

June 21, 22, 23 UT (Sun., Mon., Tue.)

	Aries		Venus		Mars		Jupiter		Saturn	
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	269°12.5	137°28.3	N19°59.4	217°04.3	N18°27.9	148°58.3	N20°58.3	255°42.6	N03°14.5	
1	284°15.0	152°27.8	58.6	232°05.0	28.4	164°00.2	58.2	270°44.9	14.6	
2	299°17.4	167°27.3	57.8	247°05.6	28.9	179°02.1	58.1	285°47.3	14.6	
3	314°19.9	182°26.9	· · 57.0	262°06.2	· · 29.3	194°04.1	· · 58.0	300°49.6	· · 14.6	
4	329°22.4	197°26.4	56.2	277°06.8	29.8	209°06.0	57.9	315°51.9	14.7	
5	344°24.8	212°25.9	55.4	292°07.5	30.3	224°07.9	57.8	330°54.2	14.7	
6	359°27.3	227°25.4	N19°54.6	307°08.1	N18°30.7	239°09.8	N20°57.7	345°56.6	N03°14.8	
7	14°29.8	242°24.9	53.8	322°08.7	31.2	254°11.7	57.6	0°58.9	14.8	
8	29°32.2	257°24.5	53.0	337°09.3	31.7	269°13.6	57.5	16°01.2	14.9	
9	44°34.7	272°24.0	· · 52.2	352°10.0	· · 32.1	284°15.6	· · 57.4	31°03.6	· · 14.9	
10	59°37.2	287°23.5	51.4	7°10.6	32.6	299°17.5	57.2	46°05.9	15.0	
11	74°39.6	302°23.0	50.6	22°11.2	33.1	314°19.4	57.1	61°08.2	15.0	
12	89°42.1	317°22.6	N19°49.8	37°11.9	N18°33.5	329°21.3	N20°57.0	76°10.5	N03°15.1	
13	104°44.5	332°22.1	49.0	52°12.5	34.0	344°23.2	56.9	91°12.9	15.1	
14	119°47.0	347°21.6	48.2	67°13.1	34.4	359°25.1	56.8	106°15.2	15.1	
15	134°49.5	2°21.1	· · 47.4	82°13.7	· · 34.9	14°27.1	· · 56.7	121°17.5	· · 15.2	
16	149°51.9	17°20.7	46.6	97°14.4	35.4	29°29.0	56.6	136°19.8	15.2	
17	164°54.4	32°20.2	45.7	112°15.0	35.8	44°30.9	56.5	151°22.2	15.3	
18	179°56.9	47°19.7	N19°44.9	127°15.6	N18°36.3	59°32.8	N20°56.4	166°24.5	N03°15.3	
19	194°59.3	62°19.3	44.1	142°16.2	36.8	74°34.7	56.3	181°26.8	15.4	
20	210°01.8	77°18.8	43.3	157°16.9	37.2	89°36.7	56.2	196°29.2	15.4	
21	225°04.3	92°18.3	· · 42.5	172°17.5	· · 37.7	104°38.6	· · 56.1	211°31.5	· · 15.5	
22	240°06.7	107°17.8	41.7	187°18.1	38.1	119°40.5	56.0	226°33.8	15.5	
23	255°09.2	122°17.4	40.9	202°18.7	38.6	134°42.4	55.9	241°36.1	15.6	
Mer.pass.	06:02	ν -0.5' d -0.8' m	-4.01	ν 0.6' d 0.5' m	1.29	ν 1.9' d -0.1' m	-1.83	ν 2.3' d 0.0' m	0.81	

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	270°11.7	137°16.9	N19°40.1	217°19.4	N18°39.1	149°44.3	N20°55.8	256°38.5	N03°15.6
1	285°14.1	152°16.4	39.3	232°20.0	39.5	164°46.2	55.7	271°40.8	15.6
2	300°16.6	167°16.0	38.4	247°20.6	40.0	179°48.2	55.6	286°43.1	15.7
3	315°19.0	182°15.5	· · 37.6	262°21.2	· · 40.4	194°50.1	· · 55.5	301°45.5	· · 15.7
4	330°21.5	197°15.1	36.8	277°21.9	40.9	209°52.0	55.4	316°47.8	15.8
5	345°24.0	212°14.6	36.0	292°22.5	41.4	224°53.9	55.3	331°50.1	15.8
6	0°26.4	227°14.1	N19°35.2	307°23.1	N18°41.8	239°55.8	N20°55.2	346°52.5	N03°15.9
7	15°28.9	242°13.7	34.4	322°23.7	42.3	254°57.7	55.1	1°54.8	15.9
8	30°31.4	257°13.2	33.5	337°24.4	42.7	269°59.6	55.0	16°57.1	16.0
9	45°33.8	272°12.7	· · 32.7	352°25.0	· · 43.2	285°01.6	· · 54.9	31°59.4	· · 16.0
10	60°36.3	287°12.3	31.9	7°25.6	43.6	300°03.5	54.8	47°01.8	16.0
11	75°38.8	302°11.8	31.1	22°26.2	44.1	315°05.4	54.7	62°04.1	16.1
12	90°41.2	317°11.4	N19°30.2	37°26.9	N18°44.6	330°07.3	N20°54.6	77°06.4	N03°16.1
13	105°43.7	332°10.9	29.4	52°27.5	45.0	345°09.2	54.5	92°08.8	16.2
14	120°46.1	347°10.4	28.6	67°28.1	45.5	0°11.1	54.4	107°11.1	16.2
15	135°48.6	2°10.0	· · 27.8	82°28.7	· · 45.9	15°13.1	· · 54.3	122°13.4	· · 16.3
16	150°51.1	17°09.5	26.9	97°29.4	46.4	30°15.0	54.2	137°15.8	16.3
17	165°53.5	32°09.1	26.1	112°30.0	46.8	45°16.9	54.1	152°18.1	16.4
18	180°56.0	47°08.6	N19°25.3	127°30.6	N18°47.3	60°18.8	N20°54.0	167°20.4	N03°16.4
19	195°58.5	62°08.2	24.5	142°31.2	47.7	75°20.7	53.9	182°22.8	16.4
20	211°00.9	77°07.7	23.6	157°31.9	48.2	90°22.6	53.7	197°25.1	16.5
21	226°03.4	92°07.3	· · 22.8	172°32.5	· · 48.6	105°24.6	· · 53.6	212°27.4	· · 16.5
22	241°05.9	107°06.8	22.0	187°33.1	49.1	120°26.5	53.5	227°29.8	16.6
23	256°08.3	122°06.4	21.1	202°33.7	49.5	135°28.4	53.4	242°32.1	16.6
Mer.pass.	05:58	ν -0.5' d -0.8' m	-4.01	ν 0.6' d 0.5' m	1.29	ν 1.9' d -0.1' m	-1.83	ν 2.3' d 0.0' m	0.81

