



THE NAUTICAL ALMANAC

27.06.2021 - 02.07.2021

Author: Andrew BAUER
Original concept from: Enno RODEGERDTS

November 12, 2021

Disclaimer: These are computer generated tables - use them at your own risk. The accuracy has been randomly checked with JPL HORIZONS System, but cannot be guaranteed. The author claims no liability for any consequences arising from use of these tables. Besides, this publication only contains the 'daily pages' of the Nautical Almanac: an official version of the Nautical Almanac is indispensable.

June 27, 28, 29 UT (Sun., Mon., Tue.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec			
0	275°19.5	153°01.2	N21°44.4	143°00.0	N19°04.8	300°51.2	S11°38.7	320°03.5	S17°42.6	Alpheratz	357°37.7	29°12.3						
1	290°21.9	168°00.4	43.8	158°00.9	04.3	315°53.7	38.7	335°06.1	42.7	Ankaa	353°10.1	-42°11.2						
2	305°24.4	182°59.7	43.2	173°01.8	03.9	330°56.2	38.8	350°08.7	42.7	Schedar	349°34.3	56°38.9						
3	320°26.9	197°59.0	•• 42.6	188°02.7	•• 03.5	345°58.7	•• 38.8	5°11.3	•• 42.8	Diphda	348°50.2	-17°52.1						
4	335°29.3	212°58.3	42.0	203°03.6	03.1	1°01.2	38.8	20°13.9	42.8	Achernar	335°22.6	-57°07.5						
5	350°31.8	227°57.5	41.4	218°04.5	02.6	16°03.7	38.8	35°16.5	42.8	Hamal	327°54.6	23°33.6						
6	5°34.2	242°56.8	N21°40.8	233°05.4	N19°02.2	31°06.3	S11°38.9	50°19.1	S17°42.9	Polaris	315°39.2	89°20.9						
7	20°36.7	257°56.1	40.1	248°06.2	01.8	46°08.8	38.9	65°21.7	42.9	Acamar	315°14.3	-40°13.0						
8	35°39.2	272°55.3	39.5	263°07.1	01.4	61°11.3	38.9	80°24.2	43.0	Menkar	314°09.4	4°10.3						
9	50°41.6	287°54.6	•• 38.9	278°08.0	•• 00.9	76°13.8	•• 39.0	95°26.8	•• 43.0	Mirfak	308°32.7	49°56.0						
10	65°44.1	302°53.9	38.3	293°08.9	00.5	91°16.3	39.0	110°29.4	43.0	Aldebaran	290°43.2	16°33.0						
11	80°46.6	317°53.1	37.7	308°09.8	19°00.1	106°18.8	39.0	125°32.0	43.1	Rigel	281°07.0	-8°10.6						
12	95°49.0	332°52.4	N21°37.0	323°10.7	N18°59.6	121°21.3	S11°39.1	140°34.6	S17°43.1	Capella	280°26.6	46°01.0						
13	110°51.5	347°51.7	36.4	338°11.6	59.2	136°23.8	39.1	155°37.2	43.2	Bellatrix	278°26.3	6°22.1						
14	125°54.0	2°51.0	35.8	353°12.5	58.8	151°26.3	39.1	170°39.8	43.2	Elnath	278°05.9	28°37.4						
15	140°56.4	17°50.2	•• 35.2	8°13.4	•• 58.4	166°28.9	•• 39.2	185°42.4	•• 43.2	Alnilam	275°41.0	-1°11.3						
16	155°58.9	32°49.5	34.5	23°14.3	57.9	181°31.4	39.2	200°45.0	43.3	Betelgeuse	270°55.5	7°24.6						
17	171°01.4	47°48.8	33.9	38°15.2	57.5	196°33.9	39.2	215°47.6	43.3	Canopus	263°54.2	-52°42.4						
18	186°03.8	62°48.1	N21°33.3	53°16.1	N18°57.1	211°36.4	S11°39.2	230°50.2	S17°43.4	Sirius	258°29.1	-16°44.8						
19	201°06.3	77°47.3	32.7	68°16.9	56.6	226°38.9	39.3	245°52.8	43.4	Adhara	255°08.5	-29°00.1						
20	216°08.7	92°46.6	32.0	83°17.8	56.2	241°41.4	39.3	260°55.4	43.5	Procyon	244°54.2	5°10.2						
21	231°11.2	107°45.9	•• 31.4	98°18.7	•• 55.8	256°43.9	•• 39.3	275°58.0	•• 43.5	Pollux	243°21.2	27°58.5						
22	246°13.7	122°45.2	30.8	113°19.6	55.4	271°46.5	39.4	291°00.5	43.5	Avior	234°16.4	-59°34.8						
23	261°16.1	137°44.4	30.1	128°20.5	54.9	286°49.0	39.4	306°03.1	43.6	Suhail	222°48.7	-43°31.2						
Mer.pass. 05:38			ν-0.7' d-0.6' m-3.86			ν0.9' d-0.4' m1.8			ν2.5' d-0.0' m-2.61			ν2.6' d-0.0' m0.4			Miaplacidus 221°39.5 -69°48.5			
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Alphard 217°50.8 -8°45.1				
0	276°18.6	152°43.7	N21°29.5	143°21.4	N18°54.5	301°51.5	S11°39.4	321°05.7	S17°43.6	Regulus 207°37.7 11°51.9								
1	291°21.1	167°43.0	28.9	158°22.3	54.1	316°54.0	39.5	336°08.3	43.7	Dubhe 193°44.9 61°38.5								
2	306°23.5	182°42.3	28.2	173°23.2	53.6	331°56.5	39.5	351°10.9	43.7	Denebola 182°28.0 14°27.3								
3	321°26.0	197°41.6	•• 27.6	188°24.1	•• 53.2	346°59.0	•• 39.5	6°13.5	•• 43.8	Gienah 175°46.5 -17°39.7								
4	336°28.5	212°40.8	27.0	203°25.0	52.8	2°01.6	39.6	21°16.1	43.8	Acrux 173°03.2 -63°13.3								
5	351°30.9	227°40.1	26.3	218°25.9	52.3	17°04.1	39.6	36°18.7	43.8	Gacrux 171°54.7 -57°14.2								
