNE, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Feb.	15	23	48	01.44	-2	37	29.8	30.749 826	0.29	1.09	14	07	45
	16	23	48	08.87	2	36	40.7	30.758 602	0.29	1.09	14	03	57
	17	23	48	16.37	2	35	51.2	30.767 124	0.29	1.09	14	00	08
	18	23	48	23.92	2	35	01.4	30.775 389	0.29	1.09	13	56	20
	19	23	48	31.53	2	34	11.3	30.783 396	0.29	1.09	13	52	32
	20	23	48	39.19	2	33	20.9	30.791 143	0.29	1.09	13	48	43
	21	23	48	46.90	-2	32	30.2	30.798 629	0.29	1.09	13	44	55
	22	23	48	54.66	2	31	39.2	30.805 851	0.29	1.09	13	41	07
	23	23	49	02.46	2	30	48.0	30.812 808	0.29	1.09	13	37	19
	24	23	49	10.31	2	29	56.6	30.819 499	0.29	1.09	13	33	31
	25	23	49	18.19	2	29	04.9	30.825 923	0.29	1.09	13	29	43
	26	23	49	26.11	2	28	13.0	30.832 076	0.29	1.09	13	25	55
	27	23	49	34.08	-2	27	20.9	30.837 959	0.29	1.09	13	22	07
	28	23	49	42.08	2	26	28.6	30.843 570	0.29	1.09	13	18	19
	29	23	49	50.12	2	25	36.1	30.848 907	0.29	1.09	13	14	31
Mar.	1	23	49	58.19	2	24	43.4	30.853 969	0.29	1.09	13	10	43
	2	23	50	06.30	2	23	50.5	30.858 754	0.28	1.09	13	06	55
	3	23	50	14.45	2	22	57.4	30.863 262	0.28	1.09	13	03	07
	4	23	50	22.62	-2	22	04.1	30.867 491	0.28	1.09	12	59	20
	5	23	50	30.83	2	21	10.7	30.871 439	0.28	1.09	12	55	32
	6	23	50	39.06	2	20	17.2	30.875 106	0.28	1.09	12	51	44
	7	23	50	47.32	2	19	23.6	30.878 489	0.28	1.08	12	47	57
	8	23	50	55.59	2	18	29.9	30.881 590	0.28	1.08	12	44	09
	9	23	51	03.88	2	17	36.1	30.884 405	0.28	1.08	12	40	21
	10	23	51	12.18	-2	16	42.3	30.886 934	0.28	1.08	12	36	34
	11	23	51	20.50	2	15	48.4	30.889 177	0.28	1.08	12	32	46
	12	23	51	28.83	2	14	54.5	30.891 133	0.28	1.08	12	28	58
	13	23	51	37.17	2	14	00.5	30.892 802	0.28	1.08	12	25	11
	14	23	51	45.53	2	13	06.6	30.894 184	0.28	1.08	12	21	23
	15	23	51	53.89	2	12	12.6	30.895 279	0.28	1.08	12	17	36
	16	23	52	02.27	-2	11	18.6	30.896 088	0.28	1.08	12	13	48
	17	23	52	10.65	2	10	24.7	30.896 610	0.28	1.08	12	10	00
	18	23	52	19.02	2	09	30.9	30.896 847	0.28	1.08	12	06	13
	19	23	52	27.39	2	08	36.8	30.896 799	0.28	1.08	12	02	25
	20	23	52	35.76	2	07	42.8	30.896 466	0.28	1.08	11	58	38
	21	23	52	44.13	2	06	49.0	30.895 849	0.28	1.08	11	54	50
	22	23	52	52.49	-2	05	55.3	30.894 949	0.28	1.08	11	51	02
	23	23	53	00.84	2	05	01.8	30.893 766	0.28	1.08	11	47	15
	24	23	53	09.18	2	04	08.3	30.892 300	0.28	1.08	11	43	27
	25	23	53	17.50	2	03	15.0	30.890 554	0.28	1.08	11	39	40
	26	23	53	25.81	2	02	21.8	30.888 526	0.28	1.08	11	35	52
	27	23	53	34.11	2	01	28.7	30.886 219	0.28	1.08	11	32	04
	28	23	53	42.40	-2	00	35.7	30.883 633	0.28	1.08	11	28	17
	29	23	53	50.67	1	59	42.9	30.880 768	0.28	1.08	11	24	29
	30	23	53	58.92	1	58	50.3	30.877 625	0.28	1.08	11	20	41
	31	23	54	07.15	1	57	57.8	30.874 206	0.28	1.09	11	16	54
Apr.	1	23	54	15.37	-1	57	05.5	30.870 511	0.28	1.09	11	13	06

NEPTUNE, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Apr.	1	23	54	15.37	-1	57	05.5	30.870 511	0.28	1.09	11	13	06
	2	23	54	23.55	1	56	13.4	30.866 540	0.28	1.09	11	09	18
	3	23	54	31.72	1	55	21.5	30.862 296	0.28	1.09	11	05	30
	4	23	54	39.85	1	54	29.8	30.857 778	0.28	1.09	11	01	42
	5	23	54	47.94	1	53	38.4	30.852 988	0.29	1.09	10	57	54
	6	23	54	56.00	1	52	47.3	30.847 927	0.29	1.09	10	54	07
	7	23	55	04.03	-1	51	56.5	30.842 596	0.29	1.09	10	50	19
	8	23	55	12.01	1	51	05.9	30.836 997	0.29	1.09	10	46	31
	9	23	55	19.96	1	50	15.7	30.831 132	0.29	1.09	10	42	43
	10	23	55	27.87	1	49	25.7	30.825 002	0.29	1.09	10	38	55
	11	23	55	35.74	1	48	36.0	30.818 609	0.29	1.09	10	35	06
	12	23	55	43.58	1	47	46.6	30.811 957	0.29	1.09	10	31	18
	13	23	55	51.37	-1	46	57.5	30.805 046	0.29	1.09	10	27	30
	14	23	55	59.11	1	46	08.8	30.797 881	0.29	1.09	10	23	42
	15	23	56	06.80	1	45	20.4	30.790 462	0.29	1.09	10	19	54
	16	23	56	14.44	1	44	32.4	30.782 794	0.29	1.09	10	16	05
	17	23	56	22.03	1	43	44.8	30.774 877	0.29	1.09	10	12	17
	18	23	56	29.56	1	42	57.6	30.766 716	0.29	1.09	10	08	28
	19	23	56	37.03	-1	42	10.9	30.758 311	0.29	1.09	10	04	40
	20	23	56	44.44	1	41	24.5	30.749 667	0.29	1.09	10	00	51
	21	23	56	51.80	1	40	38.6	30.740 784	0.29	1.09	9	57	03
	22	23	56	59.09	1	39	53.1	30.731 667	0.29	1.09	9	53	14
	23	23	57	06.32	1	39	08.0	30.722 318	0.29	1.09	9	49	25
	24	23	57	13.50	1	38	23.4	30.712 738	0.29	1.09	9	45	37
	25	23	57	20.61	-1	37	39.2	30.702 931	0.29	1.09	9	41	48
	26	23	57	27.66	1	36	55.4	30.692 900	0.29	1.09	9	37	59
	27	23	57	34.64	1	36	12.1	30.682 646	0.29	1.09	9	34	10
	28	23	57	41.56	1	35	29.3	30.672 173	0.29	1.09	9	30	21
	29	23	57	48.41	1	34	46.9	30.661 483	0.29	1.09	9	26	32
	30	23	57	55.19	1	34	05.0	30.650 578	0.29	1.09	9	22	42
May	1	23	58	01.90	-1	33	23.7	30.639 462	0.29	1.09	9	18	53
	2	23	58	08.52	1	32	42.9	30.628 136	0.29	1.09	9	15	04
	3	23	58	15.07	1	32	02.6	30.616 605	0.29	1.09	9	11	14
	4	23	58	21.54	1	31	22.9	30.604 871	0.29	1.09	9	07	25
	5	23	58	27.92	1	30	43.7	30.592 936	0.29	1.10	9	03	35
	6	23	58	34.23	1	30	05.1	30.580 805	0.29	1.10	8	59	46
	7	23	58	40.46	-1	29	27.1	30.568 480	0.29	1.10	8	55	56
	8	23	58	46.61	1	28	49.6	30.555 965	0.29	1.10	8	52	06
	9	23	58	52.67	1	28	12.6	30.543 264	0.29	1.10	8	48	16
	10	23	58	58.66	1	27	36.3	30.530 381	0.29	1.10	8	44	26
	11	23	59	04.55	1	27	00.5	30.517 320	0.29	1.10	8	40	36
	12	23	59	10.36	1	26	25.3	30.504 085	0.29	1.10	8	36	46
	13	23	59	16.08	-1	25	50.8	30.490 680	0.29	1.10	8	32	56
	14	23	59	21.70	1	25	16.9	30.477 108	0.29	1.10	8	29	05
	15	23	59	27.23	1	24	43.6	30.463 374	0.29	1.10	8	25	15
	16	23	59	32.67	1	24	11.0	30.449 482	0.29	1.10	8	21	24
	17	23	59	38.00	-1	23	39.0	30.435 436	0.29	1.10	8	17	34

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
May	17	23	59	38.00	-1	23	39.0	30.435 436	0.29	1.10	8	17	34
	18	23	59	43.24	1	23	07.7	30.421 240	0.29	1.10	8	13	43
	19	23	59	48.38	1	22	37.1	30.406 897	0.29	1.10	8	09	52
	20	23	59	53.43	1	22	07.1	30.392 411	0.29	1.10	8	06	01
	21	23	59	58.38	1	21	37.8	30.377 787	0.29	1.10	8	02	10
	22	0	00	03.23	1	21	09.1	30.363 029	0.29	1.10	7	58	19
	23	0	00	07.98	-1	20	41.1	30.348 139	0.29	1.10	7	54	28
	24	0	00	12.64	1	20	13.7	30.333 122	0.29	1.10	7	50	37
	25	0	00	17.20	1	19	47.0	30.317 983	0.29	1.10	7	46	45
	26	0	00	21.65	1	19	21.0	30.302 723	0.29	1.11	7	42	54
	27	0	00	26.00	1	18	55.7	30.287 349	0.29	1.11	7	39	02
	28	0	00	30.25	1	18	31.1	30.271 862	0.29	1.11	7	35	10
	29	0	00	34.39	-1	18	07.2	30.256 267	0.29	1.11	7	31	18
	30	0	00	38.41	1	17	44.1	30.240 568	0.29	1.11	7	27	26
	31	0	00	42.33	1	17	21.7	30.224 770	0.29	1.11	7	23	34
June	1	0	00	46.14	1	17	00.0	30.208 875	0.29	1.11	7	19	42
	2	0	00	49.83	1	16	39.1	30.192 888	0.29	1.11	7	15	50
	3	0	00	53.42	1	16	18.9	30.176 815	0.29	1.11	7	11	58
	4	0	00	56.90	-1	15	59.4	30.160 658	0.29	1.11	7	08	05
	5	0	01	00.27	1	15	40.6	30.144 424	0.29	1.11	7	04	13
	6	0	01	03.53	1	15	22.6	30.128 116	0.29	1.11	7	00	20
	7	0	01	06.68	1	15	05.3	30.111 740	0.29	1.11	6	56	27
	8	0	01	09.72	1	14	48.7	30.095 301	0.29	1.11	6	52	34
	9	0	01	12.64	1	14	32.9	30.078 803	0.29	1.11	6	48	41
	10	0	01	15.44	-1	14	17.9	30.062 251	0.29	1.11	6	44	48
	11	0	01	18.12	1	14	03.7	30.045 650	0.29	1.11	6	40	55
	12	0	01	20.69	1	13	50.3	30.029 005	0.29	1.12	6	37	01
	13	0	01	23.13	1	13	37.7	30.012 321	0.29	1.12	6	33	08
	14	0	01	25.46	1	13	25.8	29.995 603	0.29	1.12	6	29	14
	15	0	01	27.67	1	13	14.7	29.978 854	0.29	1.12	6	25	20
	16	0	01	29.76	-1	13	04.4	29.962 080	0.29	1.12	6	21	26
	17	0	01	31.73	1	12	54.9	29.945 286	0.29	1.12	6	17	33
	18	0	01	33.59	1	12	46.1	29.928 475	0.29	1.12	6	13	38
	19	0	01	35.33	1	12	38.1	29.911 653	0.29	1.12	6	09	44
	20	0	01	36.96	1	12	30.8	29.894 823	0.29	1.12	6	05	50
	21	0	01	38.47	1	12	24.3	29.877 991	0.29	1.12	6	01	55
	22	0	01	39.86	-1	12	18.6	29.861 160	0.29	1.12	5	58	01
	23	0	01	41.14	1	12	13.6	29.844 336	0.29	1.12	5	54	06
	24	0	01	42.29	1	12	09.4	29.827 521	0.29	1.12	5	50	11
	25	0	01	43.33	1	12	06.0	29.810 720	0.29	1.12	5	46	16
	26	0	01	44.24	1	12	03.4	29.793 939	0.30	1.12	5	42	21
	27	0	01	45.03	1	12	01.6	29.777 180	0.30	1.13	5	38	26
	28	0	01	45.69	-1	12	00.6	29.760 449	0.30	1.13	5	34	31
	29	0	01	46.23	1	12	00.4	29.743 750	0.30	1.13	5	30	36
	30	0	01	46.66	1	12	00.9	29.727 089	0.30	1.13	5	26	40
July	1	0	01	46.97	1	12	02.2	29.710 469	0.30	1.13	5	22	44
	2	0	01	47.16	-1	12	04.3	29.693 895	0.30	1.13	5	18	49

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Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
July	1	0	01	46.97	-1	12	02.2	29.710 469	0.30	1.13	5	22	44
	2	0	01	47.16	1	12	04.3	29.693 895	0.30	1.13	5	18	49
	3	0	01	47.23	1	12	07.1	29.677 374	0.30	1.13	5	14	53
	4	0	01	47.19	1	12	10.7	29.660 909	0.30	1.13	5	10	57
	5	0	01	47.02	1	12	15.0	29.644 506	0.30	1.13	5	07	01
	6	0	01	46.74	1	12	20.2	29.628 169	0.30	1.13	5	03	05
	7	0	01	46.34	-1	12	26.1	29.611 905	0.30	1.13	4	59	08
	8	0	01	45.81	1	12	32.8	29.595 717	0.30	1.13	4	55	12
	9	0	01	45.16	1	12	40.2	29.579 611	0.30	1.13	4	51	15
	10	0	01	44.40	1	12	48.5	29.563 591	0.30	1.13	4	47	18
	11	0	01	43.51	1	12	57.5	29.547 663	0.30	1.13	4	43	22
	12	0	01	42.50	1	13	07.3	29.531 830	0.30	1.13	4	39	25
	13	0	01	41.37	-1	13	17.8	29.516 098	0.30	1.13	4	35	28
	14	0	01	40.14	1	13	29.1	29.500 471	0.30	1.14	4	31	31
	15	0	01	38.78	1	13	41.0	29.484 954	0.30	1.14	4	27	33
	16	0	01	37.32	1	13	53.7	29.469 550	0.30	1.14	4	23	36
	17	0	01	35.74	1	14	07.1	29.454 265	0.30	1.14	4	19	38
	18	0	01	34.06	1	14	21.2	29.439 101	0.30	1.14	4	15	41
	19	0	01	32.26	-1	14	36.0	29.424 065	0.30	1.14	4	11	43
	20	0	01	30.36	1	14	51.5	29.409 158	0.30	1.14	4	07	45
	21	0	01	28.34	1	15	07.7	29.394 386	0.30	1.14	4	03	47
	22	0	01	26.21	1	15	24.5	29.379 753	0.30	1.14	3	59	49
	23	0	01	23.97	1	15	42.1	29.365 262	0.30	1.14	3	55	51
	24	0	01	21.62	1	16	00.5	29.350 917	0.30	1.14	3	51	53
	25	0	01	19.15	-1	16	19.5	29.336 722	0.30	1.14	3	47	54
	26	0	01	16.58	1	16	39.2	29.322 681	0.30	1.14	3	43	56
	27	0	01	13.90	1	16	59.5	29.308 799	0.30	1.14	3	39	57
	28	0	01	11.12	1	17	20.5	29.295 080	0.30	1.14	3	35	59
	29	0	01	08.23	1	17	42.1	29.281 528	0.30	1.14	3	31	60
	30	0	01	05.25	1	18	04.4	29.268 147	0.30	1.14	3	28	01
	31	0	01	02.17	-1	18	27.2	29.254 942	0.30	1.15	3	24	02
Aug.	1	0	00	58.99	1	18	50.7	29.241 918	0.30	1.15	3	20	03
	2	0	00	55.70	1	19	14.9	29.229 078	0.30	1.15	3	16	04
	3	0	00	52.32	1	19	39.6	29.216 426	0.30	1.15	3	12	04
	4	0	00	48.84	1	20	05.0	29.203 968	0.30	1.15	3	08	05
	5	0	00	45.25	1	20	30.9	29.191 707	0.30	1.15	3	04	05
	6	0	00	41.57	-1	20	57.5	29.179 646	0.30	1.15	3	00	06
	7	0	00	37.80	1	21	24.7	29.167 791	0.30	1.15	2	56	06
	8	0	00	33.93	1	21	52.4	29.156 144	0.30	1.15	2	52	06
	9	0	00	29.97	1	22	20.7	29.144 710	0.30	1.15	2	48	07
	10	0	00	25.92	1	22	49.6	29.133 491	0.30	1.15	2	44	07
	11	0	00	21.78	1	23	18.9	29.122 492	0.30	1.15	2	40	07
	12	0	00	17.56	-1	23	48.8	29.111 716	0.30	1.15	2	36	07
	13	0	00	13.27	1	24	19.1	29.101 165	0.30	1.15	2	32	06
	14	0	00	08.89	1	24	50.0	29.090 843	0.30	1.15	2	28	06
	15	0	00	04.43	1	25	21.2	29.080 753	0.30	1.15	0	14	35
	16	23	59	59.90	-1	25	53.0	29.070 898	0.30	1.15	4	26	33

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Aug.	16	23	59	59.90	-1	25	53.0	29.070 898	0.30	1.15	4	26	33
	17	23	59	55.29	1	26	25.2	29.061 280	0.30	1.15	2	16	05
	18	23	59	50.60	1	26	57.9	29.051 903	0.30	1.15	2	12	04
	19	23	59	45.84	1	27	31.0	29.042 768	0.30	1.15	2	08	04
	20	23	59	41.00	1	28	04.6	29.033 879	0.30	1.15	2	04	03
	21	23	59	36.09	1	28	38.6	29.025 238	0.30	1.15	2	00	02
	22	23	59	31.10	-1	29	13.0	29.016 847	0.30	1.15	1	56	01
	23	23	59	26.05	1	29	47.8	29.008 709	0.30	1.15	1	52	00
	24	23	59	20.94	1	30	23.0	29.000 827	0.30	1.16	1	47	59
	25	23	59	15.76	1	30	58.5	28.993 205	0.30	1.16	1	43	58
	26	23	59	10.53	1	31	34.4	28.985 843	0.30	1.16	1	39	57
	27	23	59	05.24	1	32	10.6	28.978 746	0.30	1.16	1	35	56
	28	23	58	59.89	-1	32	47.1	28.971 917	0.30	1.16	1	31	55
	29	23	58	54.49	1	33	23.9	28.965 357	0.30	1.16	1	27	53
	30	23	58	49.03	1	34	01.1	28.959 070	0.30	1.16	1	23	52
	31	23	58	43.52	1	34	38.5	28.953 057	0.30	1.16	1	19	51
Sept.	1	23	58	37.95	1	35	16.3	28.947 322	0.30	1.16	1	15	49
	2	23	58	32.34	1	35	54.3	28.941 866	0.30	1.16	1	11	48
	3	23	58	26.68	-1	36	32.6	28.936 692	0.30	1.16	1	07	46
	4	23	58	20.97	1	37	11.1	28.931 802	0.30	1.16	1	03	45
	5	23	58	15.22	1	37	49.8	28.927 196	0.30	1.16	0	59	43
	6	23	58	09.43	1	38	28.8	28.922 878	0.30	1.16	0	55	41
	7	23	58	03.61	1	39	07.9	28.918 848	0.30	1.16	0	51	40
	8	23	57	57.75	1	39	47.1	28.915 108	0.30	1.16	0	47	38
	9	23	57	51.87	-1	40	26.5	28.911 659	0.30	1.16	0	43	36
	10	23	57	45.96	1	41	06.1	28.908 502	0.30	1.16	0	39	34
	11	23	57	40.03	1	41	45.7	28.905 639	0.30	1.16	0	35	32
	12	23	57	34.07	1	42	25.4	28.903 069	0.30	1.16	0	31	31
	13	23	57	28.10	1	43	05.2	28.900 794	0.30	1.16	0	27	29
	14	23	57	22.10	1	43	45.1	28.898 814	0.30	1.16	0	23	27
	15	23	57	16.08	-1	44	25.0	28.897 130	0.30	1.16	0	19	25
	16	23	57	10.05	1	45	05.0	28.895 742	0.30	1.16	0	15	23
	17	23	57	03.99	1	45	45.1	28.894 650	0.30	1.16	0	11	21
	18	23	56	57.93	1	46	25.2	28.893 855	0.30	1.16	0	07	19
	19	23	56	51.85	1	47	05.3	28.893 357	0.30	1.16	0	03	17
	20	23	56	45.77	1	47	45.4	28.893 157	0.30	1.16	23	55	13
	21	23	56	39.68	-1	48	25.5	28.893 254	0.30	1.16	23	51	11
	22	23	56	33.60	1	49	05.5	28.893 650	0.30	1.16	23	47	09
	23	23	56	27.53	1	49	45.4	28.894 345	0.30	1.16	23	43	08
	24	23	56	21.45	1	50	25.2	28.895 339	0.30	1.16	23	39	06
	25	23	56	15.39	1	51	04.9	28.896 634	0.30	1.16	23	35	04
	26	23	56	09.32	1	51	44.6	28.898 228	0.30	1.16	23	31	02
	27	23	56	03.27	-1	52	24.1	28.900 122	0.30	1.16	23	26	60
	28	23	55	57.23	1	53	03.5	28.902 316	0.30	1.16	23	22	58
	29	23	55	51.19	1	53	42.8	28.904 810	0.30	1.16	23	18	56
	30	23	55	45.17	1	54	22.0	28.907 603	0.30	1.16	23	14	54
Oct.	1	23	55	39.17	-1	55	01.0	28.910 695	0.30	1.16	23	10	52

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RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Oct.	1	23	55	39.17	-1	55	01.0	28.910 695	0.30	1.16	23	10	52
	2	23	55	33.19	1	55	39.8	28.914 085	0.30	1.16	23	06	50
	3	23	55	27.24	1	56	18.3	28.917 773	0.30	1.16	23	02	49
	4	23	55	21.31	1	56	56.7	28.921 757	0.30	1.16	22	58	47
	5	23	55	15.41	1	57	34.8	28.926 036	0.30	1.16	22	54	45
	6	23	55	09.55	1	58	12.6	28.930 609	0.30	1.16	22	50	43
	7	23	55	03.73	-1	58	50.1	28.935 474	0.30	1.16	22	46	42
	8	23	54	57.94	1	59	27.3	28.940 631	0.30	1.16	22	42	40
	9	23	54	52.20	2	00	04.2	28.946 077	0.30	1.16	22	38	39
	10	23	54	46.50	2	00	40.7	28.951 810	0.30	1.16	22	34	37
	11	23	54	40.84	2	01	16.9	28.957 828	0.30	1.16	22	30	36
	12	23	54	35.23	2	01	52.8	28.964 130	0.30	1.16	22	26	34
	13	23	54	29.66	-2	02	28.3	28.970 713	0.30	1.16	22	22	33
	14	23	54	24.14	2	03	03.5	28.977 575	0.30	1.16	22	18	31
	15	23	54	18.67	2	03	38.3	28.984 713	0.30	1.16	22	14	30
	16	23	54	13.25	2	04	12.7	28.992 126	0.30	1.16	22	10	29
	17	23	54	07.89	2	04	46.6	28.999 811	0.30	1.16	22	06	28
	18	23	54	02.59	2	05	20.2	29.007 766	0.30	1.15	22	02	26
	19	23	53	57.35	-2	05	53.2	29.015 990	0.30	1.15	21	58	25
	20	23	53	52.18	2	06	25.8	29.024 478	0.30	1.15	21	54	24
	21	23	53	47.08	2	06	57.9	29.033 231	0.30	1.15	21	50	23
	22	23	53	42.05	2	07	29.5	29.042 245	0.30	1.15	21	46	23
	23	23	53	37.08	2	08	00.7	29.051 519	0.30	1.15	21	42	22
	24	23	53	32.18	2	08	31.3	29.061 049	0.30	1.15	21	38	21
	25	23	53	27.36	-2	09	01.5	29.070 834	0.30	1.15	21	34	20
	26	23	53	22.60	2	09	31.1	29.080 870	0.30	1.15	21	30	20
	27	23	53	17.92	2	10	00.2	29.091 155	0.30	1.15	21	26	19
	28	23	53	13.31	2	10	28.8	29.101 685	0.30	1.15	21	22	19
	29	23	53	08.79	2	10	56.8	29.112 459	0.30	1.15	21	18	19
	30	23	53	04.34	2	11	24.2	29.123 472	0.30	1.15	21	14	18
	31	23	52	59.99	-2	11	51.0	29.134 720	0.30	1.15	21	10	18
Nov.	1	23	52	55.72	2	12	17.2	29.146 201	0.30	1.15	21	06	18
	2	23	52	51.54	2	12	42.8	29.157 911	0.30	1.15	21	02	18
	3	23	52	47.46	2	13	07.8	29.169 846	0.30	1.15	20	58	18
	4	23	52	43.47	2	13	32.0	29.182 002	0.30	1.15	20	54	19
	5	23	52	39.58	2	13	55.6	29.194 374	0.30	1.15	20	50	19
	6	23	52	35.78	-2	14	18.6	29.206 960	0.30	1.15	20	46	19
	7	23	52	32.08	2	14	40.8	29.219 754	0.30	1.15	20	42	20
	8	23	52	28.48	2	15	02.4	29.232 752	0.30	1.15	20	38	20
	9	23	52	24.98	2	15	23.4	29.245 951	0.30	1.15	20	34	21
	10	23	52	21.58	2	15	43.6	29.259 344	0.30	1.14	20	30	22
	11	23	52	18.27	2	16	03.2	29.272 929	0.30	1.14	20	26	23
	12	23	52	15.07	-2	16	22.1	29.286 701	0.30	1.14	20	22	24
	13	23	52	11.98	2	16	40.2	29.300 654	0.30	1.14	20	18	25
	14	23	52	08.99	2	16	57.7	29.314 786	0.30	1.14	20	14	26
	15	23	52	06.11	2	17	14.3	29.329 091	0.30	1.14	20	10	27
	16	23	52	03.35	-2	17	30.3	29.343 566	0.30	1.14	20	06	29

NEPTUNE, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Apparent Declination			True Distance from the Earth	Hor. Parallax	Semi Diameter	Ephemeris Transit		
		h	m	s	°	'	"		"	"	h	m	s
Nov.	16	23	52	03.35	-2	17	30.3	29.343 566	0.30	1.14	20	06	29
	17	23	52	00.70	2	17	45.4	29.358 206	0.30	1.14	20	02	30
	18	23	51	58.17	2	17	59.8	29.373 007	0.30	1.14	19	58	32
	19	23	51	55.74	2	18	13.4	29.387 965	0.30	1.14	19	54	34
	20	23	51	53.43	2	18	26.3	29.403 076	0.30	1.14	19	50	36
	21	23	51	51.23	2	18	38.4	29.418 336	0.30	1.14	19	46	38
	22	23	51	49.15	-2	18	49.8	29.433 740	0.30	1.14	19	42	40
	23	23	51	47.18	2	19	00.4	29.449 283	0.30	1.14	19	38	42
	24	23	51	45.32	2	19	10.2	29.464 961	0.30	1.14	19	34	44
	25	23	51	43.58	2	19	19.3	29.480 768	0.30	1.14	19	30	47
	26	23	51	41.96	2	19	27.5	29.496 701	0.30	1.14	19	26	49
	27	23	51	40.46	2	19	35.0	29.512 753	0.30	1.14	19	22	52
	28	23	51	39.08	-2	19	41.6	29.528 921	0.30	1.13	19	18	55
	29	23	51	37.83	2	19	47.4	29.545 198	0.30	1.13	19	14	58
	30	23	51	36.71	2	19	52.4	29.561 580	0.30	1.13	19	11	01
Dec.	1	23	51	35.71	2	19	56.5	29.578 060	0.30	1.13	19	07	04
	2	23	51	34.84	2	19	59.8	29.594 635	0.30	1.13	19	03	07
	3	23	51	34.10	2	20	02.3	29.611 297	0.30	1.13	18	59	11
	4	23	51	33.48	-2	20	03.9	29.628 042	0.30	1.13	18	55	14
	5	23	51	32.99	2	20	04.7	29.644 864	0.30	1.13	18	51	18
	6	23	51	32.62	2	20	04.7	29.661 758	0.30	1.13	18	47	22
	7	23	51	32.38	2	20	03.8	29.678 717	0.30	1.13	18	43	26
	8	23	51	32.26	2	20	02.2	29.695 737	0.30	1.13	18	39	30
	9	23	51	32.26	2	19	59.7	29.712 812	0.30	1.13	18	35	34
	10	23	51	32.39	-2	19	56.4	29.729 936	0.30	1.13	18	31	38
	11	23	51	32.65	2	19	52.3	29.747 104	0.30	1.13	18	27	43
	12	23	51	33.04	2	19	47.3	29.764 311	0.30	1.13	18	23	47
	13	23	51	33.56	2	19	41.5	29.781 552	0.30	1.12	18	19	52
	14	23	51	34.21	2	19	34.8	29.798 822	0.30	1.12	18	15	57
	15	23	51	35.00	2	19	27.2	29.816 115	0.29	1.12	18	12	02
	16	23	51	35.91	-2	19	18.8	29.833 428	0.29	1.12	18	08	07
	17	23	51	36.95	2	19	09.6	29.850 754	0.29	1.12	18	04	12
	18	23	51	38.11	2	18	59.6	29.868 090	0.29	1.12	18	00	18
	19	23	51	39.40	2	18	48.8	29.885 430	0.29	1.12	17	56	23
	20	23	51	40.81	2	18	37.2	29.902 769	0.29	1.12	17	52	29
	21	23	51	42.35	2	18	24.8	29.920 101	0.29	1.12	17	48	34
	22	23	51	44.01	-2	18	11.6	29.937 423	0.29	1.12	17	44	40
	23	23	51	45.79	2	17	57.6	29.954 728	0.29	1.12	17	40	46
	24	23	51	47.70	2	17	42.7	29.972 011	0.29	1.12	17	36	52
	25	23	51	49.74	2	17	27.1	29.989 267	0.29	1.12	17	32	58
	26	23	51	51.91	2	17	10.6	30.006 490	0.29	1.12	17	29	05
	27	23	51	54.21	2	16	53.3	30.023 675	0.29	1.12	17	25	11
	28	23	51	56.63	-2	16	35.1	30.040 817	0.29	1.12	17	21	18
	29	23	51	59.18	2	16	16.2	30.057 910	0.29	1.11	17	17	24
	30	23	52	01.86	2	15	56.4	30.074 949	0.29	1.11	17	13	31
	31	23	52	04.66	2	15	35.9	30.091 928	0.29	1.11	17	09	38
	32	23	52	07.59	-2	15	14.5	30.108 841	0.29	1.11	17	05	45

PLUTO, 2024
HELIOCENTRIC POSITIONS FOR 0^h TERRESTRIAL TIME
MEAN EQUINOX AND ECLIPTIC OF DATE

Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector	Date		Heliocentric Longitude			Heliocentric Latitude			Radius Vector
		°	'	"	°	'	"				°	'	"	°	'	"	
Jan.	1	299	54	00.3	-2	50	27.5	34.922 77	July	4	300	46	33.4	-3	06	16.9	35.047 98
	6	299	55	25.8	2	50	53.3	34.926 14		9	300	47	58.3	3	06	42.4	35.051 38
	11	299	56	51.3	2	51	19.1	34.929 52		14	300	49	23.2	3	07	07.9	35.054 77
	16	299	58	16.8	2	51	44.8	34.932 90		19	300	50	48.1	3	07	33.4	35.058 16
	21	299	59	42.3	2	52	10.6	34.936 27		24	300	52	12.9	3	07	58.9	35.061 56
	26	300	01	07.7	2	52	36.4	34.939 65		29	300	53	37.7	3	08	24.4	35.064 95
	31	300	02	33.2	-2	53	02.1	34.943 03	Aug.	3	300	55	02.6	-3	08	49.9	35.068 35
Feb.	5	300	03	58.6	2	53	27.8	34.946 41		8	300	56	27.3	3	09	15.4	35.071 74
	10	300	05	24.0	2	53	53.6	34.949 79		13	300	57	52.1	3	09	40.9	35.075 14
	15	300	06	49.4	2	54	19.3	34.953 17		18	300	59	16.9	3	10	06.4	35.078 54
	20	300	08	14.8	2	54	45.0	34.956 55		23	301	00	41.6	3	10	31.8	35.081 93
	25	300	09	40.1	2	55	10.7	34.959 93		28	301	02	06.4	3	10	57.3	35.085 33
Mar.	1	300	11	05.5	-2	55	36.5	34.963 31	Sept.	2	301	03	31.1	-3	11	22.7	35.088 73
	6	300	12	30.8	2	56	02.2	34.966 69		7	301	04	55.8	3	11	48.2	35.092 13
	11	300	13	56.1	2	56	27.8	34.970 08		12	301	06	20.5	3	12	13.6	35.095 52
	16	300	15	21.4	2	56	53.5	34.973 46		17	301	07	45.2	3	12	39.1	35.098 92
	21	300	16	46.6	2	57	19.2	34.976 84		22	301	09	09.8	3	13	04.5	35.102 32
	26	300	18	11.9	2	57	44.9	34.980 22		27	301	10	34.5	3	13	29.9	35.105 72
	31	300	19	37.1	-2	58	10.5	34.983 61	Oct.	2	301	11	59.1	-3	13	55.3	35.109 12
Apr.	5	300	21	02.3	2	58	36.2	34.986 99		7	301	13	23.7	3	14	20.7	35.112 53
	10	300	22	27.5	2	59	01.9	34.990 38		12	301	14	48.3	3	14	46.1	35.115 93
	15	300	23	52.7	2	59	27.5	34.993 76		17	301	16	12.8	3	15	11.5	35.119 33
	20	300	25	17.9	2	59	53.1	34.997 15		22	301	17	37.4	3	15	36.9	35.122 73
	25	300	26	43.0	3	00	18.8	35.000 53		27	301	19	01.9	3	16	02.3	35.126 13
	30	300	28	08.2	-3	00	44.4	35.003 92	Nov.	1	301	20	26.4	-3	16	27.6	35.129 54
May	5	300	29	33.3	3	01	10.0	35.007 31		6	301	21	50.9	3	16	53.0	35.132 94
	10	300	30	58.4	3	01	35.6	35.010 69		11	301	23	15.4	3	17	18.3	35.136 35
	15	300	32	23.5	3	02	01.2	35.014 08		16	301	24	39.9	3	17	43.7	35.139 75
	20	300	33	48.5	3	02	26.8	35.017 47		21	301	26	04.4	3	18	09.0	35.143 15
	25	300	35	13.6	3	02	52.4	35.020 86		26	301	27	28.8	3	18	34.4	35.146 56
	30	300	36	38.6	-3	03	18.0	35.024 25	Dec.	1	301	28	53.2	-3	18	59.7	35.149 97
June	4	300	38	03.7	3	03	43.5	35.027 64		6	301	30	17.6	3	19	25.0	35.153 37
	9	300	39	28.7	3	04	09.1	35.031 03		11	301	31	42.0	3	19	50.3	35.156 78
	14	300	40	53.6	3	04	34.7	35.034 42		16	301	33	06.4	3	20	15.6	35.160 19
	19	300	42	18.6	3	05	00.2	35.037 81		21	301	34	30.7	3	20	40.9	35.163 59
	24	300	43	43.6	3	05	25.8	35.041 20		26	301	35	55.1	3	21	06.2	35.167 00
	29	300	45	08.5	-3	05	51.3	35.044 59		31	301	37	19.4	-3	21	31.5	35.170 41
July	4	300	46	33.4	-3	06	16.9	35.047 98		36	301	38	43.7	-3	21	56.8	35.173 82

N.B: Pluto is now classified as a dwarf planet as per resolution of IAU

PLUTO, 2024

GEOCENTRIC LONGITUDE AND LATITUDE FOR 0^h TERRESTRIAL TIME

Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude			Date		Apparent Geocentric Longitude			Apparent Geocentric Latitude		
		°	'	"	°	'	"			°	'	"	°	'	"
Jan.	1	299	21	27.9	-2	46	02.6	July	4	301	18	55.8	-3	11	31.4
	6	299	30	52.4	2	46	20.7		9	301	12	11.9	3	12	05.7
	11	299	40	28.3	2	46	40.7		14	301	05	16.1	3	12	37.7
	16	299	50	10.7	2	47	02.7		19	300	58	14.0	3	13	07.2
	21	299	59	55.8	2	47	26.8		24	300	51	08.8	3	13	34.2
	26	300	09	41.0	2	47	52.8		29	300	44	03.2	3	13	58.8
	31	300	19	21.7	-2	48	20.9	Aug.	3	300	37	02.8	-3	14	20.8
Feb.	5	300	28	55.5	2	48	51.1		8	300	30	09.8	3	14	40.4
	10	300	38	19.4	2	49	23.3		13	300	23	29.0	3	14	57.5
	15	300	47	28.2	2	49	57.5		18	300	17	04.9	3	15	12.2
	20	300	56	20.1	2	50	33.7		23	300	10	59.5	3	15	24.6
	25	301	04	51.0	2	51	11.7		28	300	05	17.0	3	15	34.8
Mar.	1	301	12	58.1	-2	51	51.6	Sept.	2	300	00	00.4	-3	15	42.9
	6	301	20	39.9	2	52	33.2		7	299	55	12.2	3	15	49.0
	11	301	27	52.4	2	53	16.5		12	299	50	56.6	3	15	53.4
	16	301	34	33.0	2	54	01.2		17	299	47	15.6	3	15	56.1
	21	301	40	40.2	2	54	47.5		22	299	44	10.4	3	15	57.3
	26	301	46	10.8	2	55	35.0		27	299	41	44.4	3	15	57.3
	31	301	51	04.3	-2	56	23.6	Oct.	2	299	39	57.7	-3	15	56.2
Apr.	5	301	55	19.3	2	57	13.3		7	299	38	52.7	3	15	54.2
	10	301	58	53.0	2	58	03.7		12	299	38	31.1	3	15	51.5
	15	302	01	45.7	2	58	54.9		17	299	38	51.9	3	15	48.4
	20	302	03	55.7	2	59	46.5		22	299	39	56.6	3	15	45.1
	25	302	05	22.7	3	00	38.5		27	299	41	44.6	3	15	41.8
	30	302	06	08.1	-3	01	30.6	Nov.	1	299	44	15.2	-3	15	38.6
May	5	302	06	10.2	3	02	22.6		6	299	47	29.2	3	15	35.9
	10	302	05	30.1	3	03	14.3		11	299	51	24.9	3	15	33.7
	15	302	04	08.8	3	04	05.6		16	299	56	00.4	3	15	32.4
	20	302	02	06.3	3	04	56.2		21	300	01	15.4	3	15	32.0
	25	301	59	25.6	3	05	46.0		26	300	07	06.5	3	15	32.9
	30	301	56	08.1	-3	06	34.7	Dec.	1	300	13	32.9	-3	15	35.1
June	4	301	52	14.3	3	07	22.2		6	300	20	32.7	3	15	38.7
	9	301	47	48.2	3	08	08.2		11	300	28	01.8	3	15	44.1
	14	301	42	50.8	3	08	52.7		16	300	35	58.8	3	15	51.2
	19	301	37	25.6	3	09	35.4		21	300	44	20.0	3	16	00.3
	24	301	31	36.6	3	10	16.1		26	300	53	02.1	3	16	11.4
	29	301	25	25.3	-3	10	54.9		31	301	02	03.4	-3	16	24.6
July	4	301	18	55.8	-3	11	31.4		36	301	11	19.5	-3	16	40.0

N.B : Pluto is now classified as a dwarf planet as per resolution of I.A.U

PLUTO, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Red. To Astrom. (J 2000.0)	Apparent Declination			Red. To Astrom. (J 2000.0)	True Distance from the Earth	Hor. Parallax	Ephemeris Transit	
		h	m	s	s	°	'	"	"		"	h	m
Jan.	1	20	08	32.80	+83.71	-22	59	24.7	-242.17	35.848 082	0.25	13	26
	6	20	09	12.98	83.67	22	57	42.7	243.40	35.876 660	0.25	13	07
	11	20	09	53.97	83.70	22	55	59.4	244.95	35.898 103	0.24	12	48
	16	20	10	35.44	83.73	22	54	16.5	246.11	35.912 253	0.24	12	29
	21	20	11	17.11	83.73	22	52	34.2	247.49	35.919 053	0.24	12	10
	26	20	11	58.81	83.78	22	50	53.2	249.08	35.918 531	-0.24	11	51
	31	20	12	40.21	+83.80	-22	49	14.7	-250.34	35.910 736	0.24	11	32
Feb.	5	20	13	21.13	83.83	22	47	39.0	251.91	35.895 742	0.24	11	13
	10	20	14	01.38	83.93	22	46	07.0	253.37	35.873 656	0.25	10	54
	15	20	14	40.58	83.96	22	44	39.7	254.68	35.844 662	0.25	10	35
	20	20	15	18.60	84.06	22	43	17.4	256.31	35.809 046	0.25	10	16
	25	20	15	55.18	84.14	22	42	01.4	257.57	35.767 135	0.25	9	57
Mar.	1	20	16	30.09	+84.19	-22	40	51.8	-258.90	35.719 261	0.25	9	38
	6	20	17	03.24	84.31	22	39	49.0	260.45	35.665 773	0.25	9	19
	11	20	17	34.35	84.42	22	38	54.4	261.58	35.607 064	0.25	9	00
	16	20	18	03.23	84.52	22	38	07.7	263.03	35.543 607	0.25	8	40
	21	20	18	29.79	84.67	22	37	30.0	264.32	35.475 938	0.25	8	21
	26	20	18	53.80	84.77	22	37	01.5	265.34	35.404 586	0.25	8	02
	31	20	19	15.21	+84.90	-22	36	42.1	-266.65	35.330 074	0.25	7	43
Apr.	5	20	19	33.93	85.07	22	36	32.6	267.73	35.252 932	0.25	7	23
	10	20	19	49.76	85.19	22	36	33.0	268.67	35.173 732	0.25	7	04
	15	20	20	02.74	85.38	22	36	43.3	269.86	35.093 112	0.25	6	44
	20	20	20	12.71	85.54	22	37	04.0	270.57	35.011 710	0.25	6	25
	25	20	20	19.68	85.67	22	37	34.5	271.38	34.930 126	0.25	6	05
	30	20	20	23.72	+85.87	-22	38	14.7	-272.28	34.848 939	0.25	5	46
May	5	20	20	24.74	86.05	22	39	04.9	272.71	34.768 729	0.25	5	26
	10	20	20	22.77	86.22	22	40	04.2	273.43	34.690 116	0.25	5	06
	15	20	20	17.91	86.43	22	41	12.7	273.88	34.613 735	0.25	4	47
	20	20	20	10.14	86.59	22	42	30.0	274.06	34.540 168	0.25	4	27
	25	20	19	59.67	86.77	22	43	54.9	274.46	34.469 947	0.26	4	07
	30	20	19	46.59	+86.99	-22	45	27.4	-274.55	34.403 565	0.26	3	47
June	4	20	19	30.94	87.14	22	47	06.8	274.50	34.341 523	0.26	3	27
	9	20	19	12.99	87.35	22	48	52.0	274.63	34.284 335	0.26	3	07
	14	20	18	52.80	87.52	22	50	42.8	274.25	34.232 471	0.26	2	47
	19	20	18	30.62	87.66	22	52	37.9	273.97	34.186 324	0.26	2	27
	24	20	18	06.72	87.86	22	54	36.4	273.73	34.146 221	0.26	2	07
	29	20	17	41.21	+88.00	-22	56	37.9	-273.03	34.112 459	0.26	1	47
July	4	20	17	14.37	88.15	22	58	40.8	272.64	34.085 335	0.26	1	27
	9	20	16	46.46	88.31	23	00	44.8	271.94	34.065 122	0.26	1	07
	14	20	16	17.67	88.40	23	02	48.9	271.04	34.052 004	0.26	0	47
	19	20	15	48.37	88.52	23	04	51.5	270.41	34.046 083	0.26	0	27
	24	20	15	18.82	88.65	23	06	52.3	269.45	34.047 399	0.26	0	06
	29	20	14	49.18	+88.71	-23	08	50.3	-268.51	34.055 975	0.26	23	42
Aug.	3	20	14	19.84	88.82	23	10	44.5	267.71	34.071 825	0.26	23	22
	8	20	13	50.99	88.87	23	12	34.5	266.53	34.094 893	0.26	23	02
	13	20	13	22.93	88.89	23	14	19.0	265.57	34.125 026	0.26	22	42
	18	20	12	56.02	+88.96	-23	15	57.2	-264.70	34.162 002	0.26	22	22

N.B: Pluto is now classified as a dwarf planet as per resolution of I A U

PLUTO, 2024

RIGHT ASCENSION AND DECLINATION FOR 0^h TERRESTRIAL TIME

Date		Apparent Right Ascension			Red. To Astrom. (J 2000.0)	Apparent Declination			Red. To Astrom. (J 2000.0)	True Distance from the Earth	Hor. Parallax	Ephemeris Transit	
		h	m	s	s	°	'	"	"		"	h	m
Aug.	18	20	12	56.02	+88.96	-23	15	57.2	-264.70	34.162 002	0.26	22	22
	23	20	12	30.37	88.97	23	17	29.1	263.51	34.205 561	0.26	22	02
	28	20	12	06.30	88.98	23	18	53.3	262.76	34.255 443	0.26	21	42
Sept.	2	20	11	44.04	89.00	23	20	09.9	261.75	34.311 353	0.26	21	22
	7	20	11	23.73	88.94	23	21	18.2	260.74	34.372 913	0.26	21	02
	12	20	11	05.71	88.91	23	22	17.4	260.10	34.439 671	0.26	20	42
	17	20	10	50.10	+88.89	-23	23	07.8	-259.22	34.511 130	0.25	20	22
	22	20	10	37.01	88.82	23	23	48.7	258.59	34.586 796	0.25	20	02
	27	20	10	26.66	88.79	23	24	20.0	258.14	34.666 184	0.25	19	42
Oct.	2	20	10	19.09	88.70	23	24	41.9	257.44	34.748 755	0.25	19	22
	7	20	10	14.45	88.60	23	24	53.7	257.13	34.833 907	0.25	19	03
	12	20	10	12.88	88.55	23	24	55.7	256.94	34.921 001	0.25	18	43
	17	20	10	14.31	+88.45	-23	24	48.3	-256.59	35.009 399	0.25	18	23
	22	20	10	18.83	88.38	23	24	30.9	256.80	35.098 500	0.25	18	04
	27	20	10	26.43	88.31	23	24	04.6	256.75	35.187 711	0.25	17	44
Nov.	1	20	10	37.04	88.18	23	23	29.1	256.85	35.276 390	0.25	17	25
	6	20	10	50.74	88.10	23	22	44.5	257.33	35.363 872	0.25	17	05
	11	20	11	07.40	88.03	23	21	51.8	257.61	35.449 501	0.25	16	46
	16	20	11	26.88	+87.93	-23	20	50.9	-258.20	35.532 671	0.25	16	27
	21	20	11	49.16	87.89	23	19	42.4	258.97	35.612 832	0.25	16	07
	26	20	12	14.02	87.80	23	18	27.2	259.52	35.689 433	0.25	15	48
Dec.	1	20	12	41.37	87.72	23	17	05.2	260.47	35.761 910	0.25	15	29
	6	20	13	11.12	87.69	23	15	37.2	261.45	35.829 713	0.25	15	10
	11	20	13	42.94	87.61	23	14	04.2	262.30	35.892 351	0.25	14	51
	16	20	14	16.75	+87.59	-23	12	26.3	-263.65	35.949 415	0.24	14	31
	21	20	14	52.30	87.57	23	10	44.8	264.68	36.000 550	0.24	14	12
	26	20	15	29.33	87.51	23	09	00.1	265.85	36.045 401	0.24	13	53
	31	20	16	07.74	87.50	23	07	12.6	267.32	36.083 633	0.24	13	34
	36	20	16	47.22	+87.50	-23	05	23.8	-268.48	36.114 965	0.24	13	15

N.B: Pluto is now classified as a dwarf planet as per resolution of I A U

MAJOR PLANETS, 2024

HELIOCENTRIC OSCULATING ORBITAL ELEMENTS
REFERRED TO THE MEAN ECLIPTIC AND EQUINOX OF J 2000.0

Date	Julian Date 246	Inclina-tion i	Longitude Asc. Node q	Longitude Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
				MERCURY				
		°	°	°		°		°
Dec'23 2	0280.5	7.0036	48.301	77.49411305	0.387 097	4.092 36	0.205 637	0.8749
Jan'24 11	0320.5	7.0036	48.301	77.49428702	0.387 101	4.092 30	0.205 637	164.5675
Feb 20	0360.5	7.0035	48.301	77.494461	0.387 099	4.092 33	0.205 637	328.2599
Mar 31	0400.5	7.0035	48.300	77.49463497	0.387 097	4.092 37	0.205 637	131.9549
May 10	0440.5	7.0035	48.300	77.49480894	0.387 101	4.092 30	0.205 637	295.6472
Jun 19	0480.5	7.0035	48.300	77.49498291	0.387 093	4.092 43	0.205 637	99.3426
Jul 29	0520.5	7.0035	48.300	77.49515688	0.387 101	4.092 30	0.205 637	263.0364
Sep 7	0560.5	7.0035	48.300	77.49533085	0.387 093	4.092 42	0.205 637	66.7304
Oct 17	0600.5	7.0035	48.300	77.49550483	0.387 100	4.092 32	0.205 637	230.4248
Nov 26	0640.5	7.0035	48.300	77.4956788	0.387 097	4.092 37	0.205 637	34.1177
Jan'25 5	0680.5	7.0035	48.300	77.49585277	0.387 100	4.092 32	0.205 637	197.8115
Feb'25 14	0720.5	7.0035	48.299	77.49602674	0.387 099	4.092 33	0.205 637	1.5038
				VENUS				
Dec'23 2	0280.5	3.3945	76.613	131.5647896	0.723 336	1.602 12	0.006 760	137.3859
Jan'24 11	0320.5	3.3945	76.613	131.5647942	0.723 306	1.602 22	0.006 760	201.4728
Feb 20	0360.5	3.3945	76.613	131.5647989	0.723 302	1.602 23	0.006 760	265.5631
Mar 31	0400.5	3.3945	76.613	131.5648035	0.723 328	1.602 14	0.006 760	329.6517
May 10	0440.5	3.3945	76.612	131.5648081	0.723 350	1.602 07	0.006 760	33.7350
Jun 19	0480.5	3.3945	76.612	131.5648127	0.723 354	1.602 06	0.006 760	97.8151
Jul 29	0520.5	3.3944	76.612	131.5648173	0.723 332	1.602 13	0.006 760	161.8980
Sep 7	0560.5	3.3944	76.611	131.5648218	0.723 302	1.602 23	0.006 760	225.9864
Oct 17	0600.5	3.3944	76.611	131.5648264	0.723 304	1.602 22	0.006 760	290.0767
Nov 26	0640.5	3.3944	76.611	131.564831	0.723 332	1.602 13	0.006 760	354.1639
Jan'25 5	0680.5	3.3944	76.610	131.5648356	0.723 346	1.602 09	0.006 760	58.2470
Feb'25 14	0720.5	3.3944	76.610	131.5648402	0.723 342	1.602 10	0.006 760	122.3294
				EARTH*				
Dec'23 2	0280.5	0.0031	174.816	103.0145029	1.000 004	0.985 60	0.016 699	70.2522
Jan'24 11	0320.5	0.0031	174.815	103.0148562	1.000 006	0.985 60	0.016 699	109.6768
Feb 20	0360.5	0.0032	174.815	103.0152095	1.000 004	0.985 60	0.016 698	149.1010
Mar 31	0400.5	0.0032	174.815	103.0155629	0.999 994	0.985 62	0.016 698	188.5254
May 10	0440.5	0.0032	174.814	103.0159162	0.999 987	0.985 63	0.016 698	227.9500
Jun 19	0480.5	0.0032	174.814	103.0162695	0.999 993	0.985 62	0.016 698	267.3744
Jul 29	0520.5	0.0032	174.814	103.0166229	1.000 005	0.985 60	0.016 698	306.7979
Sep 7	0560.5	0.0032	174.814	103.0169762	1.000 007	0.985 60	0.016 698	346.2211
Oct 17	0600.5	0.0032	174.813	103.0173295	0.999 999	0.985 61	0.016 698	25.6451
Nov 26	0640.5	0.0033	174.813	103.0176829	0.999 996	0.985 61	0.016 698	65.0702
Jan'25 5	0680.5	0.0033	174.813	103.0180362	1.000 011	0.985 59	0.016 698	104.4950
Feb'25 14	0720.5	0.0033	174.813	103.0183895	1.000 027	0.985 57	0.016 698	143.9184

* Values labelled for the Earth are actually for the Earth/ Moon barycenter

FORMULAS

Mean anomaly, $M = L - \varpi$

Argument of perihelion, measured from node, $\omega = \varpi$ - q

True anomaly, $\nu = M + (2e - e^3/4)\sin M + (5e^2/4)\sin 2M + (13\,e^3/12)\sin 3M$ +é . in radians

True distance, $r = a\,(1 - e^2)/(1 + e\cos\nu)$

Heliocentric rectangular co- ordinates, referred to the ecliptic of date, may be computed from:

$x = r\{\cos(\nu + \omega)\cos$ q $- \sin(\nu + \omega)\cos i\,\sin$ q $\}$

$y = r\{\cos(\nu + \omega)\sin$ q $+ \sin(\nu + \omega)\cos i\,\cos$ q $\}$

$z = r\sin(\nu + \omega)\sin i$

MAJOR PLANETS, 2024

HELIOCENTRIC OSCULATING ORBITAL ELEMENTS
REFERRED TO THE MEAN ECLIPTIC AND EQUINOX OF J 2000.0

Date		Julian Date 246	Inclination i	Longitude Asc. Node q	Longitude Perihelion ϖ	Mean Distance a	Daily Motion n	Eccentricity e	Mean Longitude L
					MARS				
			°	°	°		°		°
Dec'23	2	0280.5	1.8478	49.487	336.1663898	1.523 608	0.524 08	0.093 422	253.1456
Jan'24	11	0320.5	1.8478	49.487	336.1668758	1.523 684	0.524 04	0.093 422	274.1071
Feb	20	0360.5	1.8478	49.487	336.1673618	1.523 757	0.524 00	0.093 422	295.0665
Mar	31	0400.5	1.8477	49.487	336.1678479	1.523 809	0.523 97	0.093 423	316.0243
May	10	0440.5	1.8477	49.486	336.1683339	1.523 830	0.523 96	0.093 423	336.9813
Jun	19	0480.5	1.8477	49.486	336.16882	1.523 820	0.523 97	0.093 423	357.9384
Jul	29	0520.5	1.8477	49.486	336.169306	1.523 788	0.523 98	0.093 423	18.8966
Sep	7	0560.5	1.8477	49.485	336.1697921	1.523 750	0.524 00	0.093 423	39.8563
Oct	17	0600.5	1.8477	49.485	336.1702781	1.523 720	0.524 02	0.093 423	60.8172
Nov	26	0640.5	1.8477	49.485	336.1707641	1.523 708	0.524 02	0.093 423	81.7789
Jan'25	5	0680.5	1.8477	49.484	336.1712502	1.523 713	0.524 02	0.093 423	102.7406
Feb'25	14	0720.5	1.8477	49.484	336.1717362	1.523 726	0.524 02	0.093 423	123.7019
					JUPITER				
Dec'23	2	0280.5	1.3028	100.507	14.38279322	5.204 036	0.083 06	0.048 537	40.2222
Jan'24	11	0320.5	1.3028	100.507	14.38302962	5.204 109	0.083 06	0.048 537	43.5435
Feb	20	0360.5	1.3028	100.507	14.38326603	5.204 174	0.083 06	0.048 537	46.8648
Mar	31	0400.5	1.3028	100.507	14.38350244	5.204 230	0.083 06	0.048 537	50.1859
May	10	0440.5	1.3028	100.508	14.38373885	5.204 279	0.083 06	0.048 538	53.5070
Jun	19	0480.5	1.3028	100.508	14.38397526	5.204 318	0.083 05	0.048 538	56.8280
Jul	29	0520.5	1.3028	100.508	14.38421167	5.204 349	0.083 05	0.048 538	60.1489
Sep	7	0560.5	1.3028	100.508	14.38444809	5.204 370	0.083 05	0.048 538	63.4698
Oct	17	0600.5	1.3028	100.508	14.3846845	5.204 382	0.083 05	0.048 538	66.7907
Nov	26	0640.5	1.3028	100.508	14.38492092	5.204 385	0.083 05	0.048 539	70.1116
Jan'25	5	0680.5	1.3028	100.509	14.38515734	5.204 379	0.083 05	0.048 539	73.4324
Feb'25	14	0720.5	1.3028	100.509	14.38539376	5.204 363	0.083 05	0.048 539	76.7533
					SATURN				
Dec'23	2	0280.5	2.4895	113.604	93.19276459	9.533 892	0.033 49	0.055 465	342.4018
Jan'24	11	0320.5	2.4895	113.604	93.19338531	9.533 759	0.033 49	0.055 465	343.7438
Feb	20	0360.5	2.4895	113.604	93.19400603	9.533 631	0.033 49	0.055 464	345.0858
Mar	31	0400.5	2.4895	113.603	93.19462675	9.533 509	0.033 49	0.055 464	346.4279
May	10	0440.5	2.4895	113.603	93.19524747	9.533 392	0.033 49	0.055 464	347.7699
Jun	19	0480.5	2.4895	113.603	93.1958682	9.533 281	0.033 49	0.055 463	349.1119
Jul	29	0520.5	2.4895	113.602	93.19648892	9.533 178	0.033 49	0.055 463	350.4538
Sep	7	0560.5	2.4895	113.602	93.19710965	9.533 081	0.033 49	0.055 463	351.7958
Oct	17	0600.5	2.4895	113.602	93.19773038	9.532 993	0.033 49	0.055 462	353.1377
Nov	26	0640.5	2.4895	113.602	93.19835111	9.532 912	0.033 49	0.055 462	354.4796
Jan'25	5	0680.5	2.4895	113.601	93.19897184	9.532 839	0.033 49	0.055 461	355.8214
Feb'25	14	0720.5	2.4895	113.601	93.19959257	9.532 775	0.033 49	0.055 461	357.1632
					URANUS				
Oct'23	23	0240.5	0.7728	74.024	173.0265504	19.174 614	0.011 74	0.046 375	55.0491
Jan'24	11	0320.5	0.7728	74.024	173.0267459	19.174 371	0.011 74	0.046 375	55.9881
Mar	31	0400.5	0.7728	74.024	173.0269414	19.174 084	0.011 74	0.046 375	56.9272
Jun	19	0480.5	0.7728	74.024	173.027137	19.173 753	0.011 74	0.046 375	57.8664
Sep	7	0560.5	0.7728	74.024	173.0273325	19.173 378	0.011 74	0.046 374	58.8056
Nov	26	0640.5	0.7728	74.024	173.0275281	19.172 959	0.011 74	0.046 374	59.7450
Feb'25	14	0720.5	0.7728	74.025	173.0277236	19.172 496	0.011 74	0.046 374	60.6845
					NEPTUNE				
Oct'23	23	0240.5	1.77001	131.783	48.12722831	30.082 976	0.005 97	0.009 457	357.0058
Jan'24	11	0320.5	1.77001	131.783	48.12729232	30.082 856	0.005 97	0.009 457	357.4851
Mar	31	0400.5	1.77001	131.783	48.12735633	30.082 692	0.005 97	0.009 457	357.9644
Jun	19	0480.5	1.77001	131.783	48.12742033	30.082 490	0.005 97	0.009 457	358.4435
Sep	7	0560.5	1.77001	131.783	48.12748434	30.082 253	0.005 97	0.009 457	358.9225
Nov	26	0640.5	1.77001	131.783	48.12754835	30.081 988	0.005 97	0.009 457	359.4014
Feb'25	14	0720.5	1.77001	131.783	48.12761236	30.081 701	0.005 97	0.009 457	359.8802

Distances are in astronomical units.

CENTRE OF MASS OF THE SOLAR SYSTEM, 2024

HELIOCENTRIC RECTANGULAR CO-ORDINATES
EQUATORIAL RECTANGULAR CO-ORDINATES OF THE BARYCENTRES S_4 (SUN TO MARS) AND S_9 (SUN TO PLUTO) REFERRED TO THE MEAN EQUINOX AND EQUATOR OF J 2000.0

Date		Barycentre S_4 (In units of 10^{-10} a.u)			Centre of Mass of the Solar System Barycentre S_9 (In units of 10^{-9} a.u)		
		x	y	z	X	Y	Z
Jan.	0	+79697285	+27454259	+09612130	+7972124	+2743292	+0960179
	10	79203142	28090806	09892975	7923098	2807542	0988538
	20	78704103	28719446	10170456	7873392	2871029	1016583
	30	78200000	29341071	10445008	7823004	2933793	1044332
Feb.	9	77690445	29956291	10717008	7771921	2995858	1071803
	19	77174940	30565572	10986693	7720126	3057243	1099004
	29	+76652769	+31169148	+11254244	+7667589	+3117954	+1125942
Mar.	10	76123134	31766908	11519675	7614278	3177981	1152616
	20	75585463	32358220	11782699	7560171	3237287	1179009
	30	75040006	32942522	12042985	7505288	3295839	1205102
Apr.	9	74486997	33519913	12300583	7449648	3353638	1230896
	19	73926136	34090398	12555549	7393243	3410679	1256391
	29	+73357084	+34653660	+12807781	+7336064	+3466942	+1281580
May	9	72779679	35209209	13057078	7278110	3522398	1306451
	19	72193920	35756553	13303229	7219388	3577019	1330992
	29	71599914	36295144	13545954	7159912	3630773	1355186
June	8	70997861	36824322	13784947	7099699	3683623	1379017
	18	70388438	37343261	14019705	7038791	3735524	1402457
	28	+69773084	+37851694	+14249970	+6977267	+3786459	+1425492
July	8	69152915	38350246	14475961	6915191	3836456	1448131
	18	68528354	38839558	14697982	6852592	3885543	1470388
	28	67899608	39320163	14916258	6789488	3933744	1492272
Aug.	7	67266748	39792580	15131031	6725891	3981082	1513794
	17	66629606	40257254	15342531	6661800	4027575	1534964
	27	+65987786	+40714555	+15550932	+6597203	+4073240	+1555789
Sept.	6	65340732	41164472	15756258	6532081	4118073	1576269
	16	64688248	41606617	15958282	6466432	4162052	1596391
	26	64030676	42041060	16157009	6400281	4205178	1616155
Oct.	6	63367745	42468251	16352672	6333622	4247471	1635570
	16	62698764	42888245	16545413	6266430	4288932	1654643
	26	+62023016	+43300700	+16735158	+6198676	+4329541	+1673369
Nov.	5	61339917	43705048	16921715	6130339	4369268	1691737
	15	60649058	44100539	17104802	6061408	4408074	1709732
	25	59950111	44486203	17284047	5991873	4445908	1727335
Dec.	5	59243068	44860748	17458849	5921743	4482704	1744514
	15	58528810	45222772	17628490	5851070	4518391	1761233
	25	+57808838	+45571685	+17792639	+5779937	+4552937	+1777475
	35	+57084203	+45907426	+17951235	+5708405	+4586339	+1793235

The heliocentric equatorial rectangular co-ordinates of the barycentre of the solar system referred to the mean equator and equinox of J 2024.5 are given by $\mathbf{r} = P\mathbf{r_0}$, where $\mathbf{r}$ and $\mathbf{r_0}$ are the column vectors of the co-ordinates X,Y, Z and X_0,Y_0, Z_0 referred to J 2020.5 and J 2000.0 respectively.

PART - II

STARS

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY 2^{d}.125 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
35	280	α Sculptoris	4.31	0	50	13.64	50.32	+0.025	-32	30	46.68	+0.030	-0.007
9	74	ι Ceti	3.56	1	15	31.40	50.27	-0.028	-10	01	17.56	+0.010	-0.028
82	674	ű Eridani	3.56	1	20	52.77	50.41	+0.110	-58	59	09.25	-0.040	-0.082
902	9072	ω Piscium	4.01	2	55	34.16	50.39	+0.095	+6	21	43.96	-0.120	-0.167
22	188	β Ceti	2.04	2	55	42.90	50.53	+0.242	-20	47	00.92	-0.020	-0.068
783	7957	η Cephei	3.43	5	01	35.35	52.66	+2.354	+71	46	58.18	+0.410	+0.368
156	1336	α Reticuli	3.35	7	51	52.01	50.57	+0.298	-78	02	23.63	+0.030	-0.015
869	8762	*o* Andromedae	3.62	8	07	08.41	50.32	+0.022	+43	45	02.92	+0.020	-0.017
848	8585	α Lacertae	3.77	8	28	58.19	50.50	+0.200	+53	17	26.88	-0.030	-0.070
7	39	ɔ Pegasi	2.83	9	29	51.52	50.30	+0.001	+12	36	02.13	+0.030	-0.011
40	334	η Ceti	3.45	12	06	41.97	50.44	+0.151	-16	07	08.18	-0.180	-0.213
803	8162	α Cephei	2.44	13	06	54.40	50.66	+0.340	+68	54	50.32	-0.060	-0.100
836	8465	ζ Cephei	3.35	14	18	00.05	50.35	+0.028	+61	08	53.21	+0.030	-0.008
1	15	α Andromedae*	2.06	14	38	59.12	50.35	+0.056	+25	40	48.26	-0.170	-0.207
47	402	ɗ Ceti	3.6	16	34	05.06	50.13	-0.163	-15	46	02.86	-0.130	-0.171
723	7310	δ Draconis	3.07	17	29	10.59	51.13	+0.758	+82	53	12.61	-0.060	-0.093
59	509	τ Ceti	3.5	18	09	10.50	48.92	-1.371	-24	48	16.87	+1.500	+1.463
890	8961	ɚ Andromedae	3.82v	18	37	32.38	50.18	-0.133	+43	46	26.80	-0.400	-0.441
1075	794	ι Eridani	4.11	19	07	06.95	50.44	+0.169	-51	42	49.64	-0.050	-0.095
71	585	ν Ceti	4	19	46	22.04	50.42	+0.134	-31	01	59.98	-0.040	-0.076
1033	361	ζ Piscium*	5.24	20	13	14.10	50.41	+0.112	-0	12	46.31	-0.060	-0.106
20	165	ŭ Andromedae	3.27	22	09	18.71	50.40	+0.092	+24	21	04.10	-0.110	-0.141
62	539	ζ Ceti	3.73	22	17	36.88	50.32	+0.025	-20	20	00.67	-0.010	-0.051
106	897	ɗ Eridani p	3.25	23	37	04.80	50.22	-0.051	-53	44	18.60	+0.080	+0.038
101	841	β Fornacis	4.46	26	34	51.81	50.49	+0.212	-45	51	13.50	+0.140	+0.103
1154	2015	δ Doradus	4.35	26	52	10.18	49.43	-0.279	-88	15	07.14	+0.070	+0.030
50	437	η Piscium	3.62	27	09	29.31	50.32	+0.024	+5	22	44.96	+0.020	-0.015
33	269	μ Andromedae	3.87	29	31	02.26	50.48	+0.173	+29	39	36.81	+0.000	-0.038
42	337	β Andromedae	2.06	30	44	49.80	50.43	+0.126	+25	56	38.14	-0.140	-0.178
863	8694	ι Cephei	3.52	33	34	34.47	50.03	-0.304	+62	37	04.21	+0.020	-0.017
66	553	β Arietis*	2.64	34	18	44.05	50.36	+0.051	+8	29	17.71	-0.100	-0.138
1085	919	τ^3 Eridani	4.09	34	52	38.95	50.08	-0.198	-38	54	14.59	+0.030	+0.001
17	153	ζ Cassiopeiae	3.66	35	24	19.14	50.33	+0.016	+44	43	17.97	+0.010	-0.018
2	21	β Cassiopeiae	2.27	35	27	33.08	50.79	+0.462	+51	12	49.45	-0.440	-0.472
809	8238	β Cephei	3.23	35	52	55.10	50.39	+0.028	+71	09	17.03	+0.030	-0.008
64	544	α Trianguli	3.41	37	12	07.00	50.22	-0.079	+16	48	03.83	-0.190	-0.223
91	779	δ Ceti	4.07	37	54	51.41	50.30	+0.013	-14	27	34.86	+0.020	-0.008
74	617	α Arietis	2	38	00	18.83	50.43	+0.130	+9	57	56.93	-0.170	-0.204
21	168	α Cassiopeiae	2.23	38	07	25.93	50.36	+0.036	+46	37	26.02	-0.030	-0.056
171	1465	α Doradus	3.27	38	10	50.86	50.36	+0.155	-74	34	47.72	+0.000	-0.031
104	874	η Eridani	3.89	39	05	35.87	50.30	+0.008	-24	32	46.28	-0.200	-0.233

* **No. 1 : *Alpheratz*, Uttara Bhadrapada - 2** **No. 66 : *Sheratan*, Asvini**
No. 1033 : Revati

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY 2^{d}.125 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
75	622	β Trianguli	3	42	41	41.92	50.45	+0.134	+20	34	56.42	-0.060	-0.091
79	664	ɔ Trianguli	4.01	43	51	35.60	50.33	+0.028	+18	57	00.55	-0.030	-0.064
32	264	ɔ Cassiopeiae	var.	44	16	16.59	50.36	+0.027	+48	49	01.53	+0.010	-0.019
73	603	ɔ Andromed. p	2.26	44	34	00.58	50.34	+0.024	+27	48	29.22	-0.030	-0.065
107	911	α Ceti	2.53	44	39	45.49	50.26	-0.032	-12	35	01.50	-0.040	-0.072
155	1326	α Horologii	3.86	46	10	09.61	50.16	-0.073	-61	43	47.67	-0.180	-0.211
48	403	ŭ Cassiopeiae	2.68	48	16	21.12	50.65	+0.323	+46	24	16.36	-0.170	-0.202
127	1084	ε Eridani	3.73	48	30	13.84	49.22	-1.054	-27	42	40.91	+0.310	+0.280
100	838	41 Arietis*	3.63	48	32	44.36	50.33	+0.029	+10	27	04.59	-0.100	-0.132
135	1136	δ Eridani	3.54	51	12	21.82	50.39	+0.113	-28	40	07.54	+0.770	+0.744
121	1030	*o* Tauri	3.6	51	30	20.16	50.21	-0.084	-9	19	55.53	-0.030	-0.059
123	1038	ξ Tauri	3.74	52	15	17.59	50.34	+0.049	-8	47	47.01	-0.030	-0.052
212	1922	β Doradus	3.48v	52	29	02.58	50.00	+0.072	-85	02	29.73	+0.030	+0.007
149	1231	ɔ Eridani	2.95	54	12	39.81	50.31	+0.039	-33	12	01.20	-0.090	-0.123
63	542	ε Cassiopeiae	3.38	55	06	15.77	50.35	+0.024	+47	33	02.35	-0.010	-0.034
109	921	ρ Persei	var.	55	15	11.52	50.41	+0.099	+20	34	34.88	-0.120	-0.139
1129	1502	α Caeli	4.45	56	29	26.84	49.88	-0.346	-62	59	08.55	-0.010	-0.032
111	936	β Persei	var.	56	30	33.42	50.32	+0.003	+22	25	52.51	+0.020	-0.002
103	854	τ Persei	3.95	58	15	11.24	50.31	-0.003	+34	22	26.39	+0.010	-0.005
99	834	η Persei	3.76	59	02	35.37	50.33	+0.013	+37	29	04.24	+0.010	-0.019
136	1142	17 Tauri	3.7	59	45	14.88	50.31	+0.009	+4	11	32.27	-0.020	-0.049
170	1464	ν^2 Eridani	3.82	60	13	43.22	50.17	-0.076	-51	48	51.94	+0.020	-0.002
151	1251	ν Tauri	3.91	60	15	42.41	50.29	+0.005	-14	26	56.12	+0.020	-0.004
139	1165	η Tauri*	2.87	60	20	04.62	50.31	+0.008	+4	03	12.21	-0.020	-0.049
108	915	ɔ Persei	2.93	60	21	46.26	50.31	-0.002	+34	31	58.80	+0.020	-0.004
893	8974	ɔ Cephei	3.21	60	26	04.68	50.64	+0.268	+64	40	24.64	+0.140	0.119
150	1239	ϑ Tauri	3.47v	60	58	36.89	50.29	-0.009	-7	57	25.45	+0.000	-0.011
120	1017	α Persei	1.79	62	25	21.52	50.34	+0.018	+30	07	41.30	-0.010	-0.030
144	1203	ζ Persei	2.85	63	27	57.31	50.30	+0.004	+11	20	10.58	+0.010	-0.011
134	1135	ν Persei	3.77	64	09	53.57	50.30	-0.015	+22	09	23.29	+0.020	+0.002
131	1122	δ Persei	3.01	65	08	38.18	50.33	+0.021	+27	18	15.85	-0.020	-0.040
148	1228	ξ Persei	4.04	65	18	52.03	50.31	+0.002	+14	56	48.14	+0.010	+0.000
147	1220	ε Persei	2.89	66	01	11.26	50.33	+0.013	+19	07	02.16	-0.010	-0.029
159	1346	ɔ Tauri	3.65	66	08	55.98	50.40	+0.110	-5	43	46.82	-0.030	-0.044
162	1373	δ Tauri	3.76	67	12	49.44	50.39	+0.101	-3	58	00.88	-0.040	-0.046
164	1409	ε Tauri	3.54	68	48	28.88	50.39	+0.100	-2	33	52.53	-0.040	-0.054
168	1457	α Tauri*	0.85	70	07	54.37	50.33	+0.036	-5	27	56.57	-0.180	-0.197
1134	1543	π^3 Orionis	3.19	72	16	13.66	50.77	+0.481	-15	22	53.42	-0.030	-0.045
186	1654	ε Leporis	3.19	72	23	55.24	50.28	+0.021	-44	57	43.71	-0.070	-0.076
179	1552	π^4 Orionis	3.69	72	26	35.79	50.28	-0.001	-16	46	08.06	+0.010	+0.001
180	1567	π^5 Orionis	3.72	72	49	59.79	50.28	+0.000	-20	00	07.51	+0.010	+0.000

* **No. 100 : Bharani** — **No.** 168 **:** ***Aldebaran*****, Rohini**

No. 139 : ***Alcyone*** **, Krittika.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY 2^{d}.125 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
188	1666	β Eridani	2.79	75	37	03.32	50.16	-0.116	-27	51	33.18	-0.060	-0.071
1144	1702	μ Leporis	3.31v	75	44	14.12	50.32	+0.051	-39	02	50.08	-0.020	-0.030
695	6927	χ Draconis	3.57	76	13	52.91	45.13	+3.502	+83	34	19.31	+0.160	-0.501
181	1577	ι Aurigae	2.69	76	58	53.96	50.30	+0.001	+10	27	26.69	-0.010	-0.018
194	1713	β Orionis	0.12	77	10	19.55	50.27	+0.000	-31	07	11.08	+0.010	-0.001
195	1735	τ Orionis	3.6	78	11	22.39	50.25	-0.018	-29	50	04.77	+0.010	-0.007
1137	1612	ζ Aurigae	3.75	78	58	32.18	50.32	+0.007	+18	12	18.71	-0.020	-0.023
183	1605	ε Aurigae	var.	79	11	00.82	50.32	-0.001	+20	56	50.65	+0.000	-0.004
185	1641	η Aurigae	3.17	79	47	18.64	50.33	+0.024	+18	17	11.11	-0.060	-0.070
204	1829	β Leporis	2.84	80	00	53.32	50.24	-0.015	-43	54	43.54	-0.080	-0.088
201	1790	ɔ Orionis	1.64	81	17	19.33	50.28	-0.010	-16	48	47.19	+0.000	-0.013
178	1542	α Camelopardi	4.29	81	19	18.12	50.33	+0.001	+43	25	19.26	+0.010	+0.006
182	1603	β Camelopardi	4.03	81	36	35.54	50.31	-0.010	+37	26	02.38	-0.010	-0.015
207	1865	α Leporis	2.58	81	43	22.59	50.26	+0.001	-41	03	17.01	+0.010	+0.002
193	1708	α Aurigae	0.08	82	12	01.52	50.36	+0.046	+22	51	52.05	-0.430	-0.429
215	1956	α Columbae	2.64	82	30	42.52	50.24	+0.009	-57	22	20.44	-0.020	-0.027
206	1852	δ Orionis	2.23	82	44	19.69	50.28	+0.002	-22	57	09.24	+0.000	-0.002
202	1791	β Tauri	1.65	82	55	02.19	50.31	+0.012	+5	23	13.00	-0.180	-0.176
209	1899	ι Orionis	2.77	83	20	23.34	50.28	+0.000	-29	11	48.92	+0.010	+0.001
210	1903	ε Orionis	1.7	83	48	21.37	50.28	+0.001	-24	30	12.06	+0.000	-0.002
(GC)	1879	λ Orionis*	3.56	84	02	56.79	50.29	-0.001	-13	21	58.99	+0.000	-0.002
211	1910	ζ Tauri	3	85	07	36.80	50.30	+0.000	-2	11	33.76	-0.020	-0.021
217	1983	ɔ Leporis	3.6	85	11	07.05	49.81	-0.439	-45	49	03.35	-0.350	-0.359
219	1998	ζ Leporis	3.55	86	19	42.30	50.25	-0.020	-38	12	45.95	+0.000	+0.000
220	2004	κ Orionis	2.06	86	44	27.05	50.27	+0.002	-33	04	03.44	+0.000	-0.002
223	2040	β Columbae	3.12	86	45	45.15	50.37	+0.136	-59	10	25.65	+0.410	+0.400
222	2035	δ Leporis	3.81	87	30	40.97	50.56	+0.301	-44	17	54.47	-0.650	-0.653
907	424	α Ursae Mins.	2.02	88	54	37.99	50.43	+0.038	+66	06	15.34	-0.040	-0.035
224	2061	α Orionis*	var.	89	05	49.21	50.32	+0.027	-16	01	26.04	+0.010	+0.009
226	2085	η Leporis	3.71	89	14	30.29	50.21	-0.052	-37	35	58.48	+0.140	+0.140
229	2120	η Columbae	3.96	89	57	12.46	50.26	+0.055	-66	15	04.54	-0.010	-0.014
227	2088	β Aurigae	1.9	90	15	08.38	50.25	-0.062	+21	30	40.52	+0.000	+0.000
225	2077	δ Aurigae	3.72	90	15	45.79	50.41	+0.095	+30	50	51.59	-0.130	-0.125
1168	2219	κ Aurigae	4.35	93	42	23.51	50.23	-0.066	+6	06	17.61	-0.260	-0.264
241	2286	μ Geminorum	2.88	95	38	40.33	50.35	+0.059	-0	49	04.33	-0.110	-0.109
244	2298	8ε Monocerotis	4.44	96	35	48.57	50.26	-0.019	-18	42	51.97	+0.000	+0.010
1173	2343	ν Geminorum	4.15	97	08	40.62	50.29	-0.007	-3	03	12.46	-0.020	-0.014
243	2294	β Canis Maj.	1.98	97	31	46.18	50.26	-0.008	-41	15	02.62	+0.000	+0.000
240	2282	ζ Canis Maj.	3.02	97	43	08.62	50.26	+0.015	-53	22	10.89	+0.000	+0.003
251	2421	ɔ Geminorum	1.93	99	26	49.82	50.34	+0.045	-6	44	23.29	-0.040	-0.039
254	2473	ε Geminorum	2.98	100	16	51.81	50.30	-0.005	+2	04	22.11	-0.020	-0.014

* **No. GC : *Mrgasiras* .** **No. 224 : *Betelgeuse* , Mag. 0.4 to 1.3 Ardra.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY $2^d.125$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				o	'	"	"	"	o	'	"	"	"
261	2540	ɗ Geminorum	3.6	101	27	57.12	50.30	+0.003	+11	01	57.96	-0.060	-0.048
256	2484	ξ Geminorum	3.36	101	33	02.24	50.18	-0.101	-10	06	09.56	-0.210	-0.200
257	2491	α Canis Maj cg	-1.46	104	25	08.66	49.71	-0.552	-39	36	39.22	-1.260	-1.256
245	2326	α Carinae	-0.72	105	17	57.11	50.22	+0.075	-75	49	15.09	+0.010	+0.024
269	2650	ζ Geminorum	3.79v	105	19	56.56	50.29	-0.009	-2	02	09.54	-0.020	-0.002
252	2451	ν Puppis	3.17	107	29	15.45	50.22	+0.008	-66	04	17.10	-0.020	-0.006
279	2777	δ Geminorum	3.53	108	51	40.93	50.27	-0.024	-0	10	32.55	-0.030	-0.016
1180	2538	κ Canis Maj.	3.96	108	54	23.77	50.23	-0.013	-55	08	40.99	-0.010	+0.003
277	2763	λ Geminorum	3.58	109	07	14.43	50.25	-0.042	-5	37	57.76	-0.060	-0.043
282	2821	ι Geminorum	3.79	109	17	56.14	50.19	-0.109	+5	45	37.39	-0.120	-0.103
1187	2714	22 δ Monocerotis	4.15	109	44	10.77	50.28	-0.002	-21	44	31.84	-0.010	+0.005
287	2891	α Gemino. *Cg**	1.95	110	34	55.44	50.15	-0.155	+10	05	52.61	-0.140	-0.126
268	2618	ε Canis Maj.	1.5	111	06	12.56	50.26	+0.006	-51	21	26.72	-0.010	+0.003
270	2653	o^2 Canis Maj.	3.02	111	20	36.78	50.25	-0.007	-46	07	39.45	-0.010	+0.002
1183	2646	σ Canis Maj.	3.47	111	53	47.86	50.24	-0.009	-50	13	23.10	-0.010	+0.004
285	2845	β Canis Min.	2.9	112	31	59.93	50.24	-0.047	-13	29	05.32	-0.060	-0.046
317	3323	*o* Ursae Maj.	3.36	113	20	18.61	50.21	-0.121	+40	14	42.51	-0.160	-0.145
295	2990	β Geminorum	1.14	113	33	14.05	49.69	-0.614	+6	41	08.92	-0.170	-0.158
273	2693	δ Canis Maj.	1.86	113	44	11.64	50.25	-0.006	-48	27	01.75	-0.010	+0.004
294	2985	κ Geminorum	3.57	114	00	28.58	50.27	-0.024	+3	04	50.96	-0.080	-0.057
291	2943	α C. Min. *cg*	0.38	116	07	25.06	49.74	-0.540	-16	01	28.75	-1.150	-1.132
263	2553	τ Puppis	2.93	118	03	52.93	50.36	+0.188	-72	51	03.94	-0.080	-0.056
293	2970	26 α Monocerotis	3.93	119	37	18.03	50.20	-0.078	-30	27	04.51	-0.050	-0.033
283	2827	η Canis Maj.	2.45	119	52	35.56	50.25	-0.008	-50	36	22.38	-0.020	+0.004
278	2773	π Puppis	2.7	120	38	23.68	50.22	-0.019	-58	31	20.86	-0.020	+0.002
335	3569	ι Ursae Maj.	3.14	123	08	25.68	49.92	-0.399	+29	34	30.45	-0.380	-0.359
341	3594	κ Ursae Maj.	3.6	124	16	47.89	50.30	-0.015	+28	58	53.31	-0.090	-0.062
312	3249	β Cancri	3.52	124	35	56.59	50.26	-0.032	-10	17	08.24	-0.080	-0.058
321	3366	η Cancri	5.33	125	44	59.27	50.26	-0.035	+1	34	23.91	-0.080	-0.054
1204	3045	ξ Puppis	3.34	126	22	54.85	50.26	-0.003	-44	56	13.87	-0.030	-0.003
368	3888	*v* Ursae Maj.	3.8	126	36	36.49	50.06	-0.261	+42	39	10.15	-0.290	-0.269
328	3475	ι Cancri	4.02	126	41	19.20	50.29	-0.013	+10	25	42.53	-0.070	-0.047
358	3775	ɗ Ursae Maj.	3.17	127	36	07.93	49.50	-0.820	+34	53	32.68	-0.880	-0.862
1228	3449	ɔ Cancri	4.66	127	52	48.72	50.20	-0.092	+3	11	32.21	-0.090	-0.066
1194	2878	ρ Puppis	3.25	129	01	36.76	49.97	-0.262	-63	46	16.56	+0.130	+0.157
326	3461	δ Cancri*	3.94	129	03	52.39	50.34	+0.043	+0	04	40.18	-0.250	-0.225
1223	3410	δ Hydrae	4.16	130	38	44.64	50.23	-0.064	-12	23	26.11	-0.050	-0.024
433	4434	ϑ Draconis	3.84	130	40	45.44	50.32	-0.026	+57	14	35.07	-0.070	-0.040
1224	3418	σ Hydrae	4.44	131	33	05.09	50.28	-0.013	-14	35	59.66	-0.050	-0.022
308	3185	ρ Puppis	2.81	131	43	41.36	50.14	-0.128	-43	16	04.14	+0.000	+0.023
352	3705	α Lyncis	3.13	132	11	02.23	50.08	-0.227	+17	57	56.66	-0.080	-0.054

* **No. 287 : *Castor,* Punarvasu-2, Mag. 1.95 & 2.95.** **No. 326 : Pusya.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY 2^d.125 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	′	″	″	″	°	′	″	″	″
1239	3627	ξ Cancri	5.14	133	33	11.61	50.30	+0.000	+5	25	33.50	-0.020	+0.005
550	5563	β Ursae Min.	2.08	133	40	08.71	50.35	-0.044	+72	59	21.98	-0.060	-0.031
337	3572	α Cancri	4.25	133	59	02.38	50.33	+0.041	-5	04	42.73	-0.040	-0.020
334	3547	ζ Hydrae	3.11	134	55	00.57	50.19	-0.101	-10	58	03.80	-0.040	-0.014
417	4301	α Ursae Maj.	1.79	135	32	31.18	50.24	-0.087	+49	40	52.66	-0.150	-0.125
(329)	3482	ε Hydrae m*	3.38	136	25	41.72	50.06	-0.228	-23	26	07.04	-0.130	-0.105
472	4787	κ Draconis	3.87v	136	36	09.65	50.26	-0.090	+61	45	49.85	-0.070	-0.042
306	3165	ζ Puppis	2.25	138	53	19.33	50.19	-0.057	-58	20	45.61	-0.030	+0.000
416	4295	β Ursae Maj.	2.37	139	46	47.95	50.40	+0.071	+45	08	06.91	+0.040	+0.073
383	4033	ɚ Ursae Maj.	3.45	139	53	33.06	50.15	-0.155	+29	53	11.03	-0.140	-0.103
347	3665	ɗ Hydrae	3.88	140	37	54.12	50.52	+0.224	-13	03	07.88	-0.280	-0.255
367	3873	ε Leonis	2.98	141	02	50.31	50.26	-0.040	+9	43	00.83	-0.050	-0.026
386	4069	μ Ursae Maj.	3.05	141	34	40.59	50.21	-0.101	+28	59	59.12	-0.040	-0.003
371	3905	μ Leonis	3.88	141	46	17.77	50.11	-0.188	+12	20	58.77	-0.160	-0.127
569	5735	ɔ Ursae Min.	3.05	141	56	58.83	50.31	-0.080	+75	14	33.62	-0.050	-0.019
262	2550	α Pictoris	3.27	144	25	21.61	48.18	-1.938	-83	02	14.17	+0.110	+0.148
365	3852	*o* Leonis	3.52	144	35	18.05	50.17	-0.122	-3	45	22.32	-0.120	-0.081
327	3468	α Pyxidis	3.68	146	50	22.25	50.25	-0.022	-48	55	17.05	-0.030	0.006
354	3748	α Hydrae	1.98	147	37	12.79	50.26	-0.026	-22	22	51.03	-0.010	+0.026
309	3207	ɔ^2 Velorum	1.78	147	41	10.25	50.24	-0.015	-64	27	45.94	-0.030	+0.004
384	4031	ζ Leonis	3.44	147	54	30.40	50.32	+0.020	+11	51	59.22	-0.030	+0.000
1250	3845	ι Hydrae	3.91	147	59	02.04	50.36	+0.070	-14	16	34.22	-0.070	-0.044
379	3975	η Leonis	3.52	148	14	51.42	50.30	-0.001	+4	52	01.47	-0.040	-0.001
420	4335	ɣ Ursae Maj.	3.01	149	09	24.94	50.26	-0.054	+35	32	19.32	-0.090	-0.055
380	3982	α Leonis*	1.35	150	10	11.48	50.06	-0.235	+0	27	56.04	-0.120	-0.082
447	4554	ɔ Ursae Maj.	2.44	150	49	22.64	50.42	+0.104	+47	08	35.57	+0.030	+0.065
303	3117	χ Carinae	3.47	151	03	45.91	50.14	-0.105	-70	19	31.46	-0.030	+0.001
456	4660	δ Ursae Maj.	3.31	151	24	41.30	50.44	+0.119	+51	39	30.38	+0.040	+0.074
364	3849	κ Hydrae	5.06	153	01	03.12	50.26	-0.020	-26	35	54.82	-0.060	-0.028
1243	3718	ɗ Pyxidis	4.72	153	23	56.93	50.28	-0.008	-39	02	00.20	-0.050	-0.012
441	4518	χ Ursae Maj.	3.71	154	00	13.46	50.13	-0.177	+41	32	40.84	-0.090	-0.048
396	4133	ρ Leonis	3.85	156	43	52.24	50.30	-0.005	+0	09	02.33	-0.040	-0.005
425	4377	ν Ursae Maj.	3.48	156	59	49.53	50.27	-0.040	+26	09	48.57	-0.020	+0.014
521	5291	α Draconis	3.65	157	48	15.95	50.22	-0.111	+66	21	45.88	-0.070	-0.037
1261	3970	*ν*^{2} Hydrae	4.6	158	39	56.22	50.24	-0.045	-23	10	37.18	-0.030	+0.003
483	4905	ε Ursae Maj.	1.77	159	16	51.10	50.46	+0.150	+54	19	12.44	+0.040	+0.070
381	3994	ɚ Hydrae	3.61	159	42	25.01	50.13	-0.165	-22	00	51.28	-0.200	-0.159
1270	4116	δ Sextantis	5.21	160	26	52.99	50.26	-0.040	-11	20	42.64	-0.070	-0.031
345	3634	ɚ Velorum	2.21	161	31	31.14	50.24	-0.040	-55	52	12.34	-0.040	+0.001
422	4357	δ Leonis*	2.56	161	39	39.22	50.48	+0.188	+14	20	01.83	-0.100	-0.062
423	4359	ɗ Leonis	3.34	163	45	56.30	50.27	-0.025	+9	40	27.20	-0.130	-0.096

* **No. 329 : Aslesa.** **No. 422 : *Zosma* , Purva Phalguni-1.**

No. 380 : *Regulus* , Magha.

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY 2^{d}.125 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
1227	3447	*o* Velorum	3.62	165	04	08.68	50.20	-0.073	-66	16	33.15	-0.040	+0.001
389	4094	μ Hydrae	3.81	165	22	36.30	50.20	-0.093	-24	40	18.62	-0.160	-0.125
497	5054	ζ Ursae Maj. pr	2.27	166	02	53.59	50.50	+0.188	+56	22	47.54	+0.030	+0.067
1304	4527	93 Leonis*	4.53v	169	18	59.70	50.16	-0.140	+17	18	33.10	-0.110	-0.065
410	4232	ν Hydrae	3.11	170	42	25.70	50.30	+0.004	-21	47	46.79	+0.180	+0.221
444	4534	β Leonis	2.14	171	57	27.55	49.88	-0.417	+12	15	53.79	-0.340	-0.306
392	4104	α Antliae	4.25	172	46	48.47	50.20	-0.089	-37	25	39.33	-0.060	-0.025
315	3307	ε Carinae	1.86	173	27	40.33	50.19	-0.093	-72	40	47.88	-0.060	-0.012
1283	4287	α Crateris	4.08	174	01	37.06	49.78	-0.512	-22	43	00.45	-0.110	-0.074
485	4915	α CVn sq	2.9	174	54	34.29	50.00	-0.302	+40	07	14.08	-0.110	-0.069
426	4382	δ Crateris	3.56	177	01	36.79	50.09	-0.206	-17	34	17.99	+0.100	+0.139
509	5191	η Ursae Maj.	1.86	177	16	43.04	50.14	-0.156	+54	23	14.38	-0.120	-0.083
445	4540	β Virginis	3.61	177	30	42.73	51.08	+0.789	+0	41	39.86	+0.000	+0.047
353	3734	κ Velorum	2.5	179	13	40.86	50.26	-0.027	-63	43	19.03	-0.040	+0.000
531	5404	ɗ Bootis	4.05	182	57	32.18	50.44	+0.147	+60	06	19.10	-0.490	-0.456
639	6396	ζ Draconis	3.17	183	45	14.34	49.98	-0.289	84	45	39.53	-0.050	-0.013
361	3803	N Velorum	3.13	184	32	57.76	50.25	-0.056	-64	14	20.82	-0.060	-0.020
460	4689	η Virginis	3.89	184	38	42.23	50.25	-0.051	+2	35	19.55	-0.090	-0.042
492	4983	β Com	4.26	184	42	02.67	48.98	-1.319	+32	30	52.14	+0.390	+0.429
571	5744	ι Draconis	3.29	185	18	01.42	50.23	-0.059	+71	05	34.80	-0.040	+0.004
351	3699	ι Carinae	2.25	185	39	40.24	50.25	-0.048	-67	07	01.31	-0.050	-0.011
1326	4828	ρ Virginis	4.88	185	51	25.58	50.41	0.116	+13	32	31.34	-0.090	-0.049
375	3940	ű Velorum	3.54	186	17	00.96	50.29	-0.019	-59	57	04.06	-0.050	-0.005
434	4450	ȝ Hydrae	3.54	188	19	38.02	50.11	-0.193	-31	36	00.56	-0.170	-0.131
488	4932	ε Virginis	2.83	190	16	53.70	50.02	-0.269	+16	12	12.71	-0.130	-0.090
457	4662	ɔ Corvi	2.59	191	03	57.71	50.14	-0.161	-14	30	07.47	-0.090	-0.045
484	4910	δ Virginis	3.38	191	48	02.94	49.88	-0.415	+8	36	39.36	-0.270	-0.232
453	4630	ε Corvi	3	192	00	21.96	50.22	-0.074	-19	40	28.42	-0.050	-0.018
475	4813	χ Virginis	4.66	192	29	44.89	50.24	-0.060	-3	28	10.00	-0.100	-0.052
465	4757	δ Corvi*	2.95	193	47	32.75	50.16	-0.140	-12	11	55.43	-0.250	-0.211
319	3347	β Volantis	3.77	195	30	25.05	50.88	+0.547	-75	35	12.68	-0.120	-0.082
471	4786	β Corvi	2.65	197	42	34.06	50.33	+0.026	-18	02	46.06	-0.090	-0.048
535	5435	ɔ Bootis	3.03	198	00	25.94	50.02	-0.268	+49	33	03.29	+0.050	0.079
513	5235	η Bootis	2.68	199	40	51.61	50.39	+0.095	+28	04	24.23	-0.390	-0.354
281	2803	δ Volantis	3.98	199	44	42.23	50.37	-0.039	-82	28	42.59	-0.050	-0.006
501	5107	ζ Virginis	3.37	202	01	45.99	50.01	-0.284	+9	44	32.46	-0.100	-0.066
534	5429	ρ Bootis	3.58	203	07	45.85	50.09	-0.191	+42	27	02.74	+0.030	+0.066
498	5056	α Virginis*	0.98	204	11	00.15	50.27	-0.028	-2	03	22.51	-0.080	-0.041
526	5340	α Bootis*	-0.04	204	34	32.12	50.01	-0.286	+30	43	09.53	-2.300	-2.265
555	5602	β Bootis	3.5	204	35	46.62	50.23	-0.039	+54	08	57.06	-0.080	-0.044
495	5020	ɔ Hydrae	3	207	21	37.73	50.38	+0.079	-13	44	39.97	-0.060	-0.017

* **No. 1304 : Uttara Phalguni-2.** **No. 498 : *Spica* , Citra.**
No. 465 : *Algorel* , Hasta. **No. 526 : *Arcturus* , Svati.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY 2^{d}.125 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
452	4621	δ Centauri	2.6	207	49	18.95	50.28	-0.033	-44	30	41.47	-0.060	-0.026
406	4199	θ Carinae	2.76	209	31	35.48	50.29	-0.046	-62	08	27.27	-0.050	-0.012
348	3685	β Carinae	1.68	212	18	01.10	49.90	-0.463	-72	14	19.69	-0.160	-0.133
496	5028	ι Centauri	2.75	213	28	04.39	50.01	-0.305	-26	01	10.73	-0.260	-0.219
563	5681	δ Bootis	3.47	213	30	13.85	50.46	+0.189	+48	57	47.41	-0.110	-0.069
525	5338	ι Virginis	4.08	214	08	27.28	50.43	+0.140	+7	11	41.33	-0.440	-0.409
523	5315	κ Virginis	4.19	214	50	09.20	50.26	-0.039	+2	54	42.89	+0.100	+0.135
436	4467	λ Centauri	3.13	214	52	56.71	50.29	-0.045	-56	47	29.33	-0.060	-0.033
455	4656	δ Crucis	2.8	216	00	13.95	50.28	-0.042	-50	25	18.39	-0.060	-0.032
468	4763	γ Crucis	1.63v	217	04	51.77	50.58	+0.257	-47	50	04.71	-0.230	-0.199
1371	5359	λ Virginis	4.52	217	17	39.50	50.27	-0.024	+0	29	19.48	-0.010	+0.023
385	4037	ω Carinae	3.32	217	46	34.01	50.30	-0.054	-67	23	04.98	-0.060	-0.033
519	5287	π Hydrae	3.27	218	57	58.70	50.39	+0.092	-13	03	08.85	-0.140	-0.115
572	5747	β Cr. Borealis	3.68	219	27	33.84	49.99	-0.286	+46	03	07.38	-0.020	+0.018
1189	2736	γ^2 Volantis	3.78	220	10	44.96	49.66	-0.682	-82	37	09.18	-0.050	+0.065
545	5487	μ Virginis	3.88	220	28	30.84	50.50	+0.203	+9	40	04.96	-0.300	-0.268
442	4520	λ Muscae	3.64	221	19	45.66	50.16	-0.181	-58	30	34.35	-0.080	-0.053
508	5193	μ Centauri	3.04v	221	52	38.03	50.29	-0.015	-28	58	54.07	-0.050	-0.028
481	4853	β Crucis	1.25	221	59	07.82	50.28	-0.046	-48	38	28.72	-0.070	-0.039
462	4730	α Crucis A	1.33	222	12	32.80	50.30	-0.031	-52	52	52.84	-0.070	-0.032
578	5793	α Cr.Borealis	2.23	222	38	29.37	50.48	+0.201	+44	19	15.53	-0.080	-0.044
520	5288	θ Centauri	2.06	222	38	52.22	49.99	-0.317	-22	05	12.49	-0.700	-0.672
608	6092	τ Herculis	3.89	224	43	50.53	50.17	-0.065	+65	49	40.02	+0.000	+0.032
512	5231	ζ Centauri	2.55	225	17	28.82	50.27	-0.040	-32	56	46.10	-0.100	-0.062
548	5531	α^2 Librae*	2.75	225	25	27.83	50.21	-0.082	+0	19	48.16	-0.130	-0.095
504	5132	ε Centauri	2.3	225	53	43.02	50.30	-0.023	-39	35	18.90	-0.060	-0.028
297	3024	ζ Volantis	3.95	226	05	28.28	50.30	-0.031	-79	23	23.09	-0.010	+0.034
391	4102	I Carinae	4	228	25	20.41	50.42	+0.052	-67	53	08.61	-0.050	-0.027
564	5685	β Librae	2.61	229	42	49.16	50.20	-0.089	+8	29	35.24	-0.070	-0.043
583	5867	β Serpentis	3.67	230	17	33.35	50.37	+0.093	+34	19	26.30	-0.050	-0.026
537	5440	η Centauri	2.31	230	35	24.74	50.29	-0.023	-25	30	57.17	-0.070	-0.044
474	4798	α Muscae	2.69	230	42	48.11	50.30	-0.044	-56	33	35.48	-0.070	-0.043
556	5603	σ Librae	3.29	231	01	44.05	50.24	-0.059	-7	38	50.82	-0.090	-0.062
559	5652	ι Librae	4.54	231	20	48.34	50.27	-0.024	-1	51	08.77	-0.070	-0.047
582	5854	α Serpentis	2.65	232	25	09.06	50.42	+0.134	+25	30	21.52	+0.060	+0.079
591	5933	γ Serpentis	3.85	233	07	47.67	51.04	+0.758	+35	11	06.74	-1.190	-1.164
541	5469	α Lupi	2.3	233	50	42.22	50.30	-0.016	-30	01	43.15	-0.050	-0.024
518	5267	β Centauri	0.61	234	07	58.07	50.30	-0.026	-44	08	25.75	-0.050	-0.032
469	4773	γ Muscae	3.87	234	21	26.56	50.28	-0.069	-58	52	24.94	-0.070	-0.045
588	5892	ε Serpentis	3.71	234	40	29.29	50.40	+0.121	+24	00	16.87	+0.070	+0.091
553	5576	κ Centauri	3.13	235	08	10.59	50.30	-0.011	-24	02	03.51	-0.060	-0.029

* **No. 548 : *Zuben el Genubi*, Visakha.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY $2^{d}.125$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
552	5571	β Lupi	2.68	235	22	01.08	50.29	-0.023	-25	02	57.01	-0.070	-0.048
577	5787	ɔ Librae	3.91	235	28	51.04	50.36	+0.061	+4	23	00.20	+0.000	+0.024
585	5881	μ Serpentis	3.54	236	16	52.61	50.21	-0.082	+16	14	06.75	-0.070	-0.042
487	4923	δ Muscae	3.62	236	31	56.84	50.71	+0.360	-56	46	37.82	+0.150	+0.163
566	5705	ű' Lupi	3.56	237	50	08.03	50.24	-0.067	-17	10	54.28	-0.130	-0.105
1413	5838	κ Librae	4.74	238	05	58.36	50.29	-0.013	-0	01	22.11	-0.130	-0.109
579	5794	ν Librae	3.58	238	57	05.19	50.29	-0.010	-8	30	36.77	-0.020	+0.001
1402	5695	δ Lupi	3.22	238	59	54.87	50.30	-0.008	-21	25	44.12	-0.050	-0.029
626	6220	η Herculis	3.53	239	07	59.28	50.35	+0.116	+60	17	11.81	-0.090	-0.070
609	6095	ɔ Herculis	3.75	239	33	26.48	50.20	-0.072	+40	00	18.69	+0.010	+0.032
538	5460	α Centauri cg	var.	239	47	10.80	45.43	-4.886	-42	36	17.50	-0.900	-0.859
401	4174	ɔ Chamaeleontis	4.11	240	45	36.38	50.34	-0.049	-68	05	14.17	-0.060	-0.040
558	5649	ζ Lupi	3.41	241	05	54.29	50.22	-0.099	-32	50	06.21	-0.120	-0.104
618	6148	β Herculis	2.77	241	26	01.83	50.14	-0.126	+42	41	57.60	-0.050	-0.034
613	6117	ω Herculis	4.57	241	55	08.26	50.34	+0.067	+35	09	54.71	-0.060	-0.050
603	6056	δ Ophiuchi	2.74	242	38	40.79	50.27	-0.018	+17	14	14.44	-0.170	-0.149
539	5463	α Circini	3.19	242	42	10.76	50.23	-0.104	-46	12	26.67	-0.310	-0.292
594	5953	δ Scorpii*	2.32	242	54	48.46	50.29	-0.001	-1	59	21.01	-0.060	-0.038
592	5944	π Scorpii	2.89	243	16	55.30	50.29	-0.006	-5	28	42.26	-0.050	-0.027
597	5984	β Scorpii pr	2.62	243	31	56.29	50.29	-0.002	+1	00	17.28	-0.040	-0.020
605	6075	ε Ophiuchi	3.24	243	51	11.52	50.37	+0.079	+16	26	13.93	+0.040	+0.055
459	4674	β Chamaeleontis	4.26	245	46	38.96	50.28	-0.083	-63	35	50.63	-0.050	-0.034
411	4234	δ^{2} Chamaeleontis	4.45	245	59	44.73	50.36	-0.030	-67	47	38.15	-0.060	-0.048
607	6084	σ Scorpii	2.89	248	08	30.39	50.29	-0.007	-4	02	25.78	-0.030	-0.022
634	6324	ε Herculis	3.92	248	40	11.60	50.16	-0.085	+53	14	43.90	+0.010	+0.019
622	6175	ζ Ophiuchi	2.56	249	34	18.17	50.30	+0.010	+11	23	18.75	+0.010	+0.028
560	5671	ɔ Tr. Austrini	2.89	249	44	03.17	50.25	-0.082	-48	06	22.50	-0.070	-0.056
616	6134	α Scorpii cg*	var.	250	06	15.78	50.29	-0.006	-4	34	23.03	-0.030	-0.022
620	6165	τ Scorpii	2.82	251	47	56.77	50.30	-0.005	-6	07	24.87	-0.040	-0.023
633	6299	κ Ophiuchi	3.2	252	09	42.80	49.94	-0.339	+31	49	58.27	-0.050	-0.046
589	5897	β Tr.Australis	2.85	252	10	55.80	50.23	-0.101	-41	57	06.72	-0.450	-0.434
653	6536	β Draconis	2.79	252	18	38.40	50.08	-0.072	+75	16	29.66	+0.000	+0.011
643	6418	π Herculis	3.16	252	24	37.94	50.18	-0.051	+59	32	52.08	-0.010	+0.000
542	5470	α Apodis	3.83	254	46	16.20	50.36	-0.002	-58	14	17.02	-0.030	-0.019
641	6410	δ Herculis	3.14	255	06	22.86	50.25	-0.004	+47	40	53.45	-0.170	-0.158
628	6241	ε Scorpii	2.29	255	40	23.99	49.71	-0.588	-11	44	37.72	-0.340	-0.326
1439	6247	μ^{1} Scorpii	3.08v	256	29	51.83	50.30	-0.008	-15	25	35.04	-0.040	-0.026
1435	6229	η Arae	3.76	259	14	47.96	50.38	+0.051	-36	16	46.71	-0.030	-0.023
631	6285	ζ Arae	3.13	260	09	57.30	50.31	-0.018	-33	05	41.89	-0.040	-0.038
663	6588	ι Herculis	3.8	260	13	55.43	50.18	-0.015	+69	15	44.99	+0.000	+0.005
638	6380	η Scorpii	3.33	261	05	07.65	50.36	+0.052	-20	11	18.62	-0.290	-0.284

* **No. 594 : *Dschubba*, Anuradha** **No. 616 : *Antares*, Jyestha, Mag. 0.9 to 1.8.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY $2^{d}.125$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				°	'	"	"	"	°	'	"	"	"
625	6217	α Tr. Austr.	1.92	261	14	17.09	50.36	0.028	-46	09	16.79	-0.040	-0.031
644	6453	ɗ Ophiuchi	3.27	261	44	13.67	50.30	-0.002	-1	50	48.11	-0.030	-0.020
656	6556	α Ophiuchi	2.08	262	47	31.65	50.44	+0.163	+35	49	50.30	-0.230	-0.220
611	6102	ɔ Apodis	3.89	263	02	39.56	50.16	-0.191	-56	00	39.21	-0.110	-0.106
649	6508	ν Scorpii	2.69	264	21	17.90	50.30	+0.000	-14	00	41.86	-0.030	-0.031
645	6461	β Arae	2.85	264	32	53.07	50.31	-0.008	-32	16	05.54	-0.020	-0.026
658	6561	ɝ Serpentis	3.54	264	53	17.04	50.25	-0.040	+7	55	52.43	-0.070	-0.060
652	6527	ɚ Scorpii*	1.63	264	55	40.93	50.31	+0.000	-13	47	30.19	-0.030	-0.029
671	6688	ɝ Draconis	3.75	265	06	03.96	50.58	+0.525	+80	16	47.96	+0.080	+0.085
651	6510	α Arae	2.95	265	16	34.98	50.29	-0.031	-26	33	51.06	-0.070	-0.072
667	6623	μ Herculis	3.42	265	33	49.62	49.80	-0.453	+51	05	44.06	-0.760	-0.762
665	6603	β Ophiuchi	2.77	265	40	43.20	50.22	-0.051	+27	56	15.80	+0.160	+0.158
648	6500	δ Arae	3.62	265	53	54.57	50.26	-0.067	-37	21	34.82	-0.110	-0.099
654	6553	ɗ Scorpii	1.87	265	56	30.78	50.32	+0.016	-19	38	53.56	+0.000	-0.001
660	6580	κ Scorpii	2.41	266	48	42.20	50.30	-0.005	-15	38	51.49	-0.030	-0.027
668	6629	ɔ Ophiuchi	3.75	266	58	28.64	50.26	-0.023	+26	06	27.38	-0.080	-0.074
666	6615	ι^{1} Scorpii	3.03	267	51	53.43	50.30	+0.000	-16	43	03.27	-0.010	-0.008
669	6630	*G* Scorpii	3.21	268	15	38.05	50.35	+0.049	-13	37	30.62	+0.030	+0.034
676	6705	ɔ Draconis	2.23	268	18	36.39	50.12	-0.028	+74	55	08.57	-0.020	-0.020
661	6582	η Pavonis	3.62	268	18	56.56	50.31	-0.017	-41	18	47.06	-0.050	-0.055
672	6695	ɗ Herculis	3.86	268	49	08.23	50.24	+0.009	+60	40	54.61	+0.010	+0.006
674	6703	ɝ Herculis	3.7	269	32	19.04	50.39	+0.139	+52	40	56.83	-0.020	-0.017
673	6698	ν Ophiuchi	3.34	270	05	43.33	50.28	-0.007	+13	39	41.71	-0.120	-0.116
1471	6743	ɗ Arae	3.66	271	31	56.53	50.30	-0.012	-26	39	44.14	-0.020	-0.014
679	6746	ɔ Sagittarii	2.99	271	36	12.20	50.25	-0.056	-6	59	43.67	-0.180	-0.184
680	6771	72 Ophiuchi	3.73	272	30	06.75	50.20	-0.070	+32	59	12.70	+0.080	+0.081
681	6779	*o* Herculis	3.83	273	02	17.74	50.24	+0.002	+52	10	52.17	+0.010	+0.009
682	6812	μ Sagittarii	3.86	273	33	20.81	50.30	+0.002	+2	20	20.57	+0.000	+0.001
683	6832	η Sagittarii	3.11	273	58	09.23	50.16	-0.138	-13	22	55.37	-0.160	-0.162
687	6859	δ Sagittarii*	2.7	274	55	24.56	50.33	+0.034	-6	28	31.85	-0.030	-0.029
691	6897	α Telescopii	3.51	275	24	57.41	50.29	-0.021	-22	39	04.48	-0.050	-0.053
689	6879	ε Sagittarii	1.85	275	25	14.35	50.26	-0.045	-11	03	20.49	-0.120	-0.122
688	6869	η Serpentis	3.26	276	01	01.32	49.67	-0.614	+20	25	40.33	-0.670	-0.677
692	6913	ɚ Sagittarii	2.81	276	39	32.58	50.24	-0.053	-2	08	23.60	-0.170	-0.183
697	6951	ɗ Coronae Aust.	4.64	276	53	12.22	50.34	+0.031	-19	03	59.38	-0.020	-0.024
1482	6973	α Scuti	3.85	279	21	30.14	50.25	-0.037	+14	54	54.22	-0.300	-0.310
214	1953	ɔ Mensae	5.19	279	54	38.24	50.37	+1.084	-79	59	21.81	-0.300	0.238
1487	7039	ű Sagittarii	3.17	280	31	26.58	50.35	+0.053	-3	57	25.22	+0.000	-0.004
1489	7063	β Scuti	4.22	282	43	19.26	50.27	-0.006	+18	10	58.64	+0.000	-0.016
706	7121	σ Sagittarii*	2.02	282	43	39.75	50.31	+0.008	-3	27	10.21	-0.050	-0.055
710	7150	$ɝ^{2}$ Sagittarii	3.51	283	47	36.91	50.33	+0.032	+1	39	29.59	+0.000	-0.015

* **No. 652 : *Schaula* , Mula.** **No. 706 : *Nunki* , Uttarasadha.**

No. 687 : Purvasadha-1.

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY 2^{d}.125 TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude °	'	"	Annual Variation "	Annual Proper Motion "	Latitude °	'	"	Annual Variation "	Annual Proper Motion "
1496	7234	τ Sagittarii	3.32	285	10	33.96	50.22	-0.083	-5	05	36.29	-0.230	-0.243
699	7001	α Lyrae	0.03	285	39	36.11	50.73	+0.505	+61	43	54.11	+0.270	0.256
720	7264	π Sagittarii	2.89	286	35	38.53	50.29	-0.004	+1	26	02.24	-0.020	-0.035
717	7236	ϑ Aquilae	3.44	287	40	26.60	50.26	-0.029	+17	33	44.36	-0.070	-0.087
754	7665	δ Pavonis	3.56	287	57	52.06	51.48	+1.141	-44	42	43.38	-1.430	-1.445
712	7176	ε Aquilae	4.02	288	36	10.44	50.19	-0.075	+37	33	50.59	-0.060	-0.066
705	7106	β Lyrae	var.	289	13	27.03	50.25	+0.005	+55	58	52.78	+0.010	-0.003
810	8254	ν Octantis	3.76	290	01	53.88	50.15	-0.212	-57	47	01.08	-0.200	-0.217
716	7235	ζ Aquilae	2.99	290	08	13.85	50.24	-0.023	+36	10	56.14	-0.080	-0.094
713	7178	ɔ Lyrae	3.24	292	15	45.32	50.24	-0.003	+55	00	36.89	+0.020	+0.003
775	7913	β Pavonis	3.42	292	50	15.13	50.28	-0.055	-45	57	25.69	+0.050	+0.028
730	7377	δ Aquilae	3.36	293	58	52.76	50.57	+0.294	+24	48	52.69	+0.060	+0.040
764	7790	α Pavonis	1.94	294	09	38.39	50.30	-0.025	-36	16	15.31	-0.070	-0.087
751	7623	d^1 Sagittarii	4.37	295	12	45.73	50.30	+0.001	-14	23	18.80	-0.010	-0.027
785	7986	β Indi	3.65	298	07	45.50	50.33	+0.008	-39	09	35.43	-0.010	-0.030
769	7869	α Indi	3.11	299	26	52.59	50.39	+0.078	-27	45	21.13	+0.070	0.048
1508	7405	α Vulpeculae	4.44	299	50	47.90	50.05	-0.209	+45	51	19.02	-0.060	-0.076
746	7570	η Aquilae	var.	300	46	31.37	50.29	+0.010	+21	31	14.56	+0.010	-0.009
741	7525	ɔ Aquilae	2.72	301	16	48.99	50.30	+0.020	+31	14	27.82	+0.010	-0.005
11	98	β Hydri	2.8	301	20	07.78	53.01	+2.668	-64	48	01.60	-1.910	-1.955
1513	7488	β Sagittae	4.37	301	32	48.68	50.28	+0.003	+38	12	55.56	-0.010	-0.033
732	7417	β Cygni *p*	3.08	301	35	30.94	50.25	+0.002	+48	57	54.72	+0.020	-0.002
745	7557	α Aquilae*	0.77	302	07	20.68	50.98	+0.697	+29	18	10.14	+0.290	+0.262
749	7602	β Aquilae	3.71	302	45	52.44	50.22	-0.064	+26	39	12.35	-0.460	-0.481
743	7536	δ Sagittae	3.82	303	43	40.88	50.28	+0.011	+38	54	37.67	+0.030	+0.006
761	7754	α^2 Capricorni	3.57	304	12	03.90	50.36	+0.063	+6	55	39.78	+0.010	-0.011
762	7776	β Capricorni	3.08	304	23	23.28	50.33	+0.042	+4	35	10.39	+0.010	-0.008
756	7710	ď Aquilae	3.23	305	39	15.09	50.33	+0.041	+20	19	29.02	+0.020	-0.005
752	7635	ɔ Sagittae	3.47	307	23	05.39	50.36	+0.090	+39	11	16.80	+0.030	+0.006
1550	8039	ɔ Microscopii	4.67	308	46	27.49	50.31	+0.000	-14	40	02.97	+0.030	+0.006
841	8502	α Tucanae	2.86	310	00	54.12	50.21	-0.120	-45	24	21.44	+0.030	+0.000
146	1208	ɔ Hydri	3.24	310	49	37.22	50.83	+0.537	-76	45	34.57	-0.060	-0.010
781	7950	ε Aquarii	3.77	312	03	55.25	50.32	+0.024	+8	04	41.39	-0.020	-0.042
1547	7990	μ Aquarii	4.73	313	24	01.01	50.32	+0.035	+8	14	15.59	-0.010	-0.041
768	7852	ε Delphini	4.03	314	24	07.53	50.28	+0.007	+29	04	15.56	+0.000	-0.024
726	7328	κ Cygni	3.77	315	15	18.30	50.59	+0.396	+73	48	03.04	+0.110	+0.080
829	8425	α Gruis	1.74	316	15	04.62	50.38	+0.064	-32	54	59.45	-0.160	-0.191
(771)	7882	β Delphini m*	3.64	316	40	57.32	50.35	+0.070	+31	54	56.07	-0.040	-0.069
806	8204	ζ Capricorni	3.74	317	16	46.38	50.30	+0.008	-6	59	33.66	+0.050	+0.022
774	7906	α Delphini	3.77	317	43	18.39	50.36	+0.074	+33	01	12.94	+0.000	-0.022
822	8353	ɔ Gruis	3.01	317	45	47.80	50.40	+0.095	-23	03	09.20	-0.030	-0.058

* **No. 745 : *Altair*, Sravana.** **No. 771 : *Rotanev*, Dhanistha-1.**

Annual rate of Precession in longitude for the middle of the year = 50".29

LONGITUDE AND LATITUDE OF STARS, 2024.5

MEAN PLACES FOR JULY $2^d.125$ TERRESTRIAL TIME

Cat. No. FK5	BS= HR No.	Star	Mag.	Longitude			Annual Variation	Annual Proper Motion	Latitude			Annual Variation	Annual Proper Motion
				o	'	"	"	"	o	'	"	"	"
733	7420	ι Cygni	3.79	318	18	18.66	50.47	+0.252	+71	26	59.78	+0.130	+0.104
778	7928	δ Delphini	4.43	318	27	24.32	50.24	-0.037	+31	56	29.57	-0.010	-0.035
1541	7948	ɔ Delphini sq	4.27	319	42	30.44	50.17	-0.110	+32	41	57.56	-0.140	-0.177
860	8675	ε Gruis	3.49	321	04	29.57	50.39	+0.077	-39	47	25.09	-0.080	-0.115
846	8556	δ^1 Gruis	3.97	321	56	47.48	50.34	+0.027	-31	20	57.23	+0.010	-0.017
812	8278	ɔ Capricorni	3.68	322	08	03.64	50.47	+0.172	-2	33	34.39	-0.060	-0.084
856	8636	β Gruis	2.11v	322	40	20.75	50.46	+0.145	-35	26	03.30	-0.040	-0.071
800	8131	α Equulei	3.92	323	27	31.56	50.32	+0.029	+20	07	10.35	-0.070	-0.102
808	8232	β Aquarii	2.91	323	44	13.51	50.31	+0.017	+8	36	47.90	+0.020	-0.015
819	8322	δ Capricorni	2.87	323	53	09.52	50.44	+0.149	-2	36	20.80	-0.340	-0.368
1569	8264	ξ Aquarii	4.69	324	27	40.41	50.40	+0.103	+5	57	20.49	-0.030	-0.062
765	7796	ɔ Cygni	2.2	325	10	47.02	50.27	+0.007	+57	07	22.40	+0.030	-0.001
780	7949	ε Cygni	2.46	328	05	22.15	50.97	+0.705	+49	25	18.90	+0.190	+0.155
815	8308	ε Pegasi	var.	332	13	34.54	50.32	+0.031	+22	05	54.91	+0.020	-0.011
849	8592	ν Aquarii	5.2	332	53	10.64	50.46	+0.154	-10	54	12.92	-0.180	-0.218
797	8115	ζ Cygni	3.2	333	22	50.75	50.24	-0.031	+43	41	35.69	-0.020	-0.051
827	8414	α Aquarii	2.96	333	55	34.24	50.31	+0.015	+11	15	29.44	+0.020	-0.016
867	8728	α PsA	1.16	334	12	19.40	50.55	+0.253	-21	08	19.27	-0.260	-0.287
777	7924	α Cygni	1.25	335	39	59.64	50.28	+0.007	+59	54	18.55	+0.040	+0.001
842	8518	ɔ Aquarii	3.84	337	03	24.32	50.42	+0.126	+8	14	02.11	-0.010	-0.042
834	8450	ɗ Pegasi	3.53	337	10	35.04	50.57	+0.278	+16	20	20.92	-0.040	-0.077
861	8679	τ Aquarii	4.01	338	56	17.34	50.28	-0.026	-5	39	56.08	+0.010	-0.030
866	8709	δ Aquarii	3.27	339	12	57.11	50.25	-0.047	-8	11	32.05	+0.030	-0.008
3	25	ε Phoenicis	3.88	339	59	35.18	50.32	+0.011	-41	57	30.09	-0.180	-0.220
850	8597	η Aquarii	4.02	340	50	03.88	50.36	+0.064	+8	21	48.22	-0.040	-0.087
792	8079	ξ Cygni	3.72	341	08	14.52	50.30	+0.014	+56	34	52.57	+0.030	-0.003
864	8698	ɚ Aquarii*	3.74	341	55	06.78	50.32	+0.025	-0	23	13.63	+0.060	+0.030
72	591	α Hydri	2.86	342	28	09.94	50.74	+0.420	-64	14	38.90	-0.160	-0.194
831	8430	ι Pegasi	3.76	344	45	04.43	50.63	+0.339	+34	15	15.15	-0.070	-0.104
54	472	α Eridani	0.46	345	39	33.57	50.39	+0.084	-59	22	45.32	-0.060	-0.092
12	99	α Phoenicis	2.39	345	50	17.83	50.27	-0.042	-40	38	11.79	-0.400	-0.444
855	8634	ζ Pegasi	3.4	346	29	36.41	50.37	+0.072	+17	40	43.28	+0.000	-0.043
141	1175	β Reticuli	3.85	351	45	17.61	51.11	+0.797	-76	05	24.04	-0.220	-0.260
878	8852	ɔ Piscium	3.69	351	47	59.87	51.00	+0.713	+7	15	17.93	-0.250	-0.285
871	8781	α Pegasi	2.49	353	49	37.55	50.34	+0.043	+19	24	19.82	-0.020	-0.065
1044	440	ŭ Phoenicis	3.95	353	58	14.34	50.64	+0.337	-52	34	56.90	+0.070	+0.035
862	8684	μ Pegasi	3.48	354	43	38.54	50.43	+0.130	+29	23	10.19	-0.070	-0.102
857	8650	η Pegasi	2.94	356	03	12.20	50.29	+0.002	+35	06	28.93	+0.010	-0.029
68	566	χ Eridani	3.7	356	36	11.66	51.60	+1.308	-57	01	07.56	-0.170	-0.210
49	429	ɔ Phoenicis	3.41	358	29	16.39	50.11	-0.186	-47	35	09.61	-0.130	-0.167
870	8775	β Pegasi*	2.42v	359	42	59.31	50.57	+0.270	+31	08	27.70	+0.080	+0.037

* **No. 864 : Satabhisaj.**

No. 870 : *Scheat*, Purva Bhadrapada-2.

BS = Bright Star Catalogue HR = Havard Revised Catalogue FK5 = Fifth Fundamental Catalogue

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1	15	α Andromedae*	2.06	B9p Hg Mn	0	09	39.6	3.117	+104	+29	13	32.23	+19.86	-163
2	21	β Cassiopeiae*	2.27	F2 III	0	10	30.1	3.247	+685	+59	17	05.32	19.84	-181
3	25	ε Phoenicis	3.88	K0 III	0	10	38.8	3.024	+118	-45	36	44.67	19.84	-181
7	39	ɔ Pegasi*	2.83	B2 IV	0	14	30.0	3.099	+2	+15	19	10.64	19.99	-12
9	74	ι Ceti	3.56	K1 IIIb	0	20	40.6	3.056	-9	-8	41	17.87	19.92	-36
11	98	β Hydri	2.80	G1 IV	0	27	00.2	3.051	+6622	-77	06	59.69	20.23	+324
12	99	α Phoenicis	2.39	K0 III b	0	27	29.3	2.949	+183	-42	10	23.85	+19.50	-396
17	153	ζ Cassiopeiae	3.66	B2 IV	0	38	21.0	3.384	+22	+54	01	53.11	19.75	-9
20	165	ŭ Andromedae	3.27	K3 III	0	40	38.7	3.228	+106	+30	59	40.76	19.64	-92
21	168	α Cassiopeiae*	2.23	K0^{-} IIIa	0	41	54.8	3.451	+64	+56	40	16.79	19.67	-32
22	188	β Ceti*	2.04	G9 III CH-1 CN 0.5 Ca 1	0	44	49.1	3.008	+164	-17	51	09.10	19.69	+32
33	269	μ Andromedae	3.87	A5 IV-V	0	58	07.3	3.356	+130	+38	37	54.09	19.43	+33
32	264	ɔ Cassiopeiae*	2.47	B0 IVnpe(shell)	0	58	12.5	3.681	+36	+60	50	55.74	+19.39	-5
35	280	α Sculptoris	4.31	B4 Vp	0	59	47.1	2.884	+17	-29	13	32.06	19.37	+4
40	334	η Ceti	3.45	K2^{-}III CN0.5	1	09	49.4	3.019	+147	-10	03	10.75	18.98	-138
42	337	β Andromedae*	2.06	M0^{+}IIIa	1	11	06.7	3.384	+146	+35	44	59.20	18.97	-114
1033	361	ζ Piscium*	5.24	F0Vn	1	15	00.9	3.143	+97	+7	42	15.20	18.92	-56
47	402	ɗ Ceti	3.60	K0 IIIb	1	25	14.9	3.001	-53	-8	03	27.72	18.45	-218
48	403	ŭ Cassiopeiae	2.68	A5 IV	1	27	26.5	3.990	+401	+60	21	42.07	+18.55	-52
49	429	ɔ Phoenicis	3.41	M0^{-} IIIa	1	29	25.6	2.597	-13	-43	11	36.22	18.33	-208
1044	440	ŭ Phoenicis	3.95	G9 III	1	32	16.1	2.489	+144	-48	56	45.87	18.59	+151
50	437	η Piscium	3.62	G7 IIIa	1	32	47.9	3.223	+19	+15	28	16.55	18.41	-6
54	472	α Eridani*	0.46	B3Vnp(shell)	1	38	37.4	2.225	+117	-57	06	46.36	18.18	-35
52	464	51 Andromedae	3.57	K3^{-} III	1	39	30.6	3.723	+65	+48	45	04.92	18.07	-113
59	509	τ Ceti	3.50	G8 V	1	45	12.4	2.789	-1190	-15	48	33.15	+18.82	+858
62	539	ζ Ceti	3.73	K0 III	1	52	40.3	2.965	+28	-10	12	53.67	17.63	-39
64	544	α Trianguli	3.41	F6 IV	1	54	29.1	3.441	+8	+29	41	49.81	17.36	-235
66	553	β Arietis*	2.64	A4 V	1	55	59.9	3.330	+68	+20	55	36.27	17.42	-111
63	542	ε Cassiopeiae	3.38	B3 IV:p(shell)	1	56	11.1	4.398	+48	+63	47	21.97	17.50	-21
68	566	χ Eridani	3.70	G8 III-IVCN-0.5Hŭ0.5	1	56	54.6	2.329	+730	-51	29	15.83	17.78	+291
72	591	α Hydri	2.86	F0n III-IV	1	59	32.5	1.889	+368	-61	27	04.63	+17.40	+26
71	585	ν Ceti	4.00	M0 IIIb	2	01	09.6	2.827	+97	-20	57	36.17	17.28	-24
73	603	ɔ Andromed.* p	2.26	K3^{-} Iib	2	05	24.9	3.715	+40	+42	26	45.89	17.06	-52
70	580	50 Cassiopeiae	3.98	A1 Va	2	05	34.8	5.278	-99	+72	32	17.57	17.13	+22
74	617	α Arietis*	2.00	K2 IIIab	2	08	33.6	3.399	+138	+23	34	37.59	16.82	-149
75	622	β Trianguli	3.00	A5 IV	2	11	00.6	3.596	+122	+35	06	07.06	16.81	-41
82	674	ű Eridani	3.56	B8 V	2	17	23.1	2.141	+102	-51	23	58.76	+16.52	-27
79	664	ɔ Trianguli	4.01	A0 IV-Vn	2	18	46.8	3.591	+38	+33	57	33.36	16.43	-51
91	779	δ Ceti	4.07	B2 IV	2	40	44.5	3.083	+9	+0	25	58.48	+15.31	-4

* **No. 1 : *Alpheratz,* Uttara Bhadrapada - 2**
No. 2 : *Caph*
No. 7 : *Algenib,* Uttara Bhadrapada - 1
No. 21 : *Schedar* . Mag. 2.1 to 2.6
No. 22 : *Deneb Kaitos or Diphda*
No. 32 : *Cih* . Mag. 1.6 to 3.2
No. 42 : *Mirach*
No. 1033 : Revati
No. 54 : *Achernar*
No. 66 : *Sheratan,* Asvini
No. 73 : *Almach,* Mag. f. 5.1
No. 74 : *Hamal*

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1075	794	ι Eridani	4.11	K0.5 IIIb Fe-0.5	2	41	38.0	2.367	+119	-39	45	05.76	+15.23	-32
94	801	35 Arietis	4.66	B3 V	2	44	53.8	3.540	+6	+27	48	35.73	15.06	-12
101	841	β Fornacis	4.46	G8.5 III Fe-0.5	2	50	07.0	2.512	+71	-32	18	15.00	14.92	155
100	838	41 Arietis*	3.63	B8 Vn	2	51	26.0	3.551	+50	+27	21	35.93	14.57	-118
99	834	η Persei	3.76	K3^{-}Ib-IIa	2	52	30.2	4.431	+20	+55	59	43.15	14.61	-14
103	854	τ Persei	3.95	G5 III + A4 V	2	56	00.7	4.301	+0	+52	51	39.32	14.41	-5
104	874	η Eridani	3.89	K1 IIIb	2	57	37.6	2.936	+53	-8	48	07.09	+14.10	-220
106	897	ɗ Eridani* p	3.25	A5 IV	2	59	11.5	2.276	-39	-40	12	27.36	14.24	+19
907	424	α Ursae Mins.*	2.02	F5-8 Ib	3	03	39.9	89.974	+2164	+89	21	56.38	13.92	-20
1085	919	τ^{ɔ} Eridani	4.09	A4 V	3	03	28.4	2.647	-105	-23	31	46.56	13.90	-53
107	911	α Ceti*	2.53	M1.5 IIIa	3	03	33.8	3.145	-6	+4	11	03.78	13.87	-78
108	915	ɔ Persei	2.93	G5 III + A2 V	3	06	35.2	4.393	0	+53	36	01.66	13.75	-5
109	921	ρ Persei*	3.39	M4 II	3	06	45.4	3.872	+111	+38	56	00.47	+13.64	-106
111	936	β Persei*	2.12	B8 V + F:	3	09	46.4	3.933	+3	+41	02	53.77	13.55	-1
120	1017	α Persei*	1.79	F5 Ib	3	26	05.1	4.322	+25	+49	56	46.74	12.45	-25
121	1030	ο Tauri	3.60	G6 IIIa Fe-1	3	26	08.1	3.239	-45	+9	06	48.51	12.39	-78
123	1038	ξ Tauri	3.74	B9 Vn	3	28	30.0	3.262	+40	+9	48	59.36	12.26	-39
127	1084	ε Eridani	3.73	K2 V	3	34	05.2	2.832	-658	-9	22	36.26	11.94	+23
135	1136	δ Eridani	3.54	K0^{+}IV	3	44	25.4	2.880	-61	-9	40	55.13	+11.92	+745
131	1122	δ Persei	3.01	B5 III	3	44	40.8	4.305	+28	+47	51	49.39	11.12	-34
141	1175	β Reticuli	3.85	K2 III	3	44	30.9	0.774	+489	-64	43	49.28	11.24	+74
136	1142	17 Tauri	3.70	B6 III	3	46	20.1	3.578	+14	+24	11	18.60	10.99	-46
134	1135	ν Persei	3.77	F5 II	3	46	52.1	4.103	-13	+42	39	13.62	11.00	-2
146	1208	ɔ Hydri	3.24	M2 III	3	46	53.2	-0.851	+116	-74	09	48.36	11.11	+114
139	1165	η Tauri*	2.87	B7 IIIn	3	48	56.8	3.581	+14	+24	10	44.30	+10.80	-46
142	1178	27 Tauri	3.63	B8 III	3	50	37.5	3.582	+13	+24	07	35.12	10.68	-47
144	1203	ζ Persei	2.85	B1 Ib	3	55	40.7	3.790	+4	+31	57	15.67	10.34	-10
149	1231	ɔ Eridani	2.95	M0.5 IIIb Ca-1	3	59	10.4	2.804	+42	-13	26	25.34	9.97	-112
147	1220	ε Persei	2.89	B 0.5 IV	3	59	30.4	4.049	+16	+40	04	44.05	10.03	-26
148	1228	ξ Persei	4.04	O 7.5 IIIf	4	00	33.7	3.913	+2	+35	51	33.55	9.98	0
150	1239	λ Tauri	3.47v	B3 V	4	02	02.5	3.334	-4	+12	33	27.92	+9.85	-12
151	1251	ν Tauri	3.91	A1 Va	4	04	27.7	3.200	+3	+6	03	19.81	9.68	-3
152	1273	48 Persei	4.04	B3 Ve	4	10	27.0	4.385	+20	+47	46	31.92	9.19	-31
155	1326	α Horologii	3.86	K2 III	4	14	48.9	1.992	+41	-42	14	06.80	8.67	-209
156	1336	α Reticuli	3.35	G8II-III	4	14	44.8	0.790	+65	-62	24	46.78	8.93	+45
159	1346	ɔ Tauri	3.65	G9.5 IIIab CN 0.5	4	21	11.5	3.424	+80	+15	41	05.36	8.35	-25
162	1373	δ Tauri	3.76	G9.5 III CN 0.5	4	24	21.1	3.470	+75	+17	35	52.67	+8.09	-30
1121	1393	43 Eridani	3.96	K3.5^{-}IIIb	4	24	57.5	2.257	+56	-33	57	40.78	8.13	+50
164	1409	ε Tauri	3.54	G9.5 III CN 0.5	4	30	03.0	3.514	+76	+19	13	57.76	7.63	-38
171	1465	α Doradus	3.27	A0p Si	4	34	31.7	1.305	+60	-54	59	42.86	7.30	-4
170	1464	ν$^{˂}$ Eridani	3.82	G8.5 IIIa	4	36	30.3	2.336	-35	-30	30	48.81	+7.13	-12

* **No. 907 : (Nb) : *Polaris*, Dhruva**
No. 100 : Bharani
No. 106 : Acamar.
No. 107 : *Menkar*
No. 109 : Mag. 3.3 to 4.0.
No. 111 : *Algol*, Mag. 2.1 to 3.4.
No. 120 : *Mirphak.*
No. 139 : *Alcyone*, Krittika.

MEAN PLACES OF STARS, J 2024.5

FOR JULY $2^{d}.125$ TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
168	1457	α Tauri*	0.85	$K5^{+}$III	4	37	19.8	3.451	+44	+16	33	23.46	+6.88	-190
172	1481	53 Eridani	3.87	K1.5IIIb	4	39	18.2	2.752	-52	-14	15	27.47	6.76	-155
1129	1502	α Caeli	4.45	F1 V	4	41	21.2	1.937	-126	-41	49	05.60	6.67	-77
1134	1543	$\pi^{ↄ}$ Orionis	3.19	F6 V	4	51	10.3	3.263	+313	+7	00	07.43	5.94	+10
179	1552	π^{4} Orionis	3.69	B2 III	4	52	30.8	3.202	-1	+5	38	42.18	5.82	+1
180	1567	$\pi^{ↄ}$ Orionis	3.72	B2 III	4	55	31.8	3.131	0	+2	28	43.96	5.56	0
178	1542	α Camelopardi	4.29	O9.5 Ia	4	56	30.2	6.014	-1	+66	22	50.61	+5.49	+6
181	1577	ι Aurigae	2.69	K3 II	4	58	35.6	3.919	+3	+33	12	09.14	5.29	-18
183	1605	ε Aurigae*	2.99V	A9 Ia	5	03	43.9	4.321	-1	+43	51	24.92	4.87	-4
1137	1612	ζ Aurigae	3.75	K5II + B5 V	5	04	11.7	4.208	+8	+41	06	32.59	4.81	-22
182	1603	β Camelopardi	4.03	G1 Ib-Iia	5	05	36.5	5.367	-9	+60	28	29.37	4.70	-16
186	1654	ε Leporis	3.19	K4 III	5	06	30.0	2.543	+18	-22	20	22.94	4.56	-74
185	1641	η Aurigae	3.17	B3 V	5	08	14.2	4.221	+26	+41	15	54.25	+4.42	-68
188	1666	β Eridani*	2.79	A3 IVn	5	09	03.3	2.954	-63	-5	03	23.69	4.34	-81
1144	1702	μ Leporis	3.31	B9p Hg Mn	5	14	02.0	2.699	+30	-16	10	41.62	3.97	-26
194	1713	β Orionis*	0.12	B8 Ia	5	15	43.0	2.887	0	-8	10	30.48	3.85	-1
193	1708	α Aurigae*	0.08	G6 III + G2 II	5	18	30.2	4.444	+71	+46	01	12.83	3.18	-425
195	1735	τ Orionis	3.60	B5 III	5	18	47.8	2.917	-10	-6	49	11.00	3.58	-8
1147	1765	22 Orionis	4.73	B2 IV-V	5	23	00.9	3.067	0	-0	21	36.87	+3.22	-1
201	1790	ɔ Orionis*	1.64	B2 III	5	26	26.8	3.222	-6	+6	22	11.43	2.91	-14
202	1791	β Tauri*	1.65	B7 III	5	27	50.6	3.799	+17	+28	37	32.70	2.63	-175
204	1829	β Leporis	2.84	G5 II	5	29	17.8	2.574	-3	-20	44	29.56	2.59	-89
214	1953	ɔ Mensae	5.19	K2 III	5	30	55.5	2.338	+321	-76	19	19.63	2.82	+282
206	1852	δ Orionis*	2.23	O9.5 II	5	33	15.6	3.069	+1	-0	16	58.44	2.33	-2
207	1865	α Leporis*	2.58	F0 Ib	5	33	48.7	2.649	+1	-17	48	23.08	+2.29	+2
212	1922	β Doradus	3.76v	F7-G2 Ib	5	33	50.4	0.529	+3	-62	28	27.11	2.29	+9
(GC)	1879	λ Orionis*	3.54	O8 IIIf	5	36	29.3	3.308	-1	+9	56	54.65	2.05	-2
209	1899	ι Orionis	2.77	O9 III	5	36	38.0	2.938	0	-5	53	44.33	2.04	+1
210	1903	ε Orionis*	1.70	B0 Ia	5	37	27.5	3.048	+1	-1	11	17.53	1.97	-2
211	1910	ζ Tauri	3.00	B2 IIIpe (shell)	5	39	06.6	3.590	0	+21	09	18.80	1.80	-21
215	1956	α Columbae*	2.64	B7 IV	5	40	32.2	2.176	+5	-34	03	45.06	+1.67	-26
1154	2015	δ Doradus	4.35	A7 V^{+}n	5	44	49.1	0.114	-49	-65	43	35.20	1.33	+8
217	1983	ɔ Leporis	3.60	F7 V	5	45	29.1	2.503	-212	-22	26	31.19	0.90	-369
219	1998	ζ Leporis	3.55	A2 Van	5	48	04.0	2.721	-11	-14	48	52.39	1.04	-1
220	2004	κ Orionis*	2.06	B0.5 Ia	5	48	55.2	2.848	+1	-9	39	45.83	0.97	-2
223	2040	β Columbae	3.12	K1.5 III	5	51	49.5	2.119	+49	-35	45	37.92	1.12	+401
222	2035	δ Leporis	3.81	K0 III Fe 1.5 CH 0.5	5	52	22.5	2.582	+161	-20	52	43.33	+0.02	-649
224	2061	α Orionis*	0.5	M1 M2 Ia Iab	5	56	29.9	3.251	+17	+7	24	34.48	+0.31	+9

No. 168 **:** ***Aldebaran*****, Rohini**

* **No. 183 : Mag. 2.9 to 3.8.**

No. 188 : ***Cursa*** **.**

No. 194 : ***Rigel.***

No. 193 : ***Capella*** **, Brahmahridaya.**

No. 201 : ***Bellatrix.***

No. 202 : ***El Nath*** **, Agni.**

No. 206 : ***Mintaka*** **.**

No. 207 : ***Arneb*** **.**

No. GC : ***Mrgasiras*** **.**

No. 210 : ***Alnilam.***

No. 215 : ***Phakt*** **.**

No. 220 : ***Saiph*** **.**

No. 224 : ***Betelgeuse*** **, Mag. 0.4 to 1.3 Ardra.**

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
226	2085	η Leporis	3.71	F1 V	5	57	31.3	2.735	-28	-14	09	53.95	+0.36	+139
229	2120	η Columbae	3.96	G8/K1 II	5	59	53.9	1.840	+20	-42	48	54.16	-0.01	-14
227	2088	β Aurigae*	1.90	A1 IV	6	01	19.6	4.404	-54	+44	56	49.87	0.12	0
225	2077	δ Aurigae*	3.72	K0^{-} III	6	01	32.7	4.943	+92	+54	17	00.72	0.26	-126
1163	2134	1 Geminorum	4.16	G5 III-IV	6	05	36.6	3.649	-6	+23	15	35.29	0.59	-100
1168	2219	κ Aurigae	4.35	G9 IIIb	6	16	56.4	3.823	-57	+29	29	11.94	1.74	-262
240	2282	ζ Canis Maj.	3.02	B2.5 V	6	21	15.3	2.306	+7	-30	04	32.66	-1.85	+3
243	2294	β Canis Maj.*	1.98	B1 II-III	6	23	46.7	2.644	-4	-17	58	11.07	2.08	0
241	2286	μ Geminorum	2.88	M3 IIIab	6	24	26.5	3.630	+39	+22	29	55.38	2.24	-111
245	2326	α Carinae*	-0.7	A9 II	6	24	29.8	1.333	+25	-52	42	35.80	2.12	+21
244	2298	8ε Monocerotis	4.44	A6 IV	6	25	04.0	3.181	-12	+4	34	42.29	2.18	+11
1173	2343	ν Geminorum	4.15	B6 III	6	30	25.1	3.562	-5	+20	11	39.78	2.67	-14
252	2451	ν Puppis	3.17	B8 IIIn	6	38	30.7	1.838	+2	-43	13	06.98	-3.36	-6
251	2421	ɔ Geminorum*	1.93	A1 IVs	6	39	07.6	3.465	+29	+16	22	34.48	3.45	-42
254	2473	ε Geminorum	2.98	G8 Ib	6	45	26.3	3.689	-4	+25	06	16.45	3.96	-13
257	2491	α Canis Maj* cg	-1.5	A0m A1 Va	6	46	13.6	2.643	-387	-16	45	04.74	5.22	-1204
256	2484	ξGeminorum	3.36	F5 IV	6	46	39.8	3.366	-79	+12	52	01.49	4.24	-191
262	2550	α Pictoris	3.27	A6 Vn	6	48	26.5	0.612	-96	-61	58	05.12	3.94	+269
263	2553	τ Puppis	2.93	K1 III	6	50	32.7	1.490	+38	-50	38	41.22	-4.45	-70
1180	2538	κ Canis Maj.	3.96	B1.5 Ive	6	50	45.4	2.243	-5	-32	32	17.40	4.40	+4
261	2540	ɗ Geminorum	3.60	A3 III-IV	6	54	24.1	3.949	-2	+33	55	45.48	4.76	-48
268	2618	ε Canis Maj.*	1.50	B2 II	6	59	35.4	2.360	+3	-29	00	24.67	5.15	+3
1183	2646	σ Canis Maj.	3.47	K7 IB	7	02	41.7	2.392	-4	-27	58	16.98	5.41	+5
270	2653	o^{2} Canis Maj.	3.02	B3 Ia	7	04	02.9	2.507	-3	-23	52	14.27	5.52	+3
269	2650	ζ Geminorum*	3.79v	F9 Ib (var)	7	05	33.6	3.555	-6	+20	31	55.92	-5.66	0
1189	2736	ɔ^{2} Volantis	3.78	G9 III	7	08	31.9	0.533	+48	-70	32	18.61	5.80	+106
273	2693	δ Canis Maj.	1.86	F8 Ia	7	09	23.3	2.441	-2	-26	26	00.83	5.97	+4
1187	2714	22δ Monocerotis	4.15	A1 III^{+}	7	13	06.9	3.064	-1	-0	32	06.59	6.28	+5
281	2803	δ Volantis	3.98	F9 Ib	7	16	48.7	0.049	-12	-68	00	07.44	6.59	+5
278	2773	π Puppis	2.70	K3 Ib	7	18	00.5	2.121	-8	-37	08	34.03	6.69	+4
277	2763	λ Geminorum	3.58	A4 IV	7	19	30.0	3.444	-33	+16	29	38.90	-6.85	-36
279	2777	δ Geminorum	3.53	F0 V^{+}	7	21	35.0	3.578	-19	+21	56	06.33	7.00	-12
283	2827	η Canis Maj.	2.45	B5 Ia	7	25	03.9	2.375	-3	-29	21	08.23	7.26	+5
282	2821	ι Geminorum	3.79	G9 IIIb	7	27	14.7	3.719	-93	+27	44	49.94	7.53	-86
285	2845	β Canis Min.*	2.90	B8 V	7	28	28.7	3.251	-35	+8	14	16.99	7.58	-38
1194	2878	ρ Puppis	3.25	K5 III	7	30	00.5	1.905	-50	-43	21	07.87	7.48	+187
287	2891	α Gemino.* *cg*	1.95	Alm A2 Va	7	36	09.6	3.819	-135	+31	49	57.61	-8.26	-98
291	2943	α C. Min.* *cg*	0.38	F5 IV-V	7	40	35.0	3.137	-477	+5	09	37.61	9.54	-1021
297	3024	ζ Volantis	3.95	G9 III	7	41	30.2	0.785	+67	-72	39	52.14	-8.57	+18

* **No. 225 : Prajapati.**
No. 227 : *Menkalinam* .
No. 243 : *Mirzam.*
No. 245 : *Canopus* , Agastya.
No. 251 : *Alhena* .