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	271°10.8	137°05.9	N19°20.3	217°34.4	N18°50.0	150°30.3	N20°53.3	257°34.4	N03°16.7
1	286°13.3	152°05.5	19.5	232°35.0	50.5	165°32.2	53.2	272°36.8	16.7
2	301°15.7	167°05.0	18.6	247°35.6	50.9	180°34.1	53.1	287°39.1	16.7
3	316°18.2	182°04.6	· · 17.8	262°36.2	· · 51.4	195°36.0	· · 53.0	302°41.4	· · 16.8
4	331°20.6	197°04.1	17.0	277°36.9	51.8	210°38.0	52.9	317°43.8	16.8
5	346°23.1	212°03.7	16.1	292°37.5	52.3	225°39.9	52.8	332°46.1	16.9
6	1°25.6	227°03.2	N19°15.3	307°38.1	N18°52.7	240°41.8	N20°52.7	347°48.4	N03°16.9
7	16°28.0	242°02.8	14.4	322°38.7	53.2	255°43.7	52.6	2°50.8	17.0
8	31°30.5	257°02.3	13.6	337°39.4	53.6	270°45.6	52.5	17°53.1	17.0
9	46°33.0	272°01.9	· · 12.8	352°40.0	· · 54.1	285°47.5	· · 52.4	32°55.4	· · 17.0
10	61°35.4	287°01.5	11.9	7°40.6	54.5	300°49.4	52.3	47°57.8	17.1
11	76°37.9	302°01.0	11.1	22°41.2	55.0	315°51.4	52.2	63°00.1	17.1
12	91°40.4	317°00.6	N19°10.2	37°41.8	N18°55.4	330°53.3	N20°52.1	78°02.4	N03°17.2
13	106°42.8	332°00.1	09.4	52°42.5	55.8	345°55.2	52.0	93°04.8	17.2
14	121°45.3	346°59.7	08.6	67°43.1	56.3	0°57.1	51.9	108°07.1	17.3
15	136°47.7	1°59.3	· · 07.7	82°43.7	· · 56.7	15°59.0	· · 51.8	123°09.4	· · 17.3
16	151°50.2	16°58.8	06.9	97°44.3	57.2	31°00.9	51.7	138°11.8	17.3
17	166°52.7	31°58.4	06.0	112°45.0	57.6	46°02.8	51.6	153°14.1	17.4
18	181°55.1	46°57.9	N19°05.2	127°45.6	N18°58.1	61°04.8	N20°51.5	168°16.4	N03°17.4
19	196°57.6	61°57.5	04.3	142°46.2	58.5	76°06.7	51.4	183°18.8	17.5
20	212°00.1	76°57.1	03.5	157°46.8	59.0	91°08.6	51.2	198°21.1	17.5
21	227°02.5	91°56.6	· · 02.6	172°47.5	· · 59.4	106°10.5	· · 51.1	213°23.4	· · 17.6
22	242°05.0	106°56.2	01.8	187°48.1	18°59.9	121°12.4	51.0	228°25.8	17.6
23	257°07.5	121°55.8	00.9	202°48.7	19°00.3	136°14.3	50.9	243°28.1	17.6
Mer.pass.	05:54	ν -0.4' d -0.8' m	-4.01	ν 0.6' d 0.5' m	1.29	ν 1.9' d -0.1' m	-1.82	ν 2.3' d 0.0' m	0.81

	SHA	Dec
Alpheratz	357°33.5	29°14.1
Ankaa	353°06.0	-42°09.4
Schedar	349°29.8	56°40.7
Diphda	348°46.2	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°46.5	89°22.3
Acamar	315°11.2	-40°11.7
Menkar	314°05.1	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.2
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	-27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.7	61°36.7
Denebola	182°23.7	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°33.9	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigel Kent.	139°38.2	-60°56.9
Kochab	137°19.0	74°02.9
Zuben'ubi	136°54.4	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.4
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.4
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6	45°22.3
Enif	33°37.4	9°59.8
Al Na'ir	27°31.2	-46°49.7
Fomalhaut	15°13.1	-29°28.7
Scheat	13°43.9	28°13.5
Markab	13°28.6	15°20.8

Jun 21 Sun	SHA	Mer.pass
Venus	228°15.8	14:51
Mars	307°51.8	09:31
Jupiter	239°45.8	14:02
Saturn	346°30.1	06:56

Jun 22 Mon	SHA	Mer.pass
Venus	227°05.3	14:51
Mars	307°07.7	09:30
Jupiter	239°32.7	13:59
Saturn	346°26.8	06:52

Jun 23 Tue	SHA	Mer.pass
Venus	225°55.1	14:52
Mars	306°23.6	09:29
Jupiter	239°19.5	13:56
Saturn	346°23.6	06:49