6	6°33.4	242°39.4	N21°25.7	233°26.8	N18°51.9	32°06.6	S11°39.6	51°21.3	S17°43.9	Alioth 166°15.5 55°51.0								
7	21°35.9	257°38.7	25.0	248°27.7	51.5	47°09.1	39.7	66°23.9	43.9	Spica 158°25.2 -11°16.3								
8	36°38.3	272°38.0	24.4	263°28.6	51.1	62°11.6	39.7	81°26.5	44.0	Alkaid 152°54.2 49°12.7								
9	51°40.8	287°37.3	•• 23.7	278°29.4	•• 50.6	77°14.1	•• 39.7	96°29.1	•• 44.0	Hadar 148°39.7 -60°28.7								
10	66°43.2	302°36.5	23.1	293°30.3	50.2	92°16.7	39.8	111°31.7	44.0	Menkent 148°00.8 -36°28.6								
11	81°45.7	317°35.8	22.5	308°31.2	49.8	107°19.2	39.8	126°34.3	44.1	Arcturus 145°50.4 19°04.5								
12	96°48.2	332°35.1	N21°21.8	323°32.1	N18°49.3	122°21.7	S11°39.8	141°36.9	S17°44.1	Rigel Kent. 139°43.8 -60°55.5								
13	111°50.6	347°34.4	21.2	338°33.0	48.9	137°24.2	39.9	156°39.5	44.2	Kochab 137°19.2 74°04.4								
14	126°53.1	2°33.7	20.5	353°33.9	48.5	152°26.7	39.9	171°42.1	44.2	Zuben'ubi 136°59.0 -16°07.8								
15	141°55.6	17°33.0	•• 19.9	8°34.8	•• 48.0	167°29.3	•• 39.9	186°44.7	•• 44.3	Alphecca 126°05.9 26°38.7								
16	156°58.0	32°32.3	19.2	23°35.7	47.6	182°31.8	40.0	201°47.3	44.3	Antares 112°19.0 -26°28.7								
17	172°00.5	47°31.5	18.6	38°36.6	47.2	197°34.3	40.0	216°49.9	44.3	Atria 107°15.3 -69°04.0								
18	187°03.0	62°30.8	N21°17.9	53°37.5	N18°46.7	212°36.8	S11°40.0	231°52.4	S17°44.4	Sabik 102°05.8 -15°45.0								
19	202°05.4	77°30.1	17.3	68°38.4	46.3	227°39.4	40.1	246°55.0	44.4	Shaula 96°13.9 -37°07.1								
20	217°07.9	92°29.4	16.6	83°39.3	45.9	242°41.9	40.1	261°57.6	44.5	Rasalhague 96°00.9 12°32.7								
21	232°10.4	107°28.7	•• 15.9	98°40.2	•• 45.4	257°44.4	•• 40.1	277°00.2	•• 44.5	Eltanin 90°43.0 51°29.2								
22	247°12.8	122°28.0	15.3	113°41.1	45.0	272°46.9	40.2	292°02.8	44.6	Kaus Aust. 83°35.9 -34°22.4								
23	262°15.3	137°27.3	14.6	128°42.0	44.6	287°49.4	40.2	307°05.4	44.6	Vega 80°34.7 38°48.2								
Mer.pass. 05:34			ν-0.7' d-0.6' m-3.86			ν0.9' d-0.4' m1.8			ν2.5' d-0.0' m-2.62			ν2.6' d-0.0' m0.4			Nunki 75°51.0 -26°16.1			
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	Altair 62°02.4 8°55.5				
0	277°17.7	152°26.6	N21°14.0	143°42.9	N18°44.1	302°52.0	S11°40.2	322°08.0	S17°44.6	Peacock 53°09.8 -56°39.8								
1	292°20.2	167°25.9	13.3	158°43.8	43.7	317°54.5	40.3	337°10.6	44.7	Deneb 49°27.3 45°21.3								
2	307°22.7	182°25.2	12.6	173°44.7	43.3	332°57.0	40.3	352°13.2	44.7	Enif 33°41.4 9°58.3								
3	322°25.1	197°24.4	•• 12.0	188°45.6	•• 42.8	347°59.5	•• 40.3	7°15.8	•• 44.8	Al Na'ir 27°36.3 -46°51.3								
4	337°27.6	212°23.7	11.3	203°46.5	42.4	3°02.1	40.4	22°18.4	44.8	Fomalhaut 15°17.6 -29°30.4								
5	352°30.1	227°23.0	10.7	218°47.3	41.9	18°04.6	40.4	37°21.0	44.9	Scheat 13°47.8 28°11.7								
6	7°32.5	242°22.3	N21°10.0	233°48.2	N18°41.5	33°07.1	S11°40.4	52°23.6	S17°44.9	Markab 13°32.6 15°19.1								
7	22°35.0	257°21.6	09.3	248°49.1	41.1	48°09.6	40.5	67°26.2	44.9	Jun 27 Sun SHA Mer.pass								
8	37°37.5	272°20.9	08.7	263°50.0	40.6	63°12.2	40.5	82°28.8	45.0	Venus 237°41.7 13:49								
9	52°39.9	287°20.2	•• 08.0	278°50.9	•• 40.2	78°14.7	•• 40.5	97°31.4	•• 45.0	Mars 227°40.5 14:27								
10	67°42.4	302°19.5	07.3	293°51.8	39.8	93°17.2	40.6	112°34.0	45.1	Jupiter 25°31.7 03:56								
11	82°44.8	317°18.8	06.6	308°52.7	39.3	108°19.7	40.6	127°36.6	45.1	Saturn 44°44.1 02:39								
12	97°47.3	332°18.1	N21°06.0	323°53.6	N18°38.9	123°22.3	S11°40.7	142°39.2	S17°45.2	Jun 28 Mon SHA Mer.pass								
13	112°49.8	347°17.4	05.3	338°54.5	38.4	138°24.8	40.7	157°41.8	45.2	Venus 236°25.1 13:50								
14	127°52.2	2°16.7	04.6	353°55.4	38.0	153°27.3	40.7	172°44.4	45.2	Mars 227°02.8 14:26								
15	142°54.7	17°16.0	•• 04.0	8°56.3	•• 37.6	168°29.9	•• 40.8	187°47.0	•• 45.3	Jupiter 25°32.9 03:52								
16	157°57.2	32°15.3	03.3	23°57.2	37.1	183°32.4	40.8	202°49.6	45.3	Saturn 44°47.1 02:35								
17	17																	