No. 257 : *Sirius* , Lubdhaka Mag. - 1.46.
No. 268 : *Adhara.*
No. 269 : Mekbuda Mag. 3.7 to 4.1.
No. 285 : *Gomeisa.*
No. 287 : *Castor,* Punarvasu-2, Mag. 1.95 & 2.
No. 291 : *Procyon* , Mag. 0.38 & 11.3.

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
293	2970	26α Monocerotis	3.93	G9 III Fe-1	7	42	25.1	2.866	-49	-9	36	35.73	-8.68	-19
294	2985	κ Geminorum	3.57	G8 III	7	45	55.4	3.614	-24	+24	20	13.91	8.99	-52
295	2990	β Geminorum*	1.14	K0 IIIb	7	46	48.7	3.662	-474	+27	57	53.94	9.05	-44
1204	3045	ξ Puppis	3.34	G6 Iab-Ib	7	50	19.5	2.525	-2	-24	55	21.72	9.28	-2
301	3080	213 G. Puppis	3.73	K1/2 II + A	7	53	03.6	2.065	-8	-40	38	24.75	9.49	+3
303	3117	χ Carinae	3.47	B3p Si	7	57	24.1	1.524	-32	-53	02	56.01	9.80	+21
306	3165	ζ Puppis	2.25	O5 Iafn	8	04	26.8	2.111	-24	-40	04	24.27	-10.34	+12
308	3185	ρ Puppis	2.81	F5 (Ib-II)p	8	08	35.3	2.557	-61	-24	22	34.57	10.61	+49
309	3207	ɔ´ Velorum	1.78	WC8 + O9I:	8	10	17.3	1.850	-4	-47	24	35.43	10.78	+6
312	3249	β Cancri	3.52	K 4 III Ba 0.5	8	17	50.6	3.249	-30	+9	06	30.03	11.39	-49
315	3307	ε Carinae	1.86	K3: III + B2: V	8	23	00.9	1.225	-35	-59	35	20.63	11.70	+15
319	3347	β Volantis	3.77	K2 III	8	25	59.8	0.632	-61	-66	13	08.66	12.08	-155
316	3314	Br 1197 Hydrae	3.90	A0 Va	8	26	53.0	2.996	-44	-3	59	16.25	-12.01	-23
317	3323	*o* Ursae Maj.	3.36	G5 III	8	32	16.8	4.927	-182	+60	38	01.74	12.46	-107
321	3366	η Cancri	5.33	K3 III	8	34	07.3	3.460	-34	+20	21	22.40	12.53	-43
1223	3410	δ Hydrae	4.16	A1 Ivnn	8	38	57.1	3.172	-44	+5	37	00.44	12.82	-7
1224	3418	σ Hydrae	4.44	K1 III	8	40	02.2	3.132	-12	+3	15	13.89	12.90	-18
1227	3447	*o* Velorum	3.62	B3 IV	8	40	59.7	1.719	-24	-53	00	35.31	12.93	+20
1226	3445	53 G. Velorum	3.84	F0 Ia	8	41	26.4	1.994	0	-46	44	12.82	-12.98	+3
327	3468	α Pyxidis	3.68	B1.5 III	8	44	34.7	2.414	-9	-33	16	33.04	13.18	+11
1228	3449	ɔ Cancri	4.66	A1 Va	8	44	42.0	3.461	-76	+21	22	43.42	13.23	-39
326	3461	δ Cancri*	3.94	K0 IIIb	8	46	04.4	3.400	-13	+18	03	45.49	13.51	-228
(329)	3482	ε Hydrae* m	3.38	G5: III + A:	8	48	04.2	3.170	-155	+6	19	39.09	13.45	-40
328	3475	ι Cancri	4.02	G8 II-III	8	48	10.5	3.616	-19	+28	40	06.98	13.46	-42
336	3571	108 G. Carinae	3.84	B7 II-III	8	55	36.0	1.354	-28	-60	44	19.85	-13.86	+38
334	3547	ζ Hydrae	3.11	G9 IIIa	8	56	41.2	3.167	-66	+5	51	03.07	13.95	+15
337	3572	α Cancri*	4.25	A5m	8	59	49.5	3.275	23	+11	45	41.10	14.19	-31
335	3569	ι Ursae Maj.	3.14	A7 Ivn	9	00	52.4	4.074	-443	+47	56	37.28	14.45	-225
342	3614	97 G. Velorum	3.75	K2 III	9	05	00.1	2.073	-44	-47	11	46.39	14.49	-13
341	3594	κ Ursae Maj.	3.60	A0 IIIn	9	05	17.2	4.064	-32	+47	03	28.34	14.55	-54
345	3634	λ Velorum	2.21	K4.5 Ib	9	08	53.9	2.212	-17	-43	31	56.84	-14.70	+13
1239	3627	ξ Cancri	5.14	G9 IIIa Fe-0.5 CH-I	9	10	45.8	3.438	+1	+21	56	41.56	14.82	+5
348	3685	β Carinae	1.68	A1 III	9	13	27.5	0.629	-311	-69	49	06.11	14.87	+109
347	3665	ɗ Hydrae	3.88	B9.5 IV (C II)	9	15	38.3	3.118	+86	+2	12	34.45	15.41	-310
351	3699	ι Carinae	2.25	A7 Ib	9	17	44.7	1.605	-26	-59	22	43.42	15.22	+8
352	3705	α Lyncis	3.13	K7 IIIab	9	22	32.4	3.635	-179	+34	17	15.04	15.48	+19
1243	3718	ɗ Pyxidis	4.72	M0.5 III	9	22	34.8	2.660	-8	-26	04	14.81	-15.50	-8
353	3734	κ Velorum*	2.50	B2 IV-V	9	22	52.4	1.861	-10	-55	06	57.95	15.50	+9
354	3748	α Hydrae*	1.98	K3 II-III	9	28	47.5	2.948	-9	-8	45	57.53	15.80	+33
361	3803	N Velorum	3.13	K5 III	9	31	58.1	1.826	-39	-57	08	35.38	16.00	+4
355	3757	23 Ursae Maj.	3.67	F0 IV	9	33	26.0	4.653	+160	+62	57	10.60	16.05	+27
358	3775	ɗ Ursae Maj.	3.17	F6 IV	9	34	28.9	3.972	-1024	+51	33	51.09	-16.66	-529

* **No. 295 : *Pollux*, Punarvasu-1.**
No. 326 : Pusya.
No. 329 : Aslesa.

No. 337 : Acubens. (Aslesa.)
No. 353 : *Markeb* .
No. 354 : *Alphard* .

MEAN PLACES OF STARS, J 2024.5

FOR JULY $2^{d}.125$ TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
1250	3845	ι Hydrae	3.91	K2.5 III	9	41	06.4	3.062	+32	-1	15	18.76	-16.54	-64
364	3849	κ Hydrae	5.06	B5 V	9	41	28.9	2.878	-19	-14	26	40.20	16.51	-20
365	3852	ο Leonis	3.52	F5 II + A5?	9	42	27.4	3.196	-96	+9	46	46.96	16.58	-37
367	3873	ε Leonis	2.98	G1 II	9	47	14.2	3.393	-34	+23	39	36.84	16.78	-11
368	3888	ν Ursae Maj.	3.80	F0 IV	9	52	42.7	4.206	-379	+58	55	19.51	17.18	-150
371	3905	μ Leonis	3.88	K2 III CN I Ca I	9	54	09.1	3.398	-160	+25	53	25.49	17.15	-56
375	3940	ű Velorum	3.54	B5 Ib	9	57	43.5	2.115	-12	-54	41	06.40	-17.25	+3
1261	3970	ν^{2} Hydrae	4.60	B8 V	10	06	19.1	2.924	-25	-13	11	03.66	17.61	+18
379	3975	η Leonis	3.52	A0 Ib	10	08	39.9	3.262	-1	+16	38	31.98	17.72	0
380	3982	α Leonis*	1.35	B7 Vn	10	09	40.5	3.188	-169	+11	50	47.47	17.76	+7
381	3994	ɚ Hydrae	3.61	K0 III CN 0.5	10	11	47.0	2.927	-138	-12	28	33.60	17.94	-88
385	4037	ɣ Carinae	3.32	B8 IIIn	10	14	19.0	1.420	-76	-70	09	35.86	17.94	+7
382	4023	191 G.Velorum	3.85	A2 Va	10	15	46.1	2.529	-131	-42	14	38.86	-17.96	+45
1264	4050	187 G. Carinae	3.40	K2.5 II	10	17	54.3	2.014	-34	-61	27	18.99	18.08	+5
384	4031	ζ Leonis	3.44	F0 III	10	18	02.9	3.324	+13	+23	17	39.47	18.10	-7
383	4033	ɚ Ursae Maj.	3.45	A1 IV	10	18	33.9	3.590	-149	+42	47	27.85	18.15	-38
1268	4080	204 G.Velorum	4.83	K1 III	10	23	22.9	2.585	-20	-41	46	26.42	18.23	+56
386	4069	μ Ursae Maj.	3.05	M0 III	10	23	46.8	3.548	-72	+41	22	31.36	18.27	+35
391	4102	I Carinae	4.00	F2 V	10	24	52.4	1.172	-52	-74	09	23.57	-18.37	-26
389	4094	μ Hydrae	3.81	K4^{+} III	10	27	16.6	2.906	-89	-16	57	43.69	18.50	-80
392	4104	α Antliae	4.25	K4.5 III	10	28	16.6	2.754	-58	-31	11	35.61	18.45	+11
393	4114	196 G. Carinae	3.82	F0 Ib	10	28	47.0	2.216	-17	-58	51	54.38	18.47	0
1270	4116	δ Sextantis	5.21	B9.5 V	10	30	43.4	3.047	-32	-2	51	54.91	18.55	-14
397	4140	203 G. Carinae	3.32	B4 Vne	10	32	54.0	2.148	-27	-61	48	42.75	18.60	+9
396	4133	ρ Leonis	3.85	B1 Iab	10	34	06.0	3.154	-4	+9	10	47.16	-18.65	-3
401	4174	ɔ Chamaeleontis	4.11	M0 III	10	35	44.2	0.650	-144	-78	44	05.73	18.69	+14
406	4199	ɗ Carinae	2.76	B0.5 Vp	10	43	50.2	2.157	-35	-64	31	23.69	18.93	+10
411	4234	δ^{2} Chamaeleontis	4.45	B2.5 IV	10	45	58.8	0.474	-201	-80	40	10.03	19.00	+8
410	4232	ν Hydrae	3.11	K1.5 IIIb Hδ-0.5	10	50	50.1	2.966	+66	-16	19	20.81	18.94	+200
412	4247	46 Leonis Min.	3.83	K0^{+} III-IV	10	54	40.5	3.337	+70	+34	04	55.91	19.51	-279
1283	4287	α Crateris	4.08	K0^{+} III	11	00	58.2	2.930	-323	-18	25	46.96	-19.25	+130
416	4295	β Ursae Maj.*	2.37	A1 IV-V	11	03	18.2	3.575	+99	+56	15	01.79	19.40	+34
417	4301	α Ursae Maj.*	1.80	K0^{-} IIIa	11	05	13.2	3.644	-167	+61	37	04.90	19.54	-66
1289	4337	260 G. Carinae	3.91	G4 0-Ia	11	09	38.7	2.588	-9	-59	06	29.22	19.56	0
420	4335	ɣ Ursae Maj.	3.01	K1 III	11	11	01.9	3.346	-60	+44	21	54.37	19.61	-28
422	4357	δ Leonis*	2.56	A4 IV	11	15	24.5	3.182	+101	+20	23	20.63	19.79	-130
423	4359	ɗ Leonis*	3.34	A2 IV (Kvar)	11	15	31.4	3.142	-42	+15	17	42.89	-19.74	-79
425	4377	ν Ursae Maj.	3.48	K3^{-} III	11	19	47.8	3.225	-20	+32	57	36.89	19.71	+28
426	4382	δ Crateris	3.56	G9 IIIb CH 0.2	11	20	34.1	3.006	-84	-14	54	41.30	19.54	+208
433	4434	ɚ Draconis	3.84	M0 III Ca-1	11	32	49.9	3.484	-73	+69	11	44.05	19.92	-17
434	4450	ɝ Hydrae	3.54	G7 III	11	34	12.7	2.965	-162	-31	59	36.25	19.95	-39
436	4467	ɚ Centauri	3.13	B9.5 Iin	11	36	55.4	2.804	-61	-63	09	19.86	-19.94	-5

* **No. 380 : *Regulus* , Magha.**
No. 416 : *Merak* , Pulaha.

No. 417 : *Dubhe* , Kratu.
No. 422 : *Zosma* , Purva Phalguni-1.
No. 423 : Purva Phalguni-2.

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
442	4520	ɚ Muscae	3.64	A7 IV	11	46	46.7	2.878	-174	-66	51	52.70	-19.97	+37
441	4518	χ Ursae Maj.	3.71	K0.5 IIIb	11	47	20.1	3.143	-136	+47	38	36.42	19.98	+30
1304	4527	93 Leonis*	4.53v	G4 III-IV + A7 V	11	49	14.8	3.088	-106	+20	04	57.62	20.02	-3
444	4534	β Leonis*	2.14	A3 Va	11	50	18.5	3.056	-342	+14	26	06.02	20.14	-114
445	4540	β Virginis	3.61	F9 V	11	51	58.3	3.126	+495	+1	37	35.54	20.30	-271
447	4554	ɔ Ursae Maj.*	2.44	A0 Van	11	55	06.5	3.125	+107	+53	33	30.53	20.02	+12
452	4621	δ Centauri	2.60	B2 IVne	12	09	38.3	3.141	-36	-50	51	31.60	-20.03	-8
453	4630	ε Corvi	3.00	K2.5 IIIa	12	11	23.3	3.098	-51	-22	45	21.31	20.00	+13
455	4656	δ Crucis	2.80	B2 IV	12	16	27.6	3.229	-53	-58	53	06.16	20.00	-9
456	4660	δ Ursae Maj.*	3.31	A2 Van	12	16	37.7	2.940	+127	+56	53	47.82	19.98	+9
457	4662	ɔ Corvi*	2.59	B8p Hg Mn	12	17	04.2	3.096	-112	-17	40	40.17	19.96	+23
459	4674	β Chamaeleontis	4.26	B5 Vn	12	19	50.2	3.678	-175	-79	26	52.83	19.95	+17
460	4689	η Virginis	3.89	AI IV^{+}	12	21	09.6	3.073	-42	-0	48	10.01	-19.97	-18
462	4730	α Crucis*A	1.33	B0.5 IV	12	27	58.8	3.393	-53	-63	14	04.43	19.90	-12
465	4757	δ Corvi*	2.95	B9.5 IV^{-}n	12	31	08.1	3.115	-146	-16	39	05.64	19.99	-138
468	4763	ɔ Crucis	1.63v	M3.5 III	12	32	32.4	3.372	+29	-57	15	00.22	20.10	-262
469	4773	ɔ Muscae	3.87	B5 V	12	33	57.7	3.680	-127	-72	16	04.58	19.82	-2
472	4787	κ Draconis	3.87v	B6 IIIpe	12	34	30.9	2.524	-112	+69	39	12.27	19.80	+12
471	4786	β Corvi	2.65	G5 IIb	12	35	40.7	3.166	+2	-23	31	54.93	-19.85	-54
474	4798	α Muscae	2.69	B2 IV-V	12	38	40.3	3.659	-90	-69	16	12.59	19.77	-13
475	4813	χ Virginis	4.66	K2 III CN 1.5	12	40	30.8	3.104	-51	-8	07	48.45	19.75	-25
1326	4828	ρ Virginis	4.88	A0 Va(ɚ Boo)	12	43	07.5	3.037	+57	+10	06	03.31	19.78	-90
481	4853	β Crucis	1.25	B0.5 III	12	49	10.2	3.558	-63	-59	49	19.89	19.60	-14
483	4905	ε Ursae Maj.*	1.77	A0p Cr	12	55	06.0	2.620	+132	+55	49	38.15	19.47	-6
484	4910	δ Virginis*	3.38	M3^{+}III	12	56	50.3	3.025	-313	+3	15	53.10	-19.48	-54
485	4915	α CVn sq*	2.90	A0p Si Eu	12	57	10.2	2.796	-198	+38	11	11.46	19.36	+56
488	4932	ε Virginis*	2.83	G8 IIIab	13	03	23.8	2.987	-185	+10	49	40.65	19.26	+20
487	4923	δ Muscae	3.62	K2 III	13	03	59.7	4.242	+544	-71	40	48.90	19.29	-20
492	4983	β Com	4.26	F9.5 V	13	13	00.9	2.795	-604	+27	45	16.29	18.15	+881
495	5020	ɔ Hydrae	3.00	G8 IIIa	13	20	15.5	3.278	+47	-23	18	00.47	18.87	-45
496	5028	ι Centauri	2.75	A2 Va	13	21	59.0	3.398	-284	-36	50	26.88	-18.86	-86
497	5054	ζ Ursae Maj.*pr	2.27	A1 Va^{+}(Si)	13	24	54.5	2.404	+141	+54	47	52.80	18.70	-20
498	5056	α Virginis*	0.98	B1 V	13	26	29.2	3.171	-28	-11	17	18.39	18.66	-28
501	5107	ζ Virginis	3.37	A2 IV^{-}	13	35	56.6	3.063	-190	-0	43	13.53	18.27	+42
504	5132	ε Centauri	2.30	B1 III	13	41	27.3	3.848	-32	-53	35	23.81	18.13	-17
509	5191	η Ursae Maj.*	1.86	B3 V	13	48	30.2	2.357	-125	+49	11	30.19	17.85	-11
508	5193	μ Centauri	3.04	B2 IV-Vpne(shell)	13	51	06.2	3.646	-21	-42	35	41.21	-17.75	-20
513	5235	η Bootis	2.68	G0 IV	13	55	51.1	2.857	-44	+18	16	32.72	17.89	-358
512	5231	ζ Centauri	2.55	B2.5 IV	13	57	04.9	3.780	-56	-47	24	28.30	-17.52	-42

* **No. 1304 : Uttara Phalguni-2.**
No. 444 : *Denebola,* Uttara Phalguni-1.
No. 447 : *Phecda or Phad,* Pulastya.
No. 456 : *Megrez,* Atri.
No. 457 : *Minkar.*
No. 462 : *Acrux* .
No. 465 : *Algorel* , Hasta.
No. 483 : *Alioth,* Angira.
No. 484 : Minelauva.
No. 485 : 12 Canum Venaticorum, Mag. *p* 2.9 &
No. 488 : *Vindemiatrix.*
No. 497 : *Mizar* , Vasista. Mag. *f* . 4.0.
No. 498 : *Spica* , Citra.
No. 509 : *Alkaid, Benetnasch,* Marichi.

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
521	5291	α Draconis*	3.65	A0 III	14	05	03.2	1.629	-84	+64	15	33.40	-17.11	+18
518	5267	β Centauri*	0.61	B1 III	14	05	34.5	4.301	-43	-60	29	23.39	17.13	-19
519	5287	π Hydrae	3.27	K2$^-$ III Fe-0.5	14	07	46.4	3.436	+33	-26	47	57.39	17.15	-139
520	5288	ɗ Centauri	2.06	K0$^-$ IIIb	14	08	08.0	3.557	-429	-36	29	21.84	17.51	-520
523	5315	κ Virginis	4.19	K2.5 III Fe-0.5	14	14	12.4	3.211	+5	-10	23	11.99	16.56	+140
526	5340	α Bootis*	-0.04	K1.5 III Fe-0.5	14	16	46.8	2.739	-769	+19	03	20.91	18.58	-2000
525	5338	ι Virginis	4.08	F7 III-IV	14	17	18.2	3.156	-2	-6	06	58.91	-16.98	-432
1371	5359	ɚ Virginis	4.52	A5m:	14	20	26.4	3.259	-11	-13	28	57.76	16.36	+30
531	5404	ɗ Bootis	4.05	F7 V	14	26	01.8	2.042	-253	+51	44	17.82	16.51	-398
534	5429	ρ Bootis	3.58	K3 III	14	32	53.1	2.585	-77	+30	15	53.58	15.63	+119
535	5435	ɔ Bootis	3.03	A7 IV$^+$	14	33	03.8	2.415	-97	+38	12	07.31	15.58	+153
537	5440	η Centauri	2.31	B1.5 IVpne(shell)	14	37	04.4	3.841	-31	-42	15	50.45	15.55	-35
538	5460	α Centauri* cg	0.00	K1 V	14	41	16.9	4.131	-5000	-60	56	05.96	-14.59	+691
541	5469	α Lupi	2.30	B1.5 III	14	43	34.3	4.028	-21	-47	29	30.29	15.17	-18
545	5487	μ Virginis	3.88	F2 V	14	44	21.3	3.171	+73	-5	45	48.30	15.42	-316
539	5463	α Circini	3.19	A 7p Sr Eu	14	44	31.0	4.937	-302	-65	04	47.47	15.33	-232
544	5485	371 G.Cen	4.05	K3 IIIb	14	45	09.8	3.694	-52	-35	16	39.79	15.24	-180
547	5511	109 Virginis	3.72	A0 Ivnn	14	47	29.4	3.040	-76	+1	47	26.99	14.95	-27
542	5470	α Apodis	3.83	K3 III CN 0.5	14	51	01.4	7.802	-41	-79	08	44.37	-14.73	-16
550	5563	β Ursae Min.*	2.08	K4$^-$ III	14	50	39.6	-0.101	-76	+74	03	19.04	14.72	+12
548	5531	α²Librae*	2.75	A3 III-IV	14	52	14.3	3.332	-73	-16	08	31.82	14.71	-67
552	5571	β Lupi	2.68	B2 IV	15	00	08.9	3.961	-32	-43	13	51.57	14.20	-39
553	5576	κ Centauri	3.13	B2 V	15	00	45.9	3.933	-17	-42	12	03.23	14.15	-24
555	5602	β Bootis	3.50	G8 IIIa Fe-0.5	15	02	52.1	2.261	-35	+40	17	41.87	14.02	-28
556	5603	σ Librae	3.29	M2.5 III	15	05	30.6	3.529	-54	-25	22	36.05	-13.87	-43
559	5652	ι Librae*	4.54	B9p Si	15	13	37.4	3.434	-25	-19	52	58.31	13.34	-39
558	5649	ζ Lupi	3.41	G8 III	15	14	03.6	4.353	-122	-52	11	25.86	13.35	-73
563	5681	δ Bootis	3.47	G8 III Fe-I	15	16	29.5	2.421	+69	+33	13	28.41	13.23	-112
564	5685	β Librae*	2.61	B8 IIIn	15	18	19.7	3.239	-65	-9	28	18.45	13.01	-19
560	5671	ɔ Tr. Austrini	2.89	A1 III	15	21	14.0	5.708	-132	-68	46	02.65	12.83	-31
569	5735	ɔ Ursae Min.	3.05	A 3 III	15	20	42.5	-0.040	-40	+71	44	48.54	-12.81	+20
1402	5695	δ Lupi	3.22	B1.5 IVn	15	22	59.4	3.965	-13	-40	44	04.07	12.71	-26
566	5705	ű' Lupi	3.56	K4 III	15	23	22.1	3.830	-74	-36	20	54.46	12.74	-85
571	5744	ι Draconis	3.29	K2 III	15	25	28.7	1.345	-12	+58	52	51.25	12.49	+17
572	5747	β Cr. Borealis	3.68	F0p Cr Eu	15	28	50.4	2.476	-137	+29	01	20.96	12.19	+86
578	5793	α Cr.Borealis*	2.23	A0 IV	15	35	43.6	2.543	+91	+26	38	00.78	11.89	-88
577	5787	ɔ Librae	3.91	G8.5 III	15	36	54.0	3.368	+45	-14	52	10.43	-11.71	+9
579	5794	ν Librae	3.58	K3.5 III	15	38	31.1	3.659	-7	-28	12	51.63	11.60	+3
1413	5838	κ Librae	4.74	M0$^-$ IIIb	15	43	21.8	3.470	-26	-19	45	23.37	11.36	-103
582	5854	α Serpentis*	2.65	K2 IIIb CN I	15	45	28.6	2.961	+92	+6	21	00.43	-11.05	+47

* **No. 518 :** ***Agena*.**
No. 521 : ***Thuban*.**
No. 526 : ***Arcturus*, Svati.**
No. 538 : Rigil *Kentaurus* Mag. 0.33 & 1.70.
No. 548 : ***Zuben el Genubi*, Visakha.**
No. 550 : ***Kochab*.**
No. 559 : Visakha.
No. 564 : ***Zuben es Chamali.***
No. 578 : ***Margarita, Alphecca.***
No. 582 : ***Unukalhaly.***

MEAN PLACES OF STARS, J 2024.5
FOR JULY 2^{d}.125 TERRESTRIAL TIME
(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
583	5867	β Serpentis	3.67	A2 IV	15	47	19.2	2.773	+46	15	20	47.79	-11.01	-45
585	5881	μ Serpentis	3.54	A0 III	15	50	54.1	3.139	-57	-3	30	12.76	10.73	-24
588	5892	ε Serpentis	3.71	A5m	15	52	02.4	2.997	86	+4	24	20.14	10.55	+63
589	5897	β Tr.Australis	2.85	F0 1V	15	57	19.4	5.352	-283	-63	30	12.59	10.62	-398
591	5933	ɔ Serpentis	3.85	F6 V	15	57	35.2	2.776	+218	+15	34	59.47	11.48	-1281
592	5944	π Scorpii	2.89	B1 V + B2 V	16	00	20.3	3.644	-8	-26	10	57.64	10.02	-26
594	5953	δ Scorpii*	2.32	B0.3 IV	16	01	47.2	3.560	-8	-22	41	22.13	-9.91	-22
597	5984	β Scorpii*pr	2.62	B0.5 V	16	06	51.9	3.500	-4	-19	52	13.98	9.52	-19
603	6056	δ Ophiuchi	2.74	M0.5 III	16	15	37.9	3.151	-29	-3	45	20.25	8.96	-143
605	6075	ε Ophiuchi	3.24	G9.5 IIIb Fe-0.5	16	19	37.2	3.182	+57	-4	45	01.50	8.46	+41
608	6092	τ Herculis	3.89	B5 IV	16	20	28.7	1.808	-11	+46	15	21.88	8.39	+40
607	6084	σ Scorpii	2.89	B1 III	16	22	40.9	3.659	-8	-25	38	58.43	8.28	-21
609	6095	ɔ Herculis	3.75	A9 IIIbn	16	23	00.1	2.650	-33	+19	05	49.53	-8.19	+43
613	6117	ω Herculis	4.57	B9 p Cr	16	26	32.9	2.773	+30	+13	58	42.46	8.01	-59
616	6134	α Scorpii* cg	0.96	M1.5 Iab-Ib	16	30	54.8	3.691	-7	-26	29	03.24	7.62	-20
618	6148	β Herculis	2.77	G7 III a Fe-0.5	16	31	16.5	2.583	-70	+21	26	15.77	7.58	-15
611	6102	ɔ Apodis	3.89	G8/K0 III	16	37	17.2	9.429	-452	-78	56	48.76	7.15	-77
620	6165	τ Scorpii	2.82	B0 V	16	37	24.7	3.747	-6	-28	15	52.94	7.09	-22
622	6175	ζ Ophiuchi	2.56	O9.5 Vn	16	38	30.6	3.311	+9	-10	36	53.21	-6.95	+26
626	6220	η Herculis	3.53	G7 III Fe-1	16	43	44.2	2.061	+32	+38	52	37.03	6.63	-82
625	6217	α Tr. Austr.*	1.92	K2 IIb-IIIa	16	51	16.8	6.415	+26	-69	04	08.36	5.95	-34
1438	6243	20 Ophiuchi	4.65	F7 III	16	51	11.5	3.326	+65	-10	49	27.79	6.02	-92
628	6241	ε Scorpii	2.29	K2 III	16	51	45.3	3.899	-493	-34	20	07.69	6.14	-257
1435	6229	η Arae	3.76	K5 III	16	51	54.8	5.213	+49	-59	04	55.75	5.90	-28
1439	6247	μ^1 Scorpii	3.08v	B1.5 IVn	16	53	32.1	4.078	-9	-38	05	13.46	-5.76	-25
633	6299	κ Ophiuchi	3.20	K2 III	16	58	49.8	2.844	-197	+9	20	19.12	5.30	-11
631	6285	ζ Arae	3.13	K4 III	17	00	39.4	4.990	-23	-56	01	33.23	5.17	-36
634	6324	ε Herculis	3.92	A0 IV^{+}	17	01	13.7	2.299	-36	+30	53	30.26	5.06	+27
635	6355	60 Herculis	4.91	A4 IV	17	06	30.9	2.786	+35	+12	42	32.04	4.64	-10
639	6396	ζ Draconis	3.17	B6 III	17	08	51.8	0.189	-33	+65	41	04.59	4.41	+22
638	6380	η Scorpii	3.33	F2 V:p(Cr)	17	13	54.8	4.310	+23	-43	16	07.94	-4.29	-287
643	6418	π Herculis	3.16	K3 II	17	15	54.1	2.093	-22	+36	46	58.30	3.83	+4
641	6410	δ Herculis	3.14	A1 Vann	17	16	02.4	2.468	-15	+24	48	42.66	3.98	-157
644	6453	ɗ Ophiuchi	3.27	B2 IV	17	23	31.0	3.691	-3	-25	01	18.17	3.20	-20
645	6461	β Arae	2.85	K3 Ib-IIa	17	27	20.5	5.002	-9	-55	33	00.13	2.87	-25
1457	6486	44 Ophiuchi	4.17	A9m:	17	27	52.1	3.670	0	-24	11	44.19	2.92	-116
653	6536	β Draconis	2.79	G2 Ib-IIa	17	30	59.3	1.360	-17	+52	17	02.90	-2.52	+15
649	6508	v Scorpii	2.69	B2 IV	17	32	25.9	4.086	-1	-37	18	46.49	2.44	-31
648	6500	δ Arae	3.62	B8 Vn	17	33	18.9	5.432	-79	-60	42	03.45	2.42	-96
651	6510	α Arae	2.95	B2 Vne	17	33	44.4	4.648	-32	-49	53	34.17	2.36	-70
652	6527	ɚ Scorpii*	1.63	B1.5 IV	17	35	16.5	4.081	-1	-37	07	09.08	2.19	-29
656	6556	α Ophiuchi*	2.08	A5 Vnn	17	36	04.4	2.788	+83	+12	32	38.21	-2.31	-226

* **No. 594 : *Dschubba,* Anuradha**
No. 597 : *Graffias,* Mag. 2.9, 5.1
No. 616 : *Antares* , Jyestha, Mag. 0.9 to 1.8.
No. 625 : *Atria.*
No. 652 : *Schaula* , Mula.
No. 656 : *Ras Alhague.*

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec- tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
658	6561	ɜ Serpentis	3.54	F0 IIIb	17	38	59.5	3.439	-29	-15	24	42.65	-1.89	-58
654	6553	ɗ Scorpii	1.87	F1 III	17	39	04.9	4.318	+14	-43	00	38.89	1.83	-2
663	6588	ι Herculis	3.80	B3 IV	17	40	09.5	1.697	-5	+45	59	39.83	1.73	+5
660	6580	κ Scorpii	2.41	B1.5 III	17	44	11.1	4.156	-5	-39	02	24.41	1.41	-27
665	6603	β Ophiuchi	2.77	K2 III CN 0.5	17	44	41.0	2.966	-27	+4	33	32.08	1.18	159
667	6623	μ Herculis	3.42	G5IV	17	47	25.1	2.352	-232	+27	42	27.97	1.85	-752
661	6582	η Pavonis	3.62	K1 IIIa CN I	17	48	08.5	5.900	-21	-64	43	55.07	-1.09	-54
668	6629	ɔ Ophiuchi	3.75	A0 Van	17	49	07.3	3.011	-14	+2	41	59.77	1.02	-74
666	6615	ι^1 Scorpii	3.03	F2 Ia	17	49	18.0	4.201	0	-40	08	02.31	0.94	-8
669	6630	*G* Scorpii	3.21	K2 III	17	51	31.6	4.087	+41	-37	02	54.98	0.71	+33
671	6688	ɜ Draconis	3.75	K2 III	17	53	57.2	1.040	+114	+56	52	10.11	0.45	+80
672	6695	ɗ Herculis	3.86	K1 IIa CN2	17	57	05.6	2.060	+4	+37	14	54.93	0.25	+6
676	6705	ɔ Draconis*	2.23	K5 III	17	57	10.6	1.396	-8	+51	29	13.07	-0.27	-19
674	6703	ɜ Herculis	3.70	G8.5 III	17	58	43.1	2.334	+64	+29	14	48.28	0.13	-17
673	6698	ν Ophiuchi	3.34	G 9 IIIa	18	00	22.6	3.305	-4	-9	46	28.58	-0.08	-116
677	6714	67 Ophiuchi	3.97	B5 Ib	18	01	52.4	3.007	+1	+2	55	56.09	+0.16	-8
679	6746	ɔ Sagittarii	2.99	K0^{+} III	18	07	22.9	3.855	-41	-30	25	17.10	0.46	-185
1471	6743	ɗ Arae	3.66	B2 Ib	18	08	32.3	4.670	-10	-50	05	13.67	0.73	-14
680	6771	72 Ophiuchi	3.73	A5 IV-V	18	08	30.7	2.846	-41	+9	34	08.81	+0.82	+80
681	6779	*o* Herculis	3.83	A0 II-III	18	08	29.9	2.342	+1	+28	46	02.42	0.75	+10
682	6812	μ Sagittarii	3.86	B9 Ia	18	15	13.7	3.589	+1	-21	03	00.72	1.33	+1
683	6832	η Sagittarii	3.11	M3.5 IIIab	18	19	17.1	4.059	-106	-36	45	06.74	1.52	-167
695	6927	χ Draconis	3.57	F7 V	18	20	36.7	-1.088	+1201	+72	44	34.39	1.45	-345
687	6859	δ Sagittarii*	2.70	K2.5 IIIa CN 0.5	18	22	33.7	3.840	+27	-29	48	55.42	1.94	-28
688	6869	η Serpentis	3.26	K0 III-IV	18	22	34.7	3.106	-364	-2	53	25.97	+1.27	-702
690	6895	109 Herculis	3.84	K2 IIIab	18	24	44.6	2.559	+141	+21	46	56.95	1.92	-242
689	6879	ε Sagittarii*	1.85	A0 II^{-}n(shell)	18	25	47.9	3.980	-31	-34	22	14.35	2.13	-124
691	6897	α Telescopii	3.51	B3 IV	18	28	47.3	4.444	-15	-45	57	08.16	2.46	-54
692	6913	ɚ Sagittarii	2.81	K1 IIIb	18	29	28.9	3.702	-32	-25	24	21.30	2.39	-185
697	6951	ɗ Coronae Aust.	4.64	G8 III	18	35	15.0	4.279	+28	-42	17	32.26	3.05	-22
1482	6973	α Scuti	3.85	K3 III	18	36	32.4	3.265	-10	-8	13	29.73	+2.87	-312
699	7001	α Lyrae*	0.03	A0 Va	18	37	46.1	2.033	+172	+38	48	27.86	3.57	+287
1487	7039	ű Sagittarii	3.17	B8 III	18	47	11.2	3.745	+40	-26	57	48.03	4.10	+1
1489	7063	β Scuti	4.22	G4 IIa	18	48	28.5	3.183	-3	-4	43	11.04	4.19	-16
705	7106	β Lyrae*	3.45	B7 Vpe(shell)	18	50	59.1	2.217	+3	+33	23	32.97	4.42	-3
706	7121	σ Sagittarii*	2.02	B3 IV	18	56	47.0	3.716	+10	-26	15	50.72	4.86	-54
710	7150	ɜ´ Sagittarii	3.51	K1 III	18	59	11.4	3.575	+24	-21	04	20.36	+5.11	-12
713	7178	ɔ Lyrae	3.24	B9 II	18	59	51.6	2.246	-2	+32	43	28.33	5.18	+2
712	7176	ε Aquilae	4.02	K1^{-}III CN 0.5	19	00	44.1	2.724	-35	+15	06	11.46	5.18	-74
716	7235	ζ Aquilae	2.99	A0 Vann	19	06	32.2	2.758	-3	+13	54	05.48	5.64	-96
717	7236	ɚ Aquilae	3.44	A0 IVp(wk 4481)	19	07	32.9	3.183	-11	-4	50	38.04	5.73	-90
1496	7234	τ Sagittarii	3.32	K1.5 IIIb	19	08	28.1	3.740	-40	-27	37	56.75	+5.65	-251

No. 676 : *Eltanin.*
No. 687 : Purvasadha-1.
No. 689 : *Kaus Australis* , Purvasadha-2.
No. 699 : *Vega* , Abhijit.
No. 705 : Sheliak Mag. 3.3 to 4.3.
No. 706 : *Nunki* , Uttarasadha.

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^d.1255 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spectral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
720	7264	π Sagittarii	2.89	F2 II-III	19	11	13.2	3.563	0	-20	58	57.27	+6.09	-35
723	7310	δ Draconis	3.07	G9 III	19	12	33.2	-0.005	+164	+67	42	16.71	6.33	+93
726	7328	κ Cygni	3.77	G9 III	19	17	40.1	1.384	+65	+53	24	52.27	6.79	+125
730	7377	δ Aquilae	3.36	F2 IV-V	19	26	44.0	3.024	+171	+3	09	55.38	7.49	+83
1508	7405	α Vulpeculae	4.44	M0.5 IIIb	19	29	43.5	2.498	-92	+24	42	57.41	7.54	-106
733	7420	ι Cygni	3.79	A4 V	19	30	19.4	1.511	+21	+51	46	58.38	7.83	+130
732	7417	β Cygni∗*p*	3.08	K3 II + B9.5 V	19	31	42.6	2.421	+2	+28	00	45.10	+7.81	-2
1513	7488	β Sagittae	4.37	G8 IIIa CN 0.5	19	42	09.0	2.695	+7	+17	32	03.58	8.61	-32
741	7525	ɔ Aquilae	2.72	K3 II	19	47	25.5	2.852	+12	+10	40	28.44	9.05	-2
743	7536	δ Sagittae	3.82	M2 II + A0 V	19	48	28.8	2.676	+5	+18	35	46.34	9.14	+8
745	7557	α Aquilae∗	0.77	A7 Vnn	19	51	58.7	2.926	+362	+8	56	04.86	9.79	+387
746	7570	η Aquilae	3.90V.	F6-GI Ib	19	53	43.2	3.054	+7	+1	04	12.79	9.53	-7
749	7602	β Aquilae∗	3.71	G8 IV	19	56	31.0	2.946	+33	+6	28	10.38	+9.27	-482
752	7635	ɔ Sagittae	3.47	M0$^-$ III	19	59	50.8	2.669	+46	+19	33	36.59	10.03	+24
751	7623	d^1 Sagittarii	4.37	B2.5 IV	20	01	19.5	3.890	+5	-35	12	28.88	10.09	-26
754	7665	δ Pavonis	3.56	G6/8 IV	20	11	06.3	5.812	+1998	-66	06	59.41	9.72	-1125
756	7710	ɗ Aquilae	3.23	B9.5 III$^+$	20	12	34.1	3.093	+26	-0	44	49.87	10.96	+4
757	7735	31 *o*^{2} Cygni	3.79	K2 II+ B4 V	20	14	24.2	1.890	+4	+46	48	59.98	11.09	+3
761	7754	α^2 Capricorni∗	3.57	G9III	20	19	24.7	3.322	+44	-12	28	01.92	+11.46	+4
762	7776	β Capricorni	3.08	K0 II: + A5n: V:	20	22	23.1	3.363	+29	-14	42	08.33	11.67	+2
765	7796	ɔ Cygni	2.20	F8 Ib	20	23	06.5	2.155	+4	+40	20	10.45	11.72	0
764	7790	α Pavonis	1.94	B2.5 V	20	27	34.2	4.700	+9	-56	39	15.44	11.94	-89
768	7852	ε Delphini	4.03	B6 III	20	34	23.0	2.866	+9	+11	23	16.61	12.48	-22
(771)	7882	β Delphini∗m	3.64	F5 IV	20	38	41.9	2.814	+81	+14	40	53.68	12.75	-47
769	7869	α Indi	3.11	K0 III CN-1	20	39	16.8	4.189	+52	-47	12	14.77	+12.90	+66
774	7906	α Delphini∗	3.77	B9 IV	20	40	46.6	2.787	+46	+15	59	59.20	12.93	-2
777	7924	α Cygni∗	1.25	A2 Ia	20	42	16.1	2.048	+3	+45	22	08.02	13.04	+2
778	7928	δ Delphini	4.43	F0m	20	44	36.2	2.801	-13	+15	09	49.55	13.14	-43
783	7957	η Cephei	3.43	K0 IV	20	45	47.0	1.209	+119	+61	56	04.33	14.08	+819
775	7913	β Pavonis	3.42	A6 IV$^-$	20	47	08.1	5.317	-76	-66	06	45.72	13.37	+11
780	7949	ε Cygni	2.46	K0 III	20	47	12.2	2.431	+286	+34	03	47.46	+13.69	+329
1541	7948	ɔ Delphini sq	4.27	K1 IV	20	47	47.7	2.784	-22	+16	12	49.93	13.20	-197
781	7950	ε Aquarii	3.77	A1 III$^-$	20	49	00.0	3.242	+24	-9	24	16.48	13.44	-34
1547	7990	μ Aquarii	4.73	F2m	20	53	58.4	3.230	+30	-8	53	23.74	13.76	-30
785	7986	β Indi	3.65	K1 II	20	56	42.3	4.633	+21	-58	21	34.91	13.94	-26
1550	8039	ɔ Microscopii	4.67	G8 III	21	02	47.3	3.662	-2	-32	09	37.51	14.35	+5
792	8079	ξ Cygni	3.72	K4.5 Ib-II	21	05	49.4	2.187	+8	+44	01	35.57	+14.53	+1
797	8115	ζ Cygni	3.20	G8$^+$ III-IIIa Ba 0.5	21	13	58.8	2.557	+1	+30	19	42.69	14.95	-56
800	8131	α Equulei	3.92	G2 II-III + A4 V	21	17	02.9	2.998	+39	+5	21	01.30	15.10	-88
803	8162	α Cephei∗	2.44	A7 V$^+$ n	21	19	09.7	1.427	+219	+62	41	23.89	15.36	+50
806	8204	ζ Capricorni	3.74	G4 Ib: Ba 2	21	28	03.7	3.413	+1	-22	18	14.14	+15.82	+23

∗ **No. 732 : *Albireo* ., Mag. *f* . 5.4.**
No. 745 : *Altair* , Sravana.
No. 749 : *Alshain* .
No. 761 : Giedi or Algedi.
No. 771 : *Rotanev* , Dhanistha-1.
No. 774 : *Saulocin,* Dhanistha-2.
No. 777 : *Deneb.*
No. 803 : *Alderamin.*

MEAN PLACES OF STARS, J 2024.5

FOR JULY 2^{d}.125 TERRESTRIAL TIME

(The Annual Variations are for the middle of the year)

Cat. No. FK5	BS =HR No.	Star	Mag.	Spec-tral Type	Right Ascension			Annual Variation	Annual Proper motion	Declination			Annual Variation	Annual Proper motion
					h	m	s	s	s (0.0001)	°	'	"	"	" (0.001)
809	8238	β Cephei	3.23	B1 III	21	28	58.0	0.745	+21	+70	40	06.79	+15.85	+7
808	8232	β Aquarii*	2.91	G0 Ib	21	32	50.8	3.153	+14	-5	27	44.04	16.04	-8
1569	8264	ξ Aquarii	4.69	A5 Vn	21	39	03.2	3.188	+78	-7	44	35.56	16.34	-25
812	8278	ɔ Capricorni	3.68	A7 m:	21	41	26.7	3.314	+132	-16	33	01.80	16.47	-23
810	8254	ν Octantis	3.76	K0 III	21	44	06.3	6.397	+141	-77	16	44.44	16.38	-240
815	8308	ε Pegasi*	2.34	K2 Ib-II	21	45	23.4	2.947	+21	+9	59	17.93	16.68	-1
819	8322	δ Capricorni	2.87	F2m	21	48	23.4	3.302	+183	-16	00	54.05	+16.53	-296
822	8353	ɔ Gruis	3.01	B8 IV-Vs	21	55	24.3	3.609	+86	-37	14	54.70	17.13	-21
827	8414	α Aquarii*	2.96	G2 Ib	22	07	02.5	3.079	+13	-0	11	59.76	17.65	-10
831	8430	ι Pegasi	3.76	F5 V	22	08	09.2	2.799	+220	+25	27	56.06	17.73	+25
829	8425	α Gruis*	1.74	B7 Vn	22	09	45.9	3.747	+126	-46	50	28.73	17.62	-151
834	8450	ɗ Pegasi	3.53	A2m AI IV-V	22	11	26.1	3.026	+185	+6	19	09.28	17.86	+27
836	8465	ζ Cephei	3.35	K1.5 Ib	22	11	42.5	2.092	+19	+58	19	21.41	+17.85	+4
841	8502	α Tucanae	2.86	K3 III	22	20	09.5	4.048	-96	-60	08	11.23	18.13	-43
842	8518	ɔ Aquarii	3.84	B9.5 III-IV	22	22	55.2	3.096	+88	-1	15	47.19	18.28	+7
846	8556	δ^1 Gruis	3.97	G6/8 III	22	30	43.5	3.557	+26	-43	22	10.60	18.53	-5
848	8585	α Lacertae	3.77	A1 Va	22	32	18.4	2.487	+144	+50	24	32.62	18.61	+19
849	8592	ν Aquarii	5.20	F5 V	22	36	01.8	3.271	+158	-20	34	55.17	18.57	-144
850	8597	η Aquarii	4.02	B9 IV-V:n	22	36	36.9	3.081	+61	+0	00	34.02	+18.67	-56
855	8634	ζ Pegasi	3.40	B8.5 III	22	42	41.1	2.995	+55	+10	57	35.46	18.90	-12
856	8636	β Gruis	2.10	M4.5 III	22	44	07.2	3.551	+133	-46	45	21.04	18.94	-8
857	8650	η Pegasi	2.94	G8 II + F0V	22	44	09.3	2.822	+11	+30	20	59.88	18.93	-25
860	8675	ε Gruis	3.49	A2 Va	22	50	01.3	3.586	+115	-51	11	14.64	19.04	-71
863	8694	ι Cephei	3.52	K0$^-$ III	22	50	33.5	2.155	-108	+66	19	46.83	19.00	-125
861	8679	τ Aquarii	4.01	M0 III	22	50	53.2	3.170	-8	-13	27	45.91	+19.10	-38
862	8684	μ Pegasi	3.48	G8$^+$ III	22	51	11.3	2.904	+108	+24	43	53.37	19.10	-42
864	8698	ɚ Aquarii*	3.74	M2.5 III Fe-0.5	22	53	53.5	3.126	+8	-7	26	55.34	19.25	+37
866	8709	δ Aquarii	3.27	A3 IV-V	22	55	56.9	3.176	-28	-15	41	23.98	19.24	-25
867	8728	α PsA*	1.16	A3 Va	22	58	60.0	3.300	+255	-29	29	30.78	19.17	-164
869	8762	*o* Andromedae	3.62	B6 pe (shell)	23	03	03.2	2.777	+20	+42	27	29.00	19.42	-6
870	8775	β Pegasi*	2.42	M2.5 II-III	23	04	57.9	2.919	+143	+28	12	58.10	+19.60	+138
871	8781	α Pegasi*	2.49	A0 III-IV	23	05	59.0	2.994	+44	+15	20	15.01	19.44	-42
873	8812	88 Aquarii	3.66	K1.5 III	23	10	45.0	3.189	+40	-21	02	20.43	19.61	+31
878	8852	ɔ Piscium	3.69	G9 III: Fe-2	23	18	26.2	3.112	+509	+3	24	59.33	19.73	+17
890	8961	ɚ Andromedae	3.82v	G8 III-IV	23	38	46.3	2.960	+157	+46	35	27.92	19.53	-421
893	8974	ɔ Cephei	3.21	K1 III-IV CN I	23	40	22.5	2.527	-213	+77	46	09.63	20.12	+151
902	9072	ω Piscium	4.01	F4V	0	00	34.3	3.086	+103	+6	59	56.03	+19.93	-115

BS = Bright Star Catalogue HR = Havard Revised Catalogue FK5 = Fifth Fundamental Catalogue

* **No. 808 : *Sadalsuud.***
No. 815 : *Enif*. Mag. 0.7 to 3.5.
No. 827 : *Sadalmelik.*
No. 829 : *Al Nair.*
No. 864 : Satabhisaj.
No. 867 : *Fomalhaut*.
No. 870 : *Scheat*, Purva Bhadrapada-2.
No. 871 : *Markab*, Purva Bhadrapada-1.

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		γ Pegasi (HR39)						α Phoenicis (HR 99)						β Ceti (HR 188)						β Andromedae (HR 337)					
Mag. Spect.		2.83			B2 IV			2.39			K0 III b			2.04			G9 III CH-1 CN 0.5 Ca 1			2.06			$M0^+$IIIa		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	0	14	28	+15	19	03	0	27	28	-42	10	49	0	44	47	-17	51	27	1	11	05	+35	45	01
	11	0	14	28	15	19	02	0	27	28	42	10	49	0	44	47	17	51	28	1	11	04	35	45	01
	21	0	14	28	15	19	01	0	27	28	42	10	48	0	44	47	17	51	28	1	11	04	35	44	60
	31	0	14	28	15	19	01	0	27	28	42	10	47	0	44	47	17	51	28	1	11	04	35	44	59
Feb.	10	0	14	27	15	18	60	0	27	27	42	10	45	0	44	47	17	51	27	1	11	04	35	44	58
	20	0	14	27	15	18	59	0	27	27	42	10	44	0	44	47	17	51	27	1	11	04	35	44	56
Mar.	1	0	14	27	+15	18	58	0	27	27	-42	10	42	0	44	47	-17	51	26	1	11	04	+35	44	55
	11	0	14	27	15	18	57	0	27	27	42	10	39	0	44	47	17	51	25	1	11	04	35	44	53
	21	0	14	27	15	18	56	0	27	27	42	10	36	0	44	47	17	51	23	1	11	04	35	44	52
	31	0	14	27	15	18	56	0	27	27	42	10	34	0	44	47	17	51	22	1	11	04	35	44	50
Apr.	10	0	14	28	15	18	56	0	27	27	42	10	31	0	44	47	17	51	20	1	11	04	35	44	49
	20	0	14	28	15	18	56	0	27	28	42	10	27	0	44	47	17	51	18	1	11	04	35	44	48
	30	0	14	28	+15	18	57	0	27	28	-42	10	24	0	44	47	-17	51	16	1	11	04	+35	44	47
May	10	0	14	28	15	18	57	0	27	28	42	10	21	0	44	47	17	51	13	1	11	04	35	44	46
	20	0	14	28	15	18	59	0	27	28	42	10	18	0	44	48	17	51	11	1	11	04	35	44	46
	30	0	14	29	15	19	00	0	27	29	42	10	15	0	44	48	17	51	08	1	11	05	35	44	47
June	9	0	14	29	15	19	02	0	27	29	42	10	13	0	44	48	17	51	06	1	11	05	35	44	47
	19	0	14	29	15	19	04	0	27	29	42	10	11	0	44	49	17	51	04	1	11	05	35	44	48
	29	0	14	30	+15	19	06	0	27	30	-42	10	09	0	44	49	-17	51	02	1	11	06	+35	44	50
July	9	0	14	30	15	19	08	0	27	30	42	10	07	0	44	49	17	50	60	1	11	06	35	44	52
	19	0	14	30	15	19	10	0	27	31	42	10	06	0	44	50	17	50	58	1	11	07	35	44	53
	29	0	14	31	15	19	12	0	27	31	42	10	06	0	44	50	17	50	57	1	11	07	35	44	56
Aug.	8	0	14	31	15	19	15	0	27	31	42	10	05	0	44	50	17	50	55	1	11	07	35	44	58
	18	0	14	31	15	19	17	0	27	32	42	10	06	0	44	50	17	50	55	1	11	08	35	45	00
	28	0	14	31	+15	19	19	0	27	32	-42	10	07	0	44	51	-17	50	54	1	11	08	+35	45	03
Sept.	7	0	14	32	15	19	20	0	27	32	42	10	08	0	44	51	17	50	54	1	11	08	35	45	05
	17	0	14	32	15	19	22	0	27	32	42	10	10	0	44	51	17	50	55	1	11	08	35	45	08
	27	0	14	32	15	19	23	0	27	32	42	10	11	0	44	51	17	50	55	1	11	08	35	45	10
Oct.	7	0	14	32	15	19	24	0	27	32	42	10	14	0	44	51	17	50	56	1	11	09	35	45	12
	17	0	14	32	15	19	25	0	27	32	42	10	16	0	44	51	17	50	57	1	11	09	35	45	14
	27	0	14	32	+15	19	26	0	27	32	-42	10	18	0	44	51	-17	50	58	1	11	09	+35	45	16
Nov.	6	0	14	32	15	19	26	0	27	32	42	10	20	0	44	51	17	50	60	1	11	09	35	45	18
	16	0	14	32	15	19	27	0	27	32	42	10	22	0	44	51	17	51	01	1	11	09	35	45	19
	26	0	14	32	15	19	27	0	27	32	42	10	24	0	44	51	17	51	02	1	11	09	35	45	21
Dec.	6	0	14	32	15	19	27	0	27	32	42	10	25	0	44	51	17	51	03	1	11	09	35	45	22
	16	0	14	31	15	19	26	0	27	32	42	10	26	0	44	51	17	51	04	1	11	08	35	45	22
	26	0	14	31	+15	19	26	0	27	31	-42	10	27	0	44	51	-17	51	05	1	11	08	+35	45	22
	36	0	14	31	+15	19	25	0	27	31	-42	10	27	0	44	51	-17	51	06	1	11	08	+35	45	22

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		ζ Ceti (HR 539)						ν Ceti (HR 585)						α Arietis (HR 617)						α Ceti (HR 911)					
Mag. Spect.		3.73			K0 III			4.00			M0 IIIb			2.00			K2 IIIab			2.53			M1.5 IIIa		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	1	52	39	-10	13	05	2	01	09	-20	57	51	2	08	32	+23	34	38	3	03	33	+4	11	01
	11	1	52	39	10	13	06	2	01	08	20	57	52	2	08	32	23	34	38	3	03	33	4	11	00
	21	1	52	39	10	13	07	2	01	08	20	57	53	2	08	32	23	34	37	3	03	32	4	10	60
	31	1	52	39	10	13	07	2	01	08	20	57	53	2	08	32	23	34	37	3	03	32	4	10	59
Feb.	10	1	52	39	10	13	07	2	01	08	20	57	53	2	08	31	23	34	36	3	03	32	4	10	59
	20	1	52	38	10	13	07	2	01	08	20	57	52	2	08	31	23	34	35	3	03	32	4	10	58
Mar.	1	1	52	38	-10	13	07	2	01	08	-20	57	52	2	08	31	+23	34	34	3	03	32	+4	10	58
	11	1	52	38	10	13	06	2	01	08	20	57	50	2	08	31	23	34	34	3	03	32	4	10	58
	21	1	52	38	10	13	05	2	01	08	20	57	49	2	08	31	23	34	33	3	03	32	4	10	58
	31	1	52	38	10	13	05	2	01	07	20	57	48	2	08	31	23	34	32	3	03	32	4	10	58
Apr.	10	1	52	38	10	13	03	2	01	07	20	57	46	2	08	31	23	34	31	3	03	32	4	10	59
	20	1	52	38	10	13	01	2	01	08	20	57	43	2	08	31	23	34	31	3	03	32	4	10	60
	30	1	52	38	-10	12	60	2	01	08	-20	57	41	2	08	31	+23	34	31	3	03	32	+4	11	00
May	10	1	52	38	10	12	58	2	01	08	20	57	39	2	08	31	23	34	31	3	03	32	4	11	01
	20	1	52	39	10	12	56	2	01	08	20	57	36	2	08	31	23	34	31	3	03	32	4	11	02
	30	1	52	39	10	12	53	2	01	08	20	57	33	2	08	32	23	34	32	3	03	32	4	11	04
June	9	1	52	39	10	12	51	2	01	08	20	57	31	2	08	32	23	34	32	3	03	32	4	11	05
	19	1	52	39	10	12	49	2	01	09	20	57	28	2	08	32	23	34	33	3	03	32	4	11	07
	29	1	52	40	-10	12	46	2	01	09	-20	57	26	2	08	33	+23	34	35	3	03	33	+4	11	09
July	9	1	52	40	10	12	44	2	01	09	20	57	23	2	08	33	23	34	36	3	03	33	4	11	11
	19	1	52	40	10	12	42	2	01	10	20	57	21	2	08	33	23	34	38	3	03	33	4	11	12
	29	1	52	41	10	12	41	2	01	10	20	57	20	2	08	34	23	34	40	3	03	34	4	11	14
Aug.	8	1	52	41	10	12	39	2	01	10	20	57	18	2	08	34	23	34	42	3	03	34	4	11	16
	18	1	52	41	10	12	38	2	01	11	20	57	17	2	08	34	23	34	43	3	03	34	4	11	17
	28	1	52	41	-10	12	37	2	01	11	-20	57	17	2	08	35	+23	34	45	3	03	35	+4	11	18
Sept.	7	1	52	42	10	12	37	2	01	11	20	57	17	2	08	35	23	34	47	3	03	35	4	11	19
	17	1	52	42	10	12	36	2	01	11	20	57	17	2	08	35	23	34	49	3	03	35	4	11	20
	27	1	52	42	10	12	36	2	01	12	20	57	18	2	08	35	23	34	50	3	03	35	4	11	21
Oct.	7	1	52	42	10	12	37	2	01	12	20	57	19	2	08	35	23	34	51	3	03	36	4	11	21
	17	1	52	42	10	12	38	2	01	12	20	57	20	2	08	36	23	34	53	3	03	36	4	11	21
	27	1	52	42	-10	12	38	2	01	12	-20	57	21	2	08	36	+23	34	54	3	03	36	+4	11	21
Nov.	6	1	52	42	10	12	40	2	01	12	20	57	23	2	08	36	23	34	55	3	03	36	4	11	20
	16	1	52	42	10	12	41	2	01	12	20	57	25	2	08	36	23	34	56	3	03	36	4	11	20
	26	1	52	42	10	12	42	2	01	12	20	57	27	2	08	36	23	34	56	3	03	36	4	11	19
Dec.	6	1	52	42	10	12	43	2	01	12	20	57	28	2	08	36	23	34	57	3	03	36	4	11	18
	16	1	52	42	10	12	44	2	01	12	20	57	30	2	08	36	23	34	57	3	03	36	4	11	18
	26	1	52	42	-10	12	45	2	01	12	-20	57	31	2	08	36	+23	34	57	3	03	36	+4	11	17
	36	1	52	42	-10	12	46	2	01	12	-20	57	32	2	08	36	+23	34	57	3	03	36	+4	11	16

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		η Tauri (HR 1165)						α Tauri (HR 1457)						β Eridani (HR 1666)						ɔ Orionis (HR 1790)					
Mag. Spect.		2.87			B7 IIIn			0.85			$K5^+III$			2.79			A3 IVn			1.64			B2 III		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	3	48	56	+24	10	49	4	37	19	+16	33	28	5	09	03	-5	03	20	5	26	26	+6	22	17
	11	3	48	56	24	10	49	4	37	19	16	33	28	5	09	03	5	03	22	5	26	26	6	22	16
	21	3	48	55	24	10	49	4	37	19	16	33	28	5	09	03	5	03	23	5	26	26	6	22	15
	31	3	48	55	24	10	49	4	37	19	16	33	28	5	09	03	5	03	24	5	26	26	6	22	15
Feb.	10	3	48	55	24	10	49	4	37	19	16	33	28	5	09	03	5	03	25	5	26	26	6	22	14
	20	3	48	55	24	10	49	4	37	18	16	33	27	5	09	02	5	03	26	5	26	26	6	22	14
Mar.	1	3	48	55	+24	10	48	4	37	18	+16	33	27	5	09	02	-5	03	26	5	26	26	+6	22	14
	11	3	48	55	24	10	48	4	37	18	16	33	27	5	09	02	5	03	26	5	26	26	6	22	14
	21	3	48	55	24	10	47	4	37	18	16	33	27	5	09	02	5	03	26	5	26	25	6	22	14
	31	3	48	54	24	10	47	4	37	18	16	33	27	5	09	02	5	03	26	5	26	25	6	22	14
Apr.	10	3	48	54	24	10	46	4	37	18	16	33	27	5	09	02	5	03	25	5	26	25	6	22	14
	20	3	48	54	24	10	46	4	37	18	16	33	27	5	09	02	5	03	24	5	26	25	6	22	14
	30	3	48	54	+24	10	45	4	37	18	+16	33	26	5	09	01	-5	03	23	5	26	25	+6	22	15
May	10	3	48	54	24	10	45	4	37	18	16	33	27	5	09	01	5	03	22	5	26	25	6	22	15
	20	3	48	54	24	10	45	4	37	18	16	33	27	5	09	01	5	03	21	5	26	25	6	22	16
	30	3	48	55	24	10	45	4	37	18	16	33	27	5	09	02	5	03	19	5	26	25	6	22	17
June	9	3	48	55	24	10	45	4	37	18	16	33	28	5	09	02	5	03	18	5	26	25	6	22	18
	19	3	48	55	24	10	46	4	37	18	16	33	28	5	09	02	5	03	16	5	26	25	6	22	19
	29	3	48	55	+24	10	47	4	37	18	+16	33	29	5	09	02	-5	03	14	5	26	25	+6	22	20
July	9	3	48	56	24	10	47	4	37	19	16	33	30	5	09	02	5	03	12	5	26	25	6	22	21
	19	3	48	56	24	10	48	4	37	19	16	33	31	5	09	02	5	03	11	5	26	26	6	22	22
	29	3	48	56	24	10	49	4	37	19	16	33	32	5	09	03	5	03	09	5	26	26	6	22	24
Aug.	8	3	48	57	24	10	51	4	37	19	16	33	33	5	09	03	5	03	07	5	26	26	6	22	25
	18	3	48	57	24	10	52	4	37	20	16	33	34	5	09	03	5	03	06	5	26	27	6	22	26
	28	3	48	57	+24	10	53	4	37	20	+16	33	35	5	09	03	-5	03	05	5	26	27	+6	22	26
Sept.	7	3	48	58	24	10	54	4	37	20	16	33	36	5	09	04	5	03	04	5	26	27	6	22	27
	17	3	48	58	24	10	55	4	37	21	16	33	36	5	09	04	5	03	04	5	26	27	6	22	28
	27	3	48	58	24	10	56	4	37	21	16	33	37	5	09	04	5	03	04	5	26	28	6	22	28
Oct.	7	3	48	58	24	10	57	4	37	21	16	33	37	5	09	05	5	03	04	5	26	28	6	22	28
	17	3	48	59	24	10	58	4	37	21	16	33	38	5	09	05	5	03	05	5	26	28	6	22	27
	27	3	48	59	+24	10	59	4	37	22	+16	33	38	5	09	05	-5	03	05	5	26	29	+6	22	27
Nov.	6	3	48	59	24	10	59	4	37	22	16	33	37	5	09	05	5	03	07	5	26	29	6	22	26
	16	3	48	59	24	10	60	4	37	22	16	33	37	5	09	06	5	03	08	5	26	29	6	22	25
	26	3	48	59	24	11	00	4	37	22	16	33	37	5	09	06	5	03	10	5	26	29	6	22	24
Dec.	6	3	48	59	24	11	01	4	37	23	16	33	37	5	09	06	5	03	11	5	26	29	6	22	23
	16	3	48	60	24	11	01	4	37	23	16	33	37	5	09	06	5	03	13	5	26	30	6	22	22
	26	3	48	60	+24	11	01	4	37	23	+16	33	37	5	09	06	-5	03	14	5	26	30	+6	22	21
	36	3	48	60	+24	11	02	4	37	23	+16	33	37	5	09	06	-5	03	16	5	26	30	+6	22	21

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		β Leporis (HR 1829)						ι Orionis (HR 1899)						α Columbae (HR 1956)						κ Orionis (HR 2004)					
Mag. Spect.		2.84			G5 II			2.77			O9 III			2.64			B7 IV			2.06			B0.5 Ia		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	5	29	18	-20	44	27	5	36	38	-5	53	40	5	40	33	-34	03	42	5	48	55	-9	39	40
	11	5	29	18	20	44	29	5	36	38	5	53	41	5	40	33	34	03	45	5	48	55	9	39	42
	21	5	29	18	20	44	31	5	36	38	5	53	43	5	40	32	34	03	47	5	48	55	9	39	44
	31	5	29	18	20	44	32	5	36	37	5	53	44	5	40	32	34	03	49	5	48	55	9	39	45
Feb.	10	5	29	17	20	44	34	5	36	37	5	53	45	5	40	32	34	03	51	5	48	55	9	39	46
	20	5	29	17	20	44	35	5	36	37	5	53	45	5	40	32	34	03	52	5	48	55	9	39	47
Mar.	1	5	29	17	-20	44	35	5	36	37	-5	53	46	5	40	32	-34	03	53	5	48	54	-9	39	48
	11	5	29	17	20	44	35	5	36	37	5	53	46	5	40	32	34	03	53	5	48	54	9	39	48
	21	5	29	17	20	44	35	5	36	37	5	53	46	5	40	31	34	03	53	5	48	54	9	39	48
	31	5	29	16	20	44	35	5	36	37	5	53	46	5	40	31	34	03	53	5	48	54	9	39	48
Apr.	10	5	29	16	20	44	34	5	36	36	5	53	45	5	40	31	34	03	52	5	48	54	9	39	47
	20	5	29	16	20	44	33	5	36	36	5	53	44	5	40	31	34	03	51	5	48	54	9	39	46
	30	5	29	16	-20	44	32	5	36	36	-5	53	44	5	40	31	-34	03	49	5	48	53	-9	39	46
May	10	5	29	16	20	44	30	5	36	36	5	53	43	5	40	30	34	03	47	5	48	53	9	39	44
	20	5	29	16	20	44	28	5	36	36	5	53	41	5	40	30	34	03	45	5	48	53	9	39	43
	30	5	29	16	20	44	26	5	36	36	5	53	40	5	40	30	34	03	42	5	48	53	9	39	41
June	9	5	29	16	20	44	23	5	36	36	5	53	38	5	40	30	34	03	39	5	48	53	9	39	40
	19	5	29	16	20	44	21	5	36	36	5	53	37	5	40	30	34	03	36	5	48	53	9	39	38
	29	5	29	16	-20	44	18	5	36	36	-5	53	35	5	40	31	-34	03	33	5	48	54	-9	39	36
July	9	5	29	16	20	44	16	5	36	37	5	53	33	5	40	31	34	03	30	5	48	54	9	39	34
	19	5	29	17	20	44	14	5	36	37	5	53	31	5	40	31	34	03	28	5	48	54	9	39	32
	29	5	29	17	20	44	11	5	36	37	5	53	30	5	40	31	34	03	25	5	48	54	9	39	30
Aug.	8	5	29	17	20	44	09	5	36	37	5	53	28	5	40	31	34	03	23	5	48	54	9	39	28
	18	5	29	17	20	44	08	5	36	38	5	53	27	5	40	32	34	03	21	5	48	55	9	39	27
	28	5	29	18	-20	44	07	5	36	38	-5	53	26	5	40	32	-34	03	19	5	48	55	-9	39	26
Sept.	7	5	29	18	20	44	06	5	36	38	5	53	25	5	40	32	34	03	18	5	48	55	9	39	25
	17	5	29	18	20	44	05	5	36	38	5	53	24	5	40	33	34	03	18	5	48	56	9	39	25
	27	5	29	19	20	44	05	5	36	39	5	53	25	5	40	33	34	03	18	5	48	56	9	39	25
Oct.	7	5	29	19	20	44	06	5	36	39	5	53	25	5	40	33	34	03	19	5	48	56	9	39	25
	17	5	29	19	20	44	07	5	36	39	5	53	25	5	40	34	34	03	20	5	48	56	9	39	26
	27	5	29	19	-20	44	08	5	36	40	-5	53	26	5	40	34	-34	03	21	5	48	57	-9	39	27
Nov.	6	5	29	20	20	44	10	5	36	40	5	53	28	5	40	34	34	03	24	5	48	57	9	39	29
	16	5	29	20	20	44	12	5	36	40	5	53	29	5	40	34	34	03	26	5	48	57	9	39	30
	26	5	29	20	20	44	14	5	36	40	5	53	31	5	40	35	34	03	29	5	48	57	9	39	32
Dec.	6	5	29	20	20	44	17	5	36	41	5	53	33	5	40	35	34	03	32	5	48	58	9	39	34
	16	5	29	20	20	44	20	5	36	41	5	53	34	5	40	35	34	03	35	5	48	58	9	39	36
	26	5	29	20	-20	44	22	5	36	41	-5	53	36	5	40	35	-34	03	38	5	48	58	-9	39	38
	36	5	29	21	-20	44	24	5	36	41	-5	53	38	5	40	35	-34	03	41	5	48	58	-9	39	40

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Name		α Orionis (HR 2061)						ζ Canis Majoris (HR 2282)						α Carinae (HR 2326)						ɔ Geminorum (HR 2421)					
Mag. Spect.		0.4 - 1.3			M1 M2 Ia Iab			3.02			B2.5V			-0.72			A9 II			1.93			A1 IVs		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	5	56	29	+7	24	42	6	21	15	-30	04	25	6	24	31	-52	42	28	6	39	07	+16	22	42
	11	5	56	29	7	24	40	6	21	15	30	04	28	6	24	31	52	42	32	6	39	07	16	22	42
	21	5	56	29	7	24	40	6	21	15	30	04	31	6	24	31	52	42	35	6	39	07	16	22	42
	31	5	56	29	7	24	39	6	21	15	30	04	33	6	24	31	52	42	38	6	39	07	16	22	42
Feb.	10	5	56	29	7	24	39	6	21	15	30	04	35	6	24	31	52	42	40	6	39	07	16	22	41
	20	5	56	29	7	24	38	6	21	15	30	04	37	6	24	30	52	42	42	6	39	07	16	22	41
Mar.	1	5	56	29	+7	24	38	6	21	15	-30	04	38	6	24	30	-52	42	44	6	39	07	+16	22	41
	11	5	56	29	7	24	38	6	21	15	30	04	39	6	24	30	52	42	45	6	39	07	16	22	42
	21	5	56	29	7	24	38	6	21	15	30	04	39	6	24	29	52	42	45	6	39	07	16	22	42
	31	5	56	29	7	24	38	6	21	14	30	04	39	6	24	29	52	42	46	6	39	06	16	22	42
Apr.	10	5	56	28	7	24	38	6	21	14	30	04	38	6	24	29	52	42	45	6	39	06	16	22	42
	20	5	56	28	7	24	39	6	21	14	30	04	38	6	24	28	52	42	44	6	39	06	16	22	42
	30	5	56	28	+7	24	39	6	21	14	-30	04	36	6	24	28	-52	42	43	6	39	06	+16	22	42
May	10	5	56	28	7	24	39	6	21	14	30	04	35	6	24	28	52	42	41	6	39	06	16	22	42
	20	5	56	28	7	24	40	6	21	13	30	04	33	6	24	28	52	42	38	6	39	06	16	22	43
	30	5	56	28	7	24	41	6	21	13	30	04	31	6	24	27	52	42	36	6	39	06	16	22	43
June	9	5	56	28	7	24	42	6	21	13	30	04	28	6	24	27	52	42	33	6	39	06	16	22	43
	19	5	56	28	7	24	43	6	21	13	30	04	26	6	24	27	52	42	29	6	39	06	16	22	43
	29	5	56	28	+7	24	44	6	21	14	-30	04	23	6	24	27	-52	42	26	6	39	06	+16	22	44
July	9	5	56	29	7	24	45	6	21	14	30	04	20	6	24	27	52	42	23	6	39	06	16	22	44
	19	5	56	29	7	24	46	6	21	14	30	04	18	6	24	28	52	42	20	6	39	06	16	22	44
	29	5	56	29	7	24	47	6	21	14	30	04	15	6	24	28	52	42	17	6	39	06	16	22	45
Aug.	8	5	56	29	7	24	48	6	21	14	30	04	12	6	24	28	52	42	14	6	39	07	16	22	45
	18	5	56	30	7	24	48	6	21	15	30	04	11	6	24	28	52	42	11	6	39	07	16	22	45
	28	5	56	30	+7	24	49	6	21	15	-30	04	09	6	24	29	-52	42	09	6	39	07	+16	22	45
Sept.	7	5	56	30	7	24	50	6	21	15	30	04	08	6	24	29	52	42	08	6	39	08	16	22	45
	17	5	56	30	7	24	50	6	21	15	30	04	07	6	24	30	52	42	07	6	39	08	16	22	45
	27	5	56	31	7	24	50	6	21	16	30	04	07	6	24	30	52	42	07	6	39	08	16	22	45
Oct.	7	5	56	31	7	24	50	6	21	16	30	04	07	6	24	30	52	42	07	6	39	08	16	22	45
	17	5	56	31	7	24	49	6	21	16	30	04	08	6	24	31	52	42	08	6	39	09	16	22	44
	27	5	56	32	+7	24	49	6	21	17	-30	04	10	6	24	31	-52	42	10	6	39	09	+16	22	44
Nov.	6	5	56	32	7	24	48	6	21	17	30	04	12	6	24	32	52	42	12	6	39	09	16	22	43
	16	5	56	32	7	24	47	6	21	17	30	04	14	6	24	32	52	42	15	6	39	10	16	22	42
	26	5	56	32	7	24	46	6	21	17	30	04	16	6	24	32	52	42	17	6	39	10	16	22	41
Dec.	6	5	56	33	7	24	45	6	21	18	30	04	19	6	24	32	52	42	21	6	39	10	16	22	41
	16	5	56	33	7	24	44	6	21	18	30	04	22	6	24	33	52	42	25	6	39	10	16	22	40
	26	5	56	33	+7	24	43	6	21	18	-30	04	25	6	24	33	-52	42	28	6	39	11	+16	22	39
	36	5	56	33	+7	24	42	6	21	18	-30	04	28	6	24	33	-52	42	32	6	39	11	+16	22	39

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		αCanis MajorisA(HR2491)						o^2 Canis Majoris(HR 2653)						β Canis Minoris(HR 2845)						α Canis Minoris A(HR 2943)					
Mag. Spect.		-1.46			A0m A1 Va			3.02			B3 Ia			2.90			B8 V			0.38			F5 IV-V		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	6	46	13	-16	44	56	7	04	03	-23	52	03	7	28	28	+8	14	27	7	40	34	+5	09	48
	11	6	46	14	16	44	58	7	04	03	23	52	06	7	28	28	8	14	26	7	40	35	5	09	47
	21	6	46	14	16	45	00	7	04	03	23	52	09	7	28	28	8	14	25	7	40	35	5	09	46
	31	6	46	14	16	45	02	7	04	03	23	52	11	7	28	28	8	14	24	7	40	35	5	09	45
Feb.	10	6	46	13	16	45	04	7	04	03	23	52	13	7	28	28	8	14	24	7	40	35	5	09	44
	20	6	46	13	16	45	05	7	04	03	23	52	15	7	28	28	8	14	23	7	40	35	5	09	43
Mar.	1	6	46	13	-16	45	06	7	04	03	-23	52	16	7	28	28	+8	14	23	7	40	35	+5	09	43
	11	6	46	13	16	45	07	7	04	02	23	52	17	7	28	28	8	14	23	7	40	34	5	09	43
	21	6	46	13	16	45	07	7	04	02	23	52	18	7	28	28	8	14	23	7	40	34	5	09	43
	31	6	46	13	16	45	08	7	04	02	23	52	18	7	28	28	8	14	23	7	40	34	5	09	43
Apr.	10	6	46	12	16	45	07	7	04	02	23	52	18	7	28	28	8	14	23	7	40	34	5	09	43
	20	6	46	12	16	45	07	7	04	02	23	52	18	7	28	28	8	14	24	7	40	34	5	09	43
	30	6	46	12	-16	45	06	7	04	02	-23	52	17	7	28	27	+8	14	24	7	40	34	+5	09	43
May	10	6	46	12	16	45	05	7	04	01	23	52	16	7	28	27	8	14	24	7	40	34	5	09	44
	20	6	46	12	16	45	03	7	04	01	23	52	14	7	28	27	8	14	25	7	40	34	5	09	44
	30	6	46	12	16	45	02	7	04	01	23	52	12	7	28	27	8	14	25	7	40	33	5	09	45
June	9	6	46	12	16	44	60	7	04	01	23	52	11	7	28	27	8	14	26	7	40	33	5	09	46
	19	6	46	12	16	44	58	7	04	01	23	52	08	7	28	27	8	14	26	7	40	33	5	09	46
	29	6	46	12	-16	44	56	7	04	01	-23	52	06	7	28	27	+8	14	27	7	40	33	+5	09	47
July	9	6	46	12	16	44	54	7	04	01	23	52	04	7	28	27	8	14	28	7	40	34	5	09	48
	19	6	46	12	16	44	52	7	04	01	23	52	01	7	28	27	8	14	28	7	40	34	5	09	49
	29	6	46	12	16	44	50	7	04	02	23	51	59	7	28	28	8	14	29	7	40	34	5	09	49
Aug.	8	6	46	13	16	44	48	7	04	02	23	51	57	7	28	28	8	14	30	7	40	34	5	09	50
	18	6	46	13	16	44	47	7	04	02	23	51	55	7	28	28	8	14	30	7	40	34	5	09	50
	28	6	46	13	-16	44	45	7	04	02	-23	51	54	7	28	28	+8	14	30	7	40	34	+5	09	51
Sept.	7	6	46	13	16	44	44	7	04	02	23	51	52	7	28	28	8	14	30	7	40	35	5	09	51
	17	6	46	14	16	44	44	7	04	03	23	51	51	7	28	29	8	14	30	7	40	35	5	09	51
	27	6	46	14	16	44	44	7	04	03	23	51	51	7	28	29	8	14	30	7	40	35	5	09	50
Oct.	7	6	46	14	16	44	44	7	04	03	23	51	51	7	28	29	8	14	29	7	40	35	5	09	50
	17	6	46	15	16	44	45	7	04	04	23	51	52	7	28	30	8	14	29	7	40	36	5	09	49
	27	6	46	15	-16	44	46	7	04	04	-23	51	53	7	28	30	+8	14	28	7	40	36	+5	09	48
Nov.	6	6	46	15	16	44	48	7	04	04	23	51	55	7	28	30	8	14	26	7	40	36	5	09	47
	16	6	46	16	16	44	50	7	04	05	23	51	57	7	28	31	8	14	25	7	40	37	5	09	45
	26	6	46	16	16	44	52	7	04	05	23	51	59	7	28	31	8	14	24	7	40	37	5	09	44
Dec.	6	6	46	16	16	44	55	7	04	05	23	52	02	7	28	31	8	14	22	7	40	37	5	09	42
	16	6	46	16	16	44	57	7	04	05	23	52	05	7	28	31	8	14	21	7	40	38	5	09	40
	26	6	46	16	-16	44	59	7	04	05	-23	52	07	7	28	32	+8	14	20	7	40	38	+5	09	39
	36	6	46	16	-16	45	02	7	04	06	-23	52	10	7	28	32	+8	14	19	7	40	38	+5	09	38

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Name		β Geminorum(HR 2990)						ξ Puppis(HR 3045)						ρ Puppis(HR 3185)						ζ Hydrae(HR 3547)					
Mag. Spect.		1.14			K0 IIIb			3.34			G6 Iab-Ib			2.81			F5 (Ib-II)p			3.11			G9 IIIa		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	7	46	48	+27	58	03	7	50	19	-24	55	07	8	08	35	-24	22	19	8	56	40	+5	51	15
	11	7	46	48	27	58	02	7	50	19	24	55	10	8	08	35	24	22	23	8	56	41	5	51	13
	21	7	46	48	27	58	03	7	50	20	24	55	13	8	08	35	24	22	25	8	56	41	5	51	12
	31	7	46	48	27	58	03	7	50	20	24	55	16	8	08	35	24	22	28	8	56	41	5	51	11
Feb.	10	7	46	49	27	58	04	7	50	20	24	55	18	8	08	35	24	22	30	8	56	41	5	51	10
	20	7	46	48	27	58	04	7	50	19	24	55	20	8	08	35	24	22	33	8	56	41	5	51	09
Mar.	1	7	46	48	+27	58	05	7	50	19	-24	55	22	8	08	35	-24	22	34	8	56	41	+5	51	09
	11	7	46	48	27	58	06	7	50	19	24	55	23	8	08	35	24	22	36	8	56	41	5	51	09
	21	7	46	48	27	58	06	7	50	19	24	55	24	8	08	35	24	22	37	8	56	41	5	51	08
	31	7	46	48	27	58	07	7	50	19	24	55	25	8	08	35	24	22	38	8	56	41	5	51	08
Apr.	10	7	46	48	27	58	07	7	50	19	24	55	25	8	08	35	24	22	38	8	56	41	5	51	09
	20	7	46	48	27	58	08	7	50	19	24	55	25	8	08	34	24	22	38	8	56	41	5	51	09
	30	7	46	47	+27	58	08	7	50	18	-24	55	25	8	08	34	-24	22	38	8	56	40	+5	51	09
May	10	7	46	47	27	58	08	7	50	18	24	55	24	8	08	34	24	22	37	8	56	40	5	51	10
	20	7	46	47	27	58	08	7	50	18	24	55	23	8	08	34	24	22	36	8	56	40	5	51	10
	30	7	46	47	27	58	07	7	50	18	24	55	21	8	08	34	24	22	35	8	56	40	5	51	11
June	9	7	46	47	27	58	07	7	50	18	24	55	20	8	08	34	24	22	33	8	56	40	5	51	11
	19	7	46	47	27	58	07	7	50	18	24	55	18	8	08	34	24	22	31	8	56	40	5	51	12
	29	7	46	47	+27	58	06	7	50	18	-24	55	15	8	08	34	-24	22	29	8	56	40	+5	51	13
July	9	7	46	47	27	58	06	7	50	18	24	55	13	8	08	34	24	22	27	8	56	40	5	51	13
	19	7	46	47	27	58	05	7	50	18	24	55	11	8	08	34	24	22	25	8	56	40	5	51	14
	29	7	46	48	27	58	05	7	50	18	24	55	09	8	08	34	24	22	23	8	56	40	5	51	14
Aug.	8	7	46	48	27	58	04	7	50	18	24	55	07	8	08	34	24	22	21	8	56	40	5	51	15
	18	7	46	48	27	58	03	7	50	18	24	55	05	8	08	34	24	22	19	8	56	40	5	51	15
	28	7	46	48	+27	58	02	7	50	19	-24	55	03	8	08	34	-24	22	17	8	56	40	+5	51	15
Sept.	7	7	46	48	27	58	02	7	50	19	24	55	02	8	08	34	24	22	16	8	56	41	5	51	15
	17	7	46	49	27	58	01	7	50	19	24	55	01	8	08	35	24	22	15	8	56	41	5	51	15
	27	7	46	49	27	57	60	7	50	19	24	55	00	8	08	35	24	22	14	8	56	41	5	51	14
Oct.	7	7	46	49	27	57	59	7	50	20	24	55	00	8	08	35	24	22	14	8	56	41	5	51	13
	17	7	46	50	27	57	58	7	50	20	24	55	01	8	08	36	24	22	15	8	56	42	5	51	12
	27	7	46	50	+27	57	57	7	50	20	-24	55	02	8	08	36	-24	22	16	8	56	42	+5	51	11
Nov.	6	7	46	50	27	57	56	7	50	21	24	55	03	8	08	36	24	22	17	8	56	42	5	51	09
	16	7	46	51	27	57	55	7	50	21	24	55	05	8	08	37	24	22	19	8	56	43	5	51	08
	26	7	46	51	27	57	54	7	50	21	24	55	07	8	08	37	24	22	21	8	56	43	5	51	06
Dec.	6	7	46	51	27	57	54	7	50	22	24	55	10	8	08	37	24	22	24	8	56	43	5	51	04
	16	7	46	52	27	57	53	7	50	22	24	55	13	8	08	37	24	22	26	8	56	44	5	51	02
	26	7	46	52	+27	57	53	7	50	22	-24	55	16	8	08	38	-24	22	29	8	56	44	+5	51	01
	36	7	46	52	+27	57	53	7	50	22	-24	55	19	8	08	38	-24	22	32	8	56	44	+5	50	59

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Name		λ Velorum(HR 3634)						α Hydrae(HR 3748)						α Leonis(HR 3982)						α Antliae(HR 4104)					
Mag. Spect.		2.21			K4.5 Ib			1.98			K3 II-III			1.35			B7 Vn			4.25			K4.5 III		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	9	08	54	-43	31	35	9	28	47	-8	45	42	10	09	39	+11	50	57	10	28	15	-31	11	13
	11	9	08	54	43	31	38	9	28	47	8	45	44	10	09	40	11	50	56	10	28	16	31	11	16
	21	9	08	54	43	31	42	9	28	47	8	45	47	10	09	40	11	50	54	10	28	16	31	11	19
	31	9	08	54	43	31	45	9	28	47	8	45	49	10	09	40	11	50	54	10	28	16	31	11	22
Feb.	10	9	08	54	43	31	49	9	28	47	8	45	51	10	09	40	11	50	53	10	28	16	31	11	26
	20	9	08	54	43	31	52	9	28	47	8	45	52	10	09	40	11	50	52	10	28	16	31	11	28
Mar.	1	9	08	54	-43	31	55	9	28	47	-8	45	53	10	09	40	+11	50	52	10	28	17	-31	11	31
	11	9	08	54	43	31	57	9	28	47	8	45	55	10	09	41	11	50	52	10	28	17	31	11	34
	21	9	08	54	43	31	60	9	28	47	8	45	56	10	09	41	11	50	52	10	28	17	31	11	36
	31	9	08	54	43	32	01	9	28	47	8	45	56	10	09	40	11	50	53	10	28	16	31	11	38
Apr.	10	9	08	54	43	32	03	9	28	47	8	45	56	10	09	40	11	50	53	10	28	16	31	11	39
	20	9	08	53	43	32	04	9	28	47	8	45	57	10	09	40	11	50	54	10	28	16	31	11	40
	30	9	08	53	-43	32	04	9	28	47	-8	45	57	10	09	40	+11	50	54	10	28	16	-31	11	41
May	10	9	08	53	43	32	04	9	28	47	8	45	56	10	09	40	11	50	55	10	28	16	31	11	42
	20	9	08	53	43	32	04	9	28	47	8	45	56	10	09	40	11	50	55	10	28	16	31	11	42
	30	9	08	52	43	32	03	9	28	46	8	45	55	10	09	40	11	50	56	10	28	16	31	11	42
June	9	9	08	52	43	32	02	9	28	46	8	45	54	10	09	40	11	50	56	10	28	16	31	11	41
	19	9	08	52	43	32	00	9	28	46	8	45	53	10	09	40	11	50	57	10	28	15	31	11	40
	29	9	08	52	-43	31	58	9	28	46	-8	45	52	10	09	40	+11	50	57	10	28	15	-31	11	39
July	9	9	08	52	43	31	56	9	28	46	8	45	51	10	09	40	11	50	57	10	28	15	31	11	38
	19	9	08	52	43	31	53	9	28	46	8	45	50	10	09	39	11	50	57	10	28	15	31	11	36
	29	9	08	52	43	31	51	9	28	46	8	45	49	10	09	39	11	50	58	10	28	15	31	11	34
Aug.	8	9	08	52	43	31	48	9	28	46	8	45	48	10	09	40	11	50	57	10	28	15	31	11	32
	18	9	08	52	43	31	46	9	28	46	8	45	47	10	09	40	11	50	57	10	28	15	31	11	30
	28	9	08	52	-43	31	43	9	28	47	-8	45	46	10	09	40	+11	50	57	10	28	15	-31	11	28
Sept.	7	9	08	52	43	31	41	9	28	47	8	45	45	10	09	40	11	50	56	10	28	15	31	11	26
	17	9	08	52	43	31	39	9	28	47	8	45	45	10	09	40	11	50	55	10	28	15	31	11	25
	27	9	08	53	43	31	38	9	28	47	8	45	45	10	09	40	11	50	54	10	28	15	31	11	24
Oct.	7	9	08	53	43	31	36	9	28	47	8	45	45	10	09	40	11	50	53	10	28	16	31	11	23
	17	9	08	53	43	31	36	9	28	48	8	45	45	10	09	41	11	50	52	10	28	16	31	11	22
	27	9	08	54	-43	31	36	9	28	48	-8	45	46	10	09	41	+11	50	50	10	28	16	-31	11	22
Nov.	6	9	08	54	43	31	37	9	28	48	8	45	48	10	09	41	11	50	48	10	28	16	31	11	23
	16	9	08	55	43	31	38	9	28	48	8	45	49	10	09	41	11	50	46	10	28	17	31	11	24
	26	9	08	55	43	31	40	9	28	49	8	45	51	10	09	42	11	50	44	10	28	17	31	11	25
Dec.	6	9	08	55	43	31	43	9	28	49	8	45	53	10	09	42	11	50	42	10	28	18	31	11	27
	16	9	08	56	43	31	46	9	28	49	8	45	56	10	09	43	11	50	40	10	28	18	31	11	29
	26	9	08	56	-43	31	49	9	28	50	-8	45	58	10	09	43	+11	50	39	10	28	18	-31	11	32
	36	9	08	56	-43	31	52	9	28	50	-8	46	00	10	09	43	+11	50	37	10	28	19	-31	11	35

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Name		ν Hydrae(HR 4232)						ჳ Hydrae(HR 4450)						β Leonis (HR 4534)						ɔ Corvi(HR 4662)					
Mag. Spect.		3.11			K1.5 IIIb Hδ-0.5			3.54			G7 III			2.14			A3 Va			2.59			B8p Hg Mn		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	10	50	49	-16	19	03	11	34	11	-31	59	14	11	50	17	+14	26	12	12	17	02	-17	40	24
	11	10	50	49	16	19	06	11	34	11	-31	59	16	11	50	17	14	26	10	12	17	03	17	40	26
	21	10	50	49	16	19	08	11	34	12	-31	59	19	11	50	18	14	26	09	12	17	03	17	40	28
	31	10	50	50	16	19	10	11	34	12	-31	59	22	11	50	18	14	26	08	12	17	03	17	40	31
Feb.	10	10	50	50	16	19	13	11	34	12	-31	59	25	11	50	18	14	26	07	12	17	04	17	40	33
	20	10	50	50	16	19	15	11	34	12	-31	59	28	11	50	18	14	26	06	12	17	04	17	40	35
Mar.	1	10	50	50	-16	19	17	11	34	13	-31	59	31	11	50	19	+14	26	06	12	17	04	-17	40	37
	11	10	50	50	16	19	19	11	34	13	-31	59	33	11	50	19	14	26	06	12	17	04	17	40	39
	21	10	50	50	16	19	20	11	34	13	-31	59	36	11	50	19	14	26	06	12	17	04	17	40	41
	31	10	50	50	16	19	21	11	34	13	-31	59	38	11	50	19	14	26	07	12	17	04	17	40	42
Apr.	10	10	50	50	16	19	22	11	34	13	-31	59	40	11	50	19	14	26	08	12	17	04	17	40	43
	20	10	50	50	16	19	23	11	34	13	-31	59	41	11	50	19	14	26	09	12	17	04	17	40	44
	30	10	50	50	-16	19	23	11	34	13	-31	59	43	11	50	19	+14	26	09	12	17	04	-17	40	45
May	10	10	50	50	16	19	24	11	34	12	-31	59	44	11	50	19	14	26	10	12	17	04	17	40	45
	20	10	50	50	16	19	23	11	34	12	-31	59	44	11	50	19	14	26	11	12	17	04	17	40	45
	30	10	50	50	16	19	23	11	34	12	-31	59	45	11	50	18	14	26	12	12	17	04	17	40	46
June	9	10	50	49	16	19	23	11	34	12	-31	59	45	11	50	18	14	26	13	12	17	04	17	40	45
	19	10	50	49	16	19	22	11	34	12	-31	59	44	11	50	18	14	26	14	12	17	04	17	40	45
	29	10	50	49	-16	19	21	11	34	12	-31	59	43	11	50	18	+14	26	14	12	17	04	-17	40	44
July	9	10	50	49	16	19	20	11	34	12	-31	59	43	11	50	18	14	26	14	12	17	04	17	40	44
	19	10	50	49	16	19	19	11	34	12	-31	59	41	11	50	18	14	26	14	12	17	04	17	40	43
	29	10	50	49	16	19	18	11	34	11	-31	59	40	11	50	18	14	26	14	12	17	03	17	40	42
Aug.	8	10	50	49	16	19	16	11	34	11	-31	59	38	11	50	18	14	26	14	12	17	03	17	40	41
	18	10	50	49	16	19	15	11	34	11	-31	59	37	11	50	18	14	26	14	12	17	03	17	40	40
	28	10	50	49	-16	19	14	11	34	11	-31	59	35	11	50	18	+14	26	13	12	17	03	-17	40	39
Sept.	7	10	50	49	16	19	13	11	34	11	-31	59	33	11	50	18	14	26	12	12	17	03	17	40	38
	17	10	50	49	16	19	12	11	34	11	-31	59	31	11	50	18	14	26	11	12	17	03	17	40	38
	27	10	50	49	16	19	12	11	34	11	-31	59	30	11	50	18	14	26	10	12	17	03	17	40	37
Oct.	7	10	50	49	16	19	11	11	34	12	-31	59	29	11	50	18	14	26	08	12	17	03	17	40	36
	17	10	50	50	16	19	11	11	34	12	-31	59	28	11	50	18	14	26	07	12	17	03	17	40	36
	27	10	50	50	-16	19	12	11	34	12	-31	59	28	11	50	18	+14	26	04	12	17	04	-17	40	37
Nov.	6	10	50	50	16	19	13	11	34	12	-31	59	28	11	50	19	14	26	02	12	17	04	17	40	37
	16	10	50	51	16	19	14	11	34	13	-31	59	28	11	50	19	14	26	00	12	17	04	17	40	38
	26	10	50	51	16	19	16	11	34	13	-31	59	29	11	50	19	14	25	58	12	17	04	17	40	39
Dec.	6	10	50	51	16	19	18	11	34	13	-31	59	31	11	50	20	14	25	55	12	17	05	17	40	41
	16	10	50	52	16	19	20	11	34	14	-31	59	32	11	50	20	14	25	53	12	17	05	17	40	43
	26	10	50	52	-16	19	22	11	34	14	-31	59	34	11	50	20	+14	25	51	12	17	05	-17	40	45
	36	10	50	52	-16	19	25	11	34	14	-31	59	37	11	50	21	+14	25	49	12	17	06	-17	40	47

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		β Corvi (HR 4786)						δ Virginis(HR 4910)						ε Virginis(HR4932)						ι Centauri (HR 5028)					
Mag. Spect.		2.65			G5 Iib			3.38			$M3^+III$			2.83			G8 IIIab			2.75			A2 Va		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	12	35	39	-23	31	37	12	56	48	+3	16	01	13	03	22	+10	49	45	13	21	56	-36	50	07
	11	12	35	39	23	31	39	12	56	49	3	15	58	13	03	22	10	49	43	13	21	57	36	50	09
	21	12	35	39	23	31	42	12	56	49	3	15	56	13	03	23	10	49	41	13	21	57	36	50	11
	31	12	35	40	23	31	44	12	56	49	3	15	55	13	03	23	10	49	39	13	21	57	36	50	13
Feb.	10	12	35	40	23	31	47	12	56	50	3	15	53	13	03	23	10	49	38	13	21	58	36	50	16
	20	12	35	40	23	31	49	12	56	50	3	15	52	13	03	23	10	49	37	13	21	58	36	50	18
Mar.	1	12	35	40	-23	31	51	12	56	50	+3	15	51	13	03	24	+10	49	37	13	21	58	-36	50	21
	11	12	35	41	23	31	53	12	56	50	3	15	50	13	03	24	10	49	36	13	21	59	36	50	23
	21	12	35	41	23	31	55	12	56	50	3	15	50	13	03	24	10	49	36	13	21	59	36	50	26
	31	12	35	41	23	31	57	12	56	51	3	15	50	13	03	24	10	49	37	13	21	59	36	50	28
Apr.	10	12	35	41	23	31	58	12	56	51	3	15	50	13	03	24	10	49	38	13	21	59	36	50	30
	20	12	35	41	23	31	60	12	56	51	3	15	50	13	03	24	10	49	38	13	21	59	36	50	32
	30	12	35	41	-23	32	01	12	56	51	+3	15	51	13	03	24	+10	49	39	13	21	59	-36	50	34
May	10	12	35	41	23	32	01	12	56	51	3	15	51	13	03	24	10	49	40	13	21	59	36	50	35
	20	12	35	41	23	32	02	12	56	51	3	15	52	13	03	24	10	49	41	13	21	59	36	50	37
	30	12	35	41	23	32	02	12	56	51	3	15	53	13	03	24	10	49	42	13	21	59	36	50	38
June	9	12	35	41	23	32	03	12	56	50	3	15	53	13	03	24	10	49	43	13	21	59	36	50	39
	19	12	35	40	23	32	02	12	56	50	3	15	54	13	03	24	10	49	44	13	21	59	36	50	39
	29	12	35	40	-23	32	02	12	56	50	+3	15	55	13	03	24	+10	49	45	13	21	59	-36	50	39
July	9	12	35	40	23	32	02	12	56	50	3	15	55	13	03	24	10	49	45	13	21	59	36	50	39
	19	12	35	40	23	32	01	12	56	50	3	15	56	13	03	24	10	49	46	13	21	58	36	50	39
	29	12	35	40	23	31	60	12	56	50	3	15	56	13	03	24	10	49	46	13	21	58	36	50	38
Aug.	8	12	35	40	23	31	59	12	56	50	3	15	56	13	03	23	10	49	46	13	21	58	36	50	37
	18	12	35	40	23	31	58	12	56	50	3	15	57	13	03	23	10	49	46	13	21	58	36	50	36
	28	12	35	40	-23	31	56	12	56	50	+3	15	57	13	03	23	+10	49	45	13	21	58	-36	50	35
Sept.	7	12	35	40	23	31	55	12	56	50	3	15	57	13	03	23	10	49	45	13	21	58	36	50	33
	17	12	35	40	23	31	54	12	56	50	3	15	56	13	03	23	10	49	44	13	21	58	36	50	32
	27	12	35	40	23	31	53	12	56	50	3	15	55	13	03	23	10	49	43	13	21	58	36	50	30
Oct.	7	12	35	40	23	31	52	12	56	50	3	15	55	13	03	23	10	49	42	13	21	58	36	50	29
	17	12	35	40	23	31	52	12	56	50	3	15	54	13	03	23	10	49	40	13	21	58	36	50	27
	27	12	35	40	-23	31	52	12	56	50	+3	15	52	13	03	23	+10	49	38	13	21	58	-36	50	26
Nov.	6	12	35	40	23	31	52	12	56	50	3	15	51	13	03	24	10	49	36	13	21	58	36	50	25
	16	12	35	41	23	31	52	12	56	50	3	15	49	13	03	24	10	49	34	13	21	58	36	50	25
	26	12	35	41	23	31	53	12	56	51	3	15	47	13	03	24	10	49	32	13	21	59	36	50	25
Dec.	6	12	35	41	23	31	55	12	56	51	3	15	44	13	03	24	10	49	29	13	21	59	36	50	25
	16	12	35	42	23	31	56	12	56	51	3	15	42	13	03	25	10	49	27	13	21	59	36	50	26
	26	12	35	42	-23	31	58	12	56	52	+3	15	40	13	03	25	+10	49	25	13	21	60	-36	50	27
	36	12	35	42	-23	32	00	12	56	52	+3	15	38	13	03	25	+10	49	22	13	22	00	-36	50	29

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		α Virginis(HR 5056)						ď Centauri (HR 5288)						α^2 Librae (HR 5531)						β Lupi (HR 5571)					
Mag. Spect.		0.98			B1 V			2.06			$K0^-$ IIIb			2.75			A3 III-IV			2.68			B2 IV		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	13	26	27	-11	17	08	14	08	05	-36	29	05	14	52	11	-16	08	25	15	00	05	-43	13	38
	11	13	26	27	11	17	10	14	08	05	36	29	06	14	52	12	16	08	26	15	00	05	43	13	38
	21	13	26	28	11	17	12	14	08	06	36	29	08	14	52	12	16	08	28	15	00	06	43	13	39
	31	13	26	28	11	17	14	14	08	06	36	29	10	14	52	12	16	08	30	15	00	06	43	13	41
Feb.	10	13	26	28	11	17	16	14	08	06	36	29	12	14	52	13	16	08	32	15	00	07	43	13	42
	20	13	26	29	11	17	17	14	08	07	36	29	14	14	52	13	16	08	33	15	00	07	43	13	44
Mar.	1	13	26	29	-11	17	19	14	08	07	-36	29	16	14	52	13	-16	08	34	15	00	07	-43	13	45
	11	13	26	29	11	17	20	14	08	07	36	29	19	14	52	14	16	08	36	15	00	08	43	13	48
	21	13	26	29	11	17	22	14	08	08	36	29	21	14	52	14	16	08	37	15	00	08	43	13	50
	31	13	26	29	11	17	22	14	08	08	36	29	23	14	52	14	16	08	38	15	00	08	43	13	51
Apr.	10	13	26	29	11	17	23	14	08	08	36	29	25	14	52	14	16	08	39	15	00	09	43	13	54
	20	13	26	29	11	17	24	14	08	08	36	29	27	14	52	14	16	08	39	15	00	09	43	13	56
	30	13	26	29	-11	17	24	14	08	08	-36	29	28	14	52	15	-16	08	40	15	00	09	-43	13	57
May	10	13	26	29	11	17	24	14	08	08	36	29	30	14	52	15	16	08	40	15	00	09	43	13	59
	20	13	26	29	11	17	24	14	08	08	36	29	31	14	52	15	16	08	40	15	00	09	43	14	01
	30	13	26	29	11	17	24	14	08	08	36	29	33	14	52	15	16	08	40	15	00	09	43	14	03
June	9	13	26	29	11	17	24	14	08	08	36	29	34	14	52	15	16	08	40	15	00	09	43	14	04
	19	13	26	29	11	17	23	14	08	08	36	29	34	14	52	15	16	08	40	15	00	09	43	14	05
	29	13	26	29	-11	17	23	14	08	08	-36	29	35	14	52	15	-16	08	40	15	00	09	-43	14	07
July	9	13	26	29	11	17	23	14	08	08	36	29	35	14	52	15	16	08	40	15	00	09	43	14	07
	19	13	26	29	11	17	22	14	08	08	36	29	35	14	52	15	16	08	39	15	00	09	43	14	08
	29	13	26	29	11	17	21	14	08	08	36	29	35	14	52	14	16	08	39	15	00	09	43	14	08
Aug.	8	13	26	29	11	17	21	14	08	08	36	29	34	14	52	14	16	08	39	15	00	09	43	14	08
	18	13	26	29	11	17	20	14	08	07	36	29	33	14	52	14	16	08	38	15	00	09	43	14	07
	28	13	26	29	-11	17	20	14	08	07	-36	29	32	14	52	14	-16	08	38	15	00	08	-43	14	07
Sept.	7	13	26	29	11	17	19	14	08	07	36	29	31	14	52	14	16	08	37	15	00	08	43	14	06
	17	13	26	29	11	17	19	14	08	07	36	29	30	14	52	14	16	08	37	15	00	08	43	14	05
	27	13	26	29	11	17	19	14	08	07	36	29	29	14	52	14	16	08	37	15	00	08	43	14	03
Oct.	7	13	26	28	11	17	19	14	08	07	36	29	27	14	52	14	16	08	36	15	00	08	43	14	02
	17	13	26	29	11	17	19	14	08	07	36	29	26	14	52	14	16	08	36	15	00	08	43	14	00
	27	13	26	29	-11	17	19	14	08	07	-36	29	25	14	52	14	-16	08	36	15	00	08	-43	13	59
Nov.	6	13	26	29	11	17	20	14	08	07	36	29	24	14	52	14	16	08	36	15	00	08	43	13	57
	16	13	26	29	11	17	21	14	08	07	36	29	23	14	52	14	16	08	37	15	00	08	43	13	56
	26	13	26	29	11	17	22	14	08	07	36	29	23	14	52	14	16	08	38	15	00	08	43	13	55
Dec.	6	13	26	30	11	17	24	14	08	08	36	29	23	14	52	14	16	08	38	15	00	08	43	13	54
	16	13	26	30	11	17	25	14	08	08	36	29	23	14	52	15	16	08	39	15	00	09	43	13	54
	26	13	26	30	-11	17	27	14	08	09	-36	29	24	14	52	15	-16	08	41	15	00	09	-43	13	54
	36	13	26	31	-11	17	29	14	08	09	-36	29	25	14	52	15	-16	08	42	15	00	10	-43	13	54

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		β Librae(HR 5685)						α Serpentis (HR 5854)						δ Scorpii (HR 5953)						δ Ophiuchi (HR 6056)					
Mag. Spect.		2.61			B8 IIIn			2.65			K2 IIIb CN I			2.32			B0.3 IV			2.74			M0.5 III		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	15	18	17	-9	28	15	15	45	26	+6	20	57	16	01	44	-22	41	20	16	15	35	-3	45	23
	11	15	18	17	9	28	17	15	45	26	6	20	55	16	01	44	22	41	21	16	15	35	3	45	24
	21	15	18	17	9	28	19	15	45	26	6	20	53	16	01	44	22	41	22	16	15	35	3	45	26
	31	15	18	18	9	28	20	15	45	27	6	20	51	16	01	45	22	41	23	16	15	36	3	45	28
Feb.	10	15	18	18	9	28	22	15	45	27	6	20	50	16	01	45	22	41	24	16	15	36	3	45	29
	20	15	18	18	9	28	23	15	45	27	6	20	49	16	01	45	22	41	25	16	15	36	3	45	30
Mar.	1	15	18	19	-9	28	24	15	45	28	+6	20	48	16	01	46	-22	41	26	16	15	37	-3	45	31
	11	15	18	19	9	28	26	15	45	28	6	20	47	16	01	46	22	41	27	16	15	37	3	45	32
	21	15	18	19	9	28	26	15	45	28	6	20	47	16	01	46	22	41	28	16	15	37	3	45	32
	31	15	18	19	9	28	27	15	45	28	6	20	47	16	01	47	22	41	29	16	15	38	3	45	32
Apr.	10	15	18	20	9	28	27	15	45	29	6	20	48	16	01	47	22	41	30	16	15	38	3	45	32
	20	15	18	20	9	28	27	15	45	29	6	20	48	16	01	47	22	41	31	16	15	38	3	45	32
	30	15	18	20	-9	28	27	15	45	29	+6	20	49	16	01	47	-22	41	31	16	15	38	-3	45	31
May	10	15	18	20	9	28	27	15	45	29	6	20	50	16	01	48	22	41	31	16	15	38	3	45	31
	20	15	18	20	9	28	27	15	45	29	6	20	52	16	01	48	22	41	32	16	15	39	3	45	30
	30	15	18	20	9	28	27	15	45	29	6	20	53	16	01	48	22	41	32	16	15	39	3	45	29
June	9	15	18	20	9	28	26	15	45	29	6	20	54	16	01	48	22	41	32	16	15	39	3	45	28
	19	15	18	20	9	28	26	15	45	29	6	20	56	16	01	48	22	41	33	16	15	39	3	45	28
	29	15	18	20	-9	28	25	15	45	29	+6	20	57	16	01	48	-22	41	33	16	15	39	-3	45	27
July	9	15	18	20	9	28	25	15	45	29	6	20	58	16	01	48	22	41	33	16	15	39	3	45	26
	19	15	18	20	9	28	24	15	45	29	6	20	59	16	01	48	22	41	33	16	15	39	3	45	25
	29	15	18	20	9	28	24	15	45	29	6	20	59	16	01	48	22	41	33	16	15	39	3	45	25
Aug.	8	15	18	20	9	28	24	15	45	29	6	20	60	16	01	48	22	41	33	16	15	39	3	45	24
	18	15	18	20	9	28	23	15	45	29	6	21	00	16	01	48	22	41	33	16	15	38	3	45	24
	28	15	18	20	-9	28	23	15	45	29	+6	21	01	16	01	47	-22	41	32	16	15	38	-3	45	24
Sept.	7	15	18	20	9	28	23	15	45	29	6	21	01	16	01	47	22	41	32	16	15	38	3	45	24
	17	15	18	19	9	28	23	15	45	29	6	21	00	16	01	47	22	41	32	16	15	38	3	45	24
	27	15	18	19	9	28	22	15	45	28	6	20	60	16	01	47	22	41	31	16	15	38	3	45	24
Oct.	7	15	18	19	9	28	22	15	45	28	6	20	59	16	01	47	22	41	31	16	15	38	3	45	24
	17	15	18	19	9	28	23	15	45	28	6	20	58	16	01	47	22	41	30	16	15	38	3	45	24
	27	15	18	19	-9	28	23	15	45	28	+6	20	57	16	01	47	-22	41	30	16	15	38	-3	45	25
Nov.	6	15	18	19	9	28	23	15	45	28	6	20	56	16	01	47	22	41	30	16	15	38	3	45	25
	16	15	18	19	9	28	24	15	45	28	6	20	54	16	01	47	22	41	30	16	15	38	3	45	26
	26	15	18	19	9	28	25	15	45	28	6	20	52	16	01	47	22	41	30	16	15	38	3	45	28
Dec.	6	15	18	20	9	28	27	15	45	29	6	20	50	16	01	47	22	41	30	16	15	38	3	45	29
	16	15	18	20	9	28	28	15	45	29	6	20	48	16	01	47	22	41	30	16	15	38	3	45	30
	26	15	18	20	-9	28	29	15	45	29	+6	20	46	16	01	48	-22	41	31	16	15	38	-3	45	32
	36	15	18	21	-9	28	31	15	45	29	+6	20	44	16	01	48	-22	41	32	16	15	38	-3	45	34

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		α Scorpii A (HR 6134)						ζ Ophiuchi (HR 6175)						ε Scorpii (HR 6241)						ɗ Ophiuchi(HR 6453)					
Mag. Spect.		0.9 - 1.8			M1.5 Iab-Ib			2.56			O9.5 Vn			2.29			K2 III			3.27			B2 IV		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	16	30	51	-26	29	03	16	38	27	-10	36	56	16	51	41	-34	20	08	17	23	27	-25	01	23
	11	16	30	51	26	29	03	16	38	28	10	36	57	16	51	42	34	20	07	17	23	27	25	01	23
	21	16	30	52	26	29	04	16	38	28	10	36	58	16	51	42	34	20	07	17	23	28	25	01	23
	31	16	30	52	26	29	05	16	38	28	10	36	60	16	51	42	34	20	08	17	23	28	25	01	24
Feb.	10	16	30	53	26	29	05	16	38	29	10	37	01	16	51	43	34	20	08	17	23	28	25	01	24
	20	16	30	53	26	29	06	16	38	29	10	37	02	16	51	43	34	20	09	17	23	29	25	01	25
Mar.	1	16	30	53	-26	29	07	16	38	29	-10	37	03	16	51	43	-34	20	09	17	23	29	-25	01	25
	11	16	30	54	26	29	08	16	38	29	10	37	04	16	51	44	34	20	10	17	23	29	25	01	26
	21	16	30	54	26	29	09	16	38	30	10	37	04	16	51	44	34	20	11	17	23	30	25	01	26
	31	16	30	54	26	29	09	16	38	30	10	37	04	16	51	44	34	20	11	17	23	30	25	01	26
Apr.	10	16	30	54	26	29	10	16	38	30	10	37	04	16	51	45	34	20	12	17	23	30	25	01	26
	20	16	30	55	26	29	11	16	38	31	10	37	04	16	51	45	34	20	13	17	23	31	25	01	27
	30	16	30	55	-26	29	11	16	38	31	-10	37	04	16	51	45	-34	20	14	17	23	31	-25	01	27
May	10	16	30	55	26	29	12	16	38	31	10	37	04	16	51	46	34	20	15	17	23	31	25	01	27
	20	16	30	55	26	29	12	16	38	31	10	37	03	16	51	46	34	20	16	17	23	31	25	01	27
	30	16	30	56	26	29	13	16	38	31	10	37	03	16	51	46	34	20	17	17	23	32	25	01	27
June	9	16	30	56	26	29	13	16	38	31	10	37	02	16	51	46	34	20	17	17	23	32	25	01	27
	19	16	30	56	26	29	14	16	38	32	10	37	02	16	51	46	34	20	18	17	23	32	25	01	28
	29	16	30	56	-26	29	14	16	38	32	-10	37	01	16	51	46	-34	20	19	17	23	32	-25	01	28
July	9	16	30	56	26	29	14	16	38	32	10	37	01	16	51	46	34	20	20	17	23	32	25	01	28
	19	16	30	56	26	29	15	16	38	32	10	37	00	16	51	46	34	20	20	17	23	32	25	01	28
	29	16	30	56	26	29	15	16	38	31	10	36	60	16	51	46	34	20	21	17	23	32	25	01	29
Aug.	8	16	30	56	26	29	15	16	38	31	10	36	60	16	51	46	34	20	22	17	23	32	25	01	29
	18	16	30	55	26	29	15	16	38	31	10	36	59	16	51	46	34	20	22	17	23	32	25	01	29
	28	16	30	55	-26	29	15	16	38	31	-10	36	59	16	51	46	-34	20	22	17	23	32	-25	01	29
Sept.	7	16	30	55	26	29	15	16	38	31	10	36	59	16	51	46	34	20	22	17	23	32	25	01	29
	17	16	30	55	26	29	14	16	38	31	10	36	59	16	51	46	34	20	22	17	23	31	25	01	29
	27	16	30	55	26	29	14	16	38	31	10	36	59	16	51	45	34	20	21	17	23	31	25	01	29
Oct.	7	16	30	55	26	29	13	16	38	31	10	36	59	16	51	45	34	20	20	17	23	31	25	01	29
	17	16	30	55	26	29	13	16	38	30	10	36	59	16	51	45	34	20	20	17	23	31	25	01	28
	27	16	30	54	-26	29	12	16	38	30	-10	36	59	16	51	45	-34	20	19	17	23	31	-25	01	28
Nov.	6	16	30	54	26	29	12	16	38	30	10	36	59	16	51	45	34	20	18	17	23	31	25	01	28
	16	16	30	54	26	29	11	16	38	30	10	36	60	16	51	45	34	20	17	17	23	31	25	01	27
	26	16	30	55	26	29	11	16	38	30	10	37	01	16	51	45	34	20	17	17	23	31	25	01	27
Dec.	6	16	30	55	26	29	11	16	38	31	10	37	01	16	51	45	34	20	16	17	23	31	25	01	27
	16	16	30	55	26	29	11	16	38	31	10	37	02	16	51	45	34	20	15	17	23	31	25	01	27
	26	16	30	55	-26	29	11	16	38	31	-10	37	04	16	51	45	-34	20	15	17	23	31	-25	01	27
	36	16	30	55	-26	29	12	16	38	31	-10	37	05	16	51	46	-34	20	15	17	23	31	-25	01	27

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Name		ϑ Scorpii (HR 6527)						α Ophiuchi(HR 6556)						β Ophiuchi (HR 6603)						δ Sagittarii (HR 6859)					
Mag. Spect.		1.63			B1.5 IV			2.08			A5 Vnn			2.77			K2 III CN 0.5			2.70			K2.5 IIIa CN 0.5		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	17	35	12	-37	07	14	17	36	01	+12	32	29	17	44	38	+4	33	23	18	22	30	-29	49	05
	11	17	35	13	37	07	13	17	36	01	12	32	27	17	44	38	4	33	21	18	22	30	29	49	04
	21	17	35	13	37	07	13	17	36	02	12	32	25	17	44	38	4	33	20	18	22	30	29	49	04
	31	17	35	13	37	07	12	17	36	02	12	32	23	17	44	39	4	33	18	18	22	31	29	49	04
Feb.	10	17	35	14	37	07	12	17	36	02	12	32	21	17	44	39	4	33	16	18	22	31	29	49	04
	20	17	35	14	37	07	12	17	36	03	12	32	20	17	44	39	4	33	15	18	22	31	29	49	03
Mar.	1	17	35	14	-37	07	12	17	36	03	+12	32	19	17	44	39	+4	33	14	18	22	31	-29	49	03
	11	17	35	15	37	07	13	17	36	03	12	32	18	17	44	40	4	33	14	18	22	32	29	49	03
	21	17	35	15	37	07	13	17	36	03	12	32	18	17	44	40	4	33	14	18	22	32	29	49	03
	31	17	35	15	37	07	13	17	36	04	12	32	18	17	44	40	4	33	14	18	22	33	29	49	03
Apr.	10	17	35	16	37	07	14	17	36	04	12	32	19	17	44	41	4	33	14	18	22	33	29	49	03
	20	17	35	16	37	07	14	17	36	04	12	32	20	17	44	41	4	33	15	18	22	33	29	49	03
	30	17	35	16	-37	07	14	17	36	05	+12	32	21	17	44	41	+4	33	16	18	22	34	-29	49	02
May	10	17	35	17	37	07	15	17	36	05	12	32	23	17	44	41	4	33	18	18	22	34	29	49	02
	20	17	35	17	37	07	16	17	36	05	12	32	24	17	44	42	4	33	19	18	22	34	29	49	02
	30	17	35	17	37	07	17	17	36	05	12	32	26	17	44	42	4	33	20	18	22	34	29	49	02
June	9	17	35	18	37	07	17	17	36	05	12	32	28	17	44	42	4	33	22	18	22	35	29	49	02
	19	17	35	18	37	07	18	17	36	05	12	32	30	17	44	42	4	33	24	18	22	35	29	49	03
	29	17	35	18	-37	07	19	17	36	06	+12	32	32	17	44	42	+4	33	25	18	22	35	-29	49	03
July	9	17	35	18	37	07	20	17	36	06	12	32	34	17	44	42	4	33	27	18	22	35	29	49	03
	19	17	35	18	37	07	21	17	36	06	12	32	36	17	44	42	4	33	28	18	22	35	29	49	04
	29	17	35	18	37	07	22	17	36	05	12	32	37	17	44	42	4	33	29	18	22	35	29	49	04
Aug.	8	17	35	18	37	07	23	17	36	05	12	32	38	17	44	42	4	33	30	18	22	35	29	49	05
	18	17	35	18	37	07	23	17	36	05	12	32	39	17	44	42	4	33	31	18	22	35	29	49	05
	28	17	35	17	-37	07	23	17	36	05	+12	32	40	17	44	42	+4	33	31	18	22	35	-29	49	06
Sept.	7	17	35	17	37	07	24	17	36	05	12	32	40	17	44	42	4	33	32	18	22	35	29	49	06
	17	17	35	17	37	07	24	17	36	05	12	32	40	17	44	42	4	33	32	18	22	35	29	49	07
	27	17	35	17	37	07	24	17	36	05	12	32	40	17	44	41	4	33	32	18	22	35	29	49	07
Oct.	7	17	35	17	37	07	23	17	36	04	12	32	40	17	44	41	4	33	32	18	22	34	29	49	07
	17	17	35	16	37	07	23	17	36	04	12	32	39	17	44	41	4	33	31	18	22	34	29	49	07
	27	17	35	16	-37	07	22	17	36	04	+12	32	38	17	44	41	+4	33	30	18	22	34	-29	49	06
Nov.	6	17	35	16	37	07	21	17	36	04	12	32	37	17	44	41	4	33	30	18	22	34	29	49	06
	16	17	35	16	37	07	20	17	36	04	12	32	35	17	44	41	4	33	28	18	22	34	29	49	06
	26	17	35	16	37	07	20	17	36	04	12	32	33	17	44	41	4	33	27	18	22	34	29	49	05
Dec.	6	17	35	16	37	07	19	17	36	04	12	32	32	17	44	41	4	33	26	18	22	34	29	49	05
	16	17	35	16	37	07	18	17	36	04	12	32	30	17	44	41	4	33	24	18	22	34	29	49	04
	26	17	35	17	-37	07	17	17	36	04	+12	32	27	17	44	41	+4	33	22	18	22	34	-29	49	04
	36	17	35	17	-37	07	16	17	36	04	+12	32	25	17	44	41	+4	33	20	18	22	34	-29	49	03

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Name		ε Sagittarii (HR 6879)						σ Sagittarii (HR 7121)						ζ Aquilae (HR 7235)						ɔ Aquilae(HR 7525)					
Mag. Spect.		1.85			A0 IIꟷn(shell)			2.02			B3 IV			2.99			A0 Vann			2.72			K3 II		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	18	25	44	-34	22	24	18	56	43	-26	16	04	19	06	29	+13	53	54	19	47	22	+10	40	15
	11	18	25	44	34	22	23	18	56	43	26	16	03	19	06	29	13	53	52	19	47	22	10	40	14
	21	18	25	44	34	22	23	18	56	44	26	16	03	19	06	29	13	53	50	19	47	22	10	40	12
	31	18	25	44	34	22	22	18	56	44	26	16	03	19	06	29	13	53	48	19	47	23	10	40	10
Feb.	10	18	25	45	34	22	22	18	56	44	26	16	02	19	06	30	13	53	46	19	47	23	10	40	09
	20	18	25	45	34	22	21	18	56	44	26	16	02	19	06	30	13	53	45	19	47	23	10	40	08
Mar.	1	18	25	45	-34	22	21	18	56	45	-26	16	02	19	06	30	+13	53	43	19	47	23	+10	40	06
	11	18	25	46	34	22	21	18	56	45	26	16	01	19	06	30	13	53	42	19	47	23	10	40	06
	21	18	25	46	34	22	20	18	56	45	26	16	01	19	06	31	13	53	42	19	47	24	10	40	06
	31	18	25	47	34	22	20	18	56	46	26	16	00	19	06	31	13	53	42	19	47	24	10	40	06
Apr.	10	18	25	47	34	22	20	18	56	46	26	15	60	19	06	31	13	53	43	19	47	24	10	40	06
	20	18	25	47	34	22	20	18	56	46	26	15	59	19	06	32	13	53	44	19	47	25	10	40	07
	30	18	25	48	-34	22	20	18	56	47	-26	15	59	19	06	32	+13	53	45	19	47	25	+10	40	08
May	10	18	25	48	34	22	20	18	56	47	26	15	58	19	06	32	13	53	47	19	47	25	10	40	10
	20	18	25	48	34	22	20	18	56	47	26	15	58	19	06	32	13	53	49	19	47	26	10	40	11
	30	18	25	49	34	22	21	18	56	48	26	15	57	19	06	33	13	53	51	19	47	26	10	40	14
June	9	18	25	49	34	22	21	18	56	48	26	15	57	19	06	33	13	53	53	19	47	26	10	40	16
	19	18	25	49	34	22	21	18	56	48	26	15	57	19	06	33	13	53	55	19	47	26	10	40	18
	29	18	25	49	-34	22	22	18	56	48	-26	15	57	19	06	33	+13	53	57	19	47	26	+10	40	20
July	9	18	25	49	34	22	23	18	56	48	26	15	57	19	06	33	13	53	60	19	47	27	10	40	22
	19	18	25	49	34	22	23	18	56	49	26	15	57	19	06	33	13	54	02	19	47	27	10	40	24
	29	18	25	49	34	22	24	18	56	49	26	15	58	19	06	34	13	54	03	19	47	27	10	40	26
Aug.	8	18	25	49	34	22	25	18	56	49	26	15	58	19	06	34	13	54	05	19	47	27	10	40	28
	18	18	25	49	34	22	26	18	56	49	26	15	58	19	06	33	13	54	07	19	47	27	10	40	29
	28	18	25	49	-34	22	26	18	56	48	-26	15	59	19	06	33	+13	54	08	19	47	27	+10	40	31
Sept.	7	18	25	49	34	22	27	18	56	48	26	15	59	19	06	33	13	54	09	19	47	27	10	40	31
	17	18	25	49	34	22	27	18	56	48	26	15	60	19	06	33	13	54	09	19	47	27	10	40	32
	27	18	25	49	34	22	27	18	56	48	26	15	60	19	06	33	13	54	10	19	47	26	10	40	33
Oct.	7	18	25	48	34	22	27	18	56	48	26	16	00	19	06	33	13	54	10	19	47	26	10	40	33
	17	18	25	48	34	22	27	18	56	48	26	16	00	19	06	33	13	54	09	19	47	26	10	40	33
	27	18	25	48	-34	22	27	18	56	47	-26	16	00	19	06	32	+13	54	09	19	47	26	+10	40	33
Nov.	6	18	25	48	34	22	26	18	56	47	26	16	00	19	06	32	13	54	08	19	47	26	10	40	32
	16	18	25	48	34	22	26	18	56	47	26	15	60	19	06	32	13	54	07	19	47	26	10	40	31
	26	18	25	48	34	22	25	18	56	47	26	15	60	19	06	32	13	54	06	19	47	26	10	40	30
Dec.	6	18	25	48	34	22	24	18	56	47	26	15	59	19	06	32	13	54	04	19	47	25	10	40	29
	16	18	25	48	34	22	23	18	56	47	26	15	59	19	06	32	13	54	03	19	47	25	10	40	28
	26	18	25	48	-34	22	23	18	56	47	-26	15	59	19	06	32	+13	54	00	19	47	25	+10	40	26
	36	18	25	48	-34	22	22	18	56	47	-26	15	59	19	06	32	+13	53	58	19	47	26	+10	40	24

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Name		α Aquilae(HR 7557)						ɔ Cygni (HR 7796)						α Cygni (HR 7924)						β Aquarii (HR 8232)					
Mag. Spect.		0.77			A7 Vnn			2.20			F8 Ib			1.25			A2 Ia			2.91			G0 Ib		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	19	51	56	+8	55	51	20	23	03	+40	20	02	20	42	13	45	22	01	21	32	48	-5	28	01
	11	19	51	56	8	55	50	20	23	03	40	19	59	20	42	13	45	21	58	21	32	48	5	28	02
	21	19	51	56	8	55	48	20	23	03	40	19	56	20	42	13	45	21	55	21	32	48	5	28	03
	31	19	51	56	8	55	46	20	23	03	40	19	53	20	42	13	45	21	52	21	32	48	5	28	03
Feb.	10	19	51	56	8	55	45	20	23	04	40	19	50	20	42	13	45	21	49	21	32	48	5	28	03
	20	19	51	56	8	55	44	20	23	04	40	19	48	20	42	13	45	21	46	21	32	48	5	28	03
Mar.	1	19	51	56	+8	55	43	20	23	04	+40	19	45	20	42	13	45	21	44	21	32	48	-5	28	04
	11	19	51	57	8	55	42	20	23	04	40	19	43	20	42	13	45	21	41	21	32	48	5	28	03
	21	19	51	57	8	55	42	20	23	04	40	19	42	20	42	14	45	21	40	21	32	49	5	28	03
	31	19	51	57	8	55	42	20	23	05	40	19	41	20	42	14	45	21	39	21	32	49	5	28	02
Apr.	10	19	51	58	8	55	43	20	23	05	40	19	41	20	42	14	45	21	38	21	32	49	5	28	01
	20	19	51	58	8	55	44	20	23	05	40	19	42	20	42	15	45	21	39	21	32	49	5	27	60
	30	19	51	58	+8	55	45	20	23	06	+40	19	43	20	42	15	45	21	39	21	32	50	-5	27	58
May	10	19	51	58	8	55	47	20	23	06	40	19	44	20	42	16	45	21	41	21	32	50	5	27	57
	20	19	51	59	8	55	48	20	23	06	40	19	46	20	42	16	45	21	42	21	32	50	5	27	55
	30	19	51	59	8	55	50	20	23	07	40	19	48	20	42	16	45	21	45	21	32	51	5	27	53
June	9	19	51	59	8	55	53	20	23	07	40	19	51	20	42	17	45	21	47	21	32	51	5	27	51
	19	19	51	60	8	55	55	20	23	07	40	19	54	20	42	17	45	21	50	21	32	51	5	27	49
	29	19	51	60	+8	55	57	20	23	08	+40	19	57	20	42	17	45	21	53	21	32	52	-5	27	48
July	9	19	51	60	8	55	59	20	23	08	40	20	01	20	42	17	45	21	57	21	32	52	5	27	46
	19	19	51	60	8	56	01	20	23	08	40	20	04	20	42	18	45	22	00	21	32	52	5	27	45
	29	19	52	00	8	56	03	20	23	08	40	20	07	20	42	18	45	22	04	21	32	52	5	27	43
Aug.	8	19	52	00	8	56	04	20	23	08	40	20	10	20	42	18	45	22	07	21	32	52	5	27	42
	18	19	52	00	8	56	06	20	23	08	40	20	13	20	42	18	45	22	10	21	32	52	5	27	41
	28	19	52	00	+8	56	07	20	23	08	+40	20	16	20	42	18	45	22	13	21	32	52	-5	27	41
Sept.	7	19	51	60	8	56	08	20	23	08	40	20	18	20	42	17	45	22	15	21	32	52	5	27	40
	17	19	51	60	8	56	08	20	23	08	40	20	20	20	42	17	45	22	18	21	32	52	5	27	40
	27	19	51	60	8	56	09	20	23	07	40	20	22	20	42	17	45	22	20	21	32	52	5	27	40
Oct.	7	19	51	60	8	56	09	20	23	07	40	20	23	20	42	17	45	22	21	21	32	52	5	27	40
	17	19	51	59	8	56	09	20	23	07	40	20	23	20	42	17	45	22	22	21	32	52	5	27	40
	27	19	51	59	+8	56	09	20	23	07	+40	20	24	20	42	16	45	22	23	21	32	52	-5	27	40
Nov.	6	19	51	59	8	56	08	20	23	06	40	20	23	20	42	16	45	22	23	21	32	52	5	27	41
	16	19	51	59	8	56	07	20	23	06	40	20	23	20	42	16	45	22	22	21	32	52	5	27	41
	26	19	51	59	8	56	06	20	23	06	40	20	21	20	42	16	45	22	21	21	32	52	5	27	42
Dec.	6	19	51	59	8	56	05	20	23	06	40	20	20	20	42	15	45	22	20	21	32	52	5	27	42
	16	19	51	59	8	56	04	20	23	06	40	20	18	20	42	15	45	22	18	21	32	52	5	27	43
	26	19	51	59	+8	56	02	20	23	06	+40	20	15	20	42	15	45	22	16	21	32	51	-5	27	44
	36	19	51	59	+8	56	01	20	23	06	+40	20	13	20	42	15	45	22	13	21	32	51	-5	27	44

APPARENT PLACES OF STARS, 2024

FOR 0^h TERRESTRIAL TIME

Name		ε Pegasi (HR 8308)						α Aquarii (HR 8414))						δ Aquarii (HR 8709)						α Pegasi (HR 8781)					
Mag. Spect.		0.7 - 3.5			K2 Ib-II			2.96			G2 Ib			3.27			A3 IV-V			2.49			A0 III-IV		
U.T.		Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
		h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
Jan.	1	21	45	21	+9	59	05	22	06	60	-0	12	16	22	55	54	-15	41	44	23	05	56	+15	20	05
	11	21	45	20	9	59	03	22	06	60	0	12	17	22	55	54	15	41	45	23	05	56	15	20	04
	21	21	45	20	9	59	02	22	06	60	0	12	17	22	55	54	15	41	45	23	05	56	15	20	03
	31	21	45	20	9	59	01	22	06	60	0	12	18	22	55	54	15	41	44	23	05	56	15	20	01
Feb.	10	21	45	21	9	58	60	22	06	60	0	12	19	22	55	54	15	41	44	23	05	56	15	20	00
	20	21	45	21	9	58	59	22	06	60	0	12	19	22	55	54	15	41	43	23	05	56	15	19	59
Mar.	1	21	45	21	+9	58	58	22	06	60	-0	12	19	22	55	54	-15	41	43	23	05	56	+15	19	58
	11	21	45	21	9	58	57	22	07	00	0	12	19	22	55	54	15	41	42	23	05	56	15	19	57
	21	21	45	21	9	58	57	22	07	00	0	12	19	22	55	55	15	41	40	23	05	56	15	19	57
	31	21	45	21	9	58	57	22	07	00	0	12	18	22	55	55	15	41	39	23	05	57	15	19	56
Apr.	10	21	45	22	9	58	57	22	07	01	0	12	18	22	55	55	15	41	37	23	05	57	15	19	56
	20	21	45	22	9	58	58	22	07	01	0	12	17	22	55	55	15	41	35	23	05	57	15	19	57
	30	21	45	22	+9	58	59	22	07	01	-0	12	15	22	55	55	-15	41	33	23	05	57	+15	19	57
May	10	21	45	22	9	59	00	22	07	01	0	12	14	22	55	56	15	41	31	23	05	58	15	19	58
	20	21	45	23	9	59	02	22	07	02	0	12	12	22	55	56	15	41	29	23	05	58	15	19	60
	30	21	45	23	9	59	04	22	07	02	0	12	10	22	55	56	15	41	27	23	05	58	15	20	01
June	9	21	45	23	9	59	06	22	07	02	0	12	08	22	55	57	15	41	25	23	05	58	15	20	03
	19	21	45	24	9	59	08	22	07	03	0	12	06	22	55	57	15	41	23	23	05	59	15	20	05
	29	21	45	24	+9	59	11	22	07	03	-0	12	04	22	55	57	-15	41	22	23	05	59	+15	20	08
July	9	21	45	24	9	59	13	22	07	03	0	12	02	22	55	58	15	41	20	23	05	59	15	20	10
	19	21	45	24	9	59	15	22	07	04	0	12	00	22	55	58	15	41	19	23	05	60	15	20	13
	29	21	45	25	9	59	17	22	07	04	0	11	59	22	55	58	15	41	18	23	05	60	15	20	15
Aug.	8	21	45	25	9	59	19	22	07	04	0	11	57	22	55	58	15	41	17	23	06	00	15	20	17
	18	21	45	25	9	59	21	22	07	04	0	11	56	22	55	59	15	41	16	23	06	00	15	20	19
	28	21	45	25	+9	59	23	22	07	04	-0	11	55	22	55	59	-15	41	16	23	06	00	+15	20	21
Sept.	7	21	45	25	9	59	24	22	07	04	0	11	54	22	55	59	15	41	16	23	06	01	15	20	23
	17	21	45	25	9	59	25	22	07	04	0	11	53	22	55	59	15	41	17	23	06	01	15	20	25
	27	21	45	25	9	59	26	22	07	04	0	11	53	22	55	59	15	41	17	23	06	01	15	20	26
Oct.	7	21	45	25	9	59	27	22	07	04	0	11	53	22	55	59	15	41	18	23	06	01	15	20	27
	17	21	45	25	9	59	27	22	07	04	0	11	53	22	55	59	15	41	19	23	06	01	15	20	28
	27	21	45	24	+9	59	27	22	07	04	-0	11	53	22	55	59	-15	41	19	23	06	00	+15	20	29
Nov.	6	21	45	24	9	59	27	22	07	04	0	11	53	22	55	59	15	41	20	23	06	00	15	20	29
	16	21	45	24	9	59	27	22	07	04	0	11	54	22	55	58	15	41	21	23	06	00	15	20	29
	26	21	45	24	9	59	26	22	07	03	0	11	54	22	55	58	15	41	22	23	06	00	15	20	29
Dec.	6	21	45	24	9	59	26	22	07	03	0	11	55	22	55	58	15	41	22	23	06	00	15	20	28
	16	21	45	24	9	59	25	22	07	03	0	11	55	22	55	58	15	41	23	23	05	60	15	20	28
	26	21	45	24	+9	59	23	22	07	03	-0	11	56	22	55	58	-15	41	23	23	05	60	+15	20	27
	36	21	45	24	+9	59	22	22	07	03	-0	11	57	22	55	58	-15	41	23	23	05	60	+15	20	26

BESSELIAN DAY NUMBERS, 2024.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Jan.	0	-0.5041	-12.235	-8.010	-3.027	+20.563	-7	+0.248	+0.027
	1	0.5014	12.181	8.060	3.356	20.504	7	0.184	0.067
	2	0.4986	12.140	8.099	3.685	20.439	7	+0.088	0.096
	3	0.4959	12.107	8.123	4.012	20.368	7	-0.028	0.108
	4	0.4932	12.076	8.128	4.339	20.290	7	0.146	0.102
	5	0.4904	12.038	8.115	4.665	20.206	7	0.248	0.077
	6	-0.4877	-11.988	-8.087	-4.989	+20.115	-7	-0.318	+0.036
	7	0.4849	11.919	8.051	5.312	20.018	7	0.341	-0.014
	8	0.4822	11.828	8.014	5.634	19.915	7	0.306	0.065
	9	0.4795	11.715	7.988	5.954	19.805	6	0.215	0.106
	10	0.4767	11.585	7.984	6.273	19.688	6	-0.081	0.125
	11	0.4740	11.449	8.010	6.590	19.565	6	+0.068	0.116
	12	-0.4713	-11.323	-8.065	-6.904	+19.435	-6	+0.195	-0.077
	13	0.4685	11.218	8.141	7.216	19.298	6	0.269	-0.018
	14	0.4658	11.143	8.223	7.526	19.155	5	0.270	+0.046
	15	0.4630	11.095	8.292	7.832	19.006	6	0.203	0.098
	16	0.4603	11.066	8.337	8.136	18.851	6	+0.092	0.124
	17	0.4576	11.041	8.350	8.436	18.690	6	-0.030	0.119
	18	-0.4548	-11.007	-8.338	-8.734	+18.524	-6	-0.128	+0.086
	19	0.4521	10.956	8.307	9.028	18.351	6	0.181	+0.036
	20	0.4493	10.884	8.272	9.319	18.174	6	0.179	-0.019
	21	0.4466	10.792	8.244	9.607	17.991	6	0.127	0.067
	22	0.4439	10.686	8.232	9.892	17.804	5	-0.039	0.100
	23	0.4411	10.575	8.242	10.174	17.611	5	+0.065	0.112
	24	-0.4384	-10.467	-8.274	-10.452	+17.413	-5	+0.163	-0.101
	25	0.4357	10.368	8.324	10.728	17.210	5	0.237	0.073
	26	0.4329	10.286	8.387	11.000	17.002	5	0.273	-0.031
	27	0.4302	10.222	8.455	11.268	16.790	5	0.264	+0.014
	28	0.4274	10.176	8.520	11.534	16.572	5	0.211	0.057
	29	0.4247	10.146	8.575	11.796	16.350	5	0.123	0.089
	30	-0.4220	-10.125	-8.615	-12.055	+16.122	-5	+0.011	+0.107
	31	0.4192	10.107	8.637	12.310	15.890	5	-0.109	0.106
Feb.	1	0.4165	10.087	8.640	12.561	15.653	5	0.219	0.086
	2	0.4138	10.056	8.627	12.809	15.411	5	0.302	0.050
	3	0.4110	10.010	8.604	13.053	15.165	5	0.343	+0.004
	4	0.4083	9.944	8.577	13.293	14.913	5	0.334	-0.046
	5	-0.4055	-9.857	-8.555	-13.529	+14.657	-5	-0.270	-0.091
	6	0.4028	9.752	8.549	13.762	14.395	5	0.158	0.120
	7	0.4001	9.636	8.569	13.989	14.129	5	-0.016	0.123
	8	0.3973	9.520	8.618	14.213	13.859	5	+0.124	0.097
	9	0.3946	9.420	8.693	14.432	13.583	5	0.227	-0.044
	10	0.3919	9.347	8.781	14.646	13.303	4	0.264	+0.021
	11	-0.3891	-9.305	-8.865	-14.855	+13.019	-4	+0.226	+0.082
	12	0.3864	9.287	8.925	15.058	12.731	5	0.128	0.121
	13	0.3836	9.280	8.953	15.257	12.439	5	+0.005	0.127
	14	0.3809	9.268	8.949	15.450	12.143	5	-0.104	0.101
	15	-0.3782	-9.239	-8.922	-15.638	+11.844	-5	-0.169	+0.052

BESSELIAN DAY NUMBERS, 2024.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Feb.	15	-0.3782	-9.239	-8.922	-15.638	+11.844	-5	-0.169	+0.052
	16	0.3754	9.188	8.886	15.821	11.542	5	0.177	-0.005
	17	0.3727	9.116	8.855	15.998	11.236	5	0.131	0.057
	18	0.3700	9.029	8.838	16.171	10.928	5	-0.046	0.094
	19	0.3672	8.935	8.842	16.338	10.618	5	+0.058	0.111
	20	0.3645	8.842	8.867	16.500	10.304	5	0.159	0.105
	21	-0.3617	-8.759	-8.911	-16.657	+9.988	-5	+0.239	-0.081
	22	0.3590	8.691	8.969	16.809	9.670	4	0.283	-0.042
	23	0.3563	8.640	9.033	16.956	9.349	4	0.285	+0.003
	24	0.3535	8.607	9.095	17.098	9.026	5	0.243	0.047
	25	0.3508	8.589	9.148	17.235	8.700	5	0.162	0.083
	26	0.3480	8.584	9.187	17.367	8.372	5	+0.054	0.104
	27	-0.3453	-8.583	-9.207	-17.494	+8.042	-5	-0.066	+0.108
	28	0.3426	8.580	9.209	17.616	7.709	5	0.180	0.094
	29	0.3398	8.570	9.193	17.733	7.374	5	0.273	0.062
Mar.	1	0.3371	8.545	9.164	17.844	7.038	5	0.328	+0.018
	2	0.3344	8.502	9.129	17.950	6.699	5	0.337	-0.031
	3	0.3316	8.439	9.098	18.051	6.358	5	0.295	-0.076
	4	-0.3289	-8.357	-9.077	-18.147	+6.015	-5	-0.206	-0.110
	5	0.3261	8.263	9.077	18.237	5.669	5	-0.084	0.123
	6	0.3234	8.164	9.103	18.322	5.322	5	+0.051	0.109
	7	0.3207	8.073	9.155	18.400	4.974	5	0.166	0.069
	8	0.3179	8.003	9.226	18.474	4.623	5	0.231	-0.008
	9	0.3152	7.960	9.301	18.541	4.271	5	0.227	+0.057
	10	-0.3125	-7.945	-9.362	-18.602	+3.917	-5	+0.153	+0.109
	11	0.3097	7.948	9.393	18.656	3.563	5	+0.036	0.131
	12	0.3070	7.952	9.388	18.705	3.207	5	-0.084	0.117
	13	0.3042	7.942	9.352	18.748	2.852	6	0.169	0.074
	14	0.3015	7.908	9.300	18.784	2.495	6	0.194	+0.015
	15	0.2988	7.851	9.248	18.814	2.139	6	0.158	-0.043
	16	-0.2960	-7.774	-9.209	-18.839	+1.783	-6	-0.073	-0.087
	17	0.2933	7.687	9.190	18.858	1.427	5	+0.036	0.110
	18	0.2906	7.600	9.195	18.871	1.072	5	0.146	0.110
	19	0.2878	7.521	9.219	18.878	0.717	5	0.237	0.089
	20	0.2851	7.456	9.258	18.881	0.362	5	0.292	0.053
	21	0.2823	7.408	9.304	18.877	+0.008	5	0.305	-0.008
	22	-0.2796	-7.378	-9.351	-18.868	-0.346	-5	+0.273	+0.037
	23	0.2769	7.364	9.390	18.854	0.699	6	0.201	0.076
	24	0.2741	7.361	9.415	18.835	1.052	6	+0.099	0.101
	25	0.2714	7.365	9.423	18.810	1.404	6	-0.020	0.110
	26	0.2687	7.369	9.411	18.780	1.755	6	0.137	0.100
	27	0.2659	7.365	9.381	18.745	2.105	6	0.237	0.072
	28	-0.2632	-7.348	-9.337	-18.704	-2.455	-6	-0.303	+0.031
	29	0.2604	7.313	9.286	18.658	2.803	6	0.324	-0.017
	30	0.2577	7.258	9.235	18.607	3.151	6	0.297	0.064
	31	0.2550	7.184	9.193	18.551	3.498	6	0.223	0.101
Apr.	1	-0.2522	-7.097	-9.169	-18.489	-3.844	-6	-0.115	-0.120