Horizontal parallax		
Venus:		0.1
Mars:		0.1

h	Sun			Moon			
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°34.4	N23°26.3	100°10.6	14.3'	N03°07.0	-15.4'	57.2'
1	194°34.2	26.3	114°43.9	14.4'	02°51.6	-15.4'	57.1'
2	209°34.1	26.3	129°17.3	14.4'	02°36.2	-15.4'	57.1'
3	224°34.0	· · 26.3	143°50.7	14.5'	02°20.8	-15.4'	57.0'
4	239°33.8	26.3	158°24.2	14.5'	02°05.4	-15.4'	57.0'
5	254°33.7	26.3	172°57.7	14.6'	01°50.1	-15.3'	57.0'
6	269°33.6	N23°26.3	187°31.2	14.6'	N01°34.7	-15.3'	56.9'
7	284°33.4	26.3	202°04.8	14.6'	01°19.4	-15.3'	56.9'
8	299°33.3	26.3	216°38.5	14.7'	01°04.1	-15.3'	56.9'
9	314°33.2	· · 26.3	231°12.2	14.7'	00°48.8	-15.3'	56.8'
10	329°33.0	26.3	245°45.9	14.8'	00°33.5	-15.3'	56.8'
11	344°32.9	26.3	260°19.7	14.8'	00°18.2	-15.3'	56.8'
12	359°32.7	N23°26.3	274°53.5	14.8'	N00°02.9	-15.2'	56.7'
13	14°32.6	26.3	289°27.3	14.9'	S00°12.3	15.2'	56.7'
14	29°32.5	26.3	304°01.2	14.9'	00°27.5	15.2'	56.6'
15	44°32.3	· · 26.3	318°35.1	14.9'	00°42.7	15.2'	56.6'
16	59°32.2	26.3	333°09.0	15.0'	00°57.9	15.1'	56.6'
17	74°32.1	26.2	347°43.0	15.0'	01°13.0	15.1'	56.5'
18	89°31.9	N23°26.2	2°17.0	15.0'	S01°28.1	15.1'	56.5'
19	104°31.8	26.2	16°51.0	15.1'	01°43.2	15.1'	56.5'
20	119°31.7	26.2	31°25.1	15.1'	01°58.3	15.0'	56.4'
21	134°31.5	· · 26.2	45°59.2	15.1'	02°13.4	15.0'	56.4'
22	149°31.4	26.2	60°33.3	15.1'	02°28.4	15.0'	56.4'
23	164°31.2	26.2	75°07.4	15.2'	02°43.4	15.0'	56.3'
SD = 15.7' d = 0.0'			SD = 15.6'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°31.1	N23°26.2	89°41.6	15.2'	S02°58.4	14.9'	56.3'
1	194°31.0	26.2	104°15.7	15.2'	03°13.3	14.9'	56.3'
2	209°30.8	26.2	118°49.9	15.2'	03°28.2	14.9'	56.2'
3	224°30.7	· · 26.2	133°24.1	15.2'	03°43.1	14.8'	56.2'
4	239°30.6	26.1	147°58.4	15.2'	03°57.9	14.8'	56.2'
5	254°30.4	26.1	162°32.6	15.3'	04°12.7	14.8'	56.1'
6	269°30.3	N23°26.1	177°06.9	15.3'	S04°27.5	14.7'	56.1'
7	284°30.2	26.1	191°41.1	15.3'	04°42.2	14.7'	56.1'
8	299°30.0	26.1	206°15.4	15.3'	04°56.9	14.7'	56.0'
9	314°29.9	· · 26.1	220°49.7	15.3'	05°11.6	14.6'	56.0'
10	329°29.7	26.0	235°24.0	15.3'	05°26.2	14.6'	56.0'
11	344°29.6	26.0	249°58.3	15.3'	05°40.8	14.6'	56.0'
12	359°29.5	N23°26.0	264°32.6	15.3'	S05°55.4	14.5'	55.9'
13	14°29.3	26.0	279°07.0	15.3'	06°09.9	14.5'	55.9'
14	29°29.2	26.0	293°41.3	15.3'	06°24.4	14.4'	55.9'
15	44°29.1	· · 25.9	308°15.6	15.3'	06°38.8	14.4'	55.8'
16	59°28.9	25.9	322°50.0	15.3'	06°53.2	14.4'	55.8'
17	74°28.8	25.9	337°24.3	15.3'	07°07.6	14.3'	55.8'
18	89°28.7	N23°25.9	351°58.6	15.3'	S07°21.9	14.3'	55.7'
19	104°28.5	25.8	6°33.0	15.3'	07°36.1	14.2'	55.7'
20	119°28.4	25.8	21°07.3	15.3'	07°50.3	14.2'	55.7'
21	134°28.3	· · 25.8	35°41.6	15.3'	08°04.5	14.1'	55.7'
22	149°28.1	25.8	50°15.9	15.3'	08°18.6	14.1'	55.6'
23	164°28.0	25.7	64°50.2	15.3'	08°32.7	14.0'	55.6'
SD = 15.7' d = -0.0'			SD = 15.4'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°27.8	N23°25.7	79°24.6	15.3'	S08°46.8	14.0'	55.6'
1	194°27.7	25.7	93°58.9	15.3'	09°00.7	13.9'	55.5'
2	209°27.6	25.7	108°33.1	15.3'	09°14.7	13.9'	55.5'
3	224°27.4	· · 25.6	123°07.4	15.3'	09°28.6	13.8'	55.5'
4	239°27.3	25.6	137°41.7	15.3'	09°42.4	13.8'	55.5'
5	254°27.2	25.6	152°15.9	15.2'	09°56.2	13.7'	55.4'
6	269°27.0	N23°25.5	166°50.2	15.2'	S10°09.9	13.7'	55.4'
7	284°26.9	25.5	181°24.4	15.2'	10°23.6	13.6'	55.4'
8	299°26.8	25.5	195°58.6	15.2'	10°37.2	13.6'	55.4'
9	314°26.6	· · 25.4	210°32.8	15.2'	10°50.8	13.5'	55.3'
10	329°26.5	25.4	225°07.0	15.2'	11°04.3	13.5'	55.3'
11	344°26.4	25.4	239°41.2	15.1'	11°17.7	13.4'	55.3'
12	359°26.2	N23°25.3	254°15.3	15.1'	S11°31.1	13.3'	55.3'
13	14°26.1	25.3	268°49.4	15.1'	11°44.5	13.3'	55.2'
14	29°26.0	25.2	283°23.5	15.1'	11°57.8	13.2'	55.2'
15	44°25.8	· · 25.2	297°57.6	15.1'	12°11.0	13.2'	55.2'
16	59°25.7	25.2	312°31.6	15.0'	12°24.2	13.1'	55.2'
17	74°25.6	25.1	327°05.7	15.0'	12°37.3	13.0'	55.1'
18	89°25.4	N23°25.1	341°39.7	15.0'	S12°50.3	13.0'	55.1'
19	104°25.3	25.0	356°13.6	14.9'	13°03.3	12.9'	55.1'
20	119°25.2	25.0	10°47.6	14.9'	13°16.2	12.9'	55.1'
21	134°25.0	· · 25.0	25°21.5	14.9'	13°29.1	12.8'	55.0'
22	149°24.9	24.9	39°55.4	14.9'	13°41.9	12.7'	55.0'
23	164°24.7	24.9	54°29.3	14.8'	13°54.6	12.7'	55.0'
SD = 15.7' d = -0.0'			SD = 15.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	--	--	01:31	22:33	--	--
62°	--	--	02:10	21:54	--	--
60°	--	00:49	02:36	21:28	23:14	--
N 58°	--	01:41	02:57	21:07	22:23	--
56°	--	02:11	03:13	20:51	21:53	--
54°	00:45	02:33	03:28	20:36	21:31	23:18
52°	01:33	02:51	03:40	20:24	21:13	22:31
50°	02:01	03:06	03:51	20:13	20:58	22:03
45°	02:46	03:36	04:13	19:51	20:28	21:18
N 40°	03:17	03:59	04:32	19:32	20:05	20:47
35°	03:40	04:17	04:47	19:17	19:47	20:24
30°	03:59	04:32	05:00	19:04	19:32	20:05
20°	04:28	04:57	05:22	18:42	19:07	19:36
N 10°	04:51	05:18	05:41	18:23	18:46	19:13
0°	05:10	05:36	05:58	18:06	18:28	18:54
S 10°	05:27	05:53	06:16	17:48	18:11	18:37
20°	05:43	06:10	06:34	17:30	17:54	18:21
30°	05:59	06:29	06:56	17:08	17:35	18:05
35°	06:08	06:40	07:08	16:56	17:24	17:56
40°	06:18	06:52	07:22	16:42	17:12	17:47
45°	06:28	07:05	07:39	16:25	16:59	17:36
S 50°	06:40	07:21	08:00	16:04	16:43	17:24
52°	06:45	07:29	08:10	15:54	16:35	17:19
54°	06:51	07:37	08:21	15:43	16:27	17:13
56°	06:57	07:46	08:34	15:30	16:18	17:07
58°	07:04	07:56	08:48	15:16	16:08	17:00
S 60°	07:11	08:08	09:06	14:58	15:56	16:53

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	11:40	13:47	16:02	23:24	22:49	22:04
N 70°	11:40	13:37	15:38	23:28	23:02	22:30
68°	11:40	13:29	15:20	23:31	23:12	22:50
66°	11:40	13:22	15:06	23:34	23:20	23:06
64°	11:40	13:17	14:54	23:36	23:28	23:19
62°	11:40	13:12	14:44	23:38	23:34	23:30
60°	11:40	13:08	14:35	23:40	23:39	23:40
N 58°	11:40	13:04	14:28	23:41	23:44	23:48
56°	11:40	13:01	14:22	23:43	23:49	23:55
54°	11:40	12:58	14:16	23:44	23:52	· · ·
52°	11:40	12:56	14:11	23:45	23:56	· · ·
50°	11:40	12:54	14:06	23:46	23:59	· · ·
45°	11:40	12:48	13:56	23:49	· · ·	00:06
N 40°	11:40	12:44	13:47	23:51	· · ·	00:12
35°	11:40	12:41	13:40	23:52	· · ·	00:17
30°	11:40	12:38	13:34	23:54	· · ·	00:22
20°	11:40	12:32	13:23	23:56	· · ·	00:30
N 10°	11:40	12:27	13:14	23:59	· · ·	00:37
0°	11:40	12:23	13:05	· · ·	00:01	00:43
S 10°	11:40	12:19	12:57	· · ·	00:03	00:50
20°	11:41	12:14	12:48	· · ·	00:05	00:57
30°	11:41	12:09	12:37	· · ·	00:08	01:05
35°	11:41	12:06	12:31	· · ·	00:09	01:09
40°	11:41	12:02	12:25	· · ·	00:11	01:15
45°	11:41	11:59	12:17	· · ·	00:13	01:21
S 50°	11:41	11:54	12:07	· · ·	00:15	01:28
52°	11:41	11:52	12:03	· · ·	00:17	01:32
54°	11:41	11:50	11:59	· · ·	00:18	01:36
56°	11:42	11:47	11:53	· · ·	00:19	01:40
58°	11:42	11:44	11:48	· · ·	00:21	01:44
S 60°	11:42	11:41	11:41	· · ·	00:22	01:50