h	Sun			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.7	N23°19.2	325°55.9	5.8'	S22°58.6	7.3'	59.1'
1	194°14.6	19.1	340°20.7	5.9'	22°51.3	7.4'	59.1'
2	209°14.4	19.0	354°45.6	6.0'	22°43.9	7.5'	59.1'
3	224°14.3	· · 18.9	9°10.6	6.1'	22°36.4	7.7'	59.0'
4	239°14.2	18.8	23°35.7	6.3'	22°28.7	7.8'	59.0'
5	254°14.1	18.7	38°01.0	6.4'	22°21.0	7.9'	59.0'
6	269°13.9	N23°18.6	52°26.4	6.5'	S22°13.0	8.1'	58.9'
7	284°13.8	18.4	66°51.9	6.6'	22°05.0	8.2'	58.9'
8	299°13.7	18.3	81°17.5	6.7'	21°56.8	8.3'	58.8'
9	314°13.5	· · 18.2	95°43.2	6.9'	21°48.5	8.4'	58.8'
10	329°13.4	18.1	110°09.1	7.0'	21°40.0	8.6'	58.8'
11	344°13.3	18.0	124°35.0	7.1'	21°31.5	8.7'	58.7'
12	359°13.2	N23°17.9	139°01.1	7.2'	S21°22.8	8.8'	58.7'
13	14°13.0	17.8	153°27.3	7.3'	21°14.0	8.9'	58.7'
14	29°12.9	17.7	167°53.7	7.5'	21°05.1	9.0'	58.6'
15	44°12.8	· · 17.6	182°20.1	7.6'	20°56.1	9.1'	58.6'
16	59°12.6	17.5	196°46.7	7.7'	20°46.9	9.3'	58.6'
17	74°12.5	17.4	211°13.4	7.8'	20°37.7	9.4'	58.5'
18	89°12.4	N23°17.2	225°40.2	7.9'	S20°28.3	9.5'	58.5'
19	104°12.3	17.1	240°07.1	8.1'	20°18.9	9.6'	58.4'
20	119°12.1	17.0	254°34.2	8.2'	20°09.3	9.7'	58.4'
21	134°12.0	· · 16.9	269°01.4	8.3'	19°59.6	9.8'	58.4'
22	149°11.9	16.8	283°28.7	8.4'	19°49.8	9.9'	58.3'
23	164°11.8	16.7	297°56.1	8.5'	19°39.9	10.0'	58.3'
SD = 15.7' $d = -0.1'$			SD = 16.1'				
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.6	N23°16.6	312°23.7	8.7'	S19°29.9	10.1'	58.3'
1	194°11.5	16.4	326°51.3	8.8'	19°19.9	10.2'	58.2'
2	209°11.4	16.3	341°19.1	8.9'	19°09.7	10.3'	58.2'
3	224°11.2	· · 16.2	355°47.0	9.0'	18°59.4	10.4'	58.1'
4	239°11.1	16.1	10°15.0	9.1'	18°49.1	10.5'	58.1'
5	254°11.0	16.0	24°43.2	9.3'	18°38.6	10.5'	58.1'
6	269°10.9	N23°15.8	39°11.4	9.4'	S18°28.1	10.6'	58.0'
7	284°10.7	15.7	53°39.8	9.5'	18°17.4	10.7'	58.0'
8	299°10.6	15.6	68°08.3	9.6'	18°06.7	10.8'	57.9'
9	314°10.5	· · 15.5	82°36.9	9.7'	17°55.9	10.9'	57.9'
10	329°10.4	15.3	97°05.6	9.8'	17°45.0	11.0'	57.9'
11	344°10.2	15.2	111°34.5	10.0'	17°34.1	11.0'	57.8'
12	359°10.1	N23°15.1	126°03.4	10.1'	S17°23.0	11.1'	57.8'
13	14°10.0	15.0	140°32.5	10.2'	17°11.9	11.2'	57.8'
14	29°09.9	14.8	155°01.7	10.3'	17°00.7	11.3'	57.7'
15	44°09.7	· · 14.7	169°31.0	10.4'	16°49.4	11.3'	57.7'
16	59°09.6	14.6	184°00.4	10.5'	16°38.1	11.4'	57.6'
17	74°09.5	14.5	198°29.9	10.6'	16°26.7	11.5'	57.6'
18	89°09.4	N23°14.3	212°59.6	10.7'	S16°15.2	11.5'	57.6'
19	104°09.2	14.2	227°29.3	10.9'	16°03.7	11.6'	57.5'
20	119°09.1	14.1	241°59.2	11.0'	15°52.0	11.7'	57.5'
21	134°09.0	· · 13.9	256°29.1	11.1'	15°40.4	11.7'	57.4'
22	149°08.8	13.8	270°59.2	11.2'	15°28.6	11.8'	57.4'