BESSELIAN DAY NUMBERS, 2024.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Apr.	1	-0.2522	-7.097	-9.169	-18.489	-3.844	-6	-0.115	-0.120
	2	0.2495	7.003	9.169	18.422	4.189	6	+0.008	0.114
	3	0.2467	6.913	9.193	18.350	4.533	6	0.121	0.083
	4	0.2440	6.838	9.238	18.272	4.876	6	0.198	-0.031
	5	0.2413	6.785	9.292	18.188	5.218	6	0.216	+0.031
	6	0.2385	6.759	9.341	18.099	5.558	6	0.168	0.089
	7	-0.2358	-6.753	-9.368	-18.004	-5.896	-6	+0.065	+0.124
	8	0.2331	6.756	9.361	17.904	6.232	6	-0.059	0.127
	9	0.2303	6.751	9.320	17.797	6.567	7	0.164	0.096
	10	0.2276	6.725	9.255	17.685	6.898	7	0.217	+0.041
	11	0.2248	6.671	9.181	17.568	7.228	7	0.202	-0.021
	12	0.2221	6.594	9.116	17.445	7.554	7	0.127	-0.075
	13	-0.2194	-6.500	-9.072	-17.317	-7.877	-6	-0.015	-0.108
	14	0.2166	6.403	9.051	17.184	8.197	6	+0.107	0.115
	15	0.2139	6.311	9.054	17.047	8.514	6	0.214	0.100
	16	0.2112	6.233	9.075	16.904	8.828	6	0.287	0.066
	17	0.2084	6.171	9.105	16.757	9.139	6	0.315	-0.022
	18	0.2057	6.128	9.138	16.606	9.447	6	0.297	+0.025
	19	-0.2029	-6.101	-9.165	-16.450	-9.751	-6	+0.235	+0.067
	20	0.2002	6.087	9.181	16.289	10.052	6	0.140	0.096
	21	0.1975	6.081	9.179	16.124	10.350	7	+0.024	0.110
	22	0.1947	6.075	9.159	15.955	10.645	7	-0.095	0.105
	23	0.1920	6.064	9.120	15.782	10.936	7	0.201	0.081
	24	0.1893	6.040	9.065	15.605	11.224	7	0.277	+0.043
	25	-0.1865	-5.999	-9.002	-15.424	-11.509	-7	-0.309	-0.005
	26	0.1838	5.937	8.937	15.238	11.790	7	0.293	0.053
	27	0.1810	5.856	8.881	15.049	12.068	7	0.229	0.093
	28	0.1783	5.760	8.841	14.855	12.343	7	0.128	0.116
	29	0.1756	5.656	8.824	14.657	12.614	7	-0.009	0.117
	30	0.1728	5.554	8.832	14.455	12.882	6	+0.104	0.092
May	1	-0.1701	-5.464	-8.861	-14.249	-13.147	-6	+0.186	-0.046
	2	0.1674	5.394	8.902	14.039	13.408	6	0.215	+0.012
	3	0.1646	5.347	8.943	13.825	13.665	6	0.183	0.070
	4	0.1619	5.323	8.968	13.606	13.919	6	+0.096	0.112
	5	0.1591	5.310	8.966	13.383	14.168	7	-0.024	0.127
	6	0.1564	5.296	8.931	13.156	14.413	7	0.141	0.110
	7	-0.1537	-5.266	-8.869	-12.925	-14.654	-7	-0.220	+0.064
	8	0.1509	5.211	8.791	12.690	14.890	7	0.236	+0.004
	9	0.1482	5.128	8.715	12.451	15.121	7	0.185	-0.056
	10	0.1454	5.024	8.655	12.209	15.347	6	-0.082	0.099
	11	0.1427	4.910	8.620	11.963	15.568	6	+0.045	0.117
	12	0.1400	4.797	8.611	11.714	15.783	6	0.167	0.110
	13	-0.1372	-4.696	-8.623	-11.462	-15.994	-6	+0.260	-0.081
	14	0.1345	4.611	8.650	11.207	16.200	6	0.308	-0.038
	15	0.1318	4.546	8.682	10.949	16.401	6	0.307	+0.010
	16	0.1290	4.499	8.710	10.688	16.596	6	0.259	0.055
	17	-0.1263	-4.466	-8.729	-10.425	-16.787	-6	+0.173	+0.089

BESSELIAN DAY NUMBERS, 2024.5
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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
May	17	-0.1263	-4.466	-8.729	-10.425	-16.787	-6	+0.173	+0.089
	18	0.1235	4.443	8.733	10.159	16.972	6	+0.063	0.108
	19	0.1208	4.423	8.718	9.891	17.153	6	-0.057	0.108
	20	0.1181	4.399	8.685	9.620	17.329	6	0.168	0.090
	21	0.1153	4.364	8.636	9.348	17.499	6	0.254	0.055
	22	0.1126	4.313	8.576	9.073	17.665	6	0.300	+0.009
	23	-0.1099	-4.242	-8.512	-8.796	-17.826	-6	-0.296	-0.040
	24	0.1071	4.150	8.455	8.516	17.982	6	0.241	0.084
	25	0.1044	4.041	8.413	8.235	18.133	6	0.145	0.113
	26	0.1016	3.921	8.394	7.952	18.279	6	-0.024	0.119
	27	0.0989	3.803	8.401	7.666	18.421	6	+0.095	0.100
	28	0.0962	3.694	8.431	7.378	18.558	5	0.186	0.058
	29	-0.0934	-3.606	-8.476	-7.088	-18.689	-5	+0.227	-0.002
	30	0.0907	3.541	8.523	6.796	18.816	5	0.207	+0.056
	31	0.0880	3.498	8.559	6.502	18.938	5	0.131	0.102
June	1	0.0852	3.470	8.570	6.206	19.054	5	+0.017	0.124
	2	0.0825	3.445	8.553	5.907	19.165	5	-0.104	0.116
	3	0.0797	3.408	8.508	5.607	19.271	6	0.199	0.079
	4	-0.0770	-3.351	-8.444	-5.305	-19.370	-5	-0.241	+0.024
	5	0.0743	3.267	8.376	5.001	19.464	5	0.218	-0.036
	6	0.0715	3.159	8.319	4.695	19.552	5	0.136	0.085
	7	0.0688	3.036	8.284	4.388	19.633	5	-0.017	0.114
	8	0.0661	2.910	8.275	4.080	19.709	5	+0.111	0.116
	9	0.0633	2.792	8.292	3.771	19.779	5	0.219	0.094
	10	-0.0606	-2.689	-8.326	-3.462	-19.842	-4	+0.287	-0.055
	11	0.0578	2.605	8.369	3.151	19.900	4	0.306	-0.007
	12	0.0551	2.541	8.412	2.841	19.951	4	0.274	+0.040
	13	0.0524	2.494	8.448	2.529	19.997	4	0.200	0.079
	14	0.0496	2.459	8.470	2.218	20.037	4	+0.096	0.104
	15	0.0469	2.430	8.474	1.906	20.072	4	-0.023	0.110
	16	-0.0441	-2.399	-8.460	-1.594	-20.101	-5	-0.139	+0.098
	17	0.0414	2.360	8.429	1.282	20.124	5	0.234	0.067
	18	0.0387	2.307	8.385	0.970	20.141	5	0.294	+0.024
	19	0.0359	2.235	8.336	0.658	20.153	5	0.306	-0.025
	20	0.0332	2.142	8.290	0.346	20.160	4	0.267	0.072
	21	0.0305	2.031	8.256	-0.035	20.161	4	0.179	0.107
	22	-0.0277	-1.906	-8.245	+0.277	-20.158	-4	-0.059	-0.121
	23	0.0250	1.778	8.259	0.588	20.149	4	+0.070	0.109
	24	0.0222	1.658	8.300	0.899	20.134	4	0.177	0.072
	25	0.0195	1.558	8.359	1.210	20.115	3	0.236	-0.017
	26	0.0168	1.482	8.423	1.521	20.090	3	0.233	+0.043
	27	0.0140	1.431	8.478	1.832	20.060	3	0.169	0.093
	28	-0.0113	-1.398	-8.512	+2.143	-20.025	-4	+0.060	+0.121
	29	0.0086	1.370	8.516	2.453	19.984	4	-0.062	0.120
	30	0.0058	1.335	8.493	2.763	19.937	5	0.166	0.090
July	1	0.0031	1.282	8.450	3.073	19.884	5	0.223	+0.039
	2	-0.0003	-1.205	-8.400	+3.383	-19.826	-4	-0.221	-0.019

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
July	1	-0.0031	-1.282	-8.450	+3.073	-19.884	-5	-0.223	+0.039
	2	-0.0003	1.205	8.400	3.383	19.826	4	0.221	-0.019
	3	+0.0024	1.105	8.356	3.691	19.761	4	0.160	0.072
	4	0.0051	0.988	8.330	3.999	19.690	3	-0.055	0.107
	5	0.0079	0.864	8.329	4.306	19.614	3	+0.068	0.117
	6	0.0106	0.743	8.354	4.611	19.531	3	0.181	0.103
	7	+0.0133	-0.636	-8.399	+4.915	-19.443	-2	+0.263	-0.069
	8	0.0161	0.547	8.456	5.217	19.349	2	0.299	-0.023
	9	0.0188	0.479	8.517	5.518	19.249	2	0.284	+0.026
	10	0.0216	0.430	8.572	5.817	19.143	2	0.223	0.068
	11	0.0243	0.395	8.614	6.113	19.032	2	0.127	0.098
	12	0.0270	0.368	8.640	6.408	18.915	3	+0.011	0.110
	13	+0.0298	-0.342	-8.647	+6.701	-18.793	-3	-0.108	+0.103
	14	0.0325	0.311	8.637	6.992	18.666	3	0.212	0.079
	15	0.0352	0.268	8.612	7.280	18.533	3	0.286	+0.040
	16	0.0380	0.209	8.580	7.566	18.396	3	0.316	-0.008
	17	0.0407	0.130	8.547	7.850	18.254	3	0.296	0.057
	18	0.0435	-0.031	8.522	8.131	18.106	2	0.226	0.097
	19	+0.0462	+0.083	-8.516	+8.410	-17.955	-2	-0.115	-0.119
	20	0.0489	0.205	8.535	8.687	17.798	2	+0.016	0.117
	21	0.0517	0.324	8.582	8.961	17.637	2	0.139	0.088
	22	0.0544	0.426	8.651	9.233	17.471	2	0.224	-0.036
	23	0.0572	0.503	8.730	9.502	17.301	2	0.246	+0.026
	24	0.0599	0.553	8.805	9.769	17.126	2	0.200	0.083
	25	+0.0626	+0.581	-8.859	+10.035	-16.947	-2	+0.102	+0.119
	26	0.0654	0.600	8.883	10.297	16.763	2	-0.021	0.125
	27	0.0681	0.622	8.877	10.558	16.574	2	0.131	0.100
	28	0.0708	0.661	8.849	10.816	16.380	2	0.200	+0.052
	29	0.0736	0.721	8.810	11.071	16.181	2	0.211	-0.006
	30	0.0763	0.805	8.774	11.324	15.977	2	0.164	0.060
	31	+0.0791	+0.907	-8.755	+11.573	-15.768	-2	-0.071	-0.100
Aug.	1	0.0818	1.017	8.758	11.820	15.554	2	+0.046	0.116
	2	0.0845	1.125	8.785	12.063	15.335	1	0.160	0.109
	3	0.0873	1.223	8.834	12.303	15.112	1	0.249	0.080
	4	0.0900	1.305	8.897	12.539	14.883	1	0.297	-0.036
	5	0.0927	1.366	8.966	12.771	14.650	1	0.296	+0.012
	6	+0.0955	+1.407	-9.030	+13.000	-14.412	-1	+0.247	+0.057
	7	0.0982	1.433	9.084	13.225	14.170	1	0.159	0.090
	8	0.1010	1.448	9.122	13.445	13.924	1	+0.047	0.108
	9	0.1037	1.459	9.141	13.662	13.674	2	-0.073	0.107
	10	0.1064	1.474	9.142	13.875	13.420	2	0.184	0.088
	11	0.1092	1.498	9.127	14.083	13.162	2	0.269	0.053
	12	+0.1119	+1.537	-9.102	+14.288	-12.900	-2	-0.316	+0.008
	13	0.1146	1.595	9.074	14.488	12.635	2	0.315	-0.040
	14	0.1174	1.671	9.050	14.684	12.366	2	0.266	0.083
	15	0.1201	1.764	9.040	14.875	12.094	2	0.173	0.112
	16	+0.1229	+1.868	-9.052	+15.063	-11.819	-1	-0.051	-0.120

BESSELIAN DAY NUMBERS, 2024.5
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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Aug.	16	+0.1229	+1.868	-9.052	+15.063	-11.819	-1	-0.051	-0.120
	17	0.1256	1.973	9.089	15.246	11.541	1	+0.076	0.102
	18	0.1283	2.069	9.152	15.425	11.260	1	0.180	-0.058
	19	0.1311	2.143	9.231	15.600	10.976	1	0.232	+0.002
	20	0.1338	2.190	9.312	15.771	10.689	1	0.216	0.065
	21	0.1366	2.211	9.377	15.938	10.399	1	0.135	0.112
	22	+0.1393	+2.216	-9.413	+16.101	-10.106	-1	+0.016	+0.129
	23	0.1420	2.220	9.414	16.260	9.810	2	-0.103	0.113
	24	0.1448	2.239	9.387	16.415	9.511	2	0.185	0.069
	25	0.1475	2.280	9.345	16.565	9.209	2	0.208	+0.010
	26	0.1502	2.346	9.303	16.711	8.903	2	0.169	-0.049
	27	0.1530	2.431	9.275	16.853	8.594	2	-0.081	0.093
	28	+0.1557	+2.526	-9.269	+16.990	-8.282	-1	+0.034	-0.115
	29	0.1585	2.621	9.287	17.123	7.968	1	0.151	0.113
	30	0.1612	2.708	9.326	17.250	7.650	1	0.246	0.088
	31	0.1639	2.778	9.381	17.372	7.329	1	0.303	-0.048
Sept.	1	0.1667	2.830	9.443	17.490	7.006	1	0.312	+0.000
	2	0.1694	2.862	9.503	17.602	6.680	1	0.274	0.046
	3	+0.1721	+2.878	-9.553	+17.708	-6.352	-1	+0.195	+0.083
	4	0.1749	2.881	9.588	17.810	6.022	2	+0.087	0.105
	5	0.1776	2.880	9.604	17.906	5.689	2	-0.033	0.109
	6	0.1804	2.880	9.601	17.996	5.355	2	0.148	0.095
	7	0.1831	2.888	9.582	18.081	5.019	2	0.242	0.065
	8	0.1858	2.910	9.550	18.161	4.682	2	0.301	+0.022
	9	+0.1886	+2.948	-9.513	+18.235	-4.343	-2	-0.317	-0.025
	10	0.1913	3.005	9.478	18.304	4.003	2	0.287	0.069
	11	0.1940	3.079	9.453	18.367	3.662	2	0.213	0.103
	12	0.1968	3.166	9.446	18.425	3.320	2	-0.107	0.118
	13	0.1995	3.258	9.461	18.478	2.977	2	+0.013	0.110
	14	0.2023	3.345	9.501	18.525	2.634	2	0.123	0.077
	15	+0.2050	+3.418	-9.561	+18.567	-2.290	-2	+0.195	-0.024
	16	0.2077	3.467	9.630	18.604	1.945	2	0.208	+0.039
	17	0.2105	3.489	9.691	18.636	1.600	2	0.154	0.095
	18	0.2132	3.490	9.727	18.663	1.254	2	+0.048	0.128
	19	0.2159	3.484	9.729	18.685	0.908	2	-0.077	0.126
	20	0.2187	3.487	9.697	18.702	0.562	2	0.178	0.090
	21	+0.2214	+3.513	-9.641	+18.714	-0.214	-3	-0.221	+0.032
	22	0.2242	3.566	9.579	18.721	+0.134	3	0.196	-0.032
	23	0.2269	3.643	9.528	18.723	0.483	2	-0.111	0.084
	24	0.2296	3.733	9.499	18.719	0.833	2	+0.009	0.114
	25	0.2324	3.827	9.495	18.710	1.183	2	0.134	0.117
	26	0.2351	3.912	9.514	18.696	1.533	2	0.241	0.097
	27	+0.2379	+3.983	-9.550	+18.675	+1.884	-2	+0.310	-0.059
	28	0.2406	4.035	9.595	18.649	2.235	2	0.331	-0.012
	29	0.2433	4.068	9.640	18.618	2.586	2	0.304	+0.035
	30	0.2461	4.083	9.676	18.580	2.936	2	0.233	0.075
Oct.	1	+0.2488	+4.086	-9.698	+18.536	+3.286	-2	+0.131	+0.102

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Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Oct.	1	+0.2488	+4.086	-9.698	+18.536	+3.286	-2	+0.131	+0.102
	2	0.2515	4.083	9.702	18.487	3.635	3	+0.012	0.110
	3	0.2543	4.080	9.687	18.432	3.984	3	-0.106	0.101
	4	0.2570	4.085	9.654	18.371	4.331	3	0.207	0.074
	5	0.2598	4.102	9.607	18.305	4.678	3	0.276	+0.034
	6	0.2625	4.135	9.554	18.232	5.023	3	0.304	-0.012
	7	+0.2652	+4.187	-9.500	+18.154	+5.367	-3	-0.287	-0.057
	8	0.2680	4.256	9.455	18.070	5.709	3	0.228	0.094
	9	0.2707	4.339	9.426	17.981	6.049	3	0.135	0.114
	10	0.2734	4.429	9.417	17.886	6.388	3	-0.025	0.113
	11	0.2762	4.518	9.430	17.786	6.724	3	+0.081	0.089
	12	0.2789	4.596	9.464	17.681	7.058	3	0.159	-0.044
	13	+0.2817	+4.655	-9.511	+17.570	+7.390	-3	+0.190	+0.014
	14	0.2844	4.691	9.558	17.455	7.720	3	0.160	0.073
	15	0.2871	4.704	9.588	17.334	8.048	3	+0.073	0.116
	16	0.2899	4.705	9.589	17.209	8.373	3	-0.048	0.130
	17	0.2926	4.707	9.555	17.079	8.696	3	0.165	0.109
	18	0.2953	4.728	9.490	16.944	9.016	3	0.237	+0.059
	19	+0.2981	+4.777	-9.411	+16.804	+9.335	-3	-0.239	-0.007
	20	0.3008	4.855	9.335	16.660	9.651	3	0.170	0.068
	21	0.3036	4.954	9.278	16.511	9.966	3	-0.049	0.109
	22	0.3063	5.061	9.249	16.356	10.278	3	+0.090	0.122
	23	0.3090	5.163	9.247	16.197	10.588	3	0.215	0.108
	24	0.3118	5.251	9.266	16.032	10.895	3	0.303	-0.073
	25	+0.3145	+5.319	-9.296	+15.862	+11.200	-3	+0.342	-0.026
	26	0.3172	5.368	9.327	15.687	11.502	3	0.329	+0.023
	27	0.3200	5.398	9.353	15.507	11.801	3	0.269	0.066
	28	0.3227	5.416	9.366	15.322	12.096	3	0.174	0.097
	29	0.3255	5.425	9.361	15.132	12.389	3	+0.058	0.110
	30	0.3282	5.433	9.338	14.936	12.677	3	-0.062	0.105
	31	+0.3309	+5.448	-9.296	+14.736	+12.963	-3	-0.168	+0.082
Nov.	1	0.3337	5.474	9.241	14.531	13.244	4	0.247	0.045
	2	0.3364	5.517	9.177	14.321	13.521	4	0.285	+0.000
	3	0.3392	5.578	9.112	14.106	13.794	4	0.278	-0.046
	4	0.3419	5.657	9.053	13.886	14.063	3	0.228	0.085
	5	0.3446	5.751	9.010	13.662	14.328	3	0.143	0.110
	6	+0.3474	+5.853	-8.986	+13.434	+14.588	-3	-0.039	-0.114
	7	0.3501	5.956	8.985	13.201	14.843	3	+0.064	0.096
	8	0.3528	6.050	9.005	12.964	15.093	3	0.145	0.057
	9	0.3556	6.128	9.039	12.724	15.339	3	0.184	-0.004
	10	0.3583	6.185	9.077	12.479	15.580	3	0.169	+0.053
	11	0.3611	6.221	9.105	12.231	15.816	3	+0.097	0.101
	12	+0.3638	+6.241	-9.110	+11.979	+16.047	-3	-0.014	+0.126
	13	0.3665	6.257	9.085	11.724	16.273	3	0.137	0.119
	14	0.3693	6.285	9.028	11.466	16.495	3	0.233	0.081
	15	0.3720	6.337	8.950	11.205	16.712	3	0.270	+0.021
	16	+0.3747	+6.419	-8.866	+10.940	+16.924	-3	-0.232	-0.043

BESSELIAN DAY NUMBERS, 2024.5
FOR 0^h TERRESTRIAL TIME

Date		τ	A	B	C	D	E	dψ	dε
			"	"	"	"	s (0.0001)		
Nov.	16	+0.3747	+6.419	-8.866	+10.940	+16.924	-3	-0.232	-0.043
	17	0.3775	6.528	8.796	10.672	17.132	3	-0.129	-0.095
	18	0.3802	6.653	8.751	10.401	17.335	3	+0.013	-0.122
	19	0.3830	6.779	8.737	10.126	17.533	2	0.156	-0.118
	20	0.3857	6.894	8.748	9.848	17.727	2	0.269	-0.089
	21	0.3884	6.989	8.776	9.566	17.916	2	0.333	-0.044
	22	+0.3912	+7.063	-8.810	+9.281	+18.099	-2	+0.340	+0.007
	23	0.3939	7.117	8.840	8.993	18.278	2	0.296	0.054
	24	0.3966	7.155	8.859	8.702	18.451	2	0.211	0.089
	25	0.3994	7.184	8.862	8.407	18.619	2	+0.099	0.108
	26	0.4021	7.209	8.847	8.110	18.781	2	-0.021	0.108
	27	0.4049	7.238	8.813	7.809	18.937	2	0.132	0.090
	28	+0.4076	+7.278	-8.765	+7.506	+19.088	-2	-0.219	+0.056
	29	0.4103	7.333	8.707	7.199	19.232	2	0.269	+0.012
	30	0.4131	7.406	8.646	6.891	19.370	2	0.273	-0.035
Dec.	1	0.4158	7.498	8.591	6.579	19.502	2	0.232	0.077
	2	0.4185	7.606	8.549	6.265	19.628	2	0.152	0.106
	3	0.4213	7.724	8.527	5.950	19.748	2	-0.048	0.115
	4	+0.4240	+7.844	-8.529	+5.632	+19.861	-2	+0.059	0.102
	5	0.4268	7.956	8.553	5.312	19.967	1	0.147	0.067
	6	0.4295	8.053	8.593	4.991	20.067	1	0.195	-0.017
	7	0.4322	8.129	8.640	4.668	20.160	1	0.190	+0.040
	8	0.4350	8.183	8.680	4.344	20.247	1	0.129	0.089
	9	0.4377	8.221	8.701	4.019	20.327	1	+0.026	0.119
	10	+0.4405	+8.251	-8.696	+3.693	+20.401	-1	-0.097	+0.122
	11	0.4432	8.287	8.661	3.366	20.469	1	0.205	0.094
	12	0.4459	8.342	8.604	3.038	20.531	1	0.268	+0.043
	13	0.4487	8.423	8.535	2.710	20.586	1	0.264	-0.019
	14	0.4514	8.532	8.472	2.381	20.636	1	0.191	0.077
	15	0.4541	8.662	8.430	2.051	20.680	1	-0.066	0.114
	16	+0.4569	+8.800	-8.417	+1.721	+20.718	-1	+0.080	-0.124
	17	0.4596	8.933	8.433	1.390	20.749	+0	0.212	0.104
	18	0.4624	9.049	8.472	1.059	20.775	0	0.301	0.064
	19	0.4651	9.143	8.521	0.726	20.795	0	0.334	-0.012
	20	0.4678	9.214	8.571	0.394	20.809	0	0.310	+0.038
	21	0.4706	9.267	8.612	+0.060	20.816	0	0.238	0.079
	22	+0.4733	+9.306	-8.637	-0.273	+20.817	+0	+0.134	+0.104
	23	0.4760	9.339	8.644	0.608	20.812	0	+0.015	0.111
	24	0.4788	9.374	8.633	0.942	20.800	0	-0.100	0.098
	25	0.4815	9.417	8.606	1.276	20.782	0	0.196	0.068
	26	0.4843	9.473	8.568	1.610	20.756	0	0.258	+0.026
	27	0.4870	9.546	8.525	1.945	20.725	0	0.276	-0.021
	28	+0.4897	+9.637	-8.485	-2.278	+20.686	+0	-0.249	-0.065
	29	0.4925	9.746	8.456	2.612	20.641	0	0.178	0.100
	30	0.4952	9.867	8.446	2.944	20.589	0	-0.075	0.116
	31	0.4979	9.992	8.460	3.276	20.530	0	+0.039	0.109
	32	+0.5007	+10.112	-8.497	-3.607	+20.464	+0	+0.140	-0.079

SECOND-ORDER DAY NUMBERS, 2024

J FOR NORTHERN DECLINATIONS

FOR 0^h TT AND EQUINOX J 2024.5

Date		RIGHT ASCENSION											
		0^h 12^h	1^h 13^h	2^h 14^h	3^h 15^h	4^h 16^h	5^h 17^h	6^h 18^h	7^h 19^h	8^h 20^h	9^h 21^h	10^h 22^h	11^h 23^h	12^h 24^h
Jan.	-3	-3	-3	-2	-1	0	2	2	2	1	0	-1	-3	-3
	7	-4	-4	-4	-2	0	2	3	3	3	1	-1	-3	-4
	17	-5	-6	-6	-4	-2	1	4	5	5	3	1	-2	-5
	27	-5	-7	-7	-6	-3	0	4	6	6	5	2	-1	-5
Feb.	6	-4	-7	-9	-8	-5	-1	3	6	8	7	4	0	-4
	16	-2	-7	-10	-10	-8	-4	1	6	9	9	7	3	-2
	26	0	-6	-10	-12	-10	-6	-1	5	9	11	9	5	0
Mar.	8	3	-4	-10	-13	-13	-9	-4	3	9	12	12	8	3
	18	5	-1	-8	-13	-14	-12	-6	0	7	12	13	11	5
	28	8	2	-6	-12	-15	-14	-9	-3	5	11	14	13	8
Apr.	7	11	4	-3	-10	-14	-15	-12	-5	2	9	13	14	11
	17	12	7	0	-8	-13	-15	-13	-8	-1	7	12	14	12
	27	13	9	3	-5	-11	-15	-14	-10	-4	4	10	14	13
May	7	14	11	5	-2	-9	-13	-15	-12	-6	1	8	12	14
	17	13	12	7	1	-6	-11	-14	-13	-8	-2	5	10	13
	27	11	11	9	3	-3	-9	-12	-12	-10	-4	2	8	11
June	6	9	11	9	5	0	-6	-10	-12	-10	-6	-1	5	9
	16	7	9	9	6	2	-4	-8	-10	-10	-7	-3	3	7
	26	4	7	8	6	3	-1	-5	-8	-9	-7	-4	0	4
July	6	2	5	6	6	4	1	-3	-6	-7	-7	-5	-2	2
	16	0	3	5	5	4	2	-1	-4	-6	-6	-5	-3	0
	26	-1	1	3	4	3	2	0	-2	-4	-5	-4	-3	-1
Aug.	5	-2	-1	1	2	3	2	1	0	-2	-3	-4	-3	-2
	15	-2	-2	0	1	1	2	1	1	-1	-2	-2	-3	-2
	25	-2	-2	-1	-1	0	1	1	1	0	0	-1	-2	-2
Sept.	4	-1	-2	-2	-1	-1	0	0	1	1	0	0	-1	-1
	14	0	-1	-2	-2	-2	-1	-1	0	1	1	1	0	0
	24	1	0	-1	-2	-2	-2	-2	-1	0	1	1	1	1
Oct.	4	2	2	1	-1	-2	-3	-3	-3	-2	0	1	2	2
	14	3	3	2	1	-1	-3	-4	-4	-3	-2	0	2	3
	24	3	4	4	3	1	-2	-4	-5	-5	-4	-2	1	3
Nov.	3	3	5	6	5	3	0	-4	-6	-7	-6	-4	-1	3
	13	1	5	7	8	6	2	-2	-6	-8	-9	-7	-3	1
	23	0	5	9	10	8	5	-1	-6	-10	-11	-9	-6	0
Dec.	3	-3	4	9	12	11	8	2	-5	-10	-13	-12	-9	-3
	13	-6	1	8	13	14	11	5	-2	-9	-14	-15	-12	-6
	23	-10	-2	7	13	16	14	9	1	-8	-14	-17	-15	-10
	33	-13	-5	4	12	17	17	12	4	-5	-13	-18	-18	-13

The second-order day number J given in this table in units of $0^s.00001$

The apparent right ascension of a star is given by:

$\alpha = \alpha_1 + \tau\mu_\alpha/100 + Aa + Bb + Cc + Dd + E + \mathrm{J}\tan^2\delta_1$

Where the position (α_1, δ_1) and centennial proper motion in right ascension (μ_α) are referred to the mean equator and equinox of J 2024.5

SECOND-ORDER DAY NUMBERS, 2024
J' FOR NORTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2024.5

Date		RIGHT ASCENSION												
		0^h 12^h	1^h 13^h	2^h 14^h	3^h 15^h	4^h 16^h	5^h 17^h	6^h 18^h	7^h 19^h	8^h 20^h	9^h 21^h	10^h 22^h	11^h 23^h	12^h 24^h
Jan.	-3	-2	-1	-1	-1	-1	-1	-2	-2	-3	-3	-3	-3	-2
	7	-4	-2	-1	-1	-1	-1	-2	-4	-5	-6	-6	-5	-4
	17	-7	-5	-2	-1	0	0	-2	-4	-6	-8	-9	-9	-6
	27	-10	-8	-5	-3	-1	-1	-2	-4	-6	-9	-11	-11	-10
Feb.	6	-13	-11	-8	-4	-2	-1	-1	-3	-6	-9	-12	-13	-13
	16	-15	-14	-10	-7	-3	-1	-1	-2	-6	-9	-13	-15	-15
	26	-18	-17	-13	-9	-5	-2	-1	-2	-5	-9	-13	-16	-18
Mar.	8	-19	-19	-16	-12	-7	-3	-1	-1	-3	-8	-13	-17	-19
	18	-20	-21	-19	-15	-10	-5	-2	-1	-2	-6	-11	-16	-20
	28	-20	-22	-21	-18	-13	-7	-3	-1	-1	-5	-10	-15	-20
Apr.	7	-19	-22	-22	-20	-15	-10	-4	-1	-1	-3	-8	-14	-19
	17	-17	-21	-22	-21	-17	-12	-6	-2	-1	-2	-6	-11	-17
	27	-14	-19	-22	-22	-19	-14	-8	-3	-1	-1	-4	-9	-14
May	7	-12	-17	-21	-22	-20	-16	-10	-5	-1	-1	-2	-7	-12
	17	-9	-14	-18	-20	-19	-16	-11	-6	-2	-1	-1	-5	-9
	27	-7	-11	-16	-18	-19	-16	-12	-8	-4	-1	-1	-3	-7
June	6	-5	-9	-13	-16	-17	-16	-13	-9	-5	-2	-1	-2	-5
	16	-3	-6	-10	-13	-15	-15	-13	-9	-6	-2	-1	-1	-3
	26	-2	-4	-7	-10	-12	-13	-12	-9	-6	-3	-1	-1	-2
July	6	-1	-2	-5	-7	-10	-11	-10	-9	-6	-4	-2	-1	-1
	16	-1	-1	-3	-5	-7	-9	-9	-8	-6	-4	-2	-1	-1
	26	-1	-1	-2	-3	-5	-6	-7	-7	-6	-4	-3	-1	-1
Aug.	5	-1	-1	-1	-2	-3	-4	-5	-5	-5	-4	-3	-2	-1
	15	-1	-1	-1	-1	-1	-2	-3	-4	-4	-4	-3	-2	-1
	25	-2	-1	-1	-1	-1	-1	-2	-2	-3	-3	-3	-2	-2
Sept.	4	-2	-2	-1	-1	-1	-1	-1	-1	-2	-2	-2	-2	-2
	14	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-2	-2	-2
	24	-3	-3	-3	-3	-2	-2	-1	-1	-1	-1	-1	-2	-3
Oct.	4	-2	-3	-4	-4	-4	-3	-2	-1	-1	-1	-1	-1	-2
	14	-2	-3	-5	-5	-6	-5	-4	-3	-2	-1	-1	-1	-2
	24	-2	-3	-5	-7	-8	-8	-7	-5	-3	-2	-1	-1	-2
Nov.	3	-1	-3	-5	-8	-10	-10	-10	-8	-5	-3	-1	-1	-1
	13	-1	-2	-5	-8	-11	-13	-13	-11	-9	-5	-2	-1	-1
	23	-1	-2	-4	-8	-12	-15	-16	-15	-12	-8	-4	-2	-1
Dec.	3	-1	-1	-4	-8	-13	-17	-19	-18	-16	-11	-7	-3	-1
	13	-1	-1	-3	-7	-12	-18	-21	-22	-20	-15	-10	-5	-1
	23	-3	-1	-2	-6	-12	-18	-23	-25	-23	-19	-13	-7	-3
	33	-4	-1	-1	-4	-10	-17	-23	-27	-27	-23	-17	-10	-4

The second-order day number J' given in this table in units of 0".0001

The apparent declination of a star is given by:
$\delta = \delta_1 + \tau\mu_\delta/100 + Aa' + Bb' + Cc' + J' \tan\delta_1$

Where the declination (δ_1) and centennial proper motion in declination (μ_δ) are referred to the mean equator and equinox of J 2024.5

SECOND-ORDER DAY NUMBERS, 2024
J FOR SOUTHERN DECLINATIONS
FOR 0^{h} TT AND EQUINOX J 2024.5

Date		RIGHT ASCENSION												
		0^{h} 12^{h}	1^{h} 13^{h}	2^{h} 14^{h}	3^{h} 15^{h}	4^{h} 16^{h}	5^{h} 17^{h}	6^{h} 18^{h}	7^{h} 19^{h}	8^{h} 20^{h}	9^{h} 21^{h}	10^{h} 22^{h}	11^{h} 23^{h}	12^{h} 24^{h}
Jan.	-3	6	14	18	17	11	3	-7	-15	-19	-18	-12	-4	6
	7	2	10	15	16	12	5	-3	-11	-16	-17	-13	-6	2
	17	-1	7	12	14	12	7	0	-8	-13	-15	-13	-8	-1
	27	-3	3	8	11	11	7	2	-4	-9	-12	-12	-8	-3
Feb.	6	-5	0	5	8	9	8	4	-1	-6	-9	-10	-9	-5
	16	-5	-1	3	6	7	7	4	0	-4	-7	-8	-8	-5
	26	-5	-3	0	3	5	5	4	2	-1	-4	-6	-6	-5
Mar.	8	-4	-3	-1	1	2	3	3	2	0	-2	-3	-4	-4
	18	-3	-3	-2	-1	1	2	2	2	1	0	-2	-3	-3
	28	-2	-2	-2	-2	-1	0	1	1	1	1	0	-1	-2
Apr.	7	-1	-1	-2	-2	-1	-1	0	0	1	1	0	0	-1
	17	0	0	-1	-1	-2	-2	-1	-1	0	0	1	1	0
	27	1	1	0	0	-1	-2	-2	-2	-1	-1	0	1	1
May	7	1	1	1	1	0	-1	-2	-2	-2	-2	-1	0	1
	17	0	1	2	2	1	0	-1	-2	-3	-3	-2	-1	0
	27	-1	1	2	3	3	2	0	-2	-3	-4	-4	-3	-1
June	6	-2	0	2	4	4	3	1	-1	-3	-5	-5	-4	-2
	16	-4	-2	1	4	5	5	3	1	-2	-5	-6	-6	-4
	26	-6	-4	0	3	6	7	5	3	-1	-4	-7	-8	-6
July	6	-8	-6	-2	2	6	8	7	5	1	-3	-7	-9	-8
	16	-10	-8	-4	1	5	8	9	7	3	-2	-6	-9	-10
	26	-11	-10	-7	-2	4	8	10	9	6	1	-5	-9	-11
Aug.	5	-12	-12	-9	-4	2	7	11	11	8	3	-3	-8	-12
	15	-11	-13	-11	-7	0	6	10	12	10	6	-1	-7	-11
	25	-10	-13	-13	-9	-3	3	9	12	12	8	2	-4	-10
Sept.	4	-8	-13	-14	-11	-6	1	7	12	13	10	5	-2	-8
	14	-6	-11	-14	-13	-8	-2	5	10	13	12	7	1	-6
	24	-3	-9	-13	-13	-10	-5	2	8	12	12	9	4	-3
Oct.	4	0	-7	-11	-13	-12	-7	-1	6	10	12	11	6	0
	14	2	-4	-9	-12	-12	-9	-3	3	8	11	11	8	2
	24	4	-1	-7	-10	-11	-9	-5	0	6	9	10	8	4
Nov.	3	6	1	-4	-8	-10	-10	-7	-2	3	7	9	9	6
	13	6	3	-2	-6	-9	-9	-7	-4	1	5	8	8	6
	23	6	4	0	-4	-6	-8	-7	-5	-1	3	5	7	6
Dec.	3	5	4	1	-2	-4	-6	-6	-5	-2	1	3	5	5
	13	4	4	2	0	-2	-4	-5	-5	-3	-1	1	3	4
	23	2	3	2	1	-1	-3	-3	-4	-3	-2	0	2	2
	33	1	1	1	1	0	-1	-2	-2	-2	-2	-1	0	1

The second-order day number J given in this table in units of $0^{s}.00001$

The apparent right ascension of a star is given by:
$\alpha = \alpha_1 + \tau\mu_\alpha/100 + Aa + Bb + Cc + Dd + E + J \tan^2\delta_1$

Where the position (α_1, δ_1) and centennial proper motion in right ascension (μ_α) are referred to the mean equator and equinox of J 2024.5

SECOND-ORDER DAY NUMBERS, 2024
J' FOR SOUTHERN DECLINATIONS
FOR 0^h TT AND EQUINOX J 2024.5

Date		RIGHT ASCENSION												
		0^h 12^h	1^h 13^h	2^h 14^h	3^h 15^h	4^h 16^h	5^h 17^h	6^h 18^h	7^h 19^h	8^h 20^h	9^h 21^h	10^h 22^h	11^h 23^h	12^h 24^h
Jan.	-3	-1	-5	-12	-19	-25	-28	-27	-23	-17	-10	-4	-1	-1
	7	-1	-3	-9	-15	-21	-25	-25	-23	-17	-11	-5	-1	-1
	17	-1	-2	-6	-11	-17	-20	-22	-21	-17	-11	-6	-2	-1
	27	-1	-1	-3	-8	-12	-16	-18	-18	-15	-11	-7	-3	-1
Feb.	6	-1	-1	-2	-5	-9	-12	-15	-15	-14	-11	-7	-4	-1
	16	-2	-1	-1	-3	-6	-9	-11	-12	-12	-10	-7	-4	-2
	26	-2	-1	-1	-1	-3	-5	-7	-9	-9	-8	-6	-4	-2
Mar.	8	-3	-1	-1	-1	-1	-3	-4	-6	-6	-6	-5	-4	-3
	18	-3	-2	-1	-1	-1	-1	-2	-3	-4	-5	-4	-4	-3
	28	-3	-2	-1	-1	-1	-1	-1	-2	-2	-3	-3	-3	-3
Apr.	7	-2	-2	-2	-1	-1	-1	-1	-1	-1	-2	-2	-2	-2
	17	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-2	-2	-2
	27	-1	-2	-2	-2	-2	-2	-1	-1	-1	-1	-1	-1	-1
May	7	-1	-1	-2	-3	-3	-3	-3	-2	-1	-1	-1	-1	-1
	17	-1	-1	-2	-3	-4	-4	-4	-4	-3	-2	-1	-1	-1
	27	-1	-1	-2	-3	-4	-5	-6	-5	-5	-3	-2	-1	-1
June	6	-1	-1	-1	-2	-4	-6	-7	-7	-7	-5	-4	-2	-1
	16	-2	-1	-1	-2	-4	-6	-8	-9	-9	-8	-6	-4	-2
	26	-3	-1	-1	-1	-4	-6	-9	-11	-11	-10	-8	-6	-3
July	6	-5	-2	-1	-1	-3	-6	-9	-12	-13	-13	-11	-8	-5
	16	-7	-3	-1	-1	-2	-5	-9	-12	-14	-15	-13	-10	-7
	26	-9	-5	-2	-1	-1	-4	-8	-12	-15	-17	-16	-13	-9
Aug.	5	-12	-7	-3	-1	-1	-3	-7	-11	-15	-18	-18	-16	-12
	15	-14	-10	-5	-2	-1	-2	-5	-10	-14	-18	-19	-18	-14
	25	-17	-12	-7	-3	-1	-1	-4	-8	-13	-17	-20	-20	-17
Sept.	4	-19	-15	-10	-5	-1	-1	-2	-6	-12	-16	-20	-21	-19
	14	-20	-16	-11	-6	-2	-1	-1	-5	-9	-15	-19	-20	-20
	24	-20	-18	-13	-8	-4	-1	-1	-3	-7	-12	-17	-20	-20
Oct.	4	-20	-18	-15	-10	-5	-2	-1	-2	-5	-10	-15	-18	-20
	14	-18	-18	-16	-11	-7	-3	-1	-1	-3	-7	-12	-16	-18
	24	-16	-17	-15	-12	-8	-4	-1	-1	-2	-5	-9	-13	-16
Nov.	3	-14	-15	-15	-12	-9	-5	-2	-1	-1	-3	-7	-10	-14
	13	-11	-13	-13	-12	-9	-6	-3	-1	-1	-2	-5	-8	-11
	23	-8	-10	-11	-11	-9	-6	-4	-1	-1	-1	-3	-5	-8
Dec.	3	-6	-8	-9	-9	-8	-6	-4	-2	-1	-1	-2	-3	-6
	13	-4	-5	-7	-7	-7	-6	-4	-2	-1	-1	-1	-2	-4
	23	-2	-3	-4	-5	-5	-5	-4	-2	-1	-1	-1	-1	-2
	33	-1	-2	-3	-3	-3	-3	-3	-2	-2	-1	-1	-1	-1

The second-order day number J' given in this table in units of 0".0001

The apparent declination of a star is given by:
$\delta = \delta_1 + \tau\mu_\delta/100 + Aa' + Bb' + Cc' + J' \tan\delta_1$

Where the declination (δ_1) and centennial proper motion in declination (μ_δ) are referred to the mean equator and equinox of J 2024.5

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Jan.	0	-0.156 564 23	+0.889 108 83	+0.385 644 49	-1727 7669	-244 6571	-106 0152
	1	0.173 818 50	0.886 523 95	0.384 524 44	1723 0013	272 3085	117 9906
	2	0.191 022 51	0.883 662 85	0.383 284 76	1717 7114	299 9015	129 9428
	3	0.208 170 97	0.880 526 14	0.381 925 68	1711 8937	327 4282	141 8687
	4	0.225 258 61	0.877 114 53	0.380 447 48	1705 5449	354 8806	153 7653
	5	0.242 280 09	0.873 428 81	0.378 850 48	1698 6612	382 2502	165 6287
	6	-0.259 230 04	+0.869 469 84	+0.377 135 03	-1691 2389	-409 5277	-177 4555
	7	0.276 103 06	0.865 238 59	0.375 301 51	1683 2738	436 7032	189 2415
	8	0.292 893 69	0.860 736 15	0.373 350 35	1674 7609	463 7655	200 9816
	9	0.309 596 43	0.855 963 70	0.371 282 05	1665 6959	490 7015	212 6701
	10	0.326 205 75	0.850 922 59	0.369 097 14	1656 0750	517 4961	224 3000
	11	0.342 716 07	0.845 614 31	0.366 796 27	1645 8960	544 1314	235 8628
	12	-0.359 121 82	+0.840 040 56	+0.364 380 14	-1635 1607	-570 5880	-247 3489
	13	0.375 417 45	0.834 203 21	0.361 849 58	1623 8753	596 8461	258 7487
	14	0.391 597 53	0.828 104 36	0.359 205 49	1612 0504	622 8869	270 0524
	15	0.407 656 71	0.821 746 25	0.356 448 88	1599 7007	648 6945	281 2521
	16	0.423 589 85	0.815 131 29	0.353 580 81	1586 8428	674 2566	292 3419
	17	0.439 391 93	0.808 261 97	0.350 602 42	1573 4938	699 5649	303 3174
	18	-0.455 058 14	+0.801 140 85	+0.347 514 85	-1559 6697	-724 6143	-314 1765
	19	0.470 583 79	0.793 770 55	0.344 319 28	1545 3843	749 4019	324 9181
	20	0.485 964 33	0.786 153 69	0.341 016 88	1530 6497	773 9264	335 5421
	21	0.501 195 32	0.778 292 91	0.337 608 83	1515 4753	798 1871	346 0488
	22	0.516 272 39	0.770 190 83	0.334 096 30	1499 8687	822 1834	356 4387
	23	0.531 191 27	0.761 850 12	0.330 480 45	1483 8362	845 9150	366 7123
	24	-0.545 947 71	+0.753 273 42	+0.326 762 44	-1467 3820	-869 3806	-376 8696
	25	0.560 537 52	0.744 463 40	0.322 943 44	1450 5094	892 5791	386 9113
	26	0.574 956 51	0.735 422 74	0.319 024 60	1433 2208	915 5081	396 8367
	27	0.589 200 55	0.726 154 14	0.315 007 10	1415 5176	938 1646	406 6451
	28	0.603 265 49	0.716 660 36	0.310 892 09	1397 4009	960 5447	416 3354
	29	0.617 147 19	0.706 944 19	0.306 680 79	1378 8716	982 6435	425 9059
	30	-0.630 841 55	+0.697 008 45	+0.302 374 38	-1359 9307	-1004 4558	-435 3547
	31	0.644 344 44	0.686 856 05	0.297 974 11	1340 5790	1025 9755	444 6794
Feb.	1	0.657 651 76	0.676 489 94	0.293 481 22	1320 8177	1047 1960	453 8773
	2	0.670 759 43	0.665 913 15	0.288 896 99	1300 6477	1068 1103	462 9456
	3	0.683 663 36	0.655 128 78	0.284 222 75	1280 0700	1088 7109	471 8810
	4	0.696 359 47	0.644 140 00	0.279 459 83	1259 0854	1108 9897	480 6801
	5	-0.708 843 71	+0.632 950 09	+0.274 609 61	-1237 6943	-1128 9371	-489 3385
	6	0.721 112 01	0.621 562 40	0.269 673 54	1215 8973	1148 5425	497 8514
	7	0.733 160 31	0.609 980 42	0.264 653 09	1193 6958	1167 7929	506 2125
	8	0.744 984 58	0.598 207 77	0.259 549 82	1171 0930	1186 6733	514 4146
	9	0.756 580 85	0.586 248 24	0.254 365 36	1148 0957	1205 1670	522 4492
	10	0.767 945 22	0.574 105 78	0.249 101 43	1124 7151	1223 2569	530 3073
	11	-0.779 073 93	+0.561 784 50	+0.243 759 83	-1100 9677	-1240 9271	-537 9811
	12	0.789 963 42	0.549 288 68	0.238 342 44	1076 8738	1258 1654	545 4640
	13	0.800 610 33	0.536 622 66	0.232 851 20	1052 4560	1274 9643	552 7519
	14	0.811 011 53	0.523 790 87	0.227 288 06	1027 7365	1291 3208	559 8434
	15	-0.821 164 12	+0.510 797 72	+0.221 654 98	-1002 7351	-1307 2356	-566 7389

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Jan.	0	-1696	-534 217	-232 104	+534 208	-1427	-4500	+232 125	+3260	-269
	1	1697	534 278	232 130	534 269	1427	4525	232 151	3285	270
	2	1697	534 323	232 150	534 314	1428	4544	232 171	3304	270
	3	1697	534 360	232 166	534 351	1428	4556	232 187	3315	270
	4	1697	534 396	232 182	534 386	1428	4558	232 203	3317	270
	5	1698	534 437	232 200	534 428	1428	4552	232 221	3311	270
	6	-1698	-534 493	-232 224	+534 484	-1428	-4539	+232 245	+3298	-270
	7	1699	534 570	232 257	534 561	1429	4521	232 278	3279	270
	8	1699	534 671	232 301	534 662	1429	4503	232 322	3261	270
	9	1700	534 798	232 356	534 789	1430	4491	232 377	3248	270
	10	1701	534 943	232 419	534 934	1431	4489	232 440	3246	270
	11	1702	535 094	232 485	535 085	1432	4502	232 506	3258	270
	12	-1703	-535 236	-232 546	+535 227	-1432	-4529	+232 567	+3285	-270
	13	1704	535 353	232 597	535 344	1433	4567	232 618	3321	271
	14	1704	535 437	232 634	535 428	1434	4606	232 655	3361	271
	15	1704	535 490	232 657	535 481	1434	4640	232 678	3394	271
	16	1705	535 523	232 671	535 513	1434	4662	232 693	3416	271
	17	1705	535 551	232 683	535 541	1434	4669	232 705	3422	271
	18	-1705	-535 588	-232 699	+535 579	-1434	-4662	+232 721	+3416	-271
	19	1705	535 645	232 724	535 636	1435	4648	232 746	3401	271
	20	1706	535 726	232 759	535 716	1435	4631	232 781	3384	271
	21	1707	535 828	232 804	535 819	1436	4618	232 825	3370	271
	22	1707	535 946	232 855	535 937	1436	4612	232 876	3364	271
	23	1708	536 071	232 909	536 061	1437	4617	232 930	3369	271
	24	-1709	-536 192	-232 961	+536 183	-1438	-4633	+232 983	+3384	-271
	25	1710	536 301	233 009	536 292	1438	4657	233 031	3408	272
	26	1710	536 393	233 049	536 384	1439	4688	233 071	3438	272
	27	1711	536 465	233 080	536 455	1439	4721	233 102	3471	272
	28	1711	536 516	233 102	536 506	1439	4753	233 124	3502	272
	29	1711	536 550	233 117	536 541	1440	4780	233 139	3529	272
	30	-1711	-536 574	-233 127	+536 564	-1440	-4799	+233 150	+3548	-272
	31	1711	536 593	233 136	536 583	1440	4810	233 158	3559	272
Feb.	1	1712	536 616	233 146	536 606	1440	4812	233 168	3560	272
	2	1712	536 650	233 160	536 640	1440	4806	233 183	3554	272
	3	1712	536 701	233 183	536 691	1440	4794	233 205	3542	272
	4	1713	536 774	233 215	536 765	1441	4781	233 237	3529	272
	5	-1713	-536 871	-233 257	+536 862	-1441	-4770	+233 279	+3518	-272
	6	1714	536 989	233 308	536 979	1442	4768	233 330	3515	272
	7	1715	537 119	233 364	537 109	1443	4778	233 386	3524	272
	8	1716	537 248	233 420	537 238	1443	4802	233 442	3548	273
	9	1716	537 359	233 468	537 350	1444	4838	233 491	3584	273
	10	1717	537 441	233 504	537 431	1444	4881	233 527	3626	273
	11	-1717	-537 488	-233 525	+537 478	-1445	-4922	+233 548	+3667	-273
	12	1717	537 508	233 533	537 498	1445	4952	233 556	3696	273
	13	1717	537 516	233 537	537 506	1445	4965	233 560	3710	273
	14	1717	537 530	233 543	537 520	1445	4963	233 566	3708	273
	15	-1718	-537 562	-233 557	+537 552	-1445	-4950	+233 580	+3694	-273

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Feb.	15	-0.821 164 12	+0.510 797 72	+0.221 654 98	-1002 7351	-1307 2356	-566 7389
	16	0.831 065 35	0.497 647 62	0.215 953 92	977 4683	1322 7117	573 4405
	17	0.840 712 65	0.484 344 93	0.210 186 81	951 9496	1337 7529	579 9505
	18	0.850 103 54	0.470 894 00	0.204 355 54	926 1899	1352 3632	586 2714
	19	0.859 235 67	0.457 299 10	0.198 462 01	900 1975	1366 5459	592 4052
	20	0.868 106 74	0.443 564 50	0.192 508 06	873 9801	1380 3033	598 3541
	21	-0.876 714 54	+0.429 694 44	+0.186 495 54	-847 5439	-1393 6378	-604 1194
	22	0.885 056 91	0.415 693 15	0.180 426 28	820 8943	1406 5505	609 7025
	23	0.893 131 73	0.401 564 83	0.174 302 09	794 0360	1419 0422	615 1043
	24	0.900 936 95	0.387 313 70	0.168 124 79	766 9733	1431 1129	620 3253
	25	0.908 470 53	0.372 943 98	0.161 896 19	739 7100	1442 7622	625 3657
	26	0.915 730 49	0.358 459 87	0.155 618 08	712 2498	1453 9889	630 2254
	27	-0.922 714 88	+0.343 865 62	+0.149 292 28	-684 5958	-1464 7910	-634 9037
	28	0.929 421 77	0.329 165 47	0.142 920 61	656 7514	1475 1660	639 4001
	29	0.935 849 28	0.314 363 73	0.136 504 89	628 7199	1485 1111	643 7130
Mar.	1	0.941 995 56	0.299 464 70	0.130 046 97	600 5045	1494 6222	647 8409
	2	0.947 858 77	0.284 472 74	0.123 548 70	572 1087	1503 6952	651 7820
	3	0.953 437 14	0.269 392 27	0.117 011 96	543 5357	1512 3249	655 5339
	4	-0.958 728 91	+0.254 227 74	+0.110 438 66	-514 7891	-1520 5055	-659 0937
	5	0.963 732 36	0.238 983 69	0.103 830 74	485 8727	1528 2293	662 4577
	6	0.968 445 81	0.223 664 71	0.097 190 17	456 7912	1535 4876	665 6215
	7	0.972 867 65	0.208 275 52	0.090 518 99	427 5512	1542 2698	668 5794
	8	0.976 996 34	0.192 820 94	0.083 819 29	398 1626	1548 5641	671 3252
	9	0.980 830 45	0.177 305 91	0.077 093 22	368 6393	1554 3582	673 8522
	10	-0.984 368 74	+0.161 735 48	+0.070 343 00	-338 9997	-1559 6416	-676 1547
	11	0.987 610 14	0.146 114 80	0.063 570 89	309 2664	1564 4072	678 2284
	12	0.990 553 84	0.130 449 07	0.056 779 20	279 4643	1568 6529	680 0718
	13	0.993 199 27	0.114 743 47	0.049 970 22	249 6167	1572 3813	681 6862
	14	0.995 546 09	0.099 003 14	0.043 146 22	219 7446	1575 5996	683 0748
	15	0.997 594 14	0.083 233 15	0.036 309 46	189 8647	1578 3168	684 2426
	16	-0.999 343 40	+0.067 438 45	+0.029 462 09	-159 9895	-1580 5422	-685 1945
	17	1.000 793 97	0.051 623 91	0.022 606 27	130 1287	1582 2848	685 9354
	18	1.001 946 05	0.035 794 33	0.015 744 07	100 2899	1583 5524	686 4694
	19	1.002 799 87	0.019 954 43	0.008 877 56	70 4790	1584 3516	686 8003
	20	1.003 355 74	+0.004 108 84	+0.002 008 73	40 7012	1584 6881	686 9312
	21	1.003 614 02	-0.011 737 81	-0.004 860 41	-10 9618	1584 5667	686 8648
	22	-1.003 575 12	-0.027 580 98	-0.011 727 91	+18 7347	-1583 9915	-686 6032
	23	1.003 239 48	0.043 416 14	0.018 591 83	48 3845	1582 9662	686 1486
	24	1.002 607 59	0.059 238 81	0.025 450 25	77 9837	1581 4939	685 5028
	25	1.001 679 99	0.075 044 54	0.032 301 25	107 5286	1579 5775	684 6672
	26	1.000 457 21	0.090 828 89	0.039 142 96	137 0164	1577 2187	683 6428
	27	0.998 939 86	0.106 587 44	0.045 973 48	166 4440	1574 4188	682 4303
	28	-0.997 128 54	-0.122 315 80	-0.052 790 94	+195 8087	-1571 1784	-681 0300
	29	0.995 023 90	0.138 009 54	0.059 593 46	225 1078	1567 4972	679 4418
	30	0.992 626 61	0.153 664 27	0.066 379 15	254 3380	1563 3738	677 6649
	31	0.989 937 38	0.169 275 54	0.073 146 12	283 4961	1558 8063	675 6979
Apr.	1	-0.986 956 95	-0.184 838 90	-0.079 892 47	+312 5781	-1553 7916	-673 5393

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Feb.	15	-1718	-537 562	-233 557	+537 552	-1445	-4950	+233 580	+3694	-273
	16	1718	537 619	233 581	537 609	1445	4933	233 605	3677	273
	17	1719	537 699	233 616	537 689	1446	4917	233 639	3661	273
	18	1719	537 796	233 658	537 786	1446	4910	233 681	3653	273
	19	1720	537 901	233 704	537 891	1447	4911	233 727	3654	273
	20	1720	538 005	233 749	537 995	1447	4924	233 772	3666	273
	21	-1721	-538 098	-233 789	+538 088	-1448	-4946	+233 812	+3687	-273
	22	1722	538 174	233 822	538 164	1448	4974	233 846	3715	273
	23	1722	538 231	233 847	538 221	1449	5005	233 871	3746	274
	24	1722	538 268	233 863	538 258	1449	5035	233 887	3776	274
	25	1722	538 287	233 872	538 277	1449	5061	233 895	3802	274
	26	1722	538 294	233 875	538 283	1449	5080	233 899	3821	274
	27	-1722	-538 295	-233 875	+538 284	-1449	-5090	+233 899	+3831	-274
	28	1722	538 297	233 876	538 287	1449	5091	233 900	3831	274
	29	1722	538 309	233 881	538 299	1449	5083	233 905	3824	274
Mar.	1	1723	538 337	233 893	538 326	1449	5069	233 917	3810	274
	2	1723	538 385	233 914	538 375	1449	5052	233 938	3793	274
	3	1723	538 455	233 945	538 445	1450	5036	233 969	3777	274
	4	-1724	-538 546	-233 984	+538 536	-1450	-5027	+234 008	+3767	-274
	5	1725	538 652	234 030	538 641	1451	5027	234 054	3766	274
	6	1725	538 762	234 078	538 751	1451	5040	234 102	3778	274
	7	1726	538 863	234 122	538 853	1452	5065	234 146	3803	274
	8	1726	538 942	234 156	538 932	1452	5100	234 180	3838	274
	9	1727	538 990	234 177	538 979	1453	5136	234 201	3874	274
	10	-1727	-539 006	-234 184	+538 996	-1453	-5166	+234 209	+3904	-274
	11	1727	539 003	234 183	538 993	1453	5181	234 207	3919	274
	12	1727	538 999	234 181	538 988	1453	5179	234 205	3916	274
	13	1727	539 009	234 186	538 999	1453	5161	234 210	3899	274
	14	1727	539 046	234 202	539 036	1453	5136	234 226	3873	274
	15	1728	539 111	234 230	539 100	1453	5111	234 254	3848	274
	16	-1728	-539 197	-234 267	+539 186	-1454	-5092	+234 291	+3829	-275
	17	1729	539 293	234 309	539 283	1454	5083	234 333	3819	275
	18	1729	539 391	234 351	539 380	1455	5085	234 375	3821	275
	19	1730	539 479	234 390	539 468	1455	5097	234 414	3832	275
	20	1730	539 552	234 421	539 541	1456	5116	234 445	3851	275
	21	1731	539 606	234 445	539 595	1456	5139	234 469	3874	275
	22	-1731	-539 639	-234 459	+539 629	-1456	-5162	+234 484	+3896	-275
	23	1731	539 655	234 466	539 645	1456	5181	234 491	3915	275
	24	1731	539 658	234 467	539 647	1456	5193	234 492	3928	275
	25	1731	539 653	234 465	539 643	1456	5197	234 490	3932	275
	26	1731	539 649	234 464	539 639	1456	5191	234 488	3926	275
	27	1731	539 653	234 466	539 643	1456	5177	234 490	3911	275
	28	-1731	-539 673	-234 474	+539 662	-1456	-5155	+234 498	+3890	-275
	29	1731	539 712	234 491	539 701	1457	5130	234 515	3865	275
	30	1732	539 773	234 518	539 763	1457	5105	234 542	3840	275
	31	1732	539 855	234 553	539 845	1457	5085	234 577	3819	275
Apr.	1	-1733	-539 953	-234 596	+539 942	-1458	-5074	+234 620	+3807	-275

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Apr.	1	-0.986 956 95	-0.184 838 90	-0.079 892 47	+312 5781	-1553 7916	-673 5393
	2	0.983 686 09	0.200 349 87	0.086 616 26	341 5793	1548 3258	671 1867
	3	0.980 125 65	0.215 803 90	0.093 315 54	370 4935	1542 4034	668 6370
	4	0.976 276 54	0.231 196 39	0.099 988 33	399 3130	1536 0183	665 8865
	5	0.972 139 74	0.246 522 70	0.106 632 59	428 0267	1529 1636	662 9310
	6	0.967 716 40	0.261 778 08	0.113 246 25	456 6202	1521 8329	659 7667
	7	-0.963 007 80	-0.276 957 75	-0.119 827 22	+485 0758	-1514 0214	-656 3903
	8	0.958 015 42	0.292 056 89	0.126 373 35	513 3718	1505 7272	652 8002
	9	0.952 740 97	0.307 070 70	0.132 882 51	541 4856	1496 9537	648 9972
	10	0.947 186 39	0.321 994 39	0.139 352 59	569 3955	1487 7083	644 9849
	11	0.941 353 80	0.336 823 33	0.145 781 53	597 0827	1478 0028	640 7688
	12	0.935 245 52	0.351 552 96	0.152 167 31	624 5331	1467 8505	636 3556
	13	-0.928 863 96	-0.366 178 89	-0.158 508 01	+651 7365	-1457 2654	-631 7527
	14	0.922 211 64	0.380 696 87	0.164 801 76	678 6863	1446 2607	626 9666
	15	0.915 291 10	0.395 102 75	0.171 046 75	705 3782	1434 8475	622 0030
	16	0.908 104 94	0.409 392 49	0.177 241 24	731 8093	1423 0358	616 8672
	17	0.900 655 79	0.423 562 16	0.183 383 54	757 9771	1410 8342	611 5635
	18	0.892 946 29	0.437 607 90	0.189 471 97	783 8792	1398 2503	606 0957
	19	-0.884 979 10	-0.451 525 92	-0.195 504 91	+809 5137	-1385 2909	-600 4672
	20	0.876 756 91	0.465 312 49	0.201 480 78	834 8786	1371 9624	594 6810
	21	0.868 282 43	0.478 963 96	0.207 398 02	859 9722	1358 2708	588 7401
	22	0.859 558 37	0.492 476 71	0.213 255 08	884 7934	1344 2215	582 6471
	23	0.850 587 47	0.505 847 21	0.219 050 46	909 3412	1329 8192	576 4043
	24	0.841 372 46	0.519 071 93	0.224 782 67	933 6152	1315 0678	570 0134
	25	-0.831 916 08	-0.532 147 41	-0.230 450 24	+957 6149	-1299 9707	-563 4756
	26	0.822 221 08	0.545 070 20	0.236 051 70	981 3399	1284 5296	556 7917
	27	0.812 290 20	0.557 836 86	0.241 585 59	1004 7894	1268 7453	549 9619
	28	0.802 126 22	0.570 443 96	0.247 050 45	1027 9619	1252 6176	542 9853
	29	0.791 731 90	0.582 888 07	0.252 444 80	1050 8546	1236 1452	535 8609
	30	0.781 110 07	0.595 165 71	0.257 767 16	1073 4634	1219 3260	528 5869
May	1	-0.770 263 60	-0.607 273 42	-0.263 016 03	+1095 7825	-1202 1572	-521 1614
	2	0.759 195 41	0.619 207 68	0.268 189 88	1117 8038	1184 6358	513 5819
	3	0.747 908 55	0.630 964 95	0.273 287 15	1139 5164	1166 7590	505 8462
	4	0.736 406 16	0.642 541 67	0.278 306 28	1160 9070	1148 5253	497 9528
	5	0.724 691 54	0.653 934 27	0.283 245 68	1181 9593	1129 9348	489 9007
	6	0.712 768 16	0.665 139 19	0.288 103 77	1202 6556	1110 9912	481 6910
	7	-0.700 639 68	-0.676 152 94	-0.292 878 98	+1222 9770	-1091 7016	-473 3267
	8	0.688 309 92	0.686 972 10	0.297 569 80	1242 9066	1072 0772	464 8126
	9	0.675 782 90	0.697 593 41	0.302 174 76	1262 4299	1052 1323	456 1559
	10	0.663 062 72	0.708 013 73	0.306 692 47	1281 5367	1031 8828	447 3643
	11	0.650 153 57	0.718 230 11	0.311 121 62	1300 2210	1011 3448	438 4460
	12	0.637 059 71	0.728 239 72	0.315 460 99	1318 4799	990 5336	429 4085
	13	-0.623 785 39	-0.738 039 91	-0.319 709 42	+1336 3130	-969 4627	-420 2586
	14	0.610 334 87	0.747 628 15	0.323 865 81	1353 7210	948 1434	411 0021
	15	0.596 712 39	0.757 001 99	0.327 929 12	1370 7052	926 5863	401 6440
	16	0.582 922 17	0.766 159 11	0.331 898 36	1387 2670	904 8004	392 1887
	17	-0.568 968 45	-0.775 097 26	-0.335 772 58	+1403 4078	-882 7937	-382 6401

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Apr.	1	-1733	-539 953	-234 596	+539 942	-1458	-5074	+234 620	+3807	-275
	2	1734	540 057	234 641	540 047	1458	5074	234 665	3807	275
	3	1734	540 158	234 685	540 147	1459	5086	234 709	3818	276
	4	1735	540 242	234 721	540 232	1459	5108	234 745	3840	276
	5	1735	540 301	234 747	540 290	1460	5134	234 771	3866	276
	6	1735	540 331	234 760	540 320	1460	5158	234 784	3890	276
	7	-1735	-540 337	-234 762	+540 326	-1460	-5171	+234 787	+3903	-276
	8	1735	540 333	234 761	540 323	1460	5168	234 785	3900	276
	9	1735	540 338	234 763	540 328	1460	5148	234 788	3880	276
	10	1736	540 367	234 776	540 357	1460	5117	234 800	3848	276
	11	1736	540 427	234 802	540 416	1460	5081	234 826	3812	276
	12	1737	540 514	234 839	540 503	1461	5050	234 863	3780	276
	13	-1737	-540 618	-234 885	+540 607	-1461	-5028	+234 908	+3758	-276
	14	1738	540 727	234 932	540 716	1462	5018	234 956	3748	276
	15	1739	540 829	234 976	540 819	1463	5020	235 000	3749	276
	16	1739	540 917	235 015	540 907	1463	5030	235 038	3759	276
	17	1740	540 986	235 045	540 976	1463	5045	235 068	3774	276
	18	1740	541 035	235 066	541 024	1464	5061	235 090	3789	276
	19	-1740	-541 064	-235 079	+541 054	-1464	-5075	+235 103	+3803	-276
	20	1740	541 080	235 085	541 069	1464	5082	235 109	3810	276
	21	1740	541 087	235 088	541 076	1464	5082	235 112	3809	276
	22	1740	541 092	235 091	541 082	1464	5072	235 115	3800	276
	23	1740	541 105	235 096	541 094	1464	5053	235 120	3781	276
	24	1741	541 131	235 108	541 121	1464	5026	235 132	3754	277
	25	-1741	-541 177	-235 128	+541 167	-1464	-4996	+235 152	+3723	-277
	26	1741	541 246	235 158	541 236	1465	4964	235 181	3691	277
	27	1742	541 337	235 197	541 327	1465	4937	235 220	3664	277
	28	1743	541 444	235 244	541 434	1466	4918	235 267	3644	277
	29	1743	541 561	235 294	541 550	1467	4910	235 317	3636	277
	30	1744	541 675	235 344	541 665	1467	4914	235 367	3639	277
May	1	-1745	-541 775	-235 388	+541 765	-1468	-4928	+235 411	+3653	-277
	2	1745	541 854	235 422	541 844	1468	4948	235 445	3673	277
	3	1745	541 905	235 444	541 895	1468	4968	235 467	3692	277
	4	1746	541 933	235 456	541 923	1469	4981	235 480	3705	277
	5	1746	541 947	235 462	541 937	1469	4980	235 486	3704	277
	6	1746	541 962	235 469	541 952	1469	4963	235 492	3687	277
	7	-1746	-541 995	-235 483	+541 985	-1469	-4933	+235 506	+3657	-277
	8	1746	542 057	235 510	542 047	1469	4896	235 533	3619	277
	9	1747	542 149	235 550	542 139	1470	4859	235 573	3582	278
	10	1748	542 265	235 600	542 255	1470	4830	235 623	3552	278
	11	1749	542 393	235 656	542 383	1471	4813	235 678	3535	278
	12	1749	542 519	235 710	542 509	1472	4809	235 733	3530	278
	13	-1750	-542 632	-235 760	+542 622	-1472	-4815	+235 782	+3536	-278
	14	1751	542 727	235 801	542 717	1473	4828	235 823	3548	278
	15	1751	542 800	235 832	542 790	1473	4844	235 855	3564	278
	16	1752	542 852	235 855	542 842	1474	4858	235 878	3578	278
	17	-1752	-542 889	-235 871	+542 879	-1474	-4867	+235 894	+3587	-278

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
May	17	-0.568 968 45	-0.775 097 26	-0.335 772 58	+1403 4078	-882 7937	-382 6401
	18	0.554 855 42	0.783 814 28	0.339 550 87	1419 1290	860 5742	373 0019
	19	0.540 587 26	0.792 308 06	0.343 232 33	1434 4320	838 1490	363 2773
	20	0.526 168 16	0.800 576 59	0.346 816 14	1449 3187	815 5250	353 4697
	21	0.511 602 27	0.808 617 92	0.350 301 46	1463 7915	792 7081	343 5815
	22	0.496 893 70	0.816 430 13	0.353 687 51	1477 8531	769 7038	333 6153
	23	-0.482 046 57	-0.824 011 38	-0.356 973 51	+1491 5062	-746 5163	-323 5726
	24	0.467 064 93	0.831 359 86	0.360 158 71	1504 7538	723 1484	313 4545
	25	0.451 952 84	0.838 473 75	0.363 242 35	1517 5981	699 6015	303 2612
	26	0.436 714 31	0.845 351 29	0.366 223 68	1530 0400	675 8756	292 9919
	27	0.421 353 38	0.851 990 67	0.369 101 93	1542 0789	651 9698	282 6456
	28	0.405 874 08	0.858 390 08	0.371 876 33	1553 7120	627 8824	272 2205
	29	-0.390 280 51	-0.864 547 70	-0.374 546 07	+1564 9339	-603 6116	-261 7149
	30	0.374 576 80	0.870 461 70	0.377 110 35	1575 7368	579 1567	251 1276
	31	0.358 767 20	0.876 130 22	0.379 568 35	1586 1106	554 5177	240 4575
June	1	0.342 856 06	0.881 551 44	0.381 919 23	1596 0436	529 6966	229 7049
	2	0.326 847 85	0.886 723 56	0.384 162 18	1605 5219	504 6980	218 8712
	3	0.310 747 18	0.891 644 84	0.386 296 39	1614 5318	479 5295	207 9595
	4	-0.294 558 82	-0.896 313 62	-0.388 321 12	+1623 0601	-454 2014	-196 9742
	5	0.278 287 63	0.900 728 38	0.390 235 65	1631 0951	428 7270	185 9218
	6	0.261 938 59	0.904 887 72	0.392 039 36	1638 6283	403 1216	174 8097
	7	0.245 516 75	0.908 790 43	0.393 731 67	1645 6543	377 4018	163 6458
	8	0.229 027 20	0.912 435 43	0.395 312 13	1652 1715	351 5841	152 4384
	9	0.212 475 01	0.915 821 84	0.396 780 32	1658 1811	325 6836	141 1950
	10	-0.195 865 26	-0.918 948 88	-0.398 135 93	+1663 6862	-299 7143	-129 9226
	11	0.179 202 96	0.921 815 93	0.399 378 70	1668 6916	273 6881	118 6269
	12	0.162 493 08	0.924 422 48	0.400 508 41	1673 2022	247 6154	107 3131
	13	0.145 740 55	0.926 768 12	0.401 524 91	1677 2228	221 5058	95 9856
	14	0.128 950 24	0.928 852 50	0.402 428 09	1680 7587	195 3676	84 6482
	15	0.112 126 97	0.930 675 40	0.403 217 86	1683 8145	169 2082	73 3045
	16	-0.095 275 53	-0.932 236 62	-0.403 894 17	+1686 3951	-143 0353	-61 9579
	17	0.078 400 64	0.933 536 08	0.404 457 01	1688 5059	116 8557	50 6114
	18	0.061 506 96	0.934 573 73	0.404 906 41	1690 1522	90 6753	39 2677
	19	0.044 599 12	0.935 349 60	0.405 242 38	1691 3399	64 4996	27 9289
	20	0.027 681 67	0.935 863 76	0.405 465 01	1692 0753	38 3326	16 5968
	21	-0.010 759 10	0.936 116 29	0.405 574 35	1692 3645	-12 1769	-5 2720
	22	+0.006 164 15	-0.936 107 33	-0.405 570 47	+1692 2128	+13 9664	+6 0457
	23	0.023 083 70	0.935 837 00	0.405 453 45	1691 6240	40 0985	17 3572
	24	0.039 995 18	0.935 305 40	0.405 223 34	1690 5993	66 2211	28 6645
	25	0.056 894 22	0.934 512 60	0.404 880 17	1689 1373	92 3362	39 9697
	26	0.073 776 45	0.933 458 69	0.404 423 95	1687 2335	118 4460	51 2744
	27	0.090 637 40	0.932 143 70	0.403 854 68	1684 8801	144 5503	62 5796
	28	+0.107 472 52	-0.930 567 71	-0.403 172 36	+1682 0679	+170 6470	+73 8852
	29	0.124 277 19	0.928 730 80	0.402 376 98	1678 7866	196 7311	85 1894
	30	0.141 046 66	0.926 633 15	0.401 468 58	1675 0259	222 7952	96 4892
July	1	0.157 776 08	0.924 275 00	0.400 447 23	1670 7761	248 8287	107 7797
	2	+0.174 460 52	-0.921 656 72	-0.399 313 04	+1666 0296	+274 8192	+119 0553

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
May	17	-1752	-542 889	-235 871	+542 879	-1474	-4867	+235 894	+3587	-278
	18	1752	542 914	235 882	542 904	1474	4869	235 905	3588	278
	19	1752	542 937	235 892	542 927	1474	4862	235 915	3581	278
	20	1752	542 963	235 904	542 953	1474	4846	235 926	3565	278
	21	1753	543 002	235 920	542 992	1474	4822	235 943	3541	278
	22	1753	543 059	235 945	543 049	1475	4793	235 968	3512	278
	23	-1753	-543 138	-235 980	+543 129	-1475	-4763	+236 002	+3481	-279
	24	1754	543 241	236 024	543 231	1476	4735	236 046	3453	279
	25	1755	543 363	236 077	543 353	1476	4715	236 099	3432	279
	26	1756	543 496	236 135	543 486	1477	4706	236 157	3423	279
	27	1757	543 629	236 192	543 619	1478	4710	236 215	3426	279
	28	1757	543 750	236 245	543 740	1478	4725	236 267	3440	279
	29	-1758	-543 849	-236 288	+543 839	-1479	-4747	+236 310	+3462	-279
	30	1759	543 921	236 319	543 911	1479	4770	236 342	3484	279
	31	1759	543 969	236 340	543 959	1480	4787	236 363	3501	279
June	1	1759	544 000	236 354	543 990	1480	4793	236 376	3507	279
	2	1759	544 028	236 366	544 019	1480	4785	236 389	3499	279
	3	1759	544 069	236 384	544 059	1480	4763	236 406	3477	279
	4	-1760	-544 133	-236 411	+544 123	-1480	-4732	+236 434	+3446	-280
	5	1760	544 227	236 452	544 217	1481	4700	236 474	3413	280
	6	1761	544 347	236 504	544 337	1482	4672	236 526	3385	280
	7	1762	544 484	236 564	544 474	1482	4655	236 585	3367	280
	8	1763	544 624	236 625	544 615	1483	4651	236 647	3362	280
	9	1764	544 757	236 682	544 748	1484	4659	236 704	3370	280
	10	-1765	-544 872	-236 732	+544 863	-1484	-4676	+236 754	+3386	-280
	11	1765	544 965	236 773	544 956	1485	4698	236 795	3407	280
	12	1766	545 037	236 804	545 027	1485	4719	236 826	3428	280
	13	1766	545 089	236 826	545 079	1486	4736	236 849	3445	281
	14	1766	545 128	236 843	545 118	1486	4747	236 866	3456	281
	15	1767	545 161	236 858	545 151	1486	4749	236 880	3458	281
	16	-1767	-545 195	-236 872	+545 185	-1486	-4742	+236 895	+3451	-281
	17	1767	545 238	236 891	545 228	1486	4727	236 913	3436	281
	18	1767	545 297	236 917	545 287	1487	4706	236 939	3415	281
	19	1768	545 377	236 952	545 368	1487	4683	236 974	3390	281
	20	1769	545 481	236 997	545 471	1488	4660	237 018	3368	281
	21	1769	545 605	237 051	545 596	1488	4645	237 073	3351	281
	22	-1770	-545 745	-237 111	+545 735	-1489	-4639	+237 133	+3345	-281
	23	1771	545 888	237 173	545 879	1490	4647	237 195	3352	281
	24	1772	546 022	237 231	546 012	1491	4667	237 253	3371	282
	25	1773	546 134	237 280	546 124	1491	4695	237 302	3399	282
	26	1773	546 218	237 317	546 209	1492	4727	237 339	3431	282
	27	1774	546 275	237 341	546 265	1492	4754	237 364	3457	282
	28	-1774	-546 312	-237 358	+546 303	-1492	-4770	+237 380	+3473	-282
	29	1774	546 343	237 371	546 333	1493	4773	237 394	3476	282
	30	1774	546 382	237 388	546 372	1493	4762	237 410	3464	282
July	1	1775	546 441	237 414	546 431	1493	4741	237 436	3443	282
	2	-1775	-546 527	-237 451	+546 517	-1494	-4717	+237 473	+3419	-282

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
July	1	+0.157 776 08	-0.924 275 00	-0.400 447 23	+1670 7761	+248 8287	+107 7797
	2	0.174 460 52	0.921 656 72	0.399 313 04	1666 0296	274 8192	119 0553
	3	0.191 094 99	0.918 778 81	0.398 066 19	1660 7806	300 7525	130 3092
	4	0.207 674 45	0.915 641 91	0.396 706 95	1655 0264	326 6134	141 5335
	5	0.224 193 84	0.912 246 84	0.395 235 65	1648 7673	352 3860	152 7211
	6	0.240 648 12	0.908 594 54	0.393 652 68	1642 0058	378 0555	163 8642
	7	+0.257 032 30	-0.904 686 12	-0.391 958 53	+1634 7471	+403 6077	+174 9559
	8	0.273 341 43	0.900 522 82	0.390 153 75	1626 9980	429 0299	185 9900
	9	0.289 570 65	0.896 105 99	0.388 238 94	1618 7663	454 3111	196 9611
	10	0.305 715 17	0.891 437 10	0.386 214 76	1610 0603	479 4413	207 8644
	11	0.321 770 30	0.886 517 69	0.384 081 89	1600 8883	504 4124	218 6961
	12	0.337 731 41	0.881 349 41	0.381 841 08	1591 2585	529 2168	229 4528
	13	+0.353 593 97	-0.875 933 94	-0.379 493 10	+1581 1790	+553 8477	+240 1312
	14	0.369 353 52	0.870 273 05	0.377 038 73	1570 6581	578 2989	250 7289
	15	0.385 005 69	0.864 368 58	0.374 478 80	1559 7037	602 5645	261 2431
	16	0.400 546 18	0.858 222 40	0.371 814 15	1548 3244	626 6396	271 6718
	17	0.415 970 79	0.851 836 44	0.369 045 66	1536 5290	650 5199	282 0132
	18	0.431 275 40	0.845 212 66	0.366 174 18	1524 3265	674 2024	292 2663
	19	+0.446 455 99	-0.838 353 05	-0.363 200 62	+1511 7260	+697 6857	+302 4312
	20	0.461 508 62	0.831 259 61	0.360 125 85	1498 7356	720 9703	312 5086
	21	0.476 429 43	0.823 934 30	0.356 950 74	1485 3612	744 0585	322 5004
	22	0.491 214 58	0.816 379 08	0.353 676 12	1471 6065	766 9539	332 4093
	23	0.505 860 29	0.808 595 85	0.350 302 82	1457 4711	789 6603	342 2380
	24	0.520 362 72	0.800 586 50	0.346 831 62	1442 9509	812 1802	351 9888
	25	+0.534 718 00	-0.792 352 87	-0.343 263 30	+1428 0390	+834 5136	+361 6626
	26	0.548 922 17	0.783 896 85	0.339 598 63	1412 7268	856 6575	371 2585
	27	0.562 971 17	0.775 220 37	0.335 838 40	1397 0057	878 6050	380 7737
	28	0.576 860 89	0.766 325 44	0.331 983 44	1380 8684	900 3465	390 2038
	29	0.590 587 14	0.757 214 17	0.328 034 62	1364 3100	921 8699	399 5430
	30	0.604 145 68	0.747 888 81	0.323 992 90	1347 3279	943 1617	408 7849
	31	+0.617 532 29	-0.738 351 75	-0.319 859 27	+1329 9228	+964 2082	+417 9225
Aug.	1	0.630 742 73	0.728 605 51	0.315 634 82	1312 0972	984 9951	426 9487
	2	0.643 772 85	0.718 652 76	0.311 320 69	1293 8565	1005 5089	435 8571
	3	0.656 618 50	0.708 496 29	0.306 918 10	1275 2075	1025 7370	444 6411
	4	0.669 275 66	0.698 139 01	0.302 428 31	1256 1592	1045 6673	453 2949
	5	0.681 740 39	0.687 583 97	0.297 852 65	1236 7215	1065 2897	461 8134
	6	+0.694 008 83	-0.676 834 28	-0.293 192 50	+1216 9050	+1084 5951	+470 1922
	7	0.706 077 26	0.665 893 15	0.288 449 28	1196 7209	1103 5756	478 4276
	8	0.717 942 06	0.654 763 87	0.283 624 44	1176 1804	1122 2247	486 5164
	9	0.729 599 72	0.643 449 78	0.278 719 45	1155 2946	1140 5367	494 4563
	10	0.741 046 84	0.631 954 28	0.273 735 82	1134 0745	1158 5068	502 2447
	11	0.752 280 13	0.620 280 80	0.268 675 07	1112 5308	1176 1308	509 8803
	12	+0.763 296 41	-0.608 432 83	-0.263 538 73	+1090 6747	+1193 4048	+517 3613
	13	0.774 092 62	0.596 413 88	0.258 328 36	1068 5168	1210 3263	524 6865
	14	0.784 665 78	0.584 227 48	0.253 045 52	1046 0684	1226 8930	531 8556
	15	0.795 013 06	0.571 877 20	0.247 691 77	1023 3408	1243 1040	538 8684
	16	+0.805 131 70	-0.559 366 59	-0.242 268 67	+1000 3450	+1258 9600	+545 7258

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
July	1	-1775	-546 441	-237 414	+546 431	-1493	-4741	+237 436	+3443	-282
	2	1775	546 527	237 451	546 517	1494	4717	237 473	3419	282
	3	1776	546 638	237 499	546 629	1494	4696	237 521	3397	282
	4	1777	546 769	237 556	546 760	1495	4683	237 578	3384	282
	5	1778	546 908	237 616	546 898	1496	4683	237 638	3384	282
	6	1779	547 042	237 674	547 032	1496	4695	237 697	3395	283
	7	-1780	-547 162	-237 726	+547 152	-1497	-4717	+237 749	+3416	-283
	8	1780	547 261	237 769	547 251	1498	4745	237 792	3444	283
	9	1781	547 337	237 802	547 327	1498	4775	237 825	3473	283
	10	1781	547 392	237 826	547 382	1498	4802	237 849	3500	283
	11	1781	547 431	237 843	547 421	1498	4823	237 866	3520	283
	12	1781	547 461	237 856	547 451	1499	4835	237 879	3533	283
	13	-1782	-547 489	-237 869	+547 479	-1499	-4839	+237 892	+3536	-283
	14	1782	547 524	237 884	547 514	1499	4834	237 907	3531	283
	15	1782	547 571	237 904	547 561	1499	4822	237 927	3519	283
	16	1783	547 638	237 933	547 628	1500	4806	237 956	3503	283
	17	1783	547 726	237 971	547 716	1500	4790	237 994	3487	283
	18	1784	547 836	238 019	547 826	1501	4779	238 042	3475	283
	19	-1785	-547 964	-238 075	+547 954	-1501	-4776	+238 097	+3471	-284
	20	1786	548 100	238 134	548 090	1502	4786	238 156	3480	284
	21	1786	548 232	238 191	548 222	1503	4808	238 214	3503	284
	22	1787	548 347	238 241	548 337	1503	4842	238 264	3536	284
	23	1788	548 433	238 278	548 423	1504	4881	238 302	3574	284
	24	1788	548 489	238 303	548 478	1504	4918	238 326	3610	284
	25	-1788	-548 520	-238 316	+548 510	-1504	-4944	+238 340	+3637	-284
	26	1788	548 540	238 325	548 530	1505	4956	238 348	3648	284
	27	1789	548 565	238 336	548 555	1505	4953	238 359	3645	284
	28	1789	548 608	238 354	548 597	1505	4939	238 378	3631	284
	29	1789	548 676	238 384	548 665	1505	4920	238 407	3612	284
	30	1790	548 769	238 424	548 759	1506	4903	238 448	3595	284
	31	-1791	-548 882	-238 474	+548 872	-1506	-4894	+238 497	+3585	-284
Aug.	1	1792	549 005	238 527	548 995	1507	4896	238 550	3586	285
	2	1792	549 126	238 580	549 116	1508	4909	238 603	3599	285
	3	1793	549 236	238 627	549 226	1508	4933	238 651	3622	285
	4	1794	549 327	238 666	549 316	1509	4964	238 690	3653	285
	5	1794	549 395	238 696	549 385	1509	4997	238 720	3686	285
	6	-1794	-549 441	-238 716	+549 431	-1510	-5029	+238 740	+3718	-285
	7	1795	549 469	238 728	549 459	1510	5055	238 753	3744	285
	8	1795	549 486	238 736	549 476	1510	5074	238 760	3762	285
	9	1795	549 499	238 741	549 488	1510	5083	238 766	3771	285
	10	1795	549 515	238 749	549 505	1510	5083	238 773	3771	285
	11	1795	549 542	238 760	549 532	1510	5076	238 785	3764	285
	12	-1795	-549 586	-238 779	+549 575	-1510	-5064	+238 803	+3752	-285
	13	1796	549 649	238 807	549 639	1511	5050	238 831	3738	285
	14	1796	549 734	238 844	549 724	1511	5039	238 868	3726	285
	15	1797	549 838	238 889	549 827	1512	5035	238 913	3721	285
	16	-1798	-549 954	-238 939	+549 944	-1512	-5040	+238 963	+3726	-286

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Aug.	16	+0.805 131 70	-0.559 366 59	-0.242 268 67	+1000 3450	+1258 9600	+545 7258
	17	0.815 019 09	0.546 699 18	0.236 777 77	977 0910	1274 4635	552 4296
	18	0.824 672 69	0.533 878 48	0.231 220 58	953 5872	1289 6189	558 9827
	19	0.834 090 02	0.520 907 94	0.225 598 60	929 8386	1304 4320	565 3887
	20	0.843 268 65	0.507 790 96	0.219 913 28	905 8460	1318 9085	571 6515
	21	0.852 206 12	0.494 530 88	0.214 166 04	881 6063	1333 0527	577 7740
	22	+0.860 899 93	-0.481 131 01	-0.208 358 27	+857 1131	+1346 8657	+583 7573
	23	0.869 347 51	0.467 594 68	0.202 491 36	832 3585	1360 3443	589 6006
	24	0.877 546 21	0.453 925 26	0.196 566 73	807 3357	1373 4813	595 3004
	25	0.885 493 32	0.440 126 23	0.190 585 85	782 0405	1386 2661	600 8515
	26	0.893 186 11	0.426 201 16	0.184 550 22	756 4721	1398 6862	606 2478
	27	0.900 621 86	0.412 153 76	0.178 461 43	730 6330	1410 7289	611 4828
	28	+0.907 797 88	-0.397 987 88	-0.172 321 12	+704 5289	+1422 3818	+616 5501
	29	0.914 711 58	0.383 707 47	0.166 131 01	678 1676	1433 6328	621 4436
	30	0.921 360 41	0.369 316 60	0.159 892 85	651 5588	1444 4719	626 1581
	31	0.927 741 96	0.354 819 43	0.153 608 46	624 7134	1454 8892	630 6887
Sept.	1	0.933 853 93	0.340 220 24	0.147 279 70	597 6431	1464 8768	635 0313
	2	0.939 694 12	0.325 523 36	0.140 908 47	570 3607	1474 4275	639 1822
	3	+0.945 260 48	-0.310 733 17	-0.134 496 70	+542 8792	+1483 5353	+643 1387
	4	0.950 551 08	0.295 854 14	0.128 046 35	515 2118	1492 1956	646 8982
	5	0.955 564 14	0.280 890 76	0.121 559 40	487 3722	1500 4046	650 4591
	6	0.960 298 00	0.265 847 56	0.115 037 84	459 3736	1508 1594	653 8201
	7	0.964 751 13	0.250 729 09	0.108 483 67	431 2292	1515 4584	656 9804
	8	0.968 922 14	0.235 539 92	0.101 898 90	402 9520	1522 3003	659 9397
	9	+0.972 809 77	-0.220 284 61	-0.095 285 55	+374 5550	+1528 6847	+662 6979
	10	0.976 412 88	0.204 967 75	0.088 645 61	346 0507	1534 6121	665 2555
	11	0.979 730 47	0.189 593 89	0.081 981 10	317 4518	1540 0837	667 6136
	12	0.982 761 64	0.174 167 59	0.075 294 00	288 7711	1545 1017	669 7733
	13	0.985 505 65	0.158 693 35	0.068 586 29	260 0202	1549 6702	671 7370
	14	0.987 961 85	0.143 175 66	0.061 859 90	231 2100	1553 7945	673 5081
	15	+0.990 129 69	-0.127 618 92	-0.055 116 76	+202 3499	+1557 4813	+675 0904
	16	0.992 008 70	0.112 027 47	0.048 358 71	173 4454	1560 7392	676 4888
	17	0.993 598 45	0.096 405 54	0.041 587 58	144 4983	1563 5763	677 7079
	18	0.994 898 52	0.080 757 32	0.034 805 13	115 5066	1565 9991	678 7517
	19	0.995 908 42	0.065 086 93	0.028 013 12	86 4641	1568 0108	679 6222
	20	0.996 627 61	0.049 398 48	0.021 213 27	57 3640	1569 6096	680 3188
	21	+0.997 055 49	-0.033 696 13	-0.014 407 33	+28 2009	+1570 7894	+680 8385
	22	0.997 191 41	0.017 984 12	0.007 597 11	-1 0274	1571 5405	681 1762
	23	0.997 034 73	-0.002 266 79	-0.000 784 44	30 3184	1571 8519	681 3260
	24	0.996 584 85	+0.013 451 41	+0.006 028 77	59 6658	1571 7125	681 2819
	25	0.995 841 26	0.029 165 93	0.012 840 54	89 0600	1571 1125	681 0387
	26	0.994 803 53	0.044 872 10	0.019 648 86	118 4891	1570 0438	680 5920
	27	+0.993 471 40	+0.060 565 22	+0.026 451 69	-147 9405	+1568 4998	+679 9382
	28	0.991 844 69	0.076 240 50	0.033 246 93	177 4005	1566 4756	679 0745
	29	0.989 923 41	0.091 893 12	0.040 032 47	206 8549	1563 9674	677 9988
	30	0.987 707 66	0.107 518 22	0.046 806 19	236 2899	1560 9724	676 7096
Oct.	1	+0.985 197 72	+0.123 110 94	+0.053 565 95	-265 6908	+1557 4891	+675 2058

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Aug.	16	-1798	-549 954	-238 939	+549 944	-1512	-5040	+238 963	+3726	-286
	17	1798	550 072	238 990	550 062	1513	5059	239 015	3744	286
	18	1799	550 179	239 037	550 169	1514	5090	239 061	3774	286
	19	1800	550 262	239 073	550 252	1514	5128	239 097	3813	286
	20	1800	550 314	239 095	550 304	1514	5168	239 120	3852	286
	21	1800	550 337	239 105	550 326	1514	5199	239 130	3883	286
	22	-1800	-550 342	-239 108	+550 331	-1514	-5217	+239 133	+3901	-286
	23	1800	550 347	239 110	550 336	1514	5217	239 135	3901	286
	24	1800	550 368	239 119	550 357	1515	5204	239 144	3888	286
	25	1801	550 414	239 139	550 403	1515	5184	239 164	3867	286
	26	1801	550 487	239 171	550 477	1515	5164	239 196	3847	286
	27	1802	550 582	239 212	550 571	1516	5150	239 237	3833	286
	28	-1803	-550 688	-239 258	+550 678	-1516	-5148	+239 283	+3830	-286
	29	1803	550 795	239 304	550 784	1517	5157	239 329	3838	286
	30	1804	550 891	239 346	550 881	1517	5176	239 371	3857	287
	31	1804	550 971	239 381	550 960	1518	5203	239 406	3884	287
Sept.	1	1805	551 028	239 406	551 017	1518	5233	239 431	3913	287
	2	1805	551 064	239 421	551 053	1518	5262	239 447	3943	287
	3	-1805	-551 081	-239 429	+551 070	-1519	-5287	+239 454	+3967	-287
	4	1805	551 085	239 431	551 074	1519	5304	239 456	3984	287
	5	1805	551 084	239 430	551 072	1519	5312	239 455	3992	287
	6	1805	551 084	239 430	551 072	1519	5310	239 456	3991	287
	7	1805	551 093	239 434	551 081	1519	5301	239 459	3981	287
	8	1805	551 117	239 444	551 106	1519	5285	239 470	3966	287
	9	-1806	-551 160	-239 463	+551 149	-1519	-5267	+239 489	+3947	-287
	10	1806	551 223	239 491	551 212	1519	5250	239 516	3930	287
	11	1807	551 306	239 527	551 295	1520	5238	239 552	3918	287
	12	1807	551 402	239 568	551 391	1520	5235	239 594	3914	287
	13	1808	551 505	239 613	551 494	1521	5243	239 638	3921	287
	14	1809	551 603	239 656	551 592	1521	5262	239 681	3940	287
	15	-1809	-551 684	-239 691	+551 673	-1522	-5292	+239 716	+3969	-287
	16	1809	551 739	239 714	551 727	1522	5325	239 740	4003	287
	17	1810	551 763	239 725	551 752	1522	5355	239 751	4032	287
	18	1810	551 764	239 726	551 753	1522	5373	239 752	4050	287
	19	1810	551 757	239 722	551 745	1522	5374	239 748	4051	287
	20	1810	551 760	239 724	551 749	1522	5358	239 750	4035	287
	21	-1810	-551 789	-239 737	+551 778	-1522	-5331	+239 762	+4008	-288
	22	1810	551 848	239 762	551 837	1523	5301	239 788	3978	288
	23	1811	551 934	239 800	551 923	1523	5276	239 825	3953	288
	24	1811	552 035	239 844	552 024	1524	5262	239 869	3938	288
	25	1812	552 139	239 889	552 128	1524	5261	239 914	3936	288
	26	1813	552 235	239 930	552 224	1525	5270	239 956	3945	288
	27	-1813	-552 314	-239 965	+552 303	-1525	-5288	+239 990	+3963	-288
	28	1814	552 372	239 990	552 361	1526	5310	240 016	3984	288
	29	1814	552 409	240 006	552 398	1526	5332	240 032	4006	288
	30	1814	552 426	240 013	552 415	1526	5350	240 039	4024	288
Oct.	1	-1814	-552 430	-240 015	+552 419	-1526	-5361	+240 041	+4035	-288

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Oct.	1	+0.985 197 72	+0.123 110 94	+0.053 565 95	-265 6908	+1557 4891	+675 2058
	2	0.982 394 01	0.138 666 37	0.060 309 59	295 0434	1553 5167	673 4870
	3	0.979 297 07	0.154 179 64	0.067 034 97	324 3331	1549 0552	671 5532
	4	0.975 907 60	0.169 645 85	0.073 739 94	353 5456	1544 1061	669 4049
	5	0.972 226 46	0.185 060 14	0.080 422 36	382 6664	1538 6714	667 0431
	6	0.968 254 62	0.200 417 67	0.087 080 09	411 6818	1532 7539	664 4693
	7	+0.963 993 22	+0.215 713 63	+0.093 711 04	-440 5781	+1526 3580	+661 6857
	8	0.959 443 50	0.230 943 25	0.100 313 12	469 3421	1519 4880	658 6944
	9	0.954 606 86	0.246 101 83	0.106 884 25	497 9610	1512 1499	655 4984
	10	0.949 484 81	0.261 184 71	0.113 422 41	526 4231	1504 3503	652 1015
	11	0.944 078 96	0.276 187 32	0.119 925 62	554 7168	1496 0971	648 5075
	12	0.938 391 07	0.291 105 17	0.126 391 92	582 8323	1487 3995	644 7214
	13	+0.932 422 94	+0.305 933 86	+0.132 819 43	-610 7620	+1478 2676	+640 7485
	14	0.926 176 46	0.320 669 11	0.139 206 29	638 5007	1468 7125	636 5945
	15	0.919 653 56	0.335 306 74	0.145 550 73	666 0473	1458 7447	632 2654
	16	0.912 856 15	0.349 842 66	0.151 851 03	693 4042	1448 3736	627 7658
	17	0.905 786 09	0.364 272 88	0.158 105 49	720 5769	1437 6044	623 0987
	18	0.898 445 20	0.378 593 43	0.164 312 45	747 5720	1426 4384	618 2646
	19	+0.890 835 23	+0.392 800 31	+0.170 470 22	-774 3943	+1414 8719	+613 2613
	20	0.882 957 89	0.406 889 51	0.176 577 10	801 0453	1402 8981	608 0849
	21	0.874 814 90	0.420 856 89	0.182 631 32	827 5214	1390 5085	602 7305
	22	0.866 408 07	0.434 698 26	0.188 631 10	853 8144	1377 6953	597 1933
	23	0.857 739 26	0.448 409 36	0.194 574 57	879 9130	1364 4524	591 4697
	24	0.848 810 50	0.461 985 87	0.200 459 86	905 8040	1350 7758	585 5573
	25	+0.839 623 92	+0.475 423 43	+0.206 285 08	-931 4732	+1336 6639	+579 4542
	26	0.830 181 82	0.488 717 69	0.212 048 31	956 9062	1322 1163	573 1602
	27	0.820 486 64	0.501 864 31	0.217 747 65	982 0889	1307 1345	566 6755
	28	0.810 540 93	0.514 858 94	0.223 381 19	1007 0074	1291 7209	560 0008
	29	0.800 347 41	0.527 697 29	0.228 947 03	1031 6478	1275 8785	553 1372
	30	0.789 908 94	0.540 375 09	0.234 443 31	1055 9968	1259 6112	546 0863
	31	+0.779 228 50	+0.552 888 12	+0.239 868 14	-1080 0404	+1242 9238	+538 8505
Nov.	1	0.768 309 20	0.565 232 19	0.245 219 71	1103 7654	1225 8221	531 4320
	2	0.757 154 30	0.577 403 20	0.250 496 18	1127 1584	1208 3126	523 8338
	3	0.745 767 18	0.589 397 11	0.255 695 80	1150 2066	1190 4028	516 0597
	4	0.734 151 35	0.601 209 95	0.260 816 81	1172 8976	1172 1017	508 1138
	5	0.722 310 45	0.612 837 87	0.265 857 52	1195 2199	1153 4188	500 0007
	6	+0.710 248 22	+0.624 277 09	+0.270 816 28	-1217 1628	+1134 3648	+491 7256
	7	0.697 968 49	0.635 523 97	0.275 691 51	1238 7170	1114 9512	483 2944
	8	0.685 475 20	0.646 574 96	0.280 481 67	1259 8746	1095 1904	474 7131
	9	0.672 772 35	0.657 426 66	0.285 185 29	1280 6292	1075 0956	465 9881
	10	0.659 863 98	0.668 075 80	0.289 800 97	1300 9770	1054 6800	457 1262
	11	0.646 754 17	0.678 519 24	0.294 327 38	1320 9168	1033 9573	448 1342
	12	+0.633 447 00	+0.688 753 97	+0.298 763 25	-1340 4497	+1012 9400	+439 0184
	13	0.619 946 51	0.698 777 09	0.303 107 35	1359 5805	991 6389	429 7840
	14	0.606 256 71	0.708 585 82	0.307 358 54	1378 3158	970 0615	420 4344
	15	0.592 381 49	0.718 177 41	0.311 515 67	1396 6629	948 2117	410 9715
	16	+0.578 324 72	+0.727 549 15	+0.315 577 59	-1414 6274	+926 0890	+401 3941

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Oct.	1	-1814	-552 430	-240 015	+552 419	-1526	-5361	+240 041	+4035	-288
	2	1814	552 426	240 013	552 415	1526	5363	240 039	4037	288
	3	1814	552 423	240 012	552 412	1526	5355	240 038	4029	288
	4	1814	552 428	240 014	552 416	1526	5339	240 040	4013	288
	5	1814	552 447	240 022	552 435	1526	5316	240 048	3990	288
	6	1814	552 484	240 039	552 473	1526	5290	240 064	3964	288
	7	-1815	-552 542	-240 064	+552 531	-1527	-5265	+240 089	+3938	-288
	8	1815	552 619	240 097	552 608	1527	5243	240 123	3916	288
	9	1816	552 712	240 138	552 701	1528	5229	240 163	3901	288
	10	1816	552 812	240 181	552 801	1528	5225	240 206	3897	289
	11	1817	552 911	240 224	552 900	1529	5231	240 249	3903	289
	12	1818	552 999	240 262	552 988	1529	5248	240 288	3920	289
	13	-1818	-553 065	-240 291	+553 054	-1529	-5271	+240 317	+3942	-289
	14	1818	553 105	240 308	553 094	1530	5294	240 334	3965	289
	15	1818	553 120	240 315	553 109	1530	5309	240 341	3980	289
	16	1818	553 120	240 315	553 109	1530	5310	240 341	3980	289
	17	1819	553 123	240 316	553 112	1530	5293	240 342	3964	289
	18	1819	553 146	240 326	553 135	1530	5261	240 352	3932	289
	19	-1819	-553 201	-240 350	+553 190	-1530	-5223	+240 375	+3893	-289
	20	1820	553 288	240 388	553 277	1531	5186	240 413	3856	289
	21	1820	553 398	240 436	553 388	1531	5159	240 461	3829	289
	22	1821	553 518	240 488	553 507	1532	5146	240 512	3814	289
	23	1822	553 631	240 537	553 621	1533	5145	240 562	3813	289
	24	1822	553 729	240 580	553 719	1533	5154	240 605	3822	290
	25	-1823	-553 806	-240 613	+553 795	-1534	-5169	+240 638	+3836	-290
	26	1823	553 861	240 637	553 850	1534	5184	240 662	3851	290
	27	1824	553 895	240 652	553 884	1534	5197	240 677	3864	290
	28	1824	553 914	240 660	553 903	1534	5203	240 685	3870	290
	29	1824	553 924	240 664	553 913	1534	5201	240 690	3868	290
	30	1824	553 934	240 669	553 923	1534	5190	240 694	3857	290
	31	-1824	-553 950	-240 676	+553 939	-1534	-5170	+240 701	+3837	-290
Nov.	1	1824	553 979	240 688	553 968	1535	5143	240 713	3810	290
	2	1824	554 027	240 709	554 016	1535	5112	240 734	3778	290
	3	1825	554 095	240 739	554 084	1535	5080	240 763	3746	290
	4	1825	554 184	240 777	554 173	1536	5052	240 802	3718	290
	5	1826	554 289	240 823	554 278	1536	5031	240 847	3696	290
	6	-1827	-554 403	-240 872	+554 392	-1537	-5020	+240 896	+3685	-290
	7	1828	554 517	240 922	554 507	1538	5020	240 946	3684	290
	8	1828	554 623	240 968	554 612	1538	5030	240 992	3693	290
	9	1829	554 710	241 006	554 700	1539	5047	241 030	3710	291
	10	1829	554 774	241 033	554 763	1539	5065	241 058	3728	291
	11	1830	554 814	241 051	554 803	1539	5079	241 075	3742	291
	12	-1830	-554 836	-241 060	+554 825	-1539	-5082	+241 085	+3744	-291
	13	1830	554 854	241 068	554 844	1539	5070	241 093	3732	291
	14	1830	554 885	241 082	554 874	1540	5042	241 106	3705	291
	15	1830	554 943	241 107	554 932	1540	5004	241 131	3666	291
	16	-1831	-555 035	-241 147	+555 024	-1540	-4964	+241 171	+3625	-291

POSITION AND VELOCITY OF THE EARTH, 2024
ORIGIN AT SOLAR SYSTEM BARYCENTRE
MEAN EQUATOR AND EQUINOX J 2000.0

Date 0^h T.D.B.		X	Y	Z	$\dot{X}$	$\dot{Y}$	$\dot{Z}$
Nov.	16	+0.578 324 72	+0.727 549 15	+0.315 577 59	-1414 6274	+926 0890	+401 3941
	17	0.564 090 21	0.736 698 27	0.319 543 16	1432 2116	903 6899	391 6997
	18	0.549 681 77	0.745 622 01	0.323 411 18	1449 4132	881 0099	381 8851
	19	0.535 103 24	0.754 317 52	0.327 180 45	1466 2255	858 0447	371 9472
	20	0.520 358 59	0.762 781 94	0.330 849 71	1482 6384	834 7919	361 8838
	21	0.505 451 85	0.771 012 40	0.334 417 70	1498 6401	811 2516	351 6941
	22	+0.490 387 20	+0.779 006 02	+0.337 883 17	-1514 2179	+787 4263	+341 3788
	23	0.475 168 94	0.786 759 99	0.341 244 87	1529 3595	763 3204	330 9394
	24	0.459 801 50	0.794 271 52	0.344 501 55	1544 0530	738 9396	320 3779
	25	0.444 289 41	0.801 537 89	0.347 652 03	1558 2871	714 2910	309 6972
	26	0.428 637 33	0.808 556 47	0.350 695 11	1572 0512	689 3816	298 9007
	27	0.412 849 99	0.815 324 68	0.353 629 66	1585 3348	664 2198	287 9916
	28	+0.396 932 26	+0.821 840 05	+0.356 454 58	-1598 1278	+638 8143	+276 9740
	29	0.380 889 10	0.828 100 18	0.359 168 80	1610 4201	613 1746	265 8521
	30	0.364 725 56	0.834 102 79	0.361 771 29	1622 2020	587 3110	254 6305
Dec.	1	0.348 446 80	0.839 845 69	0.364 261 09	1633 4639	561 2349	243 3147
	2	0.332 058 05	0.845 326 83	0.366 637 29	1644 1974	534 9591	231 9106
	3	0.315 564 64	0.850 544 26	0.368 899 03	1654 3947	508 4973	220 4248
	4	+0.298 971 96	+0.855 496 20	+0.371 045 54	-1664 0496	+481 8644	+208 8644
	5	0.282 285 47	0.860 181 02	0.373 076 10	1673 1581	455 0757	197 2367
	6	0.265 510 63	0.864 597 25	0.374 990 07	1681 7181	428 1473	185 5498
	7	0.248 652 93	0.868 743 56	0.376 786 92	1689 7297	401 0951	173 8113
	8	0.231 717 85	0.872 618 79	0.378 466 15	1697 1952	373 9344	162 0286
	9	0.214 710 83	0.876 221 93	0.380 027 37	1704 1198	346 6799	150 2087
	10	+0.197 637 24	+0.879 552 12	+0.381 470 22	-1710 5102	+319 3441	+138 3578
	11	0.180 502 38	0.882 608 58	0.382 794 44	1716 3751	291 9377	126 4805
	12	0.163 311 46	0.885 390 66	0.383 999 76	1721 7242	264 4687	114 5802
	13	0.146 069 58	0.887 897 76	0.385 085 97	1726 5669	236 9412	102 6584
	14	0.128 781 78	0.890 129 30	0.386 052 85	1730 9107	209 3571	90 7151
	15	0.111 453 02	0.892 084 71	0.386 900 19	1734 7606	181 7153	78 7489
	16	+0.094 088 22	+0.893 763 41	+0.387 627 75	-1738 1171	+154 0141	+66 7576
	17	0.076 692 33	0.895 164 79	0.388 235 26	1740 9772	126 2523	54 7396
	18	0.059 270 35	0.896 288 25	0.388 722 45	1743 3352	98 4300	42 6942
	19	0.041 827 32	0.897 133 20	0.389 089 05	1745 1833	70 5499	30 6217
	20	0.024 368 41	0.897 699 07	0.389 334 80	1746 5132	42 6170	18 5235
	21	+0.006 898 82	0.897 985 38	0.389 459 44	1747 3166	+14 6378	+6 4024
	22	-0.010 576 15	+0.897 991 70	+0.389 462 78	-1747 5865	-13 3793	-5 7382
	23	0.028 051 12	0.897 717 70	0.389 344 63	1747 3163	41 4251	17 8942
	24	0.045 520 65	0.897 163 14	0.389 104 86	1746 5000	69 4899	30 0615
	25	0.062 979 28	0.896 327 87	0.388 743 38	1745 1326	97 5635	42 2356
	26	0.080 421 45	0.895 211 87	0.388 260 14	1743 2091	125 6351	54 4113
	27	0.097 841 59	0.893 815 21	0.387 655 16	1740 7249	153 6937	66 5842
	28	-0.115 234 07	+0.892 138 08	+0.386 928 49	-1737 6753	-181 7271	-78 7484
	29	0.132 593 20	0.890 180 80	0.386 080 24	1734 0566	209 7226	90 8977
	30	0.149 913 29	0.887 943 81	0.385 110 60	1729 8652	237 6659	103 0259
	31	0.167 188 59	0.885 427 71	0.384 019 82	1725 0989	265 5414	115 1251
	32	-0.184 413 35	+0.882 633 26	+0.382 808 22	-1719 7578	-293 3328	-127 1876

$\dot{X}$, $\dot{Y}$, $\dot{Z}$ are in units of 10^{-9} a.u. per day

FRAME BIAS, PRECESSION AND NUTATION, 2024
MATRIX ELEMENTS FOR CONVERSION FROM
GCRS TO TRUE EQUINOX OF DATE

Date 0^h TT		M_{11} - 1	M_{12}	M_{13}	M_{21}	M_{22} - 1	M_{23}	M_{31}	M_{32}	M_{33} - 1
Nov.	16	-1831	-555 035	-241 147	+555 024	-1540	-4964	+241 171	+3625	-291
	17	1832	555 157	241 200	555 146	1541	4930	241 223	3591	291
	18	1833	555 296	241 260	555 286	1542	4909	241 284	3569	291
	19	1834	555 437	241 321	555 426	1543	4902	241 345	3562	291
	20	1835	555 565	241 377	555 555	1543	4908	241 400	3567	291
	21	1835	555 672	241 423	555 662	1544	4922	241 447	3580	292
	22	-1836	-555 754	-241 459	+555 744	-1544	-4939	+241 483	+3597	-292
	23	1836	555 815	241 485	555 804	1545	4954	241 509	3611	292
	24	1837	555 857	241 504	555 847	1545	4963	241 528	3620	292
	25	1837	555 889	241 517	555 878	1545	4965	241 541	3622	292
	26	1837	555 917	241 530	555 906	1545	4957	241 554	3614	292
	27	1837	555 949	241 544	555 939	1545	4941	241 568	3598	292
	28	-1837	-555 994	-241 563	+555 983	-1546	-4918	+241 587	+3575	-292
	29	1838	556 055	241 590	556 045	1546	4890	241 613	3546	292
	30	1838	556 137	241 625	556 127	1547	4860	241 649	3516	292
Dec.	1	1839	556 239	241 670	556 229	1547	4834	241 693	3489	292
	2	1840	556 360	241 722	556 350	1548	4814	241 745	3469	292
	3	1841	556 492	241 779	556 482	1548	4804	241 802	3458	292
	4	-1842	-556 626	-241 837	+556 616	-1549	-4805	+241 860	+3458	-293
	5	1842	556 751	241 892	556 741	1550	4817	241 915	3470	293
	6	1843	556 860	241 939	556 849	1551	4836	241 962	3489	293
	7	1844	556 944	241 976	556 934	1551	4859	241 999	3511	293
	8	1844	557 005	242 002	556 995	1551	4879	242 026	3531	293
	9	1844	557 047	242 020	557 037	1552	4889	242 044	3541	293
	10	-1845	-557 081	-242 035	+557 071	-1552	-4887	+242 059	+3538	-293
	11	1845	557 121	242 053	557 111	1552	4870	242 076	3522	293
	12	1845	557 182	242 079	557 172	1552	4843	242 102	3494	293
	13	1846	557 272	242 118	557 262	1553	4810	242 141	3460	293
	14	1847	557 394	242 171	557 384	1554	4779	242 194	3429	293
	15	1848	557 540	242 234	557 530	1554	4759	242 257	3409	294
	16	-1849	-557 694	-242 301	+557 684	-1555	-4753	+242 324	+3402	-294
	17	1850	557 843	242 366	557 833	1556	4761	242 389	3409	294
	18	1851	557 973	242 422	557 963	1557	4780	242 445	3428	294
	19	1851	558 078	242 468	558 068	1557	4805	242 491	3451	294
	20	1852	558 157	242 502	558 147	1558	4829	242 525	3475	294
	21	1852	558 215	242 528	558 205	1558	4849	242 551	3495	294
	22	-1852	-558 259	-242 547	+558 249	-1558	-4861	+242 570	+3507	-294
	23	1853	558 296	242 563	558 286	1559	4865	242 586	3511	294
	24	1853	558 335	242 580	558 325	1559	4860	242 603	3505	294
	25	1853	558 383	242 600	558 373	1559	4847	242 624	3492	294
	26	1854	558 445	242 627	558 435	1559	4828	242 651	3473	294
	27	1854	558 527	242 663	558 517	1560	4808	242 686	3452	295
	28	-1855	-558 629	-242 707	+558 619	-1560	-4788	+242 730	+3432	-295
	29	1856	558 750	242 760	558 740	1561	4775	242 783	3418	295
	30	1857	558 885	242 818	558 875	1562	4770	242 841	3413	295
	31	1858	559 025	242 879	559 015	1563	4777	242 902	3419	295
	32	-1858	-559 158	-242 937	+559 148	-1563	-4796	+242 960	+3437	-295

APPARENT PLACES OF POLARIS, 2024

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris												Mag. 2.02									F5-F8 Ib			
	JANUARY						FEBRUARY						MARCH						APRIL					
Date	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
1	3	03	27	+89	22	10	3	02	34	+89	22	16	3	01	39	+89	22	15	3	00	56	+89	22	08
2	3	03	26	+89	22	11	3	02	32	+89	22	16	3	01	38	+89	22	15	3	00	55	+89	22	08
3	3	03	24	+89	22	11	3	02	30	+89	22	16	3	01	36	+89	22	14	3	00	54	+89	22	08
4	3	03	22	+89	22	11	3	02	29	+89	22	16	3	01	35	+89	22	14	3	00	53	+89	22	08
5	3	03	21	+89	22	11	3	02	27	+89	22	16	3	01	33	+89	22	14	3	00	52	+89	22	08
6	3	03	19	+89	22	12	3	02	26	+89	22	16	3	01	32	+89	22	14	3	00	51	+89	22	07
7	3	03	18	+89	22	12	3	02	24	+89	22	16	3	01	30	+89	22	14	3	00	50	+89	22	07
8	3	03	17	+89	22	12	3	02	22	+89	22	16	3	01	28	+89	22	14	3	00	49	+89	22	07
9	3	03	16	+89	22	12	3	02	20	+89	22	16	3	01	26	+89	22	14	3	00	48	+89	22	06
10	3	03	14	+89	22	12	3	02	18	+89	22	16	3	01	24	+89	22	14	3	00	48	+89	22	06
11	3	03	13	+89	22	13	3	02	16	+89	22	16	3	01	22	+89	22	13	3	00	47	+89	22	06
12	3	03	11	+89	22	13	3	02	13	+89	22	16	3	01	21	+89	22	13	3	00	47	+89	22	05
13	3	03	10	+89	22	13	3	02	11	+89	22	16	3	01	19	+89	22	13	3	00	47	+89	22	05
14	3	03	08	+89	22	13	3	02	09	+89	22	16	3	01	18	+89	22	13	3	00	46	+89	22	05
15	3	03	06	+89	22	14	3	02	07	+89	22	16	3	01	17	+89	22	12	3	00	46	+89	22	05
16	3	03	04	+89	22	14	3	02	06	+89	22	16	3	01	15	+89	22	12	3	00	46	+89	22	04
17	3	03	02	+89	22	14	3	02	04	+89	22	16	3	01	14	+89	22	12	3	00	45	+89	22	04
18	3	03	00	+89	22	14	3	02	02	+89	22	16	3	01	13	+89	22	12	3	00	44	+89	22	04
19	3	02	58	+89	22	14	3	02	01	+89	22	16	3	01	12	+89	22	12	3	00	44	+89	22	04
20	3	02	57	+89	22	14	3	01	59	+89	22	16	3	01	10	+89	22	12	3	00	43	+89	22	03
21	3	02	55	+89	22	14	3	01	57	+89	22	16	3	01	09	+89	22	11	3	00	43	+89	22	03
22	3	02	54	+89	22	14	3	01	55	+89	22	16	3	01	07	+89	22	11	3	00	42	+89	22	03
23	3	02	52	+89	22	15	3	01	53	+89	22	15	3	01	06	+89	22	11	3	00	42	+89	22	02
24	3	02	51	+89	22	15	3	01	51	+89	22	15	3	01	04	+89	22	11	3	00	42	+89	22	02
25	3	02	49	+89	22	15	3	01	49	+89	22	15	3	01	03	+89	22	10	3	00	42	+89	22	02
26	3	02	47	+89	22	15	3	01	47	+89	22	15	3	01	01	+89	22	10	3	00	42	+89	22	01
27	3	02	45	+89	22	15	3	01	45	+89	22	15	3	01	00	+89	22	10	3	00	42	+89	22	01
28	3	02	43	+89	22	15	3	01	43	+89	22	15	3	00	59	+89	22	10	3	00	42	+89	22	01
29	3	02	40	+89	22	15	3	01	41	+89	22	15	3	00	58	+89	22	09	3	00	43	+89	22	00
30	3	02	38	+89	22	15							3	00	57	+89	22	09	3	00	43	+89	22	00
31	3	02	36	+89	22	15							3	00	57	+89	22	09						

APPARENT PLACES OF POLARIS, 2024

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris												Mag. 2.02										F5-F8 Ib		
	MAY						JUNE						JULY						AUGUST					
Date	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
1	3	00	43	+89	21	60	3	01	02	+89	21	51	3	01	47	+89	21	46	3	02	52	+89	21	44
2	3	00	43	+89	21	60	3	01	03	+89	21	51	3	01	50	+89	21	45	3	02	54	+89	21	44
3	3	00	42	+89	21	59	3	01	04	+89	21	51	3	01	52	+89	21	45	3	02	56	+89	21	44
4	3	00	42	+89	21	59	3	01	05	+89	21	50	3	01	54	+89	21	45	3	02	58	+89	21	44
5	3	00	42	+89	21	59	3	01	07	+89	21	50	3	01	56	+89	21	45	3	03	00	+89	21	45
6	3	00	42	+89	21	58	3	01	08	+89	21	50	3	01	58	+89	21	45	3	03	02	+89	21	45
7	3	00	43	+89	21	58	3	01	10	+89	21	50	3	02	00	+89	21	45	3	03	04	+89	21	45
8	3	00	43	+89	21	58	3	01	12	+89	21	49	3	02	02	+89	21	45	3	03	06	+89	21	45
9	3	00	44	+89	21	57	3	01	13	+89	21	49	3	02	04	+89	21	45	3	03	08	+89	21	45
10	3	00	45	+89	21	57	3	01	14	+89	21	49	3	02	05	+89	21	45	3	03	10	+89	21	45
11	3	00	46	+89	21	57	3	01	16	+89	21	49	3	02	07	+89	21	45	3	03	12	+89	21	45
12	3	00	46	+89	21	57	3	01	17	+89	21	49	3	02	09	+89	21	45	3	03	14	+89	21	45
13	3	00	47	+89	21	56	3	01	18	+89	21	49	3	02	11	+89	21	45	3	03	16	+89	21	45
14	3	00	47	+89	21	56	3	01	19	+89	21	48	3	02	13	+89	21	44	3	03	19	+89	21	45
15	3	00	48	+89	21	56	3	01	20	+89	21	48	3	02	15	+89	21	44	3	03	21	+89	21	45
16	3	00	48	+89	21	56	3	01	22	+89	21	48	3	02	17	+89	21	44	3	03	24	+89	21	45
17	3	00	48	+89	21	55	3	01	23	+89	21	48	3	02	19	+89	21	44	3	03	26	+89	21	45
18	3	00	49	+89	21	55	3	01	25	+89	21	47	3	02	21	+89	21	44	3	03	28	+89	21	46
19	3	00	49	+89	21	55	3	01	27	+89	21	47	3	02	24	+89	21	44	3	03	30	+89	21	46
20	3	00	50	+89	21	54	3	01	29	+89	21	47	3	02	26	+89	21	44	3	03	32	+89	21	46
21	3	00	51	+89	21	54	3	01	31	+89	21	47	3	02	28	+89	21	44	3	03	34	+89	21	46
22	3	00	52	+89	21	54	3	01	33	+89	21	47	3	02	30	+89	21	44	3	03	35	+89	21	46
23	3	00	53	+89	21	53	3	01	34	+89	21	47	3	02	32	+89	21	44	3	03	37	+89	21	46
24	3	00	54	+89	21	53	3	01	36	+89	21	47	3	02	34	+89	21	44	3	03	40	+89	21	46
25	3	00	55	+89	21	53	3	01	38	+89	21	46	3	02	36	+89	21	44	3	03	42	+89	21	47
26	3	00	56	+89	21	53	3	01	39	+89	21	46	3	02	38	+89	21	44	3	03	44	+89	21	47
27	3	00	57	+89	21	52	3	01	41	+89	21	46	3	02	40	+89	21	44	3	03	47	+89	21	47
28	3	00	58	+89	21	52	3	01	42	+89	21	46	3	02	42	+89	21	44	3	03	49	+89	21	47
29	3	00	59	+89	21	52	3	01	44	+89	21	46	3	02	44	+89	21	44	3	03	51	+89	21	47
30	3	01	00	+89	21	52	3	01	45	+89	21	46	3	02	47	+89	21	44	3	03	53	+89	21	47
31	3	01	01	+89	21	52							3	02	49	+89	21	44	3	03	55	+89	21	48

APPARENT PLACES OF POLARIS, 2024

FOR 0^h TERRESTRIAL TIME

α Ursae Minoris												Mag. 2.02									F5-F8 Ib			
	SEPTEMBER						OCTOBER						NOVEMBER						DECEMBER					
Date	Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination			Right Ascension			Declination		
	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"	h	m	s	°	'	"
1	3	03	57	+89	21	48	3	04	51	+89	21	55	3	05	26	+89	22	06	3	05	32	+89	22	17
2	3	03	59	+89	21	48	3	04	52	+89	21	56	3	05	26	+89	22	06	3	05	32	+89	22	17
3	3	04	01	+89	21	48	3	04	53	+89	21	56	3	05	27	+89	22	06	3	05	31	+89	22	17
4	3	04	02	+89	21	48	3	04	55	+89	21	56	3	05	28	+89	22	07	3	05	31	+89	22	18
5	3	04	04	+89	21	49	3	04	56	+89	21	56	3	05	29	+89	22	07	3	05	31	+89	22	18
6	3	04	06	+89	21	49	3	04	58	+89	21	57	3	05	30	+89	22	07	3	05	30	+89	22	19
7	3	04	08	+89	21	49	3	04	59	+89	21	57	3	05	30	+89	22	08	3	05	29	+89	22	19
8	3	04	10	+89	21	49	3	05	01	+89	21	57	3	05	31	+89	22	08	3	05	28	+89	22	19
9	3	04	12	+89	21	49	3	05	03	+89	21	58	3	05	31	+89	22	09	3	05	27	+89	22	20
10	3	04	14	+89	21	50	3	05	04	+89	21	58	3	05	31	+89	22	09	3	05	27	+89	22	20
11	3	04	16	+89	21	50	3	05	06	+89	21	58	3	05	31	+89	22	10	3	05	26	+89	22	20
12	3	04	19	+89	21	50	3	05	07	+89	21	59	3	05	31	+89	22	10	3	05	25	+89	22	21
13	3	04	21	+89	21	50	3	05	08	+89	21	59	3	05	31	+89	22	10	3	05	25	+89	22	21
14	3	04	23	+89	21	51	3	05	09	+89	21	59	3	05	32	+89	22	11	3	05	24	+89	22	21
15	3	04	24	+89	21	51	3	05	10	+89	21	60	3	05	32	+89	22	11	3	05	24	+89	22	21
16	3	04	26	+89	21	51	3	05	11	+89	22	00	3	05	33	+89	22	11	3	05	23	+89	22	22
17	3	04	27	+89	21	51	3	05	12	+89	22	00	3	05	33	+89	22	12	3	05	23	+89	22	22
18	3	04	29	+89	21	52	3	05	13	+89	22	01	3	05	34	+89	22	12	3	05	22	+89	22	22
19	3	04	30	+89	21	52	3	05	14	+89	22	01	3	05	34	+89	22	12	3	05	21	+89	22	23
20	3	04	32	+89	21	52	3	05	16	+89	22	01	3	05	34	+89	22	13	3	05	19	+89	22	23
21	3	04	34	+89	21	52	3	05	17	+89	22	02	3	05	34	+89	22	13	3	05	18	+89	22	23
22	3	04	36	+89	21	53	3	05	18	+89	22	02	3	05	34	+89	22	14	3	05	17	+89	22	24
23	3	04	38	+89	21	53	3	05	20	+89	22	02	3	05	34	+89	22	14	3	05	15	+89	22	24
24	3	04	40	+89	21	53	3	05	21	+89	22	03	3	05	33	+89	22	14	3	05	14	+89	22	24
25	3	04	42	+89	21	53	3	05	21	+89	22	03	3	05	33	+89	22	15	3	05	13	+89	22	25
26	3	04	44	+89	21	54	3	05	22	+89	22	04	3	05	33	+89	22	15	3	05	12	+89	22	25
27	3	04	45	+89	21	54	3	05	23	+89	22	04	3	05	32	+89	22	15	3	05	11	+89	22	25
28	3	04	47	+89	21	54	3	05	23	+89	22	04	3	05	32	+89	22	16	3	05	10	+89	22	25
29	3	04	48	+89	21	55	3	05	24	+89	22	05	3	05	32	+89	22	16	3	05	09	+89	22	26
30	3	04	49	+89	21	55	3	05	24	+89	22	05	3	05	32	+89	22	16	3	05	08	+89	22	26
31							3	05	25	+89	22	05							3	05	07	+89	22	26
32																			3	05	05	+89	22	26

POLARIS TABLE, 2024

LST	0^h		1^h		2^h		3^h		4^h		5^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	-26.4	+27.4	-32.6	+19.6	-36.5	+10.4	-38.0	+0.5	-36.8	-9.5	-33.1	-18.8
3	26.7	27.1	32.8	19.2	36.7	9.9	38.0	+0.0	36.7	10.0	32.8	19.2
6	27.1	26.7	33.1	18.8	36.8	9.5	38.0	-0.5	36.5	10.4	32.6	19.6
9	27.4	26.4	33.3	18.3	36.9	9.0	38.0	1.0	36.4	10.9	32.3	20.1
12	27.8	26.0	33.5	17.9	37.0	8.5	37.9	1.5	36.2	11.4	32.0	20.5
15	-28.1	+25.7	-33.8	+17.4	-37.1	+8.0	-37.9	-2.0	-36.1	-11.9	-31.8	-20.9
18	28.4	25.3	34.0	17.0	37.2	7.5	37.9	2.5	35.9	12.4	31.5	21.3
21	28.8	24.9	34.2	16.5	37.3	7.0	37.8	3.0	35.8	12.8	31.2	21.7
24	29.1	24.5	34.4	16.1	37.4	6.5	37.8	3.5	35.6	13.3	30.9	22.2
27	29.4	24.1	34.6	15.6	37.5	6.0	37.8	4.0	35.4	13.8	30.6	22.6
30	-29.7	+23.7	-34.8	+15.2	-37.6	+5.5	-37.7	-4.5	-35.2	-14.2	-30.3	-23.0
33	30.0	23.4	35.0	14.7	37.6	5.0	37.6	5.0	35.0	14.7	30.0	23.4
36	30.3	23.0	35.2	14.2	37.7	4.5	37.6	5.5	34.8	15.2	29.7	23.8
39	30.6	22.6	35.4	13.8	37.8	4.0	37.5	6.0	34.6	15.6	29.4	24.1
42	30.9	22.1	35.6	13.3	37.8	3.5	37.4	6.5	34.4	16.1	29.1	24.5
45	-31.2	+21.7	-35.8	+12.8	-37.9	+3.0	-37.3	-7.0	-34.2	-16.5	-28.8	-24.9
48	31.5	21.3	35.9	12.4	37.9	2.5	37.2	7.5	34.0	17.0	28.4	25.3
51	31.8	20.9	36.1	11.9	37.9	2.0	37.1	8.0	33.8	17.4	28.1	25.7
54	32.0	20.5	36.2	11.4	37.9	1.5	37.0	8.5	33.5	17.9	27.8	26.0
57	32.3	20.1	36.4	10.9	38.0	1.0	36.9	9.0	33.3	18.3	27.4	26.4
60	-32.6	+19.6	-36.5	+10.4	-38.0	+0.5	-36.8	-9.5	-33.1	-18.8	-27.1	-26.7
Lat. °	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
0	-.1	-.2	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
10	-.1	-.2	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
20	-.1	-.2	.0	-.2	.0	-.1	.0	.0	.0	.1	.0	.1
30	-.1	-.1	.0	-.1	.0	-.1	.0	.0	.0	.1	.0	.1
40	.0	-.1	.0	-.1	.0	.0	.0	.0	.0	.0	.0	.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
62	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
64	.1	.2	.0	.2	.0	.1	.0	.0	.0	-.1	.0	-.2
66	.1	.2	.1	.2	.0	.1	.0	.0	.0	-.1	.1	-.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	.1	-.1	.2	-.1	.2	.0	.2	.0	.2	.1	.2	.1
Feb.	.1	-.3	.1	-.2	.2	-.2	.2	-.1	.3	-.1	.3	.0
Mar.	-.1	-.3	.0	-.3	.1	-.3	.2	-.3	.2	-.2	.3	-.2
Apr.	-.2	-.3	-.1	-.3	-.1	-.4	.0	-.4	.1	-.3	.2	-.3
May	-.3	-.2	-.3	-.3	-.2	-.3	-.1	-.3	.0	-.4	.1	-.4
June	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.3	-.2	-.3	-.1	-.3
July	-.3	.1	-.3	.1	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.2
Aug.	-.1	.2	-.2	.2	-.2	.1	-.3	.1	-.3	.0	-.3	-.1
Sept.	.0	.3	.0	.3	-.1	.3	-.2	.2	-.2	.2	-.3	.1
Oct.	.2	.3	.2	.3	.1	.4	.0	.4	-.1	.3	-.2	.3
Nov.	.4	.2	.3	.3	.3	.4	.2	.4	.0	.4	-.1	.4
Dec.	.5	.0	.5	.2	.4	.3	.3	.4	.2	.5	.1	.5

Latitude = Corrected observed altitude of *Polaris* + a_0 + a_1 + a_2

Azimuth of *Polaris* = (b_0 + b_1 + b_2)/ cos (latitude)

POLARIS TABLE, 2024

LST	6^h		7^h		8^h		9^h		10^h		11^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	-27.1	-26.7	-19.2	-32.9	-10.1	-36.7	-0.2	-38.0	+9.6	-36.7	+18.7	-32.9
3	26.7	27.1	18.8	33.1	9.6	36.8	+0.3	38.0	10.1	36.5	19.2	32.7
6	26.4	27.5	18.4	33.3	9.1	36.9	0.8	38.0	10.5	36.4	19.6	32.4
9	26.0	27.8	17.9	33.6	8.6	37.0	1.2	37.9	11.0	36.3	20.0	32.1
12	25.6	28.1	17.5	33.8	8.1	37.1	1.7	37.9	11.5	36.1	20.4	31.9
15	-25.3	-28.5	-17.0	-34.0	-7.6	-37.2	+2.2	-37.9	+12.0	-36.0	+20.9	-31.6
18	24.9	28.8	16.6	34.3	7.2	37.3	2.7	37.9	12.4	35.8	21.3	31.3
21	24.5	29.1	16.1	34.5	6.7	37.4	3.2	37.8	12.9	35.6	21.7	31.1
24	24.1	29.4	15.7	34.7	6.2	37.5	3.7	37.8	13.4	35.5	22.1	30.8
27	23.7	29.8	15.2	34.9	5.7	37.6	4.2	37.7	13.8	35.3	22.5	30.5
30	-23.3	-30.1	-14.8	-35.1	-5.2	-37.6	+4.7	-37.6	+14.3	-35.1	+22.9	-30.2
33	23.0	30.4	14.3	35.3	4.7	37.7	5.2	37.6	14.7	34.9	23.3	29.9
36	22.6	30.7	13.8	35.4	4.2	37.8	5.7	37.5	15.2	34.7	23.7	29.6
39	22.1	31.0	13.4	35.6	3.7	37.8	6.2	37.4	15.7	34.5	24.0	29.3
42	21.7	31.2	12.9	35.8	3.2	37.9	6.7	37.3	16.1	34.3	24.4	28.9
45	-21.3	-31.5	-12.4	-35.9	-2.7	-37.9	+7.2	-37.2	+16.6	-34.1	+24.8	-28.6
48	20.9	31.8	12.0	36.1	2.2	37.9	7.7	37.1	17.0	33.9	25.2	28.3
51	20.5	32.1	11.5	36.3	1.7	37.9	8.1	37.0	17.4	33.6	25.5	28.0
54	20.1	32.3	11.0	36.4	1.2	38.0	8.6	36.9	17.9	33.4	25.9	27.6
57	19.7	32.6	10.5	36.5	0.7	38.0	9.1	36.8	18.3	33.2	26.3	27.3
60	-19.2	-32.9	-10.1	-36.7	-0.2	-38.0	+9.6	-36.7	+18.7	-32.9	+26.6	-26.9
Lat. °	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
0	-.1	.2	-.2	.2	-.2	.1	-.2	.0	-.2	-.1	-.2	-.2
10	-.1	.2	-.2	.2	-.2	.1	-.2	.0	-.2	-.1	-.2	-.2
20	-.1	.2	-.1	.2	-.2	.1	-.2	.0	-.2	-.1	-.1	-.1
30	-.1	.1	-.1	.1	-.1	.1	-.1	.0	-.1	-.1	-.1	-.1
40	.0	.1	-.1	.1	-.1	.0	-.1	.0	-.1	.0	-.1	-.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
62	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
64	.1	-.2	.1	-.2	.2	-.1	.2	.0	.2	.1	.1	.2
66	.1	-.2	.2	-.2	.2	-.1	.2	.0	.2	.1	.2	.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	.1	.1	.1	.1	.0	.2	.0	.2	-.1	.2	-.1	.2
Feb.	.3	.1	.2	.1	.2	.2	.1	.2	.1	.3	.0	.3
Mar.	.3	-.1	.3	-.1	.3	.1	.3	.2	.2	.2	.2	.3
Apr.	.3	-.2	.3	-.2	.4	-.1	.4	.0	.3	.1	.3	.2
May	.2	-.3	.3	-.3	.3	-.2	.4	-.1	.4	.0	.4	.1
June	.0	-.3	.1	-.3	.2	-.3	.3	-.2	.3	-.2	.3	-.1
July	-.1	-.3	-.1	-.3	.0	-.3	.1	-.3	.2	-.3	.2	-.2
Aug.	-.2	-.1	-.2	-.1	-.1	-.2	-.1	-.3	.0	-.3	.1	-.3
Sept.	-.3	.0	-.3	.0	-.3	-.1	-.2	-.2	-.2	-.2	-.1	-.3
Oct.	-.3	.2	-.3	.2	-.4	.1	-.4	.0	-.3	-.1	-.3	-.2
Nov.	-.2	.4	-.3	.4	-.4	.3	-.4	.2	-.4	.0	-.4	-.1
Dec.	.0	.5	-.2	.5	-.3	.4	-.4	.3	-.5	.2	-.5	.1

Latitude = Corrected observed altitude of *Polaris* + a_0 + a_1 + a_2
Azimuth of *Polaris* = (b_0 + b_1 + b_2)/ cos (latitude)

POLARIS TABLE, 2024

LST	12^h		13^h		14^h		15^h		16^h		17^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+26.6	-26.9	+32.7	-19.2	+36.6	-10.2	+38.0	-0.5	+36.8	+9.2	+33.2	+18.3
3	27.0	26.6	32.9	18.8	36.7	9.7	38.0	+0.0	36.7	9.7	32.9	18.8
6	27.3	26.2	33.2	18.3	36.8	9.2	38.0	0.5	36.6	10.2	32.7	19.2
9	27.7	25.9	33.4	17.9	36.9	8.7	38.0	1.0	36.4	10.7	32.4	19.6
12	28.0	25.5	33.7	17.5	37.0	8.3	37.9	1.5	36.3	11.1	32.2	20.0
15	+28.3	-25.2	+33.9	-17.0	+37.2	-7.8	+37.9	+2.0	+36.1	+11.6	+31.9	+20.5
18	28.7	24.8	34.1	16.6	37.2	7.3	37.9	2.5	36.0	12.1	31.6	20.9
21	29.0	24.4	34.3	16.1	37.3	6.8	37.9	2.9	35.8	12.5	31.4	21.3
24	29.3	24.0	34.5	15.7	37.4	6.3	37.8	3.4	35.6	13.0	31.1	21.7
27	29.6	23.6	34.7	15.3	37.5	5.9	37.8	3.9	35.5	13.4	30.8	22.1
30	+29.9	-23.3	+34.9	-14.8	+37.6	-5.4	+37.7	+4.4	+35.3	+13.9	+30.5	+22.5
33	30.2	22.9	35.1	14.3	37.6	4.9	37.6	4.9	35.1	14.4	30.2	22.9
36	30.5	22.5	35.3	13.9	37.7	4.4	37.6	5.4	34.9	14.8	29.9	23.3
39	30.8	22.1	35.5	13.4	37.8	3.9	37.5	5.9	34.7	15.3	29.6	23.7
42	31.1	21.7	35.7	13.0	37.8	3.4	37.4	6.4	34.5	15.7	29.3	24.0
45	+31.4	-21.3	+35.8	-12.5	+37.9	-2.9	+37.3	+6.8	+34.3	+16.2	+29.0	+24.4
48	31.6	20.9	36.0	12.0	37.9	2.4	37.2	7.3	34.1	16.6	28.7	24.8
51	31.9	20.4	36.1	11.6	37.9	2.0	37.1	7.8	33.9	17.0	28.3	25.2
54	32.2	20.0	36.3	11.1	37.9	1.5	37.0	8.3	33.7	17.5	28.0	25.5
57	32.4	19.6	36.4	10.6	38.0	1.0	36.9	8.8	33.4	17.9	27.7	25.9
60	+32.7	-19.2	+36.6	-10.2	+38.0	-0.5	+36.8	+9.2	+33.2	+18.3	+27.3	+26.2
Lat. °	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
0	-.1	-.2	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
10	-.1	-.2	-.1	-.2	.0	-.1	.0	.0	.0	.1	-.1	.2
20	-.1	-.2	.0	-.2	.0	-.1	.0	.0	.0	.1	.0	.1
30	-.1	-.1	.0	-.1	.0	-.1	.0	.0	.0	.1	.0	.1
40	.0	-.1	.0	-.1	.0	.0	.0	.0	.0	.0	.0	.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
62	.1	.1	.0	.1	.0	.1	.0	.0	.0	-.1	.0	-.1
64	.1	.2	.0	.2	.0	.1	.0	.0	.0	-.1	.0	-.2
66	.1	.2	.1	.2	.0	.1	.0	.0	.0	-.1	.1	-.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	-.1	.1	-.2	.1	-.2	.0	-.2	.0	-.2	-.1	-.2	-.1
Feb.	-.1	.3	-.1	.2	-.2	.2	-.2	.1	-.3	.1	-.3	.0
Mar.	.1	.3	.0	.3	-.1	.3	-.2	.3	-.2	.2	-.3	.2
Apr.	.2	.3	.1	.3	.1	.4	.0	.4	-.1	.3	-.2	.3
May	.3	.2	.3	.3	.2	.3	.1	.4	.0	.4	-.1	.4
June	.3	.0	.3	.1	.3	.2	.2	.3	.2	.3	.1	.3
July	.3	-.1	.3	-.1	.3	.0	.3	.1	.3	.2	.2	.2
Aug.	.1	-.2	.2	-.2	.2	-.1	.3	-.1	.3	.0	.3	.1
Sept.	.0	-.3	.0	-.3	.1	-.3	.2	-.2	.2	-.2	.3	-.1
Oct.	-.2	-.3	-.2	-.3	-.1	-.4	.0	-.4	.1	-.3	.2	-.3
Nov.	-.4	-.2	-.3	-.3	-.3	-.4	-.2	-.4	.0	-.4	.1	-.4
Dec.	-.5	.0	-.5	-.2	-.4	-.3	-.3	-.4	-.2	-.5	-.1	-.5

Latitude = Corrected observed altitude of *Polaris* + $a_0 + a_1 + a_2$

Azimuth of *Polaris* = $(b_0 + b_1 + b_2)$/ cos (latitude)

POLARIS TABLE, 2024

LST	18^h		19^h		20^h		21^h		22^h		23^h	
	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0	a_0	b_0
m	′	′	′	′	′	′	′	′	′	′	′	′
0	+27.3	+26.2	+19.6	+32.4	+10.5	+36.4	+0.7	+38.0	-9.1	+36.9	-18.4	+33.3
3	27.0	26.6	19.2	32.7	10.1	36.6	+0.2	38.0	9.6	36.8	18.8	33.1
6	26.6	27.0	18.7	32.9	9.6	36.7	-0.3	38.0	10.1	36.7	19.2	32.8
9	26.3	27.3	18.3	33.2	9.1	36.8	0.7	38.0	10.6	36.5	19.7	32.6
12	25.9	27.6	17.9	33.4	8.6	36.9	1.2	38.0	11.0	36.4	20.1	32.3
15	+25.5	+28.0	+17.4	+33.6	+8.1	+37.0	-1.7	+37.9	-11.5	+36.3	-20.5	+32.1
18	25.2	28.3	17.0	33.9	7.6	37.1	2.2	37.9	12.0	36.1	20.9	31.8
21	24.8	28.6	16.5	34.1	7.2	37.2	2.7	37.9	12.5	35.9	21.3	31.5
24	24.4	28.9	16.1	34.3	6.7	37.3	3.2	37.9	12.9	35.8	21.8	31.2
27	24.0	29.3	15.6	34.5	6.2	37.4	3.7	37.8	13.4	35.6	22.2	31.0
30	+23.7	+29.6	+15.2	+34.7	+5.7	+37.5	-4.2	+37.8	-13.9	+35.4	-22.6	+30.7
33	23.3	29.9	14.7	34.9	5.2	37.6	4.7	37.7	14.3	35.3	23.0	30.4
36	22.9	30.2	14.3	35.1	4.7	37.6	5.2	37.6	14.8	35.1	23.4	30.1
39	22.5	30.5	13.8	35.3	4.2	37.7	5.7	37.6	15.2	34.9	23.7	29.7
42	22.1	30.8	13.4	35.5	3.7	37.8	6.2	37.5	15.7	34.7	24.1	29.4
45	+21.7	+31.1	+12.9	+35.6	+3.2	+37.8	-6.7	+37.4	-16.1	+34.5	-24.5	+29.1
48	21.3	31.3	12.4	35.8	2.7	37.9	7.2	37.3	16.6	34.2	24.9	28.8
51	20.9	31.6	12.0	36.0	2.2	37.9	7.7	37.2	17.0	34.0	25.3	28.5
54	20.4	31.9	11.5	36.1	1.7	37.9	8.1	37.1	17.5	33.8	25.6	28.1
57	20.0	32.2	11.0	36.3	1.2	37.9	8.6	37.0	17.9	33.6	26.0	27.8
60	+19.6	+32.4	+10.5	+36.4	+0.7	+38.0	9.1	+36.9	-18.4	+33.3	-26.4	+27.4
Lat.	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1	a_1	b_1
°												
0	-.1	.2	-.2	.2	-.2	.1	-.2	.0	-.2	-.1	-.2	-.2
10	-.1	.2	-.2	.2	-.2	.1	-.2	.0	-.2	-.1	-.2	-.2
20	-.1	.2	-.1	.2	-.2	.1	-.2	.0	-.2	-.1	-.1	-.1
30	-.1	.1	-.1	.1	-.1	.1	-.1	.0	-.1	-.1	-.1	-.1
40	.0	.1	-.1	.1	-.1	.0	-.1	.0	-.1	.0	-.1	-.1
45	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
60	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
62	.1	-.1	.1	-.1	.1	-.1	.1	.0	.1	.1	.1	.1
64	.1	-.2	.1	-.2	.2	-.1	.2	.0	.2	.1	.1	.2
66	.1	-.2	.2	-.2	.2	-.1	.2	.0	.2	.1	.2	.2
Month	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2	a_2	b_2
Jan.	-.1	-.1	-.1	-.2	.0	-.2	.0	-.2	.1	-.2	.1	-.2
Feb.	-.3	-.1	-.2	-.1	-.2	-.2	-.1	-.2	-.1	-.3	.0	-.3
Mar.	-.3	.1	-.3	.0	-.3	-.1	-.3	-.2	-.2	-.2	-.2	-.3
Apr.	-.3	.2	-.3	.1	-.4	.1	-.4	.0	-.3	-.1	-.3	-.2
May	-.2	.3	-.3	.3	-.3	.2	-.4	.1	-.4	.0	-.4	-.1
June	.0	.3	-.1	.3	-.2	.3	-.3	.2	-.3	.2	-.3	.1
July	.1	.3	.1	.3	.0	.3	-.1	.3	-.2	.3	-.2	.2
Aug.	.2	.1	.2	.2	.1	.2	.1	.3	.0	.3	-.1	.3
Sept.	.3	.0	.3	.0	.3	.1	.2	.2	.2	.2	.1	.3
Oct.	.3	-.2	.3	-.2	.4	-.1	.4	.0	.3	.1	.3	.2
Nov.	.2	-.4	.3	-.3	.4	-.3	.4	-.2	.4	.0	.4	.1
Dec.	.0	-.5	.2	-.5	.3	-.4	.4	-.3	.5	-.2	.5	-.1

Latitude = Corrected observed altitude of *Polaris* + a_0 + a_1 + a_2
Azimuth of *Polaris* = (b_0 + b_1 + b_2)/ cos (latitude)

PART - III

SUNRISE, SUNSET AND MOONRISE, MOONSET

SUNRISE, 2024

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

Date \ Lat.		0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	0	5 59	6 16	6 35	6 55	7 08	7 22	7 38	7 59	8 08	8 19	8 32	8 46	9 03
	4	6 01	6 18	6 36	6 56	7 08	7 22	7 38	7 58	8 08	8 18	8 30	8 44	9 01
	8	6 03	6 19	6 37	6 57	7 09	7 22	7 38	7 57	8 06	8 17	8 28	8 42	8 58
	12	6 04	6 20	6 37	6 57	7 08	7 21	7 36	7 55	8 04	8 14	08 25	8 38	8 53
	16	6 06	6 21	6 38	6 57	7 07	7 20	7 35	7 52	8 01	8 10	8 21	8 33	8 47
	20	6 07	6 22	6 38	6 56	7 06	7 18	7 32	7 49	7 57	8 06	8 16	8 27	8 41
	24	6 08	6 22	6 37	6 55	7 04	7 16	7 29	7 45	7 52	8 01	8 10	8 21	8 33
	28	6 09	6 23	6 37	6 53	7 02	7 13	7 25	7 40	7 47	7 55	8 03	8 13	8 25
Feb.	1	6 10	6 22	6 36	6 51	6 59	7 09	7 21	7 35	7 41	7 48	7 56	8 05	8 16
	5	6 10	6 22	6 34	6 48	6 56	7 05	7 16	7 29	7 35	7 41	7 49	7 57	8 06
	9	6 11	6 21	6 33	6 45	6 53	7 01	7 11	7 22	7 28	7 34	7 40	7 48	7 56
	13	6 11	6 20	6 31	6 42	6 49	6 56	7 05	7 16	7 20	7 26	7 32	7 38	7 46
	17	6 11	6 19	6 28	6 39	6 45	6 51	6 59	7 08	7 13	7 17	7 22	7 28	7 35
	21	6 10	6 18	6 26	6 35	6 40	6 46	6 53	7 01	7 05	7 09	7 13	7 18	7 24
	25	6 10	6 16	6 23	6 31	6 35	6 40	6 46	6 53	6 56	7 00	7 03	7 08	7 12
	29	6 09	6 15	6 20	6 27	6 31	6 35	6 39	6 45	6 48	6 50	6 53	6 57	7 01
Mar.	4	6 08	6 13	6 17	6 22	6 25	6 29	6 32	6 37	6 39	6 41	6 43	6 46	6 49
	8	6 07	6 11	6 14	6 18	6 20	6 22	6 25	6 28	6 30	6 31	6 33	6 35	6 37
	12	6 06	6 09	6 11	6 13	6 15	6 16	6 18	6 20	6 21	6 22	6 23	6 24	6 25
	16	6 05	6 06	6 07	6 09	6 09	6 10	6 10	6 11	6 11	6 12	6 12	6 13	6 13
	20	6 04	6 04	6 04	6 04	6 04	6 03	6 03	6 02	6 02	6 02	6 02	6 01	6 01
	24	6 03	6 02	6 00	5 59	5 58	5 57	5 55	5 54	5 53	5 52	5 51	5 50	5 49
	28	6 02	5 59	5 57	5 54	5 52	5 50	5 48	5 45	5 44	5 42	5 41	5 39	5 37
Apr.	1	6 01	5 57	5 54	5 49	5 47	5 44	5 40	5 36	5 35	5 32	5 30	5 28	5 25

BEGINNING OF MORNING TWILIGHT

		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	0	4 44	5 01	5 16	5 30	5 37	5 44	5 52	5 59	6 03	6 06	6 10	6 14	6 18
	8	4 48	5 04	5 19	5 32	5 39	5 45	5 52	5 59	6 02	6 06	6 09	6 12	6 16
	16	4 52	5 07	5 20	5 33	5 39	5 44	5 50	5 57	5 59	6 02	6 05	6 07	6 11
	24	4 55	5 09	5 21	5 31	5 36	5 41	5 46	5 51	5 53	5 55	5 57	5 59	6 01
Feb.	1	4 58	5 10	5 20	5 29	5 33	5 36	5 40	5 43	5 44	5 45	5 47	5 48	5 49
	9	5 00	5 10	5 18	5 24	5 27	5 29	5 31	5 33	5 33	5 33	5 33	5 33	5 33
	17	5 00	5 08	5 14	5 19	5 20	5 21	5 21	5 20	5 19	5 19	5 18	5 16	5 15
	25	5 00	5 06	5 10	5 11	5 11	5 10	5 09	5 06	5 04	5 02	5 00	4 57	4 54
Mar.	4	4 59	5 03	5 04	5 03	5 01	4 59	4 55	4 49	4 47	4 43	4 40	4 35	4 30
	12	4 58	4 59	4 58	4 54	4 51	4 46	4 40	4 32	4 28	4 23	4 18	4 11	4 04
	20	4 55	4 54	4 51	4 44	4 39	4 33	4 24	4 13	4 07	4 01	3 54	3 45	3 36
	28	4 53	4 50	4 43	4 34	4 27	4 18	4 07	3 53	3 46	3 38	3 28	3 17	3 04
Apr.	5	4 50	4 45	4 36	4 23	4 14	4 04	3 50	3 32	3 23	3 12	3 00	2 45	2 27

SUNSET, 2024

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude**.**

Date	Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	0	18 06	17 49	17 31	17 10	16 58	16 44	16 27	16 07	15 57	15 47	15 34	15 20	15 03
	4	18 08	17 51	17 34	17 13	17 01	16 47	16 31	16 11	16 02	15 51	15 39	15 25	15 09
	8	18 10	17 54	17 36	17 16	17 04	16 51	16 35	16 16	16 07	15 57	15 45	15 31	15 16
	12	18 12	17 56	17 39	17 19	17 08	16 55	16 40	16 21	16 12	16 03	15 51	15 39	15 24
	16	18 13	17 58	17 41	17 23	17 12	16 59	16 45	16 27	16 19	16 09	15 59	15 47	15 32
	20	18 14	18 00	17 44	17 26	17 16	17 04	16 50	16 33	16 25	16 16	16 06	15 55	15 42
	24	18 15	18 01	17 47	17 30	17 20	17 09	16 55	16 40	16 32	16 24	16 14	16 04	15 52
	28	18 16	18 03	17 49	17 33	17 24	17 13	17 01	16 46	16 39	16 31	16 23	16 13	16 02
Feb.	1	18 17	18 05	17 51	17 36	17 28	17 18	17 07	16 53	16 46	16 39	16 31	16 22	16 12
	5	18 17	18 06	17 54	17 40	17 32	17 23	17 12	17 00	16 54	16 47	16 40	16 32	16 23
	9	18 18	18 07	17 56	17 43	17 36	17 28	17 18	17 07	17 01	16 55	16 49	16 42	16 33
	13	18 18	18 08	17 58	17 46	17 40	17 33	17 24	17 14	17 09	17 04	16 58	16 51	16 44
	17	18 17	18 09	18 00	17 50	17 44	17 37	17 30	17 20	17 16	17 12	17 06	17 01	16 54
	21	18 17	18 09	18 02	17 53	17 48	17 42	17 35	17 27	17 24	17 20	17 15	17 10	17 05
	25	18 16	18 10	18 03	17 56	17 51	17 46	17 41	17 34	17 31	17 28	17 24	17 20	17 15
	29	18 16	18 10	18 05	17 58	17 55	17 51	17 46	17 41	17 38	17 35	17 32	17 29	17 25
Mar.	4	18 15	18 11	18 06	18 01	17 58	17 55	17 52	17 47	17 45	17 43	17 41	17 38	17 35
	8	18 14	18 11	18 07	18 04	18 02	18 00	17 57	17 54	17 53	17 51	17 49	17 48	17 45
	12	18 13	18 11	18 09	18 06	18 05	18 04	18 02	18 00	18 00	17 59	17 58	17 57	17 55
	16	18 12	18 11	18 10	18 09	18 09	18 08	18 07	18 07	18 07	18 06	18 06	18 06	18 05
	20	18 11	18 11	18 11	18 12	18 12	18 12	18 13	18 13	18 14	18 14	18 14	18 15	18 15
	24	18 09	18 11	18 12	18 14	18 15	18 16	18 18	18 20	18 20	18 21	18 22	18 24	18 25
	28	18 08	18 11	18 13	18 16	18 18	18 20	18 23	18 26	18 27	18 29	18 31	18 32	18 35
Apr.	1	18 07	18 11	18 14	18 19	18 21	18 24	18 28	18 32	18 34	18 36	18 39	18 41	18 44

END OF EVENING TWILIGHT

		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Jan.	0	19 21	19 05	18 50	18 35	18 28	18 21	18 14	18 06	18 03	17 59	17 56	17 52	17 48
	8	19 25	19 08	18 54	18 41	18 34	18 28	18 21	18 14	18 11	18 08	18 04	18 01	17 57
	16	19 27	19 12	18 59	18 47	18 41	18 35	18 29	18 23	18 20	18 18	18 15	18 12	18 09
	24	19 28	19 15	19 03	18 53	18 48	18 43	18 38	18 33	18 31	18 29	18 27	18 25	18 23
Feb.	1	19 29	19 17	19 07	18 59	18 55	18 51	18 48	18 45	18 43	18 42	18 41	18 40	18 39
	9	19 29	19 19	19 11	19 04	19 02	18 59	18 58	18 57	18 56	18 56	18 56	18 56	18 57
	17	19 28	19 20	19 14	19 10	19 09	19 08	19 08	19 09	19 10	19 10	19 12	19 13	19 15
	25	19 26	19 20	19 17	19 15	19 16	19 17	19 18	19 22	19 23	19 26	19 28	19 31	19 34
Mar.	4	19 24	19 21	19 19	19 21	19 22	19 25	19 29	19 35	19 38	19 41	19 45	19 50	19 55
	12	19 22	19 21	19 22	19 26	19 29	19 34	19 40	19 49	19 53	19 58	20 03	20 10	20 17
	20	19 19	19 21	19 24	19 31	19 36	19 43	19 52	20 03	20 09	20 15	20 23	20 32	20 42
	28	19 17	19 21	19 27	19 37	19 44	19 53	20 04	20 19	20 26	20 34	20 44	20 56	21 09
Apr.	5	19 15	19 21	19 30	19 43	19 52	20 03	20 17	20 35	20 44	20 55	21 08	21 23	21 42

SUNRISE, 2024

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude.