Day	Sun		Mer. Pass	Moon		Age 6-8 41-61%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
21	01:42	01:49	12:02	17:51	05:29	
22	01:56	02:02	12:02	18:33	06:12	
23	02:09	02:15	12:02	19:16	06:54	

June 24, 25, 26 UT (Wed., Thu., Fri.)

	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	
0	272°09.9	136°55.3	N19°00.1	217°49.3	N19°00.8	151°16.2	N20°50.8	258°30.4	N03°17.7	
1	287°12.4	151°54.9	18°59.2	232°50.0	01.2	166°18.2	50.7	273°32.8	17.7	
2	302°14.9	166°54.5	58.4	247°50.6	01.6	181°20.1	50.6	288°35.1	17.8	
3	317°17.3	181°54.0	· · 57.5	262°51.2	· · 02.1	196°22.0	· · 50.5	303°37.5	· · 17.8	
4	332°19.8	196°53.6	56.7	277°51.8	02.5	211°23.9	50.4	318°39.8	17.9	
5	347°22.2	211°53.2	55.8	292°52.4	03.0	226°25.8	50.3	333°42.1	17.9	
6	2°24.7	226°52.8	N18°54.9	307°53.1	N19°03.4	241°27.7	N20°50.2	348°44.5	N03°17.9	
7	17°27.2	241°52.3	54.1	322°53.7	03.9	256°29.6	50.1	3°46.8	18.0	
8	32°29.6	256°51.9	53.2	337°54.3	04.3	271°31.6	50.0	18°49.1	18.0	
9	47°32.1	271°51.5	· · 52.4	352°54.9	· · 04.7	286°33.5	· · 49.9	33°51.5	· · 18.1	
10	62°34.6	286°51.0	51.5	7°55.6	05.2	301°35.4	49.8	48°53.8	18.1	
11	77°37.0	301°50.6	50.6	22°56.2	05.6	316°37.3	49.7	63°56.2	18.1	
12	92°39.5	316°50.2	N18°49.8	37°56.8	N19°06.1	331°39.2	N20°49.6	78°58.5	N03°18.2	
13	107°42.0	331°49.8	48.9	52°57.4	06.5	346°41.1	49.5	94°00.8	18.2	
14	122°44.4	346°49.4	48.1	67°58.0	06.9	1°43.0	49.4	109°03.2	18.3	
15	137°46.9	1°48.9	· · 47.2	82°58.7	· · 07.4	16°44.9	· · 49.2	124°05.5	· · 18.3	
16	152°49.4	16°48.5	46.3	97°59.3	07.8	31°46.9	49.1	139°07.8	18.3	
17	167°51.8	31°48.1	45.5	112°59.9	08.3	46°48.8	49.0	154°10.2	18.4	
18	182°54.3	46°47.7	N18°44.6	128°00.5	N19°08.7	61°50.7	N20°48.9	169°12.5	N03°18.4	
19	197°56.7	61°47.3	43.7	143°01.2	09.1	76°52.6	48.8	184°14.9	18.5	
20	212°59.2	76°46.8	42.9	158°01.8	09.6	91°54.5	48.7	199°17.2	18.5	
21	228°01.7	91°46.4	· · 42.0	173°02.4	· · 10.0	106°56.4	· · 48.6	214°19.5	· · 18.6	
22	243°04.1	106°46.0	41.1	188°03.0	10.4	121°58.3	48.5	229°21.9	18.6	
23	258°06.6	121°45.6	40.3	203°03.6	10.9	137°00.2	48.4	244°24.2	18.6	
Mer.pass.	05:50	ν -0.4' d -0.9' m -4.02		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.82		ν 2.3' d 0.0' m 0.80		

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	273°09.1	136°45.2	N18°39.4	218°04.3	N19°11.3	152°02.2	N20°48.3	259°26.6	N03°18.7
1	288°11.5	151°44.8	38.5	233°04.9	11.8	167°04.1	48.2	274°28.9	18.7
2	303°14.0	166°44.3	37.6	248°05.5	12.2	182°06.0	48.1	289°31.2	18.8
3	318°16.5	181°43.9	· · 36.8	263°06.1	· · 12.6	197°07.9	· · 48.0	304°33.6	· · 18.8
4	333°18.9	196°43.5	35.9	278°06.8	13.1	212°09.8	47.8	319°35.9	18.8
5	348°21.4	211°43.1	35.0	293°07.4	13.5	227°11.7	47.9	334°38.3	18.9
6	3°23.9	226°42.7	N18°34.1	308°08.0	N19°13.9	242°13.6	N20°47.7	349°40.6	N03°18.9
7	18°26.3	241°42.3	33.3	323°08.6	14.4	257°15.5	47.6	4°42.9	19.0
8	33°28.8	256°41.9	32.4	338°09.2	14.8	272°17.5	47.4	19°45.3	19.0
9	48°31.2	271°41.5	· · 31.5	353°09.9	· · 15.2	287°19.4	· · 47.3	34°47.6	· · 19.0
10	63°33.7	286°41.1	30.6	8°10.5	15.7	302°21.3	47.2	49°50.0	19.1
11	78°36.2	301°40.6	29.7	23°11.1	16.1	317°23.2	47.1	64°52.3	19.1
12	93°38.6	316°40.2	N18°28.9	38°11.7	N19°16.5	332°25.1	N20°47.0	79°54.6	N03°19.2
13	108°41.1	331°39.8	28.0	53°12.3	17.0	347°27.0	46.9	94°57.0	19.2
14	123°43.6	346°39.4	27.1	68°13.0	17.4	2°28.9	46.8	109°59.3	19.2
15	138°46.0	1°39.0	· · 26.2	83°13.6	· · 17.8	17°30.8	· · 46.7	125°01.7	· · 19.3
16	153°48.5	16°38.6	25.3	98°14.2	18.3	32°32.7	46.6	140°04.0	19.3
17	168°51.0	31°38.2	24.5	113°14.8	18.7	47°34.7	46.5	155°06.3	19.4
18	183°53.4	46°37.8	N18°23.6	128°15.5	N19°19.1	62°36.6	N20°46.4	170°08.7	N03°19.4
19	198°55.9	61°37.4	22.7	143°16.1	19.5	77°38.5	46.3	185°11.0	19.4
20	213°58.3	76°37.0	21.8	158°16.7	20.0	92°40.4	46.2	200°13.4	19.5
21	229°00.8	91°36.6	· · 20.9	173°17.3	· · 20.4	107°42.3	· · 46.1	215°15.7	· · 19.5
22	244°03.3	106°36.2	20.0	188°17.9	20.8	122°44.2	46.0	230°18.1	19.5
23	259°05.7	121°35.8	19.1	203°18.6	21.3	137°46.1	45.9	245°20.4	19.6
Mer.pass.	05:46	ν -0.4' d -0.9' m -4.02		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.82		ν 2.3' d 0.0' m 0.80	

Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	274°08.2	136°35.4	N18°18.2	218°19.2	N19°21.7	152°48.0	N20°45.7	260°22.7	N03°19.6
1	289°10.7	151°35.0	17.4	233°19.8	22.1	167°49.9	45.6	275°25.1	19.7
2	304°13.1	166°34.6	16.5	248°20.4	22.6	182°51.9	45.5	290°27.4	19.7
3	319°15.6	181°34.2	· · 15.6	263°21.0	· · 23.0	197°53.8	· · 45.4	305°29.8	· · 19.7
4	334°18.1	196°33.8	14.7	278°21.7	23.4	212°55.7	45.3	320°32.1	19.8
5	349°20.5	211°33.4	13.8	293°22.3	23.8	227°57.6	45.2	335°34.5	19.8
6	4°23.0	226°33.0	N18°12.9	308°22.9	N19°24.3	242°59.5	N20°45.1	350°36.8	N03°19.9
7	19°25.5	241°32.6	12.0	323°23.5	24.7	258°01.4	45.0	5°39.2	19.9
8	34°27.9	256°32.3	11.1	338°24.1	25.1	273°03.3	44.9	20°41.5	19.9
9	49°30.4	271°31.9	· · 10.2	353°24.8	· · 25.5	288°05.2	· · 44.8	35°43.8	· · 20.0
10	64°32.8	286°31.5	09.3	8°25.4	26.0	303°07.1	44.7	50°46.2	20.0
11	79°35.3	301°31.1	08.4	23°26.0	26.4	318°09.0	44.6	65°48.5	20.0
12	94°37.8	316°30.7	N18°07.5	38°26.6	N19°26.8	333°11.0	N20°44.5	80°50.9	N03°20.1
13	109°40.2	331°30.3	06.6	53°27.2	27.2	348°12.9	44.4	95°53.2	20.1
14	124°42.7	346°29.9	05.7	68°27.9	27.7	3°14.8	44.2	110°55.6	20.2
15	139°45.2	1°29.5	· · 04.8	83°28.5	· · 28.1	18°16.7	· · 44.1	125°57.9	· · 20.2
16	154°47.6	16°29.1	03.9	98°29.1	28.5	33°18.6	44.0	141°00.3	20.2
17	169°50.1	31°28.8	03.0	113°29.7	28.9	48°20.5	43.9	156°02.6	20.3
18	184°52.6	46°28.4	N18°02.1	128°30.3	N19°29.4	63°22.4	N20°43.8	171°04.9	N03°20.3
19	199°55.0	61°28.0	01.2	143°31.0	29.8	78°24.3	43.7	186°07.3	20.4
20	214°57.5	76°27.6	18°00.3	158°31.6	30.2	93°26.2	43.6	201°09.6	20.4
21	230°00.0	91°27.2	17°59.4	173°32.2	· · 30.6	108°28.1	· · 43.5	216°12.0	· · 20.4
22	245°02.4	106°26.8	58.5	188°32.8	31.0	123°30.1	43.4	231°14.3	20.5
23	260°04.9	121°26.5	57.6	203°33.4	31.5	138°32.0	43.3	246°16.7	20.5
Mer.pass.	05:43	ν -0.4' d -0.9' m -4.03		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.82		ν 2.3' d 0.0' m 0.80	

	SHA	Dec
Alpheratz	357°33.5	29°14.1
Ankaa	353°06.0	-42°09.4
Schedar	349°29.7	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°45.2	89°22.3
Acamar	315°11.2	-40°11.7
Menkar	314°05.1	4°11.6
Mirfak	308°26.9	49°57.2
Aldebaran	290°38.6	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.6
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.2	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.8	49°11.0
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigil Kent.	139°38.2	-60°56.9
Kochab	137°19.1	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.1	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6	45°22.4
Enif	33°37.4	9°59.8
Al Na'ir	27°31.2	-46°49.7
Fomalhaut	15°13.1	-29°28.7
Scheat	13°43.9	28°13.5
Markab	13°28.6	15°20.8

Jun 24 Wed	SHA	Mer.pass
Venus	224°45.4	14:53
Mars	305°39.4	09:28
Jupiter	239°06.3	13:53
Saturn	346°20.5	06:45

Jun 25 Thu	SHA	Mer.pass
Venus	223°36.1	14:53
Mars	304°55.2	09:27
Jupiter	238°53.1	13:50
Saturn	346°17.5	06:41

Jun 26 Fri	SHA	Mer.pass
Venus	222°27.2	14:54
Mars	304°11.0	09:26
Jupiter	238°39.8	13:47
Saturn	346°14.5	06:37