23	164°08.7	13.7	285°29.4	11.3'	15°16.8	11.9'	57.4'
SD = 15.7' $d = -0.1'$			SD = 15.9'				
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.6	N23°13.5	299°59.7	11.4'	S15°04.9	11.9'	57.3'
1	194°08.5	13.4	314°30.1	11.5'	14°53.0	12.0'	57.3'
2	209°08.3	13.3	329°00.5	11.6'	14°41.0	12.0'	57.3'
3	224°08.2	· · 13.1	343°31.1	11.7'	14°29.0	12.1'	57.2'
4	239°08.1	13.0	358°01.8	11.8'	14°16.9	12.1'	57.2'
5	254°08.0	12.9	12°32.6	11.9'	14°04.8	12.2'	57.1'
6	269°07.8	N23°12.7	27°03.5	12.0'	S13°52.6	12.3'	57.1'
7	284°07.7	12.6	41°34.5	12.1'	13°40.3	12.3'	57.1'
8	299°07.6	12.4	56°05.6	12.2'	13°28.0	12.3'	57.0'
9	314°07.5	· · 12.3	70°36.8	12.3'	13°15.7	12.4'	57.0'
10	329°07.4	12.2	85°08.1	12.4'	13°03.3	12.4'	57.0'
11	344°07.2	12.0	99°39.5	12.5'	12°50.8	12.5'	56.9'
12	359°07.1	N23°11.9	114°10.9	12.6'	S12°38.3	12.5'	56.9'
13	14°07.0	11.7	128°42.5	12.7'	12°25.8	12.6'	56.9'
14	29°06.9	11.6	143°14.2	12.7'	12°13.2	12.6'	56.8'
15	44°06.7	· · 11.4	157°45.9	12.8'	12°00.6	12.6'	56.8'
16	59°06.6	11.3	172°17.7	12.9'	11°48.0	12.7'	56.7'
17	74°06.5	11.1	186°49.7	13.0'	11°35.3	12.7'	56.7'
18	89°06.4	N23°11.0	201°21.7	13.1'	S11°22.6	12.8'	56.7'
19	104°06.2	10.9	215°53.8	13.2'	11°09.8	12.8'	56.6'
20	119°06.1	10.7	230°25.9	13.3'	10°57.0	12.8'	56.6'
21	134°06.0	· · 10.6	244°58.2	13.3'	10°44.2	12.9'	56.6'
22	149°05.9	10.4	259°30.5	13.4'	10°31.4	12.9'	56.5'
23	164°05.7	10.3	274°03.0	13.5'	10°18.5	12.9'	56.5'
SD = 15.7' $d = -0.1'$			SD = 15.6'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	—:—	—:—	01:37	22:29	—:—	—:—
62°	—:—	—:—	02:14	21:52	—:—	—:—
60°	—:—	00:57	02:40	21:27	23:08	—:—
N 58°	—:—	01:45	03:00	21:07	22:21	—:—
56°	—:—	02:14	03:16	20:50	21:52	—:—
54°	00:52	02:36	03:30	20:36	21:30	23:13
52°	01:37	02:54	03:43	20:24	21:12	22:29
50°	02:04	03:09	03:53	20:13	20:57	22:02
45°	02:49	03:38	04:16	19:51	20:28	21:17
N 40°	03:19	04:01	04:34	19:33	20:06	20:47
35°	03:42	04:19	04:49	19:18	19:48	20:24
30°	04:01	04:34	05:01	19:05	19:33	20:06
20°	04:30	04:59	05:23	18:43	19:08	19:37
N 10°	04:52	05:19	05:42	18:24	18:47	19:15
0°	05:11	05:37	06:00	18:07	18:30	18:56
S 10°	05:28	05:54	06:17	17:50	18:12	18:39
20°	05:44	06:11	06:35	17:31	17:55	18:23
30°	06:00	06:30	06:56	17:10	17:37	18:06
35°	06:09	06:41	07:09	16:58	17:26	17:58
40°	06:18	06:52	07:23	16:44	17:14	17:48
45°	06:29	07:06	07:39	16:27	17:01	17:38
S 50°	06:40	07:22	08:00	16:07	16:45	17:27
52°	06:45	07:29	08:10	15:57	16:38	17:21
54°	06:51	07:37	08:21	15:46	16:30	17:16
56°	06:57	07:46	08:33	15:33	16:21	17:10
58°	07:04	07:56	08:48	15:19	16:11	17:03
S 60°	07:11	08:08	09:05	15:02	15:59	16:56