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 1	6 01	5 57	5 54	5 49	5 47	5 44	5 40	5 36	5 35	5 32	5 30	5 28	5 25
5	5 59	5 55	5 50	5 44	5 41	5 37	5 33	5 28	5 25	5 23	5 20	5 16	5 13
9	5 58	5 53	5 47	5 40	5 36	5 31	5 26	5 19	5 16	5 13	5 09	5 05	5 01
13	5 57	5 51	5 44	5 35	5 31	5 25	5 19	5 11	5 07	5 03	4 59	4 54	4 49
17	5 56	5 49	5 40	5 31	5 25	5 19	5 12	5 03	4 59	4 54	4 49	4 43	4 37
21	5 55	5 47	5 37	5 27	5 20	5 13	5 05	4 55	4 50	4 45	4 39	4 33	4 25
25	5 55	5 45	5 35	5 23	5 16	5 08	4 58	4 47	4 42	4 36	4 30	4 22	4 14
29	5 54	5 43	5 32	5 19	5 11	5 02	4 52	4 40	4 34	4 27	4 20	4 12	4 03
May 3	5 53	5 42	5 30	5 15	5 07	4 57	4 46	4 33	4 26	4 19	4 11	4 02	3 52
7	5 53	5 41	5 27	5 12	5 03	4 53	4 41	4 26	4 19	4 11	4 03	3 53	3 42
11	5 53	5 40	5 26	5 09	5 00	4 49	4 36	4 20	4 12	4 04	3 55	3 44	3 31
15	5 53	5 39	5 24	5 07	4 56	4 45	4 31	4 14	4 06	3 57	3 47	3 35	3 22
19	5 53	5 38	5 23	5 04	4 54	4 41	4 27	4 09	4 00	3 51	3 40	3 27	3 13
23	5 53	5 38	5 21	5 02	4 51	4 38	4 23	4 04	3 55	3 45	3 33	3 20	3 05
27	5 54	5 38	5 21	5 01	4 49	4 36	4 20	4 00	3 50	3 40	3 28	3 14	2 57
31	5 54	5 38	5 20	5 00	4 48	4 34	4 17	3 57	3 47	3 36	3 23	3 08	2 51
June 4	5 55	5 38	5 20	4 59	4 46	4 32	4 15	3 54	3 44	3 32	3 19	3 04	2 45
8	5 56	5 38	5 20	4 58	4 46	4 31	4 14	3 52	3 41	3 30	3 16	3 00	2 41
12	5 56	5 39	5 20	4 58	4 46	4 31	4 13	3 51	3 40	3 28	3 14	2 58	2 38
16	5 57	5 40	5 21	4 59	4 46	4 31	4 13	3 50	3 39	3 27	3 13	2 56	2 36
20	5 58	5 40	5 21	4 59	4 46	4 31	4 13	3 51	3 40	3 27	3 13	2 56	2 36
24	5 59	5 41	5 22	5 00	4 47	4 32	4 14	3 52	3 41	3 28	3 14	2 57	2 37
28	6 00	5 42	5 23	5 02	4 49	4 34	4 16	3 53	3 43	3 30	3 16	3 00	2 40
July 2	6 01	5 43	5 25	5 03	4 50	4 36	4 18	3 56	3 45	3 33	3 19	3 03	2 44

BEGINNING OF MORNING TWILIGHT

Date	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr. 5	4 50	4 45	4 36	4 23	4 14	4 04	3 50	3 32	3 23	3 12	3 00	2 45	2 27
13	4 48	4 40	4 28	4 12	4 02	3 49	3 32	3 10	2 58	2 45	2 29	2 09	1 42
21	4 45	4 35	4 21	4 02	3 50	3 34	3 14	2 47	2 33	2 15	1 54	1 23	0 19
29	4 43	4 31	4 14	3 53	3 38	3 20	2 56	2 23	2 05	1 41	1 07		
May 7	4 41	4 27	4 09	3 44	3 27	3 06	2 39	1 58	1 33	0 57			
15	4 40	4 24	4 04	3 36	3 18	2 54	2 22	1 31	0 54				
23	4 40	4 22	4 00	3 30	3 10	2 44	2 07	1 01					
31	4 40	4 21	3 57	3 25	3 04	2 35	1 54	0 13					
June 8	4 41	4 21	3 56	3 23	3 00	2 30	1 45						
16	4 42	4 22	3 57	3 22	2 59	2 28	1 40						
24	4 44	4 24	3 58	3 24	3 00	2 29	1 41						
July 2	4 46	4 26	4 01	3 27	3 04	2 34	1 48						
10	4 47	4 28	4 04	3 32	3 10	2 41	1 59						

SUNSET, 2024

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82º.5 - λ) mins. or deduct 4 x (λ - 82º.5) mins. as the station is west or east of 82º.5 E. Longitude**.**

Date \ Lat.		0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr.	1	18 07	18 11	18 14	18 19	18 21	18 24	18 28	18 32	18 34	18 36	18 39	18 41	18 44
	5	18 06	18 10	18 15	18 21	18 25	18 28	18 33	18 38	18 41	18 44	18 47	18 50	18 54
	9	18 05	18 10	18 17	18 24	18 28	18 33	18 38	18 45	18 48	18 51	18 55	18 59	19 04
	13	18 04	18 10	18 18	18 26	18 31	18 37	18 43	18 51	18 55	18 59	19 03	19 08	19 14
	17	18 03	18 11	18 19	18 29	18 34	18 41	18 48	18 57	19 01	19 06	19 11	19 17	19 24
	21	18 02	18 11	18 20	18 31	18 37	18 45	18 53	19 04	19 08	19 14	19 19	19 26	19 34
	25	18 01	18 11	18 21	18 34	18 41	18 49	18 58	19 10	19 15	19 21	19 28	19 35	19 44
	29	18 01	18 11	18 23	18 36	18 44	18 53	19 03	19 16	19 22	19 28	19 36	19 44	19 53
May	3	18 00	18 12	18 24	18 39	18 47	18 57	19 08	19 22	19 29	19 36	19 44	19 53	20 03
	7	18 00	18 12	18 26	18 41	18 50	19 01	19 13	19 28	19 35	19 43	19 52	20 02	20 13
	11	18 00	18 13	18 27	18 44	18 54	19 05	19 18	19 34	19 42	19 50	20 00	20 10	20 23
	15	18 00	18 14	18 29	18 47	18 57	19 09	19 23	19 40	19 48	19 57	20 07	20 19	20 32
	19	18 00	18 15	18 31	18 49	19 00	19 12	19 27	19 45	19 54	20 03	20 14	20 27	20 42
	23	18 00	18 16	18 32	18 52	19 03	19 16	19 31	19 50	19 59	20 10	20 21	20 35	20 50
	27	18 01	18 17	18 34	18 54	19 06	19 19	19 35	19 55	20 05	20 15	20 28	20 42	20 59
	31	18 01	18 18	18 36	18 56	19 08	19 22	19 39	20 00	20 09	20 21	20 33	20 48	21 06
June	4	18 02	18 19	18 37	18 58	19 11	19 25	19 42	20 03	20 14	20 25	20 39	20 54	21 13
	8	18 03	18 20	18 38	19 00	19 13	19 27	19 45	20 07	20 17	20 29	20 43	20 59	21 18
	12	18 04	18 21	18 40	19 02	19 14	19 29	19 47	20 09	20 20	20 32	20 46	21 03	21 23
	16	18 04	18 22	18 41	19 03	19 16	19 31	19 49	20 11	20 22	20 35	20 49	21 06	21 26
	20	18 05	18 23	18 42	19 04	19 17	19 32	19 50	20 13	20 24	20 36	20 50	21 07	21 28
	24	18 06	18 24	18 43	19 05	19 18	19 33	19 51	20 13	20 24	20 36	20 51	21 07	21 28
	28	18 07	18 24	18 43	19 05	19 18	19 33	19 51	20 13	20 24	20 36	20 50	21 07	21 27
July	2	18 08	18 25	18 44	19 05	19 18	19 33	19 50	20 12	20 23	20 35	20 48	21 04	21 24

END OF EVENING TWILIGHT

		h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Apr.	5	19 15	19 21	19 30	19 43	19 52	20 03	20 17	20 35	20 44	20 55	21 08	21 23	21 42
	13	19 13	19 22	19 33	19 49	20 00	20 13	20 30	20 53	21 05	21 18	21 35	21 56	22 24
	21	19 12	19 23	19 37	19 56	20 08	20 24	20 45	21 13	21 27	21 45	22 08	22 40	
	29	19 12	19 24	19 41	20 03	20 17	20 36	21 00	21 34	21 53	22 17	22 54		
May	7	19 12	19 26	19 45	20 10	20 27	20 48	21 16	21 58	22 23	23 03			
	15	19 13	19 29	19 50	20 17	20 36	21 00	21 32	22 25	23 04				
	23	19 14	19 32	19 54	20 24	20 45	21 11	21 48	22 57					
	31	19 16	19 35	19 58	20 31	20 52	21 21	22 03						
June	8	19 18	19 37	20 02	20 36	20 59	21 29	22 14						
	16	19 20	19 40	20 05	20 40	21 03	21 34	22 22						
	24	19 21	19 41	20 07	20 41	21 05	21 36	22 24						
July	2	19 23	19 42	20 07	20 41	21 04	21 34	22 20						
	10	19 23	19 42	20 06	20 39	21 01	21 29	22 11						

SUNRISE, 2024

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING
OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

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Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 2	6 01	5 43	5 25	5 03	4 50	4 36	4 18	3 56	3 45	3 33	3 19	3 03	2 44
6	6 01	5 44	5 26	5 05	4 52	4 38	4 20	3 59	3 49	3 37	3 23	3 08	2 49
10	6 02	5 45	5 27	5 07	4 54	4 40	4 23	4 03	3 53	3 41	3 28	3 13	2 55
14	6 02	5 46	5 29	5 09	4 57	4 43	4 27	4 07	3 57	3 46	3 34	3 19	3 02
18	6 03	5 47	5 30	5 11	5 00	4 46	4 31	4 11	4 02	3 52	3 40	3 26	3 10
22	6 03	5 48	5 32	5 13	5 02	4 50	4 35	4 16	4 07	3 58	3 46	3 34	3 18
26	6 03	5 49	5 33	5 16	5 05	4 53	4 39	4 21	4 13	4 04	3 53	3 41	3 27
30	6 03	5 49	5 35	5 18	5 08	4 57	4 43	4 27	4 19	4 10	4 01	3 49	3 37
Aug. 3	6 03	5 50	5 36	5 20	5 11	5 00	4 48	4 32	4 25	4 17	4 08	3 58	3 46
7	6 02	5 50	5 38	5 23	5 14	5 04	4 52	4 38	4 32	4 24	4 16	4 06	3 56
11	6 02	5 51	5 39	5 25	5 17	5 08	4 57	4 44	4 38	4 31	4 24	4 15	4 05
15	6 01	5 51	5 40	5 28	5 20	5 12	5 02	4 50	4 44	4 38	4 31	4 24	4 15
19	6 00	5 51	5 41	5 30	5 23	5 16	5 07	4 56	4 51	4 45	4 39	4 32	4 24
23	5 59	5 51	5 42	5 32	5 26	5 19	5 11	5 02	4 57	4 52	4 47	4 41	4 34
27	5 58	5 51	5 43	5 34	5 29	5 23	5 16	5 08	5 04	5 00	4 55	4 50	4 44
31	5 57	5 51	5 44	5 37	5 32	5 27	5 21	5 14	5 10	5 07	5 03	4 58	4 53
Sept. 4	5 56	5 51	5 45	5 39	5 35	5 31	5 26	5 20	5 17	5 14	5 10	5 07	5 02
8	5 54	5 50	5 46	5 41	5 38	5 35	5 31	5 26	5 23	5 21	5 18	5 15	5 12
12	5 53	5 50	5 47	5 43	5 41	5 38	5 35	5 32	5 30	5 28	5 26	5 24	5 21
16	5 52	5 50	5 48	5 45	5 44	5 42	5 40	5 38	5 36	5 35	5 34	5 32	5 31
20	5 50	5 49	5 48	5 47	5 47	5 46	5 45	5 44	5 43	5 42	5 42	5 41	5 40
24	5 49	5 49	5 49	5 50	5 50	5 50	5 50	5 50	5 50	5 50	5 50	5 49	5 49
28	5 47	5 49	5 50	5 52	5 53	5 53	5 54	5 56	5 56	5 57	5 57	5 58	5 59
Oct. 2	5 46	5 49	5 51	5 54	5 56	5 57	5 59	6 02	6 03	6 04	6 05	6 07	6 08

BEGINNING OF MORNING TWILIGHT

Date	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 2	4 46	4 26	4 01	3 27	3 04	2 34	1 48						
10	4 47	4 28	4 04	3 32	3 10	2 41	1 59						
18	4 49	4 31	4 08	3 38	3 17	2 51	2 13	1 00					
26	4 50	4 34	4 13	3 44	3 25	3 01	2 28	1 33	0 49				
Aug. 3	4 51	4 36	4 17	3 51	3 34	3 13	2 44	2 00	1 33	0 47			
11	4 51	4 38	4 21	3 58	3 43	3 24	2 59	2 24	2 04	1 38	0 55		
19	4 50	4 39	4 25	4 05	3 52	3 35	3 14	2 45	2 30	2 11	1 46	1 09	
27	4 48	4 40	4 28	4 11	4 00	3 46	3 28	3 04	2 52	2 38	2 20	1 58	1 26
Sept. 4	4 46	4 40	4 31	4 17	4 08	3 56	3 41	3 22	3 12	3 01	2 48	2 31	2 11
12	4 44	4 40	4 33	4 22	4 15	4 06	3 54	3 38	3 30	3 21	3 11	2 59	2 44
20	4 41	4 40	4 35	4 27	4 22	4 15	4 05	3 53	3 47	3 40	3 32	3 23	3 12
28	4 39	4 39	4 37	4 32	4 28	4 23	4 16	4 07	4 02	3 57	3 51	3 44	3 36
Oct. 6	4 36	4 39	4 39	4 37	4 35	4 31	4 27	4 20	4 17	4 13	4 09	4 04	3 58

SUNSET, 2024

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

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Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 2	18 08	18 25	18 44	19 05	19 18	19 33	19 50	20 12	20 23	20 35	20 48	21 04	21 24
6	18 08	18 25	18 44	19 05	19 17	19 32	19 49	20 10	20 21	20 32	20 46	21 01	21 20
10	18 09	18 26	18 43	19 04	19 16	19 30	19 47	20 08	20 18	20 29	20 42	20 57	21 15
14	18 10	18 26	18 43	19 03	19 15	19 28	19 44	20 05	20 14	20 25	20 37	20 51	21 08
18	18 10	18 25	18 42	19 01	19 13	19 26	19 41	20 01	20 10	20 20	20 32	20 45	21 01
22	18 10	18 25	18 41	18 59	19 10	19 23	19 38	19 56	20 05	20 14	20 25	20 38	20 53
26	18 10	18 24	18 40	18 57	19 08	19 19	19 34	19 51	19 59	20 08	20 19	20 30	20 44
30	18 10	18 23	18 38	18 55	19 04	19 16	19 29	19 45	19 53	20 01	20 11	20 22	20 35
Aug. 3	18 10	18 22	18 36	18 52	19 01	19 11	19 24	19 39	19 46	19 54	20 03	20 13	20 25
7	18 09	18 21	18 34	18 48	18 57	19 07	19 18	19 32	19 39	19 46	19 54	20 04	20 14
11	18 09	18 19	18 31	18 45	18 53	19 02	19 12	19 25	19 31	19 38	19 46	19 54	20 04
15	18 08	18 18	18 29	18 41	18 48	18 56	19 06	19 18	19 23	19 29	19 36	19 44	19 52
19	18 07	18 16	18 26	18 37	18 43	18 51	19 00	19 10	19 15	19 21	19 27	19 33	19 41
23	18 06	18 14	18 23	18 33	18 38	18 45	18 53	19 02	19 07	19 11	19 17	19 23	19 30
27	18 05	18 12	18 19	18 28	18 33	18 39	18 46	18 54	18 58	19 02	19 07	19 12	19 18
31	18 04	18 09	18 16	18 23	18 28	18 33	18 39	18 46	18 49	18 53	18 56	19 01	19 06
Sept. 4	18 02	18 07	18 12	18 19	18 22	18 26	18 31	18 37	18 40	18 43	18 46	18 50	18 54
8	18 01	18 05	18 09	18 14	18 17	18 20	18 24	18 28	18 31	18 33	18 36	18 39	18 42
12	17 59	18 02	18 05	18 09	18 11	18 13	18 16	18 20	18 21	18 23	18 25	18 27	18 30
16	17 58	18 00	18 02	18 04	18 05	18 07	18 09	18 11	18 12	18 13	18 14	18 16	18 17
20	17 57	17 57	17 58	17 59	17 59	18 00	18 01	18 02	18 03	18 03	18 04	18 04	18 05
24	17 55	17 55	17 54	17 54	17 54	17 54	17 53	17 53	17 53	17 53	17 53	17 53	17 53
28	17 54	17 52	17 51	17 49	17 48	17 47	17 46	17 45	17 44	17 43	17 43	17 42	17 41
Oct. 2	17 52	17 50	17 47	17 44	17 42	17 40	17 38	17 36	17 35	17 33	17 32	17 31	17 29

END OF EVENING TWILIGHT

	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 2	19 23	19 42	20 07	20 41	21 04	21 34	22 20						
10	19 23	19 42	20 06	20 39	21 01	21 29	22 11						
18	19 24	19 41	20 04	20 34	20 55	21 21	21 58	23 08					
26	19 23	19 39	20 00	20 28	20 47	21 11	21 43	22 37	23 18				
Aug. 3	19 22	19 36	19 55	20 20	20 37	20 58	21 27	22 09	22 35	23 17			
11	19 20	19 33	19 49	20 12	20 26	20 45	21 09	21 44	22 03	22 28	23 07		
19	19 17	19 28	19 42	20 02	20 15	20 31	20 51	21 20	21 35	21 53	22 16	22 51	
27	19 14	19 23	19 35	19 51	20 02	20 16	20 33	20 57	21 08	21 22	21 40	22 01	22 31
Sept. 4	19 11	19 18	19 27	19 40	19 49	20 01	20 15	20 34	20 44	20 55	21 08	21 23	21 43
12	19 08	19 12	19 19	19 29	19 37	19 46	19 57	20 13	20 20	20 29	20 39	20 51	21 05
20	19 05	19 07	19 11	19 19	19 24	19 31	19 40	19 52	19 58	20 05	20 13	20 22	20 32
28	19 03	19 02	19 04	19 08	19 12	19 17	19 24	19 33	19 37	19 42	19 48	19 55	20 03
Oct. 6	19 00	18 57	18 57	18 59	19 01	19 04	19 08	19 15	19 18	19 21	19 26	19 31	19 36

SUNRISE, 2024

LOCAL MEAN TIME OF SUNRISE (SUN'S UPPER LIMB) AND BEGINNING
OF MORNING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

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Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 2	5 46	5 49	5 51	5 54	5 56	5 57	5 59	6 02	6 03	6 04	6 05	6 07	6 08
6	5 45	5 48	5 52	5 56	5 59	6 01	6 04	6 08	6 10	6 11	6 13	6 15	6 18
10	5 44	5 48	5 53	5 59	6 02	6 05	6 09	6 14	6 16	6 19	6 21	6 24	6 28
14	5 43	5 48	5 55	6 01	6 05	6 10	6 15	6 21	6 23	6 26	6 30	6 33	6 37
18	5 42	5 49	5 56	6 04	6 09	6 14	6 20	6 27	6 30	6 34	6 38	6 42	6 47
22	5 41	5 49	5 57	6 07	6 12	6 18	6 25	6 33	6 37	6 42	6 46	6 51	6 57
26	5 41	5 49	5 59	6 09	6 16	6 22	6 30	6 40	6 44	6 49	6 55	7 01	7 07
30	5 40	5 50	6 01	6 12	6 19	6 27	6 36	6 47	6 52	6 57	7 03	7 10	7 18
Nov. 3	5 40	5 51	6 02	6 16	6 23	6 31	6 41	6 53	6 59	7 05	7 12	7 19	7 28
7	5 40	5 52	6 05	6 19	6 27	6 36	6 47	7 00	7 06	7 13	7 20	7 29	7 38
11	5 41	5 53	6 07	6 22	6 31	6 41	6 52	7 07	7 13	7 20	7 29	7 38	7 48
15	5 41	5 55	6 09	6 25	6 35	6 45	6 58	7 13	7 20	7 28	7 37	7 47	7 58
19	5 42	5 56	6 11	6 28	6 38	6 50	7 03	7 19	7 27	7 36	7 45	7 56	8 08
23	5 43	5 58	6 14	6 32	6 42	6 54	7 08	7 26	7 34	7 43	7 53	8 04	8 18
27	5 44	6 00	6 16	6 35	6 46	6 59	7 13	7 31	7 40	7 50	8 00	8 13	8 27
Dec. 1	5 45	6 02	6 19	6 38	6 50	7 03	7 18	7 37	7 46	7 56	8 07	8 20	8 35
5	5 47	6 04	6 21	6 41	6 53	7 07	7 22	7 42	7 51	8 02	8 13	8 27	8 43
9	5 49	6 06	6 24	6 44	6 56	7 10	7 26	7 47	7 56	8 07	8 19	8 33	8 50
13	5 51	6 08	6 26	6 47	6 59	7 13	7 30	7 50	8 00	8 11	8 23	8 38	8 55
17	5 52	6 10	6 28	6 50	7 02	7 16	7 33	7 54	8 03	8 14	8 27	8 42	8 59
21	5 54	6 12	6 30	6 52	7 04	7 18	7 35	7 56	8 06	8 17	8 30	8 45	9 02
25	5 56	6 14	6 32	6 54	7 06	7 20	7 37	7 58	8 07	8 19	8 31	8 46	9 03
29	5 58	6 16	6 34	6 55	7 07	7 21	7 38	7 58	8 08	8 19	8 32	8 46	9 03
33	6 00	6 17	6 35	6 56	7 08	7 22	7 38	7 58	8 08	8 19	8 31	8 45	9 02

BEGINNING OF MORNING TWILIGHT

Date \ Lat.	0º	10º	20º	30º	35º	40º	45º	50º	52º	54º	56º	58º	60º
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 6	4 36	4 39	4 39	4 37	4 35	4 31	4 27	4 20	4 17	4 13	4 09	4 04	3 58
14	4 33	4 38	4 41	4 42	4 41	4 40	4 37	4 33	4 31	4 28	4 26	4 22	4 18
22	4 31	4 38	4 43	4 47	4 47	4 48	4 47	4 45	4 44	4 43	4 42	4 40	4 37
30	4 29	4 39	4 46	4 52	4 54	4 56	4 57	4 57	4 57	4 57	4 57	4 56	4 55
Nov. 7	4 29	4 40	4 49	4 57	5 00	5 04	5 06	5 09	5 10	5 11	5 11	5 12	5 12
15	4 28	4 41	4 53	5 02	5 07	5 11	5 16	5 20	5 22	5 23	5 25	5 27	5 28
23	4 29	4 44	4 57	5 08	5 14	5 19	5 25	5 30	5 33	5 35	5 38	5 40	5 43
Dec. 1	4 31	4 47	5 01	5 14	5 20	5 26	5 33	5 40	5 43	5 46	5 49	5 52	5 56
9	4 34	4 51	5 05	5 19	5 26	5 33	5 40	5 48	5 51	5 54	5 58	6 02	6 06
17	4 37	4 54	5 10	5 24	5 31	5 38	5 46	5 54	5 58	6 01	6 05	6 09	6 13
25	4 41	4 58	5 14	5 28	5 35	5 42	5 50	5 58	6 02	6 05	6 09	6 13	6 17
33	4 46	5 02	5 17	5 31	5 38	5 45	5 52	6 00	6 03	6 06	6 10	6 14	6 18
41	4 50	5 05	5 19	5 32	5 39	5 45	5 52	5 59	6 02	6 05	6 08	6 11	6 15

SUNSET, 2024

LOCAL MEAN TIME OF SUNSET (SUN'S UPPER LIMB) AND ENDING
OF EVENING TWILIGHT ON THE MERIDIAN OF GREENWICH

To obtain the standard time at any station, add four minutes for each degree if the station is west of the standard meridian, or deduct four minutes for each degree if the station is east of the standard meridian.

In India, to obtain I.S.T., add 4 x (82°.5 - λ) mins. or deduct 4 x (λ - 82°.5) mins. as the station is west or east of 82°.5 E. Longitude.

Date \ Lat.	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 2	17 52	17 50	17 47	17 44	17 42	17 40	17 38	17 36	17 35	17 33	17 32	17 31	17 29
6	17 51	17 48	17 44	17 39	17 37	17 34	17 31	17 27	17 26	17 24	17 22	17 19	17 17
10	17 50	17 45	17 40	17 35	17 31	17 28	17 24	17 19	17 17	17 14	17 11	17 08	17 05
14	17 49	17 43	17 37	17 30	17 26	17 22	17 17	17 10	17 08	17 05	17 01	16 58	16 53
18	17 48	17 41	17 34	17 26	17 21	17 16	17 10	17 02	16 59	16 55	16 51	16 47	16 42
22	17 48	17 40	17 31	17 22	17 16	17 10	17 03	16 55	16 51	16 46	16 42	16 36	16 31
26	17 47	17 38	17 29	17 18	17 12	17 05	16 57	16 47	16 43	16 38	16 32	16 26	16 19
30	17 47	17 37	17 26	17 14	17 08	17 00	16 51	16 40	16 35	16 29	16 23	16 16	16 09
Nov. 3	17 47	17 36	17 24	17 11	17 04	16 55	16 45	16 33	16 28	16 21	16 15	16 07	15 58
7	17 47	17 35	17 23	17 08	17 00	16 51	16 40	16 27	16 21	16 14	16 06	15 58	15 48
11	17 48	17 35	17 21	17 06	16 57	16 47	16 35	16 21	16 14	16 07	15 59	15 50	15 39
15	17 48	17 35	17 20	17 04	16 54	16 44	16 31	16 16	16 08	16 01	15 52	15 42	15 30
19	17 49	17 35	17 19	17 02	16 52	16 41	16 27	16 11	16 03	15 55	15 45	15 34	15 22
23	17 50	17 35	17 19	17 01	16 50	16 38	16 24	16 07	15 59	15 50	15 40	15 28	15 14
27	17 51	17 36	17 19	17 00	16 49	16 36	16 22	16 04	15 55	15 45	15 35	15 22	15 08
Dec. 1	17 53	17 37	17 19	17 00	16 48	16 35	16 20	16 01	15 52	15 42	15 31	15 18	15 02
5	17 54	17 38	17 20	17 00	16 48	16 35	16 19	15 59	15 50	15 40	15 28	15 14	14 58
9	17 56	17 39	17 21	17 00	16 48	16 35	16 18	15 58	15 49	15 38	15 26	15 12	14 55
13	17 58	17 41	17 22	17 01	16 49	16 35	16 19	15 58	15 48	15 37	15 25	15 10	14 53
17	18 00	17 43	17 24	17 03	16 50	16 36	16 20	15 59	15 49	15 38	15 25	15 11	14 53
21	18 02	17 44	17 26	17 05	16 52	16 38	16 21	16 00	15 51	15 39	15 27	15 12	14 54
25	18 04	17 47	17 28	17 07	16 54	16 40	16 24	16 03	15 53	15 42	15 29	15 14	14 57
29	18 06	17 49	17 30	17 09	16 57	16 43	16 26	16 06	15 56	15 45	15 33	15 18	15 01
33	18 08	17 51	17 33	17 12	17 00	16 46	16 30	16 10	16 00	15 50	15 37	15 23	15 07

END OF EVENING TWILIGHT

Date	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
Oct. 6	19 00	18 57	18 57	18 59	19 01	19 04	19 08	19 15	19 18	19 21	19 26	19 31	19 36
14	18 59	18 54	18 51	18 50	18 50	18 52	18 54	18 58	19 00	19 02	19 05	19 08	19 12
22	18 58	18 51	18 45	18 42	18 41	18 41	18 41	18 43	18 44	18 45	18 46	18 48	18 50
30	18 58	18 48	18 41	18 35	18 33	18 31	18 30	18 29	18 29	18 29	18 29	18 30	18 31
Nov. 7	18 59	18 48	18 38	18 30	18 27	18 23	18 20	18 18	18 17	18 16	18 15	18 14	18 14
15	19 01	18 48	18 36	18 26	18 22	18 17	18 13	18 09	18 07	18 05	18 03	18 02	18 00
23	19 04	18 49	18 36	18 25	18 19	18 13	18 08	18 02	18 00	17 57	17 55	17 52	17 49
Dec. 1	19 07	18 51	18 37	18 24	18 18	18 11	18 05	17 58	17 55	17 52	17 49	17 46	17 42
9	19 11	18 54	18 39	18 26	18 19	18 12	18 04	17 57	17 54	17 50	17 47	17 43	17 39
17	19 15	18 58	18 43	18 28	18 21	18 14	18 06	17 58	17 55	17 51	17 47	17 43	17 39
25	19 19	19 02	18 47	18 32	18 25	18 18	18 10	18 02	17 59	17 55	17 51	17 47	17 43
33	19 23	19 06	18 51	18 37	18 30	18 23	18 16	18 09	18 05	18 02	17 58	17 55	17 50
41	19 25	19 10	18 56	18 43	18 36	18 30	18 24	18 17	18 14	18 11	18 08	18 04	18 01

DURATION OF TWILIGHT, 2024
MORNING AND EVENING TWILIGHT: CIVIL (6º), NAUTICAL (12º)
AND ASTRONOMICAL (18º)

Date	Lat.	0º Civ.	0º Nt.	0º Ast.	10º Civ.	10º Nt.	10º Ast.	20º Civ.	20º Nt.	20º Ast.	30º Civ.	30º Nt.	30º Ast.	40º Civ.	40º Nt.	40º Ast.
		m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
Jan.	1	23	49	75	23	49	75	24	51	79	26	56	85	30	64	97
	9	22	48	74	23	49	75	24	51	78	26	56	85	30	64	96
	17	22	48	74	22	48	74	24	51	77	26	55	84	30	63	95
	25	22	47	73	22	48	73	23	50	76	25	54	83	29	62	94
Feb.	2	22	47	72	22	47	73	23	49	76	25	54	82	29	61	93
	10	21	46	71	22	47	72	23	49	75	25	53	81	28	60	92
	18	21	46	70	21	46	71	22	48	74	24	52	80	28	59	91
	26	21	45	70	21	46	70	22	48	74	24	52	80	27	59	90
Mar.	5	21	45	69	21	46	70	22	48	73	24	52	79	27	59	90
	13	21	45	69	21	45	70	22	48	73	24	52	80	27	58	90
	21	21	45	69	21	45	70	22	48	73	24	52	80	27	59	91
	29	21	45	69	21	46	70	22	48	74	24	52	81	27	59	92
Apr.	6	21	45	69	21	46	71	22	48	75	24	53	82	28	61	95
	14	21	45	70	21	46	71	23	49	76	25	54	83	28	62	97
	22	21	46	70	22	47	72	23	50	77	25	55	85	29	63	100
	30	21	46	71	22	47	73	23	50	77	25	55	87	29	65	103
May	8	22	47	72	22	48	74	23	51	79	26	57	89	30	67	108
	16	22	47	73	22	49	75	24	52	81	26	58	91	31	69	112
	24	22	48	74	23	49	76	24	53	82	27	59	93	32	71	116
June	1	22	48	74	23	50	77	24	53	83	27	60	95	32	73	119
	9	23	49	75	23	50	77	25	54	84	27	61	96	33	74	122
	17	23	49	75	23	50	78	25	54	84	28	61	97	33	75	123
	25	23	49	75	23	50	78	25	54	84	27	61	97	33	75	123
July	3	23	49	75	23	50	77	24	54	84	27	60	96	33	74	122
	11	22	48	74	23	50	77	24	53	83	27	60	95	32	73	119
	19	22	48	74	23	49	76	24	53	82	27	59	93	32	71	115
	27	22	47	73	22	49	75	24	52	80	26	58	91	31	69	111
Aug.	4	22	47	72	22	48	74	23	51	79	26	56	88	30	67	106
	12	21	46	71	22	47	73	23	50	78	25	55	86	29	65	103
	20	21	46	70	22	47	72	23	49	76	25	54	85	29	63	99
	28	21	45	70	21	46	71	22	49	75	25	53	83	28	61	96
Sept.	5	21	45	69	21	46	71	22	48	74	24	53	82	28	60	94
	13	21	45	69	21	46	70	22	48	74	24	52	81	27	59	92
	21	21	45	69	21	45	70	22	48	73	24	52	80	27	59	91
	29	21	45	69	21	45	70	22	48	73	24	52	79	27	58	90
Oct.	7	21	45	69	21	46	70	22	48	73	24	52	79	27	58	90
	15	21	45	70	21	46	70	22	48	74	24	52	80	27	59	90
	23	21	46	70	21	46	71	22	48	74	24	52	80	28	59	91
	31	21	46	71	22	47	72	23	49	75	25	53	81	28	60	92
Nov.	8	22	47	72	22	47	73	23	49	76	25	54	82	29	61	93
	16	22	47	73	22	48	73	23	50	76	25	54	83	29	62	94
	24	22	48	74	22	48	74	24	51	77	26	55	84	30	63	95
Dec.	2	22	48	74	23	49	75	24	51	78	26	56	85	30	64	96
	10	23	49	75	23	49	75	24	51	78	26	56	85	30	64	97
	18	23	49	75	23	49	75	24	52	79	26	56	86	31	65	98
	26	23	49	75	23	49	75	24	52	79	26	56	85	31	65	98
	34	23	49	75	23	49	75	24	51	78	26	56	85	30	64	97

DURATION OF TWILIGHT, 2024
MORNING AND EVENING TWILIGHT: CIVIL (6º), NAUTICAL (12º)
AND ASTRONOMICAL (18º)

Date	Lat.	45º Civ.	45º Nt.	45º Ast.	50º Civ.	50º Nt.	50º Ast.	55º Civ.	55º Nt.	55º Ast.	60º Civ.	60º Nt.	60º Ast.
		m	m	m	m	m	m	m	m	m	m	m	m
Jan.	0	34	71	106	38	80	119	45	93	137	57	113	165
	8	33	70	105	38	78	117	44	91	135	55	111	161
	16	33	69	104	37	77	116	43	88	132	52	106	156
	24	32	68	102	36	75	113	41	86	129	50	102	151
Feb.	1	31	67	101	35	74	112	40	84	126	48	98	147
	9	31	65	100	34	72	110	39	82	124	45	95	143
	17	30	64	98	33	71	108	38	80	122	44	92	140
	25	30	64	98	33	70	108	37	79	121	42	91	139
Mar.	5	29	63	98	32	70	108	36	78	121	42	90	140
	13	29	64	98	32	70	108	36	79	121	42	90	142
	21	29	64	99	32	71	110	36	80	125	42	92	147
	29	30	65	101	33	72	113	37	81	130	43	95	155
Apr.	6	30	66	104	33	74	117	38	85	137	44	100	169
	14	31	68	108	34	77	123	39	89	147	46	107	193
	22	32	70	112	35	80	130	41	94	161	50	119	**
	30	32	72	117	36	83	139	43	100	184	53	135	**
May	8	33	76	123	38	88	151	46	110	**	59	169	**
	16	35	79	130	40	93	167	49	121	**	65	**	**
	24	36	82	137	42	99	188	52	136	**	74	**	**
June	1	36	84	144	43	104	**	54	156	**	85	**	**
	9	37	86	150	44	108	**	57	194	**	96	**	**
	17	37	87	153	45	110	**	58	**	**	106	**	**
	25	37	87	153	45	110	**	58	**	**	105	**	**
July	3	37	86	150	44	107	**	57	187	**	95	**	**
	11	36	84	144	43	103	**	54	154	**	83	**	**
	19	35	81	137	41	98	186	51	134	**	73	**	**
	27	34	78	129	40	93	165	48	120	**	64	**	**
Aug.	4	33	75	123	38	87	149	45	109	**	58	165	**
	12	32	72	116	36	82	138	42	100	182	53	134	**
	20	31	69	111	35	79	129	41	93	160	49	118	**
	28	31	67	107	34	76	122	39	88	146	46	107	192
Sept.	5	30	66	104	33	74	117	38	84	136	44	100	168
	13	30	65	101	33	72	113	37	81	130	43	95	155
	21	29	64	99	32	71	110	36	79	125	42	92	147
	29	29	63	98	32	70	108	36	78	122	41	90	142
Oct.	7	29	63	97	32	70	107	36	78	121	42	90	139
	15	30	64	98	33	70	107	37	78	121	42	90	139
	23	30	64	98	33	71	108	37	80	121	43	92	140
	31	31	65	99	34	72	109	38	81	123	45	94	142
Nov.	8	31	66	101	35	74	111	40	84	126	47	98	146
	16	32	68	102	36	75	113	41	86	129	50	102	151
	24	33	69	104	37	77	116	43	88	132	52	106	156
Dec.	2	33	70	105	38	78	117	44	91	135	55	110	161
	10	34	71	106	38	80	119	45	92	137	57	113	164
	18	34	71	107	39	80	120	46	93	138	58	115	166
	26	34	71	107	38	80	119	46	93	138	58	114	166
	34	34	71	106	38	79	119	45	92	136	56	112	163

SUNRISE, SUNSET AND TWILIGHT, 2024
CORRECTION FOR SOUTHERN LATITUDES

For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add
July	Dec.	m	Aug.	Feb.	m	Sept.	Mar.	m	Oct.	Apr.	m	Nov.	May	m
1	31	+1	7	3	-8	12	10	-14	19	16	-15	26	25	-10
July	Jan.		8	4	8	13	11	14	20	17	15	27	26	9
2	0	+1	9	5	9	14	12	14	21	18	15	28	27	9
3	1	0	10	6	9	15	13	14	22	19	15	29	28	9
4	2	0	11	7	9	16	14	14	23	20	15	30	29	9
5	3	0	12	8	9	17	15	15	24	21	14	Dec.	May	
6	4	-1	13	9	9	18	16	15	25	22	14	1	30	8
7	5	1	14	10	10	19	17	15	26	23	14	2	31	8
8	6	1	15	11	10	20	18	15	27	24	14	Dec.	June	
9	7	1	16	12	10	21	19	15	28	25	14	3	1	8
10	8	2	17	13	10	22	20	15	29	26	14	4	2	8
11	9	2	18	14	10	23	21	15	30	27	14	5	3	7
12	10	2	19	15	11	24	22	15	31	28	14	6	5	7
13	11	2	20	16	11	25	23	15	Nov.	Apr.		7	6	7
14	12	3	21	17	11	26	24	15	1	29	14	8	7	7
15	13	3	22	18	11	27	25	15	2	30	14	9	8	6
16	14	3	23	19	11	28	26	15	Nov.	May		10	9	6
17	15	3	24	19	12	29	26	15	3	1	13	11	10	6
18	16	3	25	20	12	30	27	15	4	2	13	12	11	6
19	16	4	26	21	12	Oct.	Mar.		5	3	13	13	12	5
20	17	4	27	22	12	1	28	15	6	4	13	14	13	5
21	18	4	28	23	12	2	29	15	7	5	13	15	14	5
22	19	4	29	24	12	3	30	15	8	6	13	16	15	5
23	20	5	30	25	13	4	31	15	9	7	13	17	16	4
24	21	5	31	26	13	Oct.	Apr.		10	8	12	18	17	4
25	22	5	Sept.	Feb.		5	1	16	11	9	12	19	18	4
26	23	6	1	27	13	6	2	16	12	10	12	20	19	4
27	24	6	2	28	13	7	3	16	13	11	12	21	21	3
28	25	6				8	4	15	14	12	12	22	22	3
29	26	6	Sept.	Mar.		9	5	15	15	13	12	23	23	3
30	27	7	3	1	13	10	6	15	16	14	12	24	24	3
31	28	7	4	2	13	11	7	15	17	15	11	25	25	2
Aug.	Jan.		5	3	13	12	9	15	18	17	11	26	26	2
1	29	7	6	4	14	13	10	15	19	18	11	27	27	2
2	30	7	7	5	14	14	11	15	20	19	11	28	28	2
3	30	7	8	6	14	15	12	15	21	20	11	29	29	1
4	31	8	9	7	14	16	13	15	22	21	10	30	30	1
Aug.	Feb.		10	8	14	17	14	15	23	22	10	Dec.	July	
5	1	8	11	9	14	18	15	15	24	23	10	31	1	-1
6	2	-8	12	10	-14	19	16	-15	25	24	-10	32	2	0

To obtain the times of sunrise, sunset and twilight for southern latitudes for any date, use the tables for the same northern latitude for the corresponding date given above, and apply to the times so obtained the correction given in the column headed 'Add'.

In the case of duration of twilight, however, take only the figures for the corresponding date without correction.

SUNRISE, SUNSET AND TWILIGHT, 2024
CORRECTION FOR SOUTHERN LATITUDES

For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add	For	Use	Add
Jan.	July	m	Feb.	Aug.	m	Mar.	Sept.	m	Apr.	Oct.	m	May	Nov.	m
0	1	0	5	9	+9	13	15	+14	19	22	+15	25	26	+10
1	3	0	6	10	9	14	16	14	20	23	15	26	27	9
2	4	0	7	11	9	15	17	14	21	24	14	27	28	9
			8	12	9	16	18	15	22	25	14	28	29	9
3	5	0	9	13	9	17	19	15	23	26	14	29	30	9
4	6	+1	10	14	10	18	20	15	24	27	14	May	Dec.	
5	7	1	11	15	10	19	21	15	25	28	14	30	1	8
6	8	1	12	16	10	20	22	15	26	29	14	31	2	8
7	9	1	13	17	10	21	23	15	27	30	14	June	Dec.	
8	10	2	14	18	10	22	24	15	28	31	14	1	3	8
9	11	2	15	19	11	23	25	15	Apr.	Nov.		2	4	8
10	12	2	16	20	11	24	26	15	29	1	14	3	5	7
11	13	2	17	21	11	25	27	15	30	2	14	4	5	7
12	14	3	18	22	11	26	29	15	May	Nov.		5	6	7
13	15	3	19	23	11	27	30	15	1	3	13	6	7	7
14	16	3	20	25	12	Mar.	Oct.		2	4	13	7	8	7
15	17	3	21	26	12	28	1	15	3	5	13	8	9	6
16	18	4	22	27	12	29	2	15	4	6	13	9	10	6
17	19	4	23	28	12	30	3	15	5	7	13	10	11	6
18	21	4	24	29	12	31	4	16	6	8	13	11	12	6
19	22	5	25	30	13	Apr.	Oct.		7	9	13	12	13	5
20	23	5	26	31	13	1	5	16	8	10	12	13	14	5
21	24	5				2	6	16	9	11	12	14	15	5
22	25	5	Feb.	Sept.		3	7	16	10	12	12	15	16	5
23	26	6	27	1	13	4	7	15	11	13	12	16	17	4
24	27	6	28	2	13	5	8	15	12	14	12	17	18	4
25	28	6	Mar.	Sept.		6	9	15	13	15	12	18	19	4
26	29	6	1	3	13	7	10	15	14	16	12	19	20	4
27	30	7	2	4	13	8	11	15	15	16	11	20	21	3
28	31	7	3	5	13	9	12	15	16	17	11	21	21	3
Jan.	Aug.		4	6	14	10	13	15	17	18	11	22	22	3
29	1	7	5	7	14	11	14	15	18	19	11	23	23	3
30	2	7	6	8	14	12	15	15	19	20	11	24	24	3
31	3	7	7	9	14	13	16	15	20	21	11	25	25	2
Feb.	Aug.		8	10	14	14	17	15	21	22	10	26	26	2
1	5	8	9	11	14	15	18	15	22	23	10	27	27	2
2	6	8	10	12	14	16	19	15	23	24	10	28	28	1
3	7	8	11	13	14	17	20	15	24	25	10	29	29	1
4	8	+9	12	14	+14	18	21	+15	25	26	+10	30	30	+1

To obtain the times of sunrise, sunset and twilight for southern latitudes for any date, use the tables for the same northern latitude for the corresponding date given above, and apply to the times so obtained the correction given in the column headed 'Add'.

In the case of duration of twilight, however, take only the figures for the corresponding date without correction.

SUNRISE AND SUNSET, 2024

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date	Kolkata 22° N 32'				Varanasi 25° N 18'				Chennai 13° N 00'				Delhi 28° N 35'				Mumbai 18° N 54'			
	Rise		Set		Rise		Set		Rise		Set		Rise		Set		Rise		Set	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Jan. 1	6	16.5	17	03.2	6	43.5	17	18.9	6	31.1	17	53.4	7	14.2	17	35.0	7	12.0	18	11.9
3	6	17.1	17	04.5	6	44.1	17	20.3	6	31.8	17	54.5	7	14.7	17	36.4	7	12.6	18	13.1
5	6	17.7	17	05.8	6	44.6	17	21.7	6	32.5	17	55.6	7	15.1	17	37.9	7	13.2	18	14.3
7	6	18.1	17	07.2	6	44.9	17	23.1	6	33.2	17	56.7	7	15.4	17	39.4	7	13.8	18	15.6
9	6	18.5	17	08.5	6	45.2	17	24.5	6	33.8	17	57.8	7	15.6	17	40.9	7	14.2	18	16.9
11	6	18.7	17	09.9	6	45.4	17	26.0	6	34.3	17	58.9	7	15.7	17	42.5	7	14.6	18	18.1
13	6	18.9	17	11.4	6	45.5	17	27.5	6	34.7	18	00.0	7	15.7	17	44.1	7	14.9	18	19.4
15	6	19.0	17	12.8	6	45.5	17	29.0	6	35.1	18	01.1	7	15.5	17	45.7	7	15.1	18	20.7
17	6	19.0	17	14.2	6	45.4	17	30.5	6	35.4	18	02.2	7	15.3	17	47.3	7	15.2	18	22.0
19	6	18.9	17	15.6	6	45.2	17	32.0	6	35.7	18	03.2	7	14.9	17	49.0	7	15.2	18	23.2
21	6	18.7	17	17.0	6	44.9	17	33.6	6	35.8	18	04.2	7	14.5	17	50.6	7	15.2	18	24.5
23	6	18.4	17	18.4	6	44.4	17	35.1	6	35.9	18	05.2	7	13.9	17	52.3	7	15.0	18	25.7
25	6	18.0	17	19.8	6	43.9	17	36.6	6	36.0	18	06.2	7	13.2	17	53.9	7	14.8	18	27.0
27	6	17.6	17	21.2	6	43.3	17	38.1	6	35.9	18	07.1	7	12.5	17	55.6	7	14.5	18	28.2
29	6	17.0	17	22.6	6	42.6	17	39.6	6	35.8	18	08.0	7	11.6	17	57.2	7	14.1	18	29.4
31	6	16.4	17	23.9	6	41.8	17	41.0	6	35.6	18	08.9	7	10.6	17	58.8	7	13.6	18	30.5
Feb. 2	6	15.6	17	25.2	6	41.0	17	42.5	6	35.3	18	09.7	7	09.5	18	00.4	7	13.1	18	31.6
4	6	14.8	17	26.5	6	40.0	17	43.9	6	34.9	18	10.5	7	08.3	18	02.0	7	12.4	18	32.7
6	6	13.9	17	27.7	6	38.9	17	45.3	6	34.5	18	11.3	7	07.1	18	03.6	7	11.7	18	33.8
8	6	13.0	17	29.0	6	37.8	17	46.7	6	34.0	18	12.0	7	05.7	18	05.1	7	10.9	18	34.8
10	6	11.9	17	30.2	6	36.6	17	48.0	6	33.5	18	12.7	7	04.3	18	06.7	7	10.0	18	35.8
12	6	10.8	17	31.3	6	35.3	17	49.3	6	32.9	18	13.3	7	02.8	18	08.2	7	09.1	18	36.8
14	6	09.6	17	32.5	6	33.9	17	50.6	6	32.2	18	13.9	7	01.2	18	09.7	7	08.1	18	37.7
16	6	08.4	17	33.6	6	32.5	17	51.9	6	31.5	18	14.5	6	59.5	18	11.1	7	07.0	18	38.6
18	6	07.1	17	34.6	6	30.9	17	53.1	6	30.7	18	15.0	6	57.8	18	12.6	7	05.9	18	39.5
20	6	05.7	17	35.7	6	29.4	17	54.3	6	29.8	18	15.5	6	56.0	18	14.0	7	04.7	18	40.3
22	6	04.3	17	36.7	6	27.8	17	55.4	6	28.9	18	16.0	6	54.1	18	15.4	7	03.5	18	41.1
24	6	02.8	17	37.7	6	26.1	17	56.6	6	27.9	18	16.4	6	52.2	18	16.8	7	02.1	18	41.9
26	6	01.3	17	38.6	6	24.3	17	57.7	6	26.9	18	16.8	6	50.2	18	18.1	7	00.8	18	42.6
28	5	59.7	17	39.5	6	22.6	17	58.8	6	25.9	18	17.1	6	48.2	18	19.4	6	59.4	18	43.4
Mar. 1	5	58.1	17	40.4	6	20.7	17	59.8	6	24.8	18	17.5	6	46.1	18	20.7	6	57.9	18	44.0
3	5	56.4	17	41.3	6	18.9	18	00.9	6	23.7	18	17.8	6	44.0	18	22.0	6	56.5	18	44.7
5	5	54.7	17	42.1	6	17.0	18	01.9	6	22.5	18	18.0	6	41.8	18	23.3	6	54.9	18	45.3
7	5	53.0	17	43.0	6	15.0	18	02.8	6	21.4	18	18.3	6	39.6	18	24.5	6	53.4	18	45.9
9	5	51.2	17	43.8	6	13.1	18	03.8	6	20.1	18	18.5	6	37.4	18	25.7	6	51.8	18	46.5
11	5	49.4	17	44.5	6	11.1	18	04.8	6	18.9	18	18.7	6	35.2	18	26.9	6	50.2	18	47.1
13	5	47.6	17	45.3	6	09.1	18	05.7	6	17.6	18	18.9	6	32.9	18	28.1	6	48.5	18	47.6
15	5	45.8	17	46.0	6	07.1	18	06.6	6	16.4	18	19.1	6	30.6	18	29.3	6	46.9	18	48.2
17	5	43.9	17	46.8	6	05.0	18	07.5	6	15.1	18	19.3	6	28.3	18	30.4	6	45.2	18	48.7
19	5	42.0	17	47.5	6	03.0	18	08.4	6	13.8	18	19.4	6	26.0	18	31.6	6	43.5	18	49.2
21	5	40.1	17	48.2	6	01.0	18	09.3	6	12.5	18	19.5	6	23.7	18	32.7	6	41.8	18	49.7
23	5	38.2	17	48.9	5	58.9	18	10.2	6	11.1	18	19.7	6	21.4	18	33.9	6	40.1	18	50.2
25	5	36.3	17	49.6	5	56.9	18	11.1	6	09.8	18	19.8	6	19.1	18	35.0	6	38.4	18	50.7
27	5	34.4	17	50.3	5	54.8	18	12.0	6	08.5	18	19.9	6	16.8	18	36.1	6	36.8	18	51.1
29	5	32.5	17	51.0	5	52.8	18	12.8	6	07.2	18	20.1	6	14.5	18	37.2	6	35.1	18	51.6
31	5	30.6	17	51.7	5	50.7	18	13.7	6	05.9	18	20.2	6	12.2	18	38.3	6	33.4	18	52.1
Apr. 2	5	28.7	17	52.4	5	48.7	18	14.6	6	04.6	18	20.3	6	09.9	18	39.5	6	31.7	18	52.6

SUNRISE AND SUNSET, 2024

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date	Kolkata 22° N 32'				Varanasi 25° N 18'				Chennai 13° N 00'				Delhi 28° N 35'				Mumbai 18° N 54'			
	Rise		Set		Rise		Set		Rise		Set		Rise		Set		Rise		Set	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Apr. 2	5	28.7	17	52.4	5	48.7	18	14.6	6	04.6	18	20.3	6	09.9	18	39.5	6	31.7	18	52.6
4	5	26.8	17	53.1	5	46.6	18	15.5	6	03.3	18	20.5	6	07.6	18	40.6	6	30.1	18	53.1
6	5	25.0	17	53.8	5	44.6	18	16.4	6	02.0	18	20.6	6	05.4	18	41.7	6	28.4	18	53.6
8	5	23.1	17	54.5	5	42.6	18	17.2	6	00.8	18	20.8	6	03.2	18	42.8	6	26.8	18	54.1
10	5	21.3	17	55.2	5	40.6	18	18.1	5	59.6	18	20.9	6	01.1	18	44.0	6	25.2	18	54.6
12	5	19.5	17	55.9	5	38.7	18	19.0	5	58.4	18	21.1	5	58.9	18	45.1	6	23.7	18	55.1
14	5	17.8	17	56.6	5	36.8	18	20.0	5	57.2	18	21.3	5	56.8	18	46.3	6	22.1	18	55.7
16	5	16.0	17	57.4	5	34.9	18	20.9	5	56.0	18	21.5	5	54.8	18	47.4	6	20.6	18	56.2
18	5	14.4	17	58.1	5	33.1	18	21.8	5	54.9	18	21.8	5	52.7	18	48.6	6	19.2	18	56.8
20	5	12.7	17	58.9	5	31.2	18	22.8	5	53.8	18	22.0	5	50.8	18	49.8	6	17.7	18	57.3
22	5	11.1	17	59.7	5	29.5	18	23.7	5	52.8	18	22.3	5	48.8	18	50.9	6	16.4	18	57.9
24	5	09.5	18	00.5	5	27.8	18	24.7	5	51.8	18	22.6	5	46.9	18	52.1	6	15.0	18	58.6
26	5	08.0	18	01.3	5	26.1	18	25.7	5	50.8	18	22.9	5	45.1	18	53.3	6	13.8	18	59.2
28	5	06.6	18	02.1	5	24.5	18	26.7	5	49.9	18	23.2	5	43.3	18	54.6	6	12.5	18	59.8
30	5	05.2	18	02.9	5	22.9	18	27.7	5	49.0	18	23.6	5	41.5	18	55.8	6	11.3	19	00.5
May 2	5	03.8	18	03.8	5	21.5	18	28.7	5	48.1	18	24.0	5	39.9	18	57.0	6	10.2	19	01.2
4	5	02.5	18	04.6	5	20.0	18	29.7	5	47.4	18	24.4	5	38.3	18	58.2	6	09.1	19	01.9
6	5	01.3	18	05.5	5	18.7	18	30.8	5	46.6	18	24.8	5	36.7	18	59.5	6	08.1	19	02.6
8	5	00.2	18	06.4	5	17.4	18	31.8	5	45.9	18	25.2	5	35.2	19	00.7	6	07.2	19	03.3
10	4	59.1	18	07.3	5	16.1	18	32.8	5	45.3	18	25.7	5	33.9	19	01.9	6	06.3	19	04.1
12	4	58.1	18	08.2	5	15.0	18	33.9	5	44.7	18	26.2	5	32.5	19	03.2	6	05.5	19	04.8
14	4	57.1	18	09.1	5	13.9	18	34.9	5	44.2	18	26.7	5	31.3	19	04.4	6	04.7	19	05.6
16	4	56.2	18	10.0	5	12.9	18	36.0	5	43.7	18	27.2	5	30.1	19	05.6	6	04.0	19	06.4
18	4	55.4	18	10.9	5	12.0	18	37.0	5	43.3	18	27.8	5	29.1	19	06.8	6	03.4	19	07.1
20	4	54.7	18	11.8	5	11.1	18	38.1	5	43.0	18	28.4	5	28.1	19	08.0	6	02.8	19	07.9
22	4	54.1	18	12.7	5	10.4	18	39.1	5	42.7	18	28.9	5	27.2	19	09.2	6	02.3	19	08.7
24	4	53.5	18	13.6	5	09.7	18	40.1	5	42.4	18	29.5	5	26.4	19	10.3	6	01.9	19	09.5
26	4	53.0	18	14.5	5	09.1	18	41.1	5	42.2	18	30.1	5	25.7	19	11.5	6	01.5	19	10.3
28	4	52.6	18	15.4	5	08.6	18	42.1	5	42.1	18	30.7	5	25.0	19	12.6	6	01.2	19	11.1
30	4	52.2	18	16.2	5	08.2	18	43.1	5	42.0	18	31.3	5	24.5	19	13.7	6	01.0	19	11.8
June 1	4	52.0	18	17.1	5	07.8	18	44.0	5	42.0	18	31.9	5	24.0	19	14.7	6	00.8	19	12.6
3	4	51.8	18	17.9	5	07.5	18	44.9	5	42.1	18	32.5	5	23.7	19	15.7	6	00.7	19	13.3
5	4	51.7	18	18.7	5	07.4	18	45.8	5	42.1	18	33.1	5	23.4	19	16.6	6	00.7	19	14.1
7	4	51.6	18	19.4	5	07.3	18	46.6	5	42.3	18	33.7	5	23.2	19	17.5	6	00.7	19	14.8
9	4	51.6	18	20.2	5	07.2	18	47.4	5	42.5	18	34.3	5	23.1	19	18.4	6	00.8	19	15.5
11	4	51.7	18	20.9	5	07.3	18	48.1	5	42.7	18	34.9	5	23.1	19	19.2	6	01.0	19	16.1
13	4	51.9	18	21.5	5	07.4	18	48.8	5	43.0	18	35.4	5	23.2	19	19.9	6	01.2	19	16.7
15	4	52.1	18	22.1	5	07.6	18	49.5	5	43.3	18	36.0	5	23.4	19	20.6	6	01.5	19	17.3
17	4	52.4	18	22.7	5	07.9	18	50.0	5	43.6	18	36.5	5	23.6	19	21.2	6	01.8	19	17.8
19	4	52.8	18	23.2	5	08.3	18	50.6	5	44.0	18	37.0	5	24.0	19	21.7	6	02.1	19	18.3
21	4	53.2	18	23.6	5	08.7	18	51.0	5	44.5	18	37.4	5	24.4	19	22.1	6	02.5	19	18.8
23	4	53.7	18	24.0	5	09.1	18	51.4	5	44.9	18	37.8	5	24.9	19	22.5	6	03.0	19	19.2
25	4	54.2	18	24.3	5	09.7	18	51.7	5	45.4	18	38.2	5	25.4	19	22.8	6	03.5	19	19.5
27	4	54.8	18	24.6	5	10.3	18	51.9	5	45.9	18	38.5	5	26.0	19	23.0	6	04.0	19	19.8
29	4	55.4	18	24.8	5	10.9	18	52.1	5	46.4	18	38.8	5	26.7	19	23.1	6	04.6	19	20.0
July 1	4	56.0	18	24.9	5	11.6	18	52.2	5	46.9	18	39.0	5	27.4	19	23.2	6	05.2	19	20.2
3	4	56.7	18	24.9	5	12.3	18	52.2	5	47.5	18	39.2	5	28.2	19	23.1	6	05.8	19	20.3

SUNRISE AND SUNSET, 2024

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date	Kolkata 22º N 32'				Varanasi 25º N 18'				Chennai 13º N 00'				Delhi 28º N 35'				Mumbai 18º N 54'			
	Rise		Set		Rise		Set		Rise		Set		Rise		Set		Rise		Set	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
July 1	4	56.0	18	24.9	5	11.6	18	52.2	5	46.9	18	39.0	5	27.4	19	23.2	6	05.2	19	20.2
3	4	56.7	18	24.9	5	12.3	18	52.2	5	47.5	18	39.2	5	28.2	19	23.1	6	05.8	19	20.3
5	4	57.5	18	24.9	5	13.1	18	52.1	5	48.0	18	39.4	5	29.1	19	22.9	6	06.4	19	20.3
7	4	58.2	18	24.8	5	13.9	18	51.9	5	48.6	18	39.5	5	29.9	19	22.7	6	07.1	19	20.3
9	4	59.0	18	24.6	5	14.8	18	51.7	5	49.1	18	39.5	5	30.9	19	22.4	6	07.8	19	20.2
11	4	59.8	18	24.4	5	15.6	18	51.4	5	49.7	18	39.5	5	31.8	19	21.9	6	08.5	19	20.0
13	5	00.6	18	24.0	5	16.5	18	50.9	5	50.2	18	39.4	5	32.8	19	21.4	6	09.2	19	19.8
15	5	01.4	18	23.6	5	17.5	18	50.4	5	50.8	18	39.2	5	33.8	19	20.8	6	09.9	19	19.5
17	5	02.3	18	23.1	5	18.4	18	49.8	5	51.3	18	39.0	5	34.9	19	20.1	6	10.6	19	19.1
19	5	03.1	18	22.6	5	19.3	18	49.2	5	51.9	18	38.8	5	36.0	19	19.3	6	11.3	19	18.7
21	5	04.0	18	21.9	5	20.3	18	48.4	5	52.4	18	38.5	5	37.1	19	18.4	6	12.0	19	18.1
23	5	04.9	18	21.2	5	21.3	18	47.5	5	52.9	18	38.1	5	38.2	19	17.4	6	12.7	19	17.5
25	5	05.7	18	20.4	5	22.2	18	46.6	5	53.3	18	37.6	5	39.3	19	16.3	6	13.4	19	16.9
27	5	06.6	18	19.5	5	23.2	18	45.6	5	53.8	18	37.1	5	40.4	19	15.1	6	14.1	19	16.1
29	5	07.4	18	18.6	5	24.2	18	44.5	5	54.3	18	36.6	5	41.5	19	13.9	6	14.8	19	15.3
31	5	08.3	18	17.6	5	25.1	18	43.3	5	54.7	18	36.0	5	42.6	19	12.5	6	15.4	19	14.5
Aug. 2	5	09.1	18	16.5	5	26.1	18	42.1	5	55.1	18	35.3	5	43.7	19	11.1	6	16.1	19	13.5
4	5	09.9	18	15.3	5	27.1	18	40.8	5	55.4	18	34.5	5	44.9	19	09.6	6	16.7	19	12.5
6	5	10.7	18	14.1	5	28.0	18	39.4	5	55.8	18	33.8	5	46.0	19	08.0	6	17.4	19	11.5
8	5	11.5	18	12.8	5	28.9	18	38.0	5	56.1	18	32.9	5	47.1	19	06.4	6	18.0	19	10.3
10	5	12.3	18	11.5	5	29.9	18	36.4	5	56.4	18	32.0	5	48.2	19	04.7	6	18.5	19	09.1
12	5	13.0	18	10.1	5	30.8	18	34.8	5	56.7	18	31.1	5	49.3	19	02.9	6	19.1	19	07.9
14	5	13.8	18	08.6	5	31.7	18	33.2	5	56.9	18	30.1	5	50.4	19	01.0	6	19.7	19	06.6
16	5	14.5	18	07.1	5	32.6	18	31.5	5	57.2	18	29.0	5	51.4	18	59.1	6	20.2	19	05.2
18	5	15.2	18	05.5	5	33.4	18	29.8	5	57.4	18	27.9	5	52.5	18	57.1	6	20.7	19	03.8
20	5	15.9	18	03.9	5	34.3	18	28.0	5	57.5	18	26.8	5	53.5	18	55.1	6	21.2	19	02.4
22	5	16.6	18	02.3	5	35.1	18	26.1	5	57.7	18	25.7	5	54.6	18	53.0	6	21.7	19	00.9
24	5	17.3	18	00.6	5	35.9	18	24.2	5	57.8	18	24.5	5	55.6	18	50.9	6	22.1	18	59.3
26	5	17.9	17	58.8	5	36.8	18	22.3	5	58.0	18	23.2	5	56.6	18	48.7	6	22.6	18	57.8
28	5	18.6	17	57.1	5	37.6	18	20.3	5	58.0	18	22.0	5	57.6	18	46.5	6	23.0	18	56.1
30	5	19.2	17	55.3	5	38.3	18	18.3	5	58.1	18	20.7	5	58.6	18	44.3	6	23.4	18	54.5
Sept. 1	5	19.8	17	53.4	5	39.1	18	16.3	5	58.2	18	19.3	5	59.6	18	42.0	6	23.8	18	52.8
3	5	20.4	17	51.6	5	39.9	18	14.2	5	58.2	18	18.0	6	00.5	18	39.7	6	24.2	18	51.1
5	5	21.0	17	49.7	5	40.7	18	12.1	5	58.3	18	16.6	6	01.5	18	37.3	6	24.5	18	49.4
7	5	21.6	17	47.8	5	41.4	18	10.1	5	58.3	18	15.3	6	02.5	18	35.0	6	24.9	18	47.7
9	5	22.2	17	45.8	5	42.2	18	07.9	5	58.3	18	13.9	6	03.4	18	32.6	6	25.3	18	45.9
11	5	22.7	17	43.8	5	42.9	18	05.8	5	58.3	18	12.5	6	04.4	18	30.2	6	25.6	18	44.1
13	5	23.3	17	41.9	5	43.7	18	03.7	5	58.3	18	11.0	6	05.3	18	27.8	6	26.0	18	42.3
15	5	23.9	17	39.9	5	44.4	18	01.6	5	58.4	18	09.6	6	06.3	18	25.4	6	26.3	18	40.5
17	5	24.5	17	37.9	5	45.1	17	59.4	5	58.4	18	08.2	6	07.3	18	23.0	6	26.7	18	38.8
19	5	25.0	17	35.9	5	45.9	17	57.3	5	58.4	18	06.8	6	08.2	18	20.6	6	27.0	18	37.0
21	5	25.6	17	33.9	5	46.7	17	55.1	5	58.4	18	05.4	6	09.2	18	18.2	6	27.4	18	35.2
23	5	26.2	17	31.9	5	47.4	17	53.0	5	58.4	18	04.0	6	10.2	18	15.8	6	27.7	18	33.4
25	5	26.8	17	29.9	5	48.2	17	50.9	5	58.4	18	02.6	6	11.2	18	13.4	6	28.1	18	31.6
27	5	27.4	17	27.9	5	49.0	17	48.7	5	58.5	18	01.2	6	12.2	18	11.1	6	28.5	18	29.9
29	5	28.0	17	26.0	5	49.8	17	46.6	5	58.5	17	59.9	6	13.2	18	08.7	6	28.9	18	28.1
Oct. 1	5	28.7	17	24.0	5	50.6	17	44.5	5	58.6	17	58.5	6	14.3	18	06.4	6	29.3	18	26.4

SUNRISE AND SUNSET, 2024

INDIAN STANDARD TIME OF SUNRISE AND SUNSET (SUN'S UPPER LIMB)
FOR CERTAIN STATIONS IN INDIA

Date	Kolkata 22º N 32'				Varanasi 25º N 18'				Chennai 13º N 00'				Delhi 28º N 35'				Mumbai 18º N 54'			
	Rise		Set		Rise		Set		Rise		Set		Rise		Set		Rise		Set	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Oct. 1	5	28.7	17	24.0	5	50.6	17	44.5	5	58.6	17	58.5	6	14.3	18	06.4	6	29.3	18	26.4
3	5	29.3	17	22.1	5	51.4	17	42.4	5	58.7	17	57.2	6	15.3	18	04.2	6	29.8	18	24.7
5	5	30.0	17	20.2	5	52.2	17	40.4	5	58.8	17	55.9	6	16.4	18	01.9	6	30.2	18	23.0
7	5	30.7	17	18.3	5	53.1	17	38.4	5	58.9	17	54.6	6	17.5	17	59.7	6	30.7	18	21.4
9	5	31.4	17	16.5	5	54.0	17	36.4	5	59.0	17	53.4	6	18.6	17	57.5	6	31.2	18	19.8
11	5	32.2	17	14.7	5	54.9	17	34.4	5	59.2	17	52.2	6	19.7	17	55.3	6	31.7	18	18.3
13	5	32.9	17	12.9	5	55.8	17	32.5	5	59.4	17	51.0	6	20.9	17	53.2	6	32.2	18	16.7
15	5	33.7	17	11.2	5	56.7	17	30.6	5	59.6	17	49.9	6	22.1	17	51.2	6	32.8	18	15.3
17	5	34.5	17	09.5	5	57.7	17	28.7	5	59.9	17	48.8	6	23.3	17	49.1	6	33.4	18	13.8
19	5	35.4	17	07.9	5	58.7	17	27.0	6	00.2	17	47.7	6	24.5	17	47.2	6	34.1	18	12.4
21	5	36.3	17	06.3	5	59.8	17	25.2	6	00.5	17	46.7	6	25.8	17	45.2	6	34.7	18	11.1
23	5	37.2	17	04.8	6	00.8	17	23.6	6	00.9	17	45.8	6	27.1	17	43.4	6	35.5	18	09.9
25	5	38.1	17	03.4	6	01.9	17	21.9	6	01.3	17	44.9	6	28.4	17	41.6	6	36.2	18	08.7
27	5	39.1	17	02.0	6	03.0	17	20.4	6	01.7	17	44.1	6	29.8	17	39.8	6	37.0	18	07.5
29	5	40.1	17	00.7	6	04.2	17	18.9	6	02.2	17	43.3	6	31.2	17	38.2	6	37.8	18	06.4
31	5	41.1	16	59.4	6	05.4	17	17.5	6	02.7	17	42.6	6	32.6	17	36.6	6	38.6	18	05.4
Nov. 2	5	42.2	16	58.3	6	06.6	17	16.2	6	03.3	17	41.9	6	34.1	17	35.0	6	39.5	18	04.5
4	5	43.3	16	57.2	6	07.8	17	14.9	6	03.9	17	41.3	6	35.5	17	33.6	6	40.4	18	03.6
6	5	44.4	16	56.1	6	09.1	17	13.8	6	04.6	17	40.8	6	37.0	17	32.3	6	41.4	18	02.8
8	5	45.6	16	55.2	6	10.4	17	12.7	6	05.2	17	40.4	6	38.6	17	31.0	6	42.4	18	02.1
10	5	46.8	16	54.4	6	11.8	17	11.7	6	06.0	17	40.0	6	40.1	17	29.8	6	43.4	18	01.4
12	5	48.0	16	53.6	6	13.1	17	10.8	6	06.7	17	39.7	6	41.7	17	28.8	6	44.5	18	00.9
14	5	49.2	16	52.9	6	14.5	17	10.0	6	07.5	17	39.4	6	43.3	17	27.8	6	45.6	18	00.4
16	5	50.5	16	52.4	6	15.9	17	09.3	6	08.4	17	39.3	6	44.9	17	26.9	6	46.7	17	60.0
18	5	51.8	16	51.9	6	17.3	17	08.7	6	09.3	17	39.2	6	46.5	17	26.1	6	47.9	17	59.7
20	5	53.1	16	51.5	6	18.7	17	08.2	6	10.2	17	39.2	6	48.1	17	25.5	6	49.0	17	59.5
22	5	54.4	16	51.2	6	20.2	17	07.7	6	11.1	17	39.3	6	49.7	17	24.9	6	50.2	17	59.3
24	5	55.7	16	51.0	6	21.6	17	07.4	6	12.1	17	39.4	6	51.3	17	24.4	6	51.4	17	59.3
26	5	57.0	16	50.9	6	23.1	17	07.2	6	13.1	17	39.7	6	52.9	17	24.1	6	52.7	17	59.3
28	5	58.3	16	50.9	6	24.5	17	07.1	6	14.1	17	40.0	6	54.5	17	23.9	6	53.9	17	59.4
30	5	59.7	16	51.0	6	26.0	17	07.1	6	15.2	17	40.3	6	56.1	17	23.7	6	55.2	17	59.6
Dec. 2	6	01.0	16	51.2	6	27.4	17	07.2	6	16.3	17	40.8	6	57.6	17	23.7	6	56.4	17	59.9
4	6	02.3	16	51.4	6	28.8	17	07.4	6	17.3	17	41.3	6	59.2	17	23.8	6	57.6	18	00.2
6	6	03.6	16	51.8	6	30.2	17	07.7	6	18.4	17	41.8	7	00.6	17	24.0	6	58.9	18	00.7
8	6	04.8	16	52.3	6	31.5	17	08.1	6	19.5	17	42.5	7	02.1	17	24.4	7	00.1	18	01.2
10	6	06.1	16	52.8	6	32.9	17	08.6	6	20.6	17	43.2	7	03.5	17	24.8	7	01.3	18	01.8
12	6	07.3	16	53.4	6	34.2	17	09.2	6	21.7	17	43.9	7	04.9	17	25.3	7	02.5	18	02.4
14	6	08.5	16	54.2	6	35.4	17	09.9	6	22.8	17	44.8	7	06.2	17	25.9	7	03.7	18	03.2
16	6	09.6	16	55.0	6	36.6	17	10.6	6	23.9	17	45.6	7	07.4	17	26.7	7	04.8	18	04.0
18	6	10.7	16	55.8	6	37.7	17	11.5	6	24.9	17	46.5	7	08.6	17	27.5	7	05.9	18	04.9
20	6	11.8	16	56.8	6	38.8	17	12.4	6	25.9	17	47.5	7	09.7	17	28.4	7	07.0	18	05.8
22	6	12.8	16	57.8	6	39.8	17	13.4	6	26.9	17	48.5	7	10.7	17	29.4	7	08.0	18	06.8
24	6	13.7	16	58.9	6	40.8	17	14.5	6	27.9	17	49.5	7	11.6	17	30.5	7	09.0	18	07.8
26	6	14.6	16	60.0	6	41.6	17	15.7	6	28.8	17	50.5	7	12.5	17	31.7	7	09.9	18	08.9
28	6	15.4	17	01.2	6	42.4	17	16.9	6	29.7	17	51.6	7	13.2	17	32.9	7	10.7	18	10.0
30	6	16.1	17	02.4	6	43.1	17	18.1	6	30.6	17	52.7	7	13.9	17	34.2	7	11.5	18	11.2
32	6	16.8	17	03.7	6	43.8	17	19.4	6	31.4	17	53.8	7	14.4	17	35.6	7	12.2	18	12.4

MOONRISE, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONRISE (MOON'S UPPER LIMB)

Date \ Lat.	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Jan. 0	21	44	21	33	21	22	21	09	20	52	20	30	20	54	21	39	21	33	22	03
1	22	24	22	17	22	11	22	03	21	53	21	39	21	45	22	25	22	25	22	51
2	23	04	23	01	22	59	22	56	22	52	22	47	22	33	23	10	23	18	23	39
3	23	43	23	45	23	46	23	49	23	51	23	55	23	23	23	54	**	**	**	**
4	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	10	0	26
5	0	22	0	28	0	35	0	42	0	51	1	04	0	12	0	39	1	03	1	14
6	1	05	1	15	1	26	1	39	1	55	2	16	1	05	1	28	1	59	2	05
7	1	51	2	05	2	20	2	38	3	01	3	33	2	00	2	19	2	58	2	59
8	2	41	2	59	3	19	3	42	4	10	4	52	3	00	3	15	4	00	3	57
9	3	38	3	58	4	21	4	47	5	21	6	11	4	03	4	14	5	06	4	59
10	4	38	5	01	5	25	5	53	6	29	7	24	5	07	5	17	6	11	6	03
11	5	42	6	04	6	28	6	55	7	31	8	23	6	10	6	20	7	13	7	05
12	6	45	7	05	7	26	7	51	8	21	9	06	7	08	7	21	8	09	8	04
13	7	45	8	01	8	18	8	38	9	02	9	36	7	59	8	15	8	57	8	56
14	8	41	8	53	9	05	9	18	9	35	9	58	8	44	9	06	9	38	9	43
15	9	34	9	40	9	47	9	54	10	03	10	15	9	24	9	51	10	14	10	25
16	10	23	10	24	10	25	10	26	10	28	10	30	10	01	10	33	10	48	11	05
17	11	11	11	07	11	03	10	58	10	52	10	45	10	37	11	15	11	20	11	43
18	11	59	11	50	11	41	11	30	11	17	11	00	11	14	11	56	11	53	12	21
19	12	48	12	34	12	20	12	04	11	45	11	18	11	53	12	39	12	28	13	02
20	13	39	13	22	13	03	12	42	12	16	11	40	12	34	13	26	13	07	13	45
21	14	32	14	12	13	50	13	25	12	53	12	08	13	20	14	14	13	51	14	32
22	15	27	15	05	14	41	14	14	13	39	12	47	14	10	15	07	14	39	15	24
23	16	22	16	00	15	36	15	08	14	31	13	38	15	05	16	02	15	34	16	18
24	17	16	16	55	16	32	16	05	15	31	14	41	16	01	16	57	16	31	17	15
25	18	07	17	49	17	28	17	05	16	34	15	51	16	58	17	52	17	30	18	10
26	18	55	18	39	18	22	18	03	17	39	17	04	17	54	18	44	18	28	19	05
27	19	40	19	28	19	15	19	00	18	41	18	16	18	47	19	33	19	24	19	56
28	20	21	20	13	20	05	19	55	19	43	19	27	19	38	20	20	20	18	20	45
29	21	01	20	57	20	53	20	48	20	42	20	34	20	27	21	05	21	11	21	33
30	21	40	21	40	21	41	21	41	21	42	21	42	21	16	21	49	22	02	22	20
31	22	18	22	23	22	28	22	33	22	40	22	50	22	05	22	34	22	55	23	07
Feb. 1	22	59	23	08	23	17	23	28	23	42	24	00	22	55	23	20	23	48	23	56
2	23	43	23	55	**	**	**	**	**	**	**	**	23	49	**	**	**	**	**	**
3	**	**	**	**	0	09	0	25	0	45	1	13	**	**	0	08	0	44	0	47
4	0	29	0	46	1	04	1	25	1	51	2	29	0	45	1	01	1	44	1	42
5	1	22	1	42	2	03	2	28	3	00	3	47	1	45	1	57	2	46	2	41
6	2	19	2	41	3	05	3	33	4	08	5	02	2	47	2	57	3	51	3	43
7	3	20	3	43	4	07	4	36	5	13	6	07	3	50	4	00	4	54	4	45
8	4	23	4	45	5	08	5	34	6	08	6	57	4	50	5	01	5	52	5	46
9	5	26	5	44	6	03	6	25	6	53	7	33	5	45	5	59	6	44	6	41
10	6	25	6	38	6	53	7	10	7	31	7	59	6	33	6	52	7	29	7	32
11	7	20	7	29	7	38	7	49	8	01	8	18	7	17	7	41	8	09	8	17
12	8	12	8	16	8	19	8	23	8	28	8	35	7	56	8	26	8	44	8	59
13	9	03	9	01	8	59	8	56	8	54	8	50	8	34	9	10	9	19	9	39
14	9	53	9	46	9	38	9	30	9	19	9	05	9	12	9	52	9	52	10	18
15	10	43	10	31	10	18	10	04	9	46	9	22	9	51	10	36	10	27	10	59

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Jan. 0	9	21	9	34	9	47	10	02	10	20	10	45	9	27	9	47	10	21	10	25
1	10	03	10	11	10	20	10	31	10	43	11	00	9	59	10	23	10	51	10	59
2	10	43	10	47	10	52	10	57	11	04	11	13	10	29	10	58	11	18	11	31
3	11	22	11	22	11	23	11	23	11	24	11	24	10	59	11	32	11	45	12	02
4	12	01	11	57	11	53	11	49	11	43	11	35	11	28	12	05	12	11	12	33
5	12	42	12	34	12	25	12	16	12	04	11	48	11	59	12	41	12	38	13	06
6	13	26	13	14	13	01	12	46	12	27	12	03	12	33	13	19	13	10	13	42
7	14	14	13	58	13	41	13	21	12	56	12	22	13	12	14	02	13	46	14	22
8	15	07	14	48	14	27	14	03	13	32	12	48	13	57	14	51	14	28	15	09
9	16	06	15	44	15	21	14	53	14	18	13	27	14	50	15	47	15	19	16	03
10	17	09	16	46	16	21	15	53	15	17	14	22	15	51	16	48	16	19	17	05
11	18	12	17	51	17	28	17	01	16	27	15	36	16	57	17	54	17	28	18	11
12	19	15	18	56	18	36	18	14	17	45	17	03	18	07	19	00	18	39	19	19
13	20	12	19	59	19	44	19	27	19	05	18	34	19	16	20	04	19	51	20	26
14	21	07	20	58	20	48	20	37	20	23	20	04	20	21	21	04	21	01	21	30
15	21	57	21	54	21	50	21	45	21	39	21	32	21	24	22	02	22	08	22	30
16	22	46	22	47	22	49	22	50	22	52	22	55	22	24	22	57	23	12	23	29
17	23	34	23	40	23	47	23	55	**	**	**	**	23	24	23	51	**	**	**	**
18	**	**	**	**	**	**	**	**	0	04	0	17	**	**	**	**	0	15	0	26
19	0	22	0	33	0	45	0	59	1	16	1	40	0	24	0	46	1	19	1	24
20	1	12	1	27	1	44	2	03	2	27	3	01	1	24	1	42	2	22	2	22
21	2	04	2	23	2	43	3	07	3	37	4	21	2	24	2	38	3	26	3	21
22	2	58	3	20	3	43	4	09	4	44	5	35	3	25	3	36	4	27	4	20
23	3	54	4	16	4	40	5	08	5	45	6	38	4	22	4	32	5	26	5	18
24	4	48	5	10	5	34	6	01	6	36	7	28	5	16	5	27	6	19	6	11
25	5	41	6	01	6	23	6	48	7	19	8	04	6	05	6	17	7	06	7	00
26	6	30	6	48	7	06	7	28	7	54	8	31	6	47	7	03	7	46	7	44
27	7	17	7	31	7	45	8	02	8	22	8	51	7	25	7	44	8	21	8	23
28	7	59	8	09	8	20	8	32	8	46	9	06	7	59	8	21	8	51	8	58
29	8	40	8	46	8	52	8	59	9	08	9	19	8	30	8	57	9	20	9	31
30	9	19	9	21	9	23	9	25	9	27	9	31	8	59	9	31	9	46	10	02
31	9	58	9	56	9	53	9	50	9	47	9	42	9	29	10	04	10	12	10	32
Feb. 1	10	37	10	31	10	24	10	16	10	06	9	53	9	58	10	38	10	38	11	04
2	11	19	11	09	10	57	10	44	10	28	10	06	10	30	11	14	11	08	11	38
3	12	04	11	50	11	34	11	16	10	54	10	23	11	06	11	54	11	40	12	15
4	12	54	12	35	12	16	11	53	11	25	10	45	11	47	12	39	12	18	12	58
5	13	49	13	27	13	05	12	38	12	05	11	17	12	34	13	30	13	04	13	47
6	14	48	14	25	14	01	13	33	12	56	12	02	13	30	14	27	13	59	14	44
7	15	51	15	28	15	04	14	36	14	00	13	06	14	33	15	31	15	02	15	47
8	16	54	16	33	16	12	15	47	15	15	14	27	15	42	16	36	16	12	16	55
9	17	55	17	39	17	21	17	01	16	35	15	58	16	51	17	43	17	26	18	03
10	18	52	18	40	18	28	18	14	17	57	17	32	18	00	18	46	18	38	19	10
11	19	46	19	40	19	33	19	26	19	16	19	03	19	07	19	47	19	49	20	14
12	20	37	20	36	20	35	20	34	20	33	20	32	20	11	20	45	20	57	21	16
13	21	27	21	31	21	36	21	42	21	49	21	58	21	13	21	42	22	03	22	16
14	22	16	22	26	22	36	22	48	23	03	23	24	22	15	22	38	23	09	23	16
15	23	07	23	22	23	37	23	55	**	**	**	**	23	17	23	36	**	**	**	**

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Feb. 15	10	43	10	31	10	18	10	04	9	46	9	22	9	51	10	36	10	27	10	59
16	11	35	11	18	11	01	10	41	10	16	9	43	10	32	11	23	11	06	11	43
17	12	28	12	08	11	48	11	23	10	53	10	09	11	18	12	11	11	49	12	29
18	13	23	13	01	12	37	12	10	11	36	10	45	12	07	13	03	12	36	13	20
19	14	18	13	56	13	31	13	03	12	26	11	33	13	00	13	58	13	29	14	14
20	15	12	14	50	14	26	13	59	13	24	12	31	13	56	14	52	14	25	15	09
21	16	04	15	44	15	23	14	58	14	26	13	40	14	52	15	47	15	23	16	05
22	16	52	16	35	16	17	15	56	15	30	14	52	15	48	16	39	16	21	16	59
23	17	37	17	24	17	10	16	53	16	33	16	04	16	41	17	29	17	18	17	51
24	18	19	18	10	18	00	17	49	17	35	17	15	17	34	18	16	18	12	18	41
25	19	00	18	54	18	49	18	42	18	35	18	24	18	23	19	02	19	05	19	30
26	19	39	19	38	19	37	19	36	19	34	19	32	19	12	19	47	19	57	20	16
27	20	17	20	20	20	24	20	28	20	33	20	40	20	01	20	31	20	49	21	04
28	20	57	21	05	21	13	21	22	21	33	21	49	20	50	21	16	21	42	21	52
29	21	39	21	51	22	03	22	17	22	35	23	00	21	42	22	03	22	37	22	41
Mar. 1	22	24	22	39	22	56	23	15	23	40	**	**	22	36	22	53	23	34	23	34
2	23	13	23	32	23	52	**	**	**	**	0	14	23	33	23	47	**	**	**	**
3	**	**	**	**	**	**	0	15	0	46	1	30	**	**	**	**	0	34	0	30
4	0	06	0	27	0	51	1	18	1	53	2	44	0	33	0	44	1	36	1	29
5	1	04	1	27	1	52	2	20	2	57	3	53	1	34	1	44	2	38	2	29
6	2	05	2	27	2	51	3	19	3	55	4	47	2	33	2	43	3	37	3	29
7	3	06	3	26	3	48	4	12	4	43	5	29	3	29	3	42	4	30	4	25
8	4	05	4	21	4	39	4	59	5	24	5	58	4	19	4	36	5	18	5	17
9	5	02	5	14	5	26	5	40	5	57	6	20	5	05	5	27	5	59	6	04
10	5	56	6	02	6	09	6	16	6	25	6	38	5	47	6	13	6	37	6	48
11	6	48	6	49	6	50	6	51	6	52	6	53	6	26	6	58	7	12	7	30
12	7	40	7	35	7	30	7	24	7	18	7	09	7	04	7	43	7	47	8	10
13	8	31	8	21	8	11	7	59	7	45	7	25	7	44	8	27	8	22	8	52
14	9	24	9	10	8	54	8	36	8	14	7	44	8	25	9	14	9	01	9	36
15	10	19	10	00	9	41	9	18	8	49	8	09	9	11	10	04	9	43	10	22
16	11	16	10	54	10	31	10	04	9	31	8	42	10	01	10	56	10	30	11	14
17	12	12	11	50	11	25	10	57	10	20	9	26	10	54	11	52	11	23	12	08
18	13	08	12	45	12	21	11	53	11	17	10	22	11	50	12	47	12	19	13	04
19	14	00	13	40	13	17	12	51	12	18	11	29	12	47	13	42	13	17	14	00
20	14	50	14	32	14	12	13	50	13	22	12	40	13	43	14	35	14	15	14	55
21	15	36	15	21	15	06	14	47	14	25	13	53	14	37	15	26	15	12	15	47
22	16	18	16	08	15	57	15	44	15	27	15	04	15	29	16	14	16	07	16	37
23	16	59	16	52	16	45	16	37	16	27	16	14	16	19	17	00	17	00	17	26
24	17	39	17	36	17	34	17	31	17	27	17	22	17	09	17	45	17	53	18	13
25	18	17	18	19	18	21	18	23	18	26	18	30	17	57	18	29	18	45	19	01
26	18	57	19	03	19	09	19	17	19	26	19	39	18	47	19	14	19	38	19	49
27	19	38	19	48	19	59	20	12	20	27	20	50	19	38	20	01	20	32	20	38
28	20	21	20	36	20	51	21	09	21	32	22	03	20	31	20	50	21	29	21	30
29	21	09	21	27	21	47	22	09	22	37	23	19	21	28	21	42	22	27	22	24
30	22	01	22	21	22	44	23	10	23	44	**	**	22	25	22	37	23	28	23	22
31	22	56	23	19	23	43	**	**	**	**	0	33	23	25	23	35	**	**	**	**
Apr. 1	23	54	**	**	**	**	0	11	0	48	1	43	**	**	**	**	0	29	0	20

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Feb.	15	23	07	23	22	23	37	23	55	**	**	**	**	23	17	23	36	**	**	**	**
	16	24	00	**	**	**	**	**	**	0	17	0	48	**	**	**	**	0	14	0	15
	17	**	**	0	18	0	37	1	00	1	29	2	10	0	18	0	33	1	19	1	16
	18	0	54	1	15	1	38	2	04	2	38	3	28	1	20	1	31	2	22	2	15
	19	1	49	2	12	2	36	3	04	3	41	4	34	2	18	2	28	3	22	3	14
	20	2	44	3	07	3	31	3	59	4	34	5	28	3	13	3	23	4	16	4	08
	21	3	37	3	58	4	20	4	46	5	20	6	07	4	03	4	14	5	04	4	58
	22	4	27	4	45	5	05	5	28	5	56	6	36	4	46	5	01	5	46	5	43
	23	5	14	5	29	5	45	6	03	6	26	6	57	5	26	5	43	6	22	6	23
	24	5	58	6	09	6	20	6	34	6	51	7	14	6	00	6	21	6	54	6	59
	25	6	38	6	46	6	53	7	02	7	13	7	27	6	31	6	57	7	23	7	32
	26	7	18	7	21	7	25	7	28	7	33	7	39	7	01	7	32	7	49	8	03
	27	7	57	7	56	7	55	7	53	7	52	7	49	7	31	8	04	8	15	8	34
	28	8	36	8	30	8	25	8	19	8	11	8	00	8	00	8	38	8	41	9	05
	29	9	17	9	07	8	57	8	46	8	32	8	13	8	30	9	13	9	09	9	38
Mar.	1	10	00	9	46	9	32	9	16	8	55	8	27	9	04	9	51	9	40	10	13
	2	10	46	10	29	10	11	9	50	9	24	8	47	9	42	10	33	10	15	10	53
	3	11	38	11	18	10	56	10	30	9	59	9	13	10	25	11	20	10	56	11	38
	4	12	33	12	11	11	47	11	19	10	43	9	51	11	16	12	13	11	45	12	30
	5	13	33	13	10	12	45	12	16	11	40	10	44	12	14	13	12	12	43	13	29
	6	14	34	14	12	13	49	13	22	12	47	11	56	13	19	14	15	13	48	14	32
	7	15	35	15	16	14	56	14	33	14	04	13	21	14	26	15	20	14	59	15	39
	8	16	33	16	19	16	04	15	46	15	24	14	53	15	35	16	24	16	11	16	46
	9	17	29	17	20	17	10	16	59	16	45	16	25	16	42	17	26	17	23	17	51
	10	18	21	18	17	18	14	18	09	18	04	17	57	17	49	18	26	18	32	18	55
	11	19	13	19	15	19	17	19	19	19	22	19	26	18	53	19	25	19	41	19	57
	12	20	04	20	11	20	19	20	28	20	39	20	55	19	57	20	23	20	49	20	59
	13	20	56	21	09	21	22	21	38	21	57	22	23	21	01	21	22	21	57	22	01
	14	21	50	22	07	22	25	22	46	23	13	23	51	22	06	22	22	23	05	23	04
	15	22	46	23	06	23	28	23	54	**	**	**	**	23	10	23	22	**	**	**	**
	16	23	43	**	**	**	**	**	**	0	26	1	13	**	**	**	**	0	12	0	06
	17	**	**	0	05	0	29	0	57	1	33	2	26	0	11	0	21	1	15	1	07
	18	0	39	1	02	1	26	1	55	2	31	3	26	1	09	1	18	2	12	2	03
	19	1	33	1	55	2	18	2	45	3	19	4	09	2	00	2	11	3	03	2	55
	20	2	24	2	44	3	04	3	29	3	58	4	41	2	46	2	59	3	47	3	42
	21	3	12	3	28	3	46	4	05	4	30	5	04	3	26	3	43	4	24	4	23
	22	3	56	4	09	4	22	4	37	4	56	5	22	4	02	4	22	4	57	5	00
	23	4	38	4	46	4	56	5	06	5	19	5	36	4	34	4	58	5	26	5	34
	24	5	18	5	22	5	27	5	32	5	39	5	47	5	04	5	33	5	53	6	06
	25	5	57	5	57	5	57	5	57	5	58	5	58	5	34	6	06	6	19	6	36
	26	6	35	6	31	6	27	6	23	6	17	6	09	6	02	6	39	6	45	7	07
	27	7	16	7	08	6	59	6	49	6	37	6	21	6	33	7	14	7	12	7	40
	28	7	58	7	46	7	33	7	18	7	00	6	35	7	06	7	51	7	42	8	14
	29	8	44	8	27	8	10	7	51	7	27	6	52	7	42	8	32	8	15	8	52
	30	9	33	9	14	8	53	8	29	7	59	7	16	8	23	9	17	8	54	9	35
	31	10	26	10	05	9	41	9	14	8	39	7	48	9	11	10	07	9	40	10	24
Apr.	1	11	24	11	00	10	36	10	07	9	30	8	34	10	05	11	02	10	33	11	19

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2024
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Apr. 1	23	54	**	**	**	**	0	11	0	48	1	43	**	**	**	**	0	29	0	20
2	**	**	0	17	0	41	1	10	1	47	2	41	0	23	0	33	1	28	1	19
3	0	53	1	14	1	37	2	03	2	37	3	26	1	19	1	31	2	21	2	14
4	1	51	2	09	2	28	2	51	3	19	3	58	2	10	2	24	3	10	3	07
5	2	47	3	01	3	16	3	33	3	54	4	22	2	56	3	15	3	52	3	54
6	3	41	3	50	3	59	4	10	4	23	4	41	3	38	4	02	4	30	4	38
7	4	32	4	36	4	40	4	44	4	50	4	57	4	17	4	46	5	06	5	20
8	5	24	5	22	5	20	5	18	5	16	5	12	4	55	5	31	5	40	6	00
9	6	15	6	08	6	00	5	52	5	42	5	28	5	35	6	15	6	14	6	41
10	7	08	6	56	6	43	6	28	6	10	5	46	6	15	7	01	6	52	7	24
11	8	04	7	47	7	29	7	09	6	43	6	07	7	00	7	51	7	33	8	11
12	9	01	8	41	8	19	7	54	7	23	6	37	7	49	8	44	8	19	9	02
13	10	00	9	38	9	14	8	45	8	10	7	18	8	42	9	40	9	12	9	56
14	10	58	10	35	10	10	9	42	9	05	8	10	9	40	10	37	10	08	10	53
15	11	53	11	32	11	09	10	41	10	07	9	16	10	38	11	34	11	07	11	51
16	12	45	12	26	12	05	11	42	11	11	10	27	11	36	12	29	12	07	12	47
17	13	33	13	17	13	00	12	40	12	15	11	40	12	31	13	21	13	05	13	42
18	14	16	14	04	13	52	13	37	13	18	12	52	13	24	14	10	14	01	14	33
19	14	58	14	50	14	41	14	31	14	19	14	02	14	14	14	56	14	55	15	22
20	15	38	15	34	15	30	15	25	15	19	15	11	15	04	15	42	15	47	16	10
21	16	16	16	16	16	17	16	17	16	18	16	19	15	53	16	26	16	39	16	57
22	16	55	17	00	17	05	17	11	17	18	17	28	16	42	17	11	17	32	17	45
23	17	36	17	45	17	55	18	05	18	19	18	38	17	33	17	57	18	26	18	33
24	18	19	18	32	18	46	19	03	19	23	19	51	18	26	18	46	19	22	19	25
25	19	06	19	23	19	41	20	02	20	28	21	07	19	22	19	38	20	21	20	19
26	19	57	20	17	20	38	21	04	21	36	22	23	20	20	20	32	21	22	21	16
27	20	51	21	14	21	38	22	05	22	41	23	35	21	20	21	30	22	23	22	15
28	21	49	22	11	22	36	23	05	23	42	**	**	22	18	22	28	23	23	23	14
29	22	47	23	09	23	33	24	00	**	**	0	37	23	15	23	25	**	**	**	**
30	23	44	**	**	**	**	**	**	0	34	1	26	**	**	**	**	0	17	0	10
May 1	**	**	0	04	0	24	0	48	1	18	2	01	0	06	0	19	1	06	1	02
2	0	39	0	55	1	12	1	31	1	54	2	26	0	52	1	09	1	49	1	50
3	1	32	1	43	1	55	2	08	2	24	2	46	1	34	1	56	2	27	2	33
4	2	22	2	28	2	34	2	42	2	50	3	02	2	12	2	39	3	02	3	14
5	3	12	3	13	3	13	3	14	3	16	3	17	2	49	3	22	3	36	3	53
6	4	02	3	57	3	52	3	47	3	41	3	32	3	27	4	05	4	09	4	32
7	4	53	4	43	4	33	4	21	4	07	3	48	4	06	4	49	4	44	5	14
8	5	47	5	33	5	17	4	59	4	37	4	07	4	48	5	37	5	24	5	58
9	6	44	6	25	6	05	5	43	5	14	4	33	5	36	6	28	6	07	6	47
10	7	43	7	22	6	58	6	32	5	58	5	08	6	28	7	24	6	58	7	41
11	8	43	8	20	7	56	7	27	6	51	5	57	7	25	8	22	7	53	8	38
12	9	41	9	19	8	55	8	27	7	51	6	58	8	24	9	21	8	53	9	38
13	10	35	10	15	9	54	9	29	8	56	8	09	9	24	10	18	9	54	10	36
14	11	26	11	09	10	50	10	29	10	02	9	24	10	21	11	13	10	54	11	33
15	12	12	11	58	11	44	11	28	11	07	10	37	11	16	12	03	11	52	12	25
16	12	54	12	45	12	35	12	23	12	09	11	49	12	08	12	51	12	47	13	16
17	13	35	13	30	13	24	13	17	13	09	12	58	12	58	13	37	13	40	14	04

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Lat. / Date	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Apr. 1	11	24	12	00	10	36	10	07	9	30	8	34	10	05	11	02	10	33	11	19
2	12	22	12	00	11	36	11	08	10	31	9	38	11	05	12	02	11	34	12	18
3	13	21	13	01	12	39	12	14	11	42	10	55	12	09	13	04	12	40	13	22
4	14	18	14	02	13	45	13	24	12	58	12	21	13	15	14	06	13	49	14	26
5	15	13	15	02	14	49	14	34	14	16	13	51	14	21	15	07	14	59	15	31
6	16	06	15	59	15	53	15	45	15	35	15	21	15	26	16	06	16	08	16	33
7	16	57	16	56	16	55	16	54	16	52	16	50	16	30	17	05	17	16	17	36
8	17	48	17	53	17	57	18	03	18	10	18	19	17	35	18	03	18	24	18	37
9	18	40	18	50	19	01	19	13	19	28	19	49	18	39	19	03	19	33	19	40
10	19	35	19	49	20	05	20	23	20	46	21	19	19	45	20	03	20	43	20	44
11	20	31	20	50	21	10	21	34	22	04	22	47	20	51	21	05	21	52	21	49
12	21	30	21	51	22	14	22	41	23	16	**	**	21	56	22	07	23	00	22	52
13	22	28	22	51	23	16	23	44	**	**	0	08	22	58	23	07	**	**	23	53
14	23	25	23	47	**	**	**	**	0	20	1	16	23	54	**	**	0	02	**	**
15	**	**	**	**	0	11	0	39	1	15	2	07	**	**	0	03	0	57	0	48
16	0	18	0	39	1	01	1	26	1	58	2	43	0	42	0	54	1	44	1	38
17	1	08	1	26	1	44	2	05	2	32	3	09	1	25	1	40	2	24	2	22
18	1	54	2	08	2	22	2	39	2	60	3	29	2	02	2	21	2	58	3	00
19	2	36	2	46	2	57	3	09	3	24	3	44	2	36	2	59	3	29	3	35
20	3	17	3	23	3	29	3	36	3	45	3	56	3	07	3	34	3	56	4	07
21	3	56	3	57	3	59	4	01	4	04	4	07	3	36	4	07	4	22	4	38
22	4	34	4	32	4	29	4	26	4	23	4	18	4	05	4	40	4	48	5	09
23	5	15	5	08	5	01	4	52	4	42	4	29	4	35	5	15	5	15	5	41
24	5	56	5	46	5	34	5	21	5	05	4	42	5	07	5	51	5	44	6	14
25	6	41	6	26	6	10	5	53	5	30	4	59	5	42	6	31	6	16	6	52
26	7	30	7	11	6	52	6	29	6	01	5	20	6	22	7	15	6	54	7	34
27	8	22	8	01	7	39	7	12	6	39	5	50	7	08	8	04	7	38	8	21
28	9	19	8	56	8	31	8	03	7	27	6	32	8	00	8	58	8	29	9	14
29	10	16	9	54	9	30	9	01	8	24	7	30	8	58	9	56	9	28	10	12
30	11	15	10	54	10	31	10	05	9	32	8	42	10	01	10	56	10	31	11	14
May 1	12	11	11	53	11	35	11	12	10	44	10	04	11	05	11	57	11	38	12	16
2	13	05	12	51	12	37	12	20	11	59	11	30	12	08	12	56	12	45	13	19
3	13	56	13	48	13	39	13	28	13	15	12	56	13	12	13	54	13	52	14	19
4	14	46	14	42	14	39	14	35	14	29	14	22	14	13	14	51	14	57	15	20
5	15	36	15	38	15	40	15	42	15	45	15	49	15	16	15	48	16	03	16	19
6	16	26	16	33	16	41	16	50	17	01	17	16	16	18	16	45	17	11	17	20
7	17	19	17	31	17	44	17	59	18	18	18	45	17	23	17	44	18	19	18	23
8	18	14	18	30	18	49	19	10	19	37	20	14	18	29	18	45	19	29	19	27
9	19	12	19	33	19	55	20	20	20	53	21	41	19	36	19	49	20	38	20	32
10	20	12	20	34	20	58	21	27	22	03	22	56	20	41	20	51	21	45	21	36
11	21	11	21	34	21	58	22	26	23	03	23	57	21	41	21	51	22	44	22	36
12	22	08	22	29	22	52	23	18	23	52	**	**	22	34	22	45	23	36	23	30
13	23	00	23	19	23	39	**	**	**	**	0	40	23	20	23	34	**	**	**	**
14	23	48	**	**	**	**	0	02	0	30	1	11	**	**	**	**	0	20	0	16
15	**	**	0	03	0	20	0	38	1	01	1	33	0	00	0	17	0	57	0	58
16	0	32	0	44	0	56	1	10	1	27	1	50	0	35	0	57	1	30	1	35
17	1	14	1	21	1	29	1	38	1	49	2	03	1	07	1	33	1	58	2	07

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
May	17	13	35	13	30	13	24	13	17	13	09	12	58	12	58	13	37	13	40	14	04
	18	14	14	14	12	14	11	14	10	14	08	14	06	13	47	14	21	14	32	14	51
	19	14	53	14	56	14	59	15	03	15	08	15	14	14	36	15	06	15	24	15	39
	20	15	33	15	40	15	48	15	57	16	08	16	23	15	26	15	52	16	17	16	27
	21	16	15	16	26	16	39	16	53	17	11	17	36	16	18	16	39	17	13	17	18
	22	17	01	17	17	17	33	17	52	18	16	18	51	17	13	17	31	18	11	18	11
	23	17	51	18	10	18	30	18	54	19	24	20	08	18	11	18	25	19	13	19	08
	24	18	45	19	07	19	30	19	57	20	31	21	24	19	12	19	23	20	15	20	07
	25	19	43	20	05	20	29	20	58	21	35	22	30	20	12	20	22	21	16	21	07
	26	20	41	21	04	21	28	21	55	22	31	23	24	21	10	21	20	22	13	22	05
	27	21	40	22	00	22	21	22	46	23	18	**	**	22	03	22	15	23	04	22	59
	28	22	35	22	52	23	10	23	31	23	56	0	03	22	51	23	07	23	49	23	48
	29	23	29	23	41	23	54	**	**	**	**	0	31	23	34	23	54	**	**	**	**
	30	**	**	**	**	**	**	0	08	0	27	0	52	**	**	**	**	0	28	0	32
	31	0	18	0	26	0	34	0	43	0	54	1	09	0	12	0	37	1	03	1	13
June	1	1	07	1	09	1	12	1	15	1	19	1	24	0	48	1	19	1	36	1	51
	2	1	55	1	52	1	49	1	46	1	43	1	38	1	25	2	00	2	08	2	29
	3	2	44	2	36	2	28	2	18	2	07	1	53	2	02	2	43	2	41	3	09
	4	3	35	3	23	3	09	2	54	2	35	2	10	2	41	3	28	3	18	3	51
	5	4	29	4	12	3	55	3	34	3	08	2	32	3	26	4	16	3	59	4	36
	6	5	27	5	07	4	45	4	20	3	48	3	03	4	15	5	10	4	45	5	28
	7	6	27	6	04	5	41	5	13	4	37	3	45	5	10	6	07	5	39	6	23
	8	7	27	7	04	6	39	6	11	5	35	4	41	6	08	7	06	6	37	7	23
	9	8	23	8	02	7	40	7	13	6	39	5	49	7	09	8	05	7	39	8	22
	10	9	16	8	58	8	38	8	15	7	46	7	04	8	08	9	01	8	40	9	21
	11	10	05	9	50	9	34	9	15	8	52	8	19	9	05	9	54	9	40	10	15
	12	10	49	10	38	10	26	10	13	9	56	9	33	9	59	10	44	10	36	11	08
	13	11	31	11	24	11	16	11	08	10	57	10	43	10	50	11	31	11	31	11	57
	14	12	10	12	07	12	04	12	01	11	57	11	52	11	40	12	16	12	23	12	45
	15	12	49	12	50	12	52	12	54	12	56	12	59	12	28	13	00	13	16	13	32
	16	13	29	13	34	13	40	13	47	13	56	14	08	13	18	13	45	14	08	14	19
	17	14	09	14	19	14	30	14	42	14	57	15	19	14	09	14	32	15	02	15	09
	18	14	54	15	08	15	23	15	40	16	02	16	32	15	02	15	21	15	59	16	01
	19	15	42	15	59	16	18	16	40	17	09	17	49	15	59	16	14	16	59	16	56
	20	16	34	16	55	17	18	17	44	18	16	19	06	16	59	17	11	18	02	17	55
	21	17	32	17	54	18	18	18	46	19	23	20	17	18	00	18	10	19	04	18	56
	22	18	31	18	54	19	18	19	47	20	23	21	17	19	01	19	11	20	04	19	56
	23	19	32	19	53	20	15	20	41	21	14	22	01	19	57	20	08	20	59	20	52
	24	20	29	20	47	21	06	21	28	21	55	22	33	20	47	21	02	21	47	21	44
	25	21	25	21	38	21	53	22	09	22	29	22	57	21	33	21	52	22	28	22	30
	26	22	16	22	25	22	34	22	45	22	58	23	15	22	12	22	37	23	05	23	13
	27	23	05	23	09	23	13	23	17	23	23	23	31	22	50	23	19	23	38	23	52
	28	23	53	23	51	23	50	23	49	23	47	23	45	23	26	**	**	**	**	**	**
	29	**	**	**	**	**	**	**	**	**	**	23	59	**	**	0	00	0	10	0	29
	30	0	40	0	34	0	27	0	20	0	11	**	**	0	02	0	41	0	43	1	08
July	1	1	30	1	19	1	07	0	53	0	37	0	15	0	39	1	25	1	17	1	48
	2	2	22	2	06	1	50	1	31	1	08	0	35	1	21	2	10	1	55	2	31

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
May	17	1	14	1	21	1	29	1	38	1	49	2	03	1	07	1	33	1	58	2	07
	18	1	53	1	57	2	00	2	04	2	08	2	14	1	37	2	07	2	24	2	39
	19	2	32	2	31	2	30	2	29	2	27	2	25	2	06	2	40	2	50	3	10
	20	3	12	3	06	3	01	2	55	2	47	2	37	2	35	3	14	3	17	3	41
	21	3	53	3	43	3	33	3	22	3	08	2	49	3	07	3	50	3	45	4	14
	22	4	36	4	23	4	09	3	53	3	33	3	05	3	41	4	28	4	16	4	50
	23	5	24	5	07	4	48	4	27	4	01	3	24	4	19	5	11	4	52	5	31
	24	6	16	5	56	5	34	5	09	4	37	3	51	5	04	5	59	5	35	6	16
	25	7	12	6	50	6	26	5	58	5	23	4	29	5	55	6	52	6	24	7	09
	26	8	10	7	48	7	24	6	55	6	18	5	23	6	52	7	50	7	21	8	06
	27	9	10	8	48	8	25	7	58	7	24	6	32	7	54	8	51	8	24	9	08
	28	10	07	9	49	9	29	9	05	8	35	7	52	8	58	9	52	9	31	10	11
	29	11	01	10	47	10	31	10	13	9	50	9	17	10	02	10	51	10	37	11	13
	30	11	53	11	43	11	32	11	20	11	04	10	42	11	05	11	49	11	44	12	13
	31	12	41	12	36	12	31	12	25	12	17	12	06	12	05	12	44	12	48	13	12
June	1	13	30	13	30	13	30	13	30	13	30	13	30	13	05	13	39	13	52	14	10
	2	14	18	14	23	14	28	14	35	14	43	14	54	14	06	14	34	14	56	15	08
	3	15	08	15	18	15	29	15	42	15	58	16	19	15	08	15	31	16	02	16	08
	4	16	01	16	15	16	31	16	50	17	14	17	47	16	12	16	30	17	10	17	10
	5	16	57	17	16	17	36	18	00	18	30	19	14	17	17	17	31	18	18	18	14
	6	17	56	18	17	18	41	19	08	19	43	20	34	18	22	18	33	19	26	19	19
	7	18	56	19	19	19	43	20	11	20	47	21	42	19	25	19	35	20	29	20	20
	8	19	54	20	16	20	40	21	07	21	42	22	33	20	22	20	32	21	25	21	17
	9	20	49	21	09	21	31	21	55	22	25	23	10	21	12	21	25	22	13	22	08
	10	21	40	21	57	22	14	22	34	23	00	23	35	21	55	22	11	22	53	22	52
	11	22	26	22	39	22	53	23	09	23	28	23	54	22	32	22	52	23	28	23	31
	12	23	09	23	18	23	28	23	38	23	51	**	**	23	06	23	30	23	58	**	**
	13	23	50	23	54	23	59	**	**	**	**	0	09	23	37	**	**	**	**	0	06
	14	**	**	**	**	**	**	0	05	0	12	0	21	**	**	0	05	0	25	0	38
	15	0	28	0	29	0	29	0	30	0	31	0	32	0	06	0	38	0	52	1	09
	16	1	07	1	04	1	00	0	56	0	50	0	43	0	35	1	12	1	18	1	40
	17	1	48	1	40	1	32	1	22	1	11	0	55	1	05	1	47	1	45	2	12
	18	2	30	2	18	2	05	1	51	1	34	1	09	1	38	2	23	2	15	2	46
	19	3	16	3	00	2	43	2	24	2	00	1	27	2	15	3	04	2	48	3	25
	20	4	06	3	47	3	27	3	03	2	33	1	51	2	57	3	50	3	28	4	09
	21	5	01	4	39	4	16	3	50	3	15	2	24	3	46	4	42	4	15	4	59
	22	6	00	5	37	5	13	4	44	4	07	3	13	4	41	5	40	5	10	5	56
	23	7	00	6	38	6	14	5	47	5	11	4	18	5	44	6	40	6	13	6	57
	24	8	00	7	40	7	19	6	54	6	23	5	37	6	49	7	43	7	20	8	02
	25	8	56	8	40	8	23	8	03	7	39	7	03	7	54	8	45	8	28	9	06
	26	9	50	9	38	9	26	9	12	8	54	8	30	8	58	9	44	9	36	10	07
	27	10	39	10	33	10	26	10	18	10	08	9	55	10	00	10	40	10	41	11	07
	28	11	28	11	27	11	25	11	24	11	21	11	19	11	00	11	35	11	46	12	05
	29	12	15	12	19	12	23	12	27	12	33	12	41	12	00	12	29	12	49	13	03
	30	13	04	13	13	13	22	13	33	13	46	14	04	13	00	13	25	13	53	14	01
July	1	13	54	14	08	14	22	14	39	15	00	15	29	14	02	14	21	14	58	15	01
	2	14	48	15	06	15	25	15	47	16	14	16	54	15	05	15	21	16	05	16	03

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2024
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.						FOR CERTAIN STATIONS IN INDIA IN I.S.T.			
Date \ Lat.	0º	10º	20º	30º	40º	50º	Kolkata	Chennai	Delhi	Mumbai
	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
July 1	1 30	1 19	1 07	0 53	0 37	0 15	0 39	1 25	1 17	1 48
2	2 22	2 06	1 50	1 31	1 08	0 35	1 21	2 10	1 55	2 31
3	3 17	2 58	2 37	2 13	1 44	1 02	2 07	3 01	2 39	3 20
4	4 15	3 53	3 30	3 03	2 28	1 38	2 59	3 56	3 29	4 12
5	5 14	4 51	4 27	3 59	3 22	2 28	3 56	4 53	4 24	5 10
6	6 12	5 50	5 27	4 59	4 24	3 32	4 55	5 52	5 25	6 09
7	7 07	6 47	6 25	6 01	5 30	4 44	5 56	6 50	6 27	7 08
8	7 57	7 41	7 23	7 03	6 37	6 00	6 54	7 45	7 28	8 05
9	8 43	8 30	8 17	8 02	7 43	7 16	7 49	8 36	8 26	8 59
10	9 26	9 18	9 08	8 58	8 45	8 27	8 41	9 24	9 22	9 49
11	10 06	10 02	9 57	9 52	9 46	9 37	9 32	10 10	10 14	10 37
12	10 45	10 45	10 45	10 45	10 45	10 45	10 21	10 54	11 07	11 25
13	11 24	11 28	11 33	11 38	11 44	11 53	11 10	11 39	11 59	12 12
14	12 04	12 12	12 21	12 31	12 44	13 02	11 59	12 24	12 52	13 00
15	12 46	12 59	13 12	13 28	13 47	14 14	12 51	13 12	13 47	13 51
16	13 32	13 49	14 06	14 26	14 52	15 29	13 47	14 03	14 45	14 44
17	14 22	14 42	15 03	15 28	15 59	16 45	14 44	14 57	15 46	15 41
18	15 17	15 39	16 03	16 30	17 06	17 59	15 45	15 56	16 48	16 40
19	16 16	16 39	17 04	17 32	18 09	19 04	16 46	16 56	17 50	17 41
20	17 17	17 39	18 02	18 29	19 04	19 56	17 45	17 55	18 47	18 40
21	18 17	18 36	18 57	19 21	19 51	20 33	18 38	18 52	19 39	19 35
22	19 15	19 30	19 46	20 05	20 28	21 00	19 27	19 44	20 24	20 24
23	20 09	20 19	20 30	20 43	20 59	21 20	20 10	20 32	21 03	21 09
24	21 00	21 06	21 11	21 18	21 26	21 37	20 49	21 17	21 39	21 51
25	21 50	21 50	21 50	21 50	21 51	21 51	21 26	21 59	22 11	22 29
26	22 38	22 33	22 28	22 22	22 15	22 05	22 02	22 40	22 44	23 08
27	23 27	23 17	23 07	22 55	22 40	22 21	22 40	23 24	23 19	23 48
28	** **	** **	23 49	23 31	23 10	22 39	23 20	** **	23 55	** **
29	0 18	0 04	** **	** **	23 44	23 04	** **	0 08	** **	0 30
30	1 12	0 54	0 34	0 11	** **	23 36	0 05	0 57	0 36	1 16
31	2 08	1 47	1 25	0 58	0 25	** **	0 54	1 50	1 24	2 07
Aug. 1	3 06	2 44	2 19	1 51	1 15	0 21	1 49	2 46	2 17	3 02
2	4 04	3 42	3 18	2 49	2 13	1 20	2 46	3 44	3 16	4 00
3	4 59	4 38	4 16	3 51	3 18	2 29	3 46	4 41	4 16	4 59
4	5 51	5 33	5 14	4 52	4 24	3 44	4 44	5 37	5 17	5 56
5	6 38	6 24	6 09	5 52	5 30	5 00	5 41	6 29	6 16	6 51
6	7 22	7 12	7 01	6 49	6 34	6 13	6 34	7 18	7 13	7 43
7	8 03	7 57	7 51	7 44	7 35	7 24	7 25	8 04	8 07	8 31
8	8 42	8 40	8 39	8 37	8 35	8 32	8 14	8 49	8 59	9 19
9	9 21	9 24	9 27	9 30	9 34	9 40	9 03	9 34	9 51	10 06
10	10 00	10 07	10 14	10 23	10 33	10 48	9 52	10 18	10 43	10 53
11	10 41	10 52	11 04	11 17	11 34	11 58	10 43	11 05	11 37	11 43
12	11 25	11 40	11 56	12 14	12 37	13 11	11 36	11 54	12 33	12 34
13	12 12	12 30	12 50	13 13	13 43	14 25	12 31	12 46	13 32	13 29
14	13 04	13 25	13 48	14 14	14 49	15 40	13 30	13 41	14 32	14 25
15	14 00	14 23	14 47	15 16	15 53	16 48	14 30	14 39	15 34	15 25
16	15 00	15 22	15 47	16 15	16 51	17 46	15 29	15 39	16 32	16 24

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82°.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0°		10°		20°		30°		40°		50°		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
July	1	13	54	14	08	14	22	14	39	15	00	15	29	14	02	14	21	14	58	15	01
	2	14	48	15	06	15	25	15	47	16	14	16	54	15	05	15	21	16	05	16	03
	3	15	45	16	05	16	28	16	54	17	27	18	16	16	09	16	21	17	12	17	06
	4	16	43	17	06	17	30	17	58	18	34	19	28	17	12	17	23	18	16	18	07
	5	17	42	18	04	18	28	18	57	19	33	20	25	18	11	18	21	19	14	19	06
	6	18	38	18	59	19	22	19	47	20	20	21	07	19	04	19	15	20	05	19	59
	7	19	31	19	49	20	08	20	30	20	58	21	37	19	50	20	04	20	49	20	46
	8	20	19	20	33	20	49	21	07	21	28	21	58	20	29	20	47	21	26	21	27
	9	21	04	21	14	21	25	21	38	21	53	22	14	21	04	21	27	21	57	22	03
	10	21	45	21	51	21	58	22	05	22	15	22	27	21	36	22	02	22	26	22	37
	11	22	24	22	26	22	29	22	31	22	34	22	38	22	06	22	36	22	52	23	08
	12	23	03	23	01	22	59	22	57	22	53	22	49	22	34	23	10	23	19	23	39
	13	23	43	23	37	23	30	23	23	23	13	23	01	23	04	23	44	23	45	**	**
	14	**	**	**	**	**	**	23	50	23	35	23	14	23	36	**	**	**	**	0	10
	15	0	23	0	13	0	02	**	**	23	59	23	30	**	**	0	19	0	13	0	43
	16	1	08	0	53	0	38	0	20	**	**	23	50	0	10	0	58	0	45	1	20
	17	1	56	1	38	1	19	0	56	0	29	**	**	0	49	1	41	1	22	2	00
	18	2	48	2	27	2	05	1	39	1	06	0	19	1	35	2	30	2	05	2	47
	19	3	45	3	23	2	58	2	30	1	54	1	00	2	27	3	25	2	56	3	41
	20	4	45	4	22	3	58	3	30	2	53	1	58	3	27	4	24	3	56	4	41
	21	5	46	5	25	5	03	4	36	4	03	3	13	4	32	5	28	5	02	5	46
	22	6	45	6	27	6	09	5	47	5	19	4	39	5	39	6	31	6	12	6	51
	23	7	41	7	28	7	14	6	58	6	37	6	08	6	46	7	33	7	22	7	56
	24	8	34	8	25	8	17	8	07	7	55	7	38	7	50	8	32	8	30	8	58
	25	9	24	9	21	9	18	9	14	9	10	9	04	8	53	9	30	9	37	9	58
	26	10	12	10	15	10	17	10	20	10	24	10	28	9	54	10	25	10	42	10	57
	27	11	01	11	09	11	17	11	26	11	38	11	53	10	54	11	21	11	47	11	56
	28	11	51	12	04	12	17	12	32	12	51	13	18	11	56	12	17	12	52	12	56
	29	12	44	13	00	13	18	13	39	14	05	14	42	12	59	13	15	13	58	13	57
	30	13	39	13	59	14	20	14	46	15	18	16	05	14	02	14	15	15	04	14	59
	31	14	36	14	58	15	23	15	50	16	26	17	19	15	05	15	15	16	08	16	00
Aug.	1	15	34	15	57	16	21	16	50	17	26	18	20	16	04	16	13	17	08	16	59
	2	16	30	16	52	17	16	17	42	18	16	19	06	16	58	17	09	18	00	17	53
	3	17	24	17	43	18	04	18	27	18	57	19	39	17	45	17	59	18	45	18	41
	4	18	13	18	29	18	46	19	05	19	29	20	02	18	26	18	43	19	24	19	24
	5	18	59	19	11	19	24	19	38	19	56	20	20	19	03	19	24	19	58	20	02
	6	19	42	19	49	19	58	20	07	20	18	20	33	19	36	20	01	20	27	20	36
	7	20	21	20	25	20	29	20	33	20	38	20	45	20	06	20	35	20	54	21	08
	8	21	00	21	00	20	59	20	58	20	58	20	56	20	35	21	09	21	20	21	39
	9	21	39	21	35	21	30	21	24	21	17	21	07	21	04	21	42	21	46	22	09
	10	22	19	22	10	22	01	21	50	21	37	21	19	21	35	22	16	22	13	22	41
	11	23	01	22	48	22	34	22	19	22	00	21	34	22	07	22	53	22	43	23	16
	12	23	47	23	30	23	12	22	52	22	26	21	51	22	43	23	34	23	17	23	54
	13	**	**	**	**	23	55	23	31	23	00	22	15	23	26	**	**	23	56	**	**
	14	0	36	0	16	**	**	**	**	23	42	22	50	**	**	0	19	**	**	0	37
	15	1	31	1	08	0	44	0	17	**	**	23	39	0	14	1	11	0	43	1	27
	16	2	28	2	05	1	41	1	12	0	35	**	**	1	10	2	07	1	38	2	23

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2024
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date \ Lat.		0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Aug.	16	15	00	15	22	15	47	16	15	16	51	17	46	15	29	15	39	16	32	16	24
	17	16	00	16	20	16	43	17	09	17	42	18	28	16	25	16	36	17	27	17	21
	18	16	59	17	16	17	35	17	56	18	22	19	00	17	16	17	31	18	14	18	13
	19	17	55	18	08	18	22	18	37	18	57	19	23	18	01	18	21	18	57	19	00
	20	18	49	18	57	19	05	19	14	19	26	19	41	18	43	19	09	19	35	19	44
	21	19	41	19	43	19	46	19	48	19	52	19	56	19	22	19	53	20	09	20	24
	22	20	30	20	27	20	24	20	21	20	17	20	11	20	00	20	36	20	43	21	05
	23	21	22	21	13	21	04	20	54	20	42	20	26	20	38	21	20	21	18	21	45
	24	22	13	22	00	21	46	21	31	21	11	20	44	21	19	22	05	21	54	22	27
	25	23	08	22	50	22	31	22	10	21	44	21	07	22	02	22	54	22	35	23	14
	26	**	**	23	43	23	21	22	55	22	23	21	37	22	51	23	46	23	21	**	**
	27	0	04	**	**	**	**	23	47	23	11	22	17	23	44	**	**	**	**	0	03
	28	1	02	0	39	0	15	**	**	**	**	23	12	**	**	0	41	0	13	0	58
	29	1	59	1	37	1	12	0	43	0	06	**	**	0	41	1	39	1	10	1	55
	30	2	55	2	33	2	10	1	44	1	09	0	18	1	40	2	36	2	09	2	53
	31	3	47	3	28	3	08	2	44	2	14	1	32	2	38	3	32	3	10	3	50
Sept.	1	4	35	4	19	4	03	3	44	3	21	2	46	3	35	4	24	4	09	4	45
	2	5	20	5	08	4	56	4	42	4	24	4	00	4	28	5	14	5	06	5	38
	3	6	01	5	54	5	46	5	38	5	27	5	12	5	20	6	01	6	01	6	27
	4	6	41	6	38	6	34	6	31	6	26	6	20	6	09	6	46	6	53	7	15
	5	7	20	7	21	7	22	7	24	7	26	7	29	6	58	7	31	7	46	8	02
	6	7	58	8	04	8	10	8	16	8	25	8	36	7	47	8	15	8	37	8	49
	7	8	38	8	48	8	58	9	10	9	25	9	46	8	37	9	00	9	31	9	37
	8	9	21	9	34	9	49	10	06	10	27	10	57	9	29	9	48	10	25	10	27
	9	10	06	10	23	10	42	11	03	11	31	12	10	10	22	10	38	11	22	11	20
	10	10	55	11	16	11	38	12	03	12	35	13	24	11	19	11	31	12	21	12	15
	11	11	48	12	11	12	35	13	03	13	39	14	33	12	17	12	27	13	21	13	12
	12	12	45	13	08	13	33	14	02	14	39	15	35	13	15	13	25	14	19	14	10
	13	13	44	14	05	14	29	14	56	15	31	16	22	14	11	14	21	15	14	15	06
	14	14	42	15	01	15	22	15	46	16	15	16	58	15	03	15	17	16	04	15	59
	15	15	39	15	54	16	10	16	29	16	52	17	24	15	51	16	08	16	48	16	48
	16	16	33	16	43	16	55	17	07	17	23	17	44	16	33	16	56	17	27	17	34
	17	17	26	17	31	17	37	17	43	17	50	18	00	17	14	17	42	18	03	18	15
	18	18	17	18	17	18	16	18	16	18	16	18	15	17	53	18	26	18	38	18	56
	19	19	09	19	03	18	57	18	50	18	41	18	30	18	31	19	11	19	13	19	38
	20	20	02	19	51	19	39	19	26	19	10	18	47	19	12	19	57	19	50	20	20
	21	20	57	20	41	20	24	20	05	19	42	19	08	19	56	20	45	20	29	21	06
	22	21	55	21	35	21	14	20	50	20	19	19	36	20	44	21	38	21	15	21	56
	23	22	54	22	32	22	08	21	41	21	05	20	13	21	37	22	34	22	06	22	51
	24	23	53	23	31	23	06	22	37	22	00	21	04	22	34	23	33	23	03	23	49
	25	**	**	**	**	**	**	23	37	23	01	22	08	23	34	**	**	**	**	**	**
	26	0	50	0	28	0	04	**	**	**	**	23	21	**	**	0	30	0	03	0	47
	27	1	44	1	24	1	03	0	38	0	06	**	**	0	32	1	27	1	04	1	45
	28	2	33	2	16	1	59	1	39	1	13	0	35	1	30	2	20	2	03	2	41
	29	3	19	3	06	2	52	2	36	2	17	1	50	2	24	3	11	3	01	3	34
	30	4	01	3	52	3	43	3	33	3	19	3	01	3	16	3	59	3	56	4	23
Oct.	1	4	40	4	36	4	31	4	26	4	19	4	10	4	06	4	44	4	49	5	12

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONSET (MOON'S UPPER LIMB)

FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.														FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Aug.	16	2	28	2	05	1	41	1	12	0	35	**	**	1	10	2	07	1	38	2	23
	17	3	29	3	06	2	42	2	15	1	39	0	46	2	12	3	09	2	41	3	26
	18	4	28	4	09	3	48	3	24	2	53	2	07	3	18	4	12	3	50	4	31
	19	5	27	5	11	4	54	4	35	4	11	3	37	4	25	5	16	5	00	5	37
	20	6	21	6	11	6	00	5	47	5	31	5	08	5	32	6	17	6	11	6	41
	21	7	14	7	09	7	03	6	57	6	49	6	38	6	37	7	17	7	20	7	44
	22	8	04	8	05	8	05	8	05	8	06	8	06	7	41	8	14	8	27	8	45
	23	8	55	9	00	9	07	9	14	9	22	9	34	8	44	9	12	9	35	9	46
	24	9	46	9	57	10	08	10	22	10	38	11	02	9	47	10	09	10	42	10	47
	25	10	39	10	54	11	11	11	31	11	55	12	29	10	51	11	09	11	50	11	50
	26	11	34	11	54	12	14	12	38	13	09	13	54	11	56	12	09	12	57	12	52
	27	12	31	12	53	13	17	13	45	14	20	15	12	12	59	13	10	14	02	13	55
	28	13	30	13	52	14	17	14	45	15	23	16	17	13	59	14	09	15	03	14	54
	29	14	26	14	48	15	12	15	40	16	15	17	07	14	54	15	05	15	58	15	50
	30	15	20	15	40	16	02	16	26	16	58	17	43	15	44	15	56	16	44	16	39
	31	16	10	16	27	16	45	17	06	17	32	18	08	16	26	16	42	17	25	17	23
Sept.	1	16	56	17	10	17	24	17	40	18	00	18	27	17	04	17	23	17	59	18	02
	2	17	40	17	49	17	59	18	09	18	23	18	41	17	38	18	01	18	29	18	37
	3	18	20	18	25	18	30	18	36	18	44	18	54	18	08	18	36	18	57	19	09
	4	18	59	19	00	19	01	19	02	19	03	19	05	18	37	19	10	19	23	19	40
	5	19	38	19	35	19	31	19	27	19	22	19	15	19	06	19	43	19	49	20	11
	6	20	17	20	09	20	02	19	53	19	42	19	27	19	36	20	16	20	15	20	42
	7	20	58	20	46	20	34	20	20	20	03	19	40	20	07	20	52	20	44	21	15
	8	21	42	21	26	21	10	20	51	20	28	19	55	20	41	21	31	21	16	21	51
	9	22	29	22	10	21	50	21	27	20	58	20	16	21	21	22	13	21	52	22	32
	10	23	20	22	59	22	35	22	09	21	35	20	45	22	05	23	01	22	34	23	18
	11	**	**	23	52	23	28	22	59	22	22	21	27	22	56	23	54	23	25	**	**
	12	0	15	**	**	**	**	23	57	23	20	22	24	23	54	**	**	**	**	0	10
	13	1	13	0	50	0	25	**	**	**	**	23	38	**	**	0	52	0	23	1	08
	14	2	11	1	51	1	28	1	02	0	28	**	**	0	57	1	53	1	28	2	11
	15	3	09	2	52	2	32	2	11	1	43	1	03	2	03	2	55	2	36	3	15
	16	4	05	3	52	3	38	3	22	3	01	2	32	3	10	3	57	3	46	4	19
	17	4	58	4	50	4	42	4	32	4	20	4	03	4	15	4	57	4	56	5	23
	18	5	51	5	48	5	45	5	42	5	39	5	33	5	20	5	57	6	05	6	26
	19	6	42	6	45	6	48	6	52	6	57	7	03	6	24	6	55	7	14	7	28
	20	7	34	7	43	7	52	8	02	8	15	8	33	7	30	7	55	8	23	8	31
	21	8	28	8	42	8	56	9	13	9	35	10	04	8	36	8	55	9	33	9	35
	22	9	25	9	43	10	02	10	24	10	53	11	35	9	43	9	58	10	43	10	40
	23	10	23	10	44	11	07	11	34	12	08	12	59	10	49	11	01	11	52	11	45
	24	11	23	11	46	12	10	12	39	13	16	14	11	11	53	12	02	12	57	12	48
	25	12	21	12	44	13	08	13	37	14	12	15	06	12	50	13	00	13	54	13	46
	26	13	17	13	38	14	00	14	26	14	59	15	46	13	42	13	53	14	44	14	37
	27	14	08	14	26	14	45	15	07	15	35	16	14	14	26	14	41	15	26	15	23
	28	14	55	15	10	15	25	15	43	16	04	16	34	15	05	15	24	16	02	16	03
	29	15	39	15	49	16	00	16	13	16	29	16	50	15	40	16	02	16	33	16	39
	30	16	19	16	26	16	33	16	40	16	50	17	03	16	11	16	37	17	01	17	12
Oct.	1	16	59	17	01	17	04	17	06	17	10	17	14	16	40	17	11	17	28	17	43