Horizontal parallax		
Venus:		0.1
Mars:		0.1

h	Sun			Moon			
Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°24.6	N23°24.8	69°03.1	14.8'	S14°07.3	12.6'	55.0'
1	194°24.5	24.8	83°36.9	14.8'	14°19.9	12.5'	54.9'
2	209°24.3	24.7	98°10.7	14.7'	14°32.4	12.5'	54.9'
3	224°24.2	· · 24.7	112°44.4	14.7'	14°44.9	12.4'	54.9'
4	239°24.1	24.6	127°18.1	14.7'	14°57.3	12.3'	54.9'
5	254°23.9	24.6	141°51.8	14.6'	15°09.6	12.3'	54.9'
6	269°23.8	N23°24.5	156°25.4	14.6'	S15°21.9	12.2'	54.8'
7	284°23.7	24.5	170°59.0	14.6'	15°34.1	12.1'	54.8'
8	299°23.5	24.4	185°32.5	14.5'	15°46.2	12.0'	54.8'
9	314°23.4	· · 24.4	200°06.0	14.5'	15°58.2	12.0'	54.8'
10	329°23.3	24.3	214°39.5	14.4'	16°10.2	11.9'	54.8'
11	344°23.1	24.3	229°12.9	14.4'	16°22.1	11.8'	54.7'
12	359°23.0	N23°24.2	243°46.3	14.4'	S16°33.9	11.8'	54.7'
13	14°22.9	24.2	258°19.7	14.3'	16°45.7	11.7'	54.7'
14	29°22.7	24.1	272°53.0	14.3'	16°57.4	11.6'	54.7'
15	44°22.6	· · 24.1	287°26.3	14.2'	17°09.0	11.5'	54.7'
16	59°22.5	24.0	301°59.5	14.2'	17°20.5	11.4'	54.6'
17	74°22.3	23.9	316°32.7	14.1'	17°31.9	11.4'	54.6'
18	89°22.2	N23°23.9	331°05.8	14.1'	S17°43.3	11.3'	54.6'
19	104°22.1	23.8	345°38.9	14.0'	17°54.6	11.2'	54.6'
20	119°21.9	23.8	0°12.0	14.0'	18°05.8	11.1'	54.6'
21	134°21.8	· · 23.7	14°45.0	14.0'	18°16.9	11.0'	54.6'
22	149°21.7	23.6	29°17.9	13.9'	18°27.9	11.0'	54.5'
23	164°21.5	23.6	43°50.8	13.9'	18°38.9	10.9'	54.5'
SD = 15.7' d = -0.0'			SD = 15.0'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°21.4	N23°23.5	58°23.7	13.8'	S18°49.8	10.8'	54.5'
1	194°21.3	23.5	72°56.5	13.8'	19°00.6	10.7'	54.5'
2	209°21.1	23.4	87°29.3	13.7'	19°11.3	10.6'	54.5'
3	224°21.0	· · 23.3	102°02.0	13.7'	19°21.9	10.5'	54.5'
4	239°20.9	23.3	116°34.6	13.6'	19°32.4	10.5'	54.4'
5	254°20.7	23.2	131°07.3	13.6'	19°42.9	10.4'	54.4'
6	269°20.6	N23°23.1	145°39.8	13.5'	S19°53.3	10.3'	54.4'
7	284°20.5	23.1	160°12.3	13.5'	20°03.5	10.2'	54.4'
8	299°20.3	23.0	174°44.8	13.4'	20°13.7	10.1'	54.4'
9	314°20.2	· · 22.9	189°17.2	13.4'	20°23.8	10.0'	54.4'
10	329°20.1	22.9	203°49.6	13.3'	20°33.8	9.9'	54.4'
11	344°19.9	22.8	218°21.9	13.2'	20°43.7	9.8'	54.3'
12	359°19.8	N23°22.7	232°54.1	13.2'	S20°53.6	9.7'	54.3'
13	14°19.7	22.6	247°26.3	13.1'	21°03.3	9.6'	54.3'
14	29°19.6	22.6	261°58.4	13.1'	21°12.9	9.5'	54.3'
15	44°19.4	· · 22.5	276°30.5	13.0'	21°22.5	9.4'	54.3'
16	59°19.3	22.4	291°02.6	13.0'	21°31.9	9.3'	54.3'
17	74°19.2	22.3	305°34.6	12.9'	21°41.3	9.3'	54.3'
18	89°19.0	N23°22.3	320°06.5	12.9'	S21°50.5	9.2'	54.3'
19	104°18.9	22.2	334°38.4	12.8'	21°59.7	9.1'	54.2'
20	119°18.8	22.1	349°10.2	12.8'	22°08.7	9.0'	54.2'
21	134°18.6	· · 22.0	3°41.9	12.7'	22°17.7	8.9'	54.2'
22	149°18.5	22.0	18°13.6	12.7'	22°26.5	8.8'	54.2'
23	164°18.4	21.9	32°45.3	12.6'	22°35.3	8.7'	54.2'
SD = 15.7' d = -0.1'			SD = 14.9'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	179°18.2	N23°21.8	47°16.9	12.5'	S22°44.0	8.6'	54.2'
1	194°18.1	21.7	61°48.4	12.5'	22°52.5	8.5'	54.2'
2	209°18.0	21.6	76°19.9	12.4'	23°01.0	8.3'	54.2'
3	224°17.8	· · 21.6	90°51.3	12.4'	23°09.3	8.2'	54.2'
4	239°17.7	21.5	105°22.7	12.3'	23°17.6	8.1'	54.1'
5	254°17.6	21.4	119°54.0	12.3'	23°25.7	8.0'	54.1'
6	269°17.4	N23°21.3	134°25.3	12.2'	S23°33.7	7.9'	54.1'
7	284°17.3	21.2	148°56.5	12.2'	23°41.7	7.8'	54.1'
8	299°17.2	21.1	163°27.7	12.1'	23°49.5	7.7'	54.1'
9	314°17.1	· · 21.1	177°58.8	12.0'	23°57.2	7.6'	54.1'
10	329°16.9	21.0	192°29.8	12.0'	24°04.8	7.5'	54.1'
11	344°16.8	20.9	207°00.8	11.9'	24°12.3	7.4'	54.1'
12	359°16.7	N23°20.8	221°31.8	11.9'	S24°19.7	7.3'	54.1'
13	14°16.5	20.7	236°02.6	11.8'	24°27.0	7.2'	54.1'
14	29°16.4	20.6	250°33.5	11.8'	24°34.1	7.1'	54.1'
15	44°16.3	· · 20.5	265°04.3	11.7'	24°41.2	6.9'	54.1'
16	59°16.1	20.4	279°35.0	11.7'	24°48.1	6.8'	54.0'
17	74°16.0	20.3	294°05.7	11.6'	24°54.9	6.7'	54.0'
18	89°15.9	N23°20.3	308°36.3	11.6'	S25°01.7	6.6'	54.0'
19	104°15.7	20.2	323°06.8	11.5'	25°08.3	6.5'	54.0'
20	119°15.6	20.1	337°37.4	11.5'	25°14.7	6.4'	54.0'
21	134°15.5	· · 20.0	352°07.8	11.4'	25°21.1	6.2'	54.0'
22	149°15.4	19.9	6°38.2	11.4'	25°27.4	6.1'	54.0'
23	164°15.2	19.8	21°08.6	11.3'	25°33.5	6.0'	54.0'
SD = 15.7' d = -0.1'			SD = 14.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	--	--	01:33	22:32	--	--
62°	--	--	02:11	21:54	--	--
60°	--	00:52	02:37	21:28	23:12	--
N 58°	--	01:42	02:58	21:07	22:23	--
56°	--	02:12	03:14	20:51	21:53	--
54°	00:48	02:34	03:29	20:36	21:31	23:17
52°	01:34	02:52	03:41	20:24	21:13	22:31
50°	02:02	03:07	03:52	20:13	20:58	22:03
45°	02:47	03:37	04:14	19:51	20:28	21:18
N 40°	03:18	04:00	04:32	19:33	20:06	20:47
35°	03:41	04:18	04:47	19:18	19:48	20:24
30°	04:00	04:33	05:00	19:05	19:32	20:06
20°	04:29	04:58	05:22	18:43	19:07	19:37
N 10°	04:51	05:18	05:41	18:24	18:47	19:14
0°	05:10	05:36	05:59	18:06	18:29	18:55
S 10°	05:27	05:54	06:16	17:49	18:12	18:38
20°	05:43	06:11	06:35	17:30	17:54	18:22
30°	06:00	06:30	06:56	17:09	17:36	18:05
35°	06:09	06:40	07:09	16:57	17:25	17:57
40°	06:18	06:52	07:23	16:43	17:13	17:47
45°	06:28	07:06	07:39	16:26	17:00	17:37
S 50°	06:40	07:22	08:00	16:05	16:44	17:25
52°	06:45	07:29	08:10	15:55	16:36	17:20
54°	06:51	07:37	08:21	15:44	16:28	17:14
56°	06:57	07:46	08:34	15:32	16:19	17:08
58°	07:04	07:57	08:48	15:17	16:09	17:01
S 60°	07:12	08:08	09:06	14:59	15:57	16:54