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	—:—	☐	01:43	—:—	☐	06:57
N 70°	—:—	02:11	01:12	—:—	04:42	07:26
68°	—:—	01:16	00:49	—:—	05:35	07:48
66°	01:08	00:43	00:30	03:46	06:07	08:04
64°	00:21	00:19	00:16	04:33	06:31	08:18
62°	23:59	· ·	00:03	05:03	06:49	08:29
60°	23:43	23:52	23:58	05:26	07:05	08:39
N 58°	23:29	23:43	23:53	05:44	07:17	08:47
56°	23:18	23:35	23:48	06:00	07:28	08:54
54°	23:07	23:28	23:43	06:13	07:38	09:01
52°	22:58	23:21	23:39	06:24	07:47	09:07
50°	22:50	23:15	23:35	06:34	07:54	09:12
45°	22:32	23:02	23:27	06:56	08:11	09:23
N 40°	22:18	22:52	23:20	07:13	08:24	09:33
35°	22:05	22:42	23:14	07:27	08:35	09:41
30°	21:55	22:34	23:09	07:39	08:45	09:48
20°	21:36	22:20	22:59	08:00	09:02	10:00
N 10°	21:20	22:08	22:51	08:19	09:16	10:10
0°	21:05	21:56	22:44	08:36	09:30	10:20
S 10°	20:49	21:45	22:36	08:52	09:43	10:29
20°	20:33	21:32	22:28	09:10	09:58	10:39
30°	20:14	21:18	22:19	09:31	10:14	10:51
35°	20:03	21:10	22:13	09:43	10:23	10:57
40°	19:50	21:00	22:07	09:56	10:34	11:05
45°	19:35	20:49	22:00	10:12	10:46	11:14
S 50°	19:17	20:36	21:51	10:32	11:01	11:24
52°	19:08	20:29	21:47	10:41	11:08	11:29
54°	18:58	20:22	21:43	10:52	11:16	11:34
56°	18:47	20:14	21:38	11:04	11:25	11:40
58°	18:34	20:05	21:32	11:17	11:35	11:46
S 60°	18:19	19:55	21:26	11:33	11:46	11:54