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2024
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Oct.	1	4	40	4	36	4	31	4	26	4	19	4	10	4	06	4	44	4	49	5	12
	2	5	20	5	19	5	19	5	19	5	19	5	19	4	55	5	29	5	41	5	59
	3	5	58	6	02	6	06	6	11	6	18	6	26	5	44	6	12	6	32	6	46
	4	6	37	6	46	6	55	7	05	7	18	7	35	6	33	6	58	7	26	7	34
	5	7	19	7	32	7	45	7	60	8	19	8	46	7	24	7	45	8	19	8	23
	6	8	03	8	19	8	36	8	57	9	22	9	58	8	17	8	34	9	16	9	15
	7	8	51	9	10	9	31	9	56	10	26	11	12	9	13	9	26	10	14	10	09
	8	9	42	10	04	10	27	10	55	11	30	12	22	10	09	10	20	11	13	11	05
	9	10	36	10	59	11	24	11	53	12	30	13	26	11	07	11	16	12	10	12	02
	10	11	33	11	55	12	19	12	48	13	24	14	17	12	02	12	12	13	05	12	57
	11	12	29	12	50	13	12	13	38	14	10	14	56	12	54	13	06	13	56	13	50
	12	13	25	13	42	14	01	14	21	14	48	15	25	13	42	13	57	14	40	14	38
	13	14	18	14	31	14	45	15	01	15	20	15	47	14	25	14	45	15	20	15	24
	14	15	11	15	19	15	27	15	37	15	48	16	04	15	05	15	30	15	57	16	06
	15	16	01	16	04	16	07	16	10	16	14	16	19	15	44	16	14	16	31	16	46
	16	16	52	16	50	16	47	16	43	16	39	16	34	16	22	16	58	17	05	17	27
	17	17	45	17	37	17	28	17	18	17	06	16	50	17	02	17	44	17	41	18	09
	18	18	40	18	26	18	12	17	56	17	36	17	09	17	45	18	31	18	20	18	54
	19	19	39	19	20	19	01	18	39	18	12	17	34	18	31	19	24	19	04	19	43
	20	20	39	20	18	19	55	19	29	18	55	18	07	19	25	20	20	19	55	20	37
	21	21	41	21	18	20	53	20	25	19	48	18	54	20	22	21	20	20	51	21	37
	22	22	41	22	18	21	54	21	26	20	49	19	55	21	23	22	20	21	52	22	37
	23	23	38	23	17	22	54	22	28	21	56	21	07	22	24	23	20	22	54	23	37
	24	**	**	**	**	23	53	23	31	23	03	22	22	23	23	**	**	23	56	**	**
	25	0	29	0	11	**	**	**	**	**	**	23	38	**	**	0	15	**	**	0	34
	26	1	16	1	02	0	47	0	30	0	08	**	**	0	19	1	07	0	54	1	29
	27	2	00	1	50	1	39	1	27	1	12	0	51	1	12	1	56	1	51	2	20
	28	2	40	2	34	2	28	2	21	2	12	2	01	2	02	2	42	2	44	3	09
	29	3	19	3	18	3	16	3	14	3	12	3	09	2	51	3	27	3	36	3	56
	30	3	58	4	00	4	03	4	06	4	11	4	16	3	40	4	10	4	28	4	43
	31	4	37	4	44	4	51	5	00	5	10	5	25	4	29	4	55	5	20	5	31
Nov.	1	5	18	5	29	5	41	5	54	6	11	6	35	5	20	5	42	6	14	6	19
	2	6	01	6	16	6	32	6	51	7	14	7	48	6	12	6	30	7	10	7	11
	3	6	48	7	07	7	27	7	50	8	18	9	01	7	08	7	22	8	08	8	04
	4	7	39	8	00	8	22	8	49	9	23	10	13	8	04	8	16	9	07	9	00
	5	8	32	8	55	9	19	9	48	10	24	11	20	9	02	9	11	10	05	9	57
	6	9	28	9	51	10	15	10	43	11	20	12	14	9	57	10	07	11	01	10	52
	7	10	23	10	45	11	08	11	34	12	07	12	56	10	49	11	01	11	52	11	45
	8	11	18	11	37	11	56	12	18	12	47	13	28	11	38	11	52	12	37	12	34
	9	12	10	12	25	12	40	12	58	13	20	13	51	12	20	12	39	13	17	13	19
	10	13	01	13	11	13	22	13	34	13	49	14	08	13	00	13	24	13	54	14	00
	11	13	50	13	55	14	01	14	06	14	14	14	24	13	38	14	06	14	27	14	39
	12	14	39	14	39	14	39	14	38	14	38	14	38	14	15	14	48	15	00	15	19
	13	15	30	15	24	15	18	15	12	15	04	14	53	14	52	15	32	15	34	15	58
	14	16	22	16	11	16	00	15	47	15	31	15	10	15	33	16	17	16	10	16	41
	15	17	19	17	03	16	46	16	27	16	04	15	31	16	17	17	07	16	51	17	28
	16	18	18	17	59	17	38	17	14	16	43	16	00	17	08	18	02	17	39	18	20

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Oct.	1	16	59	17	01	17	04	17	06	17	10	17	14	16	40	17	11	17	28	17	43
	2	17	38	17	36	17	34	17	31	17	28	17	24	17	09	17	44	17	53	18	13
	3	18	16	18	10	18	04	17	57	17	48	17	35	17	38	18	17	18	19	18	44
	4	18	57	18	47	18	36	18	23	18	08	17	48	18	09	18	53	18	47	19	17
	5	19	40	19	26	19	10	18	53	18	32	18	02	18	42	19	30	19	17	19	52
	6	20	25	20	08	19	49	19	27	19	00	18	21	19	20	20	11	19	52	20	30
	7	21	15	20	54	20	32	20	06	19	34	18	47	20	02	20	57	20	32	21	14
	8	22	08	21	45	21	21	20	53	20	17	19	23	20	50	21	47	21	19	22	04
	9	23	03	22	40	22	15	21	47	21	09	20	13	21	44	22	42	22	13	22	58
	10	24	00	23	38	23	15	22	47	22	11	21	19	22	43	23	41	23	13	23	57
	11	**	**	**	**	**	**	23	52	23	22	22	36	23	46	**	**	**	**	**	**
	12	0	56	0	37	0	16	**	**	**	**	**	**	**	**	0	40	0	18	0	59
	13	1	51	1	36	1	19	1	00	0	36	0	02	0	50	1	40	1	25	2	01
	14	2	43	2	33	2	21	2	08	1	52	1	30	1	54	2	39	2	32	3	03
	15	3	35	3	30	3	24	3	17	3	09	2	58	2	58	3	37	3	40	4	05
	16	4	26	4	26	4	26	4	26	4	26	4	26	4	02	4	35	4	48	5	06
	17	5	18	5	23	5	29	5	36	5	45	5	56	5	06	5	34	5	57	6	09
	18	6	11	6	22	6	34	6	47	7	05	7	28	6	12	6	35	7	08	7	13
	19	7	08	7	24	7	41	8	01	8	25	9	01	7	21	7	38	8	20	8	19
	20	8	07	8	27	8	49	9	14	9	46	10	32	8	30	8	43	9	32	9	27
	21	9	09	9	31	9	55	10	23	10	59	11	53	9	38	9	48	10	41	10	33
	22	10	10	10	33	10	58	11	27	12	03	12	58	10	40	10	50	11	44	11	36
	23	11	09	11	31	11	54	12	20	12	55	13	45	11	36	11	47	12	38	12	31
	24	12	03	12	22	12	42	13	06	13	36	14	17	12	24	12	37	13	24	13	20
	25	12	52	13	08	13	25	13	44	14	07	14	40	13	05	13	22	14	02	14	02
	26	13	37	13	49	14	02	14	16	14	33	14	57	13	41	14	02	14	35	14	40
	27	14	19	14	26	14	35	14	44	14	56	15	11	14	13	14	38	15	04	15	14
	28	14	59	15	02	15	06	15	10	15	16	15	23	14	43	15	13	15	31	15	45
	29	15	37	15	37	15	36	15	36	15	35	15	33	15	12	15	46	15	57	16	15
	30	16	16	16	11	16	06	16	00	15	54	15	44	15	41	16	19	16	23	16	46
	31	16	56	16	47	16	37	16	27	16	13	15	56	16	11	16	53	16	50	17	18
Nov.	1	17	38	17	25	17	12	16	56	16	36	16	10	16	44	17	30	17	20	17	53
	2	18	23	18	06	17	49	17	29	17	03	16	27	17	20	18	10	17	53	18	30
	3	19	12	18	52	18	31	18	06	17	36	16	51	18	01	18	55	18	31	19	13
	4	20	04	19	42	19	18	18	51	18	16	17	24	18	47	19	44	19	17	20	01
	5	20	58	20	35	20	11	19	42	19	05	18	10	19	40	20	37	20	08	20	54
	6	21	54	21	32	21	08	20	40	20	04	19	10	20	37	21	35	21	06	21	51
	7	22	50	22	29	22	08	21	43	21	10	20	23	21	38	22	32	22	08	22	50
	8	23	44	23	27	23	09	22	48	22	21	21	44	22	39	23	31	23	13	23	51
	9	**	**	**	**	**	**	23	54	23	35	23	07	23	41	**	**	**	**	**	**
	10	0	35	0	22	0	09	**	**	**	**	**	**	**	**	0	28	0	18	0	51
	11	1	25	1	17	1	09	0	59	0	48	0	31	0	42	1	24	1	23	1	50
	12	2	13	2	11	2	08	2	05	2	02	1	57	1	44	2	19	2	28	2	49
	13	3	03	3	06	3	09	3	13	3	17	3	23	2	45	3	16	3	34	3	49
	14	3	54	4	02	4	11	4	21	4	34	4	51	3	49	4	14	4	42	4	51
	15	4	48	5	02	5	17	5	33	5	54	6	23	4	56	5	16	5	53	5	55
	16	5	47	6	05	6	24	6	46	7	15	7	56	6	05	6	20	7	05	7	02

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE, 2024
LOCAL MEAN TIME AND INDIAN STANDARD TIME OF
MOONRISE (MOON'S UPPER LIMB)

	FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Lat. / Date	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Nov. 16	18	18	17	59	17	38	17	14	16	43	16	00	17	08	18	02	17	39	18	20
17	19	21	18	59	18	35	18	07	17	32	16	40	18	04	19	01	18	33	19	18
18	20	24	20	01	19	37	19	08	18	31	17	36	19	05	20	03	19	34	20	19
19	21	24	21	03	20	39	20	12	19	38	18	46	20	08	21	05	20	38	21	22
20	22	20	22	01	21	41	21	17	20	47	20	03	21	11	22	04	21	43	22	23
21	23	10	22	55	22	38	22	19	21	55	21	21	22	09	22	59	22	44	23	20
22	23	56	23	44	23	32	23	18	23	01	22	36	23	05	23	50	23	42	**	**
23	**	**	**	**	**	**	**	**	**	**	23	48	23	56	**	**	**	**	0	13
24	0	37	0	30	0	22	0	14	0	03	**	**	**	**	0	37	0	37	1	04
25	1	17	1	14	1	11	1	08	1	03	0	57	0	46	1	23	1	30	1	52
26	1	56	1	57	1	59	2	00	2	02	2	05	1	35	2	07	2	22	2	38
27	2	35	2	40	2	46	2	53	3	01	3	13	2	23	2	51	3	14	3	26
28	3	15	3	25	3	35	3	47	4	02	4	22	3	14	3	37	4	07	4	14
29	3	58	4	11	4	26	4	43	5	04	5	34	4	06	4	25	5	02	5	04
30	4	44	5	01	5	20	5	41	6	08	6	47	5	00	5	16	6	00	5	58
Dec. 1	5	34	5	54	6	15	6	41	7	14	8	01	5	57	6	09	6	59	6	53
2	6	27	6	49	7	13	7	41	8	17	9	11	6	55	7	05	7	59	7	51
3	7	23	7	46	8	10	8	38	9	15	10	10	7	52	8	02	8	56	8	47
4	8	19	8	41	9	04	9	31	10	06	10	56	8	46	8	57	9	49	9	42
5	9	15	9	34	9	54	10	18	10	48	11	31	9	36	9	49	10	36	10	32
6	10	07	10	23	10	39	10	59	11	23	11	55	10	20	10	37	11	18	11	18
7	10	58	11	09	11	21	11	35	11	52	12	14	11	00	11	22	11	54	11	59
8	11	46	11	53	11	59	12	07	12	17	12	30	11	38	12	04	12	28	12	38
9	12	33	12	35	12	36	12	38	12	41	12	44	12	13	12	44	13	00	13	16
10	13	21	13	18	13	14	13	10	13	05	12	58	12	49	13	26	13	32	13	54
11	14	10	14	02	13	53	13	43	13	30	13	13	13	27	14	08	14	06	14	33
12	15	03	14	50	14	35	14	19	13	59	13	32	14	07	14	55	14	43	15	17
13	16	00	15	42	15	23	15	01	14	34	13	56	14	54	15	46	15	27	16	05
14	17	01	16	39	16	17	15	51	15	18	14	30	15	47	16	42	16	16	17	00
15	18	04	17	41	17	17	16	48	16	12	15	18	16	45	17	43	17	15	18	00
16	19	06	18	44	18	19	17	52	17	16	16	22	17	49	18	46	18	18	19	03
17	20	05	19	45	19	23	18	58	18	25	17	38	18	52	19	48	19	24	20	05
18	20	59	20	42	20	23	20	03	19	36	18	58	19	54	20	46	20	27	21	06
19	21	48	21	35	21	21	21	05	20	44	20	16	20	52	21	40	21	29	22	02
20	22	32	22	23	22	13	22	03	21	50	21	31	21	47	22	29	22	26	22	55
21	23	13	23	09	23	04	22	58	22	51	22	42	22	38	23	16	23	21	23	44
22	23	52	23	52	23	52	23	52	23	51	23	51	23	28	**	**	**	**	**	**
23	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	01	0	13	0	32
24	0	31	0	35	0	39	0	44	0	50	0	59	0	16	0	46	1	06	1	19
25	1	11	1	19	1	28	1	38	1	50	2	07	1	06	1	31	1	58	2	07
26	1	52	2	04	2	17	2	32	2	51	3	18	1	57	2	17	2	52	2	56
27	2	37	2	53	3	10	3	30	3	55	4	30	2	50	3	07	3	49	3	48
28	3	25	3	45	4	05	4	29	5	00	5	45	3	47	4	00	4	47	4	43
29	4	17	4	39	5	02	5	30	6	04	6	56	4	44	4	55	5	48	5	40
30	5	13	5	36	6	00	6	29	7	06	8	01	5	43	5	52	6	46	6	37
31	6	10	6	32	6	56	7	24	8	00	8	52	6	39	6	49	7	42	7	34
32	7	07	7	28	7	49	8	14	8	45	9	31	7	31	7	44	8	32	8	27

The symbol (**) indicates that the phenomenon will occur on the next day

MOONSET, 2024

LOCAL MEAN TIME AND INDIAN STANDARD TIME OF MOONSET (MOON'S UPPER LIMB)

		FOR THE CENTRAL MERIDIAN OF INDIA (82º.5 E) IN L. M. T.												FOR CERTAIN STATIONS IN INDIA IN I.S.T.							
Date	Lat.	0º		10º		20º		30º		40º		50º		Kolkata		Chennai		Delhi		Mumbai	
		h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m	h	m
Nov.	16	5	47	6	05	6	24	6	46	7	15	7	56	6	05	6	20	7	05	7	02
	17	6	48	7	10	7	33	7	59	8	33	9	24	7	15	7	26	8	17	8	10
	18	7	52	8	14	8	39	9	08	9	44	10	39	8	21	8	31	9	26	9	17
	19	8	53	9	16	9	40	10	08	10	43	11	36	9	22	9	33	10	25	10	17
	20	9	52	10	12	10	33	10	59	11	30	12	15	10	15	10	27	11	17	11	11
	21	10	44	11	01	11	20	11	41	12	06	12	43	11	01	11	16	11	59	11	58
	22	11	32	11	46	12	00	12	15	12	35	13	03	11	40	11	59	12	35	12	37
	23	12	16	12	25	12	35	12	46	12	59	13	18	12	13	12	37	13	06	13	13
	24	12	56	13	02	13	07	13	13	13	20	13	30	12	44	13	12	13	34	13	46
	25	13	36	13	37	13	38	13	38	13	40	13	41	13	14	13	46	14	00	14	16
	26	14	14	14	11	14	07	14	03	13	58	13	52	13	43	14	19	14	25	14	47
	27	14	54	14	46	14	38	14	29	14	18	14	03	14	12	14	53	14	52	15	19
	28	15	35	15	24	15	11	14	57	14	40	14	16	14	44	15	29	15	21	15	52
	29	16	19	16	04	15	48	15	29	15	05	14	33	15	19	16	08	15	53	16	29
	30	17	07	16	48	16	28	16	05	15	36	14	55	15	59	16	51	16	30	17	10
Dec.	1	17	59	17	37	17	14	16	48	16	14	15	25	16	44	17	40	17	14	17	57
	2	18	53	18	30	18	06	17	38	17	01	16	07	17	35	18	32	18	04	18	49
	3	19	50	19	27	19	03	18	34	17	58	17	04	18	32	19	29	19	01	19	46
	4	20	46	20	25	20	03	19	37	19	03	18	14	19	32	20	28	20	02	20	45
	5	21	40	21	23	21	03	20	41	20	13	19	33	20	34	21	26	21	07	21	46
	6	22	31	22	18	22	03	21	47	21	26	20	55	21	35	22	23	22	11	22	45
	7	23	21	23	12	23	02	22	51	22	37	22	18	22	35	23	19	23	15	23	44
	8	**	**	**	**	**	**	23	55	23	49	23	40	23	35	**	**	**	**	**	**
	9	0	08	0	04	0	00	**	**	**	**	**	**	**	**	0	12	0	17	0	41
	10	0	56	0	57	0	58	0	59	1	00	1	02	0	34	1	07	1	21	1	38
	11	1	45	1	51	1	57	2	04	2	13	2	26	1	35	2	02	2	25	2	36
	12	2	35	2	46	2	58	3	12	3	30	3	53	2	37	2	59	3	33	3	38
	13	3	30	3	46	4	03	4	22	4	47	5	23	3	43	4	00	4	42	4	41
	14	4	29	4	49	5	10	5	35	6	06	6	52	4	51	5	04	5	53	5	48
	15	5	31	5	53	6	17	6	45	7	21	8	14	5	59	6	09	7	03	6	55
	16	6	34	6	57	7	21	7	50	8	26	9	20	7	04	7	13	8	07	7	59
	17	7	35	7	56	8	19	8	46	9	20	10	08	8	01	8	12	9	04	8	57
	18	8	31	8	50	9	10	9	33	10	01	10	41	8	51	9	05	9	51	9	48
	19	9	23	9	38	9	53	10	11	10	34	11	05	9	34	9	52	10	30	10	31
	20	10	09	10	20	10	31	10	44	11	00	11	22	10	10	10	32	11	04	11	10
	21	10	51	10	58	11	05	11	13	11	23	11	36	10	43	11	10	11	34	11	44
	22	11	32	11	34	11	37	11	40	11	43	11	47	11	13	11	44	12	00	12	16
	23	12	10	12	09	12	07	12	05	12	02	11	58	11	43	12	17	12	26	12	46
	24	12	50	12	44	12	37	12	30	12	21	12	09	12	12	12	51	12	53	13	18
	25	13	30	13	20	13	09	12	57	12	42	12	22	12	42	13	26	13	21	13	50
	26	14	13	13	59	13	44	13	27	13	06	12	37	13	16	14	04	13	51	14	25
	27	14	59	14	42	14	23	14	01	13	35	12	56	13	54	14	45	14	26	15	05
	28	15	50	15	29	15	07	14	42	14	09	13	23	14	37	15	32	15	07	15	49
	29	16	43	16	21	15	57	15	29	14	53	14	01	15	27	16	23	15	55	16	40
	30	17	40	17	18	16	53	16	24	15	48	14	53	16	22	17	20	16	51	17	36
	31	18	38	18	16	17	53	17	26	16	51	16	00	17	23	18	19	17	52	18	36
	32	19	34	19	16	18	55	18	32	18	02	17	19	18	25	19	19	18	57	19	38

The symbol (**) indicates that the phenomenon will occur on the next day

MOONRISE AND MOONSET
REDUCTION OF THE L.M.T. OF RISING OR SETTING FOR THE MERIDIAN OF 82°.5 E. LONGITUDE TO THE L.M.T. OF OTHER MERIDIANS

LONGITUDE EAST OF GREENWICH

Daily Variation in Rising or Setting	0°	30°	60°	68°	72°	76°	80°	84°	88°	92°	96°	120°	150°
m	m	m	m	m	m	m	m	m	m	m	m	m	m
28	+ 6.4	+ 4.1	+ 1.8	+ 1.1	+ 0.8	+ 0.5	+ 0.2	- 0.1	- 0.4	- 0.7	- 1.1	- 2.9	- 5.3
29	6.6	4.2	1.8	1.2	0.8	0.5	0.2	0.1	0.4	0.8	1.1	3.0	5.4
30	6.9	4.4	1.9	1.2	0.9	0.5	0.2	0.1	0.5	0.8	1.1	3.1	5.6
31	7.1	4.5	1.9	1.2	0.9	0.6	0.2	0.1	0.5	0.8	1.2	3.2	5.8
32	7.3	4.7	2.0	1.3	0.9	0.6	0.2	0.1	0.5	0.8	1.2	3.3	6.0
33	7.6	4.8	2.1	1.3	1.0	0.6	0.2	0.1	0.5	0.9	1.2	3.4	6.2
34	7.8	5.0	2.1	1.4	1.0	0.6	0.2	0.1	0.5	0.9	1.3	3.5	6.4
35	8.0	5.1	2.2	1.4	1.0	0.6	0.2	0.1	0.5	0.9	1.3	3.6	6.6
36	8.2	5.2	2.3	1.4	1.0	0.6	0.2	0.1	0.5	0.9	1.4	3.7	6.8
37	8.5	5.4	2.3	1.5	1.1	0.7	0.3	0.2	0.6	1.0	1.4	3.9	6.9
38	8.7	5.5	2.4	1.5	1.1	0.7	0.3	0.2	0.6	1.0	1.4	4.0	7.1
39	8.9	5.7	2.4	1.6	1.1	0.7	0.3	0.2	0.6	1.0	1.5	4.1	7.3
40	+ 9.2	+ 5.8	+ 2.5	+ 1.6	+ 1.2	+ 0.7	+ 0.3	- 0.2	- 0.6	- 1.1	- 1.5	- 4.2	- 7.5
41	9.4	6.0	2.6	1.7	1.2	0.7	0.3	0.2	0.6	1.1	1.5	4.3	7.7
42	9.6	6.1	2.6	1.7	1.2	0.8	0.3	0.2	0.6	1.1	1.6	4.4	7.9
43	9.9	6.3	2.7	1.7	1.3	0.8	0.3	0.2	0.7	1.1	1.6	4.5	8.1
44	10.1	6.4	2.8	1.8	1.3	0.8	0.3	0.2	0.7	1.2	1.7	4.6	8.3
45	10.3	6.6	2.8	1.8	1.3	0.8	0.3	0.2	0.7	1.2	1.7	4.7	8.4
46	10.5	6.7	2.9	1.9	1.3	0.8	0.3	0.2	0.7	1.2	1.7	4.8	8.6
47	10.8	6.9	2.9	1.9	1.4	0.8	0.3	0.2	0.7	1.2	1.8	4.9	8.8
48	11.0	7.0	3.0	1.9	1.4	0.9	0.3	0.2	0.7	1.3	1.8	5.0	9.0
49	11.2	7.1	3.1	2.0	1.4	0.9	0.3	0.2	0.7	1.3	1.8	5.1	9.2
50	+ 11.5	+ 7.3	+ 3.1	+ 2.0	+ 1.5	+ 0.9	+ 0.3	- 0.2	- 0.8	- 1.3	- 1.9	- 5.2	- 9.4
51	11.7	7.4	3.2	2.1	1.5	0.9	0.4	0.2	0.8	1.3	1.9	5.3	9.6
52	11.9	7.6	3.3	2.1	1.5	0.9	0.4	0.2	0.8	1.4	2.0	5.4	9.8
53	12.1	7.7	3.3	2.1	1.5	1.0	0.4	0.2	0.8	1.4	2.0	5.5	9.9
54	12.4	7.9	3.4	2.2	1.6	1.0	0.4	0.2	0.8	1.4	2.0	5.6	10.1
55	12.6	8.0	3.4	2.2	1.6	1.0	0.4	0.2	0.8	1.5	2.1	5.7	10.3
56	12.8	8.2	3.5	2.3	1.6	1.0	0.4	0.2	0.9	1.5	2.1	5.8	10.5
57	13.1	8.3	3.6	2.3	1.7	1.0	0.4	0.2	0.9	1.5	2.1	5.9	10.7
58	13.3	8.5	3.6	2.3	1.7	1.0	0.4	0.2	0.9	1.5	2.2	6.0	10.9
59	13.5	8.6	3.7	2.4	1.7	1.1	0.4	0.2	0.9	1.6	2.2	6.1	11.1
60	+ 13.7	+ 8.7	+ 3.8	+ 2.4	+ 1.7	+ 1.1	+ 0.4	- 0.2	- 0.9	- 1.6	- 2.3	- 6.2	- 11.3
61	14.0	8.9	3.8	2.5	1.8	1.1	0.4	0.3	0.9	1.6	2.3	6.4	11.4
62	14.2	9.0	3.9	2.5	1.8	1.1	0.4	0.3	0.9	1.6	2.3	6.5	11.6
63	14.4	9.2	3.9	2.5	1.8	1.1	0.4	0.3	1.0	1.7	2.4	6.6	11.8
64	14.7	9.3	4.0	2.6	1.9	1.2	0.4	0.3	1.0	1.7	2.4	6.7	12.0
65	14.9	9.5	4.1	2.6	1.9	1.2	0.5	0.3	1.0	1.7	2.4	6.8	12.2
66	15.1	9.6	4.1	2.7	1.9	1.2	0.5	0.3	1.0	1.7	2.5	6.9	12.4
67	15.4	9.8	4.2	2.7	2.0	1.2	0.5	0.3	1.0	1.8	2.5	7.0	12.6
68	15.6	9.9	4.3	2.7	2.0	1.2	0.5	0.3	1.0	1.8	2.6	7.1	12.8
69	15.8	10.1	4.3	2.8	2.0	1.2	0.5	0.3	1.1	1.8	2.6	7.2	12.9
70	+ 16.0	+ 10.2	+ 4.4	+ 2.8	+ 2.0	+ 1.3	+ 0.5	- 0.3	- 1.1	- 1.8	- 2.6	- 7.3	- 13.1
71	16.3	10.4	4.4	2.9	2.1	1.3	0.5	0.3	1.1	1.9	2.7	7.4	13.3
72	16.5	10.5	4.5	2.9	2.1	1.3	0.5	0.3	1.1	1.9	2.7	7.5	13.5
73	16.7	10.6	4.6	2.9	2.1	1.3	0.5	0.3	1.1	1.9	2.7	7.6	13.7
74	+ 17.0	+ 10.8	+ 4.6	+ 3.0	+ 2.2	+ 1.3	+ 0.5	- 0.3	- 1.1	- 2.0	- 2.8	- 7.7	- 13.9

SUNRISE, SUNSET AND MOONRISE, MOONSET
CORRECTION FOR LATITUDE

VARIATION PER 10° OF LATITUDE OF THE TIMES OF SUNRISE, SUNSET AND MOONRISE, MOONSET DISTRIBUTED OVER EACH DEGREE OF LATITUDE

Var. per 10° of Lat.	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	15'	30'	45'
m	m	m	m	m	m	m	m	m	m	m	m	m	m
5	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	0.1	0.3	0.4
6	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	0.2	0.3	0.5
7	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0	0.2	0.4	0.5
8	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	0.2	0.4	0.6
9	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	0.2	0.5	0.7
10	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	0.3	0.5	0.8
11	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11.0	0.3	0.6	0.8
12	1.2	2.4	3.6	4.8	6.0	7.2	8.4	9.6	10.8	12.0	0.3	0.6	0.9
13	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7	13.0	0.3	0.7	1.0
14	1.4	2.8	4.2	5.6	7.0	8.4	9.8	11.2	12.6	14.0	0.4	0.7	1.1
15	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0	0.4	0.8	1.1
16	1.6	3.2	4.8	6.4	8.0	9.6	11.2	12.8	14.4	16.0	0.4	0.8	1.2
17	1.7	3.4	5.1	6.8	8.5	10.2	11.9	13.6	15.3	17.0	0.4	0.9	1.3
18	1.8	3.6	5.4	7.2	9.0	10.8	12.6	14.4	16.2	18.0	0.5	0.9	1.4
19	1.9	3.8	5.7	7.6	9.5	11.4	13.3	15.2	17.1	19.0	0.5	1.0	1.4
20	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	0.5	1.0	1.5
21	2.1	4.2	6.3	8.4	10.5	12.6	14.7	16.8	18.9	21.0	0.5	1.1	1.6
22	2.2	4.4	6.6	8.8	11.0	13.2	15.4	17.6	19.8	22.0	0.6	1.1	1.7
23	2.3	4.6	6.9	9.2	11.5	13.8	16.1	18.4	20.7	23.0	0.6	1.2	1.7
24	2.4	4.8	7.2	9.6	12.0	14.4	16.8	19.2	21.6	24.0	0.6	1.2	1.8
25	2.5	5.0	7.5	10.0	12.5	15.0	17.5	20.0	22.5	25.0	0.6	1.3	1.9
26	2.6	5.2	7.8	10.4	13.0	15.6	18.2	20.8	23.4	26.0	0.7	1.3	2.0
27	2.7	5.4	8.1	10.8	13.5	16.2	18.9	21.6	24.3	27.0	0.7	1.4	2.0
28	2.8	5.6	8.4	11.2	14.0	16.8	19.6	22.4	25.2	28.0	0.7	1.4	2.1
29	2.9	5.8	8.7	11.6	14.5	17.4	20.3	23.2	26.1	29.0	0.7	1.5	2.2
30	3.0	6.0	9.0	12.0	15.0	18.0	21.0	24.0	27.0	30.0	0.8	1.5	2.3
31	3.1	6.2	9.3	12.4	15.5	18.6	21.7	24.8	27.9	31.0	0.8	1.6	2.3
32	3.2	6.4	9.6	12.8	16.0	19.2	22.4	25.6	28.8	32.0	0.8	1.6	2.4
33	3.3	6.6	9.9	13.2	16.5	19.8	23.1	26.4	29.7	33.0	0.8	1.7	2.5
34	3.4	6.8	10.2	13.6	17.0	20.4	23.8	27.2	30.6	34.0	0.9	1.7	2.6
35	3.5	7.0	10.5	14.0	17.5	21.0	24.5	28.0	31.5	35.0	0.9	1.8	2.6
36	3.6	7.2	10.8	14.4	18.0	21.6	25.2	28.8	32.4	36.0	0.9	1.8	2.7
37	3.7	7.4	11.1	14.8	18.5	22.2	25.9	29.6	33.3	37.0	0.9	1.9	2.8
38	3.8	7.6	11.4	15.2	19.0	22.8	26.6	30.4	34.2	38.0	1.0	1.9	2.9
39	3.9	7.8	11.7	15.6	19.5	23.4	27.3	31.2	35.1	39.0	1.0	2.0	2.9
40	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0	1.0	2.0	3.0
41	4.1	8.2	12.3	16.4	20.5	24.6	28.7	32.8	36.9	41.0	1.0	2.1	3.1
42	4.2	8.4	12.6	16.8	21.0	25.2	29.4	33.6	37.8	42.0	1.1	2.1	3.2
43	4.3	8.6	12.9	17.2	21.5	25.8	30.1	34.4	38.7	43.0	1.1	2.2	3.2
44	4.4	8.8	13.2	17.6	22.0	26.4	30.8	35.2	39.6	44.0	1.1	2.2	3.3
45	4.5	9.0	13.5	18.0	22.5	27.0	31.5	36.0	40.5	45.0	1.1	2.3	3.4
46	4.6	9.2	13.8	18.4	23.0	27.6	32.2	36.8	41.4	46.0	1.2	2.3	3.5
47	4.7	9.4	14.1	18.8	23.5	28.2	32.9	37.6	42.3	47.0	1.2	2.4	3.5
48	4.8	9.6	14.4	19.2	24.0	28.8	33.6	38.4	43.2	48.0	1.2	2.4	3.6
49	4.9	9.8	14.7	19.6	24.5	29.4	34.3	39.2	44.1	49.0	1.2	2.5	3.7
50	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	1.3	2.5	3.8

REDUCTION OF TIME

REDUCTION OF LOCAL MEAN TIME OF A PLACE INTO
THE INDIAN STANDARD TIME

A-CORRECTION TO BE ADDED TO L.M.T. TO OBTAIN I.S.T.

	LONGITUDE OF PLACE (EAST OF GREENWICH)															
	67°	68°	69°	70°	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°	81°	82°
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
0	62.0	58.0	54.0	50.0	46.0	42.0	38.0	34.0	30.0	26.0	22.0	18.0	14.0	10.0	6.0	2.0
3	61.8	57.8	53.8	49.8	45.8	41.8	37.8	33.8	29.8	25.8	21.8	17.8	13.8	9.8	5.8	1.8
6	61.6	57.6	53.6	49.6	45.6	41.6	37.6	33.6	29.6	25.6	21.6	17.6	13.6	9.6	5.6	1.6
9	61.4	57.4	53.4	49.4	45.4	41.4	37.4	33.4	29.4	25.4	21.4	17.4	13.4	9.4	5.4	1.4
12	61.2	57.2	53.2	49.2	45.2	41.2	37.2	33.2	29.2	25.2	21.2	17.2	13.2	9.2	5.2	1.2
15	61.0	57.0	53.0	49.0	45.0	41.0	37.0	33.0	29.0	25.0	21.0	17.0	13.0	9.0	5.0	1.0
18	60.8	56.8	52.8	48.8	44.8	40.8	36.8	32.8	28.8	24.8	20.8	16.8	12.8	8.8	4.8	0.8
21	60.6	56.6	52.6	48.6	44.6	40.6	36.6	32.6	28.6	24.6	20.6	16.6	12.6	8.6	4.6	0.6
24	60.4	56.4	52.4	48.4	44.4	40.4	36.4	32.4	28.4	24.4	20.4	16.4	12.4	8.4	4.4	0.4
27	60.2	56.2	52.2	48.2	44.2	40.2	36.2	32.2	28.2	24.2	20.2	16.2	12.2	8.2	4.2	0.2
30	60.0	56.0	52.0	48.0	44.0	40.0	36.0	32.0	28.0	24.0	20.0	16.0	12.0	8.0	4.0	0.0
33	59.8	55.8	51.8	47.8	43.8	39.8	35.8	31.8	27.8	23.8	19.8	15.8	11.8	7.8	3.8	
36	59.6	55.6	51.6	47.6	43.6	39.6	35.6	31.6	27.6	23.6	19.6	15.6	11.6	7.6	3.6	
39	59.4	55.4	51.4	47.4	43.4	39.4	35.4	31.4	27.4	23.4	19.4	15.4	11.4	7.4	3.4	
42	59.2	55.2	51.2	47.2	43.2	39.2	35.2	31.2	27.2	23.2	19.2	15.2	11.2	7.2	3.2	
45	59.0	55.0	51.0	47.0	43.0	39.0	35.0	31.0	27.0	23.0	19.0	15.0	11.0	7.0	3.0	
48	58.8	54.8	50.8	46.8	42.8	38.8	34.8	30.8	26.8	22.8	18.8	14.8	10.8	6.8	2.8	
51	58.6	54.6	50.6	46.6	42.6	38.6	34.6	30.6	26.6	22.6	18.6	14.6	10.6	6.6	2.6	
54	58.4	54.4	50.4	46.4	42.4	38.4	34.4	30.4	26.4	22.4	18.4	14.4	10.4	6.4	2.4	
57	58.2	54.2	50.2	46.2	42.2	38.2	34.2	30.2	26.2	22.2	18.2	14.2	10.2	6.2	2.2	
60	58.0	54.0	50.0	46.0	42.0	38.0	34.0	30.0	26.0	22.0	18.0	14.0	10.0	6.0	2.0	

B- CORRECTION TO BE SUBTRACTED FROM L.M.T. TO OBTAIN I.S.T.

	LONGITUDE OF PLACE (EAST OF GREENWICH)															
	82°	83°	84°	85°	86°	87°	88°	89°	90°	91°	92°	93°	94°	95°	96°	97°
	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
0		2.0	6.0	10.0	14.0	18.0	22.0	26.0	30.0	34.0	38.0	42.0	46.0	50.0	54.0	58.0
3		2.2	6.2	10.2	14.2	18.2	22.2	26.2	30.2	34.2	38.2	42.2	46.2	50.2	54.2	58.2
6		2.4	6.4	10.4	14.4	18.4	22.4	26.4	30.4	34.4	38.4	42.4	46.4	50.4	54.4	58.4
9		2.6	6.6	10.6	14.6	18.6	22.6	26.6	30.6	34.6	38.6	42.6	46.6	50.6	54.6	58.6
12		2.8	6.8	10.8	14.8	18.8	22.8	26.8	30.8	34.8	38.8	42.8	46.8	50.8	54.8	58.8
15		3.0	7.0	11.0	15.0	19.0	23.0	27.0	31.0	35.0	39.0	43.0	47.0	51.0	55.0	59.0
18		3.2	7.2	11.2	15.2	19.2	23.2	27.2	31.2	35.2	39.2	43.2	47.2	51.2	55.2	59.2
21		3.4	7.4	11.4	15.4	19.4	23.4	27.4	31.4	35.4	39.4	43.4	47.4	51.4	55.4	59.4
24		3.6	7.6	11.6	15.6	19.6	23.6	27.6	31.6	35.6	39.6	43.6	47.6	51.6	55.6	59.6
27		3.8	7.8	11.8	15.8	19.8	23.8	27.8	31.8	35.8	39.8	43.8	47.8	51.8	55.8	59.8
30	0.0	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0	44.0	48.0	52.0	56.0	60.0
33	0.2	4.2	8.2	12.2	16.2	20.2	24.2	28.2	32.2	36.2	40.2	44.2	48.2	52.2	56.2	60.2
36	0.4	4.4	8.4	12.4	16.4	20.4	24.4	28.4	32.4	36.4	40.4	44.4	48.4	52.4	56.4	60.4
39	0.6	4.6	8.6	12.6	16.6	20.6	24.6	28.6	32.6	36.6	40.6	44.6	48.6	52.6	56.6	60.6
42	0.8	4.8	8.8	12.8	16.8	20.8	24.8	28.8	32.8	36.8	40.8	44.8	48.8	52.8	56.8	60.8
45	1.0	5.0	9.0	13.0	17.0	21.0	25.0	29.0	33.0	37.0	41.0	45.0	49.0	53.0	57.0	61.0
48	1.2	5.2	9.2	13.2	17.2	21.2	25.2	29.2	33.2	37.2	41.2	45.2	49.2	53.2	57.2	61.2
51	1.4	5.4	9.4	13.4	17.4	21.4	25.4	29.4	33.4	37.4	41.4	45.4	49.4	53.4	57.4	61.4
54	1.6	5.6	9.6	13.6	17.6	21.6	25.6	29.6	33.6	37.6	41.6	45.6	49.6	53.6	57.6	61.6
57	1.8	5.8	9.8	13.8	17.8	21.8	25.8	29.8	33.8	37.8	41.8	45.8	49.8	53.8	57.8	61.8
60	2.0	6.0	10.0	14.0	18.0	22.0	26.0	30.0	34.0	38.0	42.0	46.0	50.0	54.0	58.0	62.0

Sunrise and Sunset

The local mean times of Sunrise and Sunset for latitudes 0° to 60° North at intervals of 4 days during the year have been given on pages 280 to 287. The timings relate to the visibility of the upper limb of the Sun on the horizon. From these tables the L.M.T. of rise or set for any day of the year and for any latitude of place can be obtained by simple interpolation. If the place is in the southern hemisphere, the corrections given on pages 290 to 291 will then have to be applied to the timings for the corresponding northern latitude. For a station in India, the timings of Sunrise and Sunset so obtained which are in L.M.T. can be reduced to I.S.T. by applying the correction given on page 314 according to the longitude of the station.

In addition to the above details given in the publication, the timings of Sunrise and Sunset of five important cities of India, viz., Kolkata, Varanasi, Chennai, Delhi and Mumbai have been specially calculated and given in I.S.T. on pages 292 to 295.

Sunrise and Sunset for Southern Latitudes

The timings of Sunrise and Sunset for southern latitudes, which have not been tabulated separately, can be deduced from those for the corresponding northern latitudes by applying the corrections given on pages 290 and 291.

Twilight

The timings of the beginning of morning twilight and ending of evening twilight have been given for latitudes 0° to 60° North on pages 280 to 287. The timings relate to the instant when the center of the Sun is 18° below the horizon. This is now known as astronomical twilight. The period of twilight has been divided into three parts - Civil when the Sun is 6° below the horizon, Nautical when 12° and Astronomical when 18° - and their durations have been given separately on pages 288 and 289 at an interval of 8 days. The figures for any intermediate date can be worked out from the tables by simple interpolation.

Moonrise and Moonset

The local mean times of Moonrise and Moonset for latitudes 0° to 50° North at 10- degrees interval together with the timings of these events in I.S.T. for four important stations in India, Viz., Kolkata, Chennai, Delhi and Mumbai for each day of the year have been given on pages 296 to 311 along with some supplementary tables on pages 312 to 313. A detailed method of calculation for any station is given below.

To find the time of Moonrise and Moonset for any station the figure for the phenomena concerned given against the date is to be taken from the table (pages 296 to 311) for the latitude just lower than the latitude of the station, to which the following corrections will have to be applied :

(a) Correction for difference in latitude;
(b) Correction for longitude, if the place is not on the Central Meridian of India (i.e., 82°.5 E. Long);
(c) Correction for converting L.M.T. into I.S.T., when and where necessary.

These corrections are detailed below :

(a) Correction for difference in latitude - The timings of Moonrise and Moonset have been given for latitudes 0°, 10°, 20°, 30°, 40° and 50° North, and in local mean time. The timing for any particular latitude of place falling within the above limits can be obtained by simple interpolation between figures for the two latitudes, one below and the other above the latitude of the given place. For this purpose the table on page 313 can be conveniently used wherein corrections for latitude are shown according to the variation per 10° of latitude of the timings of Moonrise or Moonset distributed over each degree of latitude. The correction can also be calculated directly by multiplying one-tenth of the time difference between the figures for two consecutive given latitudes by the excess of the latitude of the station over the given lower latitude.

(b) Correction for difference in longitude - The timings thus obtained are exact for the Central Meridian of India, i.e, for longitude $82^\circ.5$ East of Greenwich. For other longitudes the correction given on page 312 should be applied according to :

(i) the longitude of the station, and
(ii) the daily variation of the timings of rising or setting, as the case may be, between two consecutive dates.

If greater accuracy is not required, the daily variation may be assumed to be a constant (i.e., 50 minutes) for all dates and corrections from the following table may be applied instead of taking the corrections from the table on page 312.

Longitude of Station (East)	Correction m	Longitude of Station (East)	Correction m
0°	+ 11.5	84°	- 0.2
30°	+ 7.3	88°	- 0.8
60°	+ 3.1	92°	- 1.3
68°	+ 2.0	96°	- 1.9
72°	+ 1.5	120°	- 5.2
76°	+ 0.9	150°	- 9.4
80°	+ 0.3	180°	- 13.5

The timing thus obtained by the above two operations is in L.M.T. of the station

(c) Correction for converting L.M.T. into I.S.T. - The figures obtained by the operations (a) and (b) above would give the local mean time of Moonrise or Moonset for the given station. The local mean time can be reduced to the Indian Standard Time by the help of the reduction table on page 314. In other way to obtain the I.S.T., the L.M.T. may be increased at the rate of 4 minutes per degree of longitude if the station is to the west of $82^\circ.5$ East and decreased at the same rate if the station is to the east of $82^\circ.5$ East Longitude.

In practice, however, when dealing with the same station, it will be convenient to combine corrections (b) and (c) above, as these are constant day after day, and add this constant to the daily times corrected for latitude only.

Moonrise and Moonset for southern Latitudes

The times of Moonrise and Moonset for southern latitudes have not been given separately. The timings for a station in southern latitude can, however, be deduced from those for the corresponding northern latitude by the following formula :

Timings for a southern latitude = 2 × Timing for 0° latitude - Timing for the same northern latitude.

In this case the local mean time for the same latitude north will have to be calculated first by applying the latitude correction (a) above, and the corresponding time for the southern latitude will have to be deduced by the above formula by utilising the published figure for 0° latitude. The exact L.M.T. of rising or setting for the place in question will, however, be obtained by applying the correction (b) above to the time so deduced.

If necessary, the timings thus obtained may be reduced to I.S.T. by the usual method.

PHASES OF THE MOON, 2024

(Time in I.S.T.)

		d	h	m			d	h	m
Full Moon	Dec, 23	27	06	03	Full Moon	Jul	21	15	47
Last Quarter	Jan, 24	04	09	00	Last Quarter	Jul	28	08	22
New Moon	Jan	11	17	27	New Moon	Aug	04	16	43
First Quarter	Jan	18	09	23	First Quarter	Aug	12	20	49
Full Moon	Jan	25	23	24	Full Moon	Aug	19	23	56
Last Quarter	Feb	03	04	48	Last Quarter	Aug	26	14	56
New Moon	Feb	10	04	29	New Moon	Sep	03	07	26
First Quarter	Feb	16	20	31	First Quarter	Sep	11	11	36
Full Moon	Feb	24	18	00	Full Moon	Sep	18	08	04
Last Quarter	Mar	03	20	53	Last Quarter	Sep	25	00	20
New Moon	Mar	10	14	30	New Moon	Oct	03	00	19
First Quarter	Mar	17	09	41	First Quarter	Oct	11	00	25
Full Moon	Mar	25	12	30	Full Moon	Oct	17	16	56
Last Quarter	Apr	02	08	45	Last Quarter	Oct	24	13	33
New Moon	Apr	08	23	51	New Moon	Nov	01	18	17
First Quarter	Apr	16	00	43	First Quarter	Nov	09	11	25
Full Moon	Apr	24	05	19	Full Moon	Nov	16	02	58
Last Quarter	May	01	16	57	Last Quarter	Nov	23	06	58
New Moon	May	08	08	52	New Moon	Dec	01	11	51
First Quarter	May	15	17	18	First Quarter	Dec	08	20	57
Full Moon	May	23	19	23	Full Moon	Dec	15	14	32
Last Quarter	May	30	22	43	Last Quarter	Dec	23	03	48
New Moon	Jun	06	18	08	New Moon	Dec, 24	31	03	57
First Quarter	Jun	14	10	48	First Quarter	Jan, 25	07	05	26
Full Moon	Jun	22	06	38	Full Moon	Jan, 25	14	03	57
Last Quarter	Jun	29	03	23	Last Quarter	Jan, 25	22	02	01
New Moon	Jul	06	04	27	New Moon	Jan, 25	29	18	06
First Quarter	Jul	14	04	19	First Quarter	Jan, 25	05	13	32

PART - IV

ECLIPSES AND OCCULTATIONS

ECLIPSES, 2024

In the year 2024, there are twoeclipses of the Sun andone eclipse of the Moon.

I	April	8	Total eclipse of the Sun	
II	October	2	Annular eclipse of the Sun	
III	September	18	Partial eclipse of the Moon	

In addition, there isone Penumbral eclipse of the Moon	March 25	329

I- Total eclipse of the Sun, 8 April, 2024, Monday.

Not visible in India.

Area of Visibility

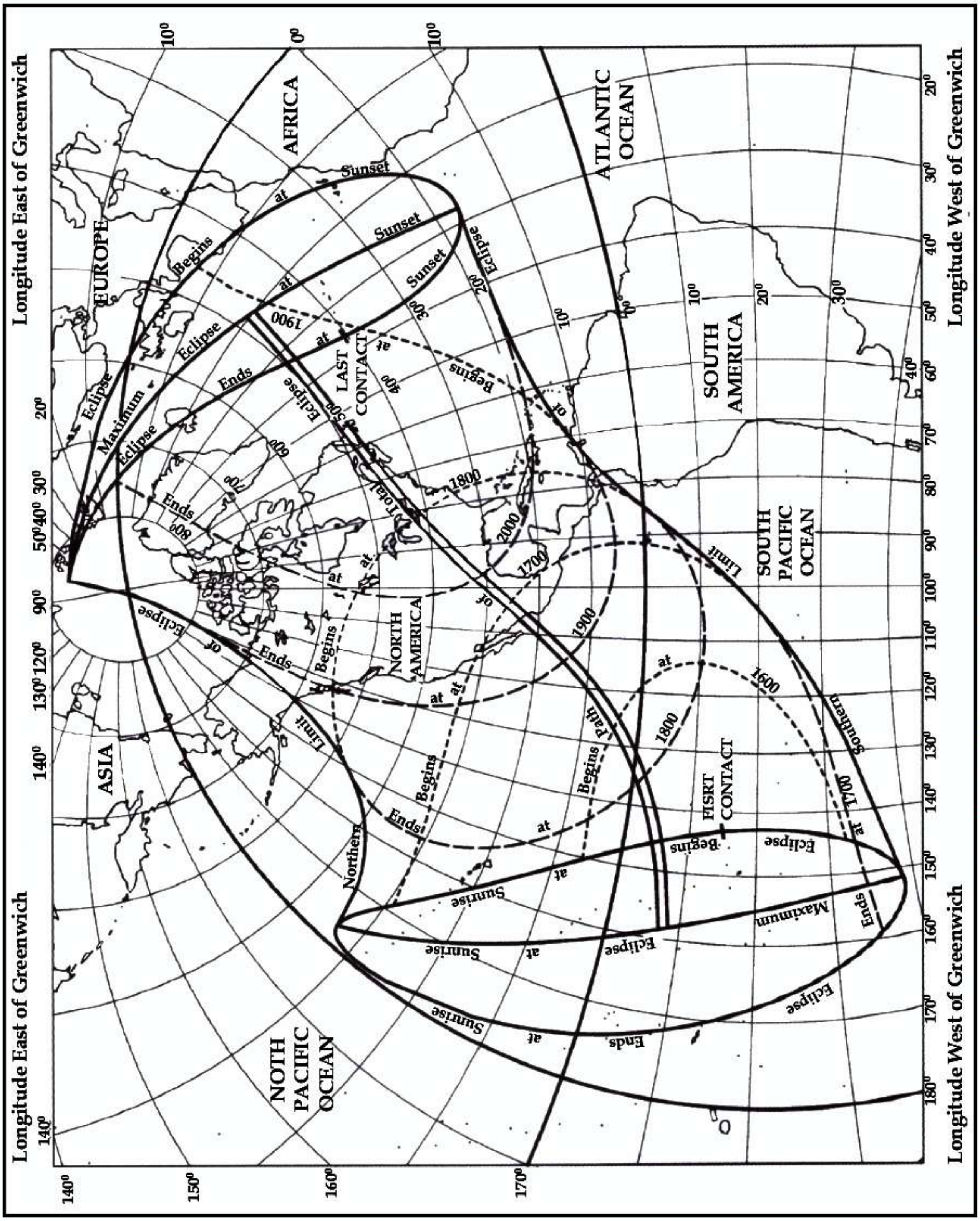
The eclipse will be visible in the region covering Polynesia (inc. Hawaii), most of North America (except Alaska), Central America, Greenland, Iceland, Azores.

ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension :April $8^d18^h36^m07^s.01$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	1	11	39.77	1	11	39.77
Hourly Motion			134.82			9.18
	°	'	"	°	'	"
Declination	7	59	22.39	7	35	46.89
Hourly Motion		17	23.91			55.81
Equatorial Horizontal Parallax		60	56.35			08.78
True Semi-diameter		16	35.94		15	58.19

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	8	15	42.3	8	21	12.3	-14	57.3	-143	07.9
Central eclipse begins	8	16	40.0	8	22	10.0	-7	49.3	-158	32.3
Greatest eclipse*	8	18	17.3	8	23	47.3	+25	17.4	-104	08.7
Central eclipse ends	8	19	54.5	9	01	24.5	+47	37.1	-19	47.6
Eclipse ends	8	20	52.3	9	02	22.3	+40	33.4	-36	05.1

*Magnitude of the eclipse = 1.0561, Duration of eclipse = 5h10 m.
Duration of Central eclipse = 3h14 m, Maximum duration of Annular phase = 4 m 32s.

TOTAL SOLAR ECLIPSE OF APRIL 8, 2024



The timing of begining and ending are expressed in UT

BESSELIAN ELEMENTS OF THE TOTAL ECLIPSE OF THE SUN APRIL 8

Terrestrial Time (TT)		Co-ordinates of the Centre of Shadow on the Fundamental Plane		Direction of the Axis of Shadow *					Radius of Penumbra and Umbra on the Fundamental Plane	
h	m	x	y	sin d	cos d	μ °	'	"	l_1	l_2
15	40	-1.511968	-0.412741	+0.131418	+0.991327	54	34	54.0	+0.534733	-0.010288
	50	-1.426730	-0.367550	+0.131461	+0.991321	57	04	56.4	+0.534753	-0.010269
16	00	-1.341488	-0.322360	+0.131504	+0.991316	59	34	58.9	+0.534772	-0.010250
	10	-1.256241	-0.277172	+0.131546	+0.991310	62	05	01.3	+0.534790	-0.010231
	20	-1.170990	-0.231986	+0.131589	+0.991304	64	35	03.8	+0.534808	-0.010214
	30	-1.085735	-0.186802	+0.131632	+0.991299	67	05	06.2	+0.534825	-0.010197
	40	-1.000476	-0.141620	+0.131675	+0.991293	69	35	08.7	+0.534841	-0.010180
	50	-0.915214	-0.096441	+0.131718	+0.991287	72	05	11.1	+0.534856	-0.010165
17	00	-0.829948	-0.051264	+0.131761	+0.991282	74	35	13.6	+0.534871	-0.010150
	10	-0.744679	-0.006090	+0.131803	+0.991276	77	05	16.0	+0.534885	-0.010136
	20	-0.659408	+0.039082	+0.131846	+0.991270	79	35	18.4	+0.534899	-0.010123
	30	-0.574133	+0.084250	+0.131889	+0.991264	82	05	20.9	+0.534911	-0.010110
	40	-0.488857	+0.129416	+0.131932	+0.991259	84	35	23.3	+0.534923	-0.010098
	50	-0.403578	+0.174578	+0.131975	+0.991253	87	05	25.8	+0.534934	-0.010087
18	00	-0.318297	+0.219738	+0.132017	+0.991247	89	35	28.2	+0.534945	-0.010076
	10	-0.233014	+0.264893	+0.132060	+0.991242	92	05	30.7	+0.534955	-0.010066
	20	-0.147731	+0.310046	+0.132103	+0.991236	94	35	33.1	+0.534964	-0.010057
	30	-0.062445	+0.355194	+0.132146	+0.991230	97	05	35.5	+0.534972	-0.010049
	40	+0.022841	+0.400339	+0.132189	+0.991225	99	35	38.0	+0.534980	-0.010041
	50	+0.108128	+0.445480	+0.132231	+0.991219	102	05	40.4	+0.534987	-0.010034
19	00	+0.193415	+0.490616	+0.132274	+0.991213	104	35	42.9	+0.534993	-0.010028
	10	+0.278703	+0.535749	+0.132317	+0.991207	107	05	45.3	+0.534999	-0.010022
	20	+0.363991	+0.580877	+0.132360	+0.991202	109	35	47.7	+0.535004	-0.010018
	30	+0.449278	+0.626001	+0.132403	+0.991196	112	05	50.2	+0.535008	-0.010013
	40	+0.534565	+0.671120	+0.132445	+0.991190	114	35	52.6	+0.535011	-0.010010
	50	+0.619852	+0.716235	+0.132488	+0.991185	117	05	55.1	+0.535014	-0.010007
20	00	+0.705138	+0.761344	+0.132531	+0.991179	119	35	57.5	+0.535016	-0.010005
	10	+0.790422	+0.806449	+0.132574	+0.991173	122	05	59.9	+0.535017	-0.010004
	20	+0.875705	+0.851548	+0.132617	+0.991167	124	36	02.4	+0.535018	-0.010003
	30	+0.960987	+0.896642	+0.132659	+0.991162	127	06	04.8	+0.535018	-0.010004
	40	+1.046267	+0.941731	+0.132702	+0.991156	129	36	07.2	+0.535017	-0.010004
	50	+1.131545	+0.986815	+0.132745	+0.991150	132	06	09.7	+0.535015	-0.010006
21	00	+1.216820	+1.031892	+0.132788	+0.991144	134	36	12.1	+0.535013	-0.010008

tanf1= 0.00467585 tanf2= 0.00465259

TT	d			Variations per minute			
hr	°	'	"	x'	y'	μ' '	"
16	7	33	23	+0.008 525	0.004 519	15	00
17	7	34	17	+0.008 527	0.004 517	15	00
18	7	35	10	+0.008 529	0.004 513	15	00
19	7	36	04	+0.008 529	0.004 513	15	00
20	7	36	57	+0.008 528	0.004 510	15	00

$\xi' = 0.004364 \rho \cos\phi' \cos(\mu+\lambda)$ $\eta' = 0.004364 \xi \sin d$

*d stands for declination and μ stands for hourangle

PATH OF CENTRAL PHASE DURING THE ECLIPSE OF THE SUN
APRIL 8

Terrestrial Time (TT)	Northern Limit		Central Line		Southern Limit		Central Line
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration of Totality
h m	° '	° '	° '	° '	° '	° '	m s
Limit	-7 10.6	-158 44.5	-7 49.3	-158 32.2	-8 27.8	-158 20.2	- -
16 40	- -	- -	-7 43.8	-157 52.1	-7 35.9	-152 58.8	2 05
16 50	-1 37.6	-138 00.6	-2 03.6	-137 01.4	-2 30.1	-136 03.5	2 53
17 00	+2 10.5	-130 34.1	+1 42.4	-129 42.4	+1 14.1	-128 51.4	3 16
17 10	+5 36.3	-125 26.1	+5 07.0	-124 37.1	+4 37.7	-123 48.6	3 34
17 20	+8 50.3	-121 24.2	+8 20.2	-120 36.6	+7 50.1	-119 49.3	3 48
17 30	+11 57.0	-118 00.3	+11 26.2	-117 13.5	+10 55.4	-116 27.1	3 59
17 40	+14 58.6	-114 59.4	+14 27.0	-114 13.4	+13 55.5	-113 27.6	4 09
17 50	+17 56.8	-112 12.1	+17 24.3	-111 26.7	+16 51.9	-110 41.6	4 16
18 00	+20 52.4	-109 31.4	+20 18.9	-108 46.7	+19 45.5	-108 02.3	4 21
18 10	+23 46.3	-106 51.6	+23 11.7	-106 07.7	+22 37.1	-105 24.1	4 24
18 20	+26 38.9	-104 07.3	+26 03.0	-103 24.5	+25 27.2	-102 41.9	4 25
18 30	+29 30.8	-101 13.0	+28 53.4	-100 31.6	+28 16.1	-99 50.5	4 23
18 40	+32 22.0	-98 02.5	+31 42.9	-97 23.2	+31 04.0	-96 44.0	4 20
18 50	+35 12.6	-94 28.4	+34 31.7	-93 51.7	+33 51.1	-93 15.3	4 15
19 00	+38 02.2	-90 20.5	+37 19.5	-89 47.8	+36 36.9	-89 15.1	4 07
19 10	+40 50.1	-85 24.8	+40 05.3	- 84 57.7	+39 20.9	- 84 30.4	3 56
19 20	+43 34.1	-79 19.6	+42 47.5	-79 00.7	+42 01.3	-78 41.4	3 43
19 30	+46 10.1	-71 27.8	+45 22.2	-71 21.6	+44 34.7	-71 14.3	3 26
19 40	+48 27.8	-60 31.9	+47 40.0	-60 47.2	+46 52.4	-61 00.1	3 05
19 50	+49 48.7	-42 09.3	+49 06.7	-43 17.8	+48 24.1	-44 18.5	2 35
Limit	+48 14.7	-19 29.1	+47 37.2	-19 47.4	+46 59.8	-20 05.2	-

II-Annular eclipse of the Sun, 2 October, 2024, wednesday.

Not Visible in India

Area of Visibility

The eclipse will be visible in the region covering Polynesia (including Hawaii), parts of western Mexico, Galapagos Islands, southern half of South America, parts of Antarctica, south Georgia.

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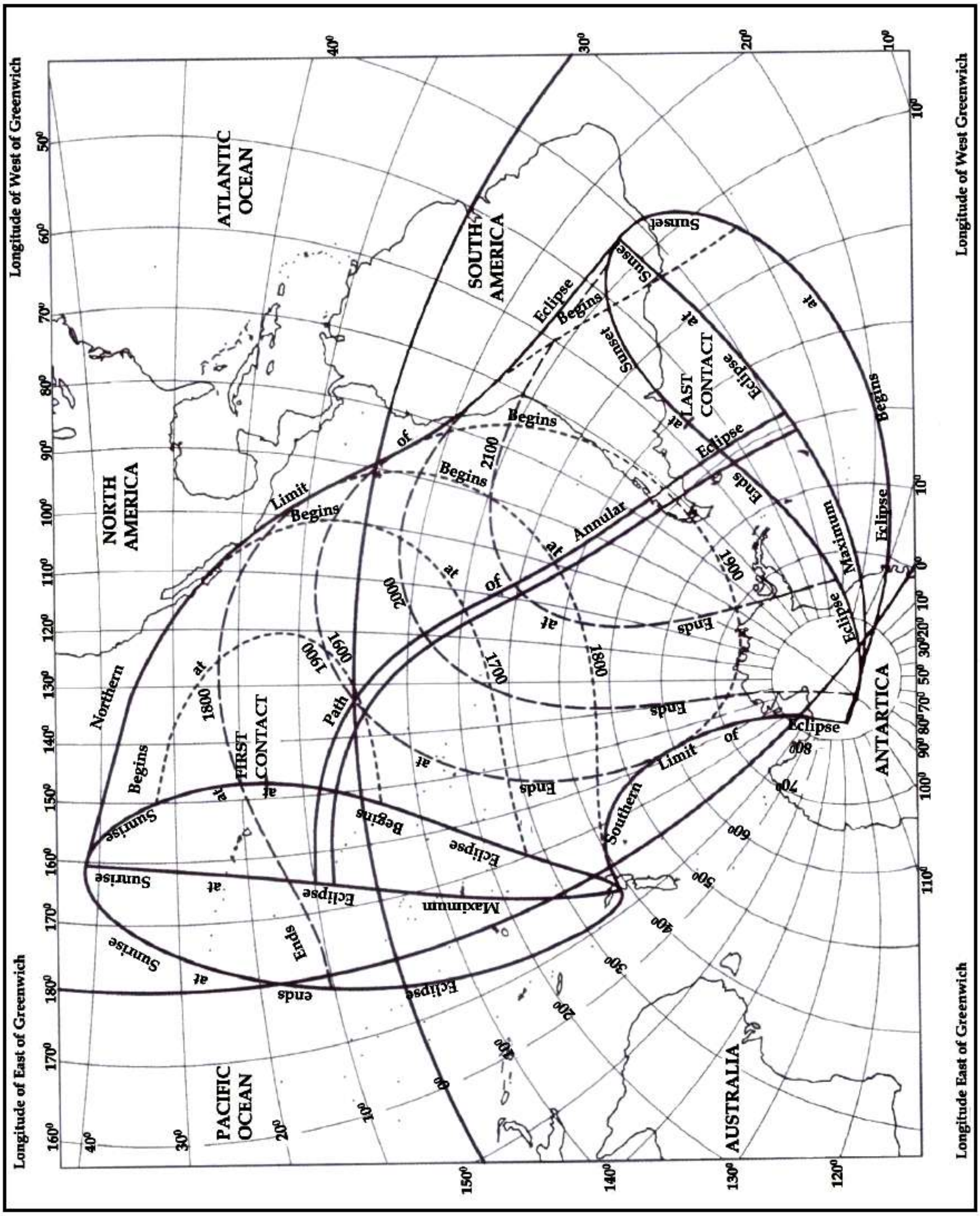
ELEMENTS OF THE ECLIPSE						
Universal Time of Conjunction in Right Ascension :October $2^d 19^h 08^m 04^s.36$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	12	37	02.37	12	37	02.37
Hourly Motion			104.39			09.08
	°	'	"	°	'	"
Declination	–4	20	59.26	–3	59	26.15
Hourly Motion		–14	3.73			–57.98
Equatorial Horizontal Parallax		53	56.38			08.79
True Semi-diameter		14	41.91		15	58.96

CIRCUMSTANCES OF THE ECLIPSE										
	Universal Time			Indian Standard Time			Latitude		Longitude	
	d	h	m	d	h	m	°	'	°	'
Eclipse begins	2	15	43.1	2	21	13.1	+16	02.0	–147	21.3
Central eclipse begins	2	16	53.6	2	22	23.6	+8	22.8	–165	33.0
Greatest eclipse*	2	18	45.0	3	00	15.0	-21	56.9	–114	31.1
Central eclipse ends	2	20	36.2	3	02	06.2	–49	28.8	–37	05.0
Eclipse ends	2	21	46.9	3	03	16.9	–41	51.8	–55	50.1

*Magnitude of the eclipse = 0.932, Duration of eclipse = 6h04 m.
Duration of Central eclipse = 3h43 m, Maximum duration of Annular phase =7 m 21s.

ANNULAR SOLAR ECLIPSE OF OCTOBER 2, 2024



The timing of begining and ending are expressed in UT

BESSELIAN ELEMENTS OF THE ANNULAR ECLIPSE OF THE SUN
OCTOBER 2

Terrestrial Time (TT)		Co-ordinates of the Centre of Shadow on the Fundamental Plane		Direction of the Axis of Shadow *					Radius of Penumbra and Umbra on the Fundamental Plane	
h	m	x	y	sin d	cos d	μ °	'	"	l_1	l_2
15	40	-1.539773	+0.448982	-0.068634	+0.997642	57	42	59.8	+0.569257	+0.024236
	50	-1.466212	+0.408366	-0.068679	+0.997639	60	13	02.4	+0.569268	+0.024247
16	00	-1.392647	+0.367751	-0.068724	+0.997636	62	43	05.0	+0.569278	+0.024257
	10	-1.319079	+0.327137	-0.068769	+0.997633	65	13	07.6	+0.569287	+0.024266
	20	-1.245508	+0.286522	-0.068814	+0.997630	67	43	10.2	+0.569296	+0.024275
	30	-1.171934	+0.245909	-0.068859	+0.997626	70	13	12.8	+0.569304	+0.024283
	40	-1.098357	+0.205295	-0.068904	+0.997623	72	43	15.4	+0.569312	+0.024291
	50	-1.024777	+0.164683	-0.068949	+0.997620	75	13	18.0	+0.569319	+0.024298
17	00	-0.951194	+0.124071	-0.068994	+0.997617	77	43	20.6	+0.569326	+0.024305
	10	-0.877610	+0.083460	-0.069039	+0.997614	80	13	23.2	+0.569332	+0.024311
	20	-0.804022	+0.042850	-0.069084	+0.997611	82	43	25.8	+0.569337	+0.024316
	30	-0.730433	+0.002241	-0.069129	+0.997608	85	13	28.4	+0.569342	+0.024321
	40	-0.656841	-0.038367	-0.069174	+0.997605	87	43	31.0	+0.569346	+0.024325
	50	-0.583248	-0.078974	-0.069219	+0.997601	90	13	33.6	+0.569350	+0.024329
18	00	-0.509652	-0.119580	-0.069264	+0.997598	92	43	36.2	+0.569353	+0.024332
	10	-0.436055	-0.160184	-0.069309	+0.997595	95	13	38.8	+0.569356	+0.024335
	20	-0.362456	-0.200787	-0.069354	+0.997592	97	43	41.4	+0.569358	+0.024336
	30	-0.288856	-0.241389	-0.069399	+0.997589	100	13	44.0	+0.569359	+0.024338
	40	-0.215254	-0.281989	-0.069444	+0.997586	102	43	46.6	+0.569360	+0.024339
	50	-0.141650	-0.322588	-0.069489	+0.997583	105	13	49.2	+0.569360	+0.024339
19	00	-0.068046	-0.363185	-0.069534	+0.997580	107	43	51.7	+0.569360	+0.024338
	10	+0.005559	-0.403781	-0.069579	+0.997576	110	13	54.3	+0.569358	+0.024337
	20	+0.079166	-0.444374	-0.069624	+0.997573	112	43	56.9	+0.569357	+0.024336
	30	+0.152773	-0.484966	-0.069669	+0.997570	115	13	59.5	+0.569355	+0.024333
	40	+0.226381	-0.525556	-0.069714	+0.997567	117	44	02.1	+0.569352	+0.024331
	50	+0.299989	-0.566143	-0.069759	+0.997564	120	14	04.7	+0.569348	+0.024327
20	00	+0.373598	-0.606729	-0.069804	+0.997561	122	44	07.3	+0.569344	+0.024323
	10	+0.447207	-0.647313	-0.069849	+0.997557	125	14	09.9	+0.569340	+0.024318
	20	+0.520817	-0.687894	-0.069894	+0.997554	127	44	12.5	+0.569334	+0.024313
	30	+0.594426	-0.728473	-0.069939	+0.997551	130	14	15.0	+0.569328	+0.024307
	40	+0.668036	-0.769050	-0.069984	+0.997548	132	44	17.6	+0.569322	+0.024301
	50	+0.741645	-0.809624	-0.070029	+0.997545	135	14	20.2	+0.569315	+0.024294
21	00	+0.815254	-0.850196	-0.070074	+0.997542	137	44	22.8	+0.569307	+0.024286
	10	+0.888863	-0.890765	-0.070119	+0.997538	140	14	25.4	+0.569299	+0.024277
	20	+0.962471	-0.931331	-0.070164	+0.997535	142	44	28.0	+0.569290	+0.024268
	30	+1.036079	-0.971895	-0.070209	+0.997532	145	14	30.6	+0.569280	+0.024259
	40	+1.109686	-1.012456	-0.070254	+0.997529	147	44	33.1	+0.569270	+0.024249
	50	+1.183292	-1.053014	-0.070299	+0.997526	150	14	35.7	+0.569259	+0.024238
22	00	+1.256897	-1.093569	-0.070344	+0.997523	152	44	38.3	+0.569247	+0.024226

tanf1= 0.00469570 tanf2= 0.00467234

TT	d			Variations per minute			
hr	°	'	"	x'	y'	μ' '	"
16	-3	56	26	+0.007 357	-0.004 061	15	00
17	-3	57	22	+0.007 360	-0.004 060	15	00
18	-3	58	18	+0.007 360	-0.004 060	15	00
19	-3	59	14	+0.007 361	-0.004 060	15	00
20	-4	00	10	+0.007 361	-0.004 058	15	00
21	-4	01	06	+0.007 361	-0.004 057	15	00

$\xi' = 0.004364\rho\cos\phi'\cos(\mu+\lambda)$ $\eta' = 0.004364\xi\sin d$

*d stands for declination and μ stands for hour angle

PATH OF CENTRAL PHASE DURING THE ANNULAR ECLIPSE OF THE SUN
OCTOBER 02

Terrestrial Time (TT)	Northern Limit		Central Line		Southern Limit		Central Line
	Latitude	Longitude	Latitude	Longitude	Latitude	Longitude	Duration of Annularity
h m	° '	° '	° '	° '	° '	° '	m s
Limit	+9 50.1	-165 10.0	+8 22.8	-165 33.0	+6 54.6	-165 57.0	- -
17 00	+6 30.8	-146 48.8	+5 37.8	-148 59.3	+4 43.9	-151 25.3	6 12
17 10	+3 25.1	-139 02.5	+2 34.8	-140 39.3	+1 43.5	-142 21.0	6 31
17 20	+0 34.2	-133 59.7	+0 13.3	-135 24.5	-1 01.9	-136 52.3	6 44
17 30	-2 09.2	-130 11.5	-2 54.5	-131 29.9	-3 40.9	-132 50.3	6 55
17 40	-4 48.0	-127 07.1	-5 31.6	-128 21.1	-6 16.1	-129 -36.9	7 04
17 50	-7 23.7	-124 30.7	-8 05.9	-125 41.8	-8 49.0	-126 54.2	7 11
18 00	-9 57.0	-122 13.2	-10 38.3	-123 22.0	-11 20.6	-124 31.9	7 17
18 10	-12 28.8	-120 08.2	-13 09.6	-121 15.2	-13 51.3	-122 23.3	7 22
18 20	-14 59.5	-118 11.1	-15 40.2	-119 16.6	-16 21.8	-120 -23.2	7 25
18 30	-17 29.6	-116 17.8	-18 -10.6	-117 22.3	-18 52.5	-118 27.6	7 28
18 40	-19 59.4	-114 25.2	-20 41.2	-115 28.7	-21 23.7	-116 33.0	7 30
18 50	-22 29.2	-112 29.8	-23 12.2	-113 32.5	-23 56.0	-114 36.0	7 31
19 00	-24 59.5	-110 28.5	-25 44.1	-111 30.3	-26 29.5	-112 32.8	7 30
19 10	-27 30.3	-108 17.4	-28 17.1	-109 18.2	-29 04.6	-110 19.7	7 29
19 20	-30 02.0	-105 52.1	-30 51.5	-106 51.7	-31 41.7	-107 51.9	7 26
19 30	-32 34.6	-103 07.3	-33 27.5	-104 05.0	-34 21.1	-105 03.3	7 23
19 40	-35 08.4	-99 55.6	-36 05.2	-100 50.5	-37 03.0	-101 45.7	7 17
19 50	-37 43.2	-96 06.7	-38 44.8	-96 57.0	-39 47.6	-97 47.3	7 10
20 00	-40 18.5	-91 24.9	-41 25.9	-92 07.6	-42 34.6	-92 49.6	7 01
20 10	-42 53.2	-85 23.7	-44 -07.3	-85 53.1	-45 23.3	-86 20.2	6 50
20 20	-45 23.9	-77 10.3	-46 46	-77 13.9	-48 10.5	-77 11.2	6 35
20 30	-47 39.8	-64 17	-49 10.1	-63 12.7	-50 43.3	-61 43.7	6 13
Limit	-48 01.9	-37 36.2	-49 28.7	-37 05.2	-50 56.3	-36 32.0	- -

III- Partial eclipse of the Moon, 18 September, 2024, Wednesday

Not Visible in India

Eclipse will be visible in the region covering Parts of Antarctica, Western Indian Ocean, Middle East, Africa, Europe, Atlantic Ocean, Americas (Except western most Alaska), eastern Polynesia.

The places from where the beginning of Umbral phase is visible at the time of moonset are- Crozet Island, Madagascar, Somalia, Most parts of Saudi Arabia, Iraq, Some parts of Iran, Some parts of Russia.

The places from where the ending of Umbral phase is visible at the time of moonrise are- South Pacific Ocean, North Pacific Ocean, Canada..

ELEMENTS OF THE ECLIPSE						
Universal Time of Oppositionin Right Ascension :September $18^d01^h48^m28^s.36$						
	MOON			SUN		
	h	m	s	h	m	s
Right Ascension	23	44	01.42	11	44	01.42
Hourly Motion			134.08			08.96
	°	'	"	°	'	"
Declination	–2	52	23.72	1	43	48.00
Hourly Motion		18	12.98			-58.06
Equatorial Horizontal Parallax		61	20.01			08.75
True Semi-diameter		16	42.38		15	55.06

CIRCUMSTANCES OF THE ECLIPSE											
	Universal Time			Indian Standard Time			Position Angle measured from the North Point of Moon's Limb (N.E.S.W.)	The Moon being in the Zenith in			
								Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	18	0	39.3	18	06	09.3	22	-3	13	-11	36
Moon enters umbra	18	2	11.8	18	07	41.8	349	-2	45	-33	57
Middle of the eclipse*	18	2	44.2	18	08	14.2	–	-2	35	-41	46
Moon leaves umbra	18	3	16.6	18	08	46.6	313	-2	26	-49	35
Moon leaves penumbra	18	4	49.2	18	10	19.2	299	-1	57	-71	55

*Magnitude of the eclipse =0.090(Moon's diam =1.0). Distance between the centers at middle 3603".8

Radius of shadow cone at Moon's distance: Penumbra 4730".4, Umbra 2782".1

EASTERN AND WESTERN LIMITS OF VISIBILITY

Eastern Limit Moonset at beginning (2h 11.8m U.T.)						Western Limit Moonrise at ending (3h 16.6m U.T.)					
Latitude	Longitude		Latitude	Longitude		Latitude	Longitude		Latitude	Longitude	
°	°	′	°	°	′	°	°	′	°	°	′
-50	+59	21	+10	+55	34	-50	-142	28	+10	-139	09
-40	+58	22	+20	+55	03	-40	-141	37	+20	-138	42
-30	+57	39	+30	+54	28	-30	-140	59	+30	-138	11
-20	+57	04	+40	+53	44	-20	-140	28	+40	-137	32
-10	+56	32	+50	+52	46	-10	-140	00	+50	-136	41
0	+56	03	+60	+51	16	0	-139	35	+60	-135	22

The eclipse is visible in the region west of the eastern limit and east of the western limit. Here, moonset and moonrise times relate to visibility of the center of the Moon on the horizon.

PENUMBRAL ECLIPSE OF THE MOON, March 25, 2024, Monday

CIRCUMSTANCES OF THE ECLIPSE											
	Universal Time			Indian Standard Time			Position Angle from the North Point of Moon's Limb (N.E.S.W)**	The Moon being in the Zenith in			
								Latitude		Longitude	
	d	h	m	d	h	m	°	°	'	°	'
Moon enters penumbra	25	4	51.0	25	10	21.0	161	+0	38	-71	53
Middle of the eclipse*	25	7	12.8	25	12	42.8	-	-1	12	-105	47
Moon leaves penumbra	25	9	34.7	25	15	04.7	257	-1	46	-140	31

* Penumbral magnitude of eclipse: 0.982

** N.E.S.W stands for North, East, South and West

Note : - A penumbral eclipse of the Moon is not to be taken as an eclipse of the Moon in the ordinary sense,as the Moon is not covered by the real shadow of the Earth during such an eclipse.

PLANETS BY THE MOON

Sl. No.	Date and Ingress - Egress Times (U.T.)			Planet	Magnitude of Planet	Area of Visibility
		h --	h			
1.	Jan – 15	19.6	22.8	Neptune	7.9	W. Antarctica, S.E Edge of S.America, S.Georgia & S.Sandwich Is., Ascension Is.
2.	Feb –12	05.5	09.1	Neptune	7.9	Marion Is., Kerguelen Is., parts of Antartica, Austrelia, Melanesia, W.Polynesia (except New Zealand), S. Micronesia.
3.	Apr –06	09.2	11.5	Saturn	1.1	Most of Antarctica, Kerguelen Is., Marion Is.
4.	Apr–07	06.5	10.5	Neptune	8.0	S. Georgia & S.Sandwich Is., Marion Is., S.E. Africa, Madagascar, S.India, S.E. Asia, W.Indonesia
5.	Apr–07	14.2	18.5	Venus	-2.1	E. Polynesia, Galapagos Is., parts of S. & E. North America, S. tip of Greenland, Iceland, Azores, Ireland.
6.	May–03	21.4	25.0	Saturn	1.2	Most of Antarctica, S.E. Australasia, S.W. Polynesia, extreme S.E. Melanesia.
7.	May–04	17.1	21.3	Neptune	7.9	S.E. Australia, most of Polynesia (except N.W.), Galapagos Is., parts of S. North America.
8.	May–05	00.1	04.5	Mars	1.1	Eastern Edge of Africa, Madagascar, Sri Lanka, S.E. Asia, N.W. Indonesia, Philippines, Eastern China, Japan, Extreme S.E. Russia
9.	May–31	06.4	10.5	Saturn	1.2	Southern South America, South Georgia, Ascension Is., parts of W. & S. Africa, Central Africa, most of East Africa.
10.	Jun –01	00.8	05.1	Neptune	7.9	Southern Africa, Madagascar, most of S., S.E. & E. Asia.
11.	Jun– 27	12.8	17.1	Saturn	1.1	E. Australia, S.E. Melanesia, most of Polynesia, S. And Central North America.
12.	Jun–28	06.6	10.8	Neptune	7.9	Easter Is., Galapagos Is., N. & W. South America, S. Central America, S.E. Caribbean, N.W. Africa, most of W. Europe.
13.	Jul –24	18.5	22.5	Saturn	0.9	E. Africa, Madagascar, most of S. Asia, N.W. Indonesia, most of China & Mongolia, Japan, southeasternmost Russia.
14.	Jul– 25	12.5	16.4	Neptune	7.8	Most of Melanesia, Micronesia, W. Hawaii, most of N.W. North America.
15.	Aug–21	00.8	04.7	Saturn	0.7	N. half of South America, Galapagos Is., S. Central America, Cape Verde Is., Azores, N.W. Africa, most of Europe.
16.	Aug–21	19.6	23.5	Neptune	7.8	Most of N. & C. Africa, Middle East, S.E. & E. Europe, northwesternmost China, most of Mongolia, Russia(except eastern parts).
17.	Sep-05	07.9	10.1	Venus	-3.8	Parts of Antarctica, South Sandwich Is.

PLANETS BY THE MOON

18.	Sep-17	08.2	12.2	Saturn	0.6	Northern Australia, Melanesia, S. & E. Micronesia, N.W. Polynesia (inc. Hawaii), central western North America.
19.	Sep-18	05.7	09.1	Neptune	7.8	N. Polynesia, North America (except Alaska, S.E. U.S.A. & Mexico), W. Greenland.
20.	Oct-14	16.1	20.2	Saturn	0.7	Ascension Is., S. & E. Africa, Madagascar, S.E. Arabian Peninsula, most of S.Asia, China & Mongolia.
21.	Oct-15	15.2	19.0	Neptune	7.8	Africa (except S. & N.W.), most of Middle East, N.W. India, N.W. half of China, Russia (except West and easternmost), northernmost Japan.
22.	Nov-11	-00.4	03.8	Saturn	0.9	E. Polynesia, Galapagos Is. N.W. South America, Central America, Caribbean southeasternmost U.S.A., W. Azores.
23.	Nov-12	00.1	03.8	Neptune	7.8	N. Polynesia, North America (except N.W. & Caribbean), Greenland, Iceland.
24.	Dec-08	06.6	10.8	Saturn	1.0	Indonesia, Philippines, N.W. edge of Australia, N.W. Micronesia, most of Japan, Aleutian Is.
25.	Dec-09	06.9	10.4	Neptune	7.9	Asia (except western parts), Philippines, Alaska.
26.	Dec-18	07.8	10.8	Mars	-0.9	N.E. & N. Russia, N. Alaska, northernmost Canada, Greenland, N.W. half of Europe, N.W. tip of Africa.

ELEMENTS OF OCCULTATIONS OF PLANETS

Sl. No.	T0 (U.T. of Conj. in R.A.)			H_0		Y	x'	y'	Body Occulted					
									Right Ascension			Declination		
	d	h	m	h	m				h	m	s	°	′	″
1.	Jan – 15	20	25.4	4	20.8	-0.9506	0.5327	0.2826	23	44	53.1	-2	-58	-34.0
2.	Feb –12	6	45.1	-7	34.1	-0.6692	0.5416	0.2902	23	47	41.6	-2	-39	-41.4
3.	Apr –06	9	24.5	0	38.1	-1.2025	0.5431	0.2803	23	4	23.2	-7	-46	-02.9
4.	Apr–07	8	10.7	-2	38.8	-0.4158	0.5424	0.2946	23	55	6.76	-1	-51	-39.2
5.	Apr–07	16	38	29	31.1	0.3871	0.4981	0.2764	0	13	50.1	0	-7	-55.8
6.	May–03	22	31.7	14	7.58	-0.8260	0.5238	0.2739	23	14	30.2	-6	-47	-35.1
7.	May–04	18	58.8	9	54.2	-0.2575	0.5342	0.2898	23	58	26.6	-1	-30	-51.8
8.	May–05	2	25.5	17	5.92	0.1947	0.5073	0.2787	0	14	35.2	0	12	21.7
9.	May–31	8	8.62	1	25.6	-0.3841	0.5278	0.2778	23	21	25.4	-6	-10	-14.2
10.	Jun –01	2	53.8	19	34.6	-0.0212	0.5272	0.2851	0	0	46.6	-1	-16	-57.4
11.	Jun– 27	15	0.12	20	1.92	0.0782	0.5296	0.2797	23	24	13.3	-5	-59	-49.6
12.	Jun–28	8	56.5	37	23.7	0.2996	0.5263	0.2844	0	1	45.9	-1	-12	-00.4
13.	Jul –24	20	46.5	17	37.4	0.3925	0.5382	0.2849	23	22	31.3	-6	-17	-52.0
14.	Jul– 25	14	53.8	35	8.9	0.5689	0.5323	0.2886	0	1	17.6	-1	-16	-31.6
15.	Aug–21	3	2.17	1	46.1	0.4539	0.5478	0.2898	23	16	56.1	-6	-58	-45.5
16.	Aug–21	21	58.8	20	3.29	0.5732	0.5368	0.2923	23	59	31.5	-1	-29	-10.1
17.	Sep-23	10	15.6	20	44.5	-1.3104	0.4309	-0.2374	12	32	17.1	-2	-31	-44.9
18.	Sep-23	10	21.9	11	1.06	0.3009	0.5512	0.2899	23	9	23.2	-7	-48	-29.6
19.	Sep-23	7	58.9	7	54	0.7668	0.5465	0.2987	23	56	55.9	-1	-46	-38.6
20.	Oct-23	18	13.1	-3	13.4	0.1124	0.5449	0.2839	23	2	43.4	-8	-28	-37.7
21.	Oct-23	17	31.8	-4	42.3	0.5778	0.5437	0.2967	23	54	14.7	-2	-4	-03.5
22.	Nov-23	1	43	-17	52.6	0.0897	0.5332	0.2756	22	59	31.1	-8	-44	-27.1
23.	Nov-23	2	25.1	-17	59.1	0.6201	0.5341	0.2901	23	52	14.8	-2	-16	-24.0
24.	Dec-23	8	55.8	-8	53.6	0.3126	0.5242	0.2714	23	1	1.84	-8	-30	-09.5
25.	Dec-23	9	18.5	-9	17.4	0.8440	0.5247	0.2840	23	51	32.3	-2	-19	-58.5
26.	Dec-23	8	48.6	6	5.52	0.9590	0.5595	-0.1732	8	34	4.68	22	11	28.6

ELEMENTS OF OCCULTATIONS OF PLANETS

Sl. No.	*l*	*a*	Sl. No.	*l*	*a*	Sl. No.	*l*	*a*
1.	0.2725	1.00	10.	0.2725	1.00	19.	0.273	1.00
2.	0.2725	1.00	11.	0.2726	1.00	20.	0.273	1.00
3.	0.2726	1.00	12.	0.2725	1.00	21.	0.273	1.00
4.	0.2725	1.00	13.	0.2726	1.00	22.	0.273	1.00
5.	0.2729	1.00	14.	0.2725	1.00	23.	0.273	1.00
6.	0.2726	1.00	15.	0.2726	1.00	24.	0.273	1.00
7.	0.2725	1.00	16.	0.2725	1.00	25.	0.2725	1.00
8.	0.2728	1.00	17.	0.2730	1.00	26.	0.2735	1.00
9.	0.2726	1.00	18.	0.273	1.00			

BRIGHT STARS BY THE MOON

Sl. No.	Date and Ingress - Egress Times (U.T.)			Star	Area of Visibility
		h --	h		
1.	Jan – 08	13.6	17.0	Antares	Most of North America, northernmost South America.
2.	Feb –05	-00.8	03.2	Antares	Parts of Middle East, Kazakhstan, half of China, S.Asia, S.E. Asia, Indonesia, Philippines, extreme W. Melanesia, parts of Japan, W. Micronesia.
3.	Mar –03	06.9	11.2	Antares	S.E. North America, C. America, Caribbean, N. & E.S. America, Ascension Is., West & W. Central Africa.
4.	Mar–30	13.0	17.4	Antares	Micronesia, N.E. Melanesia, most of Polynesia.
5.	Apr–26	18.6	23.0	Antares	N.E. Africa, parts of Middle East, southernmost India, Indonesia, most of Philippines, N.W. Australia, extreme W. Micronesia, westernmost Polynesia.
6.	May–24	01.2	05.4	Antares	S.E. North America, N.& E. South America, ascension Is., West & W. Central Africa.
7.	Jun –16	18.3	20.2	Spica	S.W. Svalbard, N.E. Scandinavia, western Russia, Central Asia.
8.	Jun– 20	09.2	13.5	Antares	Easternmost China, southern Japan, most of Micronesia, Melanesia, most of Polynesia.
9.	Jul –17	18.2	22.5	Antares	Cape Verde Is., parts of Western Africa, mopst of C., S. & E. Africa, Madagascar.
10.	Aug–10	08.9	12.9	Spica	Parts of eastern Europe, W. half of Russia, most of Asia, N. Indonesia, S. Japan, westernmost Micronesia.
11.	Aug–14	03.1	07.5	Antares	Micronesia, Melanesia, Polynesia (except New Zealand and Hawaii), Galapagos Is.
12.	Sep-06	15.4	19.7	Spica	N.E. North America, Bermuda, Azores, Ascension Is., most of W. and C. Africa.
13.	Sep-10	10.8	15.4	Antares	S. half of Africa, Madagascar, Kerguelen Is., W. & central Australia, S.E. Indonesia.
14.	Oct-07	17.2	21.7	Antares	Galapagos Is., Easter Is., S. half of South America, S.W. edge of Africa.
15.	Nov-03	-01.2	03.4	Antares	S.W. Micronesia, E. Indonesia, Melanesia, N.E. Australia, S. Polynesia (except S. New Zealand).
16.	Nov-27	10.5	14.9	Spica	Most of U.S.A. & Canada, Caribbean, N.E. edge of South America, Cape Verde Is., parts of W. Africa.
17.	Dec-24	18.1	22.7	Spica	E.China, most of Japan, Micronesia, most of Melanesia, Polynesia (except New Zealand & Hawaii).
18.	Oct-28	13.0	17.5	Antares	Eastern Polynesia, most of S. half of South America.

ELEMENTS OF OCCULTATIONS OF STARS

Sl. No.	T0 (U.T. of Conj. in R.A.)			H_0		Y	x′	y'	Body Occulted					
									Right Ascension			Declination		
	d	h	m	h	m				h	m	s	°	′	″
1.	Jan – 8	14	59.5	5	40.4	0.8073	0.5731	-0.1220	16	30	51.4	-26	-29	-02.8
2.	Feb –5	00	57.7	-6	33.2	0.5708	0.5641	-0.1186	16	30	52.3	-26	-29	-04.7
3.	Mar-3	08	54.0	3	10.8	0.3698	0.5562	-0.1161	16	30	53.3	-26	-29	-07.1
4.	Mar-30	15	03.1	11	7.29	0.2831	0.5534	-0.1155	16	30	54.1	-26	-29	-09.2
5.	Apr–26	20	39.4	18	31	0.3219	0.5565	-0.1157	16	30	54.9	-26	-29	-11.0
6.	May–24	03	10.3	2	49.4	0.3825	0.5616	-0.1154	16	30	55.4	-26	-29	-12.4
7.	Jun-16	18	11.1	22	27.8	1.2962	0.4924	-0.2478	13	26	29.3	-11	-17	-23.5
8.	Jun-20	11	11.2	12	38.1	0.3540	0.5639	-0.1138	16	30	55.7	-26	-29	-13.6
9.	July-17	20	15.5	23	30.3	0.2040	0.5614	-0.1112	16	30	55.7	-26	-29	-14.5
10.	Aug-10	10	16.6	18	8.82	0.7244	0.4883	-0.2453	13	26	28.8	-11	-17	-20.7
11.	Aug-14	05	17.0	10	19.8	-0.0047	0.5549	-0.1087	16	30	55.5	-26	-29	-14.8
12.	Sep-6	17	04.5	26	44.3	0.5796	0.4884	-0.2461	13	26	28.5	-11	-17	-19.3
13.	Sep-10	13	08.5	19	59	-0.1588	0.5484	-0.1071	16	30	55	-26	-29	-14.4
14.	Oct-7	19	28.5	4	6.5	-0.1778	0.5460	-0.1066	16	30	54.6	-26	-29	-13.2
15.	Nov-3	01	06.0	-12	32.6	-0.0906	0.5486	-0.1063	16	30	54.4	-26	-29	-11.8
16.	Nov-27	12	15.9	3	18.2	0.4648	0.4904	-0.2448	13	26	29.3	-11	-17	-22.3
17.	Dec-24	20	11.2	13	1.22	0.1893	0.4891	-0.2426	13	26	30.2	-11	-17	-27.1
18.	Dec-28	15	17.0	5	17.6	-0.0948	0.5541	-0.1030	16	30	55.2	-26	-29	-11.3

l =0.2725* and a =1.00*

*Elements l and a have identical values correct upto last significant digit (as reported) in each 18 occultations of the bright stars.

PART - V

ASTRONOMICAL PHENOMENA
AND
MISCELLANEOUS TABLES

ELONGATIONS AND MAGNITUDES OF PLANETS AT 0^h U.T.

Date	Mercury Elong.	Mercury Mag.	Venus Elong.	Venus Mag.	Date	Mercury Elong.	Mercury Mag.	Venus Elong.	Venus Mag.
	°		°			°		°	
Jan. -4	W 10	2.6	W 38	-4.1	June 29	E 16	-0.7	E 7	-3.9
1	18	0.5	37	-4	July 4	20	-0.4	8	-3.9
6	22	-0.1	36	-4	9	23	-0.2	9	-3.9
11	23	-0.3	35	-4	14	25	0	11	-3.9
16	23	-0.3	34	-4	19	27	0.2	12	-3.9
21	W 22	-0.2	W 33	-4	24	E 27	0.4	E 14	-3.9
26	20	-0.2	32	-3.9	29	26	0.7	15	-3.9
31	18	-0.3	31	-3.9	Aug 3	23	1.2	16	-3.8
Feb. 5	16	-0.4	30	-3.9	8	18	2	18	-3.8
10	13	-0.5	29	-3.9	13	12	3.4	19	-3.8
15	W 10	-0.7	W 28	-3.9	18	E 5	5.2	E 20	-3.8
20	7	-1	27	-3.9	23	W 8	4	22	-3.8
25	W 3	-1.5	26	-3.9	28	14	1.8	23	-3.8
Mar. 1	E 2	-1.8	24	-3.9	Sept 2	17	0.3	24	-3.8
6	6	-1.6	23	-3.8	7	18	-0.6	25	-3.8
11	E 11	-1.3	W 22	-3.8	12	W 16	-1	E 27	-3.9
16	15	-1.1	21	-3.8	17	12	-1.2	28	-3.9
21	18	-0.7	20	-3.8	22	8	-1.4	29	-3.9
26	19	-0.1	18	-3.8	27	W 4	-1.6	30	-3.9
31	17	1.1	17	-3.8	Oct. 2	E 1	-1.6	32	-3.9
Apr. 5	E 11	2.9	W 16	-3.8	7	E 5	-1.2	E 33	-3.9
10	E 4	----	15	-3.8	12	8	-0.8	34	-3.9
15	W 5	5.2	13	-3.8	17	11	-0.6	35	-3.9
20	13	3.2	12	-3.8	22	14	-0.4	36	-4
25	19	1.9	11	-3.9	27	16	-0.3	37	-4
30	W 23	1.1	W 10	-3.9	Nov 1	E 19	-0.3	E 38	-4
May 5	26	0.7	8	-3.9	6	20	-0.3	39	-4
10	26	0.4	7	-3.9	11	22	-0.3	40	-4.1
15	26	0.1	6	-3.9	16	23	-0.3	41	-4.1
20	24	-0.1	W 4	-3.9	21	22	-0.2	42	-4.1
25	W 21	-0.4	E 3	-3.9	26	E 19	0.3	E 43	-4.2
30	17	-0.7	2	----	Dec. 1	11	2.1	43	-4.2
June 4	13	-1.1	0	----	6	E 1	----	44	-4.2
9	7	-1.6	1	----	11	W 11	2.1	45	-4.3
14	W 1	-2.4	3	-4	16	18	0.2	46	-4.3
19	E 5	-1.8	E 4	-3.9	21	W 21	-0.3	E 46	-4.4
24	11	-1.1	5	-3.9	26	22	-0.4	47	-4.4
29	E 16	-0.7	E 7	-3.9	31	21	-0.4	47	-4.5
					36	W 20	-0.3	E 47	-4.5

Conjunction-	Mercury (d h)	Mercury (d h)	Venus (d h)	Mercury (d h)	Mercury (d h)	Venus (d h)
Inferior:	Apr. 11 23		…	Aug. 19 02	Dec. 06 02	…
Superior:	Feb. 28 09		Jun. 4 16	Jun. 14 17	Sep. 30 21	

N.B.- E. means that the planet is in the east of the Sun and W. means that it is in the west of the Sun by the amount of the arc stated.

ELONGATIONS AND MAGNITUDES OF PLANETS AT 0^h UT

Date		Mars			Jupiter			Saturn			Uranus		Neptune		Pluto	
		Elong.		Mag.	Elong.		Mag.	Elong.		Mag.	Elong.		Elong.		Elong.	
			°			°			°			°		°		°
Jan.	-9	W	10	1.4	E	126	-2.7	E	63	0.9	E.	140	E.	85	E	29
	1		13	1.4		116	-2.6		53	0.9		129		75		20
	11		15	1.4		106	-2.5		44	1		119		65		10
	21		18	1.4		96	-2.5		35	1		109		55	E	3
	31		21	1.3		87	-2.4		26	1		99		45	W	11
Feb.	10	W	23	1.3	E	78	-2.3	E	17	1	E.	88	E.	35	W	20
	20		26	1.3		69	-2.2	E	8	1		79		26		30
Mar.	1		28	1.3		60	-2.2	W	2	1		69		16		40
	11		30	1.2		52	-2.1		10	1		59	E.	6		50
	21	W	32	1.2	E	44	-2.1		19	1.1		49	W.	4	W	59
	31		35	1.2		36	-2.1	W	27	1.1	E.	40		13	E	69
Apr.	10		37	1.2		29	-2		36	1.1		31		22		79
	20	W	39	1.1	E	21	-2		45	1.2		21		32		88
	30		41	1.1		14	-2		54	1.2		12		41		98
May	10		43	1.1		6	-2		62	1.2	E.	3		51		108
	20		45	1.1	W	1	-2	W	71	1.2	W	6	W.	60	E	117
	30	W	47	1.1		8	-2		80	1.2		15		69		127
June	9		49	1		15	-2		90	1.1		24		79		137
	19		51	1		23	-2		99	1.1		33		88		146
	29	W	53	1	W	30	-2		108	1.1		42		98		156
July	9		56	1		37	-2	W	118	1	W	51	W.	107	E	166
	19		58	0.9		45	-2.1		128	0.9		60		117		175
	29	W	61	0.9	W	53	-2.1		138	0.9		70		127		173
Aug.	8		64	0.9		60	-2.2		148	0.8		79		136		164
	18		67	0.8		68	-2.2	W	158	0.7		88		146		155
Sept	28	W	70	0.8	W	77	-2.3		168	0.6	W	98	W.	156	E	145
	7		74	0.7		85	-2.3	W	177	0.6		108		166		135
	17		77	0.6		94	-2.4	E	171	0.6		117	W.	176		125
Oct.	27	W	82	0.5	W	103	-2.5		160	0.6		127	E	174		115
	7		86	0.4		113	-2.5		150	0.7		137		164		105
	17		91	0.3		123	-2.6	E	139	0.7	W	148	E	154	E	96
Nov	27	W	97	0.2	W	133	-2.7		129	0.8		158		144		86
	6		103	0		144	-2.7		119	0.8		168		133		76
	16		111	-0.2		155	-2.8		109	0.9	W	179		123		66
	26	W	119	-0.4	W	166	-2.8		99	0.9	E	171		113		56
Dec.	6		128	-0.6		178	-2.8	E	89	1		160	E	103	E	46
	16		139	-0.8	E	171	-2.8		79	1		150		93		36
	26	W	151	-1.1		159	-2.8		69	1.1		139		83		26
	36		164	-1.3		148	-2.7	E	60	1.1	E	129	E	72	E	17
				d h			d h			d h		d h		d h		d h
Conjunction:				…			May 18 19			Feb 28 21		May 13 09		Mar. 17 11		Jan. 20 14
Opposition:				…			Dec. 7 21			Sep. 8 05		Nov.17 03		Sept.21 00		July 23 06

Magnitudes at opposition: Uranus +5.7; Neptune +7.9; Pluto +14.4

N.B. - E. means that the planet is in the east of the Sun and W. means that it is in the west of the Sun by the amount of the arc stated.

CONJUNCTIONS, OPPOSITIONS ETC. OF PLANETS WITH THE SUN (IN LONGITITUDE)

UNIVERSAL TIME

MERCURY

		d	h	m			d	h	m	
Direct	Jan.	2	03	24		Aug.	28	21	08	
Greatest elongation W	Jan.	12	14	37	(23˚.5)	Sep.	5	02	30	(18˚.0)
Heliacal settingW	Feb.	8	05	34		Sept.	19	3	59	
Superior conjuction	Feb	28	08	43		Sept.	30	21	11	
Heliacal rising E.	Mar.	10	05	56		Oct.	23	09	43	
Greatest elongation E.	Mar.	24	22	34	(18˚.7)	Nov.	16	08	09	(22˚.6)
Retrograde	Apr.	1	22	22		Nov.	26	02	25	
Heliacal setting E	Apr.	5	19	28		Nov.	30	18	29	
Inferior conjunction	Apr.	11	23	03		Dec.	6	02	18	
Heliacal rising W.	Apr.	21	02	04		Dec.	10	09	32	
Direct	Apr.	25	12	55		Dec.	15	21	13	
Greatest elongation W.	May	9	21	29	(26˚.4)	Dec.	25	02	30	(22˚.0)
Heliacal setting W.	June	3	05	26						
Superior conjuction	June	14	16	33						
Heliacal rising E.	June	23	15	54						
Greatest elongation E.	July	22	06	39	(26˚.9)		…	…	…	
Retrograde	Aug.	5	04	52			…	…	…	
Heliacal setting E.	Aug.	7	17	12			…	…	…	
Inferior conjuction	Aug.	19	01	59			…	…	…	
Heliacal rising W.	Aug.	25	06	49			…	…	…	

VENUS

		d	h	m	d	h	m
Heliacal setting W.	Apr	29	17	44			
Superior conjuction	Jun	04	15	32			
Heliacal rising E.	Jun	28	11	36			
Greatest elongation E.		…	…	…			
Retrograde		…	…	…			
Heliacal setting E		…	…	…	…	…	…
Inferior conjunction		…	…	…	…	…	…
Heliacal rising W.		…	…	…	…	…	…
Direct		…	…	…	…	…	…
Greatest elongation W.		…	…	…	…	…	…

EARTH

		d	h	m			d	h	m		d	h	m
Perihelion	Jan.	3	00	39	Equinoxes	Mar.	20	03	06	Sept.	22	12	44
Aphelion	July	5	05	06	Solstices	June	20	20	51	Dec.	21	09	20

SUPERIOR PLANETS

	MARS				JUPITER				SATURN			
		d	h	m		d	h	m		d	h	m
Heliacal setting E.					May	6	17	32	Feb.	15	06	57
Conjunction					May	18	18	45	Feb.	28	21	25
Heliacal rising W.	Jan.	14	08	33	Jun	3	01	31	Mar.	21	15	44
Retrograde	Dec	6	23	31	Oct	9	07	04	June	29	19	07
Opposition		…	…	…	Dec	7	20	58	Sep	8	04	35
Direct									Nov.	15	14	21

PHENOMENA, 2024

CONJUNCTIONS, OPPOSITIONS ETC. OF PLANETS WITH THE SUN (IN LONGITUDE)

UNIVERSAL TIME

SUPERIOR PLANETS

	URANUS				NEPTUNE				PLUTO			
		d	h	m		d	h	m		d	h	m
Conjunction	May	13	09	13	Mar.	17	11	22	Jan.	20	13	46
Retrograde	Sep	1	15	16	July	2	10	37	May	2	17	45
Opposition	Nov.	17	2	45	Sep	21	01	17	July	23	05	38
Direct	Jan.	27	07	35	Dec.	7	23	40	Oct.	12	00	27

N.B.- The heliacal risings and settings have been calcuted for 23° 11' north latitude. Here E. means east of the Sun or the western horizon and W. means west of the Sun or the eastern horizon.

PHENOMENA, 2024

CONJUNCTION OF PLANETS WITH THE MOON AND OTHER PLANETS (IN LONGITUDE)

UNIVERSAL TIME

	d	h	m			d	h	m	
Jan.	8	18	44	Moon Conj. Venus		19	08	59	*Mercury Conj. Venus*
	9	18	24	Moon Conj. Mercury	May	3	23	04	Moon Conj. Saturn
	10	08	45	Moon Conj. Mars		5	02	17	Moon Conj. Mars
	14	10	50	Moon Conj. Saturn		6	05	57	Moon Conj. Mercury
	18	19	05	Moon conj. Jupiter		7	14	04	Moon Conj. Venus
	27	14	59	Mercury Conj. Mars		8	16	30	Moon conj. Jupiter
Feb.	7	20	12	Moon Conj. Venus		23	08	29	Venus conj. Jupiter
	8	07	51	Moon Conj. Mars		31	08	24	Moon Conj. Saturn
	8	23	25	Moon Conj. Mercury	Jun.	2	22	03	Moon Conj. Mars
	11	01	44	Moon Conj. Saturn		4	10	23	Mercury conj. Jupiter
	15	06	31	Moon conj. Jupiter		5	12	49	Moon conj. Jupiter
	22	07	14	*Venus conj. Mars*		5	16	46	Moon Conj. Mercury
	28	15	08	*Mercury conj. Saturn*		6	13	36	Moon Conj. Venus
Mar.	8	06	50	Moon Conj. Mars		17	12	42	*Mercury Conj. Venus*
	8	18	55	Moon Conj. Venus		27	14	57	Moon Conj. Saturn
	9	18	22	Moon Conj. Saturn	July	1	16	19	Moon Conj. Mars
	11	03	14	Moon Conj. Mercury		3	07	04	Moon conj. Jupiter
	13	23	13	Moon conj. Jupiter		6	16	27	Moon Conj. Venus
	21	23	10	*Venus conj. Saturn*		7	20	23	Moon Conj. Mercury
Apr.	6	05	07	Moon Conj. Mars		24	20	31	Moon Conj. Saturn
	6	10	09	Moon Conj. Saturn		30	9	01	Moon Conj. Mars
	7	16	21	Moon Conj. Venus		30	22	45	Moon conj. Jupiter
	9	2	38	Moon Conj. Mercury	Aug.	5	23	24	Moon Conj. Venus
	10	19	19	Moon conj. Jupiter		6	5	20	Moon Conj. Mercury
	10	20	36	*Mars Conj.Saturn*		8	3	12	Mercury Conj. Venus

CONJUNCTION OF PLANETS WITH THE MOON AND OTHER PLANETS (IN LONGITUDE)

UNIVERSAL TIME

d h m		d h m	
Aug. 14 15 22	Mars Conj. Jupiter	23 21 20	Moon Conj. Mars
21 02 45	Moon Conj. Saturn	Nov. 3 06 37	Moon Conj. Mercury
27 11 50	Moon conj. Jupiter	4 23 51	Moon Conj. Venus
28 00 00	Moon Conj. Mars	11 01 39	Moon Conj. Saturn
Sep. 1 12 37	Moon Conj. Mercury	17 14 07	Moon conj. Jupiter
5 09 13	Moon Conj. Venus	20 22 15	Moon Conj. Mars
17 10 10	Moon Conj. Saturn	Dec. 2 01 28	Moon Conj. Mercury
23 22 39	Moon conj. Jupiter	4 23 34	Moon Conj. Venus
25 12 40	Moon Conj. Mars	8 08 44	Moon Conj. Saturn
Oct' 2 22 22	Moon Conj. Mercury	14 18 43	Moon conj. Jupiter
5 18 28	Moon Conj. Venus	18 09 13	Moon Conj. Mars
14 18 08	Moon Conj. Saturn	29 08 29	Moon Conj. Mercury
21 07 25	Moon conj. Jupiter		

CONJUNCTIONS OF PLANETS WITH BRIGHT STARS (IN R.A.)

d h m		d h m	
Jan 6 08 12	Venus 6˚ .42N. of Antares	Aug. 11 22 09	Mercury 5˚ .53S. of Regulus
Jun. 1 16 52	Venus 5˚ .34N. of Aldebaran	Sep. 9 06 40	Mercury 0˚ .49N. of Regulus
Jun. 8 14 57	Mercury 5˚ .45N. of Aldebaran	Sep. 17 12 55	Venus 2˚ .63N. of Spica
Jun. 29 09 49	Mercury 4˚ .87S. of Pollux	Oct. 9 15 15	Mercury 2˚ .66N. of Spica
July 7 06 14	Venus 5˚ .68S. of Pollux	Oct. 21 06 01	Mars 5˚ .72S. of Pollux
July 13 06 57	Jupiter 4˚ .82N. of Aldebaran	Oct. 25 19 01	Venus 3˚ .11N. of Antares
July 27 12 13	Mercury 2˚ .64S. of Regulus	Nov. 10 04 07	Mercury 2˚ .02N. of Antares
Aug. 4 22 05	Venus 1˚ .09N. of Regulus	Dec. 10 11 11	Mercury 7˚ .12N. of Antares
Aug. 5 18 44	Mars 4˚ .99N. of Aldebaran	Dec. 22 00 05	Mercury 7˚ .09N. of Antares

UNIVERSAL TIME

	d	h	m			d	h	m	
Jan.	1	15	29	*Moon at Apogee*	Feb	28	21	25	Saturn in conjunction with Sun
	2	04	06	Mercury Stationary in RA	Mar.	3	15	23	LAST QUARTER
	3	00	52	Earth at Perihelion		8	05	00	Mars 3°.52N of Moon
	4	03	30	LAST QUARTER		8	17	00	Venus 3°.28N of Moon
	6	08	12	*Venus 6° .42N. of Antares*		8	17	35	Mercury 0° 2'N. of Neptune
	8	20	10	Venus 5°.70N of Moon		9	17	28	Saturn 1°.52N of Moon
	9	18	48	Mercury 6°.59N of Moon		10	07	04	Moon at Perlgee
	10	08	31	Mars 4°.16N of Moon		10	09	00	*NEW MOON*
	11	11	57	NEW MOON		11	00	56	Neptune 0°.52N of Moon
	12	14	37	Mercury Greatest elongation W		11	08	00	Mercury 1°.03N of Moon
	13	10	36	Moon at Perlgee		13	00	38	Mercury in Ascending node
	14	09	33	Saturn 2°.14N of Moon		14	01	03	Jupiter 3°.59S of Moon
	15	20	25	Neptune 0°.95N of Moon		14	11	35	Uranus 3°.44S of Moon
				Occultation		17	04	11	FIRST QUARTER
	18	03	53	FIRST QUARTER		17	11	23	*Neptune in conjunction with Sun*
	18	20	42	Jupiter 2°.77S of Moon		17	16	36	Mercury in Perihelion
	19	19	39	Uranus 2°.96S of Moon		19	21	43	Venus in Aphelion
	20	13	43	Pluto in conjunction with Sun		20	03	06	*Sun enter Vernal Equinox*
	23	08	11	Mercury in Descending node		22	02	00	Venus 0° 21' N. of Saturn
	25	17	54	FULL MOON		23	15	45	Moon at Apogee
	27	10	50	Uranus Stationary in RA		24	22	25	Mercury in Greatest Elongation (E) 18 4
	27	16	07	*Mercury 0° 15' N. of Mars*		25	07	00	FULL MOON
	27	7 1	09	Jupiter in Square with Sun		27	21	55	*Mercury greatest helio. lat N.*
	29	08	15	Moon at Apogee	Apr.	1	20	16	Mercury Stationary in RA
Feb	2	16	58	Mercury in Aphelion		2	03	15	LAST QUARTER
	2	23	18	LAST QUARTER		3	10	54	Venus 0° 17' S. of Neptune
	7	18	50	Venus 5°.43N of Moon		6	03	51	Mars 1°.98N of Moon
	8	06	30	Mars 4°.21N of Moon		6	09	24	Saturn 1°.22N of Moon
									Occultation
	8	21	59	Mercury 3°.22N of Moon		7	08	11	*Neptune 0°.42N of Moon*
	8	10 4	06	Uranus in Square with Sun					Occultation
	9	22	59	NEW MOON		7	16	38	Venus 0°.39S of Moon
	10	18	53	Moon at Perlgee					Occultation
	11	00	40	Saturn 1°.81N of Moon		7	17	51	Moon at perigee
	12	06	45	Neptune 0°.68N of Moon		8	18	21	NEW MOON : Solar Eclipse
				Occultation		9	01	24	Mercury 2°.19N of Moon
	13	23	39	Venus in Descending node		10	19	54	Venus greatest helio lat. S.
	14	19	50	*Mars 1° 56' N. of Pluto*		10	21	09	Jupiter 3°.98S of Moon
	15	08	16	Jupiter 3°.16S of Moon		10	23	51	Uranus 3°.55S of Moon
	16	02	00	Uranus 3°.23S of Moon		11	03	13	*Mars 0° 29 'N. of Saturn*
	16	15	01	FIRST QUARTER		11	22	39	Mars greatest helio lat. S.
						11	23	03	*Mercury in inferior conjunction*
	17	20	44	*Venus 2° 43' N. of Pluto*					2° 13' .3 N of Sun
	22	15	35	Venus 0° 38 'N. of Mars		15	19	13	FIRST QUARTER
	22	22	47	Mercury greatest helio lat. S.		18	22	40	*Mercury 1° 58' N. of Venus*
	24	12	30	FULL MOON		20	02	10	Moon at Apogee
	25	14	59	Moon at Apogee		20	07	21	Mercury in Descending node
	28	08	40	Mercury in superior conjunction		20	07	36	*Jupiter 0° 32 'S. of Uranus*
				1° 49' .6 S of Sun		23	23	49	FULL MOON
	28	14	03	*Mercury 0°12' S. of Saturn*		24	08	25	Mercury Stationary in RA

UNIVERSAL TIME

	d	h	m			d	h	m	
Apr.	29	04	03	*Mars 0˚0 2' S. of Neptune*	June	9	10	06	Saturn in Square with Sun
	30	16	15	*Mercury in Aphelion*		13	15	52	*Mercury in Perihelion*
May	1	11	27	LAST QUARTER		14	05	19	FIRST QUARTER
	3	22	32	Saturn 0˚.84N of Moon		14	13	35	Moon at Apogee
				Occultation		14	16	33	Mercury in superior conjunction
	4	03	24	Pluto Stationary in RA					*0˚ 56' .9 N of Sun*
	4	18	55	Neptune 0˚.28N of Moon		17	12	39	*Mercury 0˚ 53' N. of Venus*
				Occultation		20	20	51	*Sun enter Summer solctice*
	5	02	25	Mars 0˚.2S of Moon					
				Occultation		20	18	03	Neptune in Square with Sun
	5	22	05	Moon at Perlgee		22	01	08	FULL MOON
	6	08	25	Mercury 3˚.82S of Moon		23	21	10	Mercury greatest helio. lat N.
	7	16	03	Venus 3˚.51S of Moon		27	11	29	Moon at Perlgee
	8	03	22	NEW MOON		27	15	00	Saturn 0˚.08S of Moon
	8	10	39	*Mars in Perihelion*					*Occultation*
	8	12	51	Uranus 3˚.62S of Moon		28	08	56	Neptune 0˚.30S of Moon
	8	18	14	Jupiter 4˚.33S of Moon					*Occultation*
						28	21	53	LAST QUARTER
	9	21	37	Mercury in Greatest Elongation W(26˚22')		29	09	49	*Mercury 4˚ .87S. of Pollux*
	13	09	13	Uranus in conjunction with Sun					
	15	11	48	FIRST QUARTER		30	21	17	Saturn Stationary in RA
	17	18	60	Moon at Apogee	Jul	1	18	26	Mars 4˚.09S of Moon
	18	09	17	*Venus 0˚ 28 'S. of Uranus*		2	10	07	Uranus 3˚.95S of Moon
	18	18	46	Jupiter in conjunction with Sun		3	03	02	Neptune Stationary in RA
	20	22	03	Mercury greatest helio lat. S.		3	08	28	Jupiter 5˚.02S of Moon
	23	09	30	Venus 0˚ 12 'N. of Jupiter		5	05	01	*Earth at Aphelion*
	23	13	53	FULL MOON		5	22	57	NEW MOON
	30	17	13	LAST QUARTER		6	15	04	Venus 3˚.86S of Moon
	31	01	26	*Mercury 1˚ 21'S. of Uranus*		7	06	14	*Venus 5˚ .68S. of Pollux*
	31	08	09	Saturn 0˚.38N of Moon					
				Occultation		7	18	32	Mercury 3˚.22S of Moon
						10	05	02	*Venus in Perihelion*
Jun.	1	02	54	Neptune 0˚.02 N of Moon		12	08	10	Moon at Apogee
				Occultation		13	06	57	*Jupiter 4˚ .82N. of Aldebaran*
	1	16	52	*Venus 5˚ .34N. of Aldebaran*		13	22	49	FIRST QUARTER
	2	07	17	Moon at Perlgee		15	09	24	*Mars 0˚ 33' S. of Uranus*
	2	23	37	Mars 2˚.41S of Moon		17	06	30	Mercury in Descending node
	4	10	04	*Mercury 0˚ 7'S. of Jupiter*		21	10	17	FULL MOON
						22	17	14	Mercury in Greatest Elongation E(26˚5
	4	15	32	*Venus in superior conjunction*		23	05	34	Pluto in oposition with Sun
				0˚ 3' .5 S of Sun					
	5	00	37	Uranus 3˚.74S of Moon		24	05	41	Moon at Perlgee
	5	14	25	*Jupiter 4˚.67S of Moon*		24	20	46	Saturn 0˚.39S of Moon
	5	18	28	Mercury 4˚.66S of Moon					*Occultation*
	6	03	08	Venus in Ascending node		25	14	54	Neptune 0˚.57S of Moon
	6	12	38	NEW MOON					*Occultation*
	6	14	27	Venus 4˚.54S of Moon		27	12	13	*Mercury 2˚ .64S. of Regulus*
	8	14	57	*Mercury 5˚ .45N. of Aldebaran*		27	15	29	*Mercury in Aphelion*
	8	23	54	Mercury in Ascending node		28	02	52	LAST QUARTER

UNIVERSAL TIME

	d	h	m			d	h	m	
July	29	17	30	Uranus 4˚.22S of Moon	Sep	17	10	22	Saturn 0˚.31S of Moon
	30	10	37	*Mars 5˚.03S of Moon*					*Occultation*
	30	23	53	Jupiter 5˚.38S of Moon		17	12	55	*Venus 2˚.63N. of Spica*
	31	15	10	Venus greatest helio. lat N.		18	02	35+	FULL MOON : Lunar Eclipse
Aug	4	08	19	Mercury Stationary in RA		18	07	35	Neptune 0˚.66S of Moon
	4	11	13	NEW MOON					*Occultation*
	4	22	05	*Venus 1˚.09N. of Regulus*		18	13	24	Moon at Perlgee
	5	18	44	*Mars 4˚.99N. of Aldebaran*		19	20	25	Mercury greatest helio. lat N.
	5	22	03	Venus 1˚.74S of Moon		21	00	17	Neptune in oposition with Sun
						22	07	14	Uranus 4˚.53S of Moon
	6	00	02	Mercury 7˚.47S of Moon		22	12	44	*Sun enter Autumnal Equinox*
	6	15	15	*Mercury 5˚55′ S. of Venus*		23	23	21	Jupiter 5˚.83S of Moon
	9	01	31	Moon at Apogee		24	18	50	LAST QUARTER
	11	22	09	*Mercury 5˚.53S. of Regulus*		25	11	49	Mars 4˚.90S of Moon
	12	15	19	FIRST QUARTER		25	16	37	Venus in Descending node
						30	21	11	Mercury in superior conjunction
	14	16	50	*Mars 0˚1′ N. of Jupiter*					1˚ 17' .9 N of Sun
	16	11	59	Neptune Stationary in RA	Oct	2	18	49	NEW MOON : Solar Eclipse
	16	21	19	Mercury greatest helio lat. S.		2	19	39	Moon at Apogee
	19	01	59	Mercury in inferior conjunction					
				4˚ 30' .2 S of Sun		3	00	02	Mercury 1˚.80N of Moon
	19	18	26	FULL MOON		5	20	26	Venus 3˚.01N of Moon
	19	16	05	Uranus in Square with Sun		9	07	12	Jupiter Stationary in RA
	21	03	02	Saturn 0˚.46S of Moon		9	15	15	*Mercury 2˚.66N. of Spica*
				Occultation		10	18	55	FIRST QUARTER
	21	05	03	Moon at Perlgee		12	02	13	Pluto Stationary in RA
	21	21	59	Neptune 0˚.59S of Moon		13	05	53	Mercury in Descending node
				Occultation		14	18	13	Saturn 0˚.11S of Moon
	26	00	01	Uranus 4˚.44S of Moon					*Occultation*
	26	09	26	LAST QUARTER		15	17	32	Neptune 0˚.59S of Moon
	27	12	43	Jupiter 5˚.67S of Moon					*Occultation*
	28	00	22	Mars 5˚.27S of Moon		17	00	52	Moon at Perlgee
	28	02	33	Mercury Stationary in RA		17	11	26	FULL MOON
Sep	1	09	18	Mercury 5˚.03S of Moon		19	15	52	Uranus 4˚.47S of Moon
	1	15	43	Uranus Stationary in RA		21	06	01	*Mars 5˚.72S. of Pollux*
	3	01	55	NEW MOON		21	08	04	Jupiter 5˚.81S of Moon
	4	23	08	Mercury in Ascending node		23	14	44	*Mercury in Aphelion*
	5	02	30	Mercury in Greatest ElongationW(18˚1')		23	19	55	Mars 3˚.91S of Moon
	5	10	16	Venus 1˚.18N of Moon		24	08	03	LAST QUARTER
				Occultation		25	19	01	*Venus 3˚.11N. of Antares*
	5	14	54	Moon at Apogee					
						29	22	50	Moon at Apogee
	6	01	52	Mars in Ascending node		30	14	27	*Venus in Aphelion*
	8	04	35	Saturn in oposition with Sun					
	9	06	40	*Mercury 0˚.49N. of Regulus*	Nov	1	12	47	NEW MOON
	9	15	07	*Mercury in Perihelion*		3	07	36	Mercury 2˚.11N of Moon
	11	06	06	FIRST QUARTER		5	00	15	Venus 3˚.10N of Moon
	12	10	02	Jupiter in Square with Sun		9	05	55	FIRST QUARTER

UNIVERSAL TIME

	d	h	m			d	h	m	
Nov	10	04	07	*Mercury 2˚.02N. of Antares*	Dec.	7	20	58	Mars Stationary in RA
	11	01	43	Saturn 0ę.09S of Moon		7	20	58	Jupiter in oposition with Sun
				Occultation		8	08	56	Saturn 0ę.31S of Moon
	12	02	25	Neptune 0ę.62S of Moon					*Occultation*
				Occultation		8	11	01	Neptune Stationary in RA
	12	20	34	Mercury greatest helio lat. S.		8	15	27	FIRST QUARTER
	14	11	16	Moon at Perlgee		9	09	19	Neptune 0ę.83S of Moon
	15	21	29	FULL MOON					*Occultation*
	16	01	13	Uranus 4ę.36S of Moon		10	11	11	*Mercury 7˚.12N. of Antares*
	16	05	56	Saturn Stationary in RA		12	13	22	Moon at Perlgee
	16	08	09	Mercury in Greatest Elongation E(22 ę33')		13	09	34	Uranus 4ę.35S of Moon
	17	02	44	Uranus in oposition with Sun		14	19	42	Jupiter 5ę.47S of Moon
	17	14	53	Jupiter 5ę.64S of Moon		15	09	02	FULL MOON
	20	21	09	Mars 2ę.44S of Moon		15	21	30	Mercury Stationary in RA
	21	12	45	Venus greatest helio lat. S.		16	19	40	Mercury greatest helio. lat N.
	23	01	28	LAST QUARTER		18	08	48	Mars 0ę.91S of Moon
	26	04	12	Mercury Stationary in RA					*Occultation*
	26	11	56	Moon at Apogee		18	14	09	Neptune in Square with Sun
Dec	1	06	21	NEW MOON		21	09	20	*Sun enter Winter solctice*
	1	22	20	Mercury in Ascending node		22	00	05	*Mercury 7˚.09N. of Antares*
	2	02	09	Mercury 4ę.95N of Moon		22	22	18	LAST QUARTER
	4	22	40	Venus 2ę.26N of Moon		24	07	25	Moon at Apogee
	4	16	09	Saturn in Square with Sun		25	02	30	Mercury in Greatest Elongation W(22ę2')
	6	14	23	*Mercury in Perihelion*		29	04	22	Mercury 6ę.39N of Moon
	7	18	13	*Venus 0˚ 53′ N. of Pluto*		30	22	27	NEW MOON

ERRATA OF ASTRONOMICAL DIARY, 2024

UNIVERSAL TIME

	d	h	m			d	h	m	
Jan	4	18	53	Moon in descending node	July	12	22	27	Moon in descending node
	17	14	04	Moon in ascending node		26	05	31	Moon in ascending node
	31	20	18	Moon in descending node	Aug	9	01	06	Moon in descending node
Feb	13	17	03	Moon in ascending node		22	10	26	Moon in ascending node
	27	22	54	Moon in descending node	Sep	5	05	43	Moon in descending node
Mar	12	01	17	Moon in ascending node		18	19	52	Moon in ascending node
	26	04	07	Moon in descending node	Oct	2	11	52	Moon in descending node
Apr	8	12	19	Moon in ascending node		16	07	04	Moon in ascending node
	22	10	44	Moon in descending node		29	17	44	Moon in descending node
May	5	21	54	Moon in ascending node	Nov	12	15	59	Moon in ascending node
	19	16	35	Moon in descending node		25	21	32	Moon in descending node
June	2	03	07	Moon in ascending node	Dec	9	19	37	Moon in ascending node
	15	20	18	Moon in descending node		22	23	22	Moon in descending node
	29	04	25	Moon in ascending node					

TABLE-I
CONVERSION OF MEAN SOLAR INTO SIDEREAL TIME
CORRECTION TO BE *ADDED* TO A MEAN TIME INTERVAL

HOURS			MINUTES				SECONDS			
Mean Time	Correction		Mean Time	Correction	Mean Time	Correction	Mean Time	Correction	Mean Time	Correction
h	m	s	m	s	m	s	s	s	s	s
1	0	09.856	1	0.164	31	5.093	1	.003	31	.085
2	0	19.713	2	0.329	32	5.257	2	.005	32	.088
3	0	29.569	3	0.493	33	5.421	3	.008	33	.090
4	0	39.426	4	0.657	34	5.585	4	.011	34	.093
5	0	49.282	5	0.821	35	5.750	5	.014	35	.096
6	0	59.139	6	0.986	36	5.914	6	.016	36	.099
7	1	08.995	7	1.150	37	6.078	7	.019	37	.101
8	1	18.852	8	1.314	38	6.242	8	.022	38	.104
9	1	28.708	9	1.478	39	6.407	9	.025	39	.107
10	1	38.565	10	1.643	40	6.571	10	.027	40	.110
11	1	48.421	11	1.807	41	6.735	11	.030	41	.112
12	1	58.278	12	1.971	42	6.900	12	.033	42	.115
13	2	08.134	13	2.136	43	7.064	13	.036	43	.118
14	2	17.991	14	2.300	44	7.228	14	.038	44	.120
15	2	27.847	15	2.464	45	7.392	15	.041	45	.123
16	2	37.704	16	2.628	46	7.557	16	.044	46	.126
17	2	47.560	17	2.793	47	7.721	17	.047	47	.129
18	2	57.417	18	2.957	48	7.885	18	.049	48	.131
19	3	07.273	19	3.121	49	8.049	19	.052	49	.134
20	3	17.129	20	3.285	50	8.214	20	.055	50	.137
21	3	26.986	21	3.450	51	8.378	21	.057	51	.140
22	3	36.842	22	3.614	52	8.542	22	.060	52	.142
23	3	46.699	23	3.778	53	8.707	23	.063	53	.145
24	3	56.555	24	3.943	54	8.871	24	.066	54	.148
			25	4.107	55	9.035	25	.068	55	.151
			26	4.271	56	9.199	26	.071	56	.153
			27	4.435	57	9.364	27	.074	57	.156
			28	4.600	58	9.528	28	.077	58	.159
			29	4.764	59	9.692	29	.079	59	.162
			30	4.928	60	9.856	30	.082	60	.164

Local Apparent Sidereal time for any given local mean time
= mean Sid. Time for 0^h U.T. (Pages 13 to 16)
— reduction for longitude of place
+ local mean time reckoned from midnight
+ correction for local mean time added (Table-I)
+ Equation of Equinoxes.

Local apparent Sidereal Time for any hour of Universal Time.
= Sid. Time for 0^h U.T. (Pages 13 to 16)
+ longitude of place (in time)
+ Universal Time
+ correction for U.T. added (Table-I)
+ Equation of Equinoxes.

N.B. The longitude of place is to be taken in time and regarded *positive* for places East of Greenwich. The reduction of Sidereal Time for the longitude of place may be taken from the above table and with the same sign as that of longitude. The correction for the L.M.T. or U.T. added should also be taken from the above table. For details, see the examples given under the EXPLANATION.

TABLE-II

CONVERSION OF SIDEREAL INTO MEAN SOLAR TIME

CORRECTION TO BE *SUBTRACTED* FROM A SIDEREAL TIME INTERVAL

HOURS			MINUTES				SECONDS			
Sidereal Time	Correction		Sidereal Time	Correction	Sidereal Time	Correction	Sidereal Time	Correction	Sidereal Time	Correction
h	m	s	m	s	m	s	s	s	s	s
1	0	09.830	1	0.164	31	5.079	1	.003	31	.085
2	0	19.659	2	0.328	32	5.242	2	.005	32	.087
3	0	29.489	3	0.491	33	5.406	3	.008	33	.090
4	0	39.318	4	0.655	34	5.570	4	.011	34	.093
5	0	49.148	5	0.819	35	5.734	5	.014	35	.096
6	0	58.977	6	0.983	36	5.898	6	.016	36	.098
7	1	08.807	7	1.147	37	6.062	7	.019	37	.101
8	1	18.636	8	1.311	38	6.225	8	.022`	38	.104
9	1	28.466	9	1.474	39	6.389	9	.025	39	.106
10	1	38.296	10	1.638	40	6.553	10	.027	40	.109
11	1	48.125	11	1.802	41	6.717	11	.030	41	.112
12	1	57.955	12	1.966	42	6.881	12	.033	42	.115
13	2	07.784	13	2.130	43	7.045	13	.035	43	.117
14	2	17.614	14	2.294	44	7.208	14	.038	44	.120
15	2	27.443	15	2.457	45	7.372	15	.041	45	.123
16	2	37.273	16	2.621	46	7.536	16	.044	46	.126
17	2	47.103	17	2.785	47	7.700	17	.046	47	.128
18	2	56.932	18	2.949	48	7.864	18	.049	48	.131
19	3	06.762	19	3.113	49	8.027	19	.052	49	.134
20	3	16.591	20	3.277	50	8.191	20	.055	50	.137
21	3	26.421	21	3.440	51	8.355	21	.057	51	.139
22	3	36.250	22	3.604	52	8.519	22	.060	52	.142
23	3	46.080	23	3.768	53	8.683	23	.063	53	.145
24	3	55.909	24	3.932	54	8.847	24	.066	54	.147
			25	4.096	55	9.010	25	.068	55	.150
			26	4.259	56	9.174	26	.071	56	.153
			27	4.423	57	9.338	27	.074	57	.156
			28	4.587	58	9.502	28	.076	58	.158
			29	4.751	59	9.666	29	.079	59	.161
			30	4.915	60	9.830	30	.082	60	.164

Local Mean Time for any given local apparent Sidereal Time
= Time of preceding transit of First Point of Aries (pages 13 to 16)
+ reduction for longitude of place
+ given local apparent Sidereal Time — Equation of Equinoxes
— correction for Sidereal Time added (Table-II).

Otherwise, L.M.T. for any given Sidereal Time may be obtained as follows:-
Given Sidereal Time
— Sidereal Time for 0^h U.T. (pages 13 to 16)
+ reduction for longitude of place
= Sidereal interval since 0^h L.M.T.
This Sidereal interval corrected by the above table gives the required local mean time.

or, Universal Time for any given Sidereal Time may be obtained as follows:-
Given Sidereal Time —longitude of place —Sidereal Time for 0^h U.T. = Sidereal interval since 0^h U.T.
This interval converted into Mean Solar Time by the above table gives the Universal Time required.

N.B. The reduction for longitude of place is of the same sign as that of the longitude, i.e. *positive* for places East of Greenwich and *negative* for West. See Example under EXPLANATION.