Lat.	Moonrise			Moonset		
	Wed	Thu	Fri	Wed	Thu	Fri
N 72°	■	■	■	■	■	■
N 70°	18:04	■	■	21:35	■	■
68°	17:23	■	■	22:17	■	■
66°	16:56	19:05	■	22:46	22:12	■
64°	16:35	18:24	20:38	23:08	22:53	22:19
62°	16:18	17:56	19:40	23:26	23:22	23:17
60°	16:04	17:35	19:07	23:41	23:44	23:51
N 58°	15:52	17:18	18:42	23:53	· · ·	00:01
56°	15:42	17:03	18:23	· · ·	00:04	00:17
54°	15:33	16:51	18:07	00:02	00:14	00:30
52°	15:25	16:40	17:53	00:08	00:22	00:41
50°	15:18	16:30	17:41	00:13	00:30	00:51
45°	15:03	16:10	17:16	00:25	00:47	01:13
N 40°	14:50	15:53	16:56	00:35	01:00	01:30
35°	14:40	15:40	16:39	00:43	01:12	01:45
30°	14:31	15:28	16:25	00:51	01:22	01:57
20°	14:15	15:07	16:01	01:04	01:40	02:19
N 10°	14:01	14:50	15:40	01:15	01:55	02:38
0°	13:49	14:34	15:21	01:26	02:10	02:56
S 10°	13:36	14:17	15:02	01:37	02:25	03:14
20°	13:22	14:00	14:41	01:48	02:40	03:33
30°	13:07	13:40	14:17	02:01	02:58	03:55
35°	12:58	13:29	14:04	02:09	03:09	04:09
40°	12:48	13:16	13:48	02:18	03:21	04:24
45°	12:37	13:00	13:29	02:28	03:35	04:42
S 50°	12:23	12:41	13:05	02:41	03:53	05:04
52°	12:16	12:33	12:54	02:46	04:01	05:15
54°	12:09	12:23	12:41	02:53	04:10	05:27
56°	12:01	12:11	12:27	03:00	04:21	05:42
58°	11:52	11:59	12:10	03:08	04:33	05:58
S 60°	11:42	11:44	11:49	03:18	04:47	06:18

Day	Sun		Mer. Pass	Moon		Age 9-11 70-86%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
24	02:22	02:28	12:02	19:59	07:37	
25	02:34	02:41	12:03	20:45	08:22	
26	02:47	02:53	12:03	21:33	09:08	

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

	Aries			Venus			Mars			Jupiter			Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	275°07.3	136°26.1	N17°56.7	218°34.1	N19°31.9	153°33.9	N20°43.2	261°19.0	N03°20.5						
1	290°09.8	151°25.7	55.8	233°34.7	32.3	168°35.8	43.1	276°21.4	20.6						
2	305°12.3	166°25.3	54.9	248°35.3	32.7	183°37.7	43.0	291°23.7	20.6						
3	320°14.7	181°24.9	· · 54.0	263°35.9	· · 33.1	198°39.6	· · 42.8	306°26.1	· · 20.7						
4	335°17.2	196°24.6	53.0	278°36.5	33.6	213°41.5	42.7	321°28.4	20.7						
5	350°19.7	211°24.2	52.1	293°37.2	34.0	228°43.4	42.6	336°30.8	20.7						
6	5°22.1	226°23.8	N17°51.2	308°37.8	N19°34.4	243°45.3	N20°42.5	351°33.1	N03°20.8						
7	20°24.6	241°23.4	50.3	323°38.4	34.8	258°47.2	42.4	6°35.4	20.8						
8	35°27.1	256°23.1	49.4	338°39.0	35.2	273°49.2	42.3	21°37.8	20.8						
9	50°29.5	271°22.7	· · 48.5	353°39.6	· · 35.6	288°51.1	· · 42.2	36°40.1	· · 20.9						
10	65°32.0	286°22.3	47.6	8°40.3	36.1	303°53.0	42.1	51°42.5	20.9						
11	80°34.5	301°21.9	46.7	23°40.9	36.5	318°54.9	42.0	66°44.8	20.9						
12	95°36.9	316°21.6	N17°45.7	38°41.5	N19°36.9	333°56.8	N20°41.9	81°47.2	N03°21.0						
13	110°39.4	331°21.2	44.8	53°42.1	37.3	348°58.7	41.8	96°49.5	21.0						
14	125°41.8	346°20.8	43.9	68°42.7	37.7	4°00.6	41.7	111°51.9	21.1						
15	140°44.3	1°20.5	· · 43.0	83°43.3	· · 38.1	19°02.5	· · 41.5	126°54.2	· · 21.1						
16	155°46.8	16°20.1	42.1	98°44.0	38.6	34°04.4	41.4	141°56.6	21.1						
17	170°49.2	31°19.7	41.2	113°44.6	39.0	49°06.3	41.3	156°58.9	21.2						
18	185°51.7	46°19.3	N17°40.2	128°45.2	N19°39.4	64°08.2	N20°41.2	172°01.3	N03°21.2						
19	200°54.2	61°19.0	39.3	143°45.8	39.8	79°10.2	41.1	187°03.6	21.2						
20	215°56.6	76°18.6	38.4	158°46.4	40.2	94°12.1	41.0	202°06.0	21.3						
21	230°59.1	91°18.2	· · 37.5	173°47.1	· · 40.6	109°14.0	· · 40.9	217°08.3	· · 21.3						
22	246°01.6	106°17.9	36.5	188°47.7	41.0	124°15.9	40.8	232°10.7	21.3						
23	261°04.0	121°17.5	35.6	203°48.3	41.5	139°17.8	40.7	247°13.0	21.4						
Mer.pass.	05:39	ν -0.4' d -0.9' m -4.03		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.82		ν 2.3' d 0.0' m 0.79							

	Aries			Venus			Mars			Jupiter			Saturn		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	276°06.5	136°17.2	N17°34.7	218°48.9	N19°41.9	154°19.7	N20°40.6	262°15.4	N03°21.4						
1	291°08.9	151°16.8	33.8	233°49.5	42.3	169°21.6	40.5	277°17.7	21.5						
2	306°11.4	166°16.4	32.8	248°50.2	42.7	184°23.5	40.3	292°20.1	21.5						
3	321°13.9	181°16.1	· · 31.9	263°50.8	· · 43.1	199°25.4	· · 40.2	307°22.4	· · 21.5						
4	336°16.3	196°15.7	31.0	278°51.4	43.5	214°27.3	40.1	322°24.8	21.6						
5	351°18.8	211°15.3	30.1	293°52.0	43.9	229°29.2	40.0	337°27.1	21.6						
6	6°21.3	226°15.0	N17°29.1	308°52.6	N19°44.3	244°31.1	N20°39.9	352°29.5	N03°21.6						
7	21°23.7	241°14.6	28.2	323°53.2	44.7	259°33.1	39.8	7°31.8	21.7						
8	36°26.2	256°14.3	27.3	338°53.9	45.2	274°35.0	39.7	22°34.2	21.7						
9	51°28.7	271°13.9	· · 26.3	353°54.5	· · 45.6	289°36.9	· · 39.6	37°36.5	· · 21.7						
10	66°31.1	286°13.6	25.4	8°55.1	46.0	304°38.8	39.5	52°38.9	21.8						
11	81°33.6	301°13.2	24.5	23°55.7	46.4	319°40.7	39.4	67°41.2	21.8						
12	96°36.1	316°12.9	N17°23.6	38°56.3	N19°46.8	334°42.6	N20°39.3	82°43.6	N03°21.8						
13	111°38.5	331°12.5	22.6	53°57.0	47.2	349°44.5	39.1	97°45.9	21.9						
14	126°41.0	346°12.1	21.7	68°57.6	47.6	4°46.4	39.0	112°48.3	21.9						
15	141°43.4	1°11.8	· · 20.7	83°58.2	· · 48.0	19°48.3	· · 38.9	127°50.6	· · 21.9						
16	156°45.9	16°11.4	19.8	98°58.8	48.4	34°50.2	38.8	142°53.0	22.0						
17	171°48.4	31°11.1	18.9	113°59.4	48.8	49°52.1	38.7	157°55.3	22.0						
18	186°50.8	46°10.7	N17°17.9	129°00.0	N19°49.2	64°54.0	N20°38.6	172°57.7	N03°22.1						
19	201°53.3	61°10.4	17.0	144°00.7	49.6	79°55.9	38.5	188°00.1	22.1						
20	216°55.8	76°10.0	16.1	159°01.3	50.0	94°57.9	38.4	203°02.4	22.1						
21	231°58.2	91°09.7	· · 15.1	174°01.9	· · 50.5	109°59.8	· · 38.3	218°04.8	· · 22.2						
22	247°00.7	106°09.3	14.2	189°02.5	50.9	125°01.7	38.2	233°07.1	22.2						
23	262°03.2	121°09.0	13.2	204°03.1	51.3	140°03.6	38.1	248°09.5	22.2						
Mer.pass.	05:35	ν -0.4' d -0.9' m -4.04		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.81		ν 2.4' d 0.0' m 0.79							