Day	Sun		Mer. Pass	Moon		Age 17-19 93-78%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Upper Mer.Pass. hh:mm	Lower Mer.Pass. hh:mm	
27	03:01	03:07	12:03	02:22	14:50	
28	03:13	03:20	12:03	03:17	15:43	
29	03:26	03:32	12:04	04:08	16:32	

	Aries	Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	278°16.9	152°09.7	N20°57.8	144°04.4	N18°33.6	303°52.6	S11°41.1	323°10.4	S17°45.7
1	293°19.3	167°09.0	57.2	159°05.3	33.2	318°55.2	41.1	338°13.0	45.7
2	308°21.8	182°08.3	56.5	174°06.2	32.7	333°57.7	41.2	353°15.6	45.8
3	323°24.3	197°07.6	· · 55.8	189°07.1	· · 32.3	349°00.2	· · 41.2	8°18.2	· · 45.8
4	338°26.7	212°06.9	55.1	204°08.0	31.9	4°02.8	41.3	23°20.8	45.9
5	353°29.2	227°06.2	54.4	219°08.9	31.4	19°05.3	41.3	38°23.4	45.9
6	8°31.7	242°05.5	N20°53.7	234°09.8	N18°31.0	34°07.8	S11°41.3	53°26.0	S17°45.9
7	23°34.1	257°04.9	53.0	249°10.7	30.5	49°10.4	41.4	68°28.6	46.0
8	38°36.6	272°04.2	52.3	264°11.6	30.1	64°12.9	41.4	83°31.2	46.0
9	53°39.1	287°03.5	· · 51.6	279°12.5	· · 29.7	79°15.4	· · 41.4	98°33.8	· · 46.1
10	68°41.5	302°02.8	51.0	294°13.4	29.2	94°18.0	41.5	113°36.4	46.1
11	83°44.0	317°02.1	50.3	309°14.3	28.8	109°20.5	41.5	128°39.0	46.2
12	98°46.5	332°01.4	N20°49.6	324°15.2	N18°28.3	124°23.0	S11°41.6	143°41.6	S17°46.2
13	113°48.9	347°00.7	48.9	339°16.1	27.9	139°25.6	41.6	158°44.2	46.3
14	128°51.4	2°00.0	48.2	354°17.0	27.4	154°28.1	41.6	173°46.8	46.3
15	143°53.8	16°59.3	· · 47.5	9°17.9	· · 27.0	169°30.6	· · 41.7	188°49.4	· · 46.3
16	158°56.3	31°58.6	46.8	24°18.8	26.6	184°33.2	41.7	203°52.0	46.4
17	173°58.8	46°58.0	46.1	39°19.7	26.1	199°35.7	41.8	218°54.6	46.4
18	189°01.2	61°57.3	N20°45.4	54°20.6	N18°25.7	214°38.2	S11°41.8	233°57.2	S17°46.5
19	204°03.7	76°56.6	44.7	69°21.5	25.2	229°40.8	41.8	248°59.8	46.5
20	219°06.2	91°55.9	44.0	84°22.4	24.8	244°43.3	41.9	264°02.4	46.6
21	234°08.6	106°55.2	· · 43.3	99°23.3	· · 24.3	259°45.8	· · 41.9	279°05.0	· · 46.6
22	249°11.1	121°54.5	42.6	114°24.2	23.9	274°48.4	42.0	294°07.6	46.6
23	264°13.6	136°53.9	41.8	129°25.1	23.4	289°50.9	42.0	309°10.2	46.7
Mer.pass. 05:26		ν-0.7' d-0.7' m-3.86		ν0.9' d-0.4' m1.8		ν2.5' d-0.0' m-2.63		ν2.6' d-0.0' m0.4	
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°16.0	151°53.2	N20°41.1	144°26.0	N18°23.0	304°53.5	S11°42.0	324°12.8	S17°46.7
1	294°18.5	166°52.5	40.4	159°26.9	22.6	319°56.0	42.1	339°15.4	46.8
2	309°20.9	181°51.8	39.7	174°27.8	22.1	334°58.5	42.1	354°18.0	46.8
3	324°23.4	196°51.1	· · 39.0	189°28.7	· · 21.7	350°01.1	· · 42.2	9°20.6	· · 46.9
4	339°25.9	211°50.4	38.3	204°29.6	21.2	5°03.6	42.2	24°23.2	46.9
5	354°28.3	226°49.8	37.6	219°30.5	20.8	20°06.2	42.2	39°25.8	47.0
6	9°30.8	241°49.1	N20°36.9	234°31.4	N18°20.3	35°08.7	S11°42.3	54°28.4	S17°47.0
7	24°33.3	256°48.4	36.2	249°32.3	19.9	50°11.2	42.3	69°31.0	47.0
8	39°35.7	271°47.7	35.4	264°33.2	19.4	65°13.8	42.4	84°33.6	47.1
9	54°38.2	286°47.0	· · 34.7						

Jun 30 Wed	SHA	Mer.pass
Venus	233° 52.8	13:52
Mars	225° 47.5	14:23
Jupiter	25° 35.7	03:44
Saturn	44° 53.5	02:27

Jul 01 Thu	SHA	Mer.pass
Venus	232° 37.1	13:53
Mars	225° 10.0	14:21
Jupiter	25° 37.4	03:40
Saturn	44° 56.8	02:23

Jul 02 Fri	SHA	Mer.pass
Venus	231° 21.8	13:54
Mars	224° 32.5	14:20
Jupiter	25° 39.3	03:36
Saturn	45° 00.2	02:19

Horizontal parallax	
Venus:	0.1
Mars:	0.1

h	Sun			Moon			
Wed	GHA	Dec		GHA	ν	Dec	d HP
0	179°05.6	N23°10.1		288°35.5	13.6'	S10°05.6	12.9' 56.5'
1	194°05.5	10.0		303°08.1	13.7'	09°52.6	13.0' 56.4'
2	209°05.4	09.8		317°40.7	13.7'	09°39.7	13.0' 56.4'
3	224°05.2	· · 09.6		332°13.5	13.8'	09°26.7	13.0' 56.4'
4	239°05.1	09.5		346°46.3	13.9'	09°13.6	13.0' 56.3'
5	254°05.0	09.3		1°19.2	14.0'	09°00.6	13.1' 56.3'
6	269°04.9	N23°09.2		15°52.1	14.0'	S08°47.5	13.1' 56.3'
7	284°04.8	09.0		30°25.1	14.1'	08°34.4	13.1' 56.2'
8	299°04.6	08.9		44°58.2	14.2'	08°21.3	13.1' 56.2'
9	314°04.5	· · 08.7		59°31.4	14.2'	08°08.2	13.2' 56.2'
10	329°04.4	08.6		74°04.7	14.3'	07°55.0	13.2' 56.1'
11	344°04.3	08.4		88°38.0	14.4'	07°41.9	13.2' 56.1'
12	359°04.1	N23°08.2		103°11.3	14.4'	S07°28.7	13.2' 56.1'
13	14°04.0	08.1		117°44.8	14.5'	07°15.5	13.2' 56.0'
14	29°03.9	07.9		132°18.3	14.6'	07°02.3	13.2' 56.0'
15	44°03.8	· · 07.8		146°51.8	14.6'	06°49.0	13.2' 56.0'
16	59°03.7	07.6		161°25.4	14.7'	06°35.8	13.3' 55.9'
17	74°03.5	07.4		175°59.1	14.7'	06°22.5	13.3' 55.9'
18	89°03.4	N23°07.3		190°32.8	14.8'	S06°09.3	13.3' 55.9'
19	104°03.3	07.1		205°06.6	14.8'	05°56.0	13.3' 55.8'
20	119°03.2	06.9		219°40.5	14.9'	05°42.7	13.3' 55.8'
21	134°03.1	· · 06.8		234°14.4	15.0'	05°29.4	13.3' 55.8'
22	149°02.9	06.6		248°48.4	15.0'	05°16.1	13.3' 55.7'
23	164°02.8	06.4		263°22.4	15.1'	05°02.8	13.3' 55.7'
SD = 15.7' $d = -0.2'$			SD = 15.4'				