TABLE-III
CONVERSION OF ARC TO TIME

DEGREES						MINUTES		SECONDS					
°	h m	°	h m	°	h m	′	m s	″	s	″	s	″	s
0	0 00	49	3 16	98	6 32	0	0 00	0	0.000	0.00	0.000	0.50	0.033
1	0 04	50	3 20	99	6 36	1	0 04	1	0.067	.01	.001	.51	.034
2	0 08	51	3 24	100	6 40	2	0 08	2	0.133	.02	.001	.52	.035
3	0 12	52	3 28	101	6 44	3	0 12	3	0.200	.03	.002	.53	.035
4	0 16	53	3 32	102	6 48	4	0 16	4	0.267	.04	.003	.54	.036
5	0 20	54	3 36	103	6 52	5	0 20	5	0.333	.05	.003	.55	.037
6	0 24	55	3 40	104	6 56	6	0 24	6	0.400	.06	.004	.56	.037
7	0 28	56	3 44	105	7 00	7	0 28	7	0.467	.07	.005	.57	.038
8	0 32	57	3 48	106	7 04	8	0 32	8	0.533	.08	.005	.58	.039
9	0 36	58	3 52	107	7 08	9	0 36	9	0.600	.09	.006	.59	.039
10	0 40	59	3 56	108	7 12	10	0 40	10	0.667	0.10	0.007	0.60	0.040
11	0 44	60	4 00	109	7 16	11	0 44	11	0.733	.11	.007	.61	.041
12	0 48	61	4 04	110	7 20	12	0 48	12	0.800	.12	.008	.62	.041
13	0 52	62	4 08	111	7 24	13	0 52	13	0.867	.13	.009	.63	.042
14	0 56	63	4 12	112	7 28	14	0 56	14	0.933	.14	.009	.64	.043
15	1 00	64	4 16	113	7 32	15	1 00	15	1.000	.15	.010	.65	.043
16	1 04	65	4 20	114	7 36	16	1 04	16	1.067	.16	.011	.66	.044
17	1 08	66	4 24	115	7 40	17	1 08	17	1.133	.17	.011	.67	.045
18	1 12	67	4 28	116	7 44	18	1 12	18	1.200	.18	.012	.68	.045
19	1 16	68	4 32	117	7 48	19	1 16	19	1.267	.19	.013	.69	.046
20	1 20	69	4 36	118	7 52	20	1 20	20	1.333	0.20	0.013	0.70	0.047
21	1 24	70	4 40	119	7 56	21	1 24	21	1.400	.21	.014	.71	.047
22	1 28	71	4 44	120	8 00	22	1 28	22	1.467	.22	.015	.72	.048
23	1 32	72	4 48	121	8 04	23	1 32	23	1.533	.23	.015	.73	.049
24	1 36	73	4 52	122	8 08	24	1 36	24	1.600	.24	.016	.74	.049
25	1 40	74	4 56	123	8 12	25	1 40	25	1.667	.25	.017	.75	.050
26	1 44	75	5 00	124	8 16	26	1 44	26	1.733	.26	.017	.76	.051
27	1 48	76	5 04	125	8 20	27	1 48	27	1.800	.27	.018	.77	.051
28	1 52	77	5 08	126	8 24	28	1 52	28	1.867	.28	.019	.78	.052
29	1 56	78	5 12	127	8 28	29	1 56	29	1.933	.29	.019	.79	.053
30	2 00	79	5 16	128	8 32	30	2 00	30	2.000	0.30	0.020	0.80	0.053
31	2 04	80	5 20	129	8 36	31	2 04	31	2.067	.31	.021	.81	.054
32	2 08	81	5 24	130	8 40	32	2 08	32	2.133	.32	.021	.82	.055
33	2 12	82	5 28	131	8 44	33	2 12	33	2.200	.33	.022	.83	.055
34	2 16	83	5 32	132	8 48	34	2 16	34	2.267	.34	.023	.84	.056
35	2 20	84	5 36	133	8 52	35	2 20	35	2.333	.35	.023	.85	.057
36	2 24	85	5 40	134	8 56	36	2 24	36	2.400	.36	.024	.86	.057
37	2 28	86	5 44	135	9 00	37	2 28	37	2.467	.37	.025	.87	.058
38	2 32	87	5 48	136	9 04	38	2 32	38	2.533	.38	.025	.88	.059
39	2 36	88	5 52	137	9 08	39	2 36	39	2.600	.39	.026	.89	.059
40	2 40	89	5 56	138	9 12	40	2 40	40	2.667	0.40	0.027	0.90	0.06
41	2 44	90	6 00	139	9 16	41	2 44	41	2.733	.41	.027	.91	.061
42	2 48	91	6 04	140	9 20	42	2 48	42	2.800	.42	.028	.92	.061
43	2 52	92	6 08	141	9 24	43	2 52	43	2.867	.43	.029	.93	.062
44	2 56	93	6 12	142	9 28	44	2 56	44	2.933	.44	.029	.94	.063
45	3 00	94	6 16	143	9 32	45	3 00	45	3.000	.45	.030	.95	.063
46	3 04	95	6 20	144	9 36	46	3 04	46	3.067	.46	.031	.96	.064
47	3 08	96	6 24	145	9 40	47	3 08	47	3.133	.47	.031	97	.065
48	3 12	97	6 28	146	9 44	48	3 12	48	3.200	.48	.032	.98	.065

TABLE-III ---- *contd.*

CONVERSION OF ARC TO TIME

DEGREES						MINUTES		SECONDS					
°	h m	°	h m	°	h m	′	m s	″	s	″	s	″	s
147	9 48	158	10 32	169	11 16	49	3 16	49	3.267	0.49	0.033	0.99	0.066
148	9 52	159	10 36	170	11 20	50	3 20	50	3.333	0.50	0.033	1.00	0.067
149	9 56	160	10 40	171	11 24	51	3 24	51	3.400				
150	10 00	161	10 44	172	11 28	52	3 28	52	3.467				
151	10 04	162	10 48	173	11 32	53	3 32	53	3.533				
152	10 08	163	10 52	174	11 36	54	3 36	54	3.600				
153	10 12	164	10 56	175	11 40	55	3 40	55	3.667				
154	10 16	165	11 00	176	11 44	56	3 44	56	3.733				
155	10 20	166	11 04	177	11 48	57	3 48	57	3.800				
156	10 24	167	11 08	178	11 52	58	3 52	58	3.867				
157	10 28	168	11 12	179	11 56	59	3 56	59	3.933				

TABLE-IV

CONVERSION OF TIME TO ARC

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS					
m	° ′	° ′	° ′	° ′	° ′	° ′	s	′ ″	s	″	s	″
0	0 00	15 00	30 00	45 00	60 00	75 00	0	0 00	0.00	0.00	0.50	7.50
1	0 15	15 15	30 15	45 15	60 15	75 15	1	0 15	.01	0.15	.51	7.65
2	0 30	15 30	30 30	45 30	60 30	75 30	2	0 30	.02	0 30	.52	7.80
3	0 45	15 45	30 45	45 45	60 45	75 45	3	0 45	.03	0.45	.53	7.95
4	1 00	16 00	31 00	46 00	61 00	76 00	4	1 00	.04	0.60	.54	8.10
5	1 15	16 15	31 15	46 15	61 15	76 15	5	1 15	.05	0.75	.55	8.25
6	1 30	16 30	31 30	46 30	61 30	76 30	6	1 30	.06	0.90	.56	8.40
7	1 45	16 45	31 45	46 45	61 45	76 45	7	1 45	.07	1.05	.57	8.55
8	2 00	17 00	32 00	47 00	62 00	77 00	8	2 00	.08	1.20	.58	8.70
9	2 15	17 15	32 15	47 15	62 15	77 15	9	2 15	.09	1.35	.59	8.85
10	2 30	17 30	32 30	47 30	62 30	77 30	10	2 30	0.10	1.50	0.60	9.00
11	2 45	17 45	32 45	47 45	62 45	77 45	11	2 45	.11	1.65	.61	9.15
12	3 00	18 00	33 00	48 00	63 00	78 00	12	3 00	.12	1.80	.62	9.30
13	3 15	18 15	33 15	48 15	63 15	78 15	13	3 15	.13	1.95	.63	9.45
14	3 30	18 30	33 30	48 30	63 30	78 30	14	3 30	.14	2.10	.64	9.60
15	3 45	18 45	33 45	48 45	63 45	78 45	15	3 45	.15	2.25	.65	9.75
16	4 00	19 00	34 00	49 00	64 00	79 00	16	4 00	.16	2.40	.66	9.90
17	4 15	19 15	34 15	49 15	64 15	79 15	17	4 15	.17	2.55	.67	10.05
18	4 30	19 30	34 30	49 30	64 30	79 30	18	4 30	.18	2.70	.68	10.20
19	4 45	19 45	34 45	49 45	64 45	79 45	19	4 45	.19	2.85	.69	10.35
20	5 00	20 00	35 00	50 00	65 00	80 00	20	5 00	.20	3.00	0.70	10.50
21	5 15	20 15	35 15	50 15	65 15	80 15	21	5 15	.21	3.15	.71	10.65
22	5 30	20 30	35 30	50 30	65 30	80 30	22	5 30	.22	3.30	.72	10.80
23	5 45	20 45	35 45	50 45	65 45	80 45	23	5 45	.23	3.45	.73	10.95
24	6 00	21 00	36 00	51 00	66 00	81 00	24	6 00	.24	3.60	.74	11.10
25	6 15	21 15	36 15	51 15	66 15	81 15	25	6 15	.25	3.75	.75	11.25
26	6 30	21 30	36 30	51 30	66 30	81 30	26	6 30	.26	3.90	.76	11.40
27	6 45	21 45	36 45	51 45	66 45	81 45	27	6 45	.27	4.05	.77	11.55
28	7 00	22 00	37 00	52 00	67 00	82 00	28	7 00	.28	4.20	.78	11.70
29	7 15	22 15	37 15	52 15	67 15	82 15	29	7 15	.29	4.35	.79	11.85
30	7 30	22 30	37 30	52 30	67 30	82 30	30	7 30	.30	4.50	0.80	12.00

TABLE-IV ---- *contd.*
CONVERSION OF TIME TO ARC

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS					
m	° ′	° ′	° ′	° ′	° ′	° ′	s	′ ″	s	″	s	″
31	7 45	22 45	37 45	52 45	67 45	82 45	31	7 45	0.31	4.65	0.81	12.15
32	8 00	23 00	38 00	53 00	68 00	83 00	32	8 00	.32	4.80	.82	12.30
33	8 15	23 15	38 15	53 15	68 15	83 15	33	8 15	.33	4.95	.83	12.45
34	8 30	23 30	38 30	53 30	68 30	83 30	34	8 30	.34	5.10	.84	12.60
35	8 45	23 45	38 45	53 45	68 45	83 45	35	8 45	.35	5.25	.85	12.75
36	9 00	24 00	39 00	54 00	69 00	84 00	36	9 00	.36	5.40	.86	12.90
37	9 15	24 15	39 15	54 15	69 15	84 15	37	9 15	.37	5.55	.87	13.05
38	9 30	24 30	39 30	54 30	69 30	84 30	38	9 30	.38	5.70	.88	13.20
39	9 45	24 45	39 45	54 45	69 45	84 45	39	9 45	.39	5.85	.89	13.35
40	10 00	25 00	40 00	55 00	70 00	85 00	40	10 00	.40	6.00	.90	13.50
41	10 15	25 15	40 15	55 15	70 15	85 15	41	10 15	.41	6.15	.91	13.65
42	10 30	25 30	40 30	55 30	70 30	85 30	42	10 30	.42	6.30	.92	13.80
43	10 45	25 45	40 45	55 45	70 45	85 45	43	10 45	.43	6.45	.93	13.95
44	11 00	26 00	41 00	56 00	71 00	86 00	44	11 00	.44	6.60	.94	14.10
45	11 15	26 15	41 15	56 15	71 15	86 15	45	11 15	.45	6.75	.95	14.25
46	11 30	26 30	41 30	56 30	71 30	86 30	46	11 30	.46	6.90	.96	14.40
47	11 45	26 45	41 45	56 45	71 45	86 45	47	11 45	.47	7.05	.97	14.55
48	12 00	27 00	42 00	57 00	72 00	87 00	48	12 00	.48	7.20	.98	14.70
49	12 15	27 15	42 15	57 15	72 15	87 15	49	12 15	.49	7.35	0.99	14.85
50	12 30	27 30	42 30	57 30	72 30	87 30	50	12 30	0.50	7.50	1.00	15.00
51	12 45	27 45	42 45	57 45	72 45	87 45	51	12 45				
52	13 00	28 00	43 00	58 00	73 00	88 00	52	13 00				
53	13 15	28 15	43 15	58 15	73 15	88 15	53	13 15				
54	13 30	28 30	43 30	58 30	73 30	88 30	54	13 30		h	°	
55	13 45	28 45	43 45	58 45	73 45	88 45	55	13 45		6 =	90	
56	14 00	29 00	44 00	59 00	74 00	89 00	56	14 00		12 =	180	
57	14 15	29 15	44 15	59 15	74 15	89 15	57	14 15		18 =	270	
58	14 30	29 30	44 30	59 30	74 30	89 30	58	14 30				
59	14 45	29 45	44 45	59 45	74 45	89 45	59	14 45				

TABLE - V
CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS	
m	d	d	d	d	d	d	s	d
0	0.000 000	0.041 667	0.083 333	0.125 000	0.166 667	0.208 333	0	0.000 000
1	.000 694	.042 361	.084 028	.125 694	.167 361	.209 028	1	.000 012
2	.001 389	.043 056	.084 722	.126 389	.168 056	.209 722	2	.000 023
3	.002 083	.043 750	.085 417	.127 083	.168 750	.210 417	3	.000 035
4	.002 778	.044 444	.086 111	.127 778	.169 444	.211 111	4	.000 046
5	.003 472	.045 139	.086 806	.128 472	.170 139	.211 806	5	.000 058
6	.004 167	.045 833	.087 500	.129 167	.170 833	.212 500	6	.000 069
7	.004 861	.046 528	.088 194	.129 861	.171 528	.213 194	7	.000 081
8	.005 556	.047 222	.088 889	.130 556	.172 222	.213 889	8	.000 093
9	.006 250	.047 917	.089 583	.131 250	.172 917	.214 583	9	.000 104
10	0.006 944	0.048 611	0.090 278	0.131 944	0.173 611	0.215 278	10	0.000 116
11	.007 639	.049 306	.090 972	0.132 639	.174 306	.215 972	11	.000 127

TABLE - V ---- *contd.*

CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	0^h	1^h	2^h	3^h	4^h	5^h	SECONDS	
m	d	d	d	d	d	d	s	d
12	0.008 333	0.050 000	0.091 667	0.133 333	0.175 000	0.216 667	12	0.000 139
13	.009 028	.050 694	.092 361	.134 028	.175 694	.217 361	13	.000 150
14	.009 722	.051 389	.093 056	.134 722	.176 389	.218 056	14	.000 162
15	.010 417	.052 083	.093 750	.135 417	.177 083	.218 750	15	.000 174
16	.011 111	.052 778	.094 444	.136 111	.177 778	.219 444	16	.000 185
17	.011 806	.053 472	.095 139	.136 806	. 178 472	.220 139	17	.000 197
18	.012 500	.054 167	.095 833	.137 500	.179 167	.220 833	18	.000 208
19	.013 194	.054 861	.096 528	.138 194	.179 861	.221 528	19	.000 220
20	0.013 889	0.055 556	0.097 222	0.138 889	0.180 556	0.222 222	20	0.000 231
21	.014 583	056 250	.097 917	.139 583	.181 250	.222 917	21	.000 243
22	.015 278	.056 944	.098 611	.140 278	.181 944	.223 611	22	.000 255
23	.015 972	.057 639	.099 306	.140 972	182 639	.224 306	23	.000 266
24	.016 667	.058 333	.100 000	.141 667	.183 333	.225 000	24	.000 278
25	.017 361	.059 028	.100 694	.142 361	.184 028	.225 694	25	.000 289
26	.018 056	.059 722	.101 389	.143 056	.184 722	.226 389	26	.000 301
27	.018 750	.060 417	.102 083	.143 750	.185 417	.227 083	27	.000 312
28	.019 444	.061 111	.102 778	.144 444	.186 111	.227 778	28	.000 324
29	.020 139	.061 806	.103 472	.145 139	.186 806	.228 472	29	.000 336
30	0.020 833	0.062 500	0.104 167	0.145 833	0.187 500	0.229 167	30	0.000 347
31	.021 528	.063 194	.104 861	.146 528	.188 194	.229 861	31	.000 359
32	.022 222	.063 889	.105 556	.147 222	.188 889	.230 556	32	.000370
33	.022 917	.064 583	.106 250	.147 917	.189 583	.231 250	33	.000 382
34	.023 611	.065 278	.106 944	.148 611	.190 278	.231 944	34	.000 394
35	.024 306	.065 972	.107 639	.149 306	.190 972	.232 639	35	.000 405
36	.025 000	.066 667	.108 333	.150 000	.191 667	.233 333	36	.000 417
37	.025 694	.067 361	.109 028	.150 694	.192 361	.234 028	37	.000 428
38	.026 389	.068 056	.109 722	.151 389	.193 056	.234 722	38	.000 440
39	.027 083	.068 750	.110 417	.152 083	.193 750	.235 417	39	.000 451
40	0.027 778	0.069 444	0.111 111	0.152 778	0.194 444	0.236 111	40	0.000 463
41	.028 472	.070 139	.111 806	.153 472	.195 139	.236 806	41	.000 475
42	.029 167	.070 833	.112 500	.154 167	.195 833	.237 500	42	.000 486
43	.029 861	.071 528	.113 194	.154 861	.196 528	.238 194	43	.000 498
44	.030 556	.072 222	.113 889	.155 556	.197 222	.238 889	44	.000 509
45	.031 250	.072 917	.114 583	.156 250	.197 917	.239 583	45	.000 521
46	.031 944	.073 611	.115 278	.156 944	.198 611	.240 278	46	.000 532
47	.032 639	.074 306	.115 972	.157 639	.199 306	.240 972	47	.000 544
48	.033 333	.075 000	.116 667	.158 333	.200 000	.241 667	48	.000 556
49	.034 028	.075 694	.117 361	.159 028	.200 694	.242 361	49	.000 567
50	0.034 722	0.076 389	0.118 056	0.159 722	0.201 389	0.243 056	50	0.000 579
51	.035 417	.077 083	.118 750	.160 417	.202 083	.243 750	51	.000 590
52	.036 111	.077 778	.119 444	.161 111	.202 778	.244 444	52	.000 602
53	.036 806	.078 472	.120 139	.161 806	.203 472	.245 139	53	.000 613
54	.037 500	.079 167	.120 833	.162 500	.204 167	.245 833	54	.000 625
55	.038 194	.079 861	.121 528	.163 194	.204 861	.246 528	55	.000 637
56	.038 889	.080 556	.122 222	.163 889	.205 556	.247 222	56	.000 648
57	.039 583	.081 250	.122 917	.164 583	.206 250	.247 917	57	.000 660
58	.040 278	.081 944	.123 611	.165 278	.206 944	.248 611	58	.000 671
59	0.040 972	0.082 639	0.124 306	0.165 972	0.207 639	0.249 306	59	0.000 683

TABLE - V ---- *contd.*

CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	6 h	7 h	8 h	9 h	10 h	11 h	SECONDS	
m	d	d	d	d	d	d	s	d
0	0.250 000	0.291 667	0.333 333	0.375 000	0.416 667	0.458 333	0	0.000 000
1	.250 694	.292 361	.334 028	.375 694	. 417 361	.459 028	1	.000 012
2	.251 389	.293 056	.334 722	.376 389	.418 056	.459 722	2	.000 023
3	.252 083	.293 750	.335 417	.377 083	.418 750	.460 417	3	.000 035
4	.252 778	.294 444	.336 111	.377 778	.419 444	.461 111	4	.000 046
5	.253 472	.295 139	.336 806	.378 472	.420 139	.461 806	5	.000 058
6	.254 167	.295 833	.337 500	.379 167	.420 833	.462 500	6	.000 069
7	.254 861	.296 528	338 194	.379 861	.421 528	. 463 194	7	.000 081
8	.255 556	.297 222	.338 889	.380 556	.422 222	. 463 889	8	.000 093
9	.256 250	.297 917	.339 583	.381 250	.422 917	.464 583	9	.000 104
10	0.256 944	0.298 611	0.340 278	0.381 944	0.423 611	0.465 278	10	0.000 116
11	.257 639	.299 306	.340 972	.382 639	.424 306	.465 972	11	.000 127
12	.258 333	.300 000	.341 667	.383 333	.425 000	.466 667	12	.000 139
13	.259 028	.300 694	.342 361	384 028	.425 694	.467 361	13	.000 150
14	.259 722	.301 389	.343 056	.384 722	.426 389	.468 056	14	.000 162
15	.260 417	.302 083	.343 750	.385 417	.427 083	.468 750	15	.000 174
16	.261 111	.302 778	.344 444	.386 111	.427 778	.469 444	16	.000 185
17	.261 806	.303 472	.345 139	.386 806	.428 472	.470 139	17	.000 197
18	.262 500	.304 167	.345 833	.387 500	.429 167	.470 833	18	.000 208
19	.263 194	.304 861	.346 528	.388 194	.429 861	.471 528	19	.000 220
20	0.263 889	0.305 556	0.347 222	0.388 889	0.430 556	0.472 222	20	0.000 231
21	.264 583	.306 250	.347 917	.389 583	.431 250	.472 917	21	.000 243
22	.265 278	.306 944	.348 611	.390 278	.431 944	.473 661	22	.000 255
23	.265 972	.307 639	.349 306	.390 972	.432 639	.474 306	23	.000 266
24	.266 667	.308 383	.350 000	.391 667	.433 333	.475 000	24	.000 278
25	.267 361	.309 028	.350 694	.392 361	.434 028	.475 694	25	.000289
26	.268 056	.309 722	.351 389	.393 056	.434 722	.476 389	26	.000 301
27	.268 750	.310 417	.352 083	.393 750	.435 417	.477 083	27	.000 312
28	.269 444	.311 111	.352 778	.394 444	.436 111	.477 778	28	.000 324
29	.270 139	.311 806	.353 472	.395 139	.436 806	.478 472	29	.000 336
30	0.270 833	0.312 500	0.354 167	0.395 833	0.437 500	0.479 167	30	0.000 347
31	.271 528	.313 194	.354 861	.396 528	.438 194	.479 861	31	.000 359
32	.272 222	.313 889	.355 556	.397 222	.438 889	.480 556	32	.000 370
33	.272 917	.314 583	.356 250	.397 917	.439 583	.481 250	33	.000 382
34	.273 611	.315 278	.356 944	.398 611	.440 278	.481 944	34	.000 394
35	.274 306	.315 972	.357 639	.399 306	.440 972	.482 639	35	.000 405
36	.275 000	.316 667	.358 333	.400 000	.441 667	.483 333	36	.000 417
37	.275 694	.317 361	.359 028	.400 694	.442 361	.484 028	37	.000 428
38	276 389	.318 056	.359 722	.401 389	.443 056	.484 722	38	.000 440
39	.277 083	.318 750	.360 417	.402 083	.443 750	.485 417	39	.000 451
40	0.277 778	0.319 444	0.361 111	0.402 778	0.444 444	0.486 111	40	0.000 463
41	.278 472	.320 139	.361 806	.403 472	.445 139	.486 806	41	.000 475
42	279 167	.320 833	.362 500	.404 167	.445 833	.487 500	42	.000 486
43	.279 861	.321 528	.363 194	.404 861	.446 528	.488 194	43	.000 498
44	.280 556	.322 222	.363 889	.405 556	.447 222	.488 889	44	.000 509
45	.281 250	.322 917	.364 583	.406 250	.447 917	.489 583	45	.000 521
46	0.281 944	0.323 611	0.365 278	0.406 944	0.448 611	0.490 278	46	0.000 532

TABLE - V ---- *contd.*
CONVERSION OF HOURS, MINUTES AND SECONDS TO DECIMALS OF A DAY

	6^{h}	7^{h}	8^{h}	9^{h}	10^{h}	11^{h}	SECONDS	
m	d	d	d	d	d	d	s	d
47	0.282 639	0.324 306	0.365 972	0.407 639	0.449 306	0.490 972	47	0.000 544
48	.283 333	.325 000	.366 667	.408 333	.450 000	.491 667	48	.000 556
49	.284 028	.325 694	.367 361	.409 028	.450 694	.492 361	49	.000 567
50	0.284 722	0.326 389	0.368 056	0.409 722	0.451 389	0.493 056	50	0.000 579
51	.285 417	.327 083	.368 750	.410 417	.452 083	.493 750	51	.000 590
52	.286 111	.327 778	.369 444	.411 111	.452 778	.494 444	52	.000 602
53	.286 806	.328 472	. 370 139	.411 806	.453 472	.495 139	53	.000 613
54	.287 500	.329 167	.370 833	.412 500	.454 167	.495 833	54	.000 625
55	.288 194	.329 861	.371 528	.413 194	.454 861	.496 528	55	.000 637
56	.288 889	.330 556	.372 222	.413 889	.455 556	.497 222	56	.000 648
57	.289 583	.331 250	.372 917	.414 583	.456 250	.497 917	57	.000 660
58	.290 278	.331 944	.373 611	.415 278	.456 944	.498 611	58	.000 671
59	0.290 972	0.332 639	0.374 306	0.415 972	0.457 639	0.499 306	59	0.000 683

TABLE - VI
CONVERSION OF MINUTES AND SECONDS TO DECIMALS OF A DEGREE

	0′	1′	2′	3′	4′	5′
″	°	°	°	°	°	°
0	0.00000	0.01667	0.03333	0.05000	0.06667	0.08333
1	0028	1694	3361	5028		8361
2	0056	1722	3389	5056	6722	8389
3	0083	1750	3417	5083	6750	8417
4	0111	1778	3444	5111	6778	8444
5	0139	1806	3472	5139	6806	8472
6	0167	1833	3500	5167	6833	8500
7	0194	1861	3528	5194	6861	8528
8	0222	1889	3556	5222	6889	8556
9	0250	1917	3583	5250	6917	8583
10	0.00278	0.01944	0.03611	0.05278	0.06944	0.08611
11	0306	1972	3639	5306	6972	8639
12	0333	2000	3667	5333	7000	8667
13	0361	2028	3694	5361	7028	8694
14	0389	2056	3722	5389	7056	8722
15	0417	2083	3750	5417	7083	8750
16	0444	2111	3778	5444	7111	8778
17	0472	2139	3806	5472	7139	8806
18	0500	2167	3833	5500	7167	8833
19	0528	2194	3861	5528	7194	8861
20	0.00556	0.02222	0.03889	0.05556	0.07222	0.08889
21	0583	2250	3917	5583	7250	8917
22	0611	2278	3944	5611	7278	8944
23	0639	2306	3972	5639	7306	8972
24	0667	2333	4000	5667	7333	9000
25	0.00694	0.02361	0.04028	0.05694	0.07361	0.09028

″	°
0	0.0
6	0.1
12	0.2
18	0.3
24	0.4
30	0.5
36	0.6
42	0.7
48	0.8
54	0.9

TABLE - VI ---- *contd.*
CONVERSION OF MINUTES AND SECONDS TO DECIMALS OF A DEGREE

	0′	1′	2′	3′	4′	5′	In units of the fifth decimal of a Degree.	
″	°	°	°	°	°	°	″	°
26	0.00722	0.02389	0.04056	0.05722	0.07389	0.09056	0.00	0
27	0750	2417	4083	5750	7417	9083	.01	1
28	0778	2444	4111	5778	7444	9111	.05	2
29	0806	2472	4139	5806	7472	9139	.09	3
30	0.00833	0.02500	0.04167	0.05833	0.07500	0.09167	.12	4
31	0861	2528	4194	5861	7528	9194	.16	5
32	0889	2556	4222	5889	7556	9222	.19	6
33	0917	2583	4250	5917	7583	9250	.23	7
34	0944	2611	4278	5944	7611	9278	.26	8
35	0972	2639	4306	5972	7639	9306	.30	9
36	1000	2667	4333	6000	7667	9333	.34	10
37	1028	2694	4361	6028	7694	9361	.37	11
38	1056	2722	4389	6056	7722	9389	.41	12
39	1083	2750	4417	6083	7750	9417	.45	13
40	0.01111	0.02778	0.04444	0.06111	0.07778	0.09444	.48	14
41	1139	2806	4472	6139	7806	9472	.52	15
42	1167	2833	4500	6167	7833	9500	.55	16
43	1194	2861	4528	6194	7861	9528	.59	17
44	1222	2889	4556	6222	7889	9556	.62	18
45	1250	2917	4583	6250	7917	9583	.66	19
46	1278	2944	4611	6278	7944	9611	.70	20
47	1306	2972	4639	6306	7972	9639	.73	21
48	1333	3000	4667	6333	8000	9667	.77	22
49	1361	3028	4694	6361	8028	9694	.81	23
50	0.01389	0.03056	0.04722	0.06389	0.08056	0.09722	.84	24
51	1417	3083	4750	6417	8083	9750	.88	25
52	1444	3111	4778	6444	8111	9778	.91	26
53	1472	3139	4806	6472	8139	9806	.95	27
54	1500	3167	4833	6500	8167	9833	0.98	28
55	1528	3194	4861	6528	8194	9861	1.00	
56	1556	3222	4889	6556	8222	9889		
57	1583	3250	4917	6583	8250	9917	*In critical*	
58	1611	3278	4944	6611	8278	9944	*cases ascend*	
59	0.01639	0.03306	0.04972	0.06639	0.08306	0.09972		

TABLE - VII
INTERPOLATION COEFFICIENTS

n	B''	E_0''	E_1''	n	B''	E_0''	E_1''
0.00	0.00000	0.00000	0.00000	0.05	0.01188	0.01544	0.00831
.01	.00248	.00328	.00167	.06	0.01410	0.01824	0.00996
.02	.00490	.00647	.00333	.07	.01628	.02094	.01161
.03	.00728	.00955	.00500	.08	.01840	.02355	.01325
.04	.00960	.01254	.00666	.09	.02048	.02607	.01488
0.05	0.01188	0.01544	0.00831	0.10	0.02250	0.02850	0.01650

TABLE - VII ---- *contd.*
INTERPOLATION COEFFICIENTS

n	*B″*	*E₀″*	*E₁″*	n	*B″*	*E₀″*	*E₁″*
0.10	0.02250	0.02850	0.01650	0.55	0.06188	0.05981	0.06394
.11	.02448	.03084	.01811	.56	0.06160	0.05914	0.06406
.12	.02640	.03309	.01971	.57	.06128	.05842	.06413
.13	.02828	.03525	.02130	.58	.06090	.05765	.06415
.14	.03010	.03732	.02288	.59	.06048	.05685	.06410
.15	.03188	.03931	.02444	0.60	0.06000	0.05600	0.06400
.16	.03360	.04122	.02598	.61	.05948	.05511	.06384
.17	.03528	.04304	.02751	.62	.05890	.05419	.06361
.18	.03690	.04477	.02903	.63	.05828	.05322	.06333
.19	.03848	.04643	.03052	.64	.05760	.05222	.06298
0.20	0.04000	0.04800	0.03200	.65	.05688	.05119	.06256
.21	.04148	.04949	.03346	.66	.05610	.05012	.06208
.22	.04290	.05091	.03489	.67	.05528	.04901	.06154
.23	.04428	.05224	.03631	.68	.05440	.04787	.06093
.24	.04560	.05350	.03770	.69	.05348	.04670	.06025
.25	.04688	.05469	.03906	0.70	0.05250	0.04550	0.05950
.26	.04810	.05580	.04040	.71	.05148	.04427	.05868
.27	.04928	.05683	.04172	.72	.05040	.04301	.05779
.28	.05040	.05779	.04301	.73	.04928	.04172	.05683
.29	.05148	.05868	.04427	.74	.04810	.04040	.05580
0.30	0.05250	0.05950	0.04550	.75	.04688	.03906	.05469
.31	.05348	.06025	.04670	.76	.04560	.03770	.05350
.32	.05440	.06093	.04787	.77	.04428	.03631	.05224
.33	.05528	.06154	.04901	.78	.04290	.03489	.05091
.34	.05610	.06208	.05012	.79	.04148	.03346	.04949
.35	.05688	.06256	.05119	0.80	0.04000	0.03200	0.04800
.36	.05760	.06298	.05222	.81	. 03848	.03052	.04643
.37	.05828	.06333	.05322	.82	.03690	.02903	.04477
.38	.05890	.06361	.05419	.83	.03528	.02751	.04304
.39	.05948	.06384	.05511	.84	.03360	.02598	.04122
0.40	0.06000	0.06400	0.05600	.85	.03188	.02444	.03931
.41	.06048	.06410	.05685	.86	.03010	.02288	.03732
.42	.06090	.06415	.05765	.87	.02828	.02130	.03525
.43	.06128	.06413	.05842	.88	.02640	.01971	.03309
.44	.06160	.06406	.05914	.89	.02448	.01811	.03084
.45	.06188	.06394	.05981	0.90	0.02250	0.01650	0.02850
.46	.06210	.06376	.06044	.91	.02048	.01488	.02607
.47	.06228	.06352	.06103	.92	.01840	.01325	.02355
.48	.06240	.06323	.06157	.93	.01628	.01161	.02094
.49	.06248	.06289	.06206	.94	.01410	.00996	.01824
0.50	0.06250	0.06250	0.06250	.95	.01188	.00831	.01544
.51	.06248	.06206	.06289	.96	.00960	.00666	.01254
.52	.06240	.06157	.06323	.97	.00728	.00500	.00955
.53	.06228	.06103	.06352	.98	.00490	.00333	.00647
.54	.06210	.06044	.06376	0.99	.00248	.00167	.00328
0.55	0.06188	0.05981	0.06394	1.00	0.00000	0.00000	0.00000

N.B. – The coefficients are all *negative*. For details about Bessel's and Everett's interpolation formula, please *see* Explanation

TABLE – VIII
EVERETT COEFFICIENTS OF THE SECOND DIFFERENCES
(*The coefficients are all negative*)

n	E_0''	E_1''		n	E_0''	E_1''		n	E_0''	E_1''	
0.000			1.000	0.050			0.950	0.100			0.900
	0.0002	0.0001			0.0156	0.0084			0.0286	0.0166	
.001			0.999	.051			.949	.101			.899
	.0005	.0002			.0159	.0086			.0289	.0167	
.002			.998	.052			.948	.102			.898
	.0008	.0004			.0161	.0087			.0291	.0169	
.003			.997	.053			.947	.103			.897
	.0012	.0006			.0164	.0089			.0293	.0171	
.004			.996	.054			.946	.104			.896
	.0015	.0007			.0167	.0091			.0296	.0172	
.005			.995	.055			.945	.105			.895
	.0018	.0009			.0170	.0092			.0298	.0174	
.006			.994	.056			.944	.106			.894
	.0021	.0011			.0173	.0094			.0300	.0175	
.007			.993	.057			.943	.107			.893
	.0025	.0012			.0175	.0096			.0303	.0177	
.008			.992	.058			.942	.108			.892
	.0028	.0014			.0178	.0097			.0305	.0179	
.009			.991	.059			.941	.109			.891
	.0031	.0016			.0181	.0099			.0307	.0180	
.010			.990	.060			.940	.110			.890
	.0034	.0017			.0184	.0100			.0310	.0182	
.011			.989	.061			.939	.111			.889
	.0038	.0019			.0186	.0102			.0312	.0184	
.012			.988	.062			.938	.112			.888
	.0041	.0021			.0189	.0104			.0314	.0185	
.013			.987	.063			.937	.113			.887
	.0044	.0022			.0192	.0105			.0316	.0187	
.014			.986	.064			.936	.114			.886
	.0047	.0024			.0195	.0107			.0319	.0188	
.015			.985	.065			.935	.115			.885
	.0050	.0026			.0197	.0109			.0321	.0190	
.016			.984	.066			.934	.116			.884
	.0054	.0027			.0200	.0110			.0323	.0192	
.017			.983	.067			.933	.117			.883
	.0057	.0029			.0203	.0112			.0325	.0193	
.018			.982	.068			.932	.118			.882
	.0060	.0031			.0205	.0114			.0328	.0195	
.019			.981	.069			.931	.119			.881
	.0063	.0032			.0208	.0115			.0330	.0196	
.020			.980	.070			.930	.120			.880
	.0066	.0034			.0211	.0117			.0332	.0198	
.021			.979	.071			.929	.121			.879
	.0069	.0036			.0213	.0119			.0334	.0200	
.022			.978	.072			.928	.122			.878
	.0072	.0037			.0216	.0120			.0336	.0201	
.023			.977	.073			.927	.123			.877
	.0076	.0039			.0219	.0122			.0339	.0203	
.024			.976	.074			.926	.124			.876
	.0079	.0041			.0221	.0123			.0341	.0204	
.025			.975	.075			.925	.125			.875
	.0082	.0042			.0224	.0125			.0343	.0206	
.026			.974	.076			.924	.126			.874
	.0085	.0044			.0226	.0127			.0345	.0207	
.027			.973	.077			.923	.127			.873
	.0088	.0046			.0229	.0128			.0347	.0209	
.028			.972	.078			.922	.128			.872
	.0091	.0047			.0232	.0130			.0349	.0211	
.029			.971	.079			.921	.129			.871
	.0094	.0049			.0234	.0132			.0351	.0212	
.030			.970	.080			.920	.130			.870
	.0097	.0051			.0237	.0133			.0354	.0214	
.031			.969	.081			.919	.131			.869
	.0100	.0052			.0239	.0135			.0356	.0215	
.032			.968	.082			.918	.132			.868
	.0103	.0054			.0242	.0137			.0358	.0217	
.033			.967	.083			.917	.133			.867
	.0106	.0056			.0244	.0138			.0360	.0219	
.034			.966	.084			.916	.134			.866
	.0109	.0057			.0247	.0140			.0362	.0220	
.035			.965	.085			.915	.135			.865
	.0112	.0059			.0249	.0141			.0364	.0222	
.036			.964	.086			.914	.136			.864
	.0115	.0061			.0252	.0143			.0366	.0223	
.037			.963	.087			.913	.137			.863
	.0118	.0062			.0255	.0145			.0368	.0225	
.038			.962	.088			.912	.138			.862
	.0121	.0064			.0257	.0146			.0370	.0226	
.039			.961	.089			.911	.139			.861
	.0124	.0066			.0259	.0148			.0372	.0228	
.040			.960	.090			.910	.140			.860
	.0127	.0067			.0262	.0150			.0374	.0230	
.041			.959	.091			.909	.141			.859
	.0130	.0069			.0264	.0151			.0376	.0231	
.042			.958	.092			.908	.142			.858
	.0133	.0071			.0267	.0153			.0378	.0233	
.043			.957	.093			.907	.143			.857
	.0136	.0072			.0269	.0154			.0380	.0234	
.044			.956	.094			.906	.144			.856
	.0139	.0074			.0272	.0156			.0382	.0236	
.045			.955	.095			.905	.145			.855
	.0141	.0076			.0274	.0158			.0384	.0237	
.046			.954	.096			. 904	.146			.854
	.0144	.0077			.0277	.0159			.0386	.0239	
.047			.953	.097			.903	.147			.853
	.0147	.0079			.0279	.0161			.0388	.0240	
.048			.952	.098			.902	.148			.852
	.0150	.0081			.0281	.0163			.0390	.0242	
.049			.951	.099			.901	.149			.851
	0.0153	0.0082			0.0284	0.0164			0.0392	0.0244	
0.050			0.950	0.100			0.900	0.150			0.850
	E_1''	E_0''	n		E_1''	E_0''	n		E_1''	E_0''	n

Formula : $f_n = f_0 + n\,\Delta_{1/2}' + E_0''\Delta_0'' + E_1''\Delta_1''$

TABLE - VIII ---- *contd.*
EVERETT COEFFICIENTS OF THE SECOND DIFFERENCES
(*The coefficients are all negative*)

n	E_0''	E_1''		n	E_0''	E_1''		n	E_0''	E_1''	
0.150	0.0394	0.0245	0.850	0.200	0.0482	0.0321	0.800	0.300	0.0597	0.0457	0.700
.151	.0396	.0247	.849	.202	.0485	.0324	.798	.304	.0600	.0462	.696
.152	.0398	.0248	.848	.204	.0488	.0327	.796	.308	.0602	.0467	.692
.153	.0400	.0250	.847	.206	.0491	.0330	.794	.312	.0605	.0472	.688
.154	.0402	.0251	.846	.208	.0493	.0333	.792	.316	.0608	.0476	.684
.155	.0404	.0253	.845	.210	.0496	.0336	.790	.320	.0611	.0481	.680
.156	.0406	.0254	.844	.212	.0499	.0339	.788	.324	.0613	.0486	.676
.157	.0407	.0256	.843	.214	.0502	.0342	.786	.328	.0615	.0490	.672
.158	.0409	.0258	.842	.216	.0505	.0345	.784	.332	.0618	.0495	.668
.159	.0411	.0259	.841	.218	.0508	.0347	.782	.336	.0620	.0499	.664
.160	.0413	.0261	.840	.220	.0510	.0350	.780	.340	.0622	.0503	.660
.161	.0415	.0262	.839	.222	.0513	.0353	.778	.344	.0624	.0508	.656
.162	.0417	.0264	.838	.224	.0516	.0356	.776	.348	.0626	.0512	.652
.163	.0419	.0265	.837	.226	.0519	.0359	.774	.352	.0627	.0516	.648
.164	.0420	.0267	.836	.228	.0521	.0362	.772	.356	.0629	.0520	.644
.165	.0422	.0268	.835	.230	.0524	.0364	.770	.360	.0631	.0524	.640
.166	.0424	.0270	.834	.232	.0526	.0367	.768	.364	.0632	.0528	.636
.167	.0426	.0271	.833	.234	.0529	.0370	.766	.368	.0633	.0532	.632
.168	.0428	.0273	.832	.236	.0531	.0373	.764	.372	.0634	.0536	.628
.169	.0429	.0274	.831	.238	.0534	.0376	.762	.376	.0636	.0540	.624
.170	.0431	.0276	.830	.240	.0536	.0378	.760	.380	.0637	.0544	.620
.171	.0433	.0277	.829	.242	.0539	.0381	.758	.384	.0638	.0547	.616
.172	.0435	.0279	.828	.244	.0541	.0384	.756	.388	.0638	.0551	.612
.173	.0437	.0280	.827	.246	.0543	.0387	.754	.392	.0639	.0555	.608
.174	.0438	.0282	.826	.248	.0546	.0389	.752	.396	.0640	.0558	.604
.175	.0440	.0283	.825	.250	.0548	.0392	.750	.400	.0640	.0562	.600
.176	.0442	.0285	.824	.252	.0550	.0395	.748	.404	.0641	.0565	.596
.177	.0443	.0287	.823	.254	.0553	.0397	.746	.408	.0641	.0568	.592
.178	.0445	.0288	.822	.256	.0555	.0400	.744	.412	.0641	.0572	.588
.179	.0447	.0290	.821	.258	.0557	.0403	.742	.416	.0641	.0575	.584
.180	.0449	.0291	.820	.260	.0559	.0405	.740	.420	.0641	.0578	.580
.181	.0450	.0293	.819	.262	.0561	.0408	.738	.424	.0641	.0581	.576
.182	.0452	.0294	.818	.264	.0563	.0411	.736	.428	.0641	.0584	.572
.183	.0454	.0296	.817	.266	.0565	.0413	.734	.432	.0641	.0587	.568
.184	.0455	.0297	.816	.268	.0567	.0416	.732	.436	.0641	.0590	.564
.185	.0457	.0299	.815	.270	.0569	.0418	.730	.440	.0640	.0593	.560
.186	.0459	.0300	.814	.272	.0571	.0421	.728	.444	.0640	.0595	.556
.187	.0460	.0302	.813	.274	.0573	.0424	.726	.448	.0639	.0598	.552
.188	.0462	.0303	.812	.276	.0575	.0426	.724	.452	.0639	.0601	.548
.189	.0463	.0304	.811	.278	.0577	.0429	.722	.456	.0638	.0603	.544
.190	.0465	.0306	.810	.280	.0579	.0431	.720	.460	.0637	.0606	.540
.191	.0467	.0307	.809	.282	.0581	.0434	.718	.464	.0636	.0608	.536
.192	.0468	.0309	.808	.284	.0582	.0436	.716	.468	.0635	.0610	.532
.193	.0470	.0310	.807	.286	.0584	.0439	.714	.472	.0634	.0613	.528
.194	.0471	.0312	.806	.288	.0586	.0441	.712	.476	.0633	.0615	.524
.195	.0473	.0313	.805	.290	.0588	.0444	.710	.480	.0632	.0617	.520
.196	.0475	.0315	.804	.292	.0589	.0446	.708	.484	.0630	.0619	.516
.197	.0476	.0316	.803	.294	.0591	.0449	.706	.488	.0629	.0621	.512
.198	.0478	.0318	.802	.296	.0593	.0451	.704	.492	.0627	.0622	.508
.199	0.0479	0.0319	.801	.298	0.0594	0.0454	.702	.496	0.0626	0.0624	.504
0.200			0.800	0.300			0.700	0.500			0.500
	E_1''	E_0''	n		E_1''	E_0''	n		E_1''	E_0''	n

N. B. -- The table is to be used like a critical table without interpolation

TABLE – IX

JULIAN DAY NUMBER

DAYS ELAPSED AT GREENWICH NOON OF JANUARY 0

Yr. A.D.	100	200	300	400	500	600	700	800	900	1000
0	175 7582	179 4107	183 0632	186 7157	190 3682	194 0207	197 6732	201 3257	204 9782	208 6307
20	176 4887	180 1412	183 7937	187 4462	191 0987	194 7512	198 4037	202 0562	205 7087	209 3612
40	177 2192	180 8717	184 5242	188 1767	191 8292	195 4817	199 1342	202 7867	206 4392	210 0917
60	177 9497	181 6022	185 2547	188 9072	192 5597	196 2122	199 8647	203 5172	207 1697	210 8222
80	178 6802	182 3327	185 9852	189 6377	193 2902	196 9427	200 5952	204 2477	207 9002	211 5527

Yr. A.D.	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
							*	*	*	
0	212 2832	215 9357	219 5882	223 2407	226 8932	230 5447	234 1971	237 8495	241 5020	245 1544
20	213 0137	216 6662	220 3187	223 9712	227 6237	231 2752	234 9276	238 5806	242 2324	245 8849
40	213 7442	217 3967	221 0492	224 7017	228 3542	232 0057	235 6581	239 3105	242 9629	246 6154
60	214 4747	218 1272	221 7797	225 4322	229 0847	232 7362	236 3886	240 0410	243 6934	247 3459
80	215 2052	218 8577	222 5102	226 1627	229 8152	233 4667	237 1191	240 7715	244 4239	248 0764
					†					
100	215 9357	219 5882	223 2407	226 8932	230 5447	234 1971	237 8495	241 5020	245 1544	248 8069

NUMBER OF DAYS TO BE ADDED TO REDUCE TO THE BEGINNING OF EACH MONTH

Year	Jan. 0	Feb. 0	Mar. 0	Apr. 0	May 0	Jun. 0	July 0	Aug. 0	Sept. 0	Oct. 0	Nov. 0	Dec. 0
	*	*										
0	0	31	60	91	121	152	182	213	244	274	305	335
1	366	397	425	456	486	517	547	578	609	639	670	700
2	731	762	790	821	851	882	912	943	974	1004	1035	1065
3	1096	1127	1155	1186	1216	1247	1277	1308	1339	1369	1400	1430
4	1461	1492	1521	1552	1582	1613	1643	1674	1705	1735	1766	1796
5	1827	1858	1886	1917	1947	1978	2008	2039	2070	2100	2131	2161
6	2192	2223	2251	2282	2312	2343	2373	2404	2435	2465	2496	2526
7	2557	2588	2616	2647	2677	2708	2738	2769	2800	2830	2861	2891
8	2922	2953	2982	3013	3043	3074	3104	3135	3166	3196	3227	3257
9	3288	3319	3347	3378	3408	3439	3469	3500	3531	3561	3592	3622
10	3353	3684	3712	3743	3773	3804	3834	3865	3896	3926	3957	3987
11	4018	4049	4077	4108	4138	4169	4199	4230	4261	4291	4322	4352
12	4383	4414	4443	4474	4504	4535	4565	4596	4627	4657	4688	4718
13	4749	4780	4808	4839	4869	4900	4930	4961	4992	5022	5053	5083
14	5114	5145	5173	5204	5234	5265	5295	5326	5357	5387	5418	5448
15	5479	5510	5538	5569	5599	5630	5660	5691	5722	5752	5783	5813
16	5844	5875	5904	5935	5965	5996	6026	6057	6088	6118	6149	6179
17	6210	6241	6269	6300	6330	6361	6391	6422	6453	6483	6514	6544
18	6575	6606	6634	6665	6695	6726	6756	6787	6818	6848	6879	6909
19	6940	6971	6999	7030	7060	7091	7121	7152	7183	7213	7244	7274

† From 1582 October 15 to 1599 December 31 inclusive, Gregorian calendar, the numbers given by the above tables must be diminished by 10.

* The numbers given for the years 1700, 1800 and 1900 which are not leap years, are for January - 1 and consequently the numbers 0 and 31 for January 0 and February 0 of these years must be increased by 1 and read as 1 and 32 respectively.

N.B. To find the Julian Day Number for a B.C. date, first express the year astronomically, i.e. diminish it by 1 and put a negative sign before it. Then make the number positive by adding the smallest multiple of 1000. The Julian Day Number for the date thus obtained diminished by 365250 for each multiple of 1000 added will give the required Julian Day Number for the B.C. date in question.

The Julian Day is completed at noon. In order to obtain the Julian Day Number for 0^h U.T., diminish the figure obtained from the above tables by 0.5.

The tables give the Day Numbers upto 1582, Oct. 4 for the Julian calendar and from 1582, Oct. 15 onward for the Gregorian calendar.

TABLE – X

ATMOSPHERIC REFRACTION

MEAN REFRACTION FOR TEMPERATURE 25° C AND PRESSURE 1000 mb

Apparent Altitude °	′	Mean Refraction ′	″	Apparent Altitude °	′	Mean Refraction ′	″	Apparent Altitude °	′	Mean Refraction ′	″	Apparent Altitude °	Mean Refraction ′	″
-1	00	46	17.5	6	10	7	39.0	17	30	2	49.6	53	0	40.8
0	00	30	59.6		20	7	28.5	18	00	2	44.7	54		39.3
+0	10	29	09.3		30	7	18.5	18	30	2	40.0	55		37.9
	20	27	28.9		40	7	08.9	19	00	2	35.6	56		36.5
	30	25	57.8	6	50	6	59.7	19	30	2	31.4	57		35.1
0	40	24	34.6	7	00	6	50.8	20	00	2	27.3	58		33.8
0	50	23	18.3	7	10	6	42.3	21	00	2	19.8	59	0	32.6
1	00	22	07.9		20	6	34.1	22	00	2	12.9	60		31.2
	10	21	02.6		30	6	26.3	23	00	2	06.6	61		30.0
	20	20	02.4		40	6	18.7	24	00	2	00.8	62		28.8
	30	19	07.0	7	50	6	11.4	25	00	1	55.4	63		27.6
1	40	18	15.6	8	00	6	04.4	26	00	1	50.4	64		26.4
1	50	17	28.2	8	10	5	57.6	27	00	1	45.7	65	0	25.2
2	00	16	44.0		20	5	51.2	28	00	1	41.3	66		24.1
	10	16	02.6		30	5	44.7	29	00	1	37.2	67		23.0
	20	15	24.0		40	5	38.6	30	00	1	33.4	68		21.9
	30	14	48.0	8	50	5	32.6	31	00	1	29.8	69		20.8
2	40	14	14.4	9	00	5	26.8	32	00	1	26.3	70		19.7
2	50	13	42.9	9	10	5	21.3	33	00	1	23.1	71	0	18.6
3	00	13	13.5		20	5	15.9	34	00	1	20.0	72		17.6
	10	12	45.8		30	5	10.6	35	00	1	17.1	73		16.5
	20	12	19.6		40	5	05.5	36	00	1	14.3	74		15.5
	30	11	55.0	9	50	5	00.6	37	00	1	11.7	75		14.5
3	40	11	31.9	10	00	4	55.9	38	00	1	09.1	76		13.5
3	50	11	10.0	10	30	4	42.4	39	00	1	06.8	77	0	12.5
4	00	10	49.5	11	00	4	30.0	40	00	1	04.4	78		11.5
	10	10	30.1	11	30	4	18.7	41	00	1	02.2	79		10.5
	20	10	11.7	12	00	4	08.1	42	00	1	00.0	80		09.5
	30	9	54.2	12	30	3	58.4	43	00	0	57.9	81		08.6
4	40	9	37.5	13	00	3	49.3	44	00	0	56.0	82		07.6
4	50	9	21.6	13	30	3	40.8	45	00	0	54.1	83	0	06.6
5	00	9	06.5	14	00	3	32.9	46	00	0	52.2	84		05.7
	10	8	52.1	14	30	3	25.6	47	00	0	50.4	85		04.7
	20	8	38.6	15	00	3	18.6	48	00	0	48.7	86		03.8
	30	8	25.5	15	30	3	12.1	49	00	0	47.0	87		02.8
5	40	8	13.0	16	00	3	06.0	50	00	0	45.4	88		01.9
5	50	8	01.2	16	30	3	00.2	51	00	0	43.8	89	0	00.9
6	00	7	49.8	17	00	2	54.8	52	00	0	42.2	90	0	00.0
6	10	7	39.0	17	30	2	49.6	53	00	0	40.8			

Rule: True altitude of a celestial object = Its apparent or observed altitude – refraction.

N.B.-The figures of mean refraction given in the above table are for temperature 25° C and pressure 1000 mb. (750.06 mm. Or 29.530 inches of mercury barometer). For other values of temperature and pressure, corrections form the tables on the following two pages are to be taken and applied to the mean refraction.

TABLE – Xa
ATMOSPHERIC REFRACTION
CORRECTION OF MEAN REFRACTION FOR DIFFERENT VALUES OF TEMPERATURE

Apparent Altitude	- 10° C (14° F)	0° C (32° F)	10° C (50° F)	20° C (68° F)	25° C (77° F)	30° C (86° F)	40° C (104° F)	50° C (122° F)
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
- 1 00	+ 13 31.7	+ 9 17.8	+ 5 13.4	+ 1 37.7	0 00.0	- 1 32.6	- 4 22.5	- 6 54.8
0 00	7 16.3	5 04.8	2 53.4	0 54.8	0 00.0	0 52.1	2 29.6	3 58.2
+ 0 30	5 39.4	3 57.4	2 15.6	0 42.8	0 00.0	0 41.2	1 58.4	3 09.1
1 00	4 27.7	3 07.8	1 47.8	0 34.7	0 00.0	0 32.1	1 33.8	2 30.7
1 30	3 38.4	2 33.1	1 27.9	0 27.8	0 00.0	0 27.1	1 18.1	2 05.2
2 00	3 00.9	2 07.0	1 13.1	0 23.4	0 00.0	0 22.4	1 05.0	1 44.5
2 30	+ 2 32.9	+ 1 48.1	+ 1 02.1	+ 0 19.6	0 00.0	- 0 19.5	- 0 56.0	- 1 29.9
3 00	2 12.7	1 33.2	0 53.8	0 17.2	0 00.0	0 16.7	0 48.2	1 17.5
3 30	1 56.6	1 21.9	0 47.3	0 15.1	0 00.0	0 14.6	0 42.4	1 08.3
4 00	1 43.2	1 12.5	0 42.0	0 13.5	0 00.0	0 12.9	0 37.6	1 00.6
4 30	1 32.5	1 05.0	0 37.9	0 12.0	0 00.0	0 11.7	0 33.9	0 54.5
5 00	1 23.7	0 58.9	0 35.0	0 10.9	0 00.0	0 10.6	0 30.7	0 49.5
6 00	+ 1 10.2	+ 0 49.4	+ 0 30.0	+ 0 09.1	0 00.0	- 0 09.0	- 0 25.8	- 0 41.5
7 00	1 00.3	0 42.5	0 25.6	0 07.9	0 00.0	0 07.6	0 22.1	0 35.7
8 00	0 52.7	0 37.1	0 21.4	0 06.9	0 00.0	0 06.6	0 19.4	0 31.3
9 00	0 46.8	0 32.9	0 19.1	0 06.1	0 00.0	0 05.9	0 17.2	0 27.8
10 00	0 43.0	0 29.6	0 17.1	0 05.4	0 00.0	0 05.3	0 15.5	0 25.0
11 00	0 39.4	0 26.9	0 15.6	0 05.0	0 00.0	0 04.8	0 14.1	0 22.8
12 00	+ 0 35.7	+ 0 24.3	+ 0 14.2	+ 0 04.6	0 00.0	- 0 04.4	- 0 12.8	- 0 20.7
13 00	0 33.1	0 22.6	0 13.2	0 04.2	0 00.0	0 04.0	0 11.9	0 19.2
14 00	0 30.4	0 21.0	0 12.1	0 03.9	0 00.0	0 03.7	0 11.0	0 17.7
15 00	0 28.4	0 19.6	0 11.3	0 03.6	0 00.0	0 03.5	0 10.2	0 16.5
16 00	0 26.4	0 18.2	0 10.3	0 03.4	0 00.0	0 03.3	0 09.5	0 15.4
17 00	0 24.8	0 17.2	0 09.9	0 03.2	0 00.0	0 03.1	0 08.9	0 14.4
18 00	+ 0 23.3	+ 0 16.2	+ 0 09.3	+ 0 03.0	0 00.0	- 0 02.9	- 0 08.4	- 0 13.5
19 00	0 22.1	0 15.2	0 08.8	0 02.7	0 00.0	0 02.7	0 07.9	0 12.8
20 00	0 20.9	0 14.3	0 08.3	0 02.5	0 00.0	0 02.6	0 07.5	0 12.1
25 00	0 16.3	0 11.2	0 06.5	0 02.1	0 00.0	0 02.0	0 05.9	0 09.4
30 00	0 13.1	0 09.0	0 05.2	0 01.7	0 00.0	0 01.6	0 04.7	0 07.6
35 00	0 10.8	0 07.4	0 04.3	0 01.4	0 00.0	0 01.3	0 03.9	0 06.3
40 00	+ 0 09.0	+ 0 06.2	+ 0 03.6	+ 0 01.2	0 00.0	- 0 01.1	- 0 03.2	- 0 05.2
45 00	0 07.5	0 05.2	0 03.0	0 01.0	0 00.0	0 00.9	0 02.7	0 04.4
50 00	0 06.0	0 04.4	0 02.5	0 00.8	0 00.0	0 00.8	0 02.3	0 03.7
55 00	0 05.3	0 03.6	0 02.1	0 00.7	0 00.0	0 00.7	0 02.0	0 03.1
60 00	0 04.4	0 03.0	0 01.8	0 00.6	0 00.0	0 00.6	0 01.6	0 02.5
65 00	0 03.6	0 02.4	0 01.4	0 00.5	0 00.0	0 00.5	0 01.3	0 02.1
70 00	+ 0 02.8	+ 0 01.9	+ 0 01.1	+ 0 00.4	0 00.0	- 0 00.4	- 0 01.0	- 0 01.6
75 00	0 02.0	0 01.4	0 00.8	0 00.3	0 00.0	0 00.3	0 00.7	0 01.2
80 00	0 01.4	0 00.9	0 00.5	0 00.2	0 00.0	0 00.2	0 00.4	0 00.8
85 00	0 00.7	0 00.4	0 00.2	0 00.1	0 00.0	0 00.1	0 00.2	0 00.4
90 00	+ 0 00.0	+ 0 00.0	+ 0 00.0	+ 0 00.0	0 00.0	- 0 00.0	- 0 00.0	- 0 00.0

TABLE – Xb
ATMOSPHERIC REFRACTION
PRESSURE CORRECTION OF REFRACTION FOR DIFFERENT VALUES OF PRESSURE

PRESSURE			AMOUNT OF REFRACTION CORRECTED FOR PRESSURE							
			1′	2′	3′	5′	10′	20′	30′	60′
mb	mm	Inch	″	″	″	′ ″	′ ″	′ ″	′ ″	′ ″
660	495.0	19.49	- 20.4	- 40.8	- 61.3	- 1 42.3	- 3 26.5	- 7 04.9	- 10 59.1	- 24 19
670	502.5	19.79	19.8	39.7	59.5	1 39.3	3 20.4	6 52.5	10 39.8	23 36
680	510.0	20.08	19.2	38.4	57.7	1 36.3	3 14.3	6 39.8	10 20.2	22 53
690	517.5	20.38	18.6	37.2	55.9	1 33.3	3 08.2	6 27.4	10 00.9	22 10
700	525.0	20.67	18.0	36.0	54.1	1 30.3	3 02.2	6 14.9	9 41.5	21 27
710	532.5	20.97	17.4	34.8	52.3	1 27.3	2 56.1	6 02.5	9 22.2	20 45
720	540.0	21.26	- 16.8	- 33.5	- 50.6	- 1 24.3	- 2 50.0	- 5 50.0	- 9 02.8	- 20 01
730	547.5	21.56	16.2	32.4	48.7	1 21.2	2 43.9	5 37.4	8 43.3	19 18
740	555.0	21.85	15.6	31.2	46.9	1 18.2	2 37.8	5 24.9	8 23.9	18 35
750	562.6	22.15	15.0	30.0	45.1	1 15.2	2 31.8	5 12.4	8 04.6	17 53
760	570.1	22.44	14.4	28.9	43.3	1 12.3	2 25.8	5 00.2	7 45.6	17 21
770	577.6	22.74	13.8	27.6	41.5	1 09.2	2 19.7	4 47.5	7 25.9	16 27
780	585.1	23.03	- 13.2	- 26.4	- 39.7	- 1 06.2	- 2 13.6	- 4 35.0	- 7 06.5	- 15 44
790	592.6	23.33	12.6	25.2	37.9	1 03.2	2 07.6	4 22.5	6 47.2	15 01
800	600.1	23.62	12.0	24.0	36.0	1 00.2	2 01.4	4 09.9	6 27.6	14 18
810	607.6	23.92	11.4	22.8	34.3	0 57.2	1 55.4	3 57.5	6 08.3	13 35
820	615.1	24.22	10.8	21.6	32.4	0 54.2	1 49.3	3 44.9	5 48.9	12 52
830	622.6	24.51	10.2	20.4	30.7	0 51.2	1 43.3	3 32.5	5 29.6	12 10
840	630.1	24.81	- 9.6	- 19.2	- 28.9	- 0 48.2	- 1 37.2	- 3 20.0	- 5 10.2	- 11 27
850	637.6	25.10	9.0	18.0	27.0	0 45.1	1 31.1	3 07.4	4 50.7	10 43
860	645.1	25.40	8.4	16.8	25.2	0 42.1	1 25.0	2 54.9	4 31.3	10 01
870	652.6	25.69	7.8	15.6	23.4	0 39.1	1 19.0	2 42.5	4 12.0	9 18
880	660.1	25.99	7.2	14.4	21.6	0 36.1	1 12.9	2 30.0	3 52.6	8 35
890	667.6	26.28	6.6	13.2	19.8	0 33.1	1 06.8	2 17.5	3 33.3	7 52
900	675.1	26.58	- 6.0	- 12.0	- 18.0	- 0 30.1	- 1 00.7	- 2 04.9	- 3 13.7	- 7 09
910	682.6	26.87	5.4	10.8	16.2	0 27.1	0 54.7	1 52.5	2 54.3	6 26
920	690.1	27.17	4.8	9.6	14.4	0 24.1	0 48.6	1 39.9	2 35.0	5 43
930	697.6	27.46	4.2	8.4	12.6	0 21.1	0 42.5	1 27.5	2 15.7	5 01
940	705.1	27.76	3.6	7.2	10.8	0 18.1	0 36.4	1 15.0	1 50.3	4 17
950	712.6	28.05	3.0	6.0	9.0	0 15.0	0 30.3	1 02.4	1 36.9	3 34
960	720.1	28.35	- 2.4	- 4.8	- 7.2	- 0 12.0	- 0 24.3	- 0 49.9	- 1 17.4	- 2 51
970	727.6	28.64	1.8	3.6	5.4	0 09.0	0 18.2	0 37.5	0 58.2	2 09
980	735.1	28.94	1.2	2.4	3.6	0 06.0	0 12.1	0 25.0	0 38.7	1 26
990	742.6	29.24	- 0.6	- 1.2	- 1.8	- 0 03.0	- 0 06.1	- 0 12.5	- 0 19.4	- 0 43
1000	750.1	29.53	0.0	0.0	0.0	0 00.0	0 00.0	0 00.0	0 00.0	0 00
1010	757.6	29.83	+ 0.6	+ 1.2	+ 1.8	+ 0 03.1	+ 0 06.1	+ 0 12.5	+ 0 19.5	+ 0 43
1020	765.1	30.12	1.2	2.4	3.6	0 06.0	0 12.2	0 25.1	0 38.9	1 26
1030	772.6	30.42	1.8	3.6	5.4	0 09.0	0 18.2	0 37.5	0 58.2	2 09
1040	780.1	30.71	2.4	4.8	7.2	0 12.0	0 24.3	0 50.0	0 77.6	2 52
1050	787.6	31.01	+ 3.0	+ 6.0	+ 9.0	+ 0 15.0	+ 0 30.3	+ 0 62.4	+ 0 96.9	+ 3 24

TABLE – XI
FACTORS FOR COMPUTING THE GEOCENTRIC COORDINATES OF A PLACE

ϕ	S	C	ϕ	S	C
°			°		
0	0.993306	1.000000	45	0.994972	1.001678
1	0.993307	1.000001	46	0.995031	1.001737
2	0.993310	1.000004	47	0.995089	1.001795
3	0.993315	1.000009	48	0.995147	1.001854
4	0.993322	1.000016	49	0.995205	1.001912
5	0.993331	1.000025	50	0.995262	1.001970
6	0.993342	1.000037	51	0.995320	1.002028
7	0.993355	1.000050	52	0.995377	1.002085
8	0.993370	1.000065	53	0.995433	1.002142
9	0.993387	1.000082	54	0.995489	1.002198
10	0.993406	1.000101	55	0.995544	1.002254
11	0.993427	1.000122	56	0.995599	1.002309
12	0.993449	1.000145	57	0.995652	1.002363
13	0.993474	1.000169	58	0.995705	1.002416
14	0.993500	1.000196	59	0.995758	1.002468
15	0.993528	1.000224	60	0.995809	1.002520
16	0.993558	1.000254	61	0.995859	1.002570
17	0.993590	1.000286	62	0.995908	1.002620
18	0.993623	1.000320	63	0.995956	1.002668
19	0.993658	1.000355	64	0.996002	1.002715
20	0.993695	1.000392	65	0.996048	1.002761
21	0.993733	1.000430	66	0.996092	1.002805
22	0.993773	1.000470	67	0.996135	1.002848
23	0.993814	1.000511	68	0.996176	1.002890
24	0.993856	1.000554	69	0.996216	1.002930
25	0.993900	1.000598	70	0.996255	1.002969
26	0.993945	1.000644	71	0.996291	1.003006
27	0.993992	1.000691	72	0.996327	1.003041
28	0.994039	1.000739	73	0.996360	1.003075
29	0.994088	1.000788	74	0.996392	1.003107
30	0.994138	1.000838	75	0.996422	1.003138
31	0.994189	1.000889	76	0.996451	1.003166
32	0.994241	1.000941	77	0.996477	1.003193
33	0.994293	1.000994	78	0.996502	1.003218
34	0.994347	1.001048	79	0.996525	1.003241
35	0.994401	1.001103	80	0.996546	1.003262
36	0.994456	1.001158	81	0.996565	1.003281
37	0.994512	1.001214	82	0.996582	1.003299
38	0.994568	1.001271	83	0.996597	1.003314
39	0.994625	1.001328	84	0.996610	1.003327
40	0.994682	1.001386	85	0.996622	1.003338
41	0.994740	1.001444	86	0.996631	1.003348
42	0.994798	1.001502	87	0.996638	1.003355
43	0.994856	1.001560	88	0.996643	1.003360
44	0.994914	1.001619	89	0.996646	1.003363
45	0.994972	1.001678	90	0.996647	1.003364

$\rho \sin \phi' = (S+H) \sin \phi$ $\qquad$ $\rho \cos \phi' = (C+H) \cos \phi$

$H = 0.156779 \times$ elevation in meters $\times 10^{-6}$ $\qquad$ $H = 0.047786 \times$ elevation in feet $\times 10^{-6}$

TABLE – XII
CONVERSION OF GEOGRAPHIC TO GEOCENTRIC COORDINATES

φ	φ′ - φ	ρ	ONE DEGREE OF Latitude	ONE DEGREE OF Longitude	φ	φ′ - φ	ρ	ONE DEGREE OF Latitude	ONE DEGREE OF Longitude
°	′ ″		Kilometers	Kilometers	°	′ ″		Kilometers	Kilometers
0	0 00.0	1.000000	110.57	111.32	45	- 11 32.7	0.998331	111.13	78.85
1	- 0 24.1	0.999999	110.58	111.30	46	11 32.4	0.998272	111.15	77.46
2	0 48.2	0.999996	110.58	111.25	47	11 31.2	0.998214	111.17	76.06
3	1 12.2	0.999991	110.58	111.17	48	11 29.2	0.998155	111.19	74.63
4	1 36.1	0.999984	110.58	111.05	49	11 26.3	0.998097	111.21	73.17
5	1 59.9	0.999975	110.58	110.90	50	11 22.6	0.998039	111.23	71.70
6	2 23.6	0.999964	110.59	110.71	51	11 18.1	0.997982	111.25	70.20
7	2 47.0	0.999951	110.59	110.50	52	11 12.7	0.997925	111.27	68.68
8	3 10.3	0.999936	110.60	110.24	53	11 06.5	0.997868	111.29	67.14
9	3 33.4	0.999919	110.60	109.96	54	10 59.5	0.997812	111.31	65.58
10	- 3 56.2	0.999900	110.61	109.64	55	- 10 51.7	0.997756	111.32	63.99
11	4 18.7	0.999879	110.62	109.29	56	10 43.1	0.997702	111.34	62.39
12	4 40.9	0.999856	110.62	108.90	57	10 33.7	0.997648	111.36	60.77
13	5 02.8	0.999832	110.63	108.49	58	10 23.5	0.997594	111.38	59.13
14	5 24.3	0.999805	110.64	108.03	59	10 12.6	0.997542	111.40	57.48
15	5 45.4	0.999777	110.65	107.55	60	10 00.9	0.997491	111.41	55.80
16	6 06.0	0.999747	110.66	107.03	61	9 48.5	0.997440	111.43	54.11
17	6 26.3	0.999716	110.67	106.49	62	9 35.4	0.997391	111.45	52.40
18	6 46.1	0.999682	110.68	105.91	63	9 21.5	0.997343	111.46	50.67
19	7 05.4	0.999647	110.69	105.29	64	9 07.0	0.997296	111.48	48.93
20	- 7 24.1	0.999611	110.70	104.65	65	- 8 51.8	0.997250	111.49	47.18
21	7 42.4	0.999573	110.72	103.97	66	8 36.0	0.997206	111.51	45.40
22	8 00.0	0.999533	110.73	103.26	67	8 19.5	0.997163	111.52	43.62
23	8 17.1	0.999492	110.74	102.52	68	8 02.4	0.997121	111.54	41.82
24	8 33.6	0.999449	110.76	101.75	69	7 44.7	0.997081	111.55	40.01
25	8 49.5	0.999405	110.77	100.95	70	7 26.4	0.997042	111.56	38.19
26	9 04.7	0.999360	110.79	100.12	71	7 07.6	0.997005	111.57	36.35
27	9 19.3	0.999314	110.80	99.26	72	6 48.3	0.996970	111.59	34.50
28	9 33.2	0.999266	110.82	98.36	73	6 28.4	0.996936	111.60	32.65
29	9 46.4	0.999217	110.84	97.44	74	6 08.1	0.996904	111.61	30.78
30	- 9 58.9	0.999167	110.85	96.49	75	- 5 47.4	0.996874	111.61	28.90
31	10 10.7	0.999116	110.87	95.50	76	5 26.2	0.996845	111.62	27.02
32	10 21.7	0.999064	110.89	94.49	77	5 04.6	0.996818	111.63	25.12
33	10 32.0	0.999011	110.90	93.45	78	4 42.6	0.996793	111.64	23.22
34	10 41.5	0.998958	110.92	92.39	79	4 20.3	0.996770	111.65	21.31
35	10 50.2	0.998903	110.94	91.29	80	3 57.7	0.996749	111.66	19.39
36	10 58.1	0.998848	110.96	90 16	81	3 34.7	0.996730	111.67	17.47
37	11 05.3	0.998792	110.98	89.01	82	3 11.6	0.996713	111.67	15.54
38	11 11.6	0.998736	111.00	87.83	83	2 48.1	0.996697	111.68	13.61
39	11 17.1	0.998679	111.02	86.63	84	2 24.5	0.996684	111.68	11.67
40	-11 21.8	0.998622	111.03	85.39	85	- 2 00.7	0.996673	111.69	9.73
41	11 25.7	0.998564	111.05	84.14	86	1 36.7	0.996664	111.69	7.79
42	11 28.7	0.998506	111.07	82.85	87	1 12.7	0.996656	111.69	5.85
43	11 30.9	0.998447	111.09	81.54	88	0 48.5	0.996651	111.69	3.90
44	11 32.2	0.998389	111.11	80.21	89	- 0 24.3	0.996648	111.69	1.95
45	-11 32.7	0.998331	111.13	78.85	90	0 00.0	0.996647	111.69	0.00

φ and φ′ are the geographic and geocentric latitude respectively
ρ = radius of the earth.
1 kilometre = 0.621372 miles.

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Agartala	16	+23 31.8	+ 91 09.0	+6 04 36	+59.89	-34 36	+0.39677	0.91734
Agra	160	+27 05.6	+ 77 34.8	+5 10 19	+50.98	+19 51	+0.45272	0.89091
Ahmedabad	49	+23 03.0	+ 72 40.2	+4 50 41	+47.75	+39 19	+0.38912	0.92064
Aizawl	1097	+23 26.4	+ 92 43.2	+6 10 53	+60.93	-40 53	+0.39540	0.91812
Ajmer	486	+26 16.2	+ 74 22.2	+4 57 29	+48.87	+32 31	+0.43996	0.89738
Alibag (Obs.) Mumbai,	7	+19 00.0	+ 72 30.6	+4 50 02	+47.65	+39 58	+0.33350	0.94586
Aligarh	187	+27 31.8	+ 78 2.44	+5 12 10	+51.28	+17 47	+0.45946	0.88743
Allahabad	96	+25 16.2	+ 81 26.4	+5 25 46	+53.51	+04 14	+0.42429	0.90487
Amritsar	231	+31 22.8	+ 74 31.2	+4 58 05	+48.97	+31 55	+0.51771	0.85454
Bangalore	921	+12 34.8	+ 77 21.0	+5 09 24	+50.83	+20 36	+0.21641	0.97629
Bangkok, Thailand	16	+13 25.0	+100 18.0	+6 41 12	+65.91	- 71 12	+0.23052	0.97289
Baroda	35	+22 12.0	+ 73 9.6	+4 52 38	+48.07	+37 22	+0.37549	0.92632
Bhopal	506	+23 10.2	+ 77 12.6	+5 08 50	+50.73	+21 10	+0.39106	0.91989
Bhuj	105	+23 09.0	+ 69 24.0	+4 37 36	+45.60	+52 24	+0.39072	0.91997
Bhubaneswar	46	+20 00.0	+ 85 30.0	+5 42 00	+56.18	- 12 00	+0.33987	0.94007
Bikaner	224	+28 01.0	+ 73 10.8	+4 52 43	+48.09	+37 17	+0.46695	0.88349
Bilaspur,(H.P)	502	+31 11.4	+ 76 30.0	+5 06 00	+50.27	+24 00	+0.51491	0.85629
Buenos Aires (Naval Obs.), Argentina	6	-34 21.0	- 58 12.0	- 3 52 48	-38.24	.. ..	-0.56107	0.82649
Cairo	68	+30 01.0	+ 31 09.0	+2 04 36	+20.47	.. ..	+0.49733	0.86662
Canberra (Mount Stromlo), Australia	767	-35 10.2	+149 10.5	+9 56 42	+98.02	.. ..	-0.57285	0.81845
Cape Town (Ast. Obs.), S. Africa	18	-33 33.6	+ 18 15.0	+1 13 00	+11.99	.. ..	-0.54967	0.83416
Chandigarh	347	+30 25.2	+ 76 32.0	+5 06 08	+50.29	+23 52	+0.50340	0.86312
Chennai (or Madras) Obs.	7	+13 00.0	+ 80 06.6	+5 20 26	+52.64	+ 9 34	+0.22348	0.97454
Chittagong, Bangladesh	27	+22 12.6	+ 91 31.8	+6 06 07	+60.14	- 36 07	+0.37565	0.92625
Colaba Obs. Mumbai, (Bombay)	14	+19 04.2	+ 72 31.0	+4 50 04	+47.65	+39 56	+0.32465	0.94546
Colombo (Obs.), Srilanka	6	+ 6 33.6	+ 79 33.6	+5 18 14	+52.28	+11 46	+011348	0.99350
Cuttack	26	+20 16.8	+ 85 33.6	+5 42 14	+56.42	- 12 14	+0.34443	0.93839
Dacca,Bangladesh	7	+23 25.8	+ 90 15.6	+6 01 02	+59.31	- 31 02	+0.39518	0.91803
Darjeeling	2128	+27 02.0	+ 88 10.8	+5 52 43	+57.94	- 22 43	+0.45193	0.89166
Dehra Dun	682	+30 11.3	+ 78 01.2	+5 12 05	+51.27	+17 55	+0.49995	0.86520
Delhi	220	+28 21.0	+ 77 07.2	+5 08 29	+50.68	+21 31	+0.47205	0.88076
Dibrugarh	106	+27 17.4	+ 94 06.0	+6 16 24	+61.83	- 46 24	+0.45575	0.88734
Gangtok	1768	+27 12.0	+ 88 22.2	+5 53 29	+58.07	- 23 29	+0.45448	0.89029
Guwahati	55	+26 3.6.0	+ 91 21.0	+6 05 24	+60.03	- 35 24	+0.43666	0.89892
Gauribidanur (Radio Astr. Obs.)	686	+13 36.2	+ 77 26.1	+5 09 44	+50.88	+20 16	+0.23369	0.97223
Gaya	111	+24 27.0	+ 84 34.2	+5 38 17	+55.57	- 8 17	+0.41137	0.91086

1 metre = 3.2808 feet

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Geneva (Obs.), Switzerland	465	+46 07.8	+ 6 04.2	+0 24 17	+ 3.99	.. ..	+0.71739	0.69428
Greenwich (Royal Obs.).	47	+51 28.6	0 00	0 00 00.0	0.00	.. ..	+0.77872	0.62412
Hanle/ Mt.Saraswati (Indian Ast. Obs.)	4467	+32 46.8	+ 78 57.9	+5 15 51.6	+51.89	+14 8.4	+0.53870	0.84217
Haridwar	274	+29 34.8	+ 78 08.0	+5 12 32.0	+51.34	+ 17 28	+0.49076	0.87041
Heidelberg Obs., Germany	570	+49 14.0	+ 8 25.2	+0 33 41.0	+ 5.53	.. ..	+0.75382	0.65430
Helwan (Obs.), Egypt	116	+29 51.5	+ 31 22.8	+2 05 31.2	+20.62	.. ..	+0.49494	0.86800
Herstmonceux (Royal Obs.), Sussex, U.K.	31	+50 52.0	+ 0 20.3	+0 01 21.0	+ 0.22	.. ..	+0.77205	0.63241
Hyderabad (Nizamiah Obs.)	554	+17 25.9	+ 78 27.2	+5 13 49.0	+51.55	+ 16 11	+0.29768	0.95444
Imphal	801	+24 26.4	+ 93 34.8	+6 14 19.0	+61.49	- 44 19	+0.41126	0.91103
India, Central Station of	-	+23 11.0	+ 82 30.0	+5 30 00.0	+54.21	0 00	+0.39124	0.91973
Indore	556	+22 26.4	+ 75 30.0	+5 02 00.0	+49.61	+ 28 00	+0.37938	0.92481
Istambul (Univ. Obs.), Turkey	65	+41 00.7	+ 28 57.9	+1 55 51.6	+19.03	.. ..	+0.65277	0.75567
IUCAA Giravali Obs., Pune	1000	+18 19.2	+ 73 30.6	+4 54 02.0	+48.3	+35 58	+0.31237	0.94978
Jabalpur	393	+23 07.2	+ 79 34.2	+5 18 17.0	+52.29	+ 11 43	+0.39026	0.92022
Jaipur	436	+26 33.0	+ 75 31.2	+5 02 05.0	+49.62	+ 27 55	+0.44431	0.89520
Jakarta, Indonesia	23	- 6 07.2	+106 30.0	+7 06 00.0	+69.98	.. ..	-0.10590	0.99434
Jamshedpur	152	+22 29.4	+ 86 06.6	+5 44 26.0	+56.58	- 14 26	+0.38016	0.92442
Japal Rangapur (Obs.),	695	+17 05.9	+ 78 43.7	+5 14 55.0	+51.73	+ 15 05	+0.29216	0.95618
Jodhpur	224	+26 10.8	+ 73 00.6	+4 52 02.0	+47.97	+ 37 58	+0.43854	0.89803
Johannesberg, South Africa	1806	- 26 10.9	+ 28 04.5	+1 52 18.0	+18.45	.. ..	-0.43868	0.89824
Kabul, Afghanistan	1766	+34 18.0	+ 69 10.8	+4 36 43.0	+45.46	+ 53 17	+0.56051	0.82721
Kanchipuram	76	+12 30.0	+ 79 27.0	+5 17 48.0	+52.21	+ 12 12	+0.21503	0.97646
Kanpur	126	+26 15.6	+ 80 13.2	+5 20 53.0	+52.71	+ 9 07	+0.43978	0.89740
Karachi, Pakistan	4	+24 53.6	+ 67 02.4	+4 28 10.0	+44.05	+ 61 50	+0.41836	0.90763
Kathmandu, Nepal	1324	+27 23.2	+ 85 07.2	+5 40 29.0	+55.93	- 10 29	+0.45733	0.88874
Kavalur (Vainu Bappu Obs.),	725	+12 34.6	+ 78 49.6	+5 15 18.0	+51.80	+ 14 42	+0.21635	0.97627
Kodaikanal (Solar Obs.)	2343	+10 13.8	+ 77 28.1	+5 09 52.0	+50.90	+ 20 08	+0.17649	0.98457
Kohima	1405	+25 24.0	+ 94 04.8	+6 16 19.0	+61.82	- 46 19	+0.42642	0.90409
Kolkata (Alipore Obs.), (Calcutta)	6	+22 19.2	+ 88 12.0	+5 52 48.0	+57.96	- 22 48	+0.37742	0.92553
Kolkata (Presi. Coll. Obs.)	12	+22 23.4	+ 88 16.2	+5 53 05.0	+58.00	- 23 05	+0.37854	0.92506
Kurnool	281	+15 30.0	+ 78 03.0	+5 12 12.0	+51.29	+ 17 48	+0.26552	0.96390

1 metre = 3.2808 feet

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Kyoto (Univ. Ast. Dept. Obs.), Japan	86	+35 00.6	+135 20.4	+9 1 22.0	+88.93	.. ..	+0.57052	0.81997
Lahore, Pakistan	214	+31 22.2	+ 74 15.6	+4 57 02.0	+48.80	+ 32 58	+0.51756	0.85269
Lucknow	113	+26 31.2	+ 80 33.6	+5 22 14.0	+52.94	+ 7 46	+0.44383	0.89539
Maitri (Indian base station at Antarctica)	132	-70 46.0	+ 11 45.0	+0 47 00.0	+ 7.72	.. ..	-0.94069	0.33041
Mangalore	22	+12 33.0	+ 74 31.8	+4 58 07.0	+48.97	+ 31 53	+0.21587	0.97626
Moscow (Sternberg State Ast. Inst.), Russia	195	+55 27.0	+ 37 22.2	+2 29 29.0	+24.56	.. ..	+0.82001	0.56843
Mount Abu (Gurushikhar Obs.)	1700	+24 23.4	+ 72 25.8	+4 49 43.0	+47.59	+40 17	+0.41053	0.91152
Mount Palomar (Obs.), U.S.A.	1706	+33 21.4	-116 51.8	- 7 47 27.2	-76.79	.. ..	+054687	0.83633
Mount Wilson (Obs.), U.S.A.	1742	+34 13.0	-118 03.6	- 7 52 14.4	-77.58	.. ..	+0.55931	0.82802
Mysore	767	+12 10.8	+ 76 25.2	+5 05 41.0	+50.22	+ 24 19	+0.20963	0.97775
Nagpur	312	+21 05.4	+ 79 04.2	+5 16 17.0	+51.96	+ 13 43	+0.35760	0.93347
Nainital (Aryabhatta Res. Inst. Of Obs. Sci.)	1927	+29 13.8	+ 79 18.0	+5 17 12.0	+52.11	+ 12 48	+0. 48558	0.87363
New York (Rutherford Obs.), U.S.A.	25	+40 25.8	- 74 00.6	- 4 56 02.0	-48.63	.. ..	+0.64509	0.76228
Ottawa, Canada	87	+45 16.2	- 75 22.2	- 5 01 29.0	-49.53	.. ..	+0.70688	0.70497
Panaji	56	+15 18.0	+ 73 33.0	+4 54 12.0	+48.33	+ 35 48	+0.26217	0.96479
Paris (Obs.), France	67	+48 30.0	+ 2 12.0	+0 08 49.0	+ 1.45	.. ..	+0.74535	0.66387
Patiala	251	+30 12.0	+ 76 15.0	+5 05 00.0	+50.10	+ 25 00	+0.50010	0.86504
Patna	53	+25 21.6	+ 85 03.6	+5 40 14.0	+55.89	- 10 14	+0.42570	0.90420
Peshawar, Pakistan	358	+34 01.0	+ 71 34.0	+4 46 15.0	+47.03	+ 43 45	+0.55630	0.82979
Pondicherry	6	+11 34.8	+ 79 29.4	+5 17 58.0	+52.23	+ 12 02	+0. 19942	0.97978
Pune	559	+18 19.0	+ 73 30.0	+4 54 00.0	+48 .30	+ 36 00	+0.31230	0.94973
Porbandar	7	+21 22.2	+ 69 29.4	+4 37 58.0	+45.66	+ 52 02	+0.36211	0.93166
Port Blair	79	+11 24.0	+ 92 25.8	+6 09 43.0	+60.74	- 39 43	+0.19636	0.98041
Puri	6	+19 28.8	+ 85 29.4	+5 41 58.0	+56.18	- 11 58	+0.33137	0.94311
Quetta, Pakistan	1673	+30 07.2	+ 67 00.0	+4 28 00.0	+44.03	+ 62 00	+0.49901	0.86593
Rajkot	132	+22 10.8	+ 70 33.6	+4 42 14.0	+46 .36	+ 47 46	+0.37518	0.92646
Rawalpindi, Pakistan	510	+33 22.2	+ 73 03.6	+4 52 14.0	+48.01	+ 37 46	+0.54696	0.83605
Rome (Obs.), Italy	152	+41 33.0	+ 12 16.8	+0 49 07.2	+ 8.07	.. ..	+0.65982	0.74950
San Fernando (Naval Obs.), Spain	27	+36 28.0	- 6 12.2	-0 24 48.8	- 4.08	.. ..	+0.59108	0.80516
Shillong	1500	+25 20.4	+ 91 33.6	+6 06 14.0	+61.16	- 36 14	+0.42549	0.90455

1 metre = 3.2808 feet

Place	Altitude (Metre)	Latitude	Longitude In arc	Longitude In time	Reduction of Greenwich Sid. Time	Reduction of L.M.T. to Indian Standard Time	ρ sin φ′	ρ cos φ′
		° ′	° ′	h m s	s	m s		
Sholapur	476	+17 24.0	+ 75 33.6	+5 02 14	+49.65	+ 27 46	+0.29715	0.95460
Siliguri	127	+26 24.0	+ 88 13.2	+5 52 53	+57.97	- 22 53	+0.44196	0.89632
Simla	2202	+31 03.6	+ 77 07.8	+5 08 31	+50. 68	+ 21 29	+0.51312	0.85769
Singapore	18	+ 1 10.2	+103 30.6	+6 54 02	+68.02	.. ..	+0.02028	0.99980
Srinagar	1586	+34 03.6	+ 74 30.6	+4 58 02	+48.96	+ 31 58	+0.55704	0.82953
St. Petersburg Univ. Obs., Russia	3	+59 56.5	+ 30 17.7	+2 01 11	+19.91	.. ..	+0.86189	0.50214
Tehran, Iran	1200	+35 24.6	+ 51 15.0	+3 25 00	+33.68	.. ..	+0.57630	0.81610
Tokyo (Hydrographic Obs.), Japan	41	+35 24.0	+138 27.0	+9 13 48	+90.98	.. ..	+0.57605	0.81605
Thiruvanantapuram	61	+ 8 17.4	+ 76 34.2	+5 06 17	+50.31	+ 23 43	+0.14323	0.98963
Udaipur (Solar Obs.)	301	+24 21.0	+ 73 25.2	+4 53 41	+48.24	+ 36 19	+0.40980	0.91161
Udhagamandalam (Ooty) (Rad. Astr.Centre)	2150	+11 22.9	+ 76 40.0	+5 06 40	+50.38	+ 23 20	+0.19611	0.98079
Ujjain	496	+23 06.3	+ 75 28.2	+5 01 53	+49.59	+ 28 07	+0.39002	0.92033
Varanasi	76	+25 10.8	+ 83 00.0	+5 32 00	+54.54	- 2 00	+0.42288	0.90554
Visakhapatnam	38	+17 25.8	+ 83 08.4	+5 32 34	+54.63	- 2 34	+0.29763	0.95438
Washington (U. S. Naval Obs.), U.S.A.	92	+38 33.0	- 77 02.4	- 5 08 10	-50.62	.. ..	+0.61984	0.78309
Yangon, Myanmar	28	+16 27.0	+ 96 7.20	+6 24 29	+63.16	- 54 29	+0.28136	0.95933

1 metre = 3.2808 feet

SEMI-DIURNAL AND SEMI-NOCTURNAL ARCS

(FOR TRUE ALTITUDE = 0)

Lat. / Decli.	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
° '	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
0 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00	6 00
5 00	6 00	6 04	6 07	6 12	6 14	6 17	6 20	6 24	6 26	6 28	6 30	6 32	6 35
10 00	6 00	6 07	6 15	6 23	6 28	6 34	6 41	6 49	6 52	6 56	7 01	7 06	7 11
15 00	6 00	6 11	6 22	6 36	6 43	6 52	7 02	7 14	7 20	7 27	7 34	7 42	7 51
20 00	6 00	6 15	6 30	6 49	6 59	7 11	7 25	7 43	7 51	8 00	8 11	8 22	8 36
23 00	6 00	6 18	6 36	6 58	7 11	7 25	7 43	8 05	8 15	8 27	8 40	8 56	9 15
25 00	6 00	6 19	6 39	7 02	7 16	7 32	7 51	8 15	8 27	8 40	8 55	9 13	9 35
28 00	6 00	6 22	6 45	7 12	7 27	7 46	8 08	8 37	8 52	9 08	9 28	9 59	10 28
30 00	6 00	6 23	6 49	7 18	7 35	7 56	8 21	8 54	9 11	9 30	9 55	10 30	12 00

When the latitude of the place and the declination of the heavenly body are of the same sign then the figure represent semi-diurnal arc, when of opposite signs then semi-nocturnal arc.

AMPLITUDE OF RISING AND SETTING

(FOR TRUE ALTITUDE = 0)

Lat. / Decli.	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '
0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
5 00	5 00	5 05	5 19	5 47	6 06	6 32	7 05	7 48	8 08	8 32	8 58	9 28	10 02
10 00	10 00	10 09	10 39	11 34	12 14	13 06	14 13	15 40	16 23	17 11	18 05	19 08	20 19
15 00	15 00	15 14	15 59	17 23	18 25	19 45	21 28	23 45	24 52	26 07	27 34	29 14	31 10
20 00	20 00	20 19	21 21	23 16	24 41	26 31	28 56	32 09	33 45	35 35	37 42	40 12	43 10
23 00	23 00	23 50	25 03	27 21	29 04	31 18	34 15	38 15	40 16	42 37	45 22	48 40	52 44
25 00	25 00	25 25	26 44	29 13	31 04	33 29	36 42	41 06	43 21	45 58	49 06	52 54	57 42
28 00	28 00	28 28	29 58	32 50	34 58	37 48	41 36	46 55	49 41	53 00	57 06	62 22	69 52
30 00	30 00	30 31	32 09	35 16	37 37	40 45	45 00	51 04	54 18	58 17	63 24	70 39	90 00

The amplitude of rising and setting points of a heavenly body is measured from the East or the West point of the horizon towards the northern or southern direction as the case may be. The amplitude is of the same sign as that of declination of the body.

Note - If true zenith distance of the heavenly body at the time of rising or setting be 90° + h, then the figures of the above two tables would require some correction according to the value of h (vide Explanation).

AUGMENTATION OF MOON'S SEMI-DIAMETER

Moon 's Apparent Altitude

Semi-diameter	0°	6°	12°	18°	24°	30°	36°	42°	48°	54°	60°	66°	72°	78°	84°	90°
' "	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"	"
14 30	0.1	1.5	2.9	4.3	5.6	6.9	8.1	9.2	10.2	11.1	11.8	12.5	13.0	13.4	13.6	13.7
15 00	0.1	1.6	3.1	4.6	6.0	7.3	8.6	9.8	10.9	11.8	12.7	13.4	13.9	14.3	14.6	14.6
15 30	0.1	1.7	3.3	4.9	6.4	7.9	9.2	10.5	11.6	12.7	13.5	14.3	14.9	15.3	15.6	15.6
16 00	0.1	1.9	3.6	5.2	6.8	8.4	9.8	11.2	12.4	13.5	14.4	15.2	15.9	16.3	16.6	16.7
16 30	0.2	2.0	3.8	5.6	7.3	8.9	10.5	11.9	13.2	14.4	15.4	16.2	16.9	17.4	17.6	17.7
17 00	0.2	2.1	4.0	5.9	7.7	9.5	11.1	12.6	14.0	15.3	16.3	17.2	17.9	18.4	18.7	18.8

The visible or apparent semi-diameter of the moon is augmented over the tabulated value due to moon's altitude above the horizon.

ANGLE		Sin	Cos	Tan	Cot	Sec	Cosec		
Arc	Time								
°	h m							h m	°
0	0 00	0.00000	1.00000	0.00000	Infinity	1.00000	Infinity	6 00	90
1	0 04	.01745	0.99985	.01746	57.28996	.00015	57.29869	5 56	89
2	0 08	.03490	.99939	.03492	28.63625	.00061	28.65371	5 52	88
3	0 12	.05234	.99863	.05241	19.08114	.00137	19.10732	5 48	87
4	0 16	.06976	.99756	.06993	14.30067	.00244	14.33559	5 44	86
5	0 20	.08716	.99619	.08749	11.43005	.00382	11.47371	5 40	85
6	0 24	.10453	.99452	.10510	9.51436	.00551	9.56667	5 36	84
7	0 28	.12187	.99255	.12278	8.14435	.00751	8.20551	5 32	83
8	0 32	.13917	.99027	.14054	7.11537	.00983	7.18530	5 28	82
9	0 36	.15643	.98769	.15838	6.31375	.01247	6.39245	5 24	81
10	0 40	.17365	.98481	.17633	5.67128	.01543	5.75877	5 20	80
11	0 44	0.19081	0.98163	0.19438	5.14455	1.01872	5.24084	5 16	79
12	0 48	.20791	.97815	.21256	4.70463	.02234	4.80973	5 12	78
13	0 52	.22495	.97437	.23087	4.33148	.02630	4.44541	5 08	77
14	0 56	.24192	.97030	.24933	4.01078	.03061	4.13357	5 04	76
15	1 00	.25882	.96593	.26795	3.73205	.03528	3.86370	5 00	75
16	1 04	.27564	.96126	.28675	3.48741	.04030	3.62796	4 56	74
17	1 08	.29237	.95630	.30573	3.27085	.04569	3.42030	4 52	73
18	1 12	.30902	.95106	.32492	3.07768	.05146	3.23607	4 48	72
19	1 16	.32557	.94552	.34433	2.90421	.05762	3.07155	4 44	71
20	1 20	.34202	.93969	.36397	2.74748	.06418	2.92380	4 40	70
21	1 24	0.35837	0.93358	0.38386	2.60509	1.07115	2.79043	4 36	69
22	1 28	.37461	.92718	.40403	2.47509	.07853	2.66947	4 32	68
23	1 32	.39073	.92050	.42447	2.35585	.08636	2.55930	4 28	67
24	1 36	.40674	.91355	.44523	2.24604	.09464	2.45859	4 24	66
25	1 40	.42262	.90631	.46631	2.14451	.10338	2.36620	4 20	65
26	1 44	.43837	.89879	.48773	2.05030	.11260	2.28117	4 16	64
27	1 48	.45399	.89101	.50953	1.96261	.12233	2.20269	4 12	63
28	1 52	.46947	.88295	.53171	1.88073	.13257	2.13005	4 08	62
29	1 56	.48481	.87462	.55431	1.80405	.14335	2.06267	4 04	61
30	2 00	.50000	.86603	.57735	1.73205	.15470	2.00000	4 00	60
31	2 04	0.51504	0.85717	0.60086	1.66428	1.16663	1.94160	3 56	59
32	2 08	.52992	.84805	.62487	1.60033	.17918	1.88708	3 52	58
33	2 12	.54464	.83867	.64941	1.53987	.19236	1.83608	3 48	57
34	2 16	.55919	.82904	.67451	1.48256	.20622	1.78829	3 44	56
35	2 20	.57358	.81915	.70021	1.42815	.22077	1.74345	3 40	55
36	2 24	.58779	.80902	.72654	1.37638	.23607	1.70130	3 36	54
37	2 28	.60182	.79864	.75355	1.32704	.25214	1.66164	3 32	53
38	2 32	.61566	.78801	.78129	1.27994	.26902	1.62427	3 28	52
39	2 36	.62932	.77715	.80978	1.23490	.28676	1.58902	3 24	51
40	2 40	.64279	.76604	.83910	1.19175	.30541	1.55572	3 20	50
41	2 44	0.65606	0.75471	0.86929	1.15037	1.32501	1.52425	3 16	49
42	2 48	.66913	.74314	.90040	1.11061	.34563	1.49448	3 12	48
43	2 52	.68200	.73135	.93252	1.07237	.36733	1.46628	3 08	47
44	2 56	.69446	.71934	0.96569	1.03553	.39016	1.43956	3 04	46
45	3 00	0.70711	0.70711	1.00000	1.00000	1.41421	1.41421	3 00	45
		Cos	Sin	Cot	Tan	Cosec	Sec	Time	Arc
								ANGLE	

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.		Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m		h	h	m
Aden	+ 3	15	00	Belgium	+ 1	13	00
Afghanistan	+ 4 1/2	16	30	Belize	- 6Ψ	06	00Ψ
Alaska	-9	03	00	Bermuda	- 4	08	00
- Day light Saving Time	- 8	04	00	Bhutan	+ 6	18	00
Albania	+ 1	13	00	Bolivia	- 4	08	00
- Day light Saving Time	+ 2	14	00	Brazil-			
Aleutian Islands	- 10	02	00	Eastern (including coast)	- 3*	09	00*
Algeria	0	12	00	Western	- 3*	09	00*
Angola	+ 1	13	00	Territory of Acre	- 4*	08	00*
Argentina	- 3	09	00	Bulgaria	+ 2	14	00
Ascension Islands	0	12	00	Cambodia	+ 7	19	00
Australia-				Cameroon	+ 1	13	00
Capital Territory (Canberra), Victoria, New South Wales, Queensland, Tasmania.	+ 10	22	00	Canada- Newfoundland	- 3 1/2*	08	30*
South Australia, Northern Territory, Broken Hill Area	+ 9 1/2	21	30	East of Long. 63° W N W Territories (Ea-St of Long. 68° W), New Brunswick Nova Scotia, Prince Edward Island	- 4*	08	00*
- Day light Saving Time	+ 10 1/2	22	30				
Western Australia	+ 8	20	00	Quebec (West of Long.63°W), Ontario (East of Long 90° W) (Ottawa), Nunavut (East) and NW Territories (Long.. W 68°-85°)	- 5*	07	00*
- Day light Saving Time	+ 9	21	00				
Austral Islands	- 10	02	00	Ontario (West of Long. 90° W), Manitoba, NW Territories (Long. W 85°-102°), East Saskatchewan, Nunavut (Central)	- 6*	06	00*
Austria	+ 1	13	00	Alberta	- 7*	05	00*
Azores	- 1	11	00	Yukon Time	- 8	04	00
Bahrain	+ 3	15	00	Canary Island	+ 1	13	00
Bangladesh	+ 6	18	00	Cape Verde Islands	- 1	11	00

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.		Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m		h	h	m
Caroline Islands-	+ 11	23	00	Ghana	0	12	00
Truk, Ponape	+ 11	23	00	Gibraltar	+ 1↓	13	00↓
Central African Republic	+ 1	13	00	Greece	+ 2	14	00
Chile	- 4*	08	00*	Greenland			
China, People's Republic of	+ 8	20	00	Angmagssalik, W. Coast	- 3	09	00
Cocos-keeling Islands	+ 6 1/2	18	30	Thule Area	- 4	08	00
Colombia	- 5	07	00	Guam	+ 10	22	00
Congo Republic	+ 1	13	00	Guatemala	- 6	06	00
Cook Islands	- 10	02	00	Guiana			
				Dutch (Surinam)	- 3	09	00
Corsica	+ 1↓	13	00↓	French	- 3	09	00
Costa Rica	- 6	06	00	Guyana Republic	- 4	08	00
Croatia	+1	13	00	Haiti	- 5	07	00
Cuba	- 5*	07	00*	Hawaiian Islands	- 10	02	00
Czech Republic	+1	13	00	Honduras	- 6	06	00
Cyprus	+ 2	14	00	Hong Kong	+ 8*	20	00*
Dahomey Republic (Africa)	+ 1	13	00	Hungary	+ 1	13	00
Denmark	+ 1	13	00	Iceland	0	12	00
Ecuador	- 5	07	00	India	+ 5 1/2	17	30
Egypt	+ 2*	14	00*	Indonesia, Republic of-	--	--	
Estonia	+ 2	14	00	Sumatra, Java, West & Central Kalimantan	+ 7	19	00
El Salvador	- 6	06	00	Bali, South & East Kalimantan	+ 8	20	00
Ethiopia	+ 3	15	00	Irian Jaya, Maluku	+ 9	21	00
Falkland Islands	-4	08	00	Iran	+ 3 1/2	15	30
Fiji	+12	24	00	Iraq	+ 3	15	00
Finland	+2	14	00	Ireland, Republic of	0	12	00
France	+1↓	13	00↓	Israel	+2	14	00
Germany	+1	13	00	Italy	+1*	13	00*

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.		Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	
	h	h	m		h	h	m
Ivory Coast	0	12	00	Monaco	+ 1	13	00
Japan (and Japan Is.)	+ 9	21	00	Mongolia	+ 8	20	00
Jordan	+ 2	14	00	Morocco	0*	12	00*
Kenya	+ 3	15	00	Mozambique	+ 2	14	00
Korea (North & South)	+ 9	21	00	Nepal	+ 5 3/4	17	45
Kuwait	+ 3	15	00	Netherlands (Holland)	+ 1	13	00
Laos	+ 7	19	00	New Caledonia	+ 11	23	00
Latvia	+ 2	14	00	New Hebrides	+ 11	23	00
Lebanon	+ 2*	14	00*	New Zealand	+ 12	24	00
Liberia	0	12	00	Nicaragua	- 6	06	00
Libya	+ 2	14	00	Niger	+ 1	13	00
Lithuania	+ 3	15	00	Nigeria	+ 1	13	00
Luxembourg	+ 1↓	13	00↓	Norfolk Island	+ 11 1/2	23	30
Madagascar	+ 3	15	00	Norway	+ 1*	13	00*
Madeira	- 1*	11	00*	Oman (Masira, Muscat, Salalah)	+ 4	16	00
Malawi	+ 2	14	00	Pakistan	+ 5	17	00
Malaysia	+ 8	20	00	Papua New Guinea	+ 10	22	00
Maldives Island	+ 5	17	00	Paraguay	- 4	08	00
Malta	+ 1	13	00	Peru	- 5	07	00
Manchuria (China)	+ 8	20	00	Philippines	+ 8	20	00
Mariana Island	+ 10	22	00	Poland	+ 1*	13	00*
Marquesas Islands	- 9 1/2	02	30	Portugal	+ 1	13	00
Marshall Islands	+ 12	24	00	Puerto Rico	- 4	08	00
Mauritania	0	12	00	Reunion	+ 4	16	00
Mauritius	+ 4	16	00	Romania	+ 2	14	00
Mayanmar	+ 6 1/2	18	30	Sakhalin	+ 11	23	00
Mexico-				Samoa	- 11	01	00
Mexico City	- 6	06	00	Sardinia	+ 1	13	00
Sonora, Sinaloa, Nayarit, Baja California Sur	- 7	05	00				
Baja California	- 8	04	00				

STANDARD TIMES

LOCAL STANDARD TIME FOR EACH COUNTRY OR AREA
THE AHEAD OF (+) OR BEHIND (-) U.T. OR G.M.T

Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.	Country or Area	Standard Time	L.S.T at 12h U.T or 17-30 I.S.T.
	h	h m		h	h m
Saudi Arabia-			Tangier	0	12 00
Jeddah	+ 3	15 00	Thailand	+ 7	19 00
Dhahran	+ 4	16 00	Uganda	+ 3	15 00
Senegal	0	12 00	Ukraine	+ 2	14 00
Serbia	+ 1	13 00	United Arab Emirates	+ 4	16 00
Sierra Leone	0	12 00	USA Aleutian	- 10*	02 00*
Singapore	+ 8	20 30	USA Hawaii	- 10*	02 00*
Solomon Islands	+ 11	23 00	USA Pacific	- 8*	04 00*
Somalia	+ 3	15 00	USA Mountain	- 7*	05 00*
South Africa	+ 2	14 00	USA Arizona	- 7*	05 00*
Spain	+ 1↓	13 00↓	USA Central	- 6*	06 00*
Sri Lanka	+ 5 1/2	17 30	USA Eastern	- 5*	07 00*
Sudan	+ 2	14 00	Uruguay	- 3	09 00
Sweden	+ 1	13 00	Uzbekistan	+ 5	17 00
Switzerland	+ 1	13 00	Zambia	+ 2	14 00
Syria	+ 2*	14 00*	Zimbabwe	+ 2	14 00
Tanzania	+ 3	15 00			

* During summer seasons clock time differs from Standard time.
Ψ Winter time may be kept in these countries.
↓ This time is used throughout the year, but may differ from legal time.

PART - VI

INDIAN CALENDAR
AND
EXPLANATION

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INDIAN CALENDAR
EXPLANATORY NOTE

The astronomical data included in this section on Indian Calendar have been calculated in accordance with the recommendations of the Calendar Reform Committee, as outlined in its report, and the calculations have been done on the basis of the positions of the Sun, Moon and Planets, as contained in the main tables of the Ephemeris. However, the information on Luni- Solar Calendar in this section have been calculated on the basis of traditional Nirayana Calendric system following the Government's decision not to disturb the traditional procedure in fixing the days of religious festivals. Certain additional data, which are required for the compilation of an Indian Panchang (Almanac), have also been furnished to meet the requirements of the numerous Panchang makers of this country. The tables of this section have been extended beyond December, 2024 and materials up to April 20, 2025 have been furnished in order to facilitate preparation of Almanacs for one complete Indian year. The longitudes of the Sun, Moon and Planets and certain other data relating to their positions for the period of 2024 covered by this calendar have also been given in separate table for the same purpose.

All calculations contained in this section have been done for an adopted Central Station of India situated at $82^{0}30'$ longitude East of Greenwich and $23^{0}\ 11'$ latitude North (latitude of Ujjain) and accordingly the timings have been expressed in the local mean time of this Central Station, which is also the Indian Standard Time. This time (I.S.T.) is $5^{h}\ 30^{m}$ ahead on the Universal Time or Greenwich Mean Time.

The Calendar used in this section is the "National Calendar" of India as recommended by the Calendar Reform Committee and introduced by the Government of India with effect from the 22 nd March 1957, corresponding to the 1st of Chaitra, 1879 Saka Era. Thereafter, Govt. of India has decided to introduce an all India Nirayana Solar Calendar in addition to the existing National Calendar. This new Calendar has been introduced with effect from 14th April, 2004 corresponding to 1st Vaisakha of 5105 Kali, Kali Era being the Era of this new Calendar and this Calendar have fixed number of days for its months. Dates of the Nirayana Calendar have been indicated in addition to the existing National Calendar. The months of these Calendars, the number of days assigned to each month of the two Calendars, and the dates of the Gregorian calendar corresponding to the first day of each month of both the Calendars are as follows :-

Months of the National Calendar	Gregorian date for 1st of the month	Months of the Nirayana Calendar	Gregorian date for 1st of the month
Chaitra (30 days ; 31 days in a leap-year)	March 22 (March 21 in a leap-year)	Vaisakha (31 days)	April 14
		Jyaishtha (31 days)	May 15
Vaisakha (31 days)	April 21	Ashadha (31 days)	June 15
Jyaishtha (31 days)	May 22	Sravana (31 days)	July 16
Ashadha (31 days)	June 22	Bhadra (31 days)	August 16
Sravana (31 days)	July 23	Asvina (30 days)	September 16
Bhadra (31 days)	August 23	Kartika (30 days)	October 16
Asvina (30 days)	September 23	Agrahayana (30 days)	November 15
Kartika (30 days)	October 23	Pausha (30 days)	December 15
Agrahayana (30 days)	November 22	Magha (30 days)	January 14
Pausha (30 days)	December 22	Phalguna (30 days ; 31 days in a leap-year)	February 13
Magha (30 days)	January 21		
Phalguna (30 days)	February 20	Chaitra (30 days)	March 15

Different items included in this section are elaborated below :-

The Sunrise and Sunset times, calculated for the Central Station, relate respectively to the appearance and disappearance of the upper limb of the Sun on the horizon. The amount of horizontal refraction taken for this purpose is $31'$ and the semi-diameter of the Sun as $16'$, so that at the given times of Sunrise and Sunset, the centre of the Sun actually $47'$ below the horizon.

The apparent noon is the local mean time of the sun's meridian passage, i.e., the mid-day reduced to the above standard meridian of India ($82½^{0}$ E. Longitude).

The ending moments of tithis, nakshatras and yogas have been given in Indian Standard Time and shown against their ordinal numbers. The phenomena being geocentric ones, their timings in I.S.T. are applicable for the whole of India without any modification. These timings reduced by a deduction of $5^h 30^m$ would give the G.M.T. applicable for all places on the earth.

The tithi is based on the difference of longitude of the Moon and that of the Sun. A tithi is completed when the longitude of the Moon gains exactly 12^0 or its integral multiple on that of the Sun and as such there are 30 tithis in lunar month. A difference in longitude of 12^0 indicates the ending of the 1st tithi, 24^0 that of the 2nd tithi and so on. The number of tithis have been shown from Sukla 1 to Sukla 15 (full-moon) and again from Krishna 1 to Krishna 14 and Krishna 30 (new moon), using the symbols S and K for Sukla paksha (waxing Moon)and Krishna paksha (waning Moon) respectively.

A nakshatra is completed when the nirayana longitude of the Moon as measured from the initial point attains a value of $13° 20'$ or an integral multiple thereof. When this longitude is $13° 20'$ the 1st nakshatra ends and so on. There are thus 27 nakshatras in a sidereal month and the nakshatra divisions occupy fixed positions in the sphere of stars. In the case of the Sun the calculation also has been done on the same basis. But in this case, the time of Sunόs entry into a nakshatra-division has been stated, whereas in the case of the Moon, the time of its exit from the division has been given.

Like nakshatras, there are 27 yogas. Yoga is calculated from the sum of nirayana longitudes of the Sun and the Moon. When the sum amounts to $13° 20'$, the first yoga ends; when it amounts to $26° 40'$, the second yoga ends, and so on. Thus, in all 27 yogas cover 360°. Names of the nakshatras and yogas have been given at the bottom of the table. It will be seen that two of the names Vyatipata and Vaidhriti occur also under Phenomena, where they have been treated as special yogas and calculated by a somewhat different rule. The 27 yogas which have got very little astronomical significance have been included in this publication only to meet the needs of Panchang where the yoga is also one of the components.

For the purpose of calculation of rasis, nakshatras and yogas, an initial point which occupies a fixed position on the ecliptic has been adopted as the origin for the measurement of longitudes. The position of this initial point coincides with the vernal equinoctial point of vernal equinox day of 285 A.D. For the purpose of assigning a precise position to it, the tropical longitude of this initial point has been adopted as $23° 15' 00''$ for 0^h on 21st March, 1956. The tropical longitude of this fixed initial point for any day is known as ayanamsa. The longitude of a celestial body measured from this initial point is known as nirayana longitude.

The entry into different rasis of the Moon and of the Sun have been shown at the bottom of the relevant pages of the calendar and the calculations have been done on the same basis as in the case of nakshatras, utilising the nirayana longitudes. Rasis, which cover arc of 30^0 of the zodiac belt, are measured along the ecliptic from the above-mentioned initial point.

The tithi, nakshatra and yoga as are current at Sunrise at the Central Station, have been shown against the date with their ending moments in I. S. T. When the time of these or any other phenomena falls after midnight and before the next Sunrise, the time has been expressed after adding 24^h to the I.S.T. without changing the date after midnight in order to maintain continuity of time-reckoning from one Sunrise to the next, in conformity with the system followed in Indian religious calendars.

The solar months recommended for the religious calendar, such as, Saura Vaisakha, Saura Jyaishtha, etc., by the Calendar Reform Committee in 1955 have been reckoned from the moments when the apparent longitude of the Sun equals $23° 15'$, $53° 15'$ and so on. The calculation for this purpose thus has not been done with a variable ayanamsa, as in the case of rasis and nakshatras, but with a fixed ayanamsa of $23° 15'$. These months are shown for purpose of illustration only, but are not used in practice for actual luni-solar adjustment.

The lunar months for determining the dates of religious festivals are reckoned from one New-Moon to the next (Sukladi system or mukhya mana). The lunar month for this purpose is named after the Nirayana or Sidereal solar month in which the initial New-Moon from which the month starts, falls.

Phenomena mentioned in the table include New-Moon, Full-Moon, Sayana Vyatipata (when the sum of the tropical longitudes of the Sun and the Moon equals 180^0), Sayana Vaidhriti (when the above sum amounts to 360^0), eclipses, heliacal rising and setting of Venus, Mars and Jupiter and Jupiter's transit into rasis.

The principal festivals of different states have been fixed on the basis of the criterion stated here, but in doing so, the rules and conventions of the states concerned have been followed as far as practicable.

LIST OF HOLIDAYS

The list of holidays for the Government of India as well as for the State Governments have been prepared in a consolidated form and the dates fixed for them, have been shown in a separate table under the head 'Principal Festivals for Holidays'. The principal festivals of Moslems, Parsis, Jewish and Christians have also been shown separately.

AYANAMSA

The value of ayanamsa has been given in the calendar for the first day of the month and also in a separate table at the end at interval of three days. The ayanamsa value has been calculated from the polynomial of precession in longitude published by N.Capitaine et. al. (2003) in journal Astronomy and Astrophysics. The polynomial for ayanamsa has been introduced in this publication from the year 2021. The polynomial used is as given below.

Mean Ayanamsa $=23^0 51' 25''.53+5028''.796195*T+1''.1054348*T^2+0''.00007964*T^3-0''.00023857*T^4-0''.0000000383*T^5$

Where T=(JD-2451545)/36525

Ayanamsha for J2000.0 is taken as $23^0 51' 25''.53$

The Sayana Vyatipata and Sayana Vaidhriti, reported under the column "Phenomena", are calculated on the basis of defination given in the report of Calendar Reform Committee. These are classified as the Calendar Reform Committee view and no way related to the 'mahapata yoga' defined in some Indian traditional texts (siddhantic treatises).

HELIACAL RISING AND SETTING OF PLANETS, 2025
(JANUARY TO APRIL)

Planet	National Date		Nirayana Date		Gregorian Date		Time (I.S.T) h	m
Mercury sets in the West	Pausha	30, 1946 Saka	Magha	07, 5125 Kali	Jan	20, 2025	16	21
Mercury rises in the East	Phalguna	02, 1946 Saka	Phalguna	09, 5125 Kali	Feb	21, 2025	22	21
Mercury sets in the East	Phalguna	27, 1946 Saka	Chaitra	04, 5125 Kali	Mar.	18, 2025	29	54
Mercury rises in the West	Chaitra	11, 1947 Saka	Chaitra	18, 5125 Kali	Apr.	08,2025	08	37
Venus sets in the East	Phalguna	28, 1946 Saka	Chaitra	05, 5125 Kali	Mar.	19, 2025	13	05
Venus rises in the West	Chaitra	01, 1947 Saka	Chaitra	08, 5125 Kali	Mar.	22, 2025	27	01
Saturn sets in East	Phalguna	07, 1946 Saka	Phalguna	14, 5125 Kali	Feb.	26,2025	24	09
Saturn rises in West	Chaitra	14, 1947 Saka	Chaitra	21, 5125 Kali	Apr.	04,2025	06	37

N.B.- Here East means the eastern horizon or west of the Sun and West means the western horizon or east of the Sun.

RETROGRESSION OF PLANETS, 2025
(JANUARY TO APRIL)

Planet		National Date		Nirayana Date		Gregorian Date		Time (I.S.T) h	m
Mercury	Retrograde	Phalguna	24,1946 Saka	Chaitra	01,5125 Kali	Mar.	15,2025	12	20
Mercury	Direct	Chaitra	17,1947 Saka	Chaitra	24,5125 Kali	Apr.	07,2025	16	39
Venus	Retrograde	Phalguna	10,1946 Saka	Phalguna	17,5125 Kali	Mar.	01,2025	30	02
Venus	Direct	Chaitra	23,1947 Saka	Chaitra	30,5125 Kali	Apr.	13,2025	06	36
Mars	Direct	Phalguna	05,1946 Saka	Phalguna	12, 5125 Kali	Feb.	24,2025	07	32
Jupiter	Direct	Magha	15,1946 Saka	Magha	22,5125 Kali	Feb.	04,2025	15	10
Uranus	Direct	Magha	10,1946 Saka	Magha	17,5125 Kali	Jan.	30,2025	21	52

MEAN RAHU, 2025

Date		Longitude ° ′ ″	Date		Longitude ° ′ ″	Date		Longitude ° ′ ″
Jan.	-2	337 27 00	Feb.	7	335 19 49	Mar.	19	333 12 38
	8	336 55 12		17	334 48 02		29	332 40 51
	18	336 23 25		27	334 16 14	Apr.	8	332 09 03
Jan.	28	335 51 37	Mar.	9	333 44 26		18	331 37 15
							28	331 05 28

ECLIPSES, 2025
(JANUARY TO APRIL)

Total Lunar Eclipse **Not visible in India**

23, Phalguna 1946 SE, 30 Phalguna, 5125 KE, 14 March, 2025

Partial Solar eclipse **Not visible in India**

08, Chaitra 1947 SE , 15 Chaitra, 5125 KE, 29 March, 2025

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INDIAN CALENDAR

SAKA ERA 1945

Makara : Tapas

Month of PAUSHA (30 days)

Winter (Sisira), 1st Month

(*Nirayana*) 8 Pausha, 5124 Kali Era to (*Nirayana)* 7 Magha, 5124 Kali Era

Date	Week Day	Gregorian Date	Sunrise h	Sunrise m	Apparent Noon h	Apparent Noon m	Sunset h	Sunset m	Tithi No.	Tithi Ending Moment h	Tithi Ending Moment m	Nakshatra No.	Nakshatra Ending Moment h	Nakshatra Ending Moment m	Yoga No.	Yoga Ending Moment h	Yoga Ending Moment m
		2023 A.D.															
1	Fri	Dec. 22	6	37.3	11	58.3	17	19.5	S 10	8	17.1	1	21	35.9	19	11	10.9
2	Sat	23	6	37.8	11	58.8	17	20.0	11	7	12.4	2	21	19.0	20	9	07.4
									(12	30	24.7)						
3	Sun	24	6	38.3	11	59.3	17	20.6	13	29	55.5	3	21	19.3	21	7	17.2
															(22	29	41.5)
4	Mon	25	6	38.7	11	59.8	17	21.1	14	29	47.2	4	21	39.1	23	28	22.0
5	Tue	26	6	39.2	12	00.3	17	21.7	S 15	30	03.2	5	22	21.2	24	27	20.9
6	Wed	27	6	39.6	12	00.8	17	22.2	K 1	----	----	6	23	28.8	25	26	40.7
7	Thu	28	6	40.0	12	01.3	17	22.8	K 1	6	46.7	7	25	04.7	26	26	23.1
8	Fri	29	6	40.4	12	01.8	17	23.4	2	8	00.2	8	27	09.8	27	26	28.5
9	Sat	30	6	40.7	12	02.2	17	24.0	3	9	44.3	9	29	42.2	1	26	55.5
10	Sun	31	6	41.1	12	02.7	17	24.6	4	11	56.1	10	----	----	2	27	40.0
		2024A.D.															
11	Mon	Jan. 1	6	41.4	12	03.2	17	25.3	K 5	14	28.8	10	8	36.3	3	28	35.4
12	Tue	2	6	41.7	12	03.7	17	25.9	6	17	11.2	11	11	42.1	4	29	32.5
13	Wed	3	6	42.0	12	04.1	17	26.6	7	19	48.6	12	14	46.2	5	30	20.5
14	Thu	4	6	42.3	12	04.6	17	27.2	8	22	05.2	13	17	33.5	6	----	----
15	Fri	5	6	42.5	12	05.1	17	27.9	9	23	46.6	14	19	49.6	6	6	48.6
16	Sat	6	6	42.7	12	05.5	17	28.6	K 10	24	42.2	15	21	23.3	7	6	47.3
															(8	30	9.8)
17	Sun	7	6	42.9	12	05.9	17	29.3	11	24	46.5	16	22	08.2	9	28	52.5
18	Mon	8	6	43.1	12	06.4	17	30.0	12	23	59.1	17	22	03.0	10	26	55.5
19	Tue	9	6	43.3	12	06.8	17	30.7	13	22	25.1	18	21	11.3	11	24	22.0
20	Wed	10	6	43.4	12	07.2	17	31.4	14	20	11.2	19	19	40.1	12	21	17.3
21	Thu	11	6	43.5	12	07.6	17	32.1	K 30	17	27.3	20	17	38.9	13	17	48.9
22	Fri	12	6	43.6	12	08.0	17	32.8	S 1	14	23.9	21	15	18.4	14	14	04.8
23	Sat	13	6	43.6	12	08.4	17	33.5	2	11	11.5	22	12	49.5	15	10	13.3
															(16	30	22.5)
24	Sun	14	6	43.7	12	08.8	17	34.2	3	8	00.4	23	10	22.6	17	26	39.6
									(4	28	59.7)						
25	Mon	15	6	43.7	12	09.1	17	34.9	S 5	26	17.1	24	8	07.0	18	23	10.9
												(25	30	10.3)			
26	Tue	16	6	43.7	12	09.5	17	35.6	6	23	58.4	26	28	38.2	19	20	01.0
27	Wed	17	6	43.7	12	09.8	17	36.3	7	22	07.3	27	27	33.8	20	17	12.8
28	Thu	18	6	43.6	12	10.2	17	37.1	8	20	45.3	1	26	58.1	21	14	47.7
29	Fri	19	6	43.5	12	10.5	17	37.8	9	19	52.4	2	26	50.5	22	12	45.7
30	Sat	20	6	43.4	12	10.8	17	38.5	S 10	19	27.1	3	27	09.3	23	11	05.8

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana — SAKA ERA 1945

Dakshina Gola — Month of PAUSHA (30 days) — Ayanamsa on 1st : 24° 11′ 25″

(*Nirayana*) 8 Pausha, 5124 Kali Era to (*Nirayana)* 7 Magha, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2023A.D.					
1	Dec. 22	SAURA PAUSHA	CHANDRA MARGASIRSHA	1- Sun enters trop. Capricorn ($8^h 57^m.3$)		1- Uttarayana day,Mokshada Ekadasi(Smarta), Gita Jayanti.
2	23					2- Mokshada Ekadasi(Vaishnava & Vidhava), Trisprisha Maha Dvadasi, Mauna Ekadasi(Jain), Akhanda Dvadasi, Vaikuntha Ekadasi(S.India).
3	24					
4	25					4- Birthday of Sadhu T.L.Vaswani(Sindhi).
5	26				5- Full Moon ($30^h 03^m.2$) 5- Sayana Vaidhriti ($12^h 53^m.9$)	5- Margi Purnima, Shri Datta Jayanti (Maharahstra), Datta Treya Jayanti, Jor Mela - 3 days(Punjab).
6	27					6- Arudra Darsanam (Purvarunodaya) (S.India).
7	28					
8	29			8- Sun enters Purvashadha nak.($18^h 15^m.6$)		
9	30					
10	31					
	2024A.D.					
11	Jan. 1					
12	2					
13	3					
14	4					14- Ashtaka (Pupashtaka).
15	5					
16	6					16- Birthday of Parsvanath(Jain).
17	7					17- Saphala Ekadasi.
18	8				18- Sayana Vyatipata ($24^h 02^m.8$)	
19	9					
20	10					
21	11		CHANDRA PAUSHA	21- Sun enters Uttarashadha nak.($20^h 13^m.9$)	21- New Moon ($17^h 27^m.3$)	21- Vakula Amavasya (Odisha).
22	12					
23	13			23- Saura Maghadi ($28^h 33^m.1$)		23- Lohri (Punjab, Jammu & Kashmir).
24	14				24- Mars rises in East ($14^h 05^m$)	24- Makara Samkranti(N. India), Bhogi (S. India), Birthday of Sant Parmanand (Sindhi).
25	15	SAURA MAGHA				25- Makara Samkranti (Bengal), Magha Bihu(Assam), Pongal(S. India), Makara Snana, Tila Samkranti ,Tai Pongal (Kerala).
26	16					26- Mattu Pongal or Kanumu (s. India).
27	17					27- Guru Gobind Singhôs Birthday.
28	18					
29	19					
30	Jan. 20			30- Sun Enters Trop. Aquarius ($19^h 37^m.3$)	30- Sayana Vaidhriti ($19^h 31^m.3$)	30- Samba Dasami(Odisha).

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Vrisha 2, $27^h 17^m.4$; Mithuna 5, $9^h 57^m.2$; Karkata 7, $18^h 38^m.0$; Simha 9, $29^h 42^m.2$; Kanya 12, $18^h 28^m.8$; Tula 15, $6^h 46^m.3$; Vrischika 17, $16^h 01^m.7$; Dhanus 19, $21^h 11^m.3$; Makara 21, $23^h 05^m.1$; Kumbha 23, $23^h 35^m.1$; Mina 25, $24^h 37^m.4$; Mesha 27, $33^h 8^m$; Vrisha 30, $8^h 52^m.8$; Sun enters :- Nirayana Makara 24, $26^h 43^m.7$

SAKA ERA 1945

Kumbha : Tapasya

Month of MAGHA (30 days)

Winter (Sisira), 2nd Month

(*Nirayana*) 8 Magha, 5124 Kali Era to (*Nirayana)* 7 Phalguna, 5124 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi No.		Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2024A.D.																	
1	Sun	Jan.	21	6	43.3	12	11.1	17	39.2	S	11	19	27.6	4	27	52.4	24	9	46.5
2	Mon		22	6	43.1	12	11.4	17	39.9		12	19	52.2	5	28	58.5	25	8	46.2
3	Tue		23	6	43.0	12	11.6	17	40.6		13	20	39.9	6	30	26.5	26	8	04.0
4	Wed		24	6	42.8	12	11.9	17	41.3		14	21	50.5	7	----	----	27	7	39.3
5	Thu		25	6	42.5	12	12.1	17	42.0	S	15	23	24.0	7	8	16.5	1	7	31.9
6	Fri		26	6	42.3	12	12.4	17	42.7	K	1	25	20.2	8	10	28.4	2	7	41.8
7	Sat		27	6	42.0	12	12.6	17	43.4		2	27	37.3	9	13	01.4	3	8	08.4
8	Sun		28	6	41.7	12	12.8	17	44.1		3	30	11.3	10	15	52.8	4	8	50.1
9	Mon		2	6	41.4	12	13.0	17	44.8		4	----	----	11	18	57.3	5	9	43.3
10	Tue		30	6	41.1	12	13.1	17	45.5		4	8	54.6	12	22	06.2	6	10	42.7
11	Wed		31	6	40.7	12	13.3	17	46.1	K	5	11	36.6	13	25	07.9	7	11	40.5
12	Thu	Feb.	1	6	40.4	12	13.4	17	46.8		6	14	04.1	14	27	49.1	8	12	27.7
13	Fri		2	6	40.0	12	13.6	17	47.5		7	16	03.1	15	29	56.9	9	12	54.3
14	Sat		3	6	39.5	12	13.7	17	48.1		8	17	21.3	16	---	---	10	12	51.4
15	Sun		4	6	39.1	12	13.8	17	48.8		9	17	50.0	16	7	20.6	11	12	12.0
16	Mon		5	6	38.6	12	13.9	17	49.4	K	10	17	25.1	17	7	53.9	12	10	51.7
17	Tue		6	6	38.2	12	14.0	17	50.1		11	16	07.6	18	7	35.2	13	8	49.8
														(19	30	27.4)	(14	30	08.5)
18	Wed		7	6	37.7	12	14.0	17	50.7		12	14	02.4	20	28	37.3	15	26	52.7
19	THu		8	6	37.2	12	14.1	17	51.3		13	11	17.5	21	26	14.3	16	23	09.3
20	Fri		9	6	36.6	12	14.1	17	51.9		14	8	02.8	22	23	29.3	17	19	06.5
										(K	30	28	29.2)						
21	Sat		10	6	36.1	12	14.2	17	52.6	S	1	24	47.8	23	20	33.9	18	14	53.3
22	Sun		11	6	35.5	12	14.2	17	53.2		2	21	09.6	24	17	39.5	19	10	38.3
																	(20	30	30.2)
23	Mon		12	6	34.9	12	14.2	17	53.8		3	17	44.9	25	14	56.8	21	26	36.8
24	Tue		13	6	34.3	12	14.2	17	54.3		4	14	42.6	26	12	35.5	22	23	04.6
25	Wed		14	6	33.6	12	14.2	17	54.9	S	5	12	10.2	27	10	43.3	23	19	58.7
26	Thu		15	6	33.0	12	14.1	17	55.5		6	10	13.3	1	9	26.0	24	17	22.4
27	Fri		16	6	32.3	12	14.1	17	56.1		7	8	55.1	2	8	46.8	25	15	17.4
28	Sat		17	6	31.7	12	14.0	17	56.6		8	8	16.5	3	8	46.2	26	13	43.4
29	Sun		18	6	31.0	12	13.9	17	57.2		9	8	16.0	4	9	22.8	27	12	38.7
30	Mon		19	6	30.3	12	13.9	17	57.7	S	10	8	50.6	5	10	33.1	1	12	00.6

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana — SAKA ERA 1945

Dakshina Gola — Month of MAGHA (30 days) — Ayanamsa on 1st : 24° 11′ 31″

(*Nirayana*) 8 Magha, 5124 Kali Era to (*Nirayana)* 7 Phalguna, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun Date	Phenomena	Festivals
	2024A.D.					
1	Jan. 21	SAURA MAGHA	CHANDRA PAUSHA			1- Putrada Ekadasi, Martyrdom day of Hemu Kalani (Sindhi).
2	22					
3	23					3- Netajiôs Birthday.
4	24			4- Sun enters Sravana nak. ($22^h 31^m.9$)		
5	25				5- Full Moon ($23^h 24^m.0$)	5- Paushi Purnima, Pushyabhisheka yatra.
6	26					6- Floating Festval/ Tai Poosam, Republic Day.
7	27					
8	28					8- Birthday of Lala Lajpat Rai.
9	29					9- Ganesha Sankastha Chaturthi.
10	30					10- Martyrôs day (Mahatma Gandhi Commemoration Day)
11	31					
12	Feb. 1					
13	2					13- Birthday of Swami Vivekanda (According to tithi)
14	3				14- Sayana Vyatipata ($9^h 45^m.7$)	14- Astaka (Mamsastaka).
15	4					
16	5					
17	6			17- Sun enters Dhanishtha Nak.($25^h 43^m.7$)		17- Sattila Ekadasi.
18	7					
19	8					19- Meru Trayadasi(Jain), Ratanti Kalika Puja.
20	9				20- New Moon ($28^h 29^m.2$)	20- Mauni Amavasya, Mahodaya Yoga (Amavasya after $8^h 02^m.8$), Tai Amavasya, Makara Vavu (Kerala).
21	10		CHANDRA MAGHA			21- Magha Sukladi.
22	11					
23	12			23- Saura Phalgunadi ($17^h 21^m.6$)		23- Tila Chaturthi, Kunda Chaturthi.
24	13					24- Varada Chaturthi, Ganesha Puja(Bengal).
25	14	SAURA PHALGUNA			25- Sayana Vaidhriti ($27^h 52^m.9$)	25- Sri Panchami, Saraswati Puja, Vasanta Panchami.
26	15					
27	16					27- Ratha Saptami(Purvarunodaya), Vidhana Saptami, Arogya Saptami, Bhismashtami.
28	17					
29	18					
30	Feb. 19			30- Sun enters Trop. Pisces ($9^h 43^m.1$) 30- Sun enters Satabhisaj nak. ($30^h 11^m.0$)		30- Shivaji Jayanti.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :-Mithuna 2,16 ^{h} $22^m.6$; Karkata 4, 25^h $47^m.0$; Simha 7, 13^h $01^m.4$; Kanya 9, 25^h $44^m.5$; Tula 12, 14^h $31^m.9$; Vrischika 14, 25^h $04^m.3$; Dhanus 17, 7^h 35^m .2;Makara 19, 10^h $04^m.2$; Kumbha 21, 10^h $02^m.2$; Mina 23, 9^h $35^m.8$; Mesha 25, 10^h $43^m.3$;Vrisha 27, 14^h $43^m.0$; Mithuna 29,21 ^{h} $54^m.0$;

Sun enters :- Nirayana Kumbha 24, 15^h $43^m.8$.

INDIAN CALENDAR

SAKA ERA 1945

Mina : Madhu

Month of PHALGUNA (30 days)

Spring (Vasanta), 1st Month

(*Nirayana*) 8 Phalguna, 5124 Kali Era to (*Nirayana)* 6 Chaitra, 5124 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi No.		Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2024A.D.																	
1	Tue	Feb.	20	6	29.5	12	13.8	17	58.2	S	11	9	56.1	6	12	13.0	2	11	45.7
2	Wed		21	6	28.8	12	13.7	17	58.8		12	11	28.0	7	14	17.7	3	11	50.6
3	Thu		22	6	28.0	12	13.5	17	59.3		13	13	22.1	8	16	43.2	4	12	12.2
4	Fri		23	6	27.3	12	13.4	17	59.8		14	15	34.2	9	19	25.5	5	12	47.6
5	Sat		24	6	26.5	12	13.3	18	00.3	S	15	18	00.4	10	22	20.6	6	13	34.0
6	Sun		25	6	25.7	12	13.1	18	00.8	K	1	20	36.4	11	25	24.3	7	14	28.2
7	Mon		26	6	24.9	12	13.0	18	01.3		2	23	16.5	12	28	30.8	8	15	26.7
8	Tue		27	6	24.0	12	12.8	18	01.8		3	25	53.7	13	---	---	9	16	24.8
9	Wed		28	6	23.2	12	12.6	18	02.2		4	28	19.0	13	7	33.1	10	17	16.8
10	Thu		29	6	22.4	12	12.4	18	02.7	K	5	---	---	14	10	22.3	11	17	55.8
11	Fri	Mar.	1	6	21.5	12	12.2	18	03.2	K	5	6	22.6	15	12	48.6	12	18	14.5
12	Sat		2	6	20.7	12	12.0	18	03.6		6	7	54.2	16	14	42.3	13	18	06.0
13	Sun		3	6	19.8	12	11.8	18	04.1		7	8	45.2	17	15	55.0	14	17	24.3
14	Mon		4	6	18.9	12	11.6	18	04.5		8	8	49.5	18	16	21.4	15	16	05.5
15	Tue		5	6	18.0	12	11.4	18	05.0		9	8	04.4	19	15	59.7	16	14	07.9
16	Wed		6	6	17.1	12	11.2	18	05.4	K	10	6	31.2	20	14	51.8	17	11	32.8
											(11	28	14.1)						
17	Thu		7	6	16.2	12	10.9	18	05.8		12	25	20.2	21	13	02.9	18	8	23.5
																	(19	28	45.5)
18	Fri		8	6	15.3	12	10.7	18	06.3		13	21	58.2	22	10	40.9	20	24	45.7
19	Sat		9	6	14.4	12	10.4	18	06.7		14	18	18.2	23	7	55.1	21	20	32.2
														(24	28	56.2)			
20	Sun		10	6	13.4	12	10.2	18	07.1	K	30	14	30.4	25	25	55.1	22	16	13.3
21	Mon		11	6	12.5	12	09.9	18	07.5	S	1	10	45.5	26	23	02.9	23	11	57.6
22	Tue		12	6	11.6	12	09.6	18	07.9		2	7	13.6	27	20	29.7	24	7	53.2
											(3	28	04.4)				(25	28	07.8)
23	Wed		13	6	10.6	12	09.4	18	08.3		4	25	26.4	1	18	24.7	26	24	48.2
24	Thu		14	6	09.7	12	09.1	18	08.7	S	5	23	26.6	2	16	55.8	27	21	59.5
25	Fri		15	6	08.7	12	08.8	18	09.1		6	22	10.0	3	16	08.4	1	19	45.4
26	Sat		16	6	07.8	12	08.5	18	09.5		7	21	39.1	4	16	05.6	2	18	07.5
27	Sun		17	6	06.8	12	08.3	18	09.9		8	21	53.5	5	16	47.4	3	17	05.3
28	Mon		18	6	05.8	12	08.0	18	10.3		9	22	49.8	6	18	10.7	4	16	36.4
29	Tue		19	6	04.9	12	07.7	18	10.7	S	10	24	22.3	7	20	10.1	5	16	36.6
30	Wed		20	6	03.9	12	07.4	18	11.1	S	11	26	23.4	8	22	38.3	6	17	00.3

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1945

Uttarayana
Dakshina Gola

Month of PHALGUNA (30 days)

Ayanamsa on 1st : $24^0 11' 36''$

(*Nirayana*) 8 Phalguna, 5124 Kali Era to (*Nirayana)* 6 Chaitra, 5124 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2024 A.D.					
1	Feb. 20	SAURA PHALGUNA	CHANDRA MAGHA			1- Jaya Ekadasi, Bhaimi Ekadasi (Bengal), Bhisma Dvadasim.
2	21					
3	22					3- Desert Festival - 3 days (Jaisalmer).
4	23					
5	24				5- Full Moon ($18^h 00^m.4$)	5- Guru Rabi Dayôs Birthday,Maghi Purnima, Masi Masi Magham.
6	25					
7	26					
8	27					
9	28				9- Sayana Vyatipata ($14^h 03^m.2$)	
10	29					
11	Mar. 1					
12	2					
13	3					13- Astaka(Sakashtaka), Janaki Janaki Janma, Vaikkatashtami (Kerala)
14	4			14- Sun enters Purva Bhadrapada nak. ($12^h 33^m.9$)		
15	5					
16	6					16- Vijaya Ekadasi (Smarta), Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj).
17	7					17- Vijaya Ekadasi (Vaishnava & Vidhava), Maha Shivaratri (Kashmir).
18	8					18- Maha Shivaratri, Shivaratri (S. India).
19	9					
20	10		CHANDRA PHALGUNA		20- New Moon ($14^h 30^m.4$)	
21	11				21- Sayana Vaidhriti ($19^h 21^m.8$)	
22	12					22- Birthday of Sri Ramakrishna Paramahamsa Deva.
23	13			23- Saura Chaitradi ($13^h 53^m.6$)		
24	14	SAURA CHAITRA				
25	15					
26	16					
27	17			27- Sun enters Uttara Bhadrapada nak. ($20^h 55^m.3$)		27- Holastaka.
28	18					
29	19					
30	Mar. 20			30- Sun enters Trop. Aries ($8^h 36^m.4$)		30- Mahavisuva Day, Indian Year Ending Day, Amalak Ekadasi.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of $82½^0$E. Long.

Moon enters :- Karkata 2, $7^h 44^m.4$; Simha 4, $19^h 25^m.5$; Kanya 7, $8^h 10^m.9$; Tula 9, $21^h 00^m.0$; Vrischika 12, $08^h 17^m.4$; Dhanus 14, $16^h 21^m.4$; Makara 16, $20^h 28^m.2$; Kumbha 18, $21^h 20^m.2$; Mina 20, $20^h 40^m.0$; Mesha 22, $20^h 29^m.7$; Vrisha 24, $22^h 39^m.9$; Mithuna 26, $28^h 21^m.0$; Karkata 29, $13^h 37^m.3$; Sun enters: Nirayana Mina 24, $12^h 36^m.3$.

INDIAN CALENDAR

SAKA ERA 1946 — Mesha : Madhava

Month of CHAITRA(31 days) — Spring (Vasanta), 2nd Month

(*Nirayana*) 7 Chaitra, 5124 Kali Era to (*Nirayana*) 7 Vaisakha, 5125 Kali Era

Date	Week Day	Gregorian Date		Sunrise h	Sunrise m	Apparent Noon h	Apparent Noon m	Sunset h	Sunset m
		2024 A.D.							
1	Thu	Mar	21	6	02.9	12	07.1	18	11.4
2	Fri		22	6	01.9	12	06.8	18	11.8
3	Sat		23	6	01.0	12	06.5	18	12.2
4	Sun		24	6	00.0	12	06.2	18	12.6
5	Mon		25	5	59.0	12	05.9	18	12.9
6	Tue		26	5	58.0	12	05.6	18	13.3
7	Wed		27	5	57.1	12	05.3	18	13.7
8	Thu		28	5	56.1	12	05.0	18	14.0
9	Fri		29	5	55.1	12	04.7	18	14.4
10	Sat		30	5	54.1	12	04.4	18	14.8
11	Sun		31	5	53.2	12	04.1	18	15.1
12	Mon	Apr.	1	5	52.2	12	03.8	18	15.5
13	Tue		2	5	51.2	12	03.5	18	15.9
14	Wed		3	5	50.3	12	03.2	18	16.3
15	Thu		4	5	49.3	12	02.9	18	16.6
16	Fri		5	5	48.4	12	02.6	18	17.0
17	Sat		6	5	47.4	12	02.3	18	17.4
18	Sun		7	5	46.5	12	02.0	18	17.8
19	Mon		8	5	45.6	12	01.8	18	18.2
20	Tue		9	5	44.7	12	01.5	18	18.5
21	Wed		10	5	43.7	12	01.2	18	18.9
22	Thu		11	5	42.8	12	01.0	18	19.3
23	Fri		12	5	41.9	12	00.7	18	19.7
24	Sat		13	5	41.0	12	00.5	18	20.1
25	Sun		14	5	40.1	12	00.2	18	20.5
26	Mon		15	5	39.3	12	00.0	18	20.9
27	Tue		16	5	38.4	11	59.7	18	21.3
28	Wed		17	5	37.5	11	59.5	18	21.7
29	Thu		18	5	37.3	11	59.3	18	21.8
30	Fri		19	5	36.5	11	59.1	18	22.2
31	Sat		20	5	35.6	11	58.9	18	22.6

Date	Week Day	Tithi	No.	Ending Moment h	m	Nakshatra No.	Ending Moment h	m	Yoga No.	Ending Moment h	m
1	Thu	S	12	28	44.8	9	25	26.9	7	17	41.8
2	Fri		13	---	----	10	28	27.9	8	18	34.9
3	Sat		13	7	18.1	11	---	----	9	19	33.9
4	Sun		14	9	55.6	11	7	33.8	10	20	33.7
5	Mon	S	15	12	30.3	12	10	37.7	11	21	29.7
6	Tue	K	1	14	56.1	13	13	33.6	12	22	17.6
7	Wed		2	17	06.9	14	16	15.6	13	22	53.2
8	Thu		3	18	57.2	15	18	38.3	14	23	12.5
9	Fri		4	20	21.4	16	20	36.0	15	23	11.4
10	Sat	K	5	21	14.3	17	22	03.7	16	22	45.9
11	Sun		6	21	31.5	18	22	56.7	17	21	52.8
12	Mon		7	21	10.2	19	23	12.2	18	20	29.5
13	Tue		8	20	09.2	20	22	48.8	19	18	35.0
14	Wed		9	18	29.6	21	21	47.6	20	16	09.5
15	Thu	K	10	16	14.6	22	20	11.8	21	13	15.0
16	Fri		11	13	29.0	23	18	06.7	22	9	55.1
17	Sat		12	10	19.7	24	15	39.5	23	6	14.6
									(24	26	19.5)
18	Sun		13	6	54.3	25	12	58.4	25	22	16.7
			(14	27	21.6)						
19	Mon	K	30	23	50.9	26	10	12.7	26	18	13.7
20	Tue	S	1	20	31.5	27	7	32.1	27	14	18.0
						(1	29	06.7)			
21	Wed		2	17	32.8	2	27	05.6	1	10	37.3
22	Thu		3	15	03.8	3	25	38.0	2	7	18.8
									(3	28	28.9)
23	Fri		4	13	12.3	4	24	51.0	4	26	12.8
24	Sat	S	5	12	04.6	5	24	49.3	5	24	33.7
25	Sun		6	11	44.4	6	25	34.8	6	23	32.7
26	Mon		7	12	12.1	7	27	05.6	7	23	08.3
27	Tue		8	13	24.5	8	29	15.9	8	23	16.4
28	Wed		9	15	14.6	9	---	---	9	23	50.6
29	Thu	S	10	17	32.1	9	7	56.7	10	24	42.8
30	Fri		11	20	05.3	10	10	56.8	11	25	44.5
31	Sat	S	12	22	42.1	11	14	04.2	12	26	47.3

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1946

Month of CHAITRA (31 days)

Uttarayana
Uttara Gola

Ayanamsa on 1st : $24^0 11^/ 39^{//}$

(*Nirayana*) 7 Chaitra, 5124 Kali Era to (*Nirayana)* 7 Vaisakha, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024 A.D Mar. 21	S A U R A C H A I T R A	P H A L G U N A			1- Indian New Year's Day
2	22					
3	23					
4	24				4- Sayana Vyatipata (($17^h 19^m.5$)	4- Holikadahana, Panguni Uttiram
5	25				5- Full Moon ($12^h 30^m.3$)	5- Holi, Dolayatra, Birthday of Sri Chaitanya
6	26					6- Hola, Vasantatsava
7	27					
8	28					
9	29					
10	30					10- Ranga Panchami, Bijoy Govindaji Halngkar(Manipur)
11	31			11- Sun enters Revati nak. ($7^h 49^m.7$)		
12	Apr. 1					
13	2					13- Varsitaparambha(Jain), Sitalashtami
14	3					
15	4					
16	5					16- Birthday Anniversary of Swami, Leela Shah(Sindhi), Papamochini Ekadasi
17	6					17- Maha Varuni (Trayodasi after 10h 19.7m, Satabhisaj nak. Upto 15h 39.5m)
18	7				18- Sayana Vaidhriti ($16^h 57^m.4$)	18- Madhu Krishna Trayodasi.
19	8				19- New Moon ($23^h 50^m.9$) 19- Total Solar Eclipse (Not Visible in India)	
20	9		C H A N D R A C H A I T R A			20- Cheti Chand (Sindhi New year's day), Telugu New Year's Day, Chaitra Sukladi(Gudi Padava, Ugadi),
21	10					
22	11					22- Gauri Tritiya (Gangaur), Andolana Tritiya, Sarhul(Bihar)
23	12			23- Saura Vaisakhadi ($21^h 56^m.6$)		
24	13			24- Sun enters Asvini Nak. ($21^h 04^m.4$)		24- Sri (Lakshmi) Panchami, Vaishakhi(Punjab, Haryana, H.P. Delhi, Odisa), Mesa Samkranti(Odisha), Chaitra Samkranti Chadaka Puja(bengal), Cheiraoba (Manipur), Visu(Kerala) Skanda Shashthi .
25	14	S A U R A V A I S A K H				25- Meshadi(Tamilnadu), Tamil new Year's day, Vaisakhadi(Bengal), Bhag Bihu(Assam), Shilenba (Manipur), Dr B R Ambedkar Jayanti, Begining of 5125 K.E.
26	15					26- Vasanti Pujarambha, Oli Begins(Jain)
27	16					27- Asokashtami. Annapurna Puja, Mela Bahu fort (Jammu)
28	17					28- Rama Navami.
29	18				29- Sayana Vyatipata ($21^h 30^m.1$)	
30	19			30- Sun enters Trop. Taurus ($19^h 29^m.7$)		30- Trichur Pooram(Kerala), Kamada Ekadasi
31	Apr. 20					

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Simha 1, $25^h 26^m.9$; Kanya 4, $14^h 20^m.2$; Tula 6, $26^h 56^m.7$; Vrischika 9, $14^h 09^m.2$; Dhanus 11 $22^h 56^m.7$; Makara 13, $28^h 37^m.0$; Kumbha 16, $7^h 12^m.6$; Mina 18, $7^h 39^m.5$; Mesha 20, $7^h 32^m.1$; Vrisha 22, $8^h 40^m.2$; Mithuna 24, $12^h 44^m.2$; Karkata 26, $20^h 38^m.9$, Simha 29, $7^h 56^m.7$; Kanya 31, $20^h 51^m.0$;

Sun enters :- Nirayana Mesha 24, $21^h 04^m.4$.

INDIAN CALENDAR

SAKA ERA 1946

Vrisha : Sukra

Month of VAISAKHA (31 days)

Summer (Grishma), 1st Month

(*Nirayana*) 8 Vaisakha, 5125 Kali Era to (*Nirayana*) 7 Jyaishtha, 5125 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi			Nakshatra			Yoga		
										No.	Ending Moment		No.	Ending Moment		No.	Ending Moment	
				h	m	h	m	h	m		h	m		h	m		h	m
		2024 A.D.																
1	Sun	Apr.	21	5	34.2	11	58.6	18	23.3	S 13	25	11.9	12	17	08.2	13	27	43.7
2	Mon		22	5	33.4	11	58.5	18	23.7	14	27	26.2	13	19	59.7	14	28	28.1
3	Tue		23	5	32.6	11	58.3	18	24.2	S 15	29	19.0	14	22	32.1	15	28	56.1
4	Wed		24	5	31.8	11	58.1	18	24.6	K 1	---	---	15	24	41.0	16	29	04.9
5	Thu		25	5	31.0	11	57.9	18	25.0	K 1	6	46.4	16	26	23.9	17	28	52.9
6	Fri		26	5	30.3	11	57.7	18	25.4	2	7	46.6	17	27	39.8	18	28	19.2
7	Sat		27	5	29.5	11	57.6	18	25.9	3	8	18.6	18	28	28.1	19	27	23.4
8	Sun		28	5	28.8	11	57.4	18	26.3	4	8	22.2	19	28	48.9	20	26	05.5
9	Mon		29	5	28.1	11	57.3	18	26.7	K 5	7	57.7	20	28	42.5	21	24	25.6
10	Tue		30	5	27.4	11	57.2	18	27.2	6	7	05.6	21	28	09.4	22	22	23.9
11	Wed	May	1	5	26.7	11	57.1	18	27.6	7	5	46.5	22	27	10.9	23	20	01.3
										(8	28	01.8)						
12	Thu		2	5	26.0	11	56.9	18	28.1	9	25	53.5	23	25	48.8	24	17	18.9
13	Fri		3	5	25.4	11	56.8	18	28.5	K 10	23	24.6	24	24	06.2	25	14	18.6
14	Sat		4	5	24.7	11	56.7	18	29.0	11	20	39.1	25	22	07.2	26	11	03.2
15	Sun		5	5	24.1	11	56.7	18	29.5	12	17	42.4	26	19	57.3	27	7	36.5
																(1	28	03.0)
16	Mon		6	5	23.5	11	56.6	18	29.9	13	14	40.6	27	17	43.1	2	24	28.3
17	Tue		7	5	22.9	11	56.5	18	30.4	14	11	41.1	1	15	32.4	3	20	58.7
18	Wed		8	5	22.4	11	56.5	18	30.8	K 30	8	51.9	2	13	33.6	4	17	40.6
19	Thu		9	5	21.8	11	56.4	18	31.3	S 1	6	21.5	3	11	55.6	5	14	41.1
										(2	28	18.4)						
20	Fri		10	5	21.3	11	56.4	18	31.8	3	26	50.6	4	10	46.9	6	12	06.4
21	Sat		11	5	20.7	11	56.4	18	32.3	4	26	04.6	5	10	15.4	7	10	02.5
22	Sun		12	5	20.2	11	56.4	18	32.7	S 5	26	04.4	6	10	26.7	8	8	33.3
23	Mon		13	5	19.7	11	56.3	18	33.2	6	26	50.7	7	11	23.7	9	7	41.1
24	Tue		14	5	19.3	11	56.4	18	33.7	7	28	19.8	8	13	05.2	10	7	24.9
25	Wed		15	5	18.8	11	56.4	18	34.2	8	---	---	9	15	25.3	11	7	41.1
26	Thu		16	5	18.4	11	56.4	18	34.6	8	6	23.4	10	18	14.0	12	8	22.7
27	Fri		17	5	18.0	11	56.4	18	35.1	9	8	49.4	11	21	18.1	13	9	20.7
28	Sat		18	5	17.6	11	56.5	18	35.6	S 10	11	23.2	12	24	23.3	14	10	24.5
29	Sun		19	5	17.2	11	56.5	18	36.0	11	13	50.6	13	27	16.1	15	11	23.8
30	Mon		20	5	16.8	11	56.6	18	36.5	12	15	59.1	14	---	---	16	12	09.7
31	Tue		21	5	16.5	11	56.6	18	37.0	S 13	17	40.0	15	5	46.2	17	12	35.4

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana | SAKA ERA 1946
Uttara Gola | Month of VAISAKHA (31 days) | Ayanamsa on 1st : $24^0 11^/ 42^{//}$

(*Nirayana*) 8 Vaisakha, 5125 Kali Era to (*Nirayana*) 7 Jyaishtha, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024A.D. 21	SAURA VAISAKHA	CHANDRA CHAITRA			1- Ananga Trayodasi, Mahavira Jayanti (Jain), Minakshi Kalyanam
2	22					2- Damanaka Chaturdasi
3	23				3- Full Moon ($29^h 19^m.0$)	3- Chaitri Purnima, Hanumat Jayanti (S. India), Oli Ends(Jain), Babu Kuer Singh Day (Bihar)
4	24					
5	25					
6	26					
7	27			7- Sun enters Bharani nak. ($12^h 57^m.0$)		
8	28					
9	29				9- Venus sets in the east ($23^h 14^m$)	
10	30					
11	May 1				11- Sayana Vaidhriti ($27^h 56^m.2$) 11- Jupiter enters Nir. Vrisha ($13^h 00^m.0$)	11- May Day
12	2					
13	3					13- Birth Anniversary of Dada Chellaram (Sindhi).
14	4					14- Shri Vallabhacharya Jayanti, Varuthini Ekadasi
15	5					
16	6				16- Jupiter sets in the West ($23^h 02^m$)	
17	7					
18	8		CHANDRA VAISAKHA		18- New Moon ($8^h 51^m.9$)	18- Tithi of Deva Damodar (Assam), Birthday of Rabindra Nath Tagore
19	9					
20	10					20- Parasurama Jayanti, Akshya Tritiya (Rohini Nakshatra upto (10h 46.9 m), Varsitapa Samapana (Jain), Kedar Badri Yatra
21	11			21- Sun enters Krittika nak. ($7^h 02^m.5$)		
22	12					22- Shri Sankaracharya Jayanti, Sri Ramanujacharya Jayanti (S.India)
23	13			23- Saura Jyaishthadi ($18^h 21^m.8$)	23- Sayana Vyatipata ($28^h 19^m.7$)	23- Sri Ramanujacharya Jayanti
24	14	SAURA JAISHTHA				24- Gangotpatti
25	15					
26	16					26- Sita Navami
27	17					
28	18					
29	19					29- Mohini Ekadasi
30	20			30- Sun enters Trop.Gemini ($18^h 29^m.5$)		
31	21					

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Tula 3, $9^h 18^m.6$; Vrischika 5, $20^h 00^m.7$; Dhanus 7, $28^h 28^m.1$; Makara 10, $10^h 36^m.7$; Kumbha 12, $14^h 32^m.6$; Mina 14, $16^h 38^m.2$; Mesha 16, $17^h 43^m.1$; Vrisha 18, $19^h 06^m.8$; Mithuna 20, $22^h 26^m.2$; Karkata 22, $29^h 05^m.2$; Simha 25, $15^h 25^m.3$; Kanya 27, $28^h 04^m.9$; Tula 30, $16^h 34^m.5$; Sun enters :-Nirayana Vrisha 24, $17^h 53^m.7$.