Thu	GHA	Dec		GHA	ν	Dec	d HP
0	179°02.7	N23°06.3		277°56.4	15.1'	S04°49.5	13.3' 55.7'
1	194°02.6	06.1		292°30.5	15.2'	04°36.2	13.3' 55.6'
2	209°02.5	05.9		307°04.7	15.2'	04°22.9	13.3' 55.6'
3	224°02.3	· · 05.8		321°38.9	15.3'	04°09.5	13.3' 55.6'
4	239°02.2	05.6		336°13.2	15.3'	03°56.2	13.3' 55.6'
5	254°02.1	05.4		350°47.5	15.3'	03°42.9	13.3' 55.5'
6	269°02.0	N23°05.2		5°21.8	15.4'	S03°29.5	13.3' 55.5'
7	284°01.9	05.1		19°56.2	15.4'	03°16.2	13.3' 55.5'
8	299°01.7	04.9		34°30.6	15.5'	03°02.9	13.3' 55.4'
9	314°01.6	· · 04.7		49°05.1	15.5'	02°49.5	13.3' 55.4'
10	329°01.5	04.6		63°39.6	15.5'	02°36.2	13.3' 55.4'
11	344°01.4	04.4		78°14.1	15.6'	02°22.9	13.3' 55.4'
12	359°01.3	N23°04.2		92°48.7	15.6'	S02°09.6	13.3' 55.3'
13	14°01.1	04.0		107°23.3	15.6'	01°56.3	13.3' 55.3'
14	29°01.0	03.8		121°58.0	15.7'	01°42.9	13.3' 55.3'
15	44°00.9	· · 03.7		136°32.6	15.7'	01°29.6	13.3' 55.3'
16	59°00.8	03.5		151°07.4	15.7'	01°16.3	13.3' 55.2'
17	74°00.7	03.3		165°42.1	15.8'	01°03.0	13.3' 55.2'
18	89°00.5	N23°03.1		180°16.9	15.8'	S00°49.8	13.3' 55.2'
19	104°00.4	02.9		194°51.7	15.8'	00°36.5	13.3' 55.2'
20	119°00.3	02.8		209°26.5	15.9'	00°23.2	13.3' 55.1'
21	134°00.2	· · 02.6		224°01.4	15.9'	S00°10.0	13.2' 55.1'
22	149°00.1	02.4		238°36.3	15.9'	N00°03.3	13.2' 55.1'
23	163°59.9	02.2		253°11.2	15.9'	00°16.5	13.2' 55.1'
SD = 15.7' $d = -0.2'$			SD = 15.2'				