INDIAN CALENDAR

SAKA ERA 1946

Mithuna :Suchi

Month of JYAISHTHA (31 days) — Summer (Grishma), 2nd Month

(*Nirayana*) 8 Jyaishtha, 5125 Kali Era to (*Nirayana)* 7 Ashadha, 5125 Kali Era

Date	Week Day	Gregorian Date	Sunrise h	Sunrise m	Apparent Noon h	Apparent Noon m	Sunset h	Sunset m	Tithi No.	Tithi Ending Moment h	Tithi Ending Moment m	Nakshatra No.	Nakshatra Ending Moment h	Nakshatra Ending Moment m	Yoga No.	Yoga Ending Moment h	Yoga Ending Moment m
		2024 A.D.															
1	Wed	May 22	5	16.2	11	56.7	18	37.5	S 14	18	48.4	15	7	46.7	18	12	36.7
2	Thu	23	5	15.9	11	56.8	18	37.9	S 15	19	23.1	16	9	14.7	19	12	11.8
3	Fri	24	5	15.6	11	56.9	18	38.4	K 1	19	25.4	17	10	10.3	20	11	21.1
4	Sat	25	5	15.3	11	57.0	18	38.8	2	18	58.7	18	10	36.2	21	10	06.4
5	Sun	26	5	15.1	11	57.1	18	39.3	3	18	06.8	19	10	35.9	22	8	30.6
6	Mon	27	5	14.9	11	57.2	18	39.7	4	16	54.1	20	10	13.7	23	6	36.6
															(24	28	27.6)
7	Tue	28	5	14.7	11	57.3	18	40.2	K 5	15	24.2	21	9	33.5	25	26	05.9
8	Wed	29	5	14.5	11	57.4	18	40.6	6	13	40.2	22	8	38.5	26	23	33.8
9	Thu	30	5	14.3	11	57.6	18	41.1	7	11	44.4	23	7	31.3	27	20	52.8
10	Fri	31	5	14.2	11	57.7	18	41.5	8	9	38.7	24	6	13.9	1	18	04.3
												(25	28	48.2)			
11	Sat	June 1	5	14.0	11	57.9	18	41.9	9	7	24.9	26	27	16.1	2	15	09.8
									(K 10	29	05.0)						
12	Sun	2	5	13.9	11	58.0	18	42.4	11	26	41.8	27	25	40.4	3	12	11.0
13	Mon	3	5	13.8	11	58.2	18	42.8	12	24	18.9	1	24	04.9	4	9	10.5
14	Tue	4	5	13.8	11	58.4	18	43.2	13	22	01.5	2	22	34.9	5	6	11.4
															(6	27	18.0)
15	Wed	5	5	13.7	11	58.6	18	43.6	14	19	55.5	3	21	16.4	7	24	35.3
16	Thu	6	5	13.7	11	58.7	18	44.0	K 30	18	07.8	4	20	16.6	8	22	08.9
17	Fri	7	5	13.7	11	58.9	18	44.4	S 1	16	45.6	5	19	43.0	9	20	04.4
18	Sat	8	5	13.7	11	59.1	18	44.7	2	15	56.1	6	19	42.6	10	18	27.0
19	Sun	9	5	13.7	11	59.3	18	45.1	3	15	44.9	7	20	20.6	11	17	20.6
20	Mon	10	5	13.7	11	59.5	18	45.5	4	16	15.6	8	21	39.9	12	16	47.4
21	Tue	11	5	13.8	11	59.7	18	45.8	S 5	17	27.9	9	23	39.1	13	16	46.8
22	Wed	12	5	13.9	11	59.9	18	46.1	6	19	17.2	10	26	12.2	14	17	15.0
23	Thu	13	5	14.0	12	00.1	18	46.5	7	21	33.9	11	29	08.5	15	18	05.0
24	Fri	14	5	14.1	12	00.4	18	46.8	8	24	04.5	12	---	-----	16	19	07.0
25	Sat	15	5	14.2	12	00.6	18	47.1	9	26	33.0	12	8	13.9	17	20	09.9
26	Sun	16	5	14.3	12	00.8	18	47.4	S 10	28	44.1	13	11	12.8	18	21	02.2
27	Mon	17	5	14.5	12	01.0	18	47.6	11	---	-----	14	13	50.5	19	21	34.2
28	Tue	18	5	14.7	12	01.2	18	47.9	11	6	25.3	15	15	56.2	20	21	38.6
29	Wed	19	5	14.9	12	01.4	18	48.1	12	7	28.5	16	17	23.3	21	21	11.5
30	Thu	20	5	15.1	12	01.7	18	48.3	13	7	50.5	17	18	10.0	22	20	11.9
31	Fri	21	5	15.3	12	01.9	18	48.5	S 14	7	32.2	18	18	18.7	23	18	41.8

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Uttarayana — SAKA ERA 1946

Uttara Gola — Month of JYAISHTHA (31 days) — Ayanamsa on 1st : $24^0 11^/ 47^{//}$

(Nirayana) 8 Jyaishtha, 5125 Kali Era to *(Nirayana)* 7 Ashadha, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024A.D. May 22	SAURA JAISHTHA	CHANDRA VAISAKHA			1- Nrisimha Chaturdasi
2	23				2- Full moon ($19^h 23^m.1$)	2- Vaisakhi Purnima, Bhuddha Purnima.
3	24			3- Sun enters Rohini nak. ($27^h 16^m.8$)		
4	25					
5	26					
6	27				6- Sayana Vaidhriti ($14^h 42^m.3$)	
7	28					
8	29					
9	30					
10	31					
11	June 1					
12	2					12- AparaEkadasi(Smarta), Bhadrakali Ekadasi (Punjab)
13	3				13- Jupiter rises in the East ($7^h 01^m$)	13- Apara Ekadasi(Vaishnava & Vidhava)
14	4					
15	5					15- Savitri Chaturdasi, Phalaharini Kalika Puja.
16	6				16- New Moon ($18^h 07^m.8$)	16- Vata Savitri Vrata(Amavasya Paksha)
17	7		CHANDRA JYAISHTHA	17- Sun enters Mrigasiras nak. ($25^h 06^m.1$)		
18	8				18- Sayana Vyatipata ($15^h 35^m.3$)	
19	9					19- Pratap Jayanti (Rajasthan), Rambha Tritiya
20	10					20- Guru Arajan Devôs Martyardom Day (Sikh)
21	11					
22	12					22- Vindhya Vasini Puja, Aranya Shashthi(Bengal) or Jamatri Shashthi
23	13			23- Saura Ashadhadi ($24^h 38^m.8$)		
24	14					24- Mela Kshir Bhawani(Kashmir), Rajas Samkranti(Odisha)
25	15					
26	16	SAURA ASHADHA				26- Ganga Dasahara(Hasta nak. upto 11h 12.8 m).
27	17					
28	18					28- Nirjala Ekadasi, Champaka Dvadasi.
29	19					
30	20					30- Dakshinayan Day.
31	June 21				31- Sayana Vaidhriti ($26^h 52^m.8$)	31- Vata Savitri Vrata(Purnima Paksha).

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters:- Vrischika 1, $26^h 55^m.8$; Dhanus 4, $10^h 36^m.2$; Makara 6, $16^h 05^m.2$; Kumbha 8, $20^h 06^m.3$; Mina10, $23^h 10^m.3$; Mesha 12, $25^h 40^m.4$; Vrisha 14, $28^h 13^m.9$; Mithuna 17, $7^h 56^m.1$; Kartaka 19, $14^h 07^m.3$; Simha 21, $23^h 39^m.1$; Kanya 24, $11^h 54^m.6$; Tula 26, $24^h 35^m.1$; Vrischika 29, $11^h 05^m.3$; Dhanus 31, $18^h 18^m.7$;

Sun enters :-Nir. Mithuna 24, $24^h 27^m.3$.

SAKA ERA 1946

Month of ASHADHA (31 days)

Karkata : Nabhas
Rains (Varsa), 1st Month

(*Nirayana* 8 Ashadha, 5125 Kali Era to (*Nirayana)* 7 Sravana, 5125 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi			Nakshatra			Yoga		
									No.	Ending Moment		No.	Ending Moment		No.	Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2024 A.D.															
1	Sat	June 22	5	15.5	12	02.1	18	48.7	S 15	6	37.9	19	17	54.4	24	16	44.8
									(K 1	29	13.6)						
2	Sun	23	5	15.7	12	02.3	18	48.9	2	27	26.5	20	17	03.8	25	14	26.2
3	Mon	24	5	16.0	12	02.5	18	49.1	3	25	23.7	21	15	54.2	26	11	51.3
4	Tue	25	5	16.3	12	02.7	18	49.2	4	23	11.6	22	14	32.7	27	9	05.5
5	Wed	26	5	16.5	12	02.9	18	49.4	K 5	20	55.7	23	13	05.2	1	6	13.9
															(2	27	20.3)
6	Thu	27	5	16.8	12	03.1	18	49.5	6	18	40.1	24	11	36.8	3	24	27.9
7	Fri	28	5	17.1	12	03.3	18	49.6	7	16	27.7	25	10	10.8	4	21	38.6
8	Sat	29	5	17.5	12	03.5	18	49.7	8	14	20.5	26	8	49.4	5	18	53.7
9	Sun	30	5	17.8	12	03.7	18	49.7	9	12	19.7	27	7	34.2	6	16	14.4
10	Mon	Jul. 1	5	18.1	12	03.9	18	49.8	K 10	10	26.6	1	6	26.3	7	13	41.5
11	Tue	2	5	18.5	12	04.1	18	49.8	11	8	42.8	2	5	27.4	8	11	16.5
												(3	28	40.0)			
12	Wed	3	5	18.8	12	04.3	18	49.8	12	7	10.9	4	28	07.5	9	9	01.5
13	Thu	4	5	19.2	12	04.5	18	49.8	13	6	54.6	5	27	54.7	10	6	59.5
									(14	28	58.4)				(11	29	13.8)
14	Fri	5	5	19.5	12	04.7	18	49.7	K 30	28	27.4	6	28	06.5	12	27	48.4
15	Sat	6	5	19.9	12	04.8	18	49.7	S 1	28	26.6	7	28	48.0	13	26	47.1
16	Sun	7	5	20.3	12	05.0	18	49.6	2	29	00.0	8	---	---	14	26	12.5
17	Mon	8	5	20.7	12	05.2	18	49.5	3	---	---	8	6	02.9	15	26	06.0
18	Tue	9	5	21.1	12	05.3	18	49.4	3	6	09.2	9	7	52.7	16	26	26.3
19	Wed	10	5	21.5	12	05.4	18	49.3	4	7	52.6	10	10	15.3	17	27	09.7
20	Thu	11	5	21.9	12	05.6	18	49.1	S 5	10	04.1	11	13	04.3	18	28	08.9
21	Fri	12	5	22.3	12	05.7	18	49.0	6	12	33.3	12	16	08.9	19	29	14.5
22	Sat	13	5	22.7	12	05.8	18	48.8	7	15	06.1	13	19	14.8	20	---	---
23	Sun	14	5	23.2	12	05.9	18	48.6	8	17	26.5	14	22	06.5	20	6	15.2
24	Mon	15	5	23.6	12	06.0	18	48.3	9	19	19.7	15	24	29.8	21	6	59.8
25	Tue	16	5	24.0	12	06.1	18	48.1	S 10	20	34.2	16	26	13.9	22	7	18.4
26	Wed	17	5	24.4	12	06.2	18	47.8	11	21	03.1	17	27	12.7	23	7	03.9
27	Thu	18	5	24.9	12	06.3	18	47.5	12	20	44.8	18	27	25.4	24	6	12.6
															(25	28	44.0)
28	Fri	19	5	25.3	12	06.4	18	47.2	13	19	41.8	19	26	55.2	26	26	40.7
29	Sat	20	5	25.7	12	06.4	18	46.9	14	17	59.9	20	25	48.7	27	24	07.6
30	Sun	21	5	26.2	12	06.5	18	46.5	S 15	15	47.1	21	24	14.3	1	21	11.1
31	Mon	22	5	26.6	12	06.5	18	46.2	K 1	13	12.1	22	22	21.2	2	17	58.0

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1946

Dakshinayana
Uttara Gola

Month of ASHADHA (31 days)

Ayanamsa on 1st : $24^0 11' 53''$

Nirayana) 8 Ashadha, 5125 Kali Era to (*Nirayana)* 7 Sravana, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024 A.D	SAURA ASHADHA	CHANDRA JYAISHTHA		1- Full Moon ($6^h 37^m.9$)	1- Deva Snana Purnima, Guru Hargobindôs Birthday
2	June 22					
3	23					
4	24					
5	25					
	26					
6	27					
7	28				7- Venus rises in the west ($17^h 06^m$)	
8	29					
9	30					
10	July 1					
11	2					11- Yogini Ekadasi
12	3				12- Sayana Vyatipata ($28^h 08^m.2$)	
13	4					
14	5			14- Sun enters Punarvasu nak. ($23^h 40^m.5$)	14- New Moon ($28^h 27^m.4$)	
15	6					
16	7		CHANDRA ASHADHA			16- Rathayatra, Monoratha Dritiya Vrata (Bengal)
17	8					
18	9					
19	10					
20	11					20- Kumara Shashthi (Vrata).
21	12					21- Vivasvat Saptami.
22	13					22- Martyrôs Day (Kashmir)
23	14					23- Kharchi Puja (Tripura).
24	15			24- Saura Sravanadi ($11^h 25^m.9$)		24- Mela Sharik Bhagwati (Kashmir). Ultaratha (Odisha), Bahudha Yatra.
25	16	SAURA SRAVANA				25- Punaryatra(Smarta), Manasa puja Begins(Bengal)
26	17				26- Sayana Vaidhriti ($15^h 37^m.4$)	26- Harisayani Ekadasi
27	18					
28	19			28- Sun enters Pushya nak. ($23^h 11^m.2$)		
29	20					29- Mela Jawalamukhi (Kashmir)
30	21				30- Full Moon ($15^h 47^m.1$)	30- Guru Purnima, Vyasa Puja, Asadhi Purnima
31	22			31- Sun enters trop. Leo ($13^h 14^m.4$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.
Moon enters:-Makara 2, $22^h 47^m.9$; Kumbha 4, $25^h 49^m.3$; Mina 6, $28^h 31^m.9$; Mesha 9, $7^h 34^m.2$; Vrisha 11, $11^h 14^m.4$; Mithuna 13, $15^h 58^m.4$; Kartaka 15, $22^h 34^m.6$; Simha 18, $7^h 52^m.7$; Kanya 20, $19^h 49^m.5$; Tula23, $8^h 43^m.4$; Vrischika 25, $19^h 51^m.9$; Dhanus 27, $27^h 25^m.4$; Makara 30, $7^h 27^m.4$; Sun enters:-Nirayana Karkata 25, $11^h 19^m.0$.

INDIAN CALENDAR

SAKA ERA 1946

Simha : Nabhasya
Rains (Varsa), 2nd Month

Month of SRAVANA (31 days)

(*Nirayana*) 8 Sravana, 5125 Kali Era to (*Nirayana)* 7 Bhadra, 5125 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi			Nakshatra			Yoga		
										No.	Ending Moment		No.	Ending Moment		No.	Ending Moment	
				h	m	h	m	h	m		h	m		h	m		h	m
		2024 A.D.																
1	Tue	July	23	5	27.0	12	06.5	18	45.8	K 2	10	23.8	23	20	18.4	3	14	35.6
2	Wed		24	5	27.5	12	06.5	18	45.4	3	7	30.7	24	18	14.5	4	11	10.4
										(4	28	40.3)						
3	Thu		25	5	27.9	12	06.5	18	44.9	K 5	25	58.8	25	16	16.6	5	7	48.3
																(6	28	34.3)
4	Fri		26	5	28.3	12	06.5	18	44.5	6	23	31.0	26	14	30.3	7	25	31.9
5	Sat		27	5	28.8	12	06.5	18	44.0	7	21	20.0	27	12	59.8	8	22	43.7
6	Sun		28	5	28.2	12	06.5	18	43.5	8	19	28.1	1	11	47.7	9	20	11.1
7	Mon		29	5	29.6	12	06.5	18	43.0	9	17	56.3	2	10	55.3	10	17	55.0
8	Tue		30	5	30.1	12	06.4	18	42.5	K 10	16	45.4	3	10	23.4	11	15	55.7
9	Wed		31	5	30.5	12	06.4	18	42.0	11	15	56.1	4	10	12.7	12	14	13.7
10	Thu	Aug.	1	5	30.9	12	06.3	18	41.4	12	15	29.5	5	10	24.1	13	12	49.8
11	Fri		2	5	31.4	12	06.3	18	40.8	13	15	27.2	6	10	58.9	14	11	45.0
12	Sat		3	5	31.8	12	06.2	18	40.2	14	15	51.1	7	11	59.1	15	11	00.7
13	Sun		4	5	32.2	12	06.1	18	39.6	K 30	16	43.1	8	13	26.3	16	10	38.0
14	Mon		5	5	32.6	12	06.0	18	39.0	S1	18	04.0	9	15	21.6	17	10	37.8
15	Tue		6	5	33.0	12	05.9	18	38.4	2	19	53.0	10	17	44.2	18	10	59.6
16	Wed		7	5	33.5	12	05.8	18	37.7	3	22	06.4	11	20	30.6	19	11	41.3
17	Thu		8	5	33.9	12	05.6	18	37.0	4	24	37.2	12	23	34.2	20	12	38.7
18	Fri		9	5	34.3	12	05.5	18	36.3	S 5	27	14.7	13	26	44.6	21	13	45.1
19	Sat		10	5	34.7	12	05.3	18	35.6	6	---	---	14	---	---	22	14	51.7
20	Sun		11	5	35.1	12	05.2	18	34.9	6	5	45.7	14	5	48.9	23	15	48.6
21	Mon		12	5	35.5	12	05.0	18	34.2	7	7	55.7	15	8	33.2	24	16	25.5
22	Tue		13	5	35.8	12	04.8	18	33.4	8	9	31.9	16	10	44.4	25	16	33.3
23	Wed		14	5	36.2	12	04.6	18	32.6	9	10	24.1	17	12	12.8	26	16	05.5
24	Thu		15	5	36.6	12	04.4	18	31.9	S 10	10	27.1	18	12	52.8	27	14	58.3
25	Fri		16	5	37.0	12	04.2	18	31.1	11	9	40.0	19	12	43.7	1	13	11.3
26	Sat		17	5	37.4	12	04.0	18	30.3	12	8	06.2	20	11	48.8	2	10	47.2
27	Sun		18	5	37.7	12	03.8	18	29.4	13	5	51.8	21	10	14.9	3	7	50.6
										(14	27	05.2)				(4	28	28.0)
28	Mon		19	5	38.1	12	03.6	18	28.6	S 15	23	55.8	22	8	10.4	5	24	46.9
29	Tue		20	5	38.4	12	03.3	18	27.8	K 1	20	33.3	23	5	45.4	6	20	55.2
													(24	27	09.8)			
30	Wed		21	5	38.8	12	03.1	18	26.9	2	17	07.3	25	24	33.5	7	17	00.6
31	Thu		22	5	39.2	12	02.8	18	26.0	K 3	13	46.7	26	22	05.8	8	13	10.4

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1946

Dakshinayana

Uttara Gola

Month of SRAVANA (31 days)

Ayanamsa on 1st : $24^{0}11'59''$

(*Nirayana*) 8 Sravana, 5125 Kali Era to (*Nirayana)* 7 Bhadra, 5125 Kali Era

Date	Gergorian	Solar	Lunar	Transit of the Sun	Phenomena	Festivals
1	2024A.D. July 23	SAURA SRAVANA	CHANDRA ASHAD			
2	24					
3	25					3- Naga Panchami(Bengal)
4	26					
5	27					
6	28					
7	29				7- Sayana Vyatipata ($15^h 06^m.8$)	
8	30					
9	31					9- Kamika Ekadasi
10	Aug. 1					10- Tilak commemoration Day
11	2			11- Sun enters Aslesha nak. ($22^h 06^m.4$)		
12	3					12- Ker puja(Tripura)
13	4		CHANDRA SRAVANA		13- New moon ($16^h 43^m.1$)	13- Chitalagi Amavasya(Odisha), Adi Amavasya (Tamilnadu), Karkataka Vavu(Kerala)
14	5					
15	6					
16	7					16- Madhusrava Tritiya(Teej), Adi Puram (S. India)
17	8					
18	9					18- Naga Panchami
19	10					
20	11				20- Sayana Vaidhriti ($24^h 55^m.6$)	
21	12					21- Goswami Tulsidas Jayanti
22	13					
23	14					
24	15			24- Saura Bhadrapadadi ($19^h 59^m.6$)		24- Jhulana Yatrarambha, Independence Day
25	16	SAURA BHADRAPADA		25- Sun enters Magha nak. ($19^h 44^m.4$)		25- Jhulana Yatrarambha(Purvahna), Vara Maha Lakshmi Vrata(S. India), Pavitra Ekadasi, Manasa Puja Ends (Bengal)
26	17					26- Simhadi(Kerala), Begining of Kollam Era
27	18					
28	19				28- Full Moon ($23^h 55^m.8$)	28- Raksha Bandhana, Jhulana Yatra Samapana, Jhulana Yatra Samapana(Prodosa), Amarnath Yatra, Balabhadra Puja(Odisha), Naroli Purnima, Solono (Rakhi Bandhan), Avani Avittam (S. I India), Yaju Upakarma, Rik Upakarma, Sravni Purnima
29	20					29- Gayatri Japam, Sri Narayan Guru Devaĉs Birthday (Kerala)
30	21					
31	Aug. 22			31- Sun enters trop. Virgo ($20^h 25^m.0$)		31- Bahula Chaturthi(Sankashta Chaturthi), Teejri(Sindhi)

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters : Kumbha 1, $9^h 20^m.5$; Mina 3, $10^h 45^m.2$; Mesha 5, $12^h 59^m.8$; Vrisha 7, $16^h 45^m.4$; Mithuna 9, $22^h 15^m.6$; Kartaka 12, $5^h 41^m.6$; Simha 14, $15^h 21^m.6$; Kanya 16, $27^h 15^m.2$; Tula 19, $16^h 18^m.4$; Vrischika 21, $28^h 15^m.3$; Dhanus 24, $12^h 52^m.8$; Makara 26, $17^h 28^m.7$; Kumbha 28, $18^h 59^m.8$; Mina 30, $19^h 12^m.2$;

Sun enters: Nirayana Simha 25, 19^h 44.4m.

INDIAN CALENDAR

SAKA ERA 1946

Kanya: Isha

Month of BHADRA (31 days) Autumn (Sarat), 1st Month

(*Nirayana*) 8 Bhadra, 5125 Kali Era to (*Nirayana)* 7 Asvina, 5125 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2024 A.D.															
1	Fri	Aug. 23	5	39.5	12	02.6	18	25.2	K 4	10	39.4	27	19	54.4	9	9	31.1
2	Sat	24	5	39.8	12	02.3	18	24.3	K 5	7	52.4	1	18	05.9	10	6	08.3
									(6	29	31.2)				(11	27	06.5)
3	Sun	25	5	40.2	12	02.0	18	23.4	7	27	39.7	2	16	45.2	12	24	28.7
4	Mon	26	5	40.5	12	01.7	18	22.5	8	26	20.3	3	15	55.4	13	22	16.6
5	Tue	27	5	40.9	12	01.4	18	21.5	9	25	33.8	4	15	38.0	14	20	31.0
6	Wed	28	5	41.2	12	01.1	18	20.6	K 10	25	20.2	5	15	53.1	15	19	11.5
7	Thu	29	5	41.5	12	00.8	18	19.7	11	25	38.0	6	16	39.6	16	18	17.2
8	Fri	30	5	41.9	12	00.5	18	18.7	12	26	25.8	7	17	55.9	17	17	46.6
9	Sat	31	5	42.2	12	00.2	18	17.8	13	27	41.3	8	19	39.7	18	17	38.1
10	Sun	Sept. 1	5	42.5	11	59.9	18	16.8	14	29	22.2	9	21	48.8	19	17	49.8
11	Mon	2	5	42.8	11	59.6	18	15.9	K 30	---	---	10	24	20.3	20	18	19.6
12	Tue	3	5	43.2	11	59.3	18	14.9	K 30	7	25.6	11	27	10.5	21	19	05.0
13	Wed	4	5	43.5	11	58.9	18	13.9	S 1	9	47.3	12	---	---	22	20	02.6
14	Thu	5	5	43.8	11	58.6	18	12.9	2	12	21.9	12	6	14.5	23	21	07.7
15	Fri	6	5	44.1	11	58.3	18	11.9	3	15	01.9	13	9	25.3	24	22	14.7
16	Sat	7	5	44.4	11	57.9	18	10.9	4	17	37.9	14	12	34.3	25	23	16.3
17	Sun	8	5	44.7	11	57.6	18	09.9	S 5	19	59.0	15	15	31.0	26	24	04.8
18	Mon	9	5	45.0	11	57.2	18	08.9	6	21	53.9	16	18	04.4	27	24	32.0
19	Tue	10	5	45.3	11	56.9	18	07.9	7	23	12.5	17	20	04.1	1	24	30.6
20	Wed	11	5	45.6	11	56.5	18	06.9	8	23	47.0	18	21	21.9	2	23	54.7
21	Thu	12	5	45.9	11	56.2	18	05.9	9	23	33.2	19	21	52.8	3	22	40.8
22	Fri	13	5	46.2	11	55.8	18	04.9	S 10	22	30.5	20	21	35.5	4	20	47.8
23	Sat	14	5	46.6	11	55.5	18	03.9	11	20	41.7	21	20	32.5	5	18	17.4
24	Sun	15	5	46.9	11	55.1	18	02.8	12	18	12.5	22	18	49.1	6	15	13.4
25	Mon	16	5	47.2	11	54.7	18	01.8	13	15	10.5	23	16	33.0	7	11	41.3
26	Tue	17	5	47.5	11	54.4	18	00.8	14	11	44.7	24	13	53.4	8	7	48.0
															(9	27	41.1)
27	Wed	18	5	47.8	11	54.0	17	59.8	S 15	8	04.5	25	11	00.4	10	23	28.6
									(K 1	28	19.7)						
28	Thu	19	5	48.1	11	53.7	17	58.8	2	24	40.4	26	8	04.2	11	19	18.5
												(27	29	15.1)			
29	Fri	20	5	48.4	11	53.3	17	57.7	3	21	15.7	1	26	42.9	12	15	18.7
30	Sat	21	5	48.7	11	53.0	17	56.7	4	18	14.4	2	24	36.3	13	11	36.2
31	Sun	22	5	49.0	11	52.6	17	55.7	K 5	15	44.1	3	23	02.6	14	8	17.3
															(15	29	27.3)

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Dakshinayana — SAKA ERA 1946

Uttara Gola — Month of BHADRA (31 days) — Ayanamsa on 1st : $24^{0} 12^{/} 03^{//}$

(*Nirayana*) 8 Bhadra, 5125 Kali Era to (*Nirayana*) 7 Asvina, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024 A.D Aug. 23	SAURA BHADRAPADA	CHANDRA SRAVANA		1- Sayana Vyatipata ($27^{h} 27^{m}.6$)	1- Raksha Panchami(Odisha), Tithi of sri Madhava Deva (Assam)
2	24					
3	25					3- Vadi Thadri(Sindhi)
4	26					4- Janmashtami, Janmashtami (Jayanti yoga), Sri Krishna Jayanti, Durgavashtami (Except Bengal)
5	27					5- Sri Jayanti(Ramanuja), Gokulashtami(Nandotsava)
6	28					
7	29					7- Aja Ekadasi
8	30			8- Sun enters Purva Phalguni nak. ($15^{h} 46^{m}.4$)		
9	31					9- Paryusana Parvarambha (Chaturthi Paksha-Jain), Kailas Yatra-2 days
10	Sept. 1					10- Paryusana Parvarambha (Panchami Paksha-Jain), Aghora Chaturdasi
11	2					11- Saptapuri Amavasya(Odisha), Kusotpatini, Pithori
12	3				12- New Moon ($7^{h} 25^{m}.6$)	12- Jain festival, Keli Muhurth (Coorg)
13	4		CHANDRA BHADRAPADA			
14	5					14- Samveda Upakarma, Tithi of Sri Sankara Deva (Assam)
15	6				15- Sayana Vaidhriti ($6^{h} 25^{m}.0$)	15- Hartalika Gauri Tritiya, Haritalika Chaturthi
16	7					16- Samvatsari(Chaturthi Paksha-jain), Ganesha Chaturthi, Vinayaka Chaturthi(Tamilnadu),
17	8					17- Rishi Panchmi, Melapat-3 days (Jammu& Kashmir), Samvatsari (Panchmi Paksha-Jain)
18	9					18- Surya Shashthi
19	10					
20	11					20- Radhashtami, Durvashtmi (Bengal), Maha Lakashmi Vratarambha
21	12					
22	13			22- Sun enters Uttara Phalguni nak. ($9^{h} 35^{m}.0$)		
23	14					23- Dolgyaras(Madhya Pradesh), Heikra Hitamba (Manipur), Parsvaparivarthi Ekadasi, First Onam Day
24	15			24- Saura Asvinadi ($20^{h} 16^{m}.7$)		24- Sravana Dvadasi, Vamana Jayanti, Sakrotthana, Onam or Thiru Onam Day(Kerala),
25	16	SAURA ASVINA				25- Third Onam Day, Visvakarma Puja
26	17					26- Ananta Chaturdasi, Indra Purnima, Fourth Onam Day
27	18				27- Full Moon ($8^{h} 04^{m}.5$) 27- Sayana Vyatipata ($20^{h} 54^{m}.8$) 27- Partial Lunar Eclipse (Not Visible in India)	27- Pitri Paksha Tarpana Begins or Mahalaya Paksha Begins(S. India)
28	19					
29	20					
30	21					30- Samadhi day of Narayana Guru(Kerala)
31	Sept. 22					31- Jalavisuva Day

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :Mesha 1, $19^{h} 54^{m}.4$; Vrisha 3, $22^{h} 29^{m}.8$; Mithuna 5, $27^{h} 41^{m}.6$; Karkata 8, $11^{h} 34^{m}.1$; Simha 10, $21^{h} 48^{m}.8$; Kanya 13, $09^{h} 55^{m}.5$; Tula 15, $23^{h} 00^{m}.6$; Vrischika 18, $11^{h} 28^{m}.8$; Dhanus 20, $21^{h} 21^{m}.9$; Makara 22, $27^{h} 24^{m}.0$; Kumbha 24, $29^{h} 44^{m}.6$; Mina 26, $29^{h} 44^{m}.3$; Mesha 28, $29^{h} 15^{m}.1$; Vrisha 31, $6^{h} 09^{m}.4$;

Sun enters :- Nirayana Kanya 25, $19^{h} 42^{m}.9$.

INDIAN CALENDAR

SAKA ERA 1946

Tula : Urja

Month of ASVINA (30 days) Autumn (Sarat), 2nd Month

(*Nirayana*) 8 Asvina, 5125 Kali Era to (*Nirayana*) 7 Kartika, 5125 Kali Era

Date	Week Day	Gregorian Date	Sunrise h	Sunrise m	Apparent Noon h	Apparent Noon m	Sunset h	Sunset m	Tithi No.	Tithi Ending Moment h	Tithi Ending Moment m	Nakshatra No.	Nakshatra Ending Moment h	Nakshatra Ending Moment m	Yoga No.	Yoga Ending Moment h	Yoga Ending Moment m
		2024 A.D.															
1	Mon	Sep. 23	5	49.3	11	52.3	17	54.7	K 6	13	51.0	4	22	07.5	16	27	09.8
2	Tue	24	5	49.6	11	51.9	17	53.7	7	12	39.4	5	21	54.4	17	25	26.6
3	Wed	25	5	50.0	11	51.6	17	52.7	8	12	11.3	6	22	23.8	18	24	17.6
4	Thu	26	5	50.3	11	51.2	17	51.6	9	12	26.1	7	23	34.0	19	23	41.0
5	Fri	27	5	50.6	11	50.9	17	50.6	K 10	13	20.8	8	25	20.7	20	23	33.5
6	Sat	28	5	50.9	11	50.5	17	49.6	11	14	50.3	9	27	37.9	21	23	50.5
7	Sun	29	5	51.3	11	50.2	17	48.6	12	16	48.1	10	---	-----	22	24	27.1
8	Mon	30	5	51.6	11	49.9	17	47.7	13	19	07.1	10	6	18.8	23	25	17.7
9	Tue	Oct. 1	5	52.0	11	49.6	17	46.7	14	21	39.8	11	9	16.1	24	26	17.4
10	Wed	2	5	52.3	11	49.2	17	45.7	K 30	24	19.3	12	12	22.9	25	27	21.0
11	Thu	3	5	52.7	11	48.9	17	44.7	S 1	26	58.6	13	15	32.4	26	28	23.8
12	Fri	4	5	53.0	11	48.6	17	43.8	2	29	31.2	14	18	38.0	27	29	21.1
13	Sat	5	5	53.4	11	48.3	17	42.8	3	----	----	15	21	33.2	1	---	-----
14	Sun	6	5	53.7	11	48.0	17	41.8	3	7	50.0	16	24	11.3	1	6	08.1
15	Mon	7	5	54.1	11	47.7	17	40.9	4	9	48.1	17	26	25.2	2	6	39.6
16	Tue	8	5	54.5	11	47.5	17	40.0	S 5	11	18.5	18	28	08.3	3	6	50.8
17	Wed	9	5	54.9	11	47.2	17	39.0	6	12	14.9	19	29	15.1	4	6	36.6
															(5	29	52.9)
18	Thu	10	5	55.3	11	46.9	17	38.1	7	12	32.2	20	29	41.4	6	28	36.6
19	Fri	11	5	55.7	11	46.7	17	37.2	8	12	07.2	21	29	25.4	7	26	46.1
20	Sat	12	5	56.1	11	46.4	17	36.3	9	10	58.9	22	28	27.7	8	24	21.7
21	Sun	13	5	56.5	11	46.2	17	35.4	S 10	9	09.2	23	26	51.7	9	21	25.4
22	Mon	14	5	56.9	11	45.9	17	34.6	11	6	41.8	24	24	42.8	10	18	00.8
									(12	27	42.8)						
23	Tue	15	5	57.3	11	45.7	17	33.7	13	24	19.6	25	22	08.6	11	14	13.3
24	Wed	16	5	57.7	11	45.5	17	32.8	14	20	41.0	26	19	17.8	12	10	09.4
															(13	29	56.2)
25	Thu	17	5	58.2	11	45.3	17	32.0	S 15	16	56.4	27	16	20.3	14	25	41.7
26	Fri	18	5	58.6	11	45.1	17	31.2	K 1	13	15.8	1	13	26.4	15	21	34.1
27	Sat	19	5	59.0	11	44.9	17	30.4	2	9	49.2	2	10	46.8	16	17	41.5
28	Sun	20	5	59.5	11	44.7	17	29.6	3	6	46.7	3	8	31.6	17	14	11.6
									(4	28	17.6)						
29	Mon	21	6	00.0	11	44.6	17	28.8	K 5	26	30.0	4	6	50.5	18	11	11.2
												(5	29	51.1)			
30	Tue	22	6	00.4	11	44.4	17	28.0	K 6	25	29.5	6	29	38.8	19	8	45.9

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Dakshinayana

Dakshina Gola

INDIAN CALENDAR

SAKA ERA 1946

Month of ASVINA (30 days)

Ayanamsa on 1st : $24^0 12' 07''$

(*Nirayana*) 8 Asvina, 5125 Kali Era to (*Nirayana)* 7 Kartika, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024A.D. Sept. 23	SAURA ASVINA	CHANDRA BHADRAPADA			
2	24					2- Maha Lakshmi Vrata Sampana
3	25					3- Matri Navami
4	26			4- Sun enters Hasta nak. ($25^h 10^m.7$)		
5	27					
6	28					6- Indira Ekadasi
7	29					
8	30					
9	Oct. 1				9- Sayana Vaidhriti ($10^h 31^m.5$)	
10	2				10- New Moon ($24^h 19^m.3$) 10- Annular solar Eclipse (Not visible in India)	10- Mahalaya Amavasya, Sarva Pitri Amavasya, Tarpana Layba(Manipur), Mahatma Gnadhi's Birthday, Gajacchaya Parva(Moon enters Hasta nak. after 12h 22.9 m)
11	3		CHANDRA ASVINA			11- Saradiya Navaratrambha, Maharaja Agrasen's Jayanti.
12	4					
13	5					
14	6					
15	7					15- Upanga Lalita Vrata(Lalita Panchami)
16	8					
17	9					17- Oli Begins(Jain), Saraswati Avahana.
18	10			18- Sun enters Chitra nak. ($14^h 06^m.4$)		18- Durga Puja Begins (Saptami)
19	11					19- Mahastami, Ayudha Puja, Maha Navami
20	12					20- Maha Navami(Bengal), Vijaya Dasami(Dussehara or Dasahara), Saraswati Visarjana
21	13					21- Vijaya Dasami (Bengal & Kerala& Mysore), Madhavacharya Jayanti, Papankusa Ekadasi (Pasankusa) (smarta)
22	14				22- Sayana Vyatipata ($15^h 18^m.0$)	22- Papankusa Ekadasi (Pasankusa) (Vaishnava & Vidhava),Trisprisha Mahadvadasi, Bharat Milap
23	15					
24	16			24- Saura Kartikadi ($8^h 39^m.1$)		24- Kojagari Lakshmi Puja (Bengal), Kumara Purnima (Odisha), Sarat Purnima,Kojagar (Lakshmindra Puja),
25	17				25- Full Moon ($16^h 56^m.4$)	25- Maharshi Valmiki's Birthday, Oli Ends (Jain), Kaveri Samkramana Snana
26	18	SAURA KARTIKA				
27	19					
28	20					28- Karaka Chaturthi, Dasaratha Chaturthi
29	21					
30	22			30- Sun enterstrop. Scorpio ($27^h 44^m.7$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Mithuna 2, $9^h 55^m.5$; Karkata 4, $17^h 12^m.8$; Simha 6, $27^h 37^m.9$; Kanya 9, $16^h 02^m.2$; Tula 11, $29^h 06^m.1$; Vrischika 14, $17^h 33^m.7$; Dhanus 16, $28^h 08^m.3$; Makara 19, $41^m.3$; Kumbha 21, $15^h 44^m.1$; Mina 23, $16^h 49^m.0$; Mesha 25, $16^h 20^m.3$; Vrisha 27, $16^h 10^m.4$; Mithuna 29, $18^h 15^m.3$; Sun enters :- Nirayana Tula 25, $7^h 42^m.6$.

INDIAN CALENDAR

SAKA ERA 1946

Vrischika : Sahas
Hemanta, 1st Month

Month of KARTIKA (30 days)

(*Nirayana*) 8 Kartika, 5125 Kali Era to (*Nirayana*) 7 Agrahayana, 5125 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi No.		Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2024 A.D.																	
1	Wed	Oct.	23	6	00.9	11	44.3	17	27.3	K	7	25	19.4	7	---	---	20	6	59.0
																	(21	29	51.7)
2	Thu		24	6	01.4	11	44.1	17	26.5		8	25	58.9	7	6	15.8	22	29	22.2
3	Fri		25	6	01.9	11	44.0	17	25.8		9	27	23.3	8	7	40.0	23	29	26.2
4	Sat		26	6	02.4	11	43.9	17	25.1	K	10	29	24.3	9	9	45.8	24	29	57.1
5	Sun		27	6	02.9	11	43.8	17	24.4		11	---	---	10	12	24.1	25	---	---
6	Mon		28	6	03.5	11	43.7	17	23.7		11	7	51.2	11	15	23.9	25	6	47.1
7	Tue		29	6	04.0	11	43.7	17	23.1		12	10	32.2	12	18	33.8	26	7	47.7
8	Wed		30	6	04.5	11	43.6	17	22.4		13	13	16.0	13	21	43.5	27	8	51.0
9	Thu		31	6	05.1	11	43.6	17	21.8		14	15	53.3	14	24	44.6	1	9	50.5
10	Fri	Nov.	1	6	05.6	11	43.6	17	21.2	K	30	18	17.1	15	27	31.0	2	10	40.7
11	Sat		2	6	06.2	11	43.5	17	20.6	S	1	20	22.4	16	29	58.4	3	11	17.9
12	Sun		3	6	06.8	11	43.5	17	20.1		2	22	05.7	17	---	---	4	11	39.4
13	Mon		4	6	07.3	11	43.6	17	19.5		3	23	24.7	17	8	03.9	5	11	43.1
14	Tue		5	6	07.9	11	43.6	17	19.0		4	24	17.3	18	9	45.3	6	11	27.4
15	Wed		6	6	08.5	11	43.6	17	18.5	S	5	24	41.5	19	11	00.3	7	10	50.6
16	Thu		7	6	09.1	11	43.7	17	18.0		6	24	35.3	20	11	47.0	8	9	51.2
17	Fri		8	6	09.7	11	43.8	17	17.6		7	23	56.9	21	12	03.3	9	8	27.6
18	Sat		9	6	10.3	11	43.8	17	17.1		8	22	45.6	22	11	47.7	10	6	38.4
																	(11	28	23.0)
19	Sun		10	6	11.0	11	43.9	17	16.7	S	9	21	01.7	23	10	59.7	12	25	41.7
20	Mon		11	6	11.6	11	44.0	17	16.3	S	10	18	47.0	24	9	40.3	13	22	36.1
21	Tue		12	6	12.2	11	44.2	17	15.9		11	16	05.2	25	7	52.3	14	19	09.1
														(26	29	40.4)			
22	Wed		13	6	12.9	11	44.3	17	15.6		12	13	01.8	27	27	11.2	15	15	25.1
23	Thu		14	6	13.5	11	44.5	17	15.2		13	9	43.8	1	24	32.9	16	11	29.8
24	Fri		15	6	14.2	11	44.6	17	14.9		14	6	19.5	2	21	55.2	17	7	29.9
										(S	15	26	58.5)				(18	27	33.1)
25	Sat		16	6	14.8	11	44.8	17	14.6	K	1	23	50.9	3	19	28.2	19	23	47.5
26	Sun		17	6	15.5	11	45.0	17	14.4		2	21	06.9	4	17	22.8	20	20	21.2
27	Mon		18	6	16.1	11	45.2	17	14.1		3	18	56.6	5	15	49.0	21	17	21.8
28	Tue		19	6	16.8	11	45.4	17	13.9		4	17	28.8	6	14	56.0	22	14	55.9
29	Wed		20	6	17.5	11	45.7	17	13.7	K	5	16	50.1	7	14	50.5	23	13	08.2
30	Thu		21	6	18.1	11	45.9	17	13.6	K	6	17	03.7	8	15	35.6	24	12	01.1

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

Dakshinayana SAKA ERA 1946

Dakshina Gola Month of KARTIKA (30 days) Ayanamsa on 1st : $24^{0}\,12^{/}\,11^{//}$

(*Nirayana*) 8 Kartika, 5125 Kali Era to (*Nirayana)* 7 Agrahayana, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024A.D. Oct-23	SAURA KARTIKA	CHANDRA ASVINA	1- Sun enters Svati nak. ($24^h\,42^m.5$)		
2	24					2- Ahoyi Astami, Karashtami, Ahoyi Ashtami (Punjab).
3	25					
4	26				4 - Sayana Vaidhriti ($14^h\,28^m.9$)	
5	27					
6	28					6- Rama Ekadasi, Govatsa Dvadasi.
7	29					7- Dhana Trayodasi
8	30					8- Kali Chaturdasi.
9	31					9- Naraka Chaturdasi (Purvarunodaya), Kali Puja, Lakshmi Puja, Dipavali, Hanumajjanma(N. India) (Purvarunodaya), Dipavali (S.India)
10	Nov. 1		CHANDRA KARTIKA		10 - New moon ($18^h\,17^m.1$)	10- Kaumudi Dipam, Kedar Gauri Vrata, Martydrom Day of Bhagat Kanwar Ram(Sindhi), Lakshmi Dipam, Mahavira Nirvana (Jain)
11	2					11- Kartika Sukladi, Govardhana Puja, Bali Puja, Annakuta.
12	3					12- Yama Dvitiya, Visvakarma day, Bhratri Dvitiya(Bengali), Dwat Puja
13	4					
14	5					
15	6			15- Sun enters Visakha nak. ($8^h\,6^m.9$)		15- Jnana Panchami (Jain).
16	7					16- Pratihara Shashthi or Surya Shashthi (Chhat-Bihar).
17	8				17- Sayana Vyatipata ($27^h\,44^m.8$)	
18	9					18- Gopashtami or Gothastami, Trivandrum Arat(Kerala)
19	10					19- Jagaddhatri Puja, Akshaya Navami.
20	11					
21	12					21- Tulasi Vivah, Utthana or Deva Probodhani Ekadasi.
22	13					
23	14					23- Vaikuntha Chaturdasi, Vaikuntha Chaturdasi(Prodosa), Childrenôs Day(Nehruôs Birthday)
24	15			24- Saur Margasirshadi ($8^h\,48^m.2$)	24- Full Moon ($26^h\,58^m.5$)	24- Rasayatra, Tripurotsava, Kartiki Purnima, Ratha Yatra (Jain), Guru Nanakôs Birthday, Pushkar Fair,
25	16	SAURA MARGASIRSHA				25- Kartika Puja
26	17					26- Death Anniversary of Lala Lajpat Rai
27	18					
28	19			28- Sun enters Anuradha nak. ($14^h\,53^m.7$)		
29	20				29- Sayana Vaidhriti ($21^h\,35^m.9$)	29- Birthday celebration of Sri Prof Ram Panjwani(Sindhi)
30	Nov. 21			30- Sun enters trop. Saggitarius ($25^h\,26^m.5$)		

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters : Karkata 1, $24^h\,02^m.0$; Simha 4, $9^h\,45^m.8$; Kanya 6, $22^h\,10^m.9$; Tula 9, $11^h\,15^m.6$; Vrischika 11, $23^h\,23^m.5$; Dhanus 14, $9^h\,45^m.3$; Makara 16, $17^h\,54^m.0$; Kumbha 18, $23^h\,27^m.8$; Mina 20, $26^h\,21^m.8$; Mesha 22, $27^h\,11^m.2$; Vrisha 24, $27^h\,17^m.0$; Mithuna 26, $28^h\,31^m.2$; Karkata 29, $8^h\,47^m.1$;

Sun enters :- Nirayana Vrischika 25, $7^h\,32^m.0$.

INDIAN CALENDAR

SAKA ERA 1946

Dhanus : Sahasya
Hemanta, 2nd Month

Month of AGRAHAYANA (30 days)

(*Nirayana*) 8 Agrahayana, 5125 Kali Era to (*Nirayana)* 7 Pausha, 5125 Kali Era

Date	Week Day	Gregorian Date	Sunrise h	Sunrise m	Apparent Noon h	Apparent Noon m	Sunset h	Sunset m	Tithi No.	Tithi Ending Moment h	Tithi Ending Moment m	Nakshatra No.	Nakshatra Ending Moment h	Nakshatra Ending Moment m	Yoga No.	Yoga Ending Moment h	Yoga Ending Moment m
		2024A.D.															
1	Fri	Nov. 22	6	18.8	11	46.0	17	13.6	K 7	18	08.3	9	17	10.0	25	11	33.7
2	Sat	23	6	19.5	11	46.2	17	13.4	8	19	57.5	10	19	27.3	26	11	41.6
3	Sun	24	6	20.2	11	46.5	17	13.3	9	22	20.3	11	22	16.6	27	12	17.4
4	Mon	25	6	20.9	11	46.8	17	13.2	K 10	25	02.2	12	25	23.9	1	13	11.6
5	Tue	26	6	21.6	11	47.1	17	13.1	11	27	48.0	13	28	34.7	2	14	13.4
6	Wed	27	6	22.2	11	47.4	17	13.1	12	---	----	14	---	-----	3	15	12.9
7	Thu	28	6	22.9	11	47.8	17	13.1	12	6	24.2	14	7	36.0	4	16	01.5
8	Fri	29	6	23.6	11	48.1	17	13.1	13	8	40.4	15	10	17.9	5	16	33.0
9	Sat	30	6	24.3	11	48.5	17	13.1	14	10	30.3	16	12	34.7	6	16	44.1
10	Sun	Dec. 1	6	25.0	11	48.8	17	13.2	K 30	11	51.4	17	14	23.8	7	16	33.2
11	Mon	2	6	25.7	11	49.2	17	13.3	S1	12	43.8	18	15	45.6	8	16	00.7
12	Tue	3	6	26.3	11	49.6	17	13.4	2	13	09.5	19	16	41.9	9	15	07.9
13	Wed	4	6	27.0	11	50.0	17	13.5	3	13	10.8	20	17	14.9	10	13	56.4
14	Thu	5	6	27.7	11	50.4	17	13.6	4	12	49.9	21	17	26.7	11	12	27.7
15	Fri	6	6	28.3	11	50.8	17	13.8	S 5	12	08.3	22	17	18.5	12	10	42.9
16	Sat	7	6	29.0	11	51.2	17	14.0	6	11	06.6	23	16	50.6	13	8	42.2
															(14	30	25.8)
17	Sun	8	6	29.7	11	51.6	17	14.2	7	9	44.9	24	16	03.2	15	27	53.4
18	Mon	9	6	30.3	11	52.1	17	14.5	8	8	03.3	25	14	56.2	16	25	05.4
									(9	30	02.2)						
19	Tue	10	6	30.9	11	52.5	17	14.7	S 10	27	43.4	26	13	30.4	17	22	02.7
20	Wed	11	6	31.6	11	53.0	17	15.0	11	25	09.9	27	11	47.9	18	18	47.3
21	Thu	12	6	32.2	11	53.5	17	15.3	12	22	26.7	1	9	52.6	19	15	22.8
22	Fri	13	6	32.8	11	53.9	17	15.7	13	19	40.5	2	7	50.1	20	11	53.9
												(3	29	47.9)			
23	Sat	14	6	33.4	11	54.4	17	16.0	14	16	59.1	4	27	54.7	21	8	26.4
															(22	29	07.1)
24	Sun	15	6	34.0	11	54.9	17	16.4	S 15	14	31.7	5	26	20.0	23	26	03.3
25	Mon	16	6	34.5	11	55.4	17	16.8	K 1	12	27.8	6	25	13.7	24	23	22.4
26	Tue	17	6	35.1	11	55.8	17	17.2	2	10	56.6	7	24	44.2	25	21	10.9
27	Wed	18	6	35.6	11	56.3	17	17.6	3	10	06.6	8	24	58.5	26	19	33.8
28	Thu	19	6	36.2	11	56.8	17	18.1	4	10	03.4	9	25	59.9	27	18	34.0
29	Fri	20	6	36.7	11	57.3	17	18.5	K 5	10	49.3	10	27	47.2	1	18	11.4
30	Sat	21	6	37.2	11	57.8	17	19.0	K 6	12	21.8	11	30	14.2	2	18	22.5

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Dakshinayana — SAKA ERA 1946

Dakshina Gola — Month of AGRAHAYANA (30 days) — Ayanamsa on 1st : $24^{0} 12^{\prime} 15^{\prime\prime}$

(*Nirayana*) 8 Agrahayana, 5125 Kali Era to (*Nirayana)* 7 Pausha, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
1	2024 A.D. Nov. 22	SAURA MARGASIRSHA	CHANDRA KARTIK			
2	23					2- Kalashtami, Prathamastami (Odisha), Vaikkatashtami(Kerala).
3	24					3- Guru Tegh Bahadur's Martyrdom Day
4	25					
5	26					5- Utpanna Ekadasi(Smarta)
6	27					6- Vanjuli Mahadvadasi, Utpanna Ekadasi(Vaishnava & Vidhava)
7	28					
8	29					
9	30					
10	Dec. 1				10- New Moon ($11^h 51^m.4$)	
11	2		CHANDRA MARGASIRSHA	11- Sun enters Jyeshtha nak. ($19^h 9^m.5$)		
12	3					
13	4				13- Sayana Vyatipata ($10^h 57^m.1$)	
14	5					
15	6					
16	7					16- Champa Shashthi(Maharastra), Mulakarupani Shashthi (Bengal), Subrahmanya Shasthi (S.India), Guha Shasthi, Mitra Saptami.
17	8					
18	9					
19	10					
20	11					20- Mokshada Ekadasi, Mauna Ekadasi(Jain), Gita Jayanti
21	12					21- Akhanda Dvadasi, Bharani Dipam
22	13					22- Krittika dipam
23	14			23- Saura Paushadi ($23^h 38^m.3$)		23- Shri Datta Jayanti(Maharastra), Datta Treya Jayanti
24	15			24- Sun enters Mula nak.($22^h 11^m.2$)	24- Full Moon ($14^h 31^m.7$)	24- Huthri-3Days(Coorg), Margi Purnima
25	16	SAURA PAUSHA			25- Sayana Vaidhriti ($9^h 54^m.7$)	
26	17					
27	18					
28	19					
29	20					
30	Dec. 21			30- Sun enters trop. Capicron ($14^h 50^m.5$)		30- Uttarayana Day

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Simha 1, $17^h 10^m.0$; Kanya 3, $29^h 02^m.3$; Tula 6, $18^h 07^m.2$; Vrischika 8, $30^h 03^m.1$; Dhanus 11, $15^h 45^m.6$; Makara 13, $23^h 19^m.8$; Kumbha 15, $29^h 07^m.0$; Mina 18, $9^h 14^m.8$; Mesha 20, $11^h 47^m.9$; Vrisha 22, $13^h 19^m.2$; Mithuna 24, $15^h 04^m.4$; Karkata 26, $18^h 47^m.7$; Simha 28, $25^h 59^m.9$;

Sun enters :- Nirayana Dhanus 24, $22^h 11^m.2$.

INDIAN CALENDAR

SAKA ERA 1946

Makara : Tapas

Month of PAUSHA (30 days)

Winter (Sisira), 1st Month

(*Nirayana*) 8 Pausha, 5125 Kali Era to (*Nirayana*) 7 Magha, 5125 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2024 A.D.															
1	Sun	Dec. 22	6	37.7	11	58.3	17	19.5	K 7	14	32.4	12	---	----	3	19	00.0
2	Mon	23	6	38.2	11	58.8	17	20.0	8	17	08.2	12	9	09.2	4	19	54.2
3	Tue	24	6	38.6	11	59.3	17	20.6	9	19	52.8	13	12	17.2	5	20	53.5
4	Wed	25	6	39.1	11	59.8	17	21.1	K 10	22	29.6	14	15	22.2	6	21	46.5
5	Thu	26	6	39.5	12	00.3	17	21.7	11	24	44.3	15	18	09.6	7	22	23.4
6	Fri	27	6	39.9	12	00.8	17	22.2	12	26	27.0	16	20	28.6	8	22	37.0
7	Sat	28	6	40.3	12	01.3	17	22.8	13	27	33.1	17	22	13.3	9	22	23.2
8	Sun	29	6	40.7	12	01.8	17	23.4	14	28	02.0	18	23	22.2	10	21	41.1
9	Mon	30	6	41.0	12	02.2	17	24.0	K 30	27	56.8	19	23	57.5	11	20	32.1
10	Tue	31	6	41.3	12	02.7	17	24.6	S 1	27	22.4	20	24	03.7	12	18	59.2
		2025A.D.															
11	Wed	Jan. 1	6	41.6	12	03.2	17	25.3	2	26	24.6	21	23	46.2	13	17	06.4
12	Thu	2	6	41.9	12	03.7	17	25.9	3	25	08.9	22	23	10.7	14	14	57.9
13	Fri	3	6	42.2	12	04.1	17	26.6	4	23	40.1	23	22	22.0	15	12	37.4
14	Sat	4	6	42.5	12	04.6	17	27.2	S 5	22	01.6	24	21	23.6	16	10	08.0
15	Sun	5	6	42.7	12	05.1	17	27.9	6	20	15.8	25	20	18.0	17	7	32.0
															(18	28	50.8)
16	Mon	6	6	42.9	12	05.5	17	28.6	7	18	24.1	26	19	06.5	19	26	05.1
17	Tue	7	6	43.1	12	05.9	17	29.3	8	16	27.3	27	17	50.1	20	23	15.5
18	Wed	8	6	43.2	12	06.4	17	30.0	9	14	26.3	1	16	29.7	21	20	23.1
19	Thu	9	6	43.4	12	06.8	17	30.7	S 10	12	23.0	2	15	07.1	22	17	29.2
20	Fri	10	6	43.5	12	07.2	17	31.4	11	10	20.1	3	13	45.5	23	14	36.5
21	Sat	11	6	43.6	12	07.6	17	32.1	12	8	22.0	4	12	29.4	24	11	48.3
									(13	30	34.2)						
22	Sun	12	6	43.6	12	08.0	17	32.8	14	29	03.4	5	11	24.6	25	9	09.2
23	Mon	13	6	43.7	12	08.4	17	33.5	S 15	27	56.9	6	10	38.1	26	6	48.3
															(27	28	38.9)
24	Tue	14	6	43.7	12	08.8	17	34.2	K 1	27	21.7	7	10	17.0	1	26	58.3
25	Wed	15	6	43.7	12	09.1	17	34.9	2	27	23.7	8	10	28.2	2	25	46.5
26	Thu	16	6	43.6	12	09.5	17	35.6	3	28	06.7	9	11	16.7	3	25	06.0
27	Fri	17	6	43.6	12	09.8	17	36.3	4	29	30.6	10	12	45.0	4	24	56.8
28	Sat	18	6	43.5	12	10.2	17	37.1	K 5	---	---	11	14	51.6	5	25	16.0
29	Sun	19	6	43.4	12	10.5	17	37.8	K 5	7	31.2	12	17	30.3	6	25	57.4
30	Mon	20	6	43.3	12	10.8	17	38.5	K 6	9	59.0	13	20	30.1	7	26	52.1

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana | SAKA ERA 1946
Dakshina Gola | Month of PAUSHA (30 days) | Ayanamsa on 1st : $24^{0} 12^{\prime} 21^{\prime\prime}$

(*Nirayana*) 8 Pausha, 5125 Kali Era to (*Nirayana*) 7 Magha, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun	Phenomena	Festivals
	2024A.D.					
1	Dec. 22	SAURA PAUSHA	CHANDRA MARGASIRSHA			
2	23					2- Ashtaka (Pupashtaka).
3	24					
4	25					4- Birthday of Parsvanath(Jain), Birthday of Sadhu T.L Vaswani(Sindhi)
5	26					5- Jor Mela-3 days(Punjab), Saphala Ekadasi
6	27					
7	28			7- Sun enters Purvashadha nak. ($24^h 25^m.8$)		
8	29				8- Sayana Vyatipata ($18^h 36^m.0$)	
9	30				9- New Moon ($27^h 56^m.8$)	9- Vakula Amavasya (Odisha).
10	31		CHANDRA PAUSHA			
	2025A.D.					
11	Jan. 1					
12	2					
13	3					
14	4					
15	5					
16	6					16- Guru Gobind Singhôs Birthday
17	7					
18	8					
19	9					19- Samba Dasami(Odisha).
20	10			20- Sun enters Uttarashadha nak.($26^h 22^m.5$)	20- Sayana Vaidhriti ($22^h 26^m.1$)	20- Vaikuntha Ekadasi(S.India), Putrada Ekadasi
21	11					
22	12					
23	13			23- Saura Maghadi ($10^h 22^m.2$)	23- Full Moon ($27^h 56^m.9$)	23- Paushi Purnima, Arudra Darsanam (Purvarunodaya) (S.India), Lohri(Punjab, Jammu & Kashmir), Bhogi (S. India), Pushyabhisheka Yatra
24	14	SAURA MAGHA				24- Makara Samkranti(N. India), Birthday of Sant Parmanand (Sindhi). Pongal(S.India), Makara Snana, Tila Samkranti ,Tai Pongal (Kerala), Makara Samkranti (Bengal), Magha Bihu(Assam), .
25	15					25- Mattu Pongal or Kanumu (S. India).
26	16					
27	17					27- Ganesha Sankastha Chaturthi
28	18			29- Sun Enters Trop.Aquarius ($25^h 30^m.1$)		
29	19					
30	Jan. 20					

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Kanya 1, $12^h 55^m.8$; Tula 3, $25^h 51^m.1$; Vrischika 6, $13^h 56^m.9$; Dhanus 8, $23^h 22^m.2$; Makara 10, $30^h 01^m.3$; Kumbha 13, $10^h 47^m.8$; Mina 15, $14^h 35^m.0$; Mesha 17, $17^h 50^m.1$; Vrisha 19, $20^h 46^m.5$; Mithuna 21, $23^h 55^m.2$; Karkata 23, $28^h 19^m.5$; simha 26, $11^h 16^m.7$; Kanya 28, $21^h 28^m.7$; Sun enters :- Nirayana Makara 24, $8^h 55^m.7$.

.

SAKA ERA 1946

Kumbha : Tapasya

Month of MAGHA (30 days)

Winter (Sisira), 2nd Month

(*Nirayana*) 8 Magha, 5125 Kali Era to (*Nirayana)* 7 Phalguna, 5125 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi				Nakshatra			Yoga		
										No.		Ending Moment		No.	Ending Moment		No.	Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2025A.D.																	
1	Tue	Jan.	21	6	43.2	12	11.3	17	39.7	K	7	12	40.2	14	23	36.7	8	27	49.3
2	Wed		22	6	43.0	12	11.6	17	40.4		8	15	18.5	15	26	34.2	9	28	37.5
3	Thu		23	6	42.8	12	11.8	17	41.1		9	17	38.0	16	29	08.3	10	29	06.5
4	Fri		24	6	42.6	12	12.1	17	41.8	K	10	19	25.5	17	----	----	11	29	08.2
5	Sat		25	6	42.3	12	12.3	17	42.5		11	20	32.4	17	7	07.7	12	28	37.9
6	Sun		26	6	42.1	12	12.5	17	43.2		12	20	55.2	18	8	26.2	13	27	33.7
7	Mon		27	6	41.8	12	12.7	17	43.9		13	20	35.1	19	9	02.3	14	25	57.1
8	Tue		28	6	41.5	12	12.9	17	44.6		14	19	36.5	20	8	58.6	15	23	51.4
9	Wed		29	6	41.2	12	13.1	17	45.3	K	30	18	05.9	21	8	20.6	16	21	21.5
10	Thu		30	6	40.8	12	13.3	17	46.0		S1	16	11.1	22	7	15.4	17	18	33.3
														(23	29	50.9)			
11	Fri		31	6	40.5	12	13.4	17	46.7		2	13	59.6	24	28	14.5	18	15	32.5
12	Sat	Feb.	1	6	40.1	12	13.6	17	47.3		3	11	38.8	25	26	33.1	19	12	24.5
13	Sun		2	6	39.7	12	13.7	17	48.0		4	9	15.0	26	24	52.5	20	9	14.4
																	(21	30	05.9)
14	Mon		3	6	39.2	12	13.8	17	48.6	S	5	6	53.3	27	23	16.9	22	27	02.5
											(6	28	37.7)						
15	Tue		4	6	38.8	12	13.9	17	49.3		7	26	31.3	1	21	49.7	23	24	06.2
16	Wed		5	6	38.3	12	14.0	17	49.9		8	24	36.1	2	20	33.3	24	21	18.9
17	Thu		6	6	37.8	12	14.0	17	50.6		9	22	54.0	3	19	29.5	25	18	41.9
18	Fri		7	6	37.3	12	14.1	17	51.2	S	10	21	26.7	4	18	40.1	26	16	16.5
19	Sat		8	6	36.7	12	14.1	17	51.8		11	20	16.4	5	18	07.1	27	14	04.3
20	Sun		9	6	36.2	12	14.2	17	52.4		12	19	25.8	6	17	53.0	1	12	06.9
21	Mon		10	6	35.6	12	14.2	17	53.0		13	18	57.8	7	18	00.9	2	10	26.6
22	Tue		11	6	35.0	12	14.2	17	53.6		14	18	56.0	8	18	34.1	3	9	05.8
23	Wed		12	6	34.4	12	14.2	17	54.2	S	15	19	23.4	9	19	35.6	4	8	06.7
24	Thu		13	6	33.8	12	14.2	17	54.8	K	1	20	22.3	10	21	07.4	5	7	31.3
25	Fri		14	6	33.1	12	14.1	17	55.3		2	21	52.9	11	23	09.6	6	7	20.1
26	Sat		15	6	32.5	12	14.1	17	55.9		3	23	52.9	12	25	39.5	7	7	32.6
27	Sun		16	6	31.8	12	14.0	17	56.5		4	26	16.4	13	28	31.4	8	8	05.8
28	Mon		17	6	31.1	12	13.9	17	57.0	K	5	28	53.9	14	---	---	9	8	54.6
29	Tue		18	6	30.4	12	13.9	17	57.6	K	6	---	---	14	7	35.6	10	9	51.8
30	Wed		19	6	29.7	12	13.8	17	58.1	K	6	7	32.7	15	10	39.8	11	10	48.1

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

Uttarayana — SAKA ERA 1946

Dakshina Gola — Month of MAGHA (30 days) — Ayanamsa on 1st : 24° 12′ 27″

(*Nirayana*) 8 Magha, 5125 Kali Era to (*Nirayana)* 7 Phalguna, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun Date	Phenomena	Festivals
1	2025A.D. Jan. 21	SAURA MAGHA	CHANDRA PAUSHA			1- Birthday of Swami Vivekanda (According to tithi), Astaka (Mamsastaka), Martyrdom day of Hemu Kalani (Sindhi).
2	22					
3	23			3- Sun enters Sravana nak. ($28^h 44^m.9$)	3- Sayana Vyatipata ($25^h 53^m.1$)	3- Netaji's Birthday.
4	24					
5	25					5- Sattila Ekadasi.
6	26					6- Republic Day
7	27					7- Meru Trayodasi(Jain),
8	28					8- Ratanti Kalika Puja, Birthday of Lala Lajpat Rai.
9	29				9- New Moon ($18^h 05^m.9$)	9- Mauni Amavasya, Tai Amavasya, Makara Vavu (Kerala), Maha Kumbha (Prayag).
10	30		CHANDRA MAGHA			10- Magha Sukladi, Martyr's day (Mahatma Gandhi Commemoration Day)
11	31					
12	Feb. 1					12- Tila Chaturthi, Kunda Chaturthi, Varada Chaturthi.
13	2					13- Ganesha Puja(Bengal), Sri Panchami, Saraswati Puja, Vasanta Panchami.
14	3					
15	4					15- Ratha Saptami(Purvarunodaya), Vidhana Saptami, Arogya Saptami
16	5				16- Sayana Vaidhriti ($7^h 54^m.9$)	16- Bhismashtami.
17	6			17- Sun enters Dhanistha nak. ($7^h 49^m.9$)		
18	7					
19	8					19- Jaya Ekadasi, Bhaimi Ekadasi (Bengal)
20	9					20- Bhisma Dvadasi
21	10					21- Desert Festival-3 days (Jaisalmer)
22	11			22- Saura Phalgunadi ($23^h 10^m.8$)		22- Floating Festval/ Tai Poosam
23	12				23- Full Moon ($19^h 23^m.4$)	23- Guru Rabi Day's Birthday, Maghi Purnima
24	13	SAURA PHALGUNA				
25	14					
26	15					
27	16					
28	17					
29	18			29- Sun enters Trop. Pisces ($15^h 36^m.5$)	29- Sayana Vyatipata ($6^h 34^m.9$)	
30	Feb. 19			30- Sun enters Satabhisaj nak. ($12^h 26^m.4$)		30- Shivaji Jayanti.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Moon enters :- Tula 1, $10^h 03^m.5$; Vrischika 3, $22^h 32^m.6$; Dhanus 6, $8^h 26^m.2$; Makara 8, $14^h 52^m.0$; Kumbha 10, $18^h 35^m.1$; Mina 12, $20^h 58^m.6$, Mesha 14, $23^h 16^m.9$; Vrisha 16, $26^h 16^m.1$; Mithuna 18, $30^h 21^m.4$; Karkata 21, $11^h 56^m.7$; Simha 23, $19^h 35^m.6$; Kanya 25, $29^h 44^m.6$; Tula 28, $18^h 02^m.7$;

Sun enters :- Nirayana Kumbha 23, $21^h 56^m.2$.

INDIAN CALENDAR

SAKA ERA 1946

Mina : Madhu

Month of PHALGUNA (30 days)

Spring (Vasanta), 1st Month

(*Nirayana*) 8 Phalguna, 5125 Kali Era to (*Nirayana)* 7 Chaitra, 5125 Kali Era

Date	Week Day	Gregorian Date	Sunrise		Apparent Noon		Sunset		Tithi No.	Tithi Ending Moment		Nakshatra No.	Nakshatra Ending Moment		Yoga No.	Yoga Ending Moment	
			h	m	h	m	h	m		h	m		h	m		h	m
		2025A.D.															
1	Thu	Feb. 20	6	28.9	12	13.7	17	58.6	K 7	9	58.7	16	13	30.3	12	11	33.7
2	Fri	21	6	28.2	12	13.6	17	59.1	8	11	58.1	17	15	54.0	13	11	59.0
3	Sat	22	6	27.4	12	13.4	17	59.7	9	13	19.7	18	17	40.3	14	11	55.9
4	Sun	23	6	26.7	12	13.3	18	00.2	K 10	13	56.3	19	18	42.7	15	11	18.8
5	Mon	24	6	25.9	12	13.1	18	00.7	11	13	45.2	20	18	59.0	16	10	05.1
6	Tue	25	6	25.1	12	13.0	18	01.2	12	12	47.9	21	18	30.8	17	8	14.8
															(18	29	50.8)
7	Wed	26	6	24.2	12	12.8	18	01.6	13	11	08.8	22	17	23.3	19	26	57.4
8	Thu	27	6	23.4	12	12.7	18	02.1	14	8	55.1	23	15	43.7	20	23	40.8
									(K 30	30	14.8)						
9	Fri	28	6	22.6	12	12.5	18	02.6	S1	27	16.7	24	13	40.4	21	20	07.6
10	Sat	Mar. 1	6	21.7	12	12.3	18	03.1	2	24	09.8	25	11	22.7	22	16	24.8
11	Sun	2	6	20.9	12	12.1	18	03.5	3	21	02.5	26	8	59.5	23	12	39.1
12	Mon	3	6	20.0	12	11.9	18	04.0	4	18	02.7	27	6	39.2	24	8	57.1
												(1	28	29.8)	(25	29	24.6)
13	Tue	4	6	19.1	12	11.7	18	04.4	S 5	15	17.2	2	26	37.8	26	26	06.6
14	Wed	5	6	18.2	12	11.4	18	04.9	6	12	51.9	3	25	08.5	27	23	07.2
15	Thu	6	6	17.3	12	11.2	18	05.3	7	10	51.4	4	24	05.8	1	20	29.2
16	Fri	7	6	16.4	12	11.0	18	05.7	8	9	19.1	5	23	32.1	2	18	14.6
17	Sat	8	6	15.5	12	10.7	18	06.2	9	8	17.0	6	23	28.7	3	16	24.3
18	Sun	9	6	14.6	12	10.5	18	06.6	S 10	7	45.7	7	23	55.4	4	14	58.4
19	Mon	10	6	13.7	12	10.2	18	07.0	11	7	45.2	8	24	51.5	5	13	56.5
20	Tue	11	6	12.7	12	10.0	18	07.4	12	8	14.5	9	26	15.5	6	13	17.5
21	Wed	12	6	11.8	12	09.7	18	07.8	13	9	12.2	10	28	05.7	7	13	00.1
22	Thu	13	6	10.8	12	09.4	18	08.2	14	10	36.4	11	---	---	8	13	02.7
23	Fri	14	6	09.9	12	09.2	18	08.6	S 15	12	24.6	11	6	19.6	9	13	23.5
24	Sat	15	6	08.9	12	08.9	18	09.0	K 1	14	33.7	12	8	54.3	10	13	59.9
25	Sun	16	6	08.0	12	08.6	18	09.4	2	16	58.8	13	11	45.4	11	14	48.5
26	Mon	17	6	07.0	12	08.3	18	09.8	3	19	33.6	14	14	47.2	12	15	45.0
27	Tue	18	6	06.0	12	08.0	18	10.2	4	22	09.8	15	17	51.9	13	16	43.7
28	Wed	19	6	05.1	12	07.7	18	10.6	K 5	24	37.5	16	20	50.3	14	17	37.7
29	Thu	20	6	04.1	12	07.4	18	10.9	6	26	45.9	17	23	31.7	15	18	19.5
30	Fri	21	6	03.1	12	07.1	18	11.3	K 7	28	24.3	18	25	45.9	16	18	41.5

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

INDIAN CALENDAR

SAKA ERA 1946

Uttarayana
Dakshina Gola

Month of PHALGUNA (30 days)

Ayanamsa on 1st : $24^0 12^{\prime} 31^{\prime\prime}$

(*Nirayana*) 8 Phalguna, 5125 Kali Era to (*Nirayana*) 7 Chaitra, 5125 Kali Era

Date	Gregorian Date	Solar Month	Lunar Month	Transit of the Sun Date	Phenomena	Festivals
1	2025A.D. Feb. 20	SAURA PHALGUNA	CHANDRA MAGH			1- Astaka(Sakashtaka), Janaki Janma, Vaikkatashtami (Kerala)
2	21					
3	22					
4	23					4- Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj).
5	24					5- Vijaya Ekadasi.
6	25					6- Maha Shivaratri (Kashmir).
7	26					7- Maha Shivaratri, Shivaratri (S. India)
8	27				8- New Moon ($30^h 14^m.8$)	
9	28		CHANDRA PHALGUNA			
10	Mar. 1					10- Birthday of Sri Ramakrishna Paramahamsa Deva.
11	2					
12	3				12- Sayana Vaidhriti ($26^h 17^m.1$)	
13	4			13- Sun enters Purva Bhadrapada nak. ($18^h 40^m.7$)		
14	5					
15	6					15- Holastaka.
16	7					
17	8					
18	9					
19	10					19- Govinda Dvadasi, Amalaki Ekadasi.
20	11					
21	12					21- Masi Magham.
22	13			22- Saura Chaitradi ($19^h 44^m.5$)		22- Holikadahan.
23	14	SAURA CHAITRA			23- Total Lunar Eclipse (Not Visible in India) 23- Full Moon ($12^h 24^m.6$)	23- Holi, Dolayatra, Birthday of Sri Chaitanya.
24	15				24- Sayana Vyatipata ($10^h 45^m.7$)	24- Hola, Vasantatsava.
25	16					
26	17			26- Sun enters Uttara Bhadrapada nak. ($27^h 12^m.1$)		
27	18					
28	19				28- Venus sets in the West ($13^h 05^m$)	28- Ranga Panchami, Bijoy Gavindaji Holangkar (Manipur)
29	Mar. 20			29- Sun enters Trop. Aries ($14^h 31^m.4$)		29- Mahavisuva Day.
30	21					30- Indian Year Ending Day.

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of $82½^0$ E. Long.

Moon enters :- Vrischika 1, $6^h 49^m.7$; Dhanus 3, $17^h 40^m.3$; Makara 5, $24^h 56^m.0$; Kumbha 7, $28^h 37^m.0$; Mina 9, $29^h 58^m.0$; Mesha 12, $6^h 39^m.2$; Vrisha 14, $8^h 13^m.1$; Mithuna 16, $11^h 45^m.2$; Karkata 18, $17^h 45^m.9$; Simha 20, $26^h 15^m.5$; Kanya 23, $12^h 56^m.5$; Tula 25, $25^h 15^m.4$; Vrischika 28, $14^h 06^m.8$; Dhanus 30, $25^h 45^m.9$;

Sun enters: Nirayana Mina 23, $18^h 50^m.7$.

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS (2024-25 A.D.)

Festivals	Criterion	Date
		1945 S.E./ 5124 K.E./ 2024 A.D.
63. Bhogi (S.India)	Day before Pongal	Pausha 24 / Magha 1 / Jan.14
Makara Samkranti (N.India)	The Day after Lohri	Pausha 24 / Magha 1 / Jan 14
64. Makara Samkranti (Bengal),	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Magha Bihu (Assam),	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Makara Snana, Tila Samkranti,	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Pongal (S. India)	The day of Saura Maghadi	Pausha 25 / Magha 2 / Jan. 15
Tai Pongal (Kerala)	The day of Saura Maghadi (18 Ghatika rule)	Pausha 25 / Magha 2 / Jan. 15
65. Mattu Pongal or Kanumu	The Day after Pongal	Pausha 26 / Magha 3 / Jan. 16
66. Guru Gobind Singh,s Birthday	Pausha S7	Pausha 27 / Magha 4 / Jan. 17
67. Netaji's Birthday	Fixed	Magha 3 / Magha 10 / Jan. 23
68. Republic Day	Fixed	Magha 6 / Magha 13 / Jan 26
69. Sri Panchami, Vasanta Panchami	Magha S5	Magha 25 / Phalguna 2 / Feb 14
70. Shivaji Jayanti	Fixed	Magha 30 / Phalguna 7 / Feb 19
71. Guru Ravi Das's Birthday	Magha S15	Phalguna 5 / Phalguna 12/ Feb 24
72. Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj)	Phalguna K10 (Purnimanta)	Phalguna 16 / Phalguna 23 / Mar 6
73. Maha Shivratri	Magha K 14	Phalguna 18 / Phalguna 25 / Mar 8
74. Mahavishuva Day	Day of Sun's entry into Trop. Aries (Midnight rule)	Phalguna 30 / Chaitra 6 / Mar 20
		1946 S.E./5124 K.E./2024 A.D.
1. Indian New Year's Day	Fixed	Chaitra 1 / Chaitra 7 / March 21
2. Holikadahana	Phalguna S15(Night)	Chaitra 4 / Chaitra 10 / March 24
3. Holi Dolayatra	Day after Holikadahana	Chaitra 5 / Chaitra 11 / March 25
	Phalguna S15	Chaitra 5 / Chaitra 11 / March 25
4. Hola, Vasantatsava	Phalguna K1	Chaitra 6 / Chaitra 12 / March 26
5. Chaitra Sukladi(GudiPadava,Ugadi),	Chaitra S1	Chaitra 20 / Chaitra 26 / Apr 9
Cheti Chand (Sindhi New Year's Day),	Chaitra S1	Chaitra 20 / Chaitra 26 / Apr 9
Telugu New Year's Day,	Chaitra S1	Chaitra 20 / Chaitra 26 / Apr 9
Vasanta Navaratrarambha	Chaitra S1	Chaitra 20 / Chaitra 26 / Apr 9
6. Sarhul (Bihar)	Chaitra S3	Chaitra 22 / Chaitra 28 / Apr 11
7. Vaisakhi(Punjab,Hariyana,H.P.Delhi	Saura Vaisakhadi (Sunrise Rule)	Chaitra 24 / Chaitra 30 / Apr 13
& Odisha),Visu(Kerala),	Saura Vaisakhadi (Sunrise Rule)	Chaitra 24 / Chaitra 30 / Apr 13
Chaitra Samkranti, Chadak Puja	Saura Vaisakhadi (Midnight Rule)	Chaitra 24 / Chaitra 30 / Apr 13
(Bengal), Cheiraoba(Manipur)	Saura Vaisakhadi (Midnight Rule)	Chaitra 24 / Chaitra 30 / Apr 13
		1946 S.E./ 5125 K.E. /2024 A.D.
8. Meshadi (T.N), Tamil New Year's Day,	Saura Vaisakhadi (Sunset Rule)	Chaitra 25 / Vaisakha 1 / Apr 14
Vaisakhadi (Bengal),Bahag Bihu	Day following Saura Vaisakhadi	Chaitra 25 / Vaisakha 1 / Apr 14
(Assam), Shilhenba (Manipur),	(Midnight Rule)	Chaitra 25 / Vaisakha 1 / Apr 14
Dr.B.R.Ambedkar Jayanti,Beginning	Fixed	Chaitra 25 / Vaisakha 1 / Apr 14
of 5125 K.E.		Chaitra 25 / Vaisakha 1 / Apr 14
9. Vasanti Pujarambha Oli Begins (Jain)	Chaitra S7	Chaitra 26 / Vaisakha 2 / Apr. 15
10. Rama Navami	Eight days before Oli ends	Chaitra 26 / Vaisakha 2 / Apr. 15
11. Mahavira Jayanti	Chaitra S9	Chaitra 28 / Vaisakha 4 / Apr. 17
12. Oli Ends(Jain)	Chaitra S13	Vaisakha 1 / Vaisakha 8 / Apr 21
Babu Kuer Singh Day(Bihar)	Chaitra S15(Udayavyapini)	Vaisakha 3 / Vaisakha 10 / Apr 23
13. May Day	Fixed	Vaisakha 3 / Vaisakha 10 / Apr 23
14. Tithi of Deva Damodara (Assam)	Fixed	Vaisakha 11 / Vaisakha 18 / May 1
Birthday of RabindranathTagore	S1 of Saura Vaisakha	Vaisakha 18 / Vaisakha 25 / May 8
15. Akshaya Tritiya	25 Vaisakha of Beng. Calendar	Vaisakha 18 / Vaisakha 25 / May 8
16. Buddha Purnima	Vaisakha S3	Vaisakha 20 / Vaisakha 27/ May 10
17. Pratap Jayanti (Rajasthan)	Vaisakha S15	Jyaishtha 2 / Jyaishtha 9/ May 23
18. Guru Arjan Dev's Martyrdom Day	Jyaishtha S3	Jyaishtha 19 / Jyaishtha 26 / June 9
19. Rajas Samkranti (Odisha)	Jyaishtha S4	Jyaishtha 20 / Jyaishtha 27 /June10
20. Rathayatra	Saura Ashadhadi (Sunrise rule)	Jyaishtha 24 / Jyaishtha 31/ June14
21. Kharchi Puja (Tripura)	Ashadha S2	Ashadha 16 / Ashadha 23 / July 7
22. Ultaratha (Odisha),Bahudha Yatra	Ashadha S8	Ashadha 23 / Ashadha 30 / July 14
	9th day from Rathayatra	Ashadha 24 / Ashadha 31 /July 15

PRINCIPAL FESTIVALS AND ANNIVERSARIES FOR HOLIDAYS

Festivals	Criterion	Date
		1946 S.E./ 5125 K.E./ 2024 A.D
23. Punaryatra	Ashadha S10	Ashadha 25 / Sravana 1 / July 16
24. Tilak Commemoration Day	Fixed	Sravana 10 / Sravana 17 / Aug 1
25. Ker Puja (Tripura)	First Tuesday or Saturday after 14 days from Kharchi Puja not falling on K10	Sravana 12 / Sravana 19 /Aug 3
26. Karkataka Vavu (Kerala)	K30 of Saura Sravana	Sravana 13 / Sravana 20 / Aug 4
27. Independence Day	Fixed	Sarvana 24 / Sravana 31 /Aug 15
Jhulana Yatrarambha	Sravana S11	Sarvana 24 / Sravana 31 /Aug 15
28. Rik Upakarma	Sravana Nak. of Chandra Sravana	Sarvana 28 / Bhadra 4 /Aug 19
Raksha Bandhan	Sravana S15 (Pradosa)	Sarvana 28 / Bhadra 4 /Aug 19
Naroli Purnima	Sravana S15 (Aparahna&Sayahna)	Sarvana 28 / Bhadra 4 /Aug 19
Avani Avittam (S.India)	Sravana S15	Sarvana 28 / Bhadra 4 /Aug 19
Solono (Rakhi Bandhan)	Sravana S15 (Udayavyapini)	Sarvana 28 / Bhadra 4 /Aug 19
Jhulana Yatra Samapanna	Sravana S15 (Purvahna)	Sarvana 28 / Bhadra 4 /Aug 19
29. Tithi of Sri Madhava Deva (Assam)	K5 of Saura Bhadra	Bhadra 1 / Bhadra 8 /Aug 23
30. Janmashtami	Sravana K8	Bhadra 4 / Bhadra 11 /Aug 26
31. Gokulashtami (Nandotsava)	Day after Janmashtami	Bhadra 5 / Bhadra 12 /Aug 27
Sri Jayanti (Ramanuja)	Rohini Nakshatra of Saura Bhadra	Bhadra 5 / Bhadra 12 /Aug 27
32. Paryusana Parvarambha (Chaturthi Paksha-Jain)	7 Days before Samvatsari (Chaturthi Paksha)	Bhadra 9 / Bhadra 16 /Aug 31
33. ParyusanaParvarambha (Panchami Paksha-Jain)	7 Days before Samvatsari (Panchami Paksha)	Bhadra 10 / Bhadra 17 / Sep 1
34. Jain Festival	Sravana K30 (Udayavyapini)	Bhadra 12 / Bhadra 19 / Sep 3
35. Tithi of Sri Sankara Deva(Assam)	S2 of Saura Bhadra	Bhadra 14 / Bhadra 21 / Sep 5
36. Vinayak Chaturthi (Tamilnadu)	S4 of Saura Bhadra	Bhadra 16 / Bhadra 23 / Sep 7
Ganesha Chaturthi	Bhadra S4	Bhadra 16 / Bhadra 23 / Sep 7
Samvatsari (Chaturthi Paksha-Jain)	Bhadra S4 (Udayavyapini)	Bhadra 16 / Bhadra 23 / Sep 7
37. Samvatsari (Panchami Paksha-Jain)	Bhadra S5 (Current at Sunset)	Bhadra 17 / Bhadra 24 / Sep 8
38. Radhashtami	Bhadra S8	Bhadra 20 / Bhadra 27 / Sep 11
39. First Onam Day	Day before Thiru Onam Day	Bhadra 23 / Bhadra 30 / Sep 14
40. Onam or Thiru Onam Day	Sravana Nak. of Saura Bhadra	Bhadra 24 / Bhadra 31 / Sep 15
41. Third Onam Day	Day after Thiru Onam Day	Bhadra 25 / Asvina 1 / Sep 16
42. Fourth Onam Day	Two Days after Thiru Onam Day	Bhadra 26 / Asvina 2 / Sep 17
Ananta Chaturdasi	Bhadra S14	Bhadra 26 / Asvina 2 / Sep 17
43. Samadhi Day of Narayana Guru (Kerala)	Fixed	Bhadra 30 / Asvina 6 / Sep 21
44. Mahatma Gandhi's Birthday	Fixed	Asvina 10 /Asvina 17 / Oct 2
Mahalaya Amavasya, Sarvapitri	Bhadra K30	Asvina 10 /Asvina 17 / Oct 2
Amavasya,Tarpana Layba(Manipur)	Bhadra K30	Asvina 10 /Asvina 17 / Oct 2
45. Saradiya Navaratrarambha	Asvina S1	Asvina 11 /Asvina 18 / Oct 3
46. Oli Begins (Jain)	Eight Days before Oli Ends	Asvina 17 / Asvina 24 / Oct 9
47. Durga Puja Begins (Saptami)	Asvina S7	Asvina 18 / Asvina 25 / Oct 10
48. Durga Puja (Mahashtami)	Asvina S8	Asvina 19 / Asvina 26 / Oct 11
Durga Puja (Mahanavami)	Asvina S9	Asvina 19 / Asvina 26 / Oct 11
Ayudha Puja	Day before Dussehara	Asvina 19 / Asvina 26 / Oct 11
49. Durga Puja (Mahanavami)(Bengal),	Asvina S9	Asvina 20 / Asvina 27 / Oct 12
Vijaya Dasami (Dussehara or Dasahara)	Asvina S10 (Aparahna)	Asvina 20 / Asvina 27 / Oct 12
50. Vijaya Dasami (Bengal & Kerala)	Asvina S10 (Purvahna)	Asvina 21 / Asvina 28 / Oct 13
51. Kumara Purnima (Odisha)	Asvina S15(Pradosa)	Asvina 24 / Kartika 1 / Oct 16
Kojagori Lakshmi Puja (Bengal)	Asvina S15(Pradosa)	Asvina 24 / Kartika 1 / Oct 16
52. Kaveri Samkramana Snana	Saura Kartikadi (Midnight Rule)	Asvina 25 / Kartika 2 / Oct 17
Maharshi Valmiki's Birthday,	Asvina S15(Udayavyapini)	Asvina 25 / Kartika 2 / Oct 17
Oli Ends (Jain)	Asvina S15 (Udayavyapini)	Asvina 25 / Kartika 2 / Oct 17
53. NarakaChaturdasi(Purvarunodaya),	Asvina K14 (Purvarunodaya)	Kartika 9 / Kartika 16 / Oct 31
Hanumajjanma,	Asvina K14 (Udayavyapini)	Kartika 9 / Kartika 16 / Oct 31
Dipavali (S.India),	Asvina K14	Kartika 9 / Kartika 16 / Oct 31
Kali Puja, Dipavali	Asvina K30	Kartika 9 / Kartika 16 / Oct 31
54. Kartika Sukladi	Kartika S1	Kartika 11 / Kartika 18 / Nov 2
Govardhana Puja	Kartika S1	Kartika 11 / Kartika 18/ Nov 2
Bali Puja	Kartika S1	Kartika 11 / Kartika 18/ Nov 2

Festivals	Criterion	National / Nirayana/ Gregorian
		1945 S.E./ 5124 K.E./ 2024 A.D.
55. Bhratri Dvitiya, Tikka Ceremony, Bhai Duj	Kartika S2 (Aparahna)	Kartika 12 / Kartika 19 / Nov 3
Dwat Puja (Bihar)	Kartika S2 (Purvahna)	Kartika 12 / Kartika 19 / Nov 3
56. PratiharaShashthi or Surya Shashthi (Chhat - Bihar)	Kartika S6	Kartika 16 / Kartika 23 / Nov 7
57. Rasayatra	Kartika S15	Kartika 24 / Agrahayana 1 / Nov 15
Kartiki Purnima,	Kartika S15	Kartika 24 / Agrahayana 1 / Nov 15
Rathayatra (Jain),	Kartika S15 (Udayavyapini)	Kartika 24 / Agrahayana 1 / Nov 15
Guru Nanak's Birthday, Puskar Fair	Kartika S15	Kartika 24 / Agrahayana 1 / Nov 15
58. Prathamashtami (Odisha)	Kartika K8	Agrahayana 2 / Agrahayana 9 / Nov 23
59. Guru Tegh Bahadur's Martyrdom Day	Fixed	Agrahayana 3 /Agrahayana 10 / Nov 24
60. Huthri-3 Days (Coorg)	S15 to K2 of Saura Margasirsha	Agrahayana 24 / Pausha 1 / Dec 15
61. Jor Mela-3 Days (Punjab)	Fixed	Pausha 5 / Pausha 12 / Dec 26
		1945 S.E./ 5124 K.E./ 2024 A.D.
62. Guru Gobind Singh's Birthday	Pausha S7	Pausha 16 / Pausha 23 / Jan 6
63. Vaikuntha Ekadasi (S.India)	S11 of Saura Pausha	Pausha 20 / Pausha 27 / Jan 10
64. Bhogi (S.India)	Day before Pongal	Pausha 23 / Pausha 30 / Jan 13
65. Makara Samkranti (Bengal)	The Day of Saura Maghadi	Pausha 24 / Magha 1 / Jan 14
Magha Bihu (Assam)	The Day of Saura Maghadi	Pausha 24 / Magha 1 / Jan 14
Makara Snana, Tila Samkranti,	The Day of Saura Maghadi	Pausha 24 / Magha 1 / Jan 14
Pongal (S.India),	The Day of Saura Maghadi	Pausha 24 / Magha 1 / Jan 14
Tai Pongal (Kerala)	The Day of Saura Maghadi (18 Ghatika rule)	Pausha 24 / Magha 1 / Jan 14
66. Mattu Pongal or Kanumu	The Day after Pongal	Pausha 25 / Magha 2 / Jan 15
67. Netaji's Birthday	Fixed	Magha 3 / Magha 10 / Jan 23
68. Republic Day	Fixed	Magha 6 / Magha 13 / Jan 26
69. Sri Panchami, Vasanta Panchami	Magha S5	Magha 13 / Magha 20 / Feb 2
70. Guru Ravi Das's Birthday	Magha S15	Magha 23 / Magha 30 / Feb 12
71. Shivaji Jayanti	Fixed	Magha 30 / Phalguna 7/ Feb 19
72. Birthday of Swami Dayananda Saraswati (Founder of Arya Samaj)	Phalguna K10 (Purnimanta)	Phalguna 4 / Phalguna 11 / Feb 23
73. Maha Shivaratri	Magha K14	Phalguna 7 / Phalguna 14 / Feb 26
74. Holikadahana	Phalguna S15(Night)	Phalguna 22 / Phalguna 29 / Mar 13
75. Holi,	Day after Holikadahana	Phalguna 23 / Phalguna 30 / Mar 14
Dolayatra	Phalguna S15	Phalguna 23 / Phalguna 30 / Mar 14
76. Hola, Vasantatsava	Phalguna K1	Phalguna 24 / Chaitra 1 / Mar 15
77. Mahavisuva Day	Day of Sun's entry into Trop. Aries (Midnight rule)	Phalguna 29 / Chaitra 6 / Mar 20

Special Festivals for Jammu and Kashmir

Festivals	Criterion	National / Nirayana / Gregorian Saka 1945 / Kali 5124 / 2024 A.D
7. Lohri	Day before Saura Maghadi (Sunrise Rule)	Pausha 23/Pausha 30/ Jan 13
		Saka 1946/ Kali 5125/ 2024 A.D
1. Mela Bahu Fort	Chaitra S 8	Chaitra 27 / Vaisakha 3 / Apr 16
2. Mela Kshir Bhawani	Jyaishtha S 8	Jyaishtha 24 / Jyaishtha 31/ June 14
3. Guru Hargobind's Birthday	Jyaishtha K 1	Ashadha 1 / Ashadha 8 / June 22
4. Martyr's Day	Fixed	Ashadha 22 / Ashadha 29 / July 13
5. Kailas Yatra-2 Days	Sravana K 13 & K 14	Bhadra 9 / Bhadra 16 / Aug 31
6. Mela Pat - 3 Days	Bhadra S 5 to S 7	Bhadra 17 / Bhadra 24 / Sep 8
		Saka 1946 / Kali 5125 / 2025 A.D
7. Lohri	Day before Saura Maghadi (Sunrise Rule)	Pausha 23 / Pausha 30 / Jan 13

Festivals	Criterion	National/Nirayana/Gregorian
		Saka 1946/Kali 5124/2024A.D
1. Shahadat-e-Hazrat Ali	21 Ramadan	Chaitra 12/Chaitra 18/April 1
2. Jumatul Vida	Last Friday of Ramadan	Chaitra 16/Chaitra 22/April 5
3. Sab-e-Qadr*	27 Ramadan	Chaitra 18/Chaitra 24/April 7
4. Id-ul-Fitr	1 Shawwal	Chaitra 22/Chaitra 28/April 11
		Saka1946/Kali 5125/2024 A.D
5. Id-uz-Zuha(Bakrid)	10 Zulhijja	Jyaishtha 27/Ashadha 3/June17
6. Muharram	10 Muharram	Ashadha 26/Sravana 2/July 17
7. Chelhum	Fortieth Day from (39 days	Bhadra 3/ Bhadra 10/Aug 25
8. Shahadat-e-Iman Hasan	after) 10 Muharram	
9. Akheri Chahar Shumba	28 Safar	Bhadra 11/ Bhadra 18/Sep 2
10. Miland-un-Nabi or Id-e-Milad	Last Wednesday of Safar	Bhadra 13/ Bhadra 20/Sep 4
(Birthday of Prophet), Fateha Dwaz Daham or Bara Wafat	12 Rabiu'lawwal	Bhadra 25/ Aavina 1/Sep 16
11. Id-e-Maulad	17 Rabiu'lawwal	Bhadra 30/ Aavina 6/Sep 21
12. FatehaYazdaham (Giarhween Sharif)	11 Rabiu'ssani	Aavina 23/ Aavina 30/Oct 15
		Saka1946/Kali 5125/2025 A.D
13. Hazrat Ali's Birthday	13 Rajab	Pausha24/ Magha 1/Jan 14
14. Sab-e-Miraj*	27 Rajab	Magha 8/ Magha 15/Jan 28
15. Sab-e-Barat*	15 Shaban	Magha 25/ Phalguna 2/Feb 14
16. First Day of Ramadan	1 Ramadan	Phalguna 11/ Phalguna 18/Mar 02
		Saka1947/Kali 5125/2025 A.D
1. Shahadat-e-Hazrat Ali	21 Ramadan	Chaitra 1/Chaitra 8/Mar 22
2. Jumatul Vida	Last Friday of Ramadan	Chaitra 7/Chaitra 14/Mar 28
3. Sab-e-Qadr*	27 Ramadan	Chaitra 7/Chaitra 14/Mar 28
4. Id-ul-Fitr	1 Shawwal	Chaitra 10/Chaitra 17/Mar 31

*The festival is observed in the preceeding night

The Islamic Calendar (2024-25 A.D.)(Hejira: 1445-1446A.H.)

The beginning dates of the different months of the Islamic Calendar for the year 2024-25 A.D. determined on the basis of the first visibility of the lunar crescent after the New-Moon day culculated for the Central Station of India are as follows:-

1445A.H.					1445 A.H.				
Rajab	"	Jan. 13	2024A.D	(30)	Rabiu'l awwal	"	Sept 5	2024A.D.	(30)
Shaban	"	Feb. 12	"	(29)	Rabiu's sani	"	Oct 5	"	(30)
Ramadan	"	Mar. 12	"	(30)	Jumadu'l awwal	"	Nov 4	"	(30)
Shawwal	"	April 11	"	(29)	Jumadu's sani	"	Dec 4	"	(29)
Zu'lqada	"	May 10	"	(29)	Rajab	"	Jan 2	2025	(29)
Zulhijja	"	June 08	"	(30)	Shaban	"	Jan 31	"	(30)
MUHARRAM1446A.H.		July 08	"	(29)	Ramadan	"	March 2	"	(29)
Safar	"	Aug 06	"	(30)	Shawwal	"	March 31	"	(30)

N.B.-Actually the months begin from sunset of the preceding day when the Moon becomes first visible.
*The moon may be visible on 22.03.2023 in western part of India.

Fixed Calendar

According to the Fixed Calendar the beginning dates of different months are as follows : Jan. 12(2024 A.D.), Feb. 11, Mar. 11, Apr. 10, May 9, June 8, July 8, Aug. 7, Sept. 5, Oct. 5, Nov. 3, Dec. 3 , Jan. 1(2025 A.D.) Jan. 31, Mar. 1, Mar 31.

THE PARSI (SHAHENSHAHI) CALENDAR, 2024 - 2025 A.D.

(As used by the Indian Parsis)

Yazdejardi Era : 1393 - 1394

The beginning dates of different months of the Parsi Shahenshahi Calendar are as follows :
As regards the Parsi Kadmi Calendar, the months are the same but they begin 30 days earlier.

Shahrivar	**1393**	Jan. 13	**2024 A.D**	(30)	Ardibehesht	**1394**	Sept. 14	**2024 A.D**	(30)
Meher	"	Feb. 12	"	(30)	Khordad	"	Oct. 14	"	(30)
Avan	"	Mar. 13	"	(30)	Tir	"	Nov. 13	"	(30)
Adar	"	Apr. 12	"	(30)	Amardad	"	Dec. 13	"	(30)
Dei	"	May 12	"	(30)	Shahrivar	"	Jan. 12	**2025 A.D**	(30)
Bahman	"	June 11	"	(30)	Meher	"	Feb. 11	"	(30)
Aspandad	"	July 11	"	(30)	Avan	"	Mar. 13	"	(30)
Gathas(I-V)	"	Aug. 10	"	(5)	Adar	"	Apr. 12	"	(30)
FARVARDIN	**1394**	Aug. 15	"	(30)	Dei	"	May 12	"	(30)

PARSI FESTIVALS

Festivals	Criterion	**Shahenshahi**	**Kadmi**
		National / Nirayana / Gregorian Saka 1946/ Kali 5125/ 2024 A.D.	**National / Nirayana / Gregorian Saka 1946/ Kali 5125/ 2024 A.D.**
Zarthost-no-Diso	11 Dei	Jyaishtha 1 / Jyaishtha 8 / May 22	Vaisakha 2/ Vaisakha 9/ Apr. 22
Gatha Gahambar	Gatha III	Sravana 21 / Sravana 28 / Aug. 12	Ashadha 22/ Ashadha 29/ July 13
Parsi New Year Eve	Gatha V	Sravana 23 / Sravana 30 / Aug. 14	Ashadha 24/ Ashadha 31/ July 15
Parsi New Year's Day	1 Farvardin	Sravana 24 / Sravana 31 / Aug. 15	Ashadha 25/ Sravana 1/ July 16
Khordad Sal (Birthday of Prophet Zarthost)	6 Farvardin	Shravana 29 / Bhadra 5/ Aug. 20	Ashadha 30/ Sravana 6/ July 21

N.B.- Jamshedi Naoroj falls on March 21 every year

THE JEWISH CALENDAR, 2024 - 2025 A.D.

Jewish Era : 5784 - 85 A.M.

To beginning dates of different months of the Jewish Calendar are as follows:

5784 A.M.					**5784 A.M.**				
Shebat	"	Jan. 11	**2024A.D.**	(30)	Ellul	"	Sep. 4	**2024 A.D**	(29)
Vedar	"	Feb. 10	"	(30)	**TISHRI**	**5785 A.M.**	Oct. 3	"	(30)
Adar	"	Mar. 11	"	(29)	Heshvan	"	Nov. 2	"	(30)
Nisan	"	April 9	"	(30)	Kislev	"	Dec. 2	"	(30)
Iyar	"	May 9	"	(29)	Tebeth	"	Jan. 1	**2025 A.D**	(29)
Sivan	"	June 7	"	(30)	Shebat	"	Jan. 30	"	(30)
Tammuz	"	July 7	"	(29)	Adar	"	Mar. 1	"	(29)
Ab	"	Aug. 5	"	(30)	Nisan	"	Mar. 30	"	(30)

JEWISH FESTIVALS 2024-2025 A.D.

Festivals	Criterion	Date
		Saka 1946 / Kali 5124 / 2024 A.D.
Purim	14 Adar	Chaitra 04 / Chaitra 10 /March 24
		Saka 1946 / Kali 5125 / 2024 A.D.
First day of Passover (Pesach)	15 Nisan	Vaisakha 3/ Vaisakha 10 / April 23
Feast of Weeks (Shebuoth)	6 Sivan	Jyaishtha 22/ Jyaishtha 29/ June12
Tishabeab	9 Ab	Sravana 22/ Sravana 29/ Aug 13
Jewish New Year (Rosh Hashanah)	1 Tishri	Asvina 11/ Asvina 18/ Oct 3
Day of Atonement (Yom Kippur)	10 Tishri	Asvina 20/ Asvina 27/ Oct 12
First day of Tabernacles (Succoth)	15 Tishri	Asvina 25/ Kartika 2 / Oct 17
Last day of Succoth (SimhathTorah)	23 Tishri	Kartika 3/ Kartika 10 / October 25
Hanukah	25 Kislev	Pausha 5/ Pausha 12/ December 26
		Saka 1946 / Kali 5125 / 2025 A.D.
Purim	14 Adar	Phalguna 23/ Phalguna 30/ March 14
First day of Passover (Pesach)	15 Nisan	Chaitra 23/ Chaitra 30/ April 13

CHRISTIAN FESTIVALS, 2024-2025 A.D.

Festivals	Criterion	Date
		National/Nirayana/Gregorian
		Saka 1945 / Kali 5124 / 2024 A.D.
1. Christian (English) New Year's Day	Fixed	Pausha 11 / Pausha 18 / Jan. 01
2. Epiphany	Fixed	Pausha 16 / Pausha 23 / Jan. 06
3. Septuagesima Sunday	63 days before Easter Sunday	Magha 8 / Magha 15 / Jan 28
4. Quinquagesima (Shrove) Sunday	49 days before Easter Sunday	Magha 22 / Magha 29 / Feb 11
5. Ash Wednesday	46 days before Easter Sunday	Magha 25 / Phalguna 2 / Feb 14
		Saka 1946 / Kali 5124 / 2024 A.D.
6. Palm Sunday	7 days before Easter Sunday	Chaitra 4 / Chaitra 10 / Mar 24
7. Good Friday	2 days before Easter Sunday	Chaitra 9 / Chaitra 15 / Mar 29
8. Easter (Holy) Saturday	Day before Easter Sunday	Chaitra 10 / Chaitra 16 / Mar 30
9. Easter Sunday	First Sunday after the 14^{th} day of the Moon (nearly Full Moon) occurring on or immediately after March 21	Chaitra 11 / Chaitra 17 / Mar 31
10. Low Sunday	7 days after Easter Sunday	Chaitra 18 / Chaitra 24 / April 7
		Saka 1946 / Kali 5125 / 2024 A.D.
11. Rogation Sunday	35 days after Easter Sunday	Vaisakha 15 / Vaisakha 22 / May 5
12. Ascension Day-Holy Thursday	39 days after Easter Sunday	Vaisakha 19 / Vaisakha 26 / May 9
13. Ascension Sunday	3 days after Ascension day	Vaisakha 22 / Vaisakha 29 / May 12
14. Whit Sunday-Pentecost	49 days after Easter Sunday	Vaisakha 29 / Jyaishtha 5 / May 19
15. Trinity Sunday	56 days after Easter Sunday	Jyaishtha 5 / Jyaishtha 12 / May 26
16. Corpus Christi (Thursday)	60 days after Easter Sunday	Jyaishtha 9 / Jyaishtha 16 / May 30
17. First Sunday in Advent	Fourth Sunday before Christmas, i.e.,Sunday nearest to Nov.,30.	Agrahayana10/Agrahayana17/Dec1
18. Christmas Eve	Day before Christmas	Pausha 3 / Pausha 10 / Dec. 24
19. Christmas Day	Fixed	Pausha 4 / Pausha 11 / Dec. 25
20. New Year Eve	Fixed	Pausha 10 /Pausha 17 /Dec. 31
		Saka 1946 / Kali 5125 / 2025 A.D.
1. Christian (English) New Yearôs Day	Fixed	Pausha 11 / Pausha 18 / Jan. 01
2 Epiphany	Fixed	Pausha 16 / Pausha 23 / Jan. 06
3. Septuagesima Sunday	63 days before Easter Sunday	Magha 27/ Phalguna 4 / Feb 16
4. Quinquagesima (Shrove) Sunday	49 days before Easter Sunday	Phalguna 11 / Phalguna 18 / Mar 2
5. Ash Wednesday	46 days before Easter Sunday	Phalguna 14 / Phalguna 21 / Mar 5
		Saka 1947 / Kali 5125 / 2025 A.D.
6. Palm Sunday	7 days before Easter Sunday	Chaitra 23 / Chaitra 30 / April 13
		Saka 1947 / Kali 5126/ 2025 A.D.
7. Good Friday	2 days before Easter Sunday	Chaitra 28 / Vaisakha 5 / April 18
8. Easter (Holy) Saturday	Day before Easter Sunday	Chaitra 29 / Vaisakha 6 / April 19
9. Easter Sunday	First Sunday after the 14^{th} day of the Moon (nearly Full Moon) occurring on or immediately after March 21	Chaitra 30 / Vaisakha 7 / April 20

THE INDIAN LUNAR CALENDAR

TIME OF NEW MOON(IN I.S.T.) MARKING THE COMMENCEMENT OF LUNAR MONTHS

	2006 (1927-28 S.E.)	d	h	m	2009 (1930-31 S.E.)	d	h	m	2012 (1933-34 S.E.)	d	h	m
Pausha			---				---				---	
Magha	Jan.	29	19	45	Jan.	26	13	25	Jan.	23	13	09
Phalguna	Feb.	27	30	01	Feb.	25	07	05	Feb.	21	28	05
Chaitra	Mar.	29	15	45	Mar.	26	21	36	Mar.	22	20	07
Vaisakha	Apr.	27	25	14	Apr.	25	08	53	Apr.	21	12	48
Jyaishtha	May	27	10	56	May	24	17	41	May	20	05	17
Ashadha	June	25	21	35	June	22	25	05	June	19	20	32
Sravana	July	25	10	01	July	22	08	05	July	19	09	54
Bhadra	Aug.	23	24	40	Aug.	20	15	32	*Aug.*	*17*	*21*	*24*
									Sept.	16	07	41
Asvina	Sept.	22	17	15	Sept.	18	24	14	Oct.	15	17	33
Kartika	Oct.	22	10	44	Oct.	18	11	03	Nov.	13	27	38
Margasirsha	Nov.	20	27	48	Nov.	16	24	44	Dec.	13	14	12
Pausha	Dec.	20	19	31	Dec.	17	17	32			---	

	2007 (1928-29 S.E.)	d	h	m	2010 (1931-32 S.E.)	d	h	m	2013 (1934-35 S.E.)	d	h	m
Pausha			---				---		Jan.	11	25	14
Magha	Jan.	19	09	31	Jan.	15	12	41	Feb.	10	12	50
Phalguna	Feb.	17	21	44	Feb.	14	08	21	Mar.	11	25	21
Chaitra	Mar.	19	08	13	Mar.	15	26	31	Apr.	10	15	05
Vaisakha	Apr.	17	17	06	*Apr.*	*14*	*17*	*59*	May	10	05	58
					May	14	06	34				
Jyaishtha	*May*	*16*	*24*	*57*	June	12	16	45	June	8	21	26
	June	15	08	43								
Ashadha	July	14	17	34	July	11	25	10	July	8	12	44
Sravana	Aug.	12	28	33	Aug.	10	08	38	Aug.	6	27	21
Bhadra	Sept.	11	18	14	Sept.	8	16	00	Sept.	5	17	06
Asvina	Oct.	11	10	31	Oct.	7	24	15	Oct.	5	06	05
Kartika	Nov.	09	28	33	Nov.	6	10	22	Nov.	3	18	20
Margasirsha	Dec.	09	23	10	Dec.	5	23	06	Dec.	2	29	52
Pausha			---				---					

	2008 (1929-30 S.E.)	d	h	m	2011 (1932-33 S.E.)	d	h	m	2014 (1935-36 S.E.)	d	h	m
Pausha	Jan.	08	17	17	Jan.	4	14	33	Jan.	1	16	44
Magha	Feb.	07	09	14	Feb.	3	08	01	Jan.	30	27	09
Phalguna	Mar.	07	22	44	Mar.	4	26	16	Feb.	1	13	30
Chaitra	Apr.	06	09	25	Apr.	3	20	02	Mar.	30	24	15
Vaisakha	*May*	05	17	48	May	3	12	21	Apr.	29	11	44
Jyaishtha	June	03	24	53	June	1	26	33	May	28	24	10
Ashadha	July	03	07	49	July	1	14	24	June	27	13	39
Sravana	Aug.	01	15	43	July	30	24	10	July	26	28	12
Bhadra	Aug.	30	25	28	Aug.	29	08	34	Aug.	25	19	43
Asvina	Sept.	29	13	42	Sept.	27	16	39	Sept.	24	11	44
Kartika	Oct.	28	28	44	Oct.	26	25	26	Oct.	23	27	27
Margasirsha	Nov.	27	22	25	Nov.	25	11	40	Nov.	22	18	02
Pausha	Dec.	27	17	52	Dec.	24	23	36	Dec.	22	07	06

N.B.-The figres in the italics show the beginning of the intercalary (*mala or adhika*) month followed by the normal (*suddha or nija*) month of the same name.

THE INDIAN LUNAR CALENDAR

TIME OF NEW MOON(IN I.S.T.) MARKING THE
COMMENCEMENT OF LUNAR MONTHS

		2015 (1936-37 S.E.)				2018 (1939-40 S.E.)				2021 (1942-43 S.E.)				2024 (1945-46 S.E.)		
		d	h	m		d	h	m		d	h	m		d	h	m
Pausha			---				---		Jan.	13	10	30	Jan.	11	17	27
Magha	Jan.	20	18	44	Jan.	17	07	47	Feb.	11	24	36	Feb.	09	28	29
Phalguna	Feb.	18	29	17	Feb.	15	26	35	Mar.	13	15	51	Mar.	10	14	30
Chaitra	Mar.	20	15	06	Mar.	17	18	42	Apr.	12	08	01	Apr.	08	23	51
Vaisakha	Apr.	18	24	27	Apr.	16	07	27	May	11	24	30	May	08	08	52
Jyaishtha	May	18	09	43	*May*	*15*	*17*	*18*	June	10	16	23	June	06	18	08
					June	13	25	13								
Ashadha	*June*	*16*	*19*	*35*	July	13	08	18	July	10	06	47	July	05	28	27
Sravana	Aug.	14	20	23	Aug.	11	15	28	Aug.	08	19	20	Aug.	04	16	43
Bhadra	Sept.	13	12	11	Sept.	9	23	32	Sept.	07	06	22	Sept.	03	07	26
Asvina	Oct.	12	29	36	Oct.	9	09	17	Oct.	06	16	35	Oct.	02	24	19
Kartika	Nov.	11	23	17	Nov.	7	21	32	Nov.	04	26	45	Nov.	01	17	18
Margasirsha	Dec.	11	15	59	Dec.	7	12	50	Dec.	04	13	13	Dec.	01	11	51
Pausha			---				---				---		Dec.	30	27	57

		2016 (1937-38 S.E.)				2019 (1940-41 S.E.)				2022 (1943-44 S.E.)				2025 (1946-47 S.E.)		
		d	h	m		d	h	m		d	h	m		d	h	m
Pausha	Jan.	10	07	01	Jan.	6	06	58	Jan.	02	24	04			---	
Magha	Feb.	8	20	09	Feb.	4	26	34	Feb.	01	11	16	Jan.	29	18	06
Phalguna	Mar.	9	07	25	Mar.	6	21	34	Mar.	02	23	05	Feb	27	30	15
Chaitra	Apr.	7	16	54	Apr.	5	14	21	Apr.	01	11	54	Mar.	29	16	28
Vaisakha	May	6	25	00	May	4	28	16	Apr.	30	25	58	Apr.	27	25	01
Jyaishtha	June	5	08	30	June	3	15	32	May	30	17	00	May	27	8	32
Ashadha	July	4	16	31	July	2	24	46	June	29	08	22	June	25	16	02
Sravana	Aug.	2	26	15	Aug.	1	08	42	July	28	23	25	July	24	24	41
Bhadra	Sept.	1	14	33	Aug.	30	16	7	Aug.	27	13	47	Aug.	23	11	37
Asvina	Sept.	30	29	41	Sept.	28	23	56	Sept.	25	27	25	Sept.	21	25	24
Kartika	Oct.	30	23	08	Oct.	28	09	9	Oct.	25	16	19	Oct.	21	17	55
Margasirsha	Nov.	29	17	48	Nov.	26	20	36	Nov.	23	28	27	Nov.	20	12	17
Pausha	Dec.	29	12	23	Dec.	26	10	43	Dec.	23	15	47	Dec.	20	07	13

		2017 (1938-39 S.E.)				2020 (1941-42 S.E.)				2023 (1944-45 S.E.)				2026 (1947-48 S.E.)		
		d	h	m		d	h	m		d	h	m		d	h	m
Pausha			---				---				---				---	
Magha	Jan.	27	29	37	Jan.	24	27	12	Jan.	21	26	23	Jan.	18	25	22
Phalguna	Feb.	26	20	28	Feb.	23	21	2	Feb.	20	12	36	Feb	17	17	31
Chaitra	Mar.	28	08	27	Mar.	24	14	58	Mar.	21	22	53	Mar.	19	06	53
Vaisakha	Apr.	26	17	46	Apr.	23	07	56	Apr.	20	09	43	Apr.	17	17	22
Jyaishtha	May	25	25	14	May	22	23	9	May	19	21	23	*May*	*16*	*25*	*31*
													June	15	08	24
Ashadha	June	24	08	01	June	21	12	11	June	18	10	07	July	14	15	14
Sravana	July	23	15	16	July	20	23	3	July	*17*	*24*	*02*	Aug.	12	23	07
									Aug.	16	15	08				
Bhadra	Aug.	21	24	00	Aug.	19	08	12	Sept.	15	07	10	Sept.	11	08	57
Asvina	Sept.	20	11	00	Sept.	*17*	*16*	*30*	Oct.	14	23	25	Oct.	10	21	20
					Oct.	16	25	1								
Kartika	Oct.	19	24	42	Nov.	15	10	37	Nov.	13	14	57	Nov.	9	12	32
Margasirsha	Nov.	18	17	12	Dec.	14	21	47	Dec.	12	29	02	Dec.	8	30	22
Pausha	Dec.	18	12	00			---				---				---	

N.B.-The figres in the italics show the beginning of the intercalary(*mala or adhika*) month followed by the normal (*suddha or nija*) month of the same name.

INDIAN CALENDAR

SAKA ERA 1947 — Mesha : Madhava

Month of CHAITRA (30 days) — Spring (Vasanta), 2nd Month

(*Nirayana*) 7 Chaitra, 5125 Kali Era to (*Nirayana*) 7 Vaisakha, 5126 Kali Era

Date	Week Day	Gregorian Date		Sunrise		Apparent Noon		Sunset		Tithi				Nakshatra			Yoga		
										No.		Ending Moment		No.	Ending Moment		No.	Ending Moment	
				h	m	h	m	h	m			h	m		h	m		h	m
		2025A.D.																	
1	Sat	Mar	22	6	02.2	12	06.8	18	11.7	K	8	29	23.9	19	27	23.6	17	18	36.3
2	Sun		23	6	01.2	12	06.5	18	12.1		9	29	38.6	20	28	18.4	18	17	58.6
3	Mon		24	6	00.2	12	06.2	18	12.4	K	10	29	05.7	21	28	26.9	19	16	44.5
4	Tue		25	5	59.2	12	05.9	18	12.8		11	27	45.9	22	27	49.5	20	14	53.1
5	Wed		26	5	58.3	12	05.6	18	13.2		12	25	43.2	23	26	29.7	21	12	25.4
6	Thu		27	5	57.3	12	05.3	18	13.6		13	23	03.8	24	24	33.7	22	9	24.8
7	Fri		28	5	56.3	12	05.0	18	13.9		14	19	55.6	25	22	09.5	23	5	56.5
																	(24	26	06.9)
8	Sat		29	5	55.3	12	04.7	18	14.3	K	30	16	27.8	26	19	26.6	25	22	03.3
9	Sun		30	5	54.4	12	04.4	18	14.7	S	1	12	49.8	27	16	35.0	26	17	53.7
10	Mon		31	5	53.4	12	04.1	18	15.1		2	9	11.6	1	13	45.1	27	13	46.0
											(3	29	42.8)						
11	Tue	Apr.	1	5	52.4	12	03.8	18	15.4		4	26	32.9	2	11	06.8	1	9	48.0
12	Wed		2	5	51.5	12	03.5	18	15.8	S	5	23	50.3	3	8	49.8	2	6	07.1
																	(3	26	49.8)
13	Thu		3	5	50.5	12	03.2	18	16.2		6	21	42.0	4	7	02.4	4	24	01.4
14	Fri		4	5	49.6	12	03.0	18	16.5		7	20	13.3	5	5	51.2	5	21	45.3
														(6	29	20.6)			
15	Sat		5	5	48.6	12	02.7	18	16.9		8	19	27.0	7	29	32.1	6	20	03.3
16	Sun		6	5	47.7	12	02.4	18	17.3		9	19	23.6	8	---	---	7	18	55.1
17	Mon		7	5	46.7	12	02.1	18	17.7	S	10	20	00.6	8	6	24.9	8	18	18.7
18	Tue		8	5	45.8	12	01.8	18	18.1		11	21	13.5	9	7	55.1	9	18	10.3
19	Wed		9	5	44.9	12	01.5	18	18.4		12	22	56.0	10	9	57.3	10	18	25.3
20	Thu		10	5	43.9	12	01.3	18	18.8		13	25	01.2	11	12	24.7	11	18	58.7
21	Fri		11	5	43.0	12	01.0	18	19.2		14	27	22.1	12	15	10.4	12	19	45.2
22	Sat		12	5	42.1	12	00.8	18	19.6	S	15	---	---	13	18	07.8	13	20	40.2
23	Sun		13	5	41.2	12	00.5	18	20.0	S	15	5	52.2	14	21	10.8	14	21	39.2
24	Mon		14	5	40.3	12	00.2	18	20.4	K	1	8	25.5	15	24	13.7	15	22	38.0
25	Tue		15	5	39.5	12	00.0	18	20.8		2	10	56.0	16	27	10.5	16	23	32.5
26	Wed		16	5	38.6	11	59.8	18	21.2		3	13	17.6	17	---	---	17	24	18.2
27	Thu		17	5	37.7	11	59.5	18	21.6		4	15	23.9	17	5	55.2	18	24	50.1
28	Fri		18	5	36.9	11	59.3	18	22.0	K	5	17	07.9	18	8	21.1	19	25	03.3
29	Sat		19	5	36.0	11	59.1	18	22.4		6	18	22.5	19	10	21.1	20	24	52.3
30	Sun		20	5	35.2	11	58.9	18	22.8	K	7	19	01.2	20	11	48.5	21	24	12.5

N.B. - All timings are given in I.S.T. or the local mean time of the meridian of 82½° E. Long.

Names of Nakshatras:- 1.Asvini 2.Bharani 3.Krittika 4.Rohini 5.Mrigasiras 6.Ardra 7.Punarvasu 8.Pushya 9.Aslesha 10.Magha 11.Purva Phalguni 12.Uttara Phalguni 13.Hasta 14.Chitra 15.Svati 16.Visakha 17.Anuradha 18.Jyestha 19.Mula 20.Purvasadha 21.Uttarasadha 22.Sravana 23.Dhanistha 24.Satabhisaj 25.Purva Bhadrapada 26.Uttara Bhadrapada 27.Revati

Names of Yogas:- 1.Viskumbha 2.Priti 3.Ayusman 4.Saubhagya 5.Sobhana 6.Atiganda 7.Sukarma 8.Dhriti 9.Sula 10.Ganda 11. Vriddhi 12.Dhruva 13.Vyaghata 14.Harshana 15.Vajra 16.Siddhi (Asrik) 17.Vyatipata 18.Variyan 19.Parigha 20.Siva 21.Siddha 22.Sadhya 23.Subha 24.Sukla (Sukra) 25.Brahma 26.Indra 27.Vaidhriti

AYANAMSA, 2024

TRUE AYANAMSA FOR 5h 29^{m}

Date 2024		Ayanamsa			Date 2024		Ayanamsa			Date 2024		Ayanamsa			Date 2024-25		Ayanamsa		
		°	'	"				'	"				'	"			°	'	"
Jan.	1	24	11	27.1	Apr	30	24	11	43.7	Aug.	28	24	12	04.0	Dec.	26	24	12	21.4
	4	24	11	27.3	May	3	24	11	44.2	Sept.	31	24	12	04.6		29	24	12	22.1
	7	24	11	27.7		6	24	11	44.4		3	24	12	04.9	Jan.	1	24	12	23.0
	10	24	11	28.6		9	24	11	44.8		6	24	12	04.9		4	24	12	23.7
	13	24	11	29.5		12	24	11	45.6		9	24	12	05.0		7	24	12	23.9
	16	24	11	29.9		15	24	11	46.2		12	24	12	05.6		10	24	12	24.4
	19	24	11	30.2		18	24	11	46.5		15	24	12	06.2		13	24	12	25.4
	22	24	11	30.8		21	24	11	46.7		18	24	12	06.4		16	24	12	26.1
	25	24	11	31.6		24	24	11	47.2		21	24	12	06.5		19	24	12	26.4
	28	24	11	32.1		27	24	11	48.1		24	24	12	07.0		22	24	12	26.6
	31	24	11	32.3		30	24	11	48.8		27	24	12	07.6		25	24	12	27.2
Feb.	3	24	11	32.5	June	2	24	11	49.0	Oct.	30	24	12	07.9		28	24	12	28.0
	6	24	11	33.2		5	24	11	49.5		3	24	12	07.9	Feb.	31	24	12	28.6
	9	24	11	34.0		8	24	11	50.3		6	24	12	08.0		3	24	12	28.7
	12	24	11	34.3		11	24	11	51.1		9	24	12	08.5		6	24	12	29.1
	15	24	11	34.5		14	24	11	51.5		12	24	12	09.2		9	24	12	29.9
	18	24	11	35.0		17	24	11	51.7		15	24	12	09.5		12	24	12	30.5
	21	24	11	35.7		20	24	11	52.3		18	24	12	09.5		15	24	12	30.7
	24	24	11	36.1		23	24	11	53.2		21	24	12	10.1		18	24	12	30.8
	27	24	11	36.1		26	24	11	53.9		24	24	12	10.8		21	24	12	31.2
Mar.	1	24	11	36.2		29	24	11	54.2		27	24	12	11.2		24	24	12	31.8
	4	24	11	36.7	July	2	24	11	54.6		30	24	12	11.3		27	24	12	32.4
	7	24	11	37.4		5	24	11	55.5	Nov.	2	24	12	11.5	Mar.	2	24	12	32.4
	10	24	11	37.7		8	24	11	56.3		5	24	12	12.1		5	24	12	32.6
	13	24	11	37.7		11	24	11	56.7		8	24	12	12.8		8	24	12	33.3
	16	24	11	38.1		14	24	11	56.9		11	24	12	13.3		11	24	12	33.9
	19	24	11	38.8		17	24	11	57.3		14	24	12	13.4		14	24	12	34.0
	22	24	11	39.1		20	24	11	58.2		17	24	12	14.0		17	24	12	34.0
	25	24	11	39.2		23	24	11	58.9		20	24	12	15.0		20	24	12	34.3
	28	24	11	39.2		26	24	11	59.2		23	24	12	15.5		23	24	12	34.8
	31	24	11	39.6		29	24	11	59.5		26	24	12	15.7		26	24	12	35.4
Apr.	3	24	11	40.3	Aug.	1	24	12	00.2		29	24	12	16.1		29	24	12	35.4
	6	24	11	40.7		4	24	12	00.9	Dec.	2	24	12	16.7	Apr.	1	24	12	35.6
	9	24	11	40.7		7	24	12	01.2		5	24	12	17.6		4	24	12	36.3
	12	24	11	41.1		10	24	12	01.3		8	24	12	18.2		7	24	12	36.9
	15	24	11	41.8		13	24	12	01.6		11	24	12	18.5		10	24	12	37.0
	18	24	11	42.3		16	24	12	02.3		14	24	12	19.1		13	24	12	37.1
	21	24	11	42.4		19	24	12	03.0		17	24	12	20.1		16	24	12	37.3
	24	24	11	42.5		22	24	12	03.2		20	24	12	20.8		19	24	12	38.0
	27	24	11	43.0		25	24	12	03.4		23	24	12	21.1		22	24	12	38.6
	30	24	11	43.7	Aug.	28	24	12	04.0	Dec.	26	24	12	21.4	Apr.	25	24	12	38.8

Mean Ayanamsa= 23°51′25″.53 for J2000.0

Mean Ayanamsa= 24°11′32″.30+ precession from 2024.0 to date

Mean Ayanamsa= 24°12′22″.70+ precession from 2025.0 to date

True Ayanamsa= Mean Ayanamsa+ nutation in longitude

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^{h}\ 29^{m}.0$ I.S.T.

Date		Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
		°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Jan.	0	279	47	35	280	34	19	258	35	46	326	38	07	122	14	28	73	19	23	344	26	57
	1	280	48	46	293	54	10	259	52	08	327	42	41	121	55	06	73	12	56	344	31	27
	2	281	49	57	307	26	42	261	10	04	328	46	57	121	35	07	73	06	37	344	36	01
	3	282	51	07	321	09	10	262	29	24	329	50	55	121	14	35	73	00	27	344	40	41
	4	283	52	18	334	59	03	263	49	59	330	54	34	120	53	31	72	54	25	344	45	25
	5	284	53	28	348	54	25	265	11	42	331	57	53	120	31	59	72	48	33	344	50	13
	6	285	54	37	2	54	01	266	34	27	333	00	51	120	09	59	72	42	49	344	55	06
	7	286	55	47	16	57	10	267	58	08	334	03	29	119	47	36	72	37	16	345	00	04
	8	287	56	56	31	03	18	269	22	41	335	05	44	119	24	51	72	31	53	345	05	06
	9	288	58	04	45	11	31	270	48	03	336	07	36	119	01	47	72	26	39	345	10	13
	10	289	59	12	59	20	05	272	14	09	337	09	05	118	38	26	72	21	36	345	15	24
	11	291	00	19	73	26	15	273	40	57	338	10	09	118	14	53	72	16	43	345	20	39
	12	292	01	26	87	26	17	275	08	25	339	10	47	117	51	08	72	12	01	345	25	59
	13	293	02	33	101	15	60	276	36	32	340	10	59	117	27	16	72	07	29	345	31	22
	14	294	03	39	114	51	18	278	05	16	341	10	44	117	03	18	72	03	09	345	36	50
	15	295	04	45	128	09	02	279	34	35	342	09	59	116	39	17	71	58	59	345	42	22
	16	296	05	50	141	07	23	281	04	29	343	08	46	116	15	16	71	55	00	345	47	57
	17	297	06	55	153	46	14	282	34	58	344	07	02	115	51	19	71	51	13	345	53	36
	18	298	07	60	166	07	09	284	06	01	345	04	47	115	27	27	71	47	36	345	59	19
	19	299	09	04	178	13	06	285	37	37	346	01	60	115	03	43	71	44	12	346	05	06
	20	300	10	07	190	08	13	287	09	48	346	58	39	114	40	11	71	40	58	346	10	56
	21	301	11	11	201	57	24	288	42	32	347	54	43	114	16	53	71	37	57	346	16	50
	22	302	12	14	213	45	57	290	15	51	348	50	11	113	53	51	71	35	07	346	22	48
	23	303	13	16	225	39	22	291	49	45	349	45	02	113	31	09	71	32	29	346	28	49
	24	304	14	19	237	42	52	293	24	14	350	39	15	113	08	48	71	30	03	346	34	53
	25	305	15	20	250	01	07	294	59	18	351	32	47	112	46	52	71	27	49	346	41	01
	26	306	16	22	262	37	50	296	34	60	352	25	38	112	25	22	71	25	47	346	47	12
	27	307	17	22	275	35	21	298	11	19	353	17	46	112	04	22	71	23	58	346	53	27
	28	308	18	22	288	54	19	299	48	15	354	09	09	111	43	53	71	22	21	346	59	44
	29	309	19	21	302	33	31	301	25	51	354	59	45	111	23	57	71	20	55	347	06	05
	30	310	20	19	316	29	58	303	04	06	355	49	33	111	04	36	71	19	43	347	12	28
	31	311	21	16	330	39	24	304	43	01	356	38	31	110	45	53	71	18	42	347	18	55

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^{h}\ 29^{m}.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Feb. 1	312	22	12	344	56	51	306	22	38	357	26	36	110	27	48	71	17	54	347	25	24
2	313	23	07	359	17	31	308	02	57	358	13	46	110	10	23	71	17	18	347	31	56
3	314	24	00	13	37	16	309	43	59	358	59	59	109	53	41	71	16	54	347	38	30
4	315	24	52	27	52	60	311	25	45	359	45	13	109	37	41	71	16	43	347	45	08
5	316	25	43	42	02	36	313	08	16	0	29	24	109	22	26	71	16	44	347	51	47
6	317	26	32	56	04	43	314	51	31	1	12	31	109	07	56	71	16	58	347	58	30
7	318	27	19	69	58	21	316	35	32	1	54	31	108	54	11	71	17	24	348	05	14
8	319	28	06	83	42	36	318	20	19	2	35	21	108	41	13	71	18	02	348	12	01
9	320	28	50	97	16	25	320	05	51	3	14	58	108	29	02	71	18	52	348	18	51
10	321	29	34	110	38	35	321	52	09	3	53	19	108	17	38	71	19	54	348	25	42
11	322	30	15	123	47	53	323	39	12	4	30	22	108	07	01	71	21	09	348	32	36
12	323	30	56	136	43	17	325	26	59	5	06	02	107	57	12	71	22	35	348	39	31
13	324	31	34	149	24	16	327	15	28	5	40	18	107	48	11	71	24	13	348	46	28
14	325	32	12	161	51	00	329	04	37	6	13	05	107	39	57	71	26	03	348	53	28
15	326	32	48	174	04	33	330	54	23	6	44	21	107	32	31	71	28	04	349	00	29
16	327	33	22	186	06	54	332	44	43	7	14	02	107	25	53	71	30	17	349	07	31
17	328	33	56	198	00	53	334	35	32	7	42	04	107	20	02	71	32	42	349	14	36
18	329	34	28	209	50	11	336	26	43	8	08	25	107	14	59	71	35	19	349	21	42
19	330	34	58	221	39	03	338	18	10	8	33	01	107	10	42	71	38	07	349	28	50
20	331	35	28	233	32	15	340	09	44	8	55	47	107	07	13	71	41	07	349	35	59
21	332	35	56	245	34	44	342	01	13	9	16	41	107	04	30	71	44	18	349	43	10
22	333	36	23	257	51	23	343	52	25	9	35	38	107	02	33	71	47	40	349	50	22
23	334	36	49	270	26	43	345	43	06	9	52	36	107	01	21	71	51	14	349	57	36
24	335	37	13	283	24	18	347	32	58	10	07	29	107	00	55	71	54	58	350	04	50
25	336	37	36	296	46	25	349	21	42	10	20	15	107	01	13	71	58	54	350	12	06
26	337	37	57	310	33	25	351	08	54	10	30	49	107	02	16	72	03	01	350	19	23
27	338	38	17	324	43	28	352	54	10	10	39	09	107	04	03	72	07	19	350	26	41
28	339	38	35	339	12	30	354	37	02	10	45	11	107	06	32	72	11	47	350	34	00

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^{h}\ 29^{m}.0$ I.S.T.

Date	Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Mar 1	340	38	51	353	54	35	356	17	01	10	48	52	107	09	44	72	16	26	350	41	20
2	341	39	05	8	42	36	357	53	34	10	50	09	107	13	39	72	21	16	350	48	40
3	342	39	18	23	29	21	359	26	08	10	48	59	107	18	14	72	26	16	350	56	01
4	343	39	28	38	08	22	0	54	09	10	45	20	107	23	30	72	31	27	351	03	23
5	344	39	37	52	34	42	2	17	02	10	39	11	107	29	27	72	36	48	351	10	46
6	345	39	43	66	45	04	3	34	12	10	30	31	107	36	02	72	42	19	351	18	09
7	346	39	47	80	37	51	4	45	05	10	19	19	107	43	16	72	48	01	351	25	32
8	347	39	49	94	12	48	5	49	11	10	05	37	107	51	07	72	53	52	351	32	56
9	348	39	49	107	30	32	6	46	00	9	49	25	107	59	35	72	59	53	351	40	20
10	349	39	47	120	32	12	7	35	06	9	30	46	108	08	39	73	06	03	351	47	44
11	350	39	42	133	19	14	8	16	08	9	09	45	108	18	18	73	12	23	351	55	09
12	351	39	36	145	53	03	8	48	47	8	46	25	108	28	31	73	18	52	352	02	33
13	352	39	27	158	15	08	9	12	52	8	20	54	108	39	18	73	25	31	352	09	57
14	353	39	16	170	26	55	9	28	16	7	53	18	108	50	38	73	32	19	352	17	22
15	354	39	04	182	30	01	9	34	60	7	23	46	109	02	29	73	39	15	352	24	46
16	355	38	49	194	26	10	9	33	10	6	52	27	109	14	52	73	46	21	352	32	10
17	356	38	32	206	17	31	9	23	01	6	19	33	109	27	46	73	53	35	352	39	34
18	357	38	14	218	06	35	9	04	56	5	45	15	109	41	10	74	00	58	352	46	57
19	358	37	54	229	56	24	8	39	26	5	09	47	109	55	04	74	08	30	352	54	21
20	359	37	32	241	50	27	8	07	11	4	33	23	110	09	26	74	16	11	353	01	44
21	0	37	09	253	52	40	7	28	57	3	56	16	110	24	17	74	23	60	353	09	06
22	1	36	43	266	07	17	6	45	40	3	18	41	110	39	35	74	31	57	353	16	28
23	2	36	16	278	38	40	5	58	19	2	40	55	110	55	21	74	40	02	353	23	49
24	3	35	47	291	30	53	5	07	59	2	03	11	111	11	33	74	48	15	353	31	10
25	4	35	17	304	47	21	4	15	46	1	25	46	111	28	11	74	56	37	353	38	30
26	5	34	45	318	30	11	3	22	49	0	48	54	111	45	14	75	05	06	353	45	49
27	6	34	10	332	39	37	2	30	12	0	12	50	112	02	43	75	13	43	353	53	07
28	7	33	34	347	13	26	1	38	57	359	37	47	112	20	35	75	22	28	354	00	24
29	8	32	56	2	06	44	0	50	01	359	03	57	112	38	52	75	31	20	354	07	40
30	9	32	16	17	12	08	0	04	14	358	31	34	112	57	32	75	40	19	354	14	55
31	10	31	34	32	20	34	359	22	18	358	00	47	113	16	36	75	49	26	354	22	09

LONGITUDE OF SUN, MOON AND PLANETS, 2024

APPARENT GEOCENTRIC LONGITUDE FOR $5^{h}\ 29^{m}.0$ I.S.T.

Date		Sun			Moon			Mercury			Venus			Mars			Jupiter			Saturn		
		°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"	°	'	"
Apr.	1	11	30	50	47	22	43	358	44	47	357	31	47	113	36	02	75	58	40	354	29	22
	2	12	30	03	62	10	15	358	12	09	357	04	42	113	55	49	76	08	01	354	36	33
	3	13	29	15	76	37	04	357	44	44	356	39	40	114	15	59	76	17	30	354	43	44
	4	14	28	24	90	39	42	357	22	45	356	16	47	114	36	29	76	27	05	354	50	52
	5	15	27	31	104	17	14	357	06	18	355	56	09	114	57	19	76	36	46	354	57	59
	6	16	26	35	117	30	48	356	55	27	355	37	51	115	18	30	76	46	35	355	05	05
	7	17	25	37	130	22	57	356	50	10	355	21	54	115	39	59	76	56	29	355	12	09
	8	18	24	37	142	56	54	356	50	21	355	08	23	116	01	47	77	06	30	355	19	11
	9	19	23	34	155	16	09	356	55	54	354	57	19	116	23	54	77	16	38	355	26	11
	10	20	22	29	167	24	04	357	06	37	354	48	42	116	46	18	77	26	51	355	33	10
	11	21	21	22	179	23	42	357	22	21	354	42	32	117	08	60	77	37	10	355	40	06
	12	22	20	13	191	17	43	357	42	54	354	38	48	117	31	59	77	47	35	355	47	01
	13	23	19	02	203	08	27	358	08	04	354	37	30	117	55	14	77	58	06	355	53	54
	14	24	17	49	214	57	58	358	37	38	354	38	35	118	18	46	78	08	43	356	00	44
	15	25	16	34	226	48	14	359	11	25	354	42	01	118	42	34	78	19	25	356	07	33
	16	26	15	17	238	41	18	359	49	12	354	47	45	119	06	38	78	30	13	356	14	19
	17	27	13	59	250	39	24	0	30	49	354	55	44	119	30	56	78	41	06	356	21	04
	18	28	12	39	262	45	10	1	16	03	355	05	55	119	55	30	78	52	05	356	27	46
	19	29	11	17	275	01	34	2	04	45	355	18	14	120	20	19	79	03	08	356	34	25
	20	30	09	53	287	32	00	2	56	45	355	32	38	120	45	22	79	14	17	356	41	03

SUN AND MOON, 2025

DECLINATION OF SUN, LATITUDE AND DECLINATION OF MOON FOR $5^h\ 29^m.0$ I.S.T.

Date		Declination of Sun		Latitude of Moon		Declination of Moon		Date		Declination of Sun		Latitude of Moon		Declination of Moon	
		°	'	°	'	°	'			°	'	°	'	°	'
Jan.	0	-23	04.6	-4	56.0	-27	56.1	Feb.	1	-17	05.4	-1	10.8	-7	01.1
	1	22	59.9	4	36.6	25	51.8		2	16	48.2	+0	06.2	-0	11.2
	2	22	54.7	4	01.4	22	17.8		3	16	30.6	1	22.8	+6	38.8
	3	22	49.1	3	11.8	17	28.4		4	16	12.8	2	34.1	13	07.0
	4	22	43.0	2	10.4	11	42.3		5	15	54.7	3	35.4	18	51.7
	5	22	36.4	-1	00.7	-5	19.2		6	15	36.4	4	23.2	23	31.9
	6	22	29.4	+0	13.1	+1	21.2		7	15	17.7	4	55.0	26	48.3
	7	22	22.0	1	26.5	7	59.5		8	14	58.8	5	09.4	28	26.4
	8	22	14.1	2	34.8	14	15.5		9	14	39.7	5	06.3	28	20.2
	9	22	05.8	3	33.8	19	47.8		10	14	20.3	4	46.5	26	34.3
	10	21	57.0	4	19.7	24	13.8		11	14	00.7	4	11.7	23	22.6
	11	21	47.9	4	49.6	27	12.0		12	13	40.9	3	24.5	19	04.3
	12	21	38.3	5	01.9	28	26.6		13	13	20.8	2	27.9	13	59.3
	13	21	28.2	4	56.3	27	52.8		14	13	00.5	1	25.0	8	25.6
	14	21	17.8	4	33.8	25	38.6		15	12	40.0	+0	19.1	+2	38.7
	15	21	07.0	3	56.8	22	02.2		16	12	19.3	-0	46.7	-3	08.6
	16	20	55.7	3	08.1	17	25.5		17	11	58.4	1	49.9	8	45.5
	17	20	44.1	2	11.1	12	09.7		18	11	37.3	2	48.0	14	02.0
	18	20	32.1	1	09.0	6	32.2		19	11	16.0	3	39.0	18	47.8
	19	20	19.6	+0	04.9	+0	47.0		20	10	54.5	4	20.8	22	51.8
	20	20	06.8	-0	58.7	-4	54.8		21	10	32.9	4	51.9	26	01.2
	21	19	53.7	1	59.3	10	23.8		22	10	11.1	5	10.3	28	02.0
	22	19	40.1	2	54.7	15	30.6		23	9	49.1	5	14.5	28	40.8
	23	19	26.2	3	43.0	20	04.8		24	9	27.0	5	03.0	27	47.3
	24	19	11.9	4	22.1	23	54.1		25	9	04.8	4	35.1	25	17.9
	25	18	57.2	4	50.0	26	43.8		26	8	42.4	3	50.6	21	17.1
	26	18	42.3	5	04.6	28	18.1		27	8	19.9	2	50.9	15	57.8
	27	18	26.9	5	04.2	28	23.2		28	-7	57.2	-1	38.9	-9	38.7
	28	18	11.3	4	47.6	26	51.0								
	29	17	55.3	4	14.4	23	42.8								
	30	17	39.0	3	25.4	19	09.2								
	31	-17	22.3	2	22.9	-13	28.0								

SUN AND MOON, 2025

DECLINATION OF SUN, LATITUDE AND DECLINATION OF MOON FOR $5^h\ 29^m.0$ I.S.T.

Date	Declination of Sun °	'	Latitude of Moon °	'	Declination of Moon °	'	Date	Declination of Sun °	'	Latitude of Moon °	'	Declination of Moon °	'
Mar. 1	-7	34.5	-0	19.3	-2	42.9	Apr. 1	+4	33.2	+4	02.6	+20	53.7
2	7	11.6	+1	02.2	+4	24.4	2	4	56.4	4	46.4	25	16.2
3	6	48.6	2	19.5	11	16.9	3	5	19.4	5	10.7	27	55.1
4	6	25.6	3	26.9	17	28.9	4	5	42.3	5	15.6	28	41.9
5	6	02.4	4	20.2	22	36.3	5	6	05.2	5	02.5	27	41.0
6	5	39.2	4	56.6	26	18.3	6	6	27.9	4	33.4	25	07.4
7	5	15.9	5	14.7	28	20.3	7	6	50.5	3	51.2	21	20.7
8	4	52.5	5	14.8	28	36.9	8	7	13.0	2	58.8	16	40.8
9	4	29.1	4	57.8	27	12.8	9	7	35.4	1	59.0	11	25.4
10	4	05.6	4	25.8	24	21.5	10	7	57.6	+0	54.8	5	49.1
11	3	42.0	3	41.0	20	20.9	11	8	19.7	-0	11.1	+0	04.3
12	3	18.5	2	46.1	15	29.7	12	8	41.7	1	15.8	-5	37.9
13	2	54.8	1	44.3	10	05.2	13	9	03.5	2	16.9	11	06.7
14	2	31.2	+0	38.5	+4	22.4	14	9	25.2	3	11.9	16	11.2
15	2	07.5	-0	28.4	-1	25.7	15	9	46.7	3	58.5	20	39.8
16	1	43.8	1	33.3	7	07.5	16	10	08.1	4	35.0	24	20.1
17	1	20.1	2	33.8	12	32.1	17	10	29.2	4	59.7	26	59.2
18	0	56.4	3	27.5	17	28.8	18	10	50.3	5	11.4	28	25.4
19	0	32.7	4	12.3	21	46.3	19	11	11.1	5	09.2	28	29.5
20	-0	08.9	4	46.6	25	12.4	20	+11	31.8	-4	52.3	-27	07.1
21	+0	14.8	5	08.8	27	34.4							
22	0	38.5	5	17.4	28	40.2							
23	1	02.1	5	11.4	28	20.1							
24	1	25.8	4	49.9	26	29.3							
25	1	49.4	4	12.5	23	08.9							
26	2	13.0	3	19.7	18	26.6							
27	2	36.5	2	13.2	12	35.8							
28	2	60.0	-0	56.3	-5	54.7							
29	3	23.4	+0	26.0	+1	14.2							
30	3	46.7	1	47.5	8	24.6							
31	+4	10.0	+3	01.6	+15	07.6							

PLANETS, 2025

GEOCENTRIC LATITUDE AND DECLINATION FOR $5^h\ 29^m.0$ I.S.T.

Date	Mercury		Venus		Mars		Jupiter		Saturn	
	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination
	° '	° '	° '	° '	° '	° '	° '	° '	° '	° '
Jan. 0	+1 15.3	-21 41.9	-1 28.4	-14 01.2	+3 52.7	+23 26.1	-0 36.3	+21 47.8	-1 58.8	-7 56.9
2	0 58.4	22 10.4	1 20.1	13 08.9	3 57.0	23 39.3	0 35.9	21 46.7	1 58.5	7 53.1
4	0 41.7	22 36.0	1 11.2	12 15.6	4 01.0	23 52.6	0 35.5	21 45.5	1 58.3	7 49.2
6	0 25.3	22 58.3	1 01.7	11 21.5	4 04.7	24 05.7	0 35.1	21 44.5	1 58.0	7 45.3
8	+0 09.4	23 16.8	0 51.7	10 26.6	4 08.0	24 18.7	0 34.7	21 43.5	1 57.8	7 41.1
10	-0 06.0	23 31.1	0 41.0	9 31.2	4 10.9	24 31.4	0 34.3	21 42.6	1 57.5	7 36.9
12	0 20.7	23 41.0	0 29.7	8 35.2	4 13.4	24 43.6	0 33.8	21 41.7	1 57.3	7 32.6
14	0 34.8	23 46.2	0 17.8	7 38.9	4 15.5	24 55.3	0 33.4	21 41.0	1 57.1	7 28.2
16	0 48.1	23 46.6	-0 05.3	6 42.3	4 17.2	25 06.4	0 33.0	21 40.3	1 56.9	7 23.7
18	1 00.6	23 41.8	+0 07.8	5 45.5	4 18.4	25 16.8	0 32.6	21 39.8	1 56.7	7 19.1
20	1 12.2	23 31.8	0 21.5	4 48.8	4 19.2	25 26.3	0 32.1	21 39.3	1 56.5	7 14.4
22	1 22.9	23 16.5	0 35.8	3 52.1	4 19.6	25 35.1	0 31.7	21 39.0	1 56.3	7 09.6
24	1 32.5	22 55.8	0 50.7	2 55.6	4 19.5	25 42.9	0 31.3	21 38.7	1 56.1	7 04.7
26	1 41.1	22 29.4	1 06.2	1 59.4	4 19.1	25 49.9	0 30.8	21 38.5	1 55.9	6 59.8
28	1 48.5	21 57.5	1 22.3	1 03.7	4 18.2	25 55.9	0 30.4	21 38.5	1 55.8	6 54.7
30	1 54.6	21 19.8	1 39.1	-0 08.6	4 17.0	26 01.0	0 30.0	21 38.6	1 55.6	6 49.6
Feb. 1	1 59.5	20 36.3	1 56.4	+0 45.8	4 15.4	26 05.2	0 29.5	21 38.8	1 55.5	6 44.5
3	2 02.9	19 47.1	2 14.3	1 39.4	4 13.5	26 08.6	0 29.1	21 39.1	1 55.4	6 39.2
5	2 04.8	18 52.0	2 32.8	2 31.9	4 11.4	26 11.1	0 28.7	21 39.5	1 55.3	6 33.9
7	2 05.1	17 51.0	2 51.8	3 23.2	4 09.0	26 12.8	0 28.2	21 40.0	1 55.1	6 28.6
9	2 03.6	16 44.2	3 11.3	4 13.1	4 06.3	26 13.7	0 27.8	21 40.6	1 55.1	6 23.1
11	2 00.2	15 31.6	3 31.4	5 01.4	4 03.4	26 14.0	0 27.4	21 41.3	1 55.0	6 17.7
13	1 54.9	14 13.3	3 51.8	5 48.0	4 00.4	26 13.5	0 27.0	21 42.1	1 54.9	6 12.2
15	1 47.3	12 49.4	4 12.7	6 32.6	3 57.2	26 12.5	0 26.6	21 43.1	1 54.8	6 06.6
17	1 37.5	11 20.4	4 33.9	7 14.9	3 53.9	26 10.9	0 26.2	21 44.1	1 54.8	6 01.0
19	1 25.3	9 46.5	4 55.4	7 54.8	3 50.5	26 08.7	0 25.8	21 45.2	1 54.7	5 55.4
21	1 10.5	8 08.3	5 17.1	8 31.9	3 47.1	26 06.1	0 25.4	21 46.5	1 54.7	5 49.7
23	0 53.2	6 26.9	5 38.8	9 06.0	3 43.5	26 03.0	0 25.0	21 47.8	1 54.7	5 44.0
25	0 33.2	4 43.2	6 00.3	9 36.7	3 39.9	25 59.4	0 24.6	21 49.2	1 54.7	5 38.3
27	-0 10.9	-2 59.0	+6 21.6	+10 03.8	+3 36.3	+25 55.5	-0 24.2	+21 50.7	-1 54.6	-5 32.5

PLANETS, 2025

GEOCENTRIC LATITUDE AND DECLINATION FOR $5^h\ 29^m.0$ I.S.T.

Date	Mercury		Venus		Mars		Jupiter		Saturn	
	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination	Latitude	Declination
	° '	°	° '	° '	° '	° '	° '	° '	° '	° '
Mar. 1	+0 13.7	-1 16.1	+6 42.5	+10 26.7	+3 32.7	+25 51.1	-0 23.8	+21 52.3	-1 54.7	-5 26.8
3	0 40.1	+0 23.3	7 02.5	10 45.1	3 29.0	25 46.4	0 23.4	21 53.9	1 54.7	5 21.0
5	1 07.6	1 56.5	7 21.5	10 58.7	3 25.4	25 41.3	0 23.0	21 55.7	1 54.7	5 15.2
7	1 35.5	3 20.9	7 39.1	11 07.0	3 21.8	25 35.9	0 22.7	21 57.5	1 54.7	5 09.4
9	2 02.8	4 34.0	7 54.9	11 09.7	3 18.2	25 30.1	0 22.3	21 59.3	1 54.8	5 03.6
11	2 28.5	5 33.2	8 08.6	11 06.5	3 14.6	25 24.1	0 21.9	22 01.2	1 54.9	4 57.8
13	2 51.4	6 16.6	8 19.7	10 57.3	3 11.1	25 17.6	0 21.6	22 03.2	1 54.9	4 52.1
15	3 10.2	6 42.6	8 27.8	10 42.0	3 07.6	25 10.9	0 21.2	22 05.2	1 55.0	4 46.3
17	3 23.8	6 50.4	8 32.6	10 20.9	3 04.1	25 03.8	0 20.9	22 07.3	1 55.1	4 40.5
19	3 31.0	6 39.8	8 33.8	9 54.3	3 00.7	24 56.4	0 20.5	22 09.4	1 55.2	4 34.8
21	3 31.1	6 12.0	8 31.2	9 22.7	2 57.4	24 48.7	0 20.2	22 11.5	1 55.3	4 29.0
23	3 23.7	5 29.3	8 24.9	8 46.9	2 54.1	24 40.6	0 19.9	22 13.7	1 55.5	4 23.3
25	3 09.1	4 35.2	8 14.8	8 07.8	2 50.8	24 32.2	0 19.5	22 15.9	1 55.6	4 17.6
27	2 48.1	3 34.0	8 01.2	7 26.3	2 47.6	24 23.5	0 19.2	22 18.1	1 55.7	4 12.0
29	2 22.0	2 30.2	7 44.3	6 43.5	2 44.5	24 14.4	0 18.9	22 20.3	1 55.9	4 06.3
31	1 52.5	1 28.2	+7 24.7	6 00.5	2 41.4	24 04.9	0 18.6	22 22.6	1 56.1	4 00.8
2	1 21.0	+0 31.4	+7 02.6	5 18.1	2 38.4	23 55.1	0 18.3	22 24.8	1 56.3	3 55.2
Apr. 4	0 49.1	-0 17.5	6 38.7	4 37.2	2 35.4	23 44.9	0 18.0	22 27.1	1 56.4	3 49.7
6	+0 17.8	0 57.0	6 13.4	3 58.6	2 32.4	23 34.3	0 17.7	22 29.3	1 56.6	3 44.3
8	-0 12.0	1 26.4	5 47.1	3 22.8	2 29.6	23 23.4	0 17.4	22 31.5	1 56.9	3 38.9
10	0 39.6	1 45.3	5 20.3	2 50.4	2 26.7	23 12.0	0 17.1	22 33.8	1 57.1	3 33.5
12	1 04.9	1 54.1	4 53.3	2 21.7	2 23.9	23 00.3	0 16.8	22 36.0	1 57.3	3 28.2
14	1 27.5	1 53.1	4 26.4	1 56.9	2 21.2	22 48.2	0 16.5	22 38.1	1 57.6	3 23.0
16	1 47.4	1 42.9	3 59.9	1 36.2	2 18.5	22 35.6	0 16.2	22 40.3	1 57.8	3 17.8
18	2 04.6	1 24.1	3 33.9	1 19.5	2 15.9	22 22.7	0 16.0	22 42.4	1 58.1	3 12.7
20	2 19.1	0 57.4	3 08.6	1 06.9	2 13.3	22 09.3	0 15.7	22 44.5	1 58.4	3 07.7
22	-2 30.9	-0 23.3	+2 44.1	+0 58.2	+2 10.7	+21 55.6	-0 15.4	+22 46.6	-1 58.7	-3 02.8

URANUS, NEPTUNE AND PLUTO, 2025

APPARENT GEOCENTRIC LONGITUDE FOR $5^h\ 29^m.0$ I.S.T.

Date	Uranus			Neptune			Pluto			Date	Uranus			Neptune			Pluto		
	°	'	"	°	'	"	°	'	"		°	'	"	°	'	"	°	'	"
Jan. 0	53	39	38	357	17	03	301	2	03	Feb. 25	53	32	32	358	44	53	302	46	40
2	53	36	43	357	18	43	301	5	44	27	53	35	15	358	49	12	302	49	58
4	53	33	58	357	20	30	301	9	27	Mar. 1	53	38	10	358	53	32	302	53	12
6	53	31	23	357	22	24	301	13	12	3	53	41	16	358	57	55	302	56	23
8	53	28	59	357	24	27	301	16	59	5	53	44	34	359	2	20	302	59	29
10	53	26	47	357	26	37	301	20	47	7	53	48	03	359	6	48	303	2	31
12	53	24	47	357	28	55	301	24	36	9	53	51	43	359	11	17	303	5	28
14	53	22	58	357	31	20	301	28	27	11	53	55	33	359	15	47	303	8	21
16	53	21	21	357	33	52	301	32	18	13	53	59	33	359	20	18	303	11	09
18	53	19	55	357	36	31	301	36	10	15	54	3	43	359	24	50	303	13	51
20	53	18	42	357	39	16	301	40	02	17	54	8	03	359	29	22	303	16	29
22	53	17	41	357	42	08	301	43	54	19	54	12	33	359	33	55	303	19	01
24	53	16	52	357	45	07	301	47	47	21	54	17	12	359	38	28	303	21	28
26	53	16	16	357	48	13	301	51	39	23	54	22	01	359	43	01	303	23	49
28	53	15	53	357	51	24	301	55	31	25	54	26	58	359	47	34	303	26	05
30	53	15	42	357	54	42	301	59	22	27	54	32	04	359	52	06	303	28	15
Feb. 1	53	15	44	357	58	05	302	3	12	29	54	37	18	359	56	37	303	30	19
3	53	15	59	358	1	33	302	7	01	31	54	42	40	0	1	07	303	32	17
5	53	16	27	358	5	07	302	10	48	Apr. 2	54	48	10	0	5	36	303	34	08
7	53	17	07	358	8	47	302	14	34	4	54	53	47	0	10	04	303	35	54
9	53	18	00	358	12	31	302	18	18	6	54	59	32	0	14	30	303	37	34
11	53	19	06	358	16	20	302	22	01	8	55	5	23	0	18	53	303	39	06
13	53	20	25	358	20	13	302	25	40	10	55	11	20	0	23	14	303	40	32
15	53	21	55	358	24	10	302	29	17	12	55	17	23	0	27	32	303	41	52
17	53	23	38	358	28	12	302	32	51	14	55	23	32	0	31	48	303	43	05
19	53	25	33	358	32	17	302	36	23	16	55	29	47	0	36	01	303	44	11
21	53	27	40	358	36	26	302	39	52	18	55	36	07	0	40	11	303	45	12
23	53	30	00	358	40	38	302	43	17	20	55	42	32	0	44	18	303	46	05
25	53	32	32	358	44	53	302	46	40	22	55	49	02	0	48	21	303	46	52

EXPLANATION

In the following pages, a short explanation of the terms used in this Ephemeris has been given and the scope and limitations of the information furnished have been stated in a concise form. The values of the different constants and other data upon which the tabulated quantities are based have also been given in some cases in order to facilitate the use of this Ephemeris. It is not intended to furnish here any detailed explanation about the compilation of the tabular matter for which the reader is referred to the relevant literature.

Many changes have been incorporated in this publication from time to time including several recomendations of IAU at its General Assembly.

THE STANDARD EPOCH AND TIME SCALES

There are two classes of time scales used in Astronomy, one based on the Systeme International (SI) - the atomic second, the other based on the rotation of the Earth. Time scales based on the SI second include TAI and TT for practical applications. Time scale based on the rotation of the Earth include mean and apparent sidereal time and UT1. Because of irregularites in the Earth's rotation and its tidal deceleration, Earth's rotation based time scales do not advance at a uniform rate, and they increasingly lag behind the SI-second-based time scales. The widely disseminated time scale UTC is a hybrid, it advances by SI seconds but is subjct to one-second corrections (leap seconds) to keep it within $0^{s}.9$ of UT1.

The standard epoch J 2000.0 corresponds to 2000 January 1, 12^{h} TT (JD 245 1545.0 TT). A date may be expressed in years as a Julian epoch or for some purposes as a Besselian epoch.

Julian epoch = J [2000.0 + (JD − 245 1545.0)/ 365.25]
Where the quantity in the denominator is the Julian year.

Besselian epoch= B [1900.0 + (JD − 241 5020.313 52)/ 365.242 198 781]
Where the quantity in the denominator is the length of tropical year.

Prefixes J and B stand for the Julian and Besselian epochs respectively.

Various time systems used in this publication and their inter-relationships are described below :

Sidereal time system is derived from the Earth's rotation with respect to the stars. Local sidereal time is defined as the local hour angle of the vernal equinox. It is 0^{h} at the instant when the vernal equinox is at the upper transit of the local meridian. It is determined from observation of meridian transits of known stars. As the equinox oscillates about its mean position due to the effect of nutation, it gives rise to two kinds of sidereal time : the apparent sidereal time which is the hour angle of the true equinox of date and the mean sidereal time which is the hour angle of the mean equinox of date. The relation between the two is:

Apparent sidereal time = Mean sidereal time + Equation of Equinoxes

Equation of equinoxes is the total nutation in longitude multiplied by the cosine of the obliquity of the ecliptic. Its value varies within $\pm$ 1.2 seconds of time in a period of about 18.6 years.

Sidereal time on the geographic meridian of Greenwich is known as Greenwich sidereal time. Local sidereal time is related to Greenwich sidereal time (mean or apparent as appropriate) as follows:

Local sidereal time = Greenwich sidereal time + λ, where λ is the observer's longitude measured positively to the east (from 1985 onwards the sign convention for east terrestrial longitude to be positive has been adopted).

International Atomic Time (TAI) is a highly precise time scale given by atomic clocks. It is now being used as a standard in astronomy as it is independent of the Earth's rotation. Its fundamental unit, the SI second, is defined as the duration of 9 192 631 770 cycles of the radiation corresponding to the transition between two hyperfine levels of the ground state of the Cesium 133 atom. This time scale results from analysis of data from atomic time standards of many countries carried out at the Bureau International de l ' Heure in Paris.

Universal Time (UT) is used for civil time keeping. It is an outgrowth of the mean solar time system derived from the Earth's rotation with respect to the Sun. It has been formally defined through a strict relationship with the Greenwich mean sidereal time and is, therefore, determined from observation of star transits. The universal time directly derived from observation is designated UT_o. It contains nonuniformities due to variations in the rotation of the Earth and is peculiar to the observer's geographic location because of polar motion. When UT_o is corrected for Earth's polar motion, it is called UT1. When UT1 is further corrected for seasonal variation in the Earth's rotation, it is called UT2. Both UT_o and UT2 are not for general usage. Instead, the national time services provide what is known as co-ordinated universal time (UTC). It is a smoothed version of UT2 and differs from TAI by an integral number of seconds. It contains step adjustments of exactly one second (leap seconds) in order to keep it always within 0.90 seconds of UT1. Beginning with 1972, the step adjustments are usually inserted after the 60^{th} second of the last minute of December 31 or June 30. In this publication, UT1 has been used in computations relating to hour angles, etc., unless otherwise stated.

Dynamical Time replaces ephemeris time (ET) as argument of ephemerides with effect from 1985 in this publication. The concept of different dynamical times for observers in different frames of reference arises out of general theory of relativity. In this publication, terrestrial time (TT) is the tabular argument of the fundamental geocentric ephemerides and barycentric dynamical time (TDB) is the arguments of ephemerides referred to the barycentre of the solar system. The former corresponds to proper time and the latter to co-ordinate time in terms of the general theory of relativity. Both TT and TDB are independent of the Earth's rotation. These scales are so defined that the difference between them is purely periodic. Their difference is given by:-

$TDB = TT + 0^s.001\,657 \sin g + 0^s.\,000\,022 \sin (L - L_J)$, where higher order terms have been neglected. Here g is the mean anomaly of the Earth in its orbit around the Sun and is given by:-

$$g = 357^\circ.53 + 0^\circ.985\,600\,28\,(JD - 245\,1545.0)$$
$$L - L_J = 246^\circ.11 + 0.902\,517\,92\,(JD - 245\,1545.0)$$

Where $L - L_J$ is the difference in the mean longitude of the Sun and Jupiter.

Relationship Between universal time and sidereal time

Universal time is defined in terms of Greenwich mean sidereal time by:

$$\text{GMST at } 0^h\,UT1 = 6^h\,41^m\,50^s.549\,377 + 864\,018\,4^s.\,704\,478\,T_u + 0^s.092\,772\,T_u^2 - 2^s.93 \times 10^{-8}\,T_u^3 - 1^s.997 \times 10^{-6}\,T_u^4 - 2^s.5 \times 10^{-9}\,T_u^5$$

where T_u is the number of Julian centuries of 36525 days of universal time elapsed since 1 January, 2000,12^h UT (JD 245 154 5.0). In other words,

$$T_u = (JD - 245\,1545.0)/\,36525$$

The above expression implies that the ratio of UT1 to GMST at the epoch J2000.0 is 0.997 269 566 329 084 and its inverse is 1.002 737 909 350 795.

The following relationship holds during 2023:

On day of year d at t^h UT1 GMST = $6^h.111312 + 0^h.065\,709\,8246\,d + 1^h.002\,737\,91\,t$

where day of the year d is tabulated on pages 4 to 12.

EXPLANATION

In 2024 :

1 mean solar day = 1.002 737 909 35 mean sidereal days
= $24^h\ 03^m\ 56^s.555\ 37$ of mean sidereal time

1 mean sidereal day = 0.997 269 566 33 mean solar days
= $23^h\ 56^m\ 04^s.090\ 53$ of mean solar time

Conversion of local mean time to local sidereal time

Calculate local sidereal time at $15^h\ 54^m\ 42^s$ L.M.T. on 2024 January 1, for Delhi longitude,

$\lambda = 77° \ 13'\ 00''$ East ($5^h\ 08^m\ 52^s$)

		h	m	s
1.	Universal time = Local mean time $-\lambda$	10	45	50
2.	Greenwich mean sidereal time at 0^h U.T. on January 1, 2024 (Page 13).	6	40	36.0628
		h	m	s
3.	Add equivalent mean sidereal time for 10 45 50 (UT × 1.002 737 9093).	10	47	36.094
		ð ð ð	ð ð ð	ð ð ð ð
4.	Greenwich mean sidereal time at desired L.M.T.	17	28	12.722
5.	Add equation of equinoxes at UT=0^d. 45 (second order interpolation may be used).			-0.32869
		ð ð ð	ð ð ð	ð ð ð ð
6.	Greenwich apparent sidereal time	17	28	12.393
7.	Add longitude (east positive)	5	08	52.000
		ð ð ð	ð ð ð	ð ð ð ð
8.	Local apparent sidereal time	22	37	4.3929

For local mean sidereal time, the above process may be repeated by neglecting the equation of equinoxes.

Conversion of local sidereal time to local mean time

Calculate local mean time at $22^h\ 38^m$ 01.366 local apparent sidereal time on 2024 January 1, for Delhi longitude, $\lambda = 77° \ 13'\ 00''$ East ($5^h\ 08^m\ 52^s$)

		h	m	s
1.	Local apparent sidereal time	22	37	4.392
2.	Subtract longitude (east positive)	5	08	52.000
		ð ð ð	ð ð ð	ð ð ð ð
3.	Greenwich apparent sidereal time	17	28	12.393
4.	Subtract equation of equinox at 0^h U.T.			-0.3277
		ð ð ð	ð ð ð	ð ð ð ð
5.	Greenwich mean sidereal time (provisional)	17	28	12.7207
6.	Subtract Greenwich mean sidereal time at 0^h U.T.	6	40	36.628
		ð ð ð	ð ð ð	ð ð ð ð
7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.093

7.	Mean sidereal time interval (provisional) M.S.T. (P)	10	47	36.095
8.	Mean time interval in days corresponding to (7) above = (M.S.T. (P) $\times$ 0.997 269 566) = $0^d.45$ (UT). Subtract the increment to equation of equinoxes for $0^d.45$ UT (using second order interpolation)	(-)		0.00220
		ð ð ð	ð ð ð ð	ð ð ð
9.	Mean sidereal time	10	47	36.0952
10.	Equivalent UT (MST $\times$ 0.997 269 566)	10	45	50.001
11.	Local mean time = UT + λ	15	54	42.001

The mean time from the local mean sidereal time may be worked out on similar lines as above by neglecting the equation of equinoxes.

Notation for time-scales and related quantities

UT1	Universal time (also UT); counted from 0^h (mid night); unit is second of mean solar time, affected by iregularities in the Earth's rate of rotation.
UT0	local approximation to universal time; not corrected for polar motion (rarely used).
GMST	Greenwich mean sidereal time; GHA of mean equinox of date.
GAST	Greenwich apparent sidereal time; GHA of true Eqinox of date.
TAI	international atomic time; unit is the SI second of geoid.
UTC	coordinated universal time; differs from TAI by an integral number of seconds, and is the basis of most radio time signals and national and/ or legal time systems.
ΔUT	= UT1 – UTC; increment to be applied to UTC to give UT1
TDB	barycentric dynamical time; used as time-scale of ephemerides, referred to the barycentre of the solar system.
T_{eph}	the independent variable of the equations of motion used by the JPL ephemerides, in particular DE405/LE405. T_{eph} and TDB may be considered to be equivalent.
TT	terrestrial time; used as time-scale of ephemerides for observations from the Earth's surface (geoid).
TT	= TAI + $32^s.184$.
ΔT	= TT – UT1; increment to be applied to UT1 to give TT.
	= TAI + $32^s.184$ – UT1
ΔAT	= TAI –UT1; increment to be applied to UTC to give TAI; an integral number of seconds.
ΔTT	= TT – UTC = ΔAT + $32^s.184$; increment to be applied to UTC to give TT.
UT1 - UT0	= – (x sin λ + y cosλ) tanϕ/15 where λ and ϕ are usual geodetic longitude and latitude of the place, and x and y are the co-ordinates of the pole with respect to the geodetic system, in arcseconds.
GAST	= GMST + ε_γ/15 , ε_γ is equation of equinox.

In order to convert the tabulations for 0^h TT to 0^h UT, one may interpolate to $\Delta T\ \delta_{1/2}/h$ where h is the tabular interval and $\delta_{1/2}$ is the first difference of the tabular values.

REDUCTION OF TIME SCALES, 1620-1644

ΔT = ET - UT

Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT
	s		s		s		s		s
1620.0	+ 124	1625.0	+ 102	1630.0	+ 85	1635.0	+ 72	1640.0	+ 62
1621	119	1626	98	1631	82	1636	70	1641	60
1622	115	1627	95	1632	79	1637	67	1642	58
1623	110	1628	91	1633	77	1638	65	1643	57
1624	+ 106	1629	+ 88	1634	+ 74	1639	+ 63	1644	+ 55

REDUCTION OF TIME SCALES, 1645-1819

ΔT = ET - UT

Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT
	s		s		s		s		s
1645.0	+ 54	1680.0	+ 16	1715.0	+ 10	1750.0	+ 13	1785.0	+ 17
1646	53	1681	15	1716	10	1751	14	1786	17
1647	51	1682	14	1717	11	1752	14	1787	17
1648	50	1683	14	1718	11	1753	14	1788	17
1649	49	1684	13	1719	11	1754	14	1789	17
1650.0	+ 48	1685.0	+ 12	1720.0	+ 11	1755.0	+ 14	1790.0	+ 17
1651	47	1686	12	1721	11	1756	14	1791	17
1652	46	1687	11	1722	11	1757	14	1792	16
1653	45	1688	11	1723	11	1758	15	1793	16
1654	44	1689	10	1724	11	1759	15	1794	16
1655.0	+ 43	1690.0	+ 10	1725.0	+ 11	1760.0	+ 15	1795.0	+ 16
1656	42	1691	10	1726	11	1761	15	1796	15
1657	41	1692	9	1727	11	1762	15	1797	15
1658	40	1693	9	1728	11	1763	15	1798	14
1659	38	1694	9	1729	11	1764	15	1799	14
1660.0	+ 37	1695.0	+ 9	1730.0	+ 11	1765.0	+ 16	1800.0	+ 13.7
1661	36	1696	9	1731	11	1766	16	1801	13.4
1662	35	1697	9	1732	11	1767	16	1802	13.1
1663	34	1698	9	1733	11	1768	16	1803	12.9
1664	33	1699	9	1734	12	1769	16	1804	12.7
1665.0	+ 32	1700.0	+ 9	1735.0	+ 12	1770.0	+ 16	1805.0	+ 12.6
1666	31	1701	9	1736	12	1771	16	1806	12.5
1667	30	1702	9	1737	12	1772	16	1807	12.5
1668	28	1703	9	1738	12	1773	16	1808	12.5
1669	27	1704	9	1739	12	1774	16	1809	12.5
1670.0	+ 26	1705.0	+ 9	1740.0	+ 12	1775.0	+ 17	1810.0	+ 12.5
1671	25	1706	9	1741	12	1776	17	1811	12.5
1672	24	1707	9	1742	12	1777	17	1812	12.5
1673	23	1708	10	1743	12	1778	17	1813	12.5
1674	22	1709	10	1744	13	1779	17	1814	12.5
1675.0	+ 21	1710.0	+ 10	1745.0	+ 13	1780.0	+ 17	1815.0	+ 12.5
1676	20	1711	10	1746	13	1781	17	1816	12.5
1677	19	1712	10	1747	13	1782	17	1817	12.4
1678	18	1713	10	1748	13	1783	17	1818	12.3
1679	+ 17	1714	+ 10	1749	+ 13	1784	+ 17	1819	+ 12.2

This table is based on an adopted value of ï 26"/cy^2 for the tidal term ($\dot{n}$) in the mean motion of the Moon from the results of analyses of observations of lunar occultations of stars, eclipses of the Sun and transits of Mercury. (see F.R. Stephenson and L.V. Morrison, 1984 *PhD* Trans, R, Soc. London, Ser A, 313, 47-70).

To calculate the values of ΔT for a different value of the tidal term ($\dot{n}'$), add ï 0.000 091 ($\dot{n}'$ + 26) (year − 1955)^2 seconds to the tabulated values of ΔT.

REDUCTION OF TIME SCALES FROM 1820

1820 - 1983, ΔT = ET − UT. **From 1984, ΔT = TDT - UT.**
2001, ΔT = TT - UT.

Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT	Year	ΔT
	s		s		s		s		s
1820.0	+ 12.0	1863	6.97	1906	5.37	1949	28.71	1992	58.31
1821	11.7	1864	6.40	1907	6.14	1950.0	+ 29.15	1993	58.12
1822	11.4	1865.0	6.02	1908	7.75	1951	29.57	1994	59.98
1823	11.1	1866	5.41	1909	9.13	1952	29.97	1995.0	60.78
1824	10.6	1867	4.10	1910.0	+ 10.46	1953	30.36	1996	61.63
1825.0	10.2	1868	2.92	1911	11.53	1954	30.72	1997	62.29
1826	9.60	1869	1.82	1912	13.36	1955.0	31.07	1998	62.97
1827	9.10	1870.0	+ 1.61	1913	14.65	1956	31.35	1999	63.47
1828	8.60	1871	+ 0.10	1914	16.01	1957	31.68	2000.0	+ 63.83
1829	8.00	1872	− 1.02	1915.0	17.20	1958	32.18	2001	64.09
1830.0	+ 7.50	1873	1.28	1916	18.24	1959	32.68	2002	64.30
1831	7.00	1874	2.69	1917	19.06	1960.0	+ 33.15	2003	64.47
1832	6.60	1875.0	3.24	1918	20.25	1961	33.59	2004	64.57
1833	6.30	1876	3.64	1919	20.95	1962	34.00	2005.0	+ 64.69
1834	6.00	1877	4.54	1920.0	+ 21.16	1963	34.47	2006	64.85
1835.0	5.80	1878	4.71	1921	22.25	1964	35.03	2007	65.15
1836	5.70	1879	5.11	1922	22.41	1965.0	35.73	2008	65.46
1837	5.60	1880.0	− 5.40	1923	23.03	1966	36.54	2009	65.78
1838	5.60	1881	5.42	1924	23.49	1967	37.43	2010.0	+ 66.07
1839	5.60	1882	5.20	1925.0	23.62	1968	38.29	2011	66.32
1840.0	+ 5.70	1883	5.46	1926	23.86	1969	39.20	2012	66.60
1841	5.80	1884	5.46	1927	24.49	1970.0	+ 40.18	2013	66.91
1842	5.90	1885.0	5.79	1928	24.34	1971	41.17	2014	67.28
1843	6.10	1886	5.63	1929	24.08	1972	42.23	2015.0	67.64
1844	6.20	1887	5.64	1930.0	+ 24.02	1973	43.37	2016	68.10
1845.0	6.30	1888	5.80	1931	24.00	1974	44.49	2017	68.59
1846	6.50	1889	5.66	1932	23.87	1975.0	45.48	2018	68.97
1847	6.60	1890.0	− 5.87	1933	23.95	1976	46.46	2019	69.22
1848	6.80	1891	6.01	1934	23.86	1977	47.52	2020.0	+ 69.36
1849	6.90	1892	6.19	1935.0	23.93	1978	48.53		
1850.0	+ 7.10	1893	6.64	1936	23.73	1979	49.59		
1851	7.20	1894	6.44	1937	23.92	1980.0	+ 50.54		
1852	7.30	1895.0	6.47	1938	23.96	1981	51.38		
1853	7.40	1896	6.09	1939	24.02	1982	52.17		
1854	7.50	1897	5.76	1940.0	+ 24.33	1983	52.96		
1855.0	7.60	1898	4.66	1941	24.83	1984	53.79		
1856	7.70	1899	3.74	1942	25.30	1985.0	54.34		
1857	7.70	1900.0	− 2.72	1943	25.70	1986	54.87		
1858	7.80	1901	1.54	1944	26.24	1987	55.32		
1859	7.80	1902	− 0.02	1945.0	26.77	1988	55.82		
1860.0	+ 7.88	1903	+ 1.24	1946	27.28	1989	56.30		
1861	7.82	1904	2.64	1947	27.78	1990.0	+ 56.86		
1862	7.54	1905.0	3.86	1948	28.25	1991	57.57		

Extrapolated Values

2021	+ 69.50	2023	+ 70	2025	+ 70
2022	+ 70	2024	+ 70		

Difference TAI – UTC = ΔAT

Date	ΔAT s	Date	ΔAT s	Date	ΔAT s	Date	ΔAT s
1972 Jul.1		1979 Jan.1		1990 Jan.1		1999 Jan. 1	
	+ 11.00		+ 18.00		+ 25.00		+ 32.00
1973 Jan.1		1980 Jan.1		1991 Jan.1		2006 Jan. 1	
	+ 12.00		+ 19.00		+ 26.00		+ 33.00
1974 Jan.1		1981 Jul.1		1992 Jul.1		2009 Jan. 1	
	+ 13.00		+ 20.00		+ 27. 00		+ 34.00
1975 Jan.1		1982 Jul.1		1993 Jul.1		2012 Jul. 1	
	+ 14.00		+ 21.00		+ 28.00		+ 35.00
1976 Jan.1		1983 Jul.1		1994 Jul.1		2015 Jul. 1	
	+ 15.00		+ 22.00		+ 29.00		+ 36.00
1977 Jan.1		1985 Jul.1		1996 Jan.1		2017 Jan. 1	
	+ 16.00		+ 23.00		+ 30.00		+ 37.00
1978 Jan.1		1988 Jan.1		1997 Jul.1		In critical cases descend	
	+ 17.00		+ 24.00		+ 31.00	ΔET	
1979 Jan.1		1990 Jan.1		1999 Jan.1		= ΔAT + $32^s.184$	
						ΔTT	

From 1990 onwards, ΔT is for Jan. 1 0^h UTC.
See page 2 for a summary of the notation for time-scales.

Astronomical Reference System and Reference Frames

A reference system is the complete specification of how a celestial coordinate system is to be formed. Both the origin and the orientation of the fundamental planes (or axes) are defined. A reference system also incorporates a specification of the fundamental models needed to construct the system; that is, the basis for the algorithms used to transform between observable quantities and reference data in the system. A reference frame, on the other hand, consists of a set of identifiable fiducial points on the sky along with their coordinates, which serves as the practical realization of a reference system.

For example, the fundamental plane of an astronomical reference system has conventionally been the extension of the Earthôs equatorial plane, at some date, to infinity. Declination is the angular distance north or south of this plane, and right ascension is the angular distance measured eastward along the equator from some defined reference point. This reference point, the right asscension origin, has traditionally been the Equinox: the point at which the Sun, in its yearly circuit of the celestial sphere, crosses the equatorial plane moving from south to north. The Sunôs apparent yearly motion lies in the ecliptic, the plane of the Earthôs orbit. The equinox, therefore, is a direction in the space along the nodal line defined by the intersection of the ecliptic and equatorial planes; equivalently, on the celestial sphere, the equinox is at one of the two intersections of the great circles representing these planes. Because both of these planes are moving, the coordinate systems that they define must have a date associated with them; such a reference system must therefore be specified as ñthe equator and equinox of (some date)ò.

Of course, such a reference system is an idealization, because the theories of motion of the Earth that define how the two planes move are imperfect. In fact, the very definations of these planes are problematic for high precession work. Even if the fundamental planes of a reference system are defined without any reference to the motions of the Earth, there is no way magically to paint them on the celestial sphere at any particular time. Therefore, in practice, we use a specific reference frame - a set of fiducial objects with assigned coordinates - as the practical representation of an astronomical reference system. The scheme is completely analogous to how terrestrial reference systems are established using survey control stations (geodetic reference point) on the Earthôs surface.

Most commonly, a reference frame consists of a catalog of precise positions (and motions, if measurable) of stars or extragalactic objects as seen from the solar system barycenter at a specific epoch (now usually ñJ2000.0ò, which is 12h TT on January 2000). Each objectôs instantaneous position, expressed as right ascension and declination, indicates the objectôs angular distance from the catalogôs equator and origin of right ascension. Any two such objects in the catalog (if they are not coicident or antipodal) therefore uniquely orient a spherical coordinate system on the sky - a reference frame.

EXPLANATION

A modern astrometric catalog contains data on a large number of objects (N), so the coordinate system is vastly overdetermined. The quality of the reference frame defined by a catalog depends on the extent to which the coordinates of all possible pairs of objects ($N^2/2$) serve to the identical equator and right ascesion origin, within the expected random errors. Typically, every catalog contains systematic errors, that is, errors in position that are similar for objects that are in the same area of the sky, or are of the same magnitude (flux) or color (spectral index). Systematic errors mean that the reference frame is warped, or is effectively different for different classes of objects. Obviously, minimizing systematic errors when a catalog is constructed is at least as important as minimizing the random errors.

To be useful, a reference frame must be implemented at the time of actual observations, and this requires the computation of the apparent coordinates of the catalog objects at arbitrary dates and times. The accuracy with which we know the motions of the objects accross the sky is an essential factor in this computation. Astrometric star catalogs list proper motions, which are the projection of each starôs space motion onto the celestial sphere, expressed as an angular rate in right ascension and declination per unit time. Because the tabulated proper motions are never perfect, any celesial reference frame deteriorates with time. Moreover, systematic errors in the proper motions can produce time-dependent warpings and spurious rotations of the frame. Therefore, the accuracy and consistency of the proper motions are critical to the overall quality, utility, and longevity of reference frames defined by stars. Even reference frames defined by extragalactic objects, which are usually considered to have zero proper motion, may deteriorate, because many of these objects show small apparent motions that are artifacts of their emission mechanisms.

The position of solar system objects can also be used to define a reference frame. For each solar system body involved, an ephemeris is used, which is simply a table of the celestial coordinates of the body as a funtion of time (or an algorithm that yields such a table). A reference frame defined by the ephemerides of one or more solar system bodies is called a dynamical reference frame. Because the ephemerides used incorporate the motion of the Earth as well as that of the other solar system bodies, dynamical reference frames embody in a very fundamental way the moving equator and ecliptic, hence the equinox. They have therefore been used to correct the orientation of star catalog reference frames (the star positions were systematically adjusted) on the basis of simultaneous observations of star and planets. In a sense, the solar system is used as a gyrocompass. However, dynamical reference frames are not very practical for establishing a coordinate system for day to day astronomical observations.

Descriptions of reference frames and reference systems often refer to three coordinate axes, which are simply the set of right-handed cartesian axes that correspond to the usual celestial spherical coordinate system. The xy-plane is the equator, the z-axis points toward the north celestial pole, and the x-axis points toward the origin of right ascension. Although in principal this allows us to specify the position of any celestial object in rectangular coordinates, the distance scale (based on stellar parallaxes) is not established to high precession beyond the solar system. What a reference system actually defines is the way in which the two coventional astronomical angular coordinates, right ascension and declination, overlay real observable points in the sky.

The fundamental celestial reference system for astronomical application is now the International Celestial Reference System (ICRS) as provided in resolution B2 of 1997. The ñrealizationò of of the ICRS, called the International Celestial Reference Frame (ICRF), is a set of high accuracy positions of extragalactic radio sources measured by very long baseline interferometry.

The IAU Working Group on nomenclature for Fundamental Astronomy has recomended the following definations for ICRS and ICRF:

I**nternational Celestial Reference System (ICRS):** The idealized barycetric co-ordinate system to which celestial positions are referred. It is kinematically non-rotating with respect to the ensemble of distant extragalactic objects. It has no intrinsic orientation but was aligned close to the mean equator and dynamical equinox of J2000.0 for continuity with previous fundamental reference systems. Its orientation is independent of epoch, ecliptic or equator and is realized by a list of adopted coordinates of extragalactic sources.

International Celestial Reference Frame (ICRF): A set of extragalactic objects whose adopted positions and uncertainties realize the ICRS axes and give the uncertainties of the axes. It is also the name of radio catalogue whose 212 defining sources are currently the most accurate realization of the ICRS. The orientation of the ICRF catalogue was carried over from earlier IERS radio catalogs and was within the errors of the standard stellar and dynamical frames at the time of adoption. Successive revision of the ICRF are intended to minimize rotation from its original orientation.

Some important reference systems and their designations as per IAU 2000 resolution B1.6, B1.7 and B1.8, and IAU 2006 resolutions 1 and 2 are listed below:

(i) Barycentric Celestial Reference System (BCRS): a system of barycentric space-time coordinates for the solar system within the framework of General Relativity. For all practical applications, the BCRS is assumed to be oriented according to the ICRS axes, the directions of which are realized by the International Celestial Reference Frame. The ICRS is not identical to the system defined by the dynamical mean equator and equinox of J2000.0, although the difference in orientation is only about $0''.02$.

(ii) The Geocentric Celestial Reference System (GCRS): is a system of geocentric space-time coordinates within the framework of General Relativity. The directions of the GCRS axes are obtained from those of the BCRS (ICRS) by a relativistic transformation. Positions of stars obtained from ICRS reference data, corrected for proper motion, parallax, light-bending, and aberration (for a geocentric observer) are with respect to the GCRS. The same is true for planetary positions, although the corrections are somewhat different.

(iii) The J2000.0 dynamical reference system: mean equator and equinox of J2000.0; a geocentric system where the origin of right ascension is the intersection of the mean ecliptic and equator of J2000.0; the system in which the IAU 2000 precession-nutation is defined. For precise applications a small rotation (frame bias) should be made to GCRS positions before precession and nutation are applied. The J2000.0 system may also be barycentric, for example as the reference system for catalogues.

(iv) The true system of date (t); true equator and equinox of date: a geocentric system of date, the pole of which is the celestial intermediate pole (CIP), with the origin of right ascension at the equinox on the true equator of date (intermediate equator). It is a system ñbetweenò the GCRS and the Terrestrial Intermediate Reference System that seperates the components labelled precession-nutation and polar motion.

(v) The Celestial Intermediate Reference System (i): the IAU recomended geocentric system of date, the pole of which is the celestial intermediate pole (CIP), with the origin of right ascension at the celestial intermediate origin (CIO) which is located on the intermediate equator (true equator of date). It is a system ñbetweenò (intermeiate) the GCRS and the Terrestrial Intermediate Reference System that seperates the components labelled precession-nutation and polar motion.

Precession and Nutation

The algorithms for precession were based on the IAU (1976) value for the rate of general precession in ecliptic longitude. Nutation was given by the 1980 IAU Theory of Nutation. However, IAU (1976) rate of precession had been overestimated by approximately 3 milliarcseconds per year. Further observations also revealed periodic errors of a few milliarcseconds in the 1980 IAU Theory of Nutation.

As part of the 2000 IAU resolutions, the IAU 2000A precession-nutation model was introduced, based on an updated value for the rate of precession and a completely new nutation theory. As before, the model actually consists of two parts, a precession algorithm describing the smooth secular motion of the celestial pole and a nutation algorithm describing the small periodic variations in the poleôs position. The precession algorithm consists of short polynomial series for the values of certain angles. The sines and cosines of these angles, in combination, then define the elements of a precession matrix, **P**. The nutation algorithm consists of a rather long series expansion in Fourier terms for the angular offsets, in ecliptic longitude and latitude, of the actual celestial pole (as modeled) from the precession-only pole (true pole - mean pole). The sines and cosines of these offsets, in combination, then define the elements of a nutation matrix, **N.** The **P** and **N** matrices are applied to the coordinates of celestial objects, expressed as 3-vectors, to transform them from the equator and equinox of one epoch to the equator and equinox of another.

EXPLANATION

A precession transformation is applied to celestial coordinates to convert them from the mean equator and equinox of J2000.0 to the mean equator and equinox of another date, t. Nutation is applied to the resulting coordinates to transform them to the true equator and equinox of t. Generally we will start with celestial coordinates in the GCRS, which are obtained from basic ICRS data by applying the usual algoriths for proper place. Therefore before we apply precession and nutation - we must first apply the frame bias correction to transform the GCRS coordinates to the dynamical mean equator and equinox of J2000.0. Schematically,

GCRS => frame bias = mean equator & equinox of J2000.0 = precession =>

mean equator & equinox of t = nutation => true equator & equinox of t.

The reduction from a geocentric position **r** with respect to the Geocentric Celestial Reference System (GCRS) to a position $\mathbf{r}_t$ with respect to equator and equinox of date, and vice versa, is given by;

$$\mathbf{r}_t = \mathbf{M}\,\mathbf{r} \quad \text{and } \mathbf{r} = \mathbf{M}^{-1}\mathbf{r}_t$$

Using the 4-rotation Fukishma-Williams (F-W) method, the rotation matrix **M** may be witten as

$$\mathbf{M} = \mathbf{N}\,\mathbf{P}\,\mathbf{B}$$

Since the rotation to orient the GCRS to J2000.0 system are small the following approximate matrix **B** is called frame bias matrix, accurate to 2"x 10^{-9} (1 x 10^{-14} radians), may be used:

$$\mathbf{B} = \begin{bmatrix} 1 & d\alpha_0 & -\xi_0 \\ -d\alpha_0 & 1 & -\eta_0 \\ \xi_0 & \eta_0 & 1 \end{bmatrix}$$

where $d\alpha_0$ = -14.6 mas, ξ_0 = -16.6170 mas, and η_0 = -6.8192 mas, all converted to radians (divide by 206 264 806.247).

Precession

The time argument T is given by

T = (t - 2000.0)/100 = (JD_{TT} - 2451545.0)/36525, which is a function of TT.

The Capitine *et al.* method, the formulation of which seperates precession of the equator from precession of the ecliptic, is via the precession angles χ_A, ω_A, ψ_A, which are

$$\psi_A = 5038''.481\,507\,T - 1''.079\,0069\,T^2 - 0''.001\,140\,45\,T^3 + 0''.000\,132\,851\,T^4 - 9''.51 \times 10^{-8}\,T^5$$

$$\omega_A = \varepsilon_0 - 0''.025\,754\,T + 0''.051\,2623\,T^2 - 0''.007\,725\,03\,T^3 - 0''.000\,000\,467\,T^4 + 33''.37 \times 10^{-8}\,T^5$$

$$\chi_A = 10''.556\,403\,T - 2''.381\,4292\,T^2 - 0''.001\,211\,97\,T^3 + 0''.000\,170\,663\,T^4 - 5''.60 \times 10\text{-}8\,T^5$$

The mean obliquity of the ecliptic at J2000.0 (or the equivalent TDB date) is ε_0 = 84381".406

(i) A rotation from the mean equator and equinox of J2000.0 to the mean ecliptic and equinox of J2000.0. This is simply a rotation around the x-axis (the direction toward the mean equinox of J2000.0) by the angle ε_0, the mean obliquity of J2000.0. After the rotation, the fundamental plane is the ecliptic of J2000.0

(ii) A rotation around the new z-axis (the direction toward the ecliptic pole of J2000.0) by the angle $-\psi_A$, the amount of precession of the equator from J2000.0 to t.

(iii) A rotation around the new x-axis (the direction along the intersection of the mean equator of t with the ecliptic of J2000.0) by the angle $-\omega_A$, the obliquity of the mean equator of t with respect to the ecliptic of J2000.0. After the rotation, the fundamental plane is the mean equator of t.

(iv) A rotation around the new z-axis (the direction toward the mean celestial pole of t) by the angle χ_A, accounting for the precession of the ecliptic along the mean equator of t. After the rotation, the new x-axis is in the direction of the mean equinox of date.

$$\mathbf{P} = \begin{bmatrix} C_4C_2 - S_2S_4C_3 & C_4S_2C_1 + S_4C_3C_2C_1 - S_1S_4S_3 & C_4S_2S_1 + S_4C_3C_2S_1 + C_1S_4S_3 \\ -S_4C_2 - S_2C_4C_3 & -S_4S_2C_1 + C_4C_3C_2C_1 - S_1C_4S_3 & -S_4S_2S_1 + C_4C_3C_2S_1 + C_1C_4S_3 \\ S_2S_3 & -S_3C_2C_1 - S_1C_3 & -S_3C_2S_1 + C_3C_1 \end{bmatrix}$$

where $S_1 = \sin \varepsilon_0$ $S_2 = \sin(-\psi_A)$ $S_3 = \sin(-\omega_A)$ $S_4 = \sin \chi_A$
$C_1 = \cos \varepsilon_0$ $C_2 = \cos(-\psi_A)$ $C_3 = \cos(-\omega_A)$ $C_4 = \cos \chi_A$

Existing applications that use the 3-angle precession formulation of Newcomb and Lieske can be easily modified for the IAU 2000A precession, by replacing the current polynomials for the angles $\zeta_{A,}$ Z_A and θ_A with the following:

$$\zeta_A = 2''.650545 + 2306''.083227\,T + 0''.2988499\,T^2 + 0''.01801828\,T^3 - 0''.000005971\,T^4 - 0''.0000003173\,T^5$$

$$Z_A = -2''.650545 + 2306''.077181\,T + 1''.0927348\,T^2 + 0''.01826837\,T^3 - 0''.000028596\,T^4 - 0''.0000002904\,T^5$$

$$\theta_A = 2004''.191903\,T - 0''.4294934\,T^2 - 0''.04182264\,T^3 - 0''.000007089\,T^4 - 0''.0000001274\,T^5$$

The centennial (per Julian century) rates of general precession in right ascension and declination are given by :

$$m = 4612''.604\,08 + 2''.783\,169\,4\,T + 0''.108\,859\,95\,T^2 - 0''.000\,138\,268\,T^3 \text{and}$$

$$n = 2004''.191\,903 - 0''.858\,986\,8\,T - 0''.125\,467\,92\,T^2 - 0''.000\,028\,356\,T^3$$

The elements of the matrix **P** given in terms of $\zeta_{A,}$ $Z_{A,}$ θ_A are as follows:

$$\mathbf{P} = \begin{bmatrix} \cos\zeta_A \cos\theta_A \cos Z_A - \sin\zeta_A \sin Z_A & -\sin\zeta_A \cos\theta_A \cos Z_A - \cos\zeta_A \sin Z_A & -\sin\theta_A \cos Z_A \\ \cos\zeta_A \cos\theta_A \sin Z_A + \sin\zeta_A \cos Z_A & -\sin\zeta_A \cos\theta_A \sin Z_A + \cos\zeta_A \cos Z_A & -\sin\theta_A \sin Z_A \\ \cos\zeta_A \sin\theta_A & -\sin\zeta_A \sin\theta_A & \cos\theta_A \end{bmatrix}$$

The formula for reduction of precession in right ascension and declination are as follows :

$$\begin{aligned} \sin(\alpha - Z_A)\cos\delta &= \sin(\alpha_o + \zeta_A)\cos\delta_o. \\ \cos(\alpha - Z_A)\cos\delta &= \cos(\alpha_o + \zeta_A)\cos\theta_A \cos\delta_o - \sin\theta_A \sin\delta_o \\ \sin\delta &= \cos(\alpha_o + \zeta_A)\sin\theta_A \cos\delta_o + \cos\theta_A \sin\delta_o \end{aligned}$$

$$\begin{aligned} \sin(\alpha_o + \zeta_A)\cos\delta_o &= \sin(\alpha - Z_A)\cos\delta \\ \cos(\alpha_o + \zeta_A)\cos\delta_o &= \cos(\alpha - Z_A)\cos\theta_A \cos\delta + \sin\theta_A \sin\delta \\ \sin\delta_o &= -\cos(\alpha - Z_A)\sin\theta_A \cos\delta + \cos\theta_A \sin\delta \end{aligned}$$

Values of the angles ζ_A, $Z_{A,}$ θ_A and of the elements of the matrix P for reduction from the standard epoch J 2000.0 to epoch of year are as follows:

Epoch J 2024.5 — Rotation matrix P for reduction to epoch J 2024.5

$$\zeta_A = +567''.659 = +0^\circ.157683$$
$$Z_A = +562''.404 = +0^\circ.156223$$
$$\theta_A = +491''.001 = +0^\circ.136389$$

$$\mathbf{P} = \begin{bmatrix} +0.99998216 & -0.00547867 & -0.00238043 \\ +0.00547867 & +0.99998499 & -0.00000649 \\ +0.00238043 & -0.00000655 & +0.99999717 \end{bmatrix}$$

The obliquity of the ecliptic of date (with respect to the mean equator of date) is given by:

$$\varepsilon = \varepsilon_0 - 46''.836\,769 T - 0''.000\,183\,1\, T^2 + 0''.002\,003\,4\, T^3 - 0''.000\,000\,576\, T^4 - 0''.000\,000\,043\,4\, T^5$$
where $\varepsilon_0 = 84381''.406$

The precessional motion of the ecliptic specified by the inclination (π_A) and longitude of the node (Π_A) of the ecliptic of date with respect to the ecliptic and equinox of J 2000.0 are given by:

$$\text{Sin}\,\pi_A \sin\Pi_A = +4''.199\,094\, T + 0''.193\,987\, T^2 - 0''.000\,224\,66\, T^3$$
$$\text{Sin}\,\pi_A \cos\Pi_A = -46''.811\,015\, T + 0''.051\,028\, T^2 + 0''.000\,524\,13\, T^3$$

For epoch J 2024.5

$$\varepsilon = 23^\circ\,26'\,9''.93 = 23^\circ.436092$$
$$\pi_A = +11''.513 = 0^\circ.003197982$$
$$\Pi_A = 174^\circ\,48'.9 = 174^\circ.815$$

Approximate formulae for the reduction of precession in co-ordinates and orbital elements referred to the mean equinox and equator or ecliptic of date (t) are as follows :

Reduction to J 2000.0	Reduction from J 2000.0
$\alpha_o = \alpha - M - N \sin\alpha_m \tan\delta_m$	$\alpha = \alpha_o + M + N \sin\alpha_m \tan\delta_m$
$\delta_o = \delta - N\cos\alpha_m$	$\delta = \delta_o + \text{N} \cos\alpha_m$
$\lambda_o = \lambda - \text{a} + \text{b}\cos(\lambda + \text{c}') \tan\beta_o$	$\lambda = \lambda_o + \text{a} - \text{b}\cos(\lambda_o + \text{c}) \tan\beta$
$\beta_o = \beta - \text{b}\sin(\lambda + \text{c}')$	$\beta = \beta_o + \text{b}\sin(\lambda_o + \text{c})$
$\Omega_o = \Omega - \text{a} + \text{b}\sin(\Omega + \text{c}') \cot \text{i}_o$.	$\Omega = \Omega_o + \text{a} - \text{b}\sin(\Omega_o + \text{c}) \cot \text{i}$
$\text{i}_o = \text{i} - \text{b}\cos(\Omega + \text{c}')$	$\text{i} = \text{i}_o + \text{b}\cos(\Omega_o + \text{c})$
$\omega_o = \omega - \text{b}\sin(\Omega + \text{c}') \operatorname{cosec} \text{i}_o$	$\omega = \omega_o + \text{b}\sin(\Omega_o + \text{c}) \operatorname{cosec} \text{i}$

The precessional constants M, N etc. are given by :

$$M = 1^\circ.281\,155\,668\,9\, T + 0^\circ.000\,386\,551\,31\, T^2 + 0^\circ.000\,010\,079\, T^3$$
$$N = 0^\circ.556\,719\,973\,1\, T - 0^\circ.000\,119\,303\,72\, T^2 - 0^\circ.000\,011\,617\,4\, T^3$$
$$a = 1^\circ.396\,887\,83\, T + 0^\circ.000\,307\,065\,22\, T^2$$
$$b = 0^\circ.013\,055\,270\,3\, T - 0^\circ.000\,009\,303\,50\, T^2$$
$$c = 5^\circ.125\,890\,67 + 0^\circ.818\,993\,58\, T + 0^\circ.000\,104\,256\,09\, T^2 - 0^\circ.000\,104\,155\,607\, T^3$$
$$c' = 5^\circ.125\,890\,67 - 0^\circ.577\,894\,252\, T - 0^\circ.000\,164\,504\,28\, T^2 - 0^\circ.000\,104\,177\,728\, T^3$$

where $T = (t - 2000.0)/100 = (JD_{TT} - 245\,1545.0)/36525$

Formulae for the reduction from the mean equinox and equator or ecliptic of the middle of year (t_1) to date (t) are as follows :

$$\alpha = \alpha_1 + \tau (m + n \sin \alpha_1 \tan \delta_1) \qquad \delta = \delta_1 + \tau\, n \cos \alpha_1$$
$$\lambda = \lambda_1 + \tau \{p - \pi \cos (\lambda_1 + 6^\circ) \tan \beta\} \qquad \beta = \beta_1 + \tau\, \pi \sin (\lambda_1 + 6^\circ)$$
$$\Omega = \Omega_1 + \tau \{\rho - \pi \sin (\Omega_1 + 6^\circ) \cot i\} \qquad i = i_1 + \tau\, \pi \cos (\Omega_1 + 6^\circ)$$
$$\omega = \omega_1 + \tau\, \pi \sin (\Omega_1 + 6^\circ) \operatorname{cosec} i$$

where $\tau = t - t_1$ and π is the annual rate of rotation of the ecliptic. The precessional constants p, m, etc. are as follows :

		Epoch J 2024.5
Annual general precession	p =	$+ 0^\circ.013971225$
Annual precession in R.A.	m =	$+ 0^\circ.012814224$
Annual precession in Dec.	n =	$+ 0^\circ.005566695$
Annual rate of rotation	π =	$+ 0^\circ.000130519$
Longitude of axis	Π =	$+ 175^\circ.1002613$

$$\gamma = 180^\circ - \Pi = + 4^\circ.899738689$$

Where Π is the longitude of the instantaneous rotation axis of the ecliptic, measured from the mean equinox of date.

Nutation

The changes in the amplitudes of the nutation components are also not directly taken from the observations; instead a new nutation theory is developed and fit to observations by allowing a small number of geophysical constants to be free parameters. These parameters are constants in a ñtransfer functionò that modifies the amplitudes of the terms from a rigid- Earth nutation development. Since there are fewer solved-for geophysical constants than the number of terms with observed amplitudes, the fit cannot be perfect. For the IAU 2000A model, 7 geophysical parameters were determined based on the observed amplitudes of 21 nutation terms (prograde and retrograde amplitudes for each) together with the apparent change in the rate of precession in longitude. Note that the number of free parameters in the model are both quite small compared to the 1365 terms in the new, full nutation serirs.

Nutation is conventionally expressed as two small angles, $\Delta\psi$ the nutation in longitude, and $\Delta\varepsilon$, the nutation in obliquity. These angles are measured in the Ecliptic system of date, which is developed as a part of precession formulation. The angle $\Delta\psi$ is the small change in the position of the equinox along the ecliptic due to nutation, so effect of nutation on the ecliptic coordinates of a fixed point in the sky is simply to add $\Delta\psi$ to its ecliptic longitude. The angle $\Delta\varepsilon$ is the small change in the obliquity of the ecliptic due to nutation. The true obliquity of date is $\varepsilon' = \varepsilon + \Delta\varepsilon$. Nutation in obliquity reflects the orientation of the equator in space and does not affect the ecliptic coordinates of a fixed point on the sky.

Formulas for Nutation

l	is the mean anomaly of the Moon.
l'	is the mean anomaly of the Sun (Earth).
Ω	is the longitude of the ascending node of the Moonôs mean orbit on the ecliptic, measured from the mean equinox of date.
D	is the mean elongation of the Moon from the Sun.
F	is the difference $L - \Omega$, where L is the mean longitude of the Moon.
ε	$= \varepsilon_0 - 46''.836\,769\,T - 0''.000\,183\,1\,T^2 + 0''.002\,003\,4\,T^3 - 0''.000\,000\,576\,T^4 - 0''.000\,000\,043\,4\,T^5$

where $\varepsilon_0 = 84381''.406$

EXPLANATION

The fundamental arguments are given by:

The five arguments are the same fundamental luni - solar arguments used in previous nutation theories, but with updated expressions.

$$l = 485\,868''.249\,036 + (1325^r + 715\,923''.2178)\,T + 31''.8792\,T^2 + 0''.051\,635\,T^3 - 0''.000\,244\,70\,T^4$$
$$l' = 128\,7104''.793\,04 + (99^r + 129\,2581''.048)\,T - 0''.5532\,T^2 - 0''.000\,136\,T^3 - 0''.000\,011\,49\,T^4$$
$$F = 335\,779''.526\,232 + (1342^r + 295\,262''.8478)\,T - 12''.7512\,T^2 - 0''.001\,037\,T^3 + 0''.000\,004\,17\,T^4$$
$$D = 107\,2260''.703\,69 + (1236^r + 110\,5601''.209)\,T - 6''.3706\,T^2 + 0''.006\,593\,T^3 - 0''.000\,031\,69\,T^4$$
$$\Omega = 450\,160''.398\,036 - (5^r + 482\,890''.5431)\,T + 7''.722\,T^2 + 0''.007\,702\,T^3 - 0''.000\,059\,39\,T^4$$

where $1^r = 360^\circ = 129\,6000''$

Reduction for nutation - rigorous formulae

Nutation in longitude ($\Delta\psi$) and obliquity ($\Delta\varepsilon$) have been calculated using IAU 2000A series definitions (order of 1 μas) with the following adjustments which are required for use at the highest precession with the IAU 2006 precession, viz:

$$\Delta\psi = \Delta\psi_{2000A} + (0.4697 \times 10^{-6} - 2.7774 \times 10^{-6}\,T)\,\Delta\psi_{2000A}$$

$$\Delta\varepsilon = \Delta\varepsilon_{2000A} - 2.7774 \times 10^{-6}\,T\,\Delta\varepsilon_{2000A}$$

where T is measured in Julian centuries from 245 1545.0 TT. $\Delta\psi$ and $\Delta\varepsilon$ together with the true obliquity of the ecliptic (ε') are tabulated daily at 0^h TT, on page 18 to 32.

Once the nutation series has been evaluated and the values of $\Delta\psi$ and $\Delta\varepsilon$ are available, the nutation matrix can be constructed.

A mean place ($\mathbf{r}_m$) may be transformed to a true place ($\mathbf{r}_t$) and vice versa, as follows:

$$\mathbf{r}_t = \mathbf{N}\,\mathbf{r}_m \qquad \mathbf{r}_m = \mathbf{N}^{-1}\,\mathbf{r}_t$$

where $\mathbf{N} = \mathbf{R}_1(-\varepsilon')\,\mathbf{R}_3(-\Delta\psi)\,\mathbf{R}_1(+\varepsilon)$

$\varepsilon' = \varepsilon + \Delta\varepsilon$

$\mathbf{R}_1$ and $\mathbf{R}_3$ are the standard rotations about the x and z axes respectively.

(i) A rotation from the mean equator and equinox of t to the mean ecliptic and equinox of t. This is simply a rotation around the x - axis (the direction toward the mean equinox of t) by the angle ε, the mean obliquity of t.

(ii) A rotation around the new z-axis (the direction toward the ecliptic pole of t) by the angle - $\Delta\psi$, the amount of nutation in longitude at t. After the rotation, the new x- axis is in the direction of true equinox of t.

(iii) A rotation around the new x-axis (the direction toward true equinox of t by the angle $-\varepsilon'$, the true oliquity of t. After the rotation, the fundamental plane is the true equator of t, orthogonal to the computed position of the CIP at t.

The nutation matrix can be written:

$$\mathbf{N} = \begin{bmatrix} C_2 & S_2C_1 & S_2S_1 \\ -S_2C_3 & C_3C_2C_1 - S_1S_3 & C_3C_2S_1 + C_1S_3 \\ S_2S_3 & -S_3C_2C_1 - S_1C_3 & -S_3C_2S_1 + C_3C_1 \end{bmatrix}$$

where $S_1 = \sin(\varepsilon)$ $\quad S_2 = \sin(-\Delta\psi)$ $\quad S_3 = \sin(-\varepsilon - \Delta\varepsilon)$

$C_1 = \cos(\varepsilon)$ $\quad C_2 = \cos(-\Delta\psi)$ $\quad C_3 = \cos(-\varepsilon - \Delta\varepsilon)$

Approximate reduction for nutation for converting mean place to true place can be done with the help of the following formualae :

$$\Delta\alpha = (\cos\varepsilon + \sin\varepsilon\,\sin\alpha\,\tan\delta)\,\Delta\psi - \cos\alpha\,\tan\delta\,\Delta\varepsilon$$
$$\Delta\delta = \sin\varepsilon\,\cos\alpha\,\Delta\psi + \sin\alpha\,\Delta\varepsilon$$
$$\Delta\lambda = \Delta\psi; \qquad \Delta\beta = 0$$

where $\Delta\psi$ and $\Delta\varepsilon$ are nutations in longitude and obliquity respectively. Mean rectangular coordinates (x, y, z) can be converted to true rectangular co-ordinates with the help of the following :

$$\Delta x = \text{ï}\ (y \cos\varepsilon + z \sin\varepsilon)\,\Delta\psi$$
$$\Delta y = +\,x\,\Delta\psi \cos\varepsilon\ \text{ï}\ z\,\Delta\varepsilon$$
$$\Delta z = +\,x\,\Delta\psi \sin\varepsilon\ +\,y\,\Delta\varepsilon$$

where both $\Delta\psi$ and $\Delta\varepsilon$ are in radians.

The elements of the corresponding rotation matrix are:

$$\mathbf{N} = \begin{bmatrix} 1 & -\Delta\psi\cos\varepsilon & -\Delta\psi\sin\varepsilon \\ +\Delta\psi\cos\varepsilon & 1 & -\Delta\varepsilon \\ +\Delta\psi\sin\varepsilon & +\Delta\varepsilon & 1 \end{bmatrix}$$

Daily values of $\Delta\psi$ and $\Delta\varepsilon$ during 2024 are tabulated on pages 18 to 32.

Approximate reduction for precession and nutation in right ascension and declination from the standard equinox and equator of J 2000.0 to the true equinox and equator of date during 2023 can be done using the following formulae and table :

$$\alpha = \alpha_o + f + g \sin(G + \alpha_o)\ \tan\delta_o$$
$$\delta = \delta_o + g \cos(G + \alpha_o)$$

where the units of the correction to α_o and δ_o are in second of time and minutes of arc respectively.

Date 2024		*f* s	*g* s	,*g* ′	*G* h	m	Date 2024		*f* s	*g* s	*g* ′	*G* h	m
Jan.	**- 9**	+73.3	31.9	7.97	23	57	**June**	**29**	+75.1	32.6	8.16	23	57
	1	+73.5	31.9	7.98	23	57	**July**	**9**	+75.3	32.7	8.18	23	57
	11*	+73.6	32.0	7.99	23	57		**19**	+75.3	32.7	8.19	23	57
	21	+73.7	32.0	8.00	23	57		**29***	+75.4	32.8	8.20	23	57
	31	+73.8	32.1	8.02	23	56	**Aug.**	**8**	+75.6	32.8	8.21	23	56
Feb	**10**	+73.9	32.1	8.03	23	56		**18**	+75.7	32.9	8.22	23	56
	20*	+74.0	32.1	8.04	23	56		**28***	+75.7	32.9	8.23	23	56
Mar.	**1**	+74.0	32.2	8.04	23	56	**Sept.**	**7**	+75.8	32.9	8.23	23	56
	11	+74.1	32.2	8.05	23	56		**17**	+75.9	33.0	8.24	23	56
	21	+74.2	32.2	8.06	23	56		**27**	+75.9	33.0	8.25	23	56
	31* À	+74.2	32.3	8.07	23	56	**Oct.**	**7**	+76.0	33.0	8.25	23	56
Apr.	**10**	+74.3	32.3	8.07	23	56		**17***	+76.1	33.1	8.26	23	56
	20	+74.4	32.3	8.08	23	56		**27**	+76.2	33.1	8.27	23	56
	30	+74.5	32.4	8.09	23	57	**Nov.**	**6**	+76.2	33.1	8.28	23	56
May	**10***	+74.6	32.4	8.10	23	57		**16**	+76.3	33.2	8.29	23	57
	20	+74.7	32.4	8.11	23	57		**26***	+76.4	33.2	8.30	23	57
	30	+74.8	32.5	8.13	23	57	**Dec.**	**6**	+76.6	33.3	8.32	23	57
June	**9**	+74.9	32.6	8.14	23	57		**16**	+ 76.7	33.3	8.33	23	57
	19*	+75.0	32.6	8.15	23	57		**26**	+76.8	33.4	8.34	23	57
	29	+75.1	32.6	8.16	23	57		**36 ***	+76.9	33.4	8.36	23	57

* 40 - day date À400 day date for osculation epoch

EXPLANATION

Differential Precession and Nutation can be applied to obtain the differences in the mean place of an object relative to a comparison star for a standard epoch (J 2000.0) using the following formulae:

correction to R.A. : $e \tan \delta \, \Delta\alpha - f \sec^2 \delta \, \Delta\delta$

correction to declination : $f \, \Delta\alpha$

where $\Delta\alpha$ and $\Delta\delta$ are the observed differences in right ascension and declination of the object relative to the comparison star and

$e = - \cos \alpha \, (n\, t + \sin \varepsilon \, \Delta\psi) - \sin \alpha \, \Delta\varepsilon$

$f = + \sin \alpha \, (n\, t + \sin \varepsilon \, \Delta\psi) - \cos \alpha \, \Delta\varepsilon$

$\varepsilon = 23^\circ.44, \ \sin \varepsilon = 0.398$

$n = 0.000\,0972$ radian for epoch J 2023.5

t is the time in years from the standard epoch to the time of observation.

$\Delta\psi$, $\Delta\varepsilon$ are nutations in longitude and obliquity at the time of observation expressed in radians, (1" = 0.000 004 8481 rad).

Aberration

Aberration is the displacement of the position of a celestial object due to finite speed of light. The actual velocity of light in space c is the vectorial sum of its velocity relative to the observer c_r and the velocity V of the observer. Although the special theory of relativity has no provision of breaking up aberration of light into components, total effects of aberration in astronomy are broken into stellar, annual, elliptic, secular and planetary aberration for convenience of computation. In case of stars, all that can be determined is the displacement in their positions caused by the motion of the observer alone. It is calculated on the basis of the actual instantaneous motion of the Earth round the barycentre of the solar system.

Earlier, the practice was to resolve the stellar aberration into two components; one contributed by the circular motion of the Earth moving with a constant mean velocity round the Sun, and the other, a nearly constant displacement perpendicular to the major axis of the orbit arising due to ellipticity of the orbit of the Earth. The latter, known as the E-terms of aberration was included in the mean position of the stars as given in star catalogues and was omitted in the computation of day numbers. As a result, the mean places of stars differed from the catalogue mean places. This procedure was adopted to minimise the computation work for the user of star catalogues. However, this practice has caused much confusion lately because the accurate total velocity of the Earth referred to the barycentre of the solar system could not be used in computing stellar aberration. In accordance with a decision of the IAU in 1976, this occasion has been used to simplify this procedure by removing the E terms of aberration from the mean places and to include them in the reduction from mean to apparent place so that the apparent places remain unchanged. Thus, the mean places of FK5 are free from E terms. In other words, they will be the positions of the stars at epoch J 2000.0 as viewed from the barycentre of the solar system, in the co-ordinate system defined by the Earth's mean equator and equinox of J 2000.0.

The conversion of 1950.0 star catalogue positions (α, δ) to actual mean places ($\alpha+\Delta\alpha$, $\delta+\Delta\delta$) can be accomplished by :

$$\Delta\alpha = 0^s.0227 \sin(\alpha + 11^h.25) \sec \delta$$

$$\Delta\delta = 0''.341 \cos(\alpha + 11^h.25) \sin \delta + 0''.029 \cos \delta$$

For solar system objects, the displacement of the light source during the time (Δt) taken by light to travel from it to the Earth combined with the effect of relative motion of the Earth and the light is known as planetary aberration. Its computation requires a knowledge of the distance and motion of the light source and can be accomplished as follows. First, the barycentric position of the body at time t- Δt is combined with the barycentric position of the Earth at time t and then the correction for annual aberration is applied. Planetary aberration may also be computed by interpolating the geometric (geocentric) ephemeris of the body to the time t - Δt. The light time Δt is given by:

$$\Delta t \text{ (in days)} = 0.005\,7755 \text{ x distance in a.u.}$$

Annual aberration for reduction from a geometric place (α_0, δ_o) to an apparent geocentric place (α, δ) is given by :

$$\alpha = \alpha_0 + (-\dot{X} \sin \alpha_0 + \dot{Y} \cos \alpha_0) / (c \cos \delta_0)$$

$\delta = \delta_0 + (-\dot{X} \cos \alpha_0 \sin \delta_0 - \dot{Y} \sin \alpha_0 \sin \delta_0 + \dot{Z} \cos \delta_0)/ c$, where c = 173.14 a.u./day and $\dot{X}, \dot{Y}, \dot{Z}$ are the velocity components of the Earth (pages 256 to 270).

The reduction of observations of the radial velocity to a common origin at the barycentre is given by adding the component of the Earth's velocity in the direction (α_0, δ_0) of the object :

$$\dot{X} \cos \alpha_0 \cos \delta_0 + \dot{Y} \sin \alpha_0 \cos \delta_0 + \dot{Z} \sin \delta_0$$

Differential annual aberration corrections to be added to the observed differences of right ascension and declination (in the sense moving object minus star) to give true differences are:

(R.A.) $a\,\Delta\alpha + b\,\Delta\delta$ (in units of $0^s.001$) ; (declination) $c\,\Delta\alpha + d\,\Delta\delta$ (in units of $0''.01$)

Here $\Delta\alpha$ is to be taken in units of 1^m and $\Delta\delta$ in units of 1'. The coefficients a, b, c and d are defined by:

$a = -5.701 \cos (H+\alpha) \sec \delta$

$b = -0.380 \sin (H+\alpha) \sec \delta \tan \delta$

$c = +8.552 \sin (H+\alpha) \sin \delta$

$d = -0.570 \cos (H+\alpha) \cos \delta$

$H^h = 23.4 - (\text{day of year}/15.2)$

(The day of year is tabulated on pages 4 to 12)

Annual parallax correction can be calculated approximately for reduction from the catalogue place (α_0,δ_0) to the geocentric place (α,δ) using the following formulae;

$\alpha = \alpha_0 + (\pi / 15 \cos \delta_0)(X \sin \alpha_0 - Y \cos \alpha_0)$ and $\delta = \delta_0 + \pi(X \cos \alpha_0 \sin \delta_0 + Y \sin \alpha_0 \sin \delta_0 - Z \cos \delta_0)$

where π is the annual parallax and X, Y, Z, are the coordinates of the Earth as given on pages 256 to 270.

Deflection of light in the gravitational field of the Sun may significantly affect the apparent direction of a star or of a body in the solar system. The elongation (E) from the centre of the Sun is increased by an amount that, for a star, depends on the elongation in the following manner:

$$\Delta E = 0''.004\,07/ \tan (E/2)$$

E	0°.25	0°.5	1°	2°	5°	10°	20°	50°	90°
ΔE	1".866	0".933	0".466	0".233	0".093	0".047	0".023	0".009	0".004

The body disappears behind the Sun when E is less than the limmiting grazing value of about 8°.25. The effects in right ascension and declination may be calculated approximately from;

$\cos E = \sin \delta \sin \delta_0 + \cos \delta \cos \delta_0 \cos (\alpha - \alpha_0)$

$\Delta\alpha = 0^s.000\,271 \cos\delta_0 \sin (\alpha - \alpha_0)/ (1 - \cos E) \cos \delta$

$\Delta\delta = 0''.004\,07 [(\sin \delta \cos \delta_0 \cos (\alpha - \alpha_0) - \cos \delta \sin \delta_0]/ (1 - \cos E)$

where α, δ refer to the star, and α_0, δ_0 to the Sun.

EXPLANATION

TABULAR DATA

PART-I -TIME SCALES AND EPHEMERIDES

Dates of year beginning in 2024 of various Indian and important foreign chronological eras are listed on page 3 followed by Gregorian calendar for the current year (pages 4 to 12). The calendar contains, besides the usual information, a count of Julian Day (JD) number for each date. The system of Julian day numbers maintains a continuous count of astronomical days, beginning with JD = 0 on 1 January 4713 B.C., Julian proleptic calendar. Julian Day numbers for other years can be found from the table on page 355. Various time scales used in this publication, their inter -relationships (as given on page 2) and the basis for computation of sidereal time as tabulated on pages 13 to 16; have been discussed above under the section on time scales. The concept of equation of time defined as the difference between local apparent solar time and local mean solar time (in the sense apparent minus mean) is no longer used in astronomy and therefore, it is no more tabulated in this publication. It can, however, be obtained to a precision of about 1 second using the following relation :

Equation of time at 12^h U.T. = $12^h -$ tabulated value of TT of Sunôs ephemeris transit (pages 19 to 33).

In this publication, the ephemeridies of the Sun and planets were reported earlier based on computation jointly made by USNO and JPL by simultaneous numerical integration designated as DE 200/ LE 200. A more recent JPL ephemeris, DE 405/ LE 405 has now come into widespread use, provide barycentric equatorial rectangular coordinates for the period 1600 to 2201. The reference frame for basic ephemerides is the ICRF; the alignment onto this frame has an estimated accuracy of 1 - 2 arcseconds. The JPL DE 405/ LE 405 ephemerides have been developed in a barycentric reference system using a barycentric coordinate time scale $T_{eph.}$. The present edition use the DE 405/ LE 405 ephemeridies data on the positions of the Sun, Moon and planets. The value of some astronomical constants based on previously used DE200/ LE200 ephemeridies and currently used DE 405/ LE 405 ephemerides are given below.

Constant	DE 405 Value	DE 200/ LE 200 Value
Light-time for unit distance, τ_A	499.004 783 84 s	499.004 7837é é é ..s
Geocentric gravitational constant, GE	$3.986\,004\,418 \times 10^{14} m^3 s^{-2}$	3.986 004 48é é $\times 10^{14} m^3 s^{-2}$
Heliocentric gravitational constant, GS	$1.327\,124\,42\,099 \times 10^{20} m^3 s^{-2}$	1.327 124 40é é $\times 10^{20} m^3 s^{-2}$
Ratio of mass of Sun to that of Earth, (GS)/ (GE)	332 946.0 487	332 946.038é é é .
Ratio of mass of Moon to that of Earth, μ	0.012 300 0371	0.012 300 034
Obliquity of the ecliptic at J2000.0, ε	23° 26′ 21″.406	23° 26′ 21″.4119é .
Unit distance, A	$1.495\,978\,707 \times 10^{11}$ m	$1.495\,978\,7066 \times 10^{11}$ m
Ratio of mass of Sun to that of Earth + Moon	328 900.5596	328 900.55
Ratio of mass of Sun to mass of each planet :		
Jupiter	1047.348 644	1047.350
Saturn	3497.9018	3498.0
Uranus	229 02.98	229 60
Pluto	$1.365\,66 \times 10^8$	1.3×10^8
Pallas	9.709×10^9	9.247×10^9
Vesta	7.407×10^9	7.253×10^9

EXPLANATION

The Sun

Mean elements of the orbit of the Sun can be calculated with the help of the following expressions for use during 2024 only :

Geometric mean longitude	:	$L = 279^\circ.17273480 + 0.98564736\,d$
Mean longitude of perigee	:	$\Gamma = 283^\circ.34996540 + 0.00004708\,d$
Mean anomaly	:	$g = 355^\circ.82277040 + 0.98560028\,d$
Eccentricity	:	$e = 0^\circ.01669858 + 0.000\,000\,001\,d$
Obliquity of the ecliptic w.r.t. mean equator of date	:	$\varepsilon = 23^\circ.43615520 - 0.00000036\,d$

where d is the interval in days from 2024 January 0 at 0^h TT and is given by

d = JD − 245 9944.5 = day of the year (pages 4 to 12) + fraction of day from 0^h TT.

The above angular elements are referred to the mean equinox and ecliptic of date. The position of ecliptic of date with respect to the ecliptic of the standard epoch J 2000.0 is given by the formulae given under *Precession.*

The length of the principal years at 2024.0 as derived from the Sunôs mean motion are given on page 2.

Geometric longitude of the Sun with respect to the mean equinox of date is tabulated on even numbered pages 18 to 32. Apparent longitude and latitude are with respect to the true equinox and ecliptic of date respectively. The two longitudes are related as follows :

Apparent longitude = Geometric longitude + nutation in longitude − 20".4955/ R.

Aberration has been computed by dividing 20".4955 by the true distance to the Sun. Precession in longitude is the total precessional displacement of a point along the ecliptic since the epoch J 2023.5. Revised value of the annual general precession p = 0°. 013 971 16 (for J 2023.5) has been used to compute this quantity. Components of nutation are the results of summation of the revised series of nutation. The sum of the terms with period shorter than 35 days is separately tabulated under Besselian Day numbers (pages 244 to 251).

Apparent Right Ascension and true distance (radius vector), declination (tabulated on odd numbered pages 19 to 33) of the Sun have been computed from the original barycentric rectangular co-ordinates. Although the apparent right ascension and declination have been corrected for light time, the radius vector or the true geocentric distance in astronomical units is the geometric distance at the tabular time.

The Semidiameter is based on a value of 16′ 01″.18 at unit distance being inclusive of an allowance for irradiation of 1″.55. The tabular value is obtained by dividing 16′ 01″.18 by the radius vector.

Ephemeris Transit is the TT of the transit of the Sun over the ephemeris meridian which according to its definition, is 1.002 7379 ΔT east of the Greenwich meridian. Here ΔT is the difference TT − UT. This transit time. This transit time can be interpolated to other meridians with an interpolating factor *p,* as follows:

$$p = -\lambda/360 + 1.002\,7379 \times \Delta T/86400$$

where λ is the longitude (east positive). The interpolated TT can be converted into UT by subtracting ΔT from TT.

Equatorial rectangular co-ordinates (geocentric) of the Sun, referred to the ICRS axes, are given in a.u. on pages 34 to 41. The direction of these axes have been defined by the IAU and realized in practice by the coordinates of several hundred extra galactic radio sources.

EXPLANATION

Horizontal parallax (page 17) of the Sun is the angle subtended at the Sun by the equatorial radius of the Earth. The new value of the Solar parallax Π_o = 8".794 148 has been used to compute the horizontal parallax.

Mean longitude and mean anomaly (page 17) of the Sun have been computed using revised expressions for the mean motion of the Earth around the Sun as given on page 443.

Heliographic co-ordinates given on pages 42 to 45 for 0^h UT include the position angle P of the northern extremity of the axis of rotation measured eastward from the north point of the disc and the heliographic latitude B_o and longitude L_o of the central point of the disc.

The observed angular distance ρ_1 from the centre of the disc of the Sun of a feature on the Sunôs surface, as seen from the Earth, can be converted into its heliocentric angular distance ρ from the centreof the Sunôs disc as follows :

$$\sin(\rho + \rho_1) = \rho_1/S, \quad \text{where } S \text{ is the semi diameter of the Sun.}$$

The observed position (ρ, θ) of a feature (Sunspot, etc.) with respect to the centre of Sunôs disc can be converted into heliographic co-ordinates (L, B) as follows :

$$\sin B = \sin B_o \cos \rho + \cos B_o \sin \rho \cos(P - \theta)$$
$$\cos B \sin(L - L_o) = \sin \rho \sin(P - \theta)$$
$$\cos B \cos(L - L_o) = \cos \rho \cos B_o \text{ ï } \sin B_o \sin \rho \cos(P - \theta)$$

The physical ephemeris of the Sun has been calculated from the elements determined by R. C. Carrington (observation of the spots on the Sun, 1863).

The Synodic rotation numbers are given below according to R. C. Carringtonôs Greenwich photoheliographic series which commenced on 9 November, 1853 with number 1. The standard solar meridian from which heliographic longitudes on the surface of the Sun are measured (positive towards the west) is that which passes through the ascending node of the solar equator on the ecliptic on 1854 January 1, Greenwich mean noon. The beginning of each synodic rotation is the instant at which the standard solar meridian passes through the central point of the apparent disc of the Sun, i.e., when the heliographic longitude L_o of this central point is zero.

SYNODIC ROTATION NUMBERS, 2024

Number	Date of Commencement			Number	Date of Commencement			Number	Date of Commencement		
2279	2023	Dec.	21.93	2284		May	6.49	2289		Sept.	19.59
2280	2024	Jan.	18.27	2285		June	2.70	2290		Oct.	16.88
2281		Feb.	14.61	2286		June	29.90	2291		Nov.	13.18
2282		Mar.	12.94	2287	2024	July	27.11	2292		Dec.	10.49
2283		Apr.	9.24	2288		Aug.	23.34	2293	2025	Jan.	6.82

At the date of commencement of each synodic rotation period, the value of L_o is zero ; that is, the prime meridian passes through the central point of the disk.

The mean rotational elements of the Sun during 2024 are as follows :

Longitude of the ascending node of the solar equator on the ecliptic of date is 76°.01, and on the mean equator of date 16°.16. Inclination of the solar equator on the ecliptic of date is 7°.25, and on the mean equator of date 26°.10. The mean position of the pole on the solar equator is at right ascension 286°.16 and declination 63°.90. Sidereal period of rotation of the prime meridian is 14°.18 44 per day and its mean synodic period of rotation is 27.2753 days.

EXPLANATION

The Moon

The ephemerides of the Moon reported in this publication are based on the fundamental arguments developed by Simon et. al (1994). The angular elements are referred to the mean equinox and ecliptic of date. Mean elements of the mean equator and of the orbit of the Moon (page 47) can be computed during 2024 with the help of the following expressions :-

The inclination i of the mean equator of the Moon to the true equator of the Earth is given by :

$$i = 21^\circ.54101100 - 0.00187860\,d - 0.00000041\,d^2$$

The arc of the mean equator of the Moon from its ascending node on the true equator of the Earth to its ascending node on the ecliptic of date :

$$\Delta = 202^\circ.23510570 - 0.056650982\,d - 0.000000137\,d^2$$

The arc of the true equator of the Earth from the true equinox of date to the ascending node of the mean equator of the Moon :

$$\Omega' = 358^\circ.58591750 + 0.00386650\,d + 0.00000147\,d^2$$

The inclination (I) of the mean equator of the Moon to the ecliptic = $1^\circ\ 32'\ 33''.6$.

The ascending node of the mean lunar equator on the ecliptic is at the descending node of the mean lunar orbit on the ecliptic that is at longitude $\Omega + 180^\circ$.

The above expressions give the mean elements with respect to the true equator of the Earth to a precision of about $0^\circ.001$.

The following expressions for the mean elements of the orbit of the Moon Γ', Ω mean longitude of the Moon L' and elongation D are referred to the mean equinox and ecliptic of date.

Mean longitude of the Moon, measured along the ecliptic to the mean ascending node and then along the mean orbit :

$$L' = 142^\circ.84345680 + 13.17639646\,d$$

Mean longitude of the Moonôs perigee measured in the same way as L' :

$$\Gamma' = 339^\circ.74882200 + 0.1114034\,d$$

Mean longitude of the mean ascending node of the lunar orbit on the ecliptic :

$$\Omega = 20^\circ.93140180 - 0.05295374\,d$$

Mean elongation of the Moon from the Sun :

$$D = L' - L = 223^\circ.66473600 + 12.19074090\,d$$

Mean inclination of the lunar orbit to the ecliptic = $5^\circ.1566898$

The above expressions are valid for use in 2024 only.

In all the above expressions, the time argument d is the interval in days since 0^h TT January 0, 2024 and is given by $d = \mathrm{JD} - 24603090.5$

The length of the principal mean months at 2024.0 as derived from the above mean orbital elements of the Moon are given on page 2.

The apparent geocentric longitude and latitude of the Moon (pages 48 to 63) are referred to the true equinox and ecliptic of date. The true distance between the centres of the Earth and the Moon is given in a.u. Semi-diameter is derived from the horizontal parallax by $S = \mathrm{Sin}^{-1}(k \sin\pi)$ where $k = 0.272\,5076$. The semi-diameter at mean distance is taken to be $15'\ 32''.58$ without making any correction for irradiation.

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The right ascension and declination given on pages 64 to 79 for 0 hour & 12 hour of TT are referred to the true equator and equinox of date.

Horizontal parallax is tabulated at twelve hourly intervals on pages 64 to 79. It is derived from $\sin^{-1}(1/r)$ where r is the true distance in units of the Earth's equatorial radius. The tabulated R.A. and declination have been corrected for light time while the horizontal parallax is the geometric value for the tabular time.

The times of New Moon, First Quarter, Full Moon and Last Quarter are the moments at which the excess of the Moon's apparent longitude over that of the Sun is $0°$, $90°$, $180°$ and $270°$ respectively. Moon at Apogee and Perigee are the times when the Moon is at the greatest and least distance from the Earth. The timings are given in U.T. The corresponding timings in U.T. of the phases of the Moon are also given in the calendar portion on pages 4 to 12. For more precise values of the moments of New Moon and Full Moon, a reference may be made to Part VI - Indian Calendar where the times are given in I.S.T.

Moon's Age, given for 0^h TT, is the number of days elapsed since the preceding New Moon (conjunction). The times of Moon's upper and lower transit are given in TT for the ephemeris meridian. Interpolation to any other meridian by means of differences given and with the help of the ephemeris longitude will yield the local mean time of transit. The apparent geocentric declination given for the time of ephemeris transit can also be similarly interpolated.

Physical ephemeris of the Moon (pages 88 to 95) has been computed using the formulae and constants of D. Eckhardt (*The Moon and the Planets, 25 3, 1981; High precision Earth Rotation and Earth-Moon Dynamics, ed. O. Calame, pages 193-198, 1982)* with inclination *I* as given above (IAU value).

In case of the Moon, selenographic longitudes are measured for a point on the surface of the Moon from the lunar meridian that passes through the mean central point of the visible disc positive towards the west towards Mare Crisium. Selenographic latitudes are reckoned positive towards the north limb. The mean central point of the disc is defined as the point on the lunar surface intersected by the radius of the Moon directed towards the Earth, when the Moon is simultaneously at the ascending node and coincident with the mean longitude.

The Moon presents roughly the same hemisphere to the Earth. However, due to non uniformity of the revolution of the Moon around the Earth (optical libration) and an oscillation of the actual rotational motion of the Moon about its mean rotation (physical libration), about 59% of the Moon's surface can be seen from the Earth. The contribution to the Earth's selenographic longitude and latitude due to physical libration has been tabulated separately. These are geocentric values.

The tabular selenographic longitude and latitude of the Earth are the selenographic co-ordinates of the apparent central point of the Moon from which point the Earth is in selenographic zenith. These co-ordinates are the total librations (sums of optical and physical librations) in longitude and latitude respectively. When the libration in longitude, i.e. the selenographic longitude of the Earth, is positive, the mean central point of the disc is displaced eastward exposing to view a region on the west limb. When the libration in latitude, i.e. the selenographic latitude of the Earth, is positive, a region on the north limb is exposed to view.

The selenographic co-ordinates of the point on the lunar surface where the Sun is in the Zenith are the selenographic co-ordinates of the Sun. The selenographic co-longitude of the Sun tabulated in the ephemeris is obtained by subtracting the selenographic longitude of the Sun from $90°$ or $450°$; it is approximately $270°$, $0°$, $90°$ and $180°$ at new-moon, first quarter, full-moon and last quarter respectively.

The position angle of the axis is the angle that the lunar meridian through the apparent central point of the disc towards the north lunar pole forms with the declination circle through the central point, reckoned counter clockwise from the north point of the disc.

The position angle of the bright limb is the position angle of the mid point of the illuminated limb, reckoned eastward from the north point of the disc. The position angle of the two cusps may be obtained by adding $\pm\ 90^\circ$ to that of the bright limb.

The expression for calculating the selenographic altitude (a) of the Sun (above the lunar horizon) at a point at selenographic longitude l and latitude b is as follows :

$\sin a = \sin b_\circ \ \sin b + \cos b_\circ \ \cos b \ \sin (c_\circ + l)$, where $(c_\circ, b_\circ)$ are the Sun's co-longitude and latitude at the time.

The following expressions can be used to compute the differential corrections to be applied to the tabular geocentric librations to form the topocentric librations :

$$\Delta l \ = \ -\ \pi' \ \sin (Q - C) \ \sec b$$
$$\Delta b \ = \ +\ \pi' \ \cos (Q - C)$$

$\Delta C \ = \ + \sin (b + \Delta b)\, \Delta l \ -\ \pi' \ \sin Q \ \tan \delta$, where Q is the geocentric parallactic angle of the Moon and π' is the topocentric horizontal parallax. The latter is obtained from the geocentric horizontal parallax (π) (pages 64 to 79) by using :

$$\pi' = \pi \ (\sin z + 0.0084 \sin 2\, z)$$

where z is the geocentric zenith distance of the Moon. The values of z and Q may be calculated from the geocentric R.A. (α) and declination (δ) of the Moon by using :

$$\sin z \ \sin Q \ = \ \cos \phi \ \sin h$$
$$\sin z \ \cos Q \ = \ \cos \delta \ \sin \phi - \sin \delta \ \cos \phi \ \cos h$$
$$\cos z \ = \ \sin \delta \ \sin \phi + \cos \delta \ \cos \phi \ \cos h$$

where ϕ is the geocentric latitude of the observer and h is the local hour angle of the Moon given by :

$h =$ local apparent sidereal time $- \alpha$

Second differences in the tabular values of the geocentric librations must be taken into account in interpolation for the time of observation.

Major Planets

The heliocentric and geocentric positions of the major planets given on pages 96 to 197 have been derived directly from the numerical integration mentioned on page 442.

The heliocentric longitude and latitude are referred to the mean equinox and ecliptic of date. The tabular argument of heliocentric ephemeris is barycentric dynamical time (TDB).

The apparent geocentric longitude and latitude are referred to the true equinox and ecliptic of date and are planetary aberration. The apparent right ascension and declination are also corrected for planetary aberration and referred to the true equinox and equator of date. The tabular argument for both the terrestrial dynamical time (TDT). The TDT of transit over the ephemeris meridian has been furnished, which may be interpolated to any other meridian to obtain the LMT of transit.

As regards Pluto, in addition to the usual data, figures have been furnished for reduction of the apparent right ascension and apparent declination to the corresponding astrometric places referred to the mean equinox and equator of J 2000.0. The astrometric ephemeris is obtained by first adding the usual planetary aberration to the

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planet's true geocentric places referred to the standard equinox J 2000.0 and then subtracting the stellar aberration pertinent to the position occupied by the planet. The astrometric place is thus affected by the amount of the terms in the aberration dependent on the longitude of the Earth's perihelion as are the catalogue mean places of stars in the neighbourhood. The astrometric ephemeris is, therefore, rigorously comparable with photographic observations that are referred to catalogue mean places J 2000.0 of neighbouring stars, it being only necessary to correct the observations for geocentric parallax in case of the planets and proper motion in case of the stars.

The tabular true distance from the Earth is the actual geocentric distance at the tabulated time and not at the instant when the light left the planet.

The horizontal parallax of planets is 8".794 143 divided by the geocentric distance. As regards the semi-diameter, the tabulated value is the value at unit distance divided by the geocentric distance. The semi-diameters at unit distance are as follows : Mercury 3".36, Venus 8".34, Mars 4".68, Jupiter 98".57 (Equatorial) and 92".12 (Polar), Saturn 83".13 (Equatorial) and 74".96 (Polar), Uranus 35".24, Neptune 34".14 and Pluto 2".07.

The heliocentric osculating elements of the orbits of the major planets, including Pluto, are given at intervals of 40 days on pages 200 to 201. The osculating elements are the elements of the instantaneous ecliptic orbit of the planet around the Sun determined by its actual position and velocity components for the instant, and as such the elements are affected by the attractions of other planets. The true place of a planet deduced from these elements is thus inclusive of the planetary perturbations, which need not, therefore, be considered separately in such a deduction.

The osculating elements for the Earth refer to the Earth/Moon barycentre. The correction in ecliptic rectangular co-ordinates in conversion from the Earth/Moon barycentre to the Earth's centre is given by :

$$\text{Earth's Centre} = (\text{Earth / Moon barycentre}) - (0.000\,0312\cos L,\ 0.000\,2865\sin L,\ 0.0000124\,\text{sinL},$$
$$-0.00000718\,\text{sinL}, 0.00000657\,\text{cosL}, 0.00000285\,\text{cosL})$$

where $L = 218° + 481\,268°\,T$, with T measured in Julian centuries from JD 245 1545.0 to 5 decimals; the co-ordinates are in a.u. with reference to mean equinox and ecliptic of date.

PART II - STARS

The mean places of 482 stars, apparent places of 68 stars at 10-day intervals. daily apparent place of *Polaris* and tables for finding latitude of place from altitude of polaris and azimuth of polaris are given in this section. The ecliptic co-ordinates (mean longitude and latitude) of 451 stars have also been given. To facilitate reduction from mean to apparent place of a star, Besselian Day Numbers as well as the barycentric position and velocity components of the Earth alongwith rotation matrix elements for precession and nutation have been tabulated.

Mean Places of Stars (pages 215 to 226)

Beginning with the issue for 1988, calculation of the mean and apparent places are based directly on the basic-FK5 compiled by the A.R.I., Heidelberg.

The table for mean places of stars includes all stars of magnitude upto 3.9 as well as the component stars of the different lunar asterisms of the Hindus, Chinese and Arabian even when those are fainter than magnitude 3.9.

In case double or multiple stars, *m* denotes the mean position of the centre of gravity (*c.g.*) of the system; *p* the preceding component having less right ascension, *f* the following component and *A* the brighter component of the system. The magnitude of the binary stars is the integrated value for the two components.

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The mean longitude and latitude of 445 important stars have been computed using the conversion from equatorial mean positions to ecliptic co-ordinates. Similarly, annual variations in longitude and latitude, etc., are the differentials of the conversion formulae. All quantities relate to the middle of the current Julian year.

Apparent Places of Stars (pages 227 to 243)

The apparent places of 68 selected stars are reported under this section. These positions are completely based on the FK5 beginning with the issue for 1988.

Smaller aberration has been computed from the total velocity of the Earth referred to the barycentre of the solar system. The E-terms of aberration are no longer included in the mean places in the FK5, but rather in the reduction from mean to apparent places.

Reductions to apparent places have been computed rigorously and directly without the intermediary of the mean place for the begining of the year. The rigorous computation also includes effects of relativistic light deflection. Because of this, the apparent places of a star when approaching very closely the Sun cannot be interpolated by the user, but these cases are of no practical interest in normal applications.

Apparent places of 68 bright stars with annual variation and annual proper motion at 10-day interval have been given on pages 227 to 243. The number, name, are taken generally from the FK5, magnitude and spectrum are taken from SIMBAD data base. Corrections for parallax have been applied where appreciable.

The right ascension and declination are referred to the true equator and equinox of date but with the omission of the short period terms of nutation. After interpolating the given apparent places to date and longitude of the station, the following corrections for the effect of short period terms of nutation are to be applied :

$$\Delta\alpha = a\, d\psi + b\, d\varepsilon \quad \text{seconds of time}$$
$$\Delta\delta = a'\, d\psi + b'\, d\varepsilon \quad \text{seconds of arc}$$

where $d\psi$ and $d\varepsilon$ are short period terms of nutation as tabulated on pages 244 to 251. The values of a, b, a' and b' are given for each star under the apparent place.

The Apparent places of Polaris for each day of the year (pages 272 to 274) have been computed rigorously.

Besselian Day Numbers (pages 244 to 251)

All stellar data tabulations are now for the standard epoch at the middle of the current Julian year rather than the beginning of the Besselian year and accordingly the Besselian Day Numbers and second order day numbers are referred to the mean equator and equinox of the epoch, J 2024.5. Although for full precision the reduction to the apparent place has to be computed rigorously as described below, Besselian Day Numbers can still be used for less precision.

In the tabulated data, τ is the fraction of the Julian year since the standard epoch J 2024.5 A, B and E are Besselian Day Numbers designed to incorporate corrections to the position of a star on account of precession and nutation. In this case, the correction due to precession is measured from the middle of the year, and this is secured by incorporating in A the value of the precision corresponding to τ.The terms of short-period in nutation are included in A and B, which are also shown separately on pages 244 to 251.

The Besselian Day Numbers C and D, designed to include the effect of aberration, are now computed based on the total velocity of the Earth.

Second order day numbers, needed only for high declination stars for high accuracy, have been tabulated on pages 252 to 255.

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The barycentric position and velocity components of the Earth and rotation matrix elements for rigorous reduction of precesision and nutation have been tabulated on pages 256 to 270. Use of these data with examples is discussed below :-

Apparent place reduction with full precision (rigorous method)

Conversion of the barycentric co-ordinates of a star for the standard equinox and equator of J 2000.0 (TDB) to its apparent geocentric co-ordinates referred to the true equinox and equator of date (TT) can be done rigorously as follows:

The geocentric vector **P** of the star at the required epoch (ignoring the distinction between TDB and TT for the stellar case) is given be by:

$$\mathbf{P} = \mathbf{q} + T\mathbf{m} - \pi\mathbf{E_B} \quad \text{é é é .(1)}$$

Here **q** is the barycentric direction of the star at epoch J 2000.0 referred to the standard equinox and equator of J2000.0 and is given by :-

$$\mathbf{q} = (\cos\alpha_0 \cos\delta_0,\ \ \sin\alpha_0 \cos\delta_0,\ \ \sin\delta_0)$$

where α_0 and δ_0 are the right ascension and declination for the equator, equinox and epoch of J 2000.0.

The space motion vector $\mathbf{m} = (m_x, m_y, m_z)$ of the star in equation (1), expressed in radians/century, is given by :

$$\begin{aligned}
m_x &= -\mu_\alpha \cos\delta_0 \sin\alpha_0 - \mu_\delta \sin\delta_0 \cos\alpha_0 + \nu\pi \cos\delta_0 \cos\alpha_0 \\
m_y &= \mu_\alpha \cos\delta_0 \cos\alpha_0 - \mu_\delta \sin\delta_0 \sin\alpha_0 + \nu\pi \cos\delta_0 \sin\alpha_0 \\
m_z &= \mu_\delta \cos\delta_0 + \nu\pi \sin\delta_0
\end{aligned}$$

where these expressions take into account the radial velocity (v) in au/century (1 km/s = 21.094 952 75 a.u./ century), measured positively away from the Earth as well as proper motion(μ_α, μ_δ) in right ascension and declination in radian/century and π is the parallax in radians.

T is the interval in Julian centuries from J2000.0, given by T = (JD – 245 1545.0)/ 36525; $\mathbf{E}_B$ and $\dot{\mathbf{E}}_\mathbf{B}$ in a.u. per day are Earthôs barycentric position and velocity vectors at co-ordinate time t = TDB referred to the equator and equinox of J 2000.0 (pages 256 to 270).

The heliocentric position of the Earth **E** is given by

$$\mathbf{E} = \mathbf{E}_B - \mathbf{S}_B \quad \text{é é é é é é é (2)}$$

Where $\mathbf{S_B}$ is the barycentric position of the Sun at time t. This can be obtained from the heliocentric position of the barycentre tabulated on page 202 by reversing the sign of the respective x, y, and z.

The geocentric direction **p** of the star and the unit vector **e** can be computed from **p** = **P**/ |**P**| and **e** = **E**/ |**E**|

The geocentric direction $\mathbf{p_1}$ of the star after applying the correction for light deflection in the natural frame is obtained as follows:

$$\mathbf{p_1} = \mathbf{p} + (2\ \mu/c^2 E)\,(\mathbf{e} - (\mathbf{p.\,e})\,\mathbf{p})/(1 + \mathbf{p.\,e}) \quad \text{é é é é ..(3)}$$

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Where $\mu/c^2 = 9.87 \times 10^{-9}$ a.u and $E = |\mathbf{E}|$, the vector $\mathbf{p}_1$ is a unit vector to the order of μ/c^2 and dot (.) indicates scalar product.

The proper direction $\mathbf{p}_2$ in the geocentric inertial frame, that is moving with the instantaneous velocity **V** of the Earth relative to the natural frame, is given by:

$$\mathbf{p}_2 = (\beta^{-1}\mathbf{p}_1 + (1 + \mathbf{p}_1.\mathbf{V})/(1+\beta^{-1}))\mathbf{V})/(1+\mathbf{p}_1.\mathbf{V}) \ldots \ldots \quad (4)$$

Where $\mathbf{V} = \dot{\mathbf{E}}_{\mathbf{B}}/c = 0.0057755\, \dot{\mathbf{E}}_{\mathbf{B}}$ and $\beta = (1 - V^2)^{-1/2}$; the velocity **V** expressed in units of velocity of light and is equal to the Earthôs velocity in the barycentric frame to the order of V^2.

The apparent geocentric direction $\mathbf{p}_3$ is obtained by applying precession and nutation to the proper direction $\mathbf{p}_2$ by multiplying it row by column with the rotation matrix M=NPB (given on pages 257 to 271) as follows:

$$\mathbf{p}_3 = M\,\mathbf{p}_2 \ldots \ldots \ldots \quad (5)$$

The above direction $\mathbf{p}_3$ is in rectangular co- ordinates (ξ, η, ζ). It can be converted into spherical co- ordinates (α, δ) using :

$$\alpha = \tan^{-1}(\eta/\xi) \quad \text{and} \quad \delta = \tan^{-1}(\zeta/\beta) \ldots \ldots \quad (6)$$

Where $\beta = (\xi^2 + \eta^2)^{1/2}$

where the quadrant of α can be determined by the signs of ξ and η.

Correction for polar motion :

The apparent geocentric direction $\mathbf{p}_3$, given by equation (5) above, is for the true equator and equinox with the z axis pointing towards the celestial ephemeris pole. A further correction for polar motion may be applied to $\mathbf{p}_3$ to obtain $\mathbf{p}_4$ i.e. the direction relative to the conventional terrestrial reference system in which the z-axis is in the direction of the adopted mean position of the pole, as follows :

$$\mathbf{p}_4 = \mathbf{R}_2(-x)\,\mathbf{R}_1(-y)\,\mathbf{R}_3(\mathrm{GAST})\,\mathbf{p}_3$$

where GAST is the Greenwich apparent sidereal time at the corresponding instant of UT and

$$\mathbf{R}_1(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & \sin\theta \\ 0 & -\sin\theta & \cos\theta \end{bmatrix} \qquad \mathbf{R}_2(\theta) = \begin{bmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{bmatrix}$$

$$\mathbf{R}_3(\theta) = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

are the standard matrices that produce rotations through an angle θ about the x, y and z - axes respectively.

Polar motion is described by x and y, the co- ordinates of the celestial ephemeris pole with respect to the adopted origin; x and y are measured in seconds of arc from the origin along the meridians at longitudes 0° and 270°. Current values for the reduction of observations are published by the International Polar Motion Service and the Bureau International de lôHeure.

Example of stellar reduction :

Calculation of apparent position of a fictitious star on 2024, January 1 at 0^h TT from the catalogue data, mean right ascension (α_0) , declination (δ_0), centennial proper motion (μ_α, μ_δ) in right ascension and declination, parallax (π) and radial velocity (ν) of a fictitious star for the standard equinox and equator of J 2000.0 (TDB) as given below:

$\alpha_0 = 14^h\ 39^m\ 36^s.087$

$\mu_\alpha = -49.486$ s/ century
$= -0.00359872$ rad/century

$\delta_0 = -60°\ 50'\ 07''.14$

$\mu_\delta = +69''.60$ s/ century
$= +0.0003374$ rad/ century

$\pi = 0''.752$
$= 3.646 \times 10^{-6}$ rad

$\nu = -22.2$ km/ s
$\nu\pi = -0.0017074$ rad/ century

The barycentric position vector of the Sun and the position and velocity vectors of the Earth referred to J2000.0 on 2024 January 1, 0^h TDB (pages 202, 256 to 270) are :

Vector	Julian date	Barycentric Rectangular Components		
		x	y	z
$\mathbf{E_B}$	2460310.5	−0.179 3818503	+ 0.886523951	+ 0.38452444
$\dot{\mathbf{E}}_\mathbf{B}$	2460310.5	−0.017 230013	−0.002723085	−0.0011799
$\mathbf{S_B}$	2460310.5	−0.0097967252	+0.002749752	−0.000963

In order to calculate the geocentric vector **P** of the star at J 2000.0, using equation (1), the vectors **q** and **m** may be computed using positional data of the star.

$\mathbf{q} = (-0.373854098,\quad -0.312594565,\quad -0.8732226)$
$\mathbf{m} = (-0.000712684,\quad +0.001690102,\quad +0.00165534)$
$\mathbf{T} = (2460310.5\quad -245\,1545.0)/\,36525 \quad = \quad +0.24$

The geocentric vector **P** may be computed from equation (1) by substituting the vectors **q, m** and $\mathbf{E_B}$ and time **T**.

$\mathbf{P} = (-0.374024499,\quad -0.312188963,\quad -0.8728254)$ and $|\mathbf{P}| = 0.999590112$

The heliocentric position vector **E** of earth may be obtained using equation (2)

$\mathbf{E} = (-0.165851251,\quad +0.889273703,\quad +0.38548747)$ and $|\mathbf{E}| = 0.983318335$

The unit vectors **p** and **e** in the direction of **P** and **E** respectively are as follows :

$\mathbf{p} = (-0.37417787,\quad -0.312316978,\quad -0.8731833)$

$\mathbf{e} = (-0.168664862,\quad +0.904359932,\quad +0.39202714)$

The scalar product $\mathbf{p.e} = -0.5611647843$ and $2\mu/c^2 = 1.974 \times 10^{-8}$ a. u. The second term in the equation (3) represents the correction for the light deflection in the natural frame, and is given by the following vector :

$(2\mu/c^2\mathbf{E})(\mathbf{e} - (\mathbf{p.e})\,\mathbf{p})/(1 + \mathbf{p.e}) = (-0.000000017,\quad +0.000000033,\quad -0.000000004)$

Addition of the above correction to the unit vector **p** gives geocentric direction $\mathbf{p_1}$ of the star :

$\mathbf{p_1}$ = (–0.374177887, –0.312316945, –0.8731833)

The velocity vector $\mathbf{V} = 0.000\ 1010\ \dot{\mathbf{E}}_{\mathbf{B}}$ and $\beta^{-1} = (1 - V^2)^{1/2}$ are as follows:

V = (–0.0000995119, –0.0000157272, –0.000006815)

$\beta^{-1} = 0.999\ 999995$

The scalar product $\mathbf{p_1} . \mathbf{V} = +\ 0.0000480974$

Now substituting quantities computed above in the equation (4), the proper direction is obtained as:

$\mathbf{p_2}$ = (–0.374259398, –0.31231765, –0.8731481)

The precession and nutation matrix (**M**) from page 257 is as follows:

$$\mathbf{M} = \begin{bmatrix} +0.999983033 & -0.0053427777 & -0.0023213 \\ +0.005342686 & +0.999985727 & -0.000\ 04525 \\ +0.002321512 & +0.000032847 & +0.9999973 \end{bmatrix}$$

Finally the apparent geocentric direction $\mathbf{p_3}$ is obtained by multiplying the proper direction $\mathbf{p_2}$ to the precession and nutation matrix as given by the equation (5).

Thus $\mathbf{p_3}$ = (–0.370557563, –0.314273233, –0.8737636) and the apparent right ascension and declination:
$\alpha = \tan^{-1}(\eta/\xi) = 14^h\ 41^m\ 12^s.379$; $\delta = \tan^{-1}(\zeta/\beta) = -60^\circ\ 55''\ 37'.92$

EXPLANATION

PART III - Tables of Sunrise, Sunset, Twilight and Moonrise, Moonset

The times of Sunrise, Sunset and Twilight, which can be obtained immediately from the given tables by simple interpolation for the desired latitude within the scope of the tables, are in local mean time of the place. Strictly speaking, the timings of these events are for places on the meridian of Greenwich. By simple interpolation for longitude, the correct time (L.M.T.) for the station can be obtained, which can thereafter be reduced to the zonal standard time by applying correction of time pertinent to the place.

At the given times of Sunrise and Sunset, the upper limb of the Sun is on the horizon; the true zenith distance of the Sun's center is then taken as 90° 50′, allowing 16′ for semi- diameter and 34′ for horizontal refraction.

The timings of the beginning of morning twilight and ending of evening twilight relate to the instants when the center of the Sun is 18° below the horizon. This is now known as astronomical twilight. The period of twilight has been divided into three parts – Civil when the Sun is 6° below the horizon, Nautical when 12° and Astronomical when 18° and their duration have been given.

The timings of rising and setting in U.T. of a body with right ascension α, declination δ and zenith distance z at latitude ϕ and east longitude λ may be computed from

$$UT = 0.99727\ [\alpha - \lambda \ \pm \cos^{-1}\ \{(\cos z - \sin\phi \sin\delta)/(\cos\phi \ \cos\delta)\} - \text{GAST at } 0^h\ \text{UT}],$$

where each term is expressed in time measure and GAST at 0^h UT as tabulated on page 13. The negative sign in the expression corresponds to rising and positive sign to setting. If the quantity $\{(\cos z - \sin\phi \sin\delta)/(\cos\phi \cos\delta)$ is numerically greater than one, there is no phenomenon. However, the tabulated timings of Moonrise and Moonset have been computed by inverse by interpolation for the zenith distance at z = 90° 34′.001- 0.72755 π, where π is the horizontal parallax of the Moon at the time of phenomena. The above value includes semi-diameter and the effect of refraction.

The Sunrise and Sunset times for certain stations in India (Kolkata, Varanasi, Chennai, Delhi, Mumbai) have been separately computed and given in Indian Standard Time. In these calculations the amount of horizontal refraction has been taken as 31′, the value derived from consideration of the atmospheric conditions in India, and consequently the zenith distance of the Sun's center is 90° 47′ at the times given. In the section on Indian Calendar, the Sunrise and Sunset times which have been given for latitude 23° 11′ North and Central Meridian of India, also relates to the times when upper limb of the Sun is on the horizon as in the general tables.

The Moonrise and Moonset times given for certain latitudes relate to the local mean time calculated for the Central Meridian of India. By simple interpolation with the help of a table given on page 313, the local mean time for any other latitude can easily be obtained. At the time given, the Moon's upper limb is on the horizon and so the true geocentric zenith distance of the Moon's center is 90° 34′ *plus* semi- diameter of the Moon *minus* the horizontal parallax, where 34′ has been allowed for horizontal refraction. Taking the mean values of the semi-diameter and the parallax, the zenith distance of the Moon at the moment is about 89° 52′, which varies from 89° 55′ to 89° 49′ as the parallax increases from 53′.6 to 61′.9.

The times of Moonrise and Moonset for certain stations in India (Kolkata, Chennai, Delhi and Mumbai) are separately calculated and given in I.S.T.

The times of Sunrise, Sunset and Moonrise, Moonset given are for an observer on the surface of the Earth considered to be a flat surface around that point without any obstruction in the directions of rising or setting. For an observer stationed at some elevation above the surface, the rising will be further accelerated and the setting retarded according to the height of the observer. The additional arc of depression to be considered on this account is 2′.10$\sqrt{h}$ where h is the height of the observer in meters above the ground level. The dip of the sensible horizon is however 1′.77 $\sqrt{h}$. The effect of atmospheric refraction is included in the above results, without which both the terms would have got reduced to the same value of 1′.93 $\sqrt{h}$.

EXPLANATION

The values of the arc of depression according to height of the observer are given below:

Height	Depression	Height	Depression	Height	Depression	Height	Depression
Meters	′	Meters	′	Meters	′	Meters	′
0	0.0	40	13.3	300	36	2000	94
2	3.0	50	14.8	400	42	3000	115
5	4.7	75	18.2	500	47	4000	133
10	6.6	100	21.0	750	58	5000	148
20	9.4	150	25.7	1000	66	6000	163
30	11.5	200	29.7	1500	81	7000	176
40	13.3	300	36.4	2000	94	8000	188

The correction to the rising and setting times due to the above height of the observer may be obtained by multiplying the arc of depression given in the table by the figures from the table below:

Latitude of Station

Decli. of Sun	0°	10°	20°	30°	35°	40°	45°	50°	52°	54°	56°	58°	60°
° ′	m	m	m	m	m	m	m	m	m	m	m	m	m
0	.067	.068	.071	.077	.082	.087	.094	.104	.108	.113	.119	.126	.133
5	.067	.068	.071	.077	.082	.088	.095	.105	.109	.115	.121	.127	.135
10	.068	.069	.072	.079	.083	.089	.097	.108	.113	.119	.126	.133	.142
15	.069	.070	.074	.081	.086	.093	.101	.113	.119	.127	.134	.144	.156
20	.071	.072	.076	.084	.090	.097	.108	.123	.130	.139	.151	.165	.183
23 27	.073	.074	.078	.087	.093	.102	.114	.132	.142	.155	.171	.192	.223

The deviation of the rising or the setting point on the horizon (i.e., amplitude) on account of the above arc of depression h (obtained after adding to it the normal depression at rising or setting) may be found as h tan ϕ sec A, deviation being towards the north in the northern hemisphere and south in the southern hemisphere. Here A, the amplitude of the rising of setting point measured from the east or west point of the horizon, is obtained from sin A – sinδ secϕ. The values of the amplitude for certain latitudes and declinations are given in a table on page 365.

PART IV — ECLIPSES AND OCCULTATIONS

Eclipses and Occultations have been calculated on the basis of the tabulated positions of the Sun and the Moon. The semi-diameters of the Sun and the Moon used in these calculations exclude irradiation. The Sun's tabular semi-diameter which includes irradiation is diminished by 1."55 for this purpose.

The semi-diameter of the Moon given by sin $s = k$ sin π, where π is the Moon's horizontal parallax is based on the adopted constant k = 0.272 5076 to account for the irregularities of the lunar limb. It corresponds to the mean radius of Watt's datum as determined by observations of occultations and to the adopted radius of the Earth, introduced in 1982 and is consistent with the IAU system of Astronomical constants (1976). It is used with effect from 1986 in this publication. Refraction is neglected in calculation of eclipses of both the Sun and the Moon.

EXPLANATION

The circumstances of the phenomena are given provisionally in Universal Time, using $\Delta T\ (A) = +\ 70^s.0$ and the points on the Earth's surface are also expressed in terms of geographic longitude measured positively to the east.

Lunar Eclipses

In the calculation of lunar eclipses, the semi-diameter of the shadow -cone has been increased by one-fiftieth to take account of the influence of the atmosphere in absorbing Sun's rays passing through it . In the calculation of rising and setting limits, the time when the centre of the Moon becomes visible on the horizon has been considered as rising or setting. Elsewhere in this book the upper limb visible on the horizon is taken as the criterion for rising or setting. The horizontal refraction used in these calculations of rising and setting is 31′.

The method of computation of a lunar eclipse is detailed below :

Let α, δ be the right ascension and declination of the Moon at an instant T_0 at or very near to the moment of opposition, and let α', δ' be the corresponding co-ordinates of the centre of the Earth's shadow (α'= R. A. of Sun + 12^h, δ' = Sun's declination). Let π, s be parallax and semi-diameter of the Moon and π', s' be parallax and semi-diameter of the Sun.

As the Earth is not a perfect sphere, its shadow will differ slightly from a cone. It would however, be sufficient for our purpose if we use a mean radius for the Earth, which is equivalent to submitting for π a parallax π_1, reduced to latitude 45° , so that $\pi_1 = 0.9983\ 33\ \pi$.

The radius of the shadow-cone at Moon's distance is $1.02\ (\pi_1 + \pi' - s')$ for umbra, and $1.02\ (\pi_1 + \pi' + s')$ for penumbra.

Let L be the angle between the centre of the Moon and that of the shadow-cone at the desired circumstance of the eclipse, so that

$L_1 = 1.02\ (\pi_1 + \pi' - s') + s$ . . . . for first and last contacts

$L_2 = 1.02\ (\pi_1 + \pi' - s') - s$ . . . . for second and third contacts

For the penumbral eclipse,

$L' = 1.02\ (\pi_1 + \pi' + s') + s$ . . . . for first and last contacts

The Besselian elements x, y may be computed with sufficient accuracy with the following :

$x = (\alpha - \alpha')\cos\delta$ $\qquad$ x' = hourly variation of $(\alpha - \alpha')\cos\delta$

$y = (\delta - \delta')$ $\qquad$ y' = hourly variation of $(\delta - \delta')$

Let $m \sin M = x$, and $m \cos M = y$, so that $\tan M = x/y$, and $m^2 = x^2 + y^2$. The quantity m, taken always positive at all times, represents the angular distance between the centre of the Moon and of the shadow cone. The angle M may take any value from 0° to 360°.

Again, let $n \sin N = x'$, and $n \cos N = y'$, so that $n^2 = x'^2 + y'^2$, and $\tan N = x'/y'$. The angle N lies in the first or the second quadrant according as y' is positive or negative. The value of n is positive.

The time of greatest obscuration or middle of the eclipse is given by

$$T_0 - 1/n\ \{ m \cos (M - N) \} \quad \text{or} \quad T_0 - (x x' + y y')/n^2 \quad (\text{hours})$$

EXPLANATION

The auxiliary angle ψ is given by :

$\sin\psi = \{ m \sin (M - N) \} / L = (x y' - y x') / nL$. The value of either L_1, L_2 or L' should be used or L according to the circumstances of the eclipse under consideration.

Then, time of the beginning or ending = time of middle + (1/n) ($L \cos\psi$).

The value of ψ should be so taken that $\cos\psi$ may be negative for the beginning and positive for the ending of the phase. In other words, when $\sin\psi$ is positive, i.e., when $(M - N)$ falls in the 1st or the 2nd quadrant, ψ would be in the second quadrant for the beginning and in the first quadrant for the ending; and when $\sin\psi$ is negative, i.e., when $(M - N)$ is in the 3rd or the 4th quadrant, ψ would be in the third quadrant for the beginning and fourth quadrant for the ending.

If greater accuracy is desired, the computations may be repeated using the times obtained above as initial times.

The magnitude of the eclipse, the Moon's diameter being unity, is $(L_1 - \Delta) / 2s$,

where $\Delta = m \sin (M - N)$ is taken positive. When the computations are repeated for greater accuracy, the average values of L_1, Δ and s for the first and last umbral contacts or those corresponding to the time of greatest obscurations should be used.

When Δ becomes less than L_2, the eclipse is a total one. The computations of the beginning and ending of the total phase may be done in the same way as above using the value of L_2.

The position angle of contact P on the Moon's limb, measured from the north point in the direction N.E.S.W. is $180^\circ + N + \psi$ for the first and last contacts both with umbra and penumbra as the case may be, and is $N + \psi$ for the second and third contacts in case of a total eclipse.

When M is calculated for the exact time of the phenomena, i.e., beginning or ending, then P may be obtained by considering $N + \psi = M$, i.e., $P = M + 180^\circ$ or $P = M$ as the case may be.

Solar Eclipses

Computation of the elements and circumstances of solar eclipses has been done following the method of Bessel. The geometric position of the shadow of the Moon relative to the Earth is described by the Besselian elements in a system of geocentric rectangular co-ordinates. In this system, the geocentric plane perpendicular to the axis of the shadow is taken as the *xy* plane and called the fundamental plane. The *x*-axis is the intersection of the fundamental plane with the plane of equator and is positive towards east. The *y*-axis is positive towards the north. The *z*-axis is parallel to the axis of the shadow and is positive towards the Moon. The tabular values of x and y are the co-ordinates of the axis of the shadow on the fundamental plane in units of the Earth's equatorial radius. The quantities d and μ specify the declination and hour angle of the point on the celestial sphere towards which the axis of the shadow is directed.

The elements l_1 and l_2 are the radii of the penumbral and umbral cones on the fundamental plane. The elements l_2 is regarded as positive for an annular eclipse and negative for a total eclipse. The elements f_1 and f_2 are the angles between the axis of the shadow and the generators of the penumbral and umbral cones respectively.

The Besselian elements x, y, sin d, cos d, μ, l_1 and l_2 are computed and tabulated at an interval of 10 minutes to facilitate the accurate computation of the circumstances of the eclipse. The given eclipse maps show the path of the eclipse, beginning and ending times of the eclipse, the area of visibility and rising and setting limits of the eclipse.

EXPLANATION

The method of computation of the local circumstances of the solar eclipse is given below :

The approximate time (U.T.) of the beginning and ending of a solar eclipse may be obtained from the corresponding eclipse map and used as estimated initial time. To obtain the geocentric rectangular co-ordinates, ξ,, η, ζ of the observer located on the surface of the Earth in geographic longitude λ (measured east positive) and latitude ϕ in terms of the Besselian elements, we have;

$$\xi = \rho \cos \phi' \sin H$$

$$\eta = \rho \sin \phi' \cos d - \rho \cos \phi' \sin d \cos H$$

$$\zeta = \rho \sin \phi' \sin d + \rho \cos \phi' \cos d \cos H$$

and their variations per minute as :

$$\xi' = \mu' \rho \cos \phi' \cos H$$

$$\eta' = \mu' \xi \sin d - \zeta d'$$

where $H = \mu + \lambda$ and μ' is variation per minute in hour angle. In most of the cases, the variation ζ' is not needed and may be neglected. The values of $\rho \cos \phi'$ and $\rho \sin \phi'$ used above may be found for the observer's latitude ϕ using Table – XI.

The eclipse begins or ends at the station when $(x - \xi)^2 + (y - \eta)^2 = (l_1 - \zeta \tan f_1)^2$.

Now let $m \sin M = x - \xi$, $m \cos M = y - \eta$ so that $\tan M = (x - \xi)/(y - \eta)$ and $m^2 = (x - \xi)^2 + (y - \eta)^2$. The angle M may have any value from 0° to 360° and m is always positive.

Again let $n \sin N = x' - \xi'$, $n \cos N = y' - \eta'$ so that $\tan N = (x' - \xi')/(y' - \eta')$ and $n^2 = (x' - \xi')^2 + (y' - \eta')^2$. The angle N is in the first two quadrants and n is positive.

The radius of the shadow at a height ζ above the fundamental plane may be determined by $L_1 = l_1 - \zeta \tan f_1$ or $L_2 = l_2 - \zeta \tan f_2$ as the case may be.

Now the required time of the event will be obtained by applying a correction τ to the adopted initial time concerned, given by

$$\tau = -\{m \cos(M - N)\}/n + (L \cos \psi)/n \quad \text{(in minutes)}, \quad \text{where } \sin \psi = \{m \sin(M - N)\}/L$$

The value of ψ for which $\cos \psi$ is negative should be taken for the beginning of the eclipse for the beginning of the annular phase or the end of the total phase, and the value of ψ for which $\cos \psi$ is positive is to be taken for the end of the eclipse, for the end of the annular phase or the beginning of the total phase. When $M - N$ falls within 0º to 180º, ψ is in the 2nd or the 1st quadrant according to the required phase of the eclipse, for the other half it is in the 3rd or the 4th quadrant according to the phase.

If the correction τ obtained above exceeds 3 or 4 minutes and greater accuracy is desired, the computation should be repeated using the new times now obtained as initial times.

For finding the time of greatest phase , the calculations should be started adopting a new assumed time midway between the beginning and ending times. The correction to this adopted time is given by:

$$\tau = -\{m \cos(M - N)\}/n \text{ (in minutes).}$$

EXPLANATION

The magnitude of greatest partial eclipse is the fraction of the Sun's diameter obscured by the Moon at the time of greatest phase, and is given by : $M_1 = (L_1 - \Delta) / (2 L_1 - 0.5459)$ where Δ, the minimum distance between the centres of the two bodies, is given by $m \sin (M - N)$ and is to be taken positive.

The magnitude of the central phase, in the same units, is $M_2 = (0.5459) / (2 L_1 - 0.5459)$.

The position angle of the point of contact measured from the north point of the Sun in the direction N. E. S. W. (i.e. clockwise direction) may be obtained from $P = N + \psi$ or if, measured from the vertex, from $V = P - C$ where C, the parallactic angle, is given by $\tan C = (\xi / \eta)$.

Occultations

The occultations of visible planets and certain bright stars (*Aldebaran , Regulas, Spica and Antares)* by the Moon are given whenever they occur, together with the time, area of visibility and the Besselian elements. The area of visibility includes also the regions from which the occultations is visible even during day light hours. The two times given in the first table for the occultations are the times of first and last contact of the shadow cylinder with the Earth and as such the occultation may be expected to be visible only within the period between these times.

The elements are similar to those for solar eclipses and are given for T_0, the instant of conjunction in R.A. when x = 0. The common geocentric hour angle of the bodies, or more precisely of the line passing through the center of the Earth parallel to the line joining the center of the two bodies for the Greenwich meridians is H_0 and its hourly variation is about $60^m.16$ or $15^o.04$. Y is the value of y for the instant of conjunction and x', y' are the hourly variations of x and y. For a place where an occultation is visible, the times of immersion and emersion can be computed with the help of these elements by a method similar to that used in computing the local circumstances of a solar eclipse as explained below:

Let φ and λ be respectively the latitude and longitude of the place. The longitude of place is to be taken in hours and minutes and as usual measured positively towards east of Greenwich.

For night visibility of an occultation, the necessary conditions are as follows:

(1) The Sun must not be much more than an hour above the horizon at the local mean time $T_0 + \lambda$ (and it must be below the horizon at time $T_0 + \lambda + t$).

(2) The Moon must be above the horizon by an appreciable amount, i.e., the quantity $H_0 + \lambda$, taken without regard to sign for this purpose, must be less than the semidiurnal are of the star of planet by at least one hour.

For prediction of an occultation, find the approximate time (U.T.) of local apparent connection by applying to the given T_0 a correction t (in hours) taken from the following table*:

$H_0 + \lambda$

φ	h m 0-00 h	h m 0-30 h	h m 1-00 h	h m 1-30 h	h m 2-00 h	h m 2-30 h	h m 3-00 h	h m 3-30 h	h m 4-00 h	h m 4-30 h	h m 5-00 h	h m 5-30 h	h m 6-00 h
0°	0.00	0.41	0.77	1.08	1.32	1.50	1.62	1.69	1.72	1.73	1.71	1.65	1.58
10°	0.00	0.40	0.75	1.06	1.29	1.47	1.59	1.66	1.70	1.70	1.69	1.63	1.56
20°	0.00	0.37	0.70	0.99	1.21	1.38	1.51	1.58	1.62	1.63	1.61	1.56	1.50
30°	0.00	0.32	0.62	0.87	1.08	1.24	1.36	1.44	1.49	1.50	1.50	1.45	1.40
40°	0.00	0.26	0.51	0.73	0.92	1.07	1.18	1.26	1.30	1.32	1.32	1.30	1.26
50°	0.00	0.20	0.40	0.58	0.73	0.86	0.96	1.03	1.08	1.11	1.11	1.10	1.07
60°	0.00	0.15	0.29	0.42	0.53	0.63	0.72	0.78	0.83	0.85	0.87	0.86	0.85

*The value of t has the same sign as that of $\sin (H_0 + \lambda)$.

The Besselian elements x and y at the time of local conjunctions $T_0 + t$ may be calculated as follows :

$x = x' t$, and $y = Y + y' t$.

EXPLANATION

Occultations for which y - η for the time local conjunction is not within ± 0.35 will not be visible at the place. In order to decide this, an estimated value of η may be used as an approximation for which the following tables are given indicating the minimum and maximum values of η.

Limiting value of η (when on meridian i.e., when $H_0 + \lambda = 0$)

φ - d ………	0°	10°	20°	30°	40°	50°	60°
η ………	0.00	0.17	0.34	0.50	0.64	0.76	0.86

The values of η has the same sign as that of φ - d.

(* The table has been constructed taking $x' = 0.5773$; for other values of x' the figures will vary inversely. For this purpose the figures of the table may be multiplied by 1.15 for $x' = 0.50$, by 1.05 for $x' = 0.55$, by 0.95 or $x' = 0.60$ and by 0.89 for $x' = 0.65$)

Limiting value of η (when rising or setting i.e. when $H_0 + \lambda + t$ = S.D. arc)

	Latitude (φ)						
d	0°	10°	20°	30°	40°	50°	60°
0°	0.00	0.17	0.34	0.50	0.64	0.76	0.86
± 9	0.00	0.17	0.34	0.50	0.65	0.77	0.87
± 18	0.00	0.18	0.36	0.52	0.67	0.80	0.91
± 27	0.00	0.19	0.38	0.56	0.72	0.86	0.97

The value of η has the same sign that of φ

For the instant $T_0 + t$, compute the following quantities in addition to x and y :

Let H = (H + λ) + $a\,t$ (converted into arc). The value of a has been given for planets under elements; it is 1.027 for stars. The observer's position on the fundamental plane is given by:

$$\xi = \rho \cos \varphi' \sin H \quad \text{and} \quad \eta = \rho \sin \varphi' \cos d - \rho \cos \varphi' \sin d \cos H$$

and the hourly variations ;

$$\xi' = 0.2618\, a\, \rho \cos \varphi' \cos H, \quad \eta' = 0.2618\, a\, \xi \sin d.$$

The value of the co-efficient 0.2618 a is 0.2625 for stars.

Let $u = x - \xi$, $v = y - \eta$, $u' = x' - \xi'$, $v' = y' - \eta'$ so that $n^2 = u'^2 + v'^2$.

Now $\sin \psi = (uv' - vu')$ / nl, where l = 0.2725, for stars, and for planets, it will be found under elements.

The correction τ to the time of immersion and emersion is given by :

$$\tau = -(60/n^2)(uu' + vv') \mp (60\, l / n) \cos \psi$$

The negative sign in the second term is to be taken for immersion or the first contact and the positive sign for emersion or the last contact.

Instant of immersion or emersion = $T_0 + t + \tau$.

If greater accuracy is desired, a second set of calculations may be done in the following way using the new times now obtained as initial times. For the revised time of immersion or emersion T , compute H = (H + $\lambda + at) + a\tau$, $x, y, \xi, \eta, \xi', \eta'$; u, v, u', v' and D = $uu' + vv'$. The second correction t′ is given by : $t' = (30/D) \times [l^2 - (u^2 + v^2)]$ in mins. of time.

The final time of immersion or emersion = $T + t'$.

The angles of contact on the Moon's limb:

EXPLANATION

$P = M + 180°$, where $\tan M = (u + u't') / (v + v't')$,

$V = P - C$, where $\tan C = (\xi + \xi' t') / (\eta + \eta' t')$,

where t′ is to be taken in hours.

PART V – Miscellaneous Tables

Phenomena

The stellar magnitudes of planets together with their elongations from the Sun have been given under ‘phenomena’ at suitable intervals of days. The computation in the next portion of the phenomena has been based on longitude and that in the Astronomical Diary mainly on right ascension, with the exception that the conjunctions, squares and oppositions of planets with the Sun included in the latter have been calculated on the basis of longitudes. In the case of conjunctions in right ascension, the differences in declination between the planets or the Moon and the planet have also been given. The dates of heliacal visibility of planets (Mercury to Saturn) have also been given and these are based on the method given on page 465.

Interpolation

Interpolation Coefficients have been given on pages 353 to 356 according to the formula of both Bessel and Everett, for each hundredth part of the time-interval.

Let the tabular value of a function given at equal intervals be represented by f and the first and second differences by Δ with relevant dashes and subscripts as shown below. It is required to determine the value of the function at some intermediate point.

Function	First difference	Second difference
f_{-1}		
	$\Delta'_{-½}$	
f_0		Δ''_0
	$\Delta'_{½}$	
f_1		Δ''_1
	$\Delta'_{1½}$	
f_2		

The epochs for which the values of the function are to be taken should be so chosen that the time for which the value of the function is required may fall within the interval f_0 and f_2 and let n be the time interval from f_0 up to the moment for which the value of the function is required. It is expressed as a fraction of the interval at which the given values of the function are tabulated. Let f_n be the value of the function for the desired time which is now required to be determined.

The two formulae for interpolation which are generally used for the purpose are as follows :

$f_n = f_0 + n\,\Delta'_{½} + B''(\Delta''_0 + \Delta''_1)$…………………Bessel

$f_n = f_0 + n\,\Delta'_{½} + E_0''\Delta''_0 + E_1''\Delta''_1$………………Everett

in which $f_0 + n\Delta'_{½}$ may be replaced by $(1- n) f_0 + nf_1$, if necessary, and where

$$B'' = n\,(n - 1)/ 4,\quad E_0'' = - n\,(n-1)\,(n-2)/ 6 \text{ and } E_1'' = n\,(n+1)\,(n-1)/ 6$$

It will be noted that in Bessel’s formula the value of $\Delta''_0 + \Delta''_1$ is the same as $\Delta'_{1½} - \Delta'_{-½}$. The value of the coefficients B'', E_0'' and E_1'', all of which are negative within the range f_0 to f_1 , will be obtained from the table on page 353 to 356 for the given value of n.

EXPLANATION

Bessel's method of interpolation is more simple, but greater accuracy is yielded by Everett's formula on account of the fact that it includes the effect of third differences also.

The more complete formula of Bessel is as follows :

$$f_n = f_0 + n\Delta'_{½} + \{n(n-1)\,(\Delta''_0 + \Delta''_1)\}/4 + \{\,n(n-1)(n-½\,)\,\Delta'''_{½}\,\}/6 + \cdots\cdots$$

The rate of variation of the function at a point, i.e., the instantaneous motion per unit of time interval may be obtained by the following formula :

Motion = $\Delta'_{½} + C\Delta_0'' + D\Delta_1''$, where $C = -(3n^2 - 6n + 2)/6$ and $D = (3n^2 - 1)/6$

When $n = 0$, the motion $f_0' = \{(\Delta'_{-½} + \Delta'_{½})/2\} - (\Delta_1'' - \Delta_0'')/6$,
when $n = ½$, $f'_{½} = \Delta'_{½} - \{(\Delta_1'' - \Delta_0'')/24\}$ and when $n = 1$, $f_1' = \{(\Delta'_{½} + \Delta'_{1½})/2\} - (\Delta_1'' - \Delta_0'')/6$

The stationary point (i.e., when $f' = 0$) occurs when $n = ½ - (\Delta'_{½}/\Delta''_1)$ or $½ - (\Delta'_{-½}/\Delta''_0)$.

Geocentric Co-ordinates and other Constants

The tables given on pages 359 and 360 are for computing the geocentric co-ordinates of a place for which the geodetic, i.e., geographic or common latitude φ is known. From the first table, the values of $\rho \sin \varphi'$ and $\rho \cos \varphi'$ can be directly obtained, while the second table gives the values of the geocentric latitude φ′ and the radius of the Earth ρ separately

The constants used for these tables and the others given below are the 1976 I.A.U. System of astronomical constants introduced in this publication with effect from the 1985 issue.

Equatorial radius (a) = 637 8140 m = 3963.20 miles.
Polar radius (b) = 635 6755 m = 3949.91 miles.
Flattening of the Earth (f) = $(a-b)/a$ = 1/298.257 = 0.003 353 64.
Ellipticity or eccentricity (e) = 0.081 8192, e^2 = 0.006 694 39.

The following expressions are obtained from the above values of flattening and radius of the Earth.

$S = 0.994\,9743 - 0.001\,6708 \cos 2\varphi + 0.000\,0021 \cos 4\varphi$

$C = 1.001\,6799 - 0.001\,6820 \cos 2\varphi + 0.000\,0021 \cos 4\varphi$

$\rho = 0.998\,3271 + 0.001\,6764 \cos 2\varphi - 0.000\,0035 \cos 4\varphi$

$\varphi' = \varphi - 11'\,32''.726 \sin 2\varphi + 1''.163 \sin 4\varphi - 0''.003 \sin 6\varphi$

One degree of longitude (in km.) = $111.4133 \cos \varphi - 0.0935 \cos 3\varphi$

One degree of latitude (in km.) = $111.1334 - 0.5598 \cos 2\varphi + 0.0012 \cos 4\varphi$

g (cm/sec²) = $978.031 + 5.1859 \sin^2 \varphi - 0.0057 \sin^2 2\varphi - 0.000\,308H$. where H is the elevation in meters above sea level.

Period of Earth satellite of negligible mass = 84.489 09 $d^{3/2}$ mins., where d is the mean distance of the satellite from the Earth's center measured in units of 6378140 m (Earth's equatorial radius).

Invariable plane of the solar system; $\Omega = 106°35'\,01'' + 3452''T$, $I = 1°\,34'\,59'' - 18''T$

Pole of galactic plane (1950); $\alpha = 12^h\,49^m.0$, $\delta = +27°\,24'$

Solar apex (1950).. $\alpha = 18^h\,06^m$, $\delta = +30°$

Solar motion = 20.0 km. or 12.4 miles per sec.

Speed of the Earth moving around the Sun = 29.79 km. or 18.51 miles per sec.

EXPLANATION

Heliacal Rising and Setting of Planets

The planets Mercury to Saturn (as well as the Moon) remain invisible to the naked eyes for some days at the time of conjunction with the Sun. This phenomenon of planet's invisibility due to its proximity to the Sun is known as combust or heliacal setting of the planets, and it plays an important part in Indian Calendar. The dates of heliacal setting and rising of the planets marking the period or invisibility have been calculated assuming that the phenomenon occurs when, at the given station, the Sun attains a Zenith distance of $90°+h$ at the time when the zenith distance of the planet is 90°. The values of h for different planets adopted for the purpose are as follows :

Mercury 10° (Direct) and 11° (Retrograde)
Venus 6°, Mars 14,° Jupiter 8°.5 , and Saturn 12°

The day of the first visibility of the lunar crescent after a new-moon day has also been determined in a somewhat similar way on the basis of the following values of the limiting altitude of the Moon above the horizon corresponding to its azimuth difference from the Sun, when the zenith distance of the Sun is 90°.

Azimuth difference	0°	5°	10°	15°	20°
Altitude	10°.4	10°.0	9°.3	8°.0	6°.2

When the altitude of the Moon at sunset exceeds the above limit, the Moon is likely to be visible in that evening and when the excess is more than a degree, the Moon is sure to be visible. The beginning dates of the months of the Islamic Calendar have been determined on the basis of the above calculations and indicated on the date following that of the first visibility of the Moon.

In the above calculations, the atmospheric refraction and the horizontal parallax of the Moon are neglected.

The computations of heliacal rising and setting of planets and determination of the dates of first visibility of the Moon have been done for the central station of India.

ASTRONOMICAL CONSTANTS*

Units : The units meter (m), kilogram (kg.) and second (s) are the units of length, mass and time in the International System of Unit (SI).

The astronomical unit of time is a time interval of one (*D*) of 86400 seconds. An interval of 36525 days is one Julian century.

The astronomical unit of mass is the mass of the Sun (*S*).

The astronomical unit of length is that length (*A*) for which the Gaussian gravitational constant (*k*) takes the value of 0.01720209895 when the units of measurement are the astronomical unit of length, mass and time. The dimensions of k^2 are those of the constant of gravitational (*G*), i.e. $L^3M^{-1}T^{-2}$. The term "unit distance" is also used for the length *A*.

Defining Constants :

1. Gaussian gravitational constant $k = 0.017\ 202\ 098\ 95$
2. Speed of light $c = 299\ 792\ 458\ ms^{-1}$

EXPLANATION

Primary Constants :

3.	Light-time for unit distance	τ_A = 499.004 78384 s
4.	Equatorial radius for Earth	a_e = 637 8136.6 m
	[IUGG value	a_e = 637 8137 m]
5.	Dynamical form-factor for Earth	J_2 = 0.001 082 6359
6.	Geocentric gravitational constant	GE = 3.986 004 418 X 10^{14} m^3 s^{-2}
7.	Constant of Gravitation	G = 6.674 28 X 10^{-11} m^3 kg^{-1} s^{-2}
8.	Ratio of mass of Moon to that of Earth	μ = 0.012 300 0371
9.	General precession in longitude, per Julian century, at standard epoch J 2000.0	P = 5028".796195
10.	Obliquity of the ecliptic, at standard epoch J2000.0	ε = 23° 26' 21".406

Derived Constants

11.	Constant of nutation at standard epoch J2000.0	N = 9".2052 331
12.	Unit distance	$c\tau_A = A$ =1.495 978 707 x 10^{11}m
13.	Solar parallax	arc sin (a_e/A) = $\pi\odot$ = 8".794143
14.	Constant of aberration for standard Epoch J2000.0	k = 20".49551
15.	Flattening factor for the Earth	f = 0.003 352 82 = 1/298.25642
16.	Heliocentric gravitational constant	$A^3\,k^2/D^2 = GS$ = 1.327 124 42099 x 10^{20} m^3 s^{-2}
17.	Ratio of mass of Sun to that of the Earth	$(GS)/(GE) = S/E$ = 332 946.0487
18.	Ratio of mass of Sun to that of Earth + Moon	$(S/E)/(1+\mu)$ = 328 900.5596
19.	Mass of the Sun	(GS)/G = S = 1.9884 x 10^{30} kg

20. System of planetary masses :
(Ratios of mass of Sun to those of the planets etc.)

Mercury	6023600	Jupiter	1047.348644
Venus	408523.719	Saturn	3497.9018
Earth + Moon	328900.5596	Uranus	22902.98
Mars	3098703.59	Neptune	19412.26
		Pluto	136566000

Other quantities for use in the preparation of ephemerides :

It is recommended that the values given in the following list should normally be used in the preparation of new ephemerides.

21. Masses of minor planets in unit of the solar mass :

(1) Ceres	4.72 x 10^{-10}
(2) Pallas	1.03 x 10^{-10}
(3) Vesta	1.35 x 10^{-10}

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*See page 442 also for some of the constants actually used in preparation of the ephemerides reported in the publication.

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22. Masses of satellites in unit of the planet's mass :

Jupiter	Io	4.704×10^{-5}
	Europa	2.528×10^{-5}
	Ganymede	7.805×10^{-5}
	Callisto	5.667×10^{-5}
Saturn	Titan	2.366×10^{-4}
Neptune	Triton	2.089×10^{-4}

23. Equatorial radii in km.

Mercury	2439.7	Jupiter	71492	Pluto	1195
Venus	6051.8	Saturn	60268		
Earth	6378.1366	Uranus	25559	Moon	1737.4
Mars	3396.19	Neptune	24764	Sun	696000

24. Gravity fields of the planets.

	J_2	J_3	J_4
Earth	$+ 1.08263 \times 10^{-3}$	$- 2.54 \times 10^{-6}$	$- 1.61 \times 10^{-6}$
Mars	$+ 1.964 \times 10^{-3}$	$+ 36 \times 10^{-6}$	
Jupiter	$+ 14.75 \times 10^{-3}$		$- 580 \times 10^{-6}$
Saturn	$+ 16.45 \times 10^{-3}$		$- 1000 \times 10^{-6}$
Uranus	$+ 12 \times 10^{-3}$		
Neptune	$+ 4 \times 10^{-3}$		

25. Gravity field of the Moon.

$\gamma = (B-A)/C = 0.000\ 2278$		$C/MR^2 = 0''.392$
$\beta = (C-B)/B = 0.000\ 6313$		$I = 5552''.7 = 1^\circ\ 32'\ 32.7''$
$C_{20} = -0.000\ 2027$	$C_{30} = -0.000\ 006$	$C_{32} = +0.000\ 0048$
$C_{22} = +0.000\ 0223$	$C_{31} = +0.000\ 029$	$S_{32} = +0.000\ 0017$
	$S_{31} = +0.000\ 004$	$C_{33} = +0.000\ 0018$
		$S_{33} = -0.000\ 001$

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