Fri	GHA	Dec		GHA	ν	Dec	d HP
0	178°59.8	N23°02.0		267°46.1	16.0'	N00°29.7	13.2' 55.0'
1	193°59.7	01.8		282°21.0	16.0'	00°42.9	13.2' 55.0'
2	208°59.6	01.7		296°56.0	16.0'	00°56.1	13.2' 55.0'
3	223°59.5	· · 01.5		311°31.0	16.0'	01°09.3	13.2' 55.0'
4	238°59.4	01.3		326°06.0	16.0'	01°22.4	13.1' 54.9'
5	253°59.2	01.1		340°41.0	16.0'	01°35.6	13.1' 54.9'
6	268°59.1	N23°00.9		355°16.1	16.1'	N01°48.7	13.1' 54.9'
7	283°59.0	00.7		9°51.1	16.1'	02°01.8	13.1' 54.9'
8	298°58.9	00.5		24°26.2	16.1'	02°14.9	13.1' 54.9'
9	313°58.8	· · 00.3		39°01.3	16.1'	02°28.0	13.1' 54.8'
10	328°58.7	00.1		53°36.4	16.1'	02°41.1	13.0' 54.8'
11	343°58.5	23°00.0		68°11.5	16.1'	02°54.1	13.0' 54.8'
12	358°58.4	N22°59.8		82°46.6	16.1'	N03°07.1	13.0' 54.8'
13	13°58.3	59.6		97°21.7	16.1'	03°20.1	13.0' 54.8'
14	28°58.2	59.4		111°56.9	16.1'	03°33.1	12.9' 54.7'
15	43°58.1	· · 59.2		126°32.0	16.1'	03°46.0	12.9' 54.7'
16	58°58.0	59.0		141°07.2	16.1'	03°58.9	12.9' 54.7'
17	73°57.8	58.8		155°42.3	16.2'	04°11.8	12.9' 54.7'
18	88°57.7	N22°58.6		170°17.5	16.2'	N04°24.7	12.9' 54.7'
19	103°57.6	58.4		184°52.6	16.2'	04°37.6	12.8' 54.6'
20	118°57.5	58.2		199°27.8	16.2'	04°50.4	12.8' 54.6'
21	133°57.4	· · 58.0		214°02.9	16.2'	05°03.2	12.8' 54.6'
22	148°57.3	57.8		228°38.1	16.2'	05°16.0	12.7' 54.6'
23	163°57.1	57.6		243°13.2	16.1'	05°28.7	12.7' 54.6'
SD = 15.7' $d = -0.2'$			SD = 15.0'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
N 70°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68°	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66°	--	--	00:22	23:38	--	--
64°	--	--	01:42	22:25	--	--
62°	--	--	02:17	21:50	--	--
60°	--	01:04	02:42	21:25	23:02	--
N 58°	--	01:49	03:02	21:05	22:18	--
56°	--	02:17	03:19	20:49	21:50	--
54°	00:59	02:39	03:32	20:35	21:29	23:07
52°	01:40	02:56	03:44	20:23	21:11	22:27
50°	02:07	03:11	03:55	20:12	20:56	22:00
45°	02:51	03:40	04:17	19:50	20:27	21:17
N 40°	03:21	04:02	04:35	19:33	20:05	20:47
35°	03:44	04:20	04:50	19:18	19:48	20:24
30°	04:02	04:35	05:03	19:05	19:33	20:06
20°	04:31	05:00	05:24	18:44	19:08	19:37
N 10°	04:53	05:20	05:43	18:25	18:48	19:15
0°	05:12	05:38	06:00	18:08	18:30	18:56
S 10°	05:28	05:55	06:17	17:50	18:13	18:39
20°	05:44	06:12	06:36	17:32	17:56	18:24
30°	06:00	06:30	06:57	17:11	17:38	18:07
35°	06:09	06:41	07:09	16:59	17:27	17:59
40°	06:18	06:52	07:23	16:45	17:16	17:50
45°	06:28	07:05	07:39	16:29	17:02	17:40
S 50°	06:40	07:21	08:00	16:08	16:47	17:28
52°	06:45	07:29	08:09	15:59	16:39	17:23
54°	06:51	07:37	08:20	15:48	16:31	17:17
56°	06:57	07:45	08:32	15:36	16:23	17:11
58°	07:03	07:55	08:47	15:21	16:13	17:05
S 60°	07:10	08:07	09:04	15:04	16:01	16:58

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	00:59	00:29	00:04 23:39	09:17	11:18	13:11
N 70°	00:44	00:23	00:05 23:47	09:30	11:21	13:07
68°	00:31	00:18	00:05 23:53	09:41	11:24	13:03
66°	00:21	00:13	00:05 23:58	09:49	11:26	13:00
64°	00:12	00:09	00:06	09:56	11:28	12:57
62°	00:05	00:06	00:06	10:02	11:30	12:55
60°	· ·	00:03	00:06	10:07	11:31	12:53
N 58°	· ·	00:00	00:07	10:12	11:33	12:51
56°	23:58	· ·	00:07	10:16	11:34	12:49
54°	23:56	· ·	00:07	10:20	11:35	12:48
52°	23:54	· ·	00:07	10:23	11:36	12:46
50°	23:52	· ·	00:07	10:26	11:37	12:45
45°	23:48	· ·	00:08	10:33	11:39	12:43
N 40°	23:45	· ·	00:08	10:38	11:40	12:40
35°	23:42	· ·	00:08	10:42	11:41	12:39
30°	23:39	· ·	00:08	10:47	11:43	12:37
20°	23:35	· ·	00:09	10:53	11:45	12:34
N 10°	23:31	· ·	00:09	11:00	11:46	12:32
0°	23:28	· ·	00:10	11:05	11:48	12:29
S 10°	23:24	· ·	00:10	11:11	11:50	12:27
20°	23:20	· ·	00:10	11:17	11:51	12:24
30°	23:16	· ·	00:11	11:23	11:53	12:22
35°	23:13	· ·	00:11	11:27	11:54	12:20
40°	23:11	· ·	00:12	11:31	11:55	12:18
45°	23:07	· ·	00:12	11:36	11:57	12:16
S 50°	23:03	· ·	00:12	11:42	11:58	12:14
52°	23:01	· ·	00:13	11:45	11:59	12:12
54°	22:59	· ·	00:13	11:48	12:00	12:11
56°	22:57	· ·	00:13	11:51	12:01	12:10
58°	22:55	· ·	00:14	11:55	12:02	12:08
S 60°	22:52	· ·	00:14	11:59	12:03	12:06

Day	Sun		Mer. Pass hh:mm	Moon		Age 20-22 69-49%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
30	03:38	03:43	12:04	04:55	17:17	
01	03:49	03:55	12:04	05:38	17:59	
02	04:01	04:06	12:04	06:19	18:40	