	Aries			Venus			Mars			Jupiter			Saturn		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	277°05.6	136°08.6	N17°12.3	219°03.7	N19°51.7	155°05.5	N20°37.9	263°11.8	N03°22.3						
1	292°08.1	151°08.3	11.4	234°04.4	52.1	170°07.4	37.8	278°14.2	22.3						
2	307°10.6	166°08.0	10.4	249°05.0	52.5	185°09.3	37.7	293°16.5	22.3						
3	322°13.0	181°07.6	· · 09.5	264°05.6	· · 52.9	200°11.2	· · 37.6	308°18.9	· · 22.4						
4	337°15.5	196°07.3	08.5	279°06.2	53.3	215°13.1	37.5	323°21.2	22.4						
5	352°17.9	211°06.9	07.6	294°06.8	53.7	230°15.0	37.4	338°23.6	22.4						
6	7°20.4	226°06.6	N17°06.6	309°07.5	N19°54.1	245°16.9	N20°37.3	353°25.9	N03°22.5						
7	22°22.9	241°06.2	05.7	324°08.1	54.5	260°18.8	37.2	8°28.3	22.5						
8	37°25.3	256°05.9	04.8	339°08.7	54.9	275°20.7	37.1	23°30.6	22.5						
9	52°27.8	271°05.6	· · 03.8	354°09.3	· · 55.3	290°22.6	· · 37.0	38°33.0	· · 22.6						
10	67°30.3	286°05.2	02.9	9°09.9	55.7	305°24.5	36.8	53°35.4	22.6						
11	82°32.7	301°04.9	01.9	24°10.5	56.1	320°26.5	36.7	68°37.7	22.6						
12	97°35.2	316°04.6	N17°01.0	39°11.2	N19°56.5	335°28.4	N20°36.6	83°40.1	N03°22.7						
13	112°37.7	331°04.2	17°00.0	54°11.8	56.9	350°30.3	36.5	98°42.4	22.7						
14	127°40.1	346°03.9	16°59.1	69°12.4	57.3	5°32.2	36.4	113°44.8	22.7						
15	142°42.6	1°03.5	· · 58.1	84°13.0	· · 57.7	20°34.1	· · 36.3	128°47.1	· · 22.8						
16	157°45.1	16°03.2	57.2	99°13.6	58.1	35°36.0	36.2	143°49.5	22.8						
17	172°47.5	31°02.9	56.2	114°14.2	58.5	50°37.9	36.1	158°51.8	22.8						
18	187°50.0	46°02.5	N16°55.2	129°14.9	N19°58.9	65°39.8	N20°36.0	173°54.2	N03°22.9						
19	202°52.4	61°02.2	54.3	144°15.5	59.3	80°41.7	35.8	188°56.6	22.9						
20	217°54.9	76°01.9	53.3	159°16.1	59.7	95°43.6	35.7	203°58.9	22.9						
21	232°57.4	91°01.5	· · 52.4	174°16.7	20°00.1	110°45.5	· · 35.6	219°01.3	· · 23.0						
22	247°59.8	106°01.2	51.4	189°17.3	00.5	125°47.4	35.5	234°03.6	23.0						
23	263°02.3	121°00.9	50.5	204°17.9	00.9	140°49.3	35.4	249°06.0	23.0						
Mer.pass.	05:31	ν -0.3' d -0.9' m -4.04		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.81		ν 2.4' d 0.0' m 0.78							

	SHA	Dec
Alpheratz	357°33.5	29°14.1
Ankaa	353°06.0	-42°09.4
Schedar	349°29.7	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°43.7	89°22.3
Acamar	315°11.1	-40°11.7
Menkar	314°05.1	4°11.6
Mirfak	308°26.9	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.6	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.7	-69°49.8
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigel Kent.	139°38.2	-60°56.9
Kochab	137°19.1	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.5	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6	45°22.4
Enif	33°37.4	9°59.8
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°13.0	-29°28.7
Scheat	13°43.9	28°13.5
Markab	13°28.6	15°20.8

Jun 27 Sat	SHA	Mer.pass
Venus	221°18.7	14:55
Mars	303°26.7	09:25
Jupiter	238°26.5	13:44
Saturn	346°11.7	06:34

Jun 28 Sun	SHA	Mer.pass
Venus	220°10.7	14:55
Mars	302°42.4	09:24
Jupiter	238°13.2	13:41
Saturn	346°08.9	06:30

Jun 29 Mon	SHA	Mer.pass
Venus	219°03.0	14:56
Mars	301°58.1	09:23
Jupiter	237°59.9	13:38
Saturn	346°06.2	06:26

Horizontal parallax</		
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h	Sun			Moon			
Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	179°15.1	N23°19.7	35°38.9	11.3'	S25°39.5	5.9'	54.0'
1	194°15.0	19.6	50°09.2	11.2'	25°45.4	5.8'	54.0'
2	209°14.8	19.5	64°39.4	11.2'	25°51.2	5.7'	54.0'
3	224°14.7	· · 19.4	79°09.6	11.1'	25°56.8	5.5'	54.0'
4	239°14.6	19.3	93°39.7	11.1'	26°02.4	5.4'	54.0'
5	254°14.5	19.2	108°09.8	11.0'	26°07.8	5.3'	54.0'
6	269°14.3	N23°19.1	122°39.8	11.0'	S26°13.1	5.2'	54.0'
7	284°14.2	19.0	137°09.8	10.9'	26°18.2	5.0'	54.0'
8	299°14.1	18.9	151°39.7	10.9'	26°23.3	4.9'	54.0'
9	314°13.9	· · 18.8	166°09.6	10.8'	26°28.2	4.8'	53.9'
10	329°13.8	18.7	180°39.4	10.8'	26°33.0	4.7'	53.9'
11	344°13.7	18.6	195°09.2	10.8'	26°37.7	4.6'	53.9'
12	359°13.5	N23°18.5	209°39.0	10.7'	S26°42.2	4.4'	53.9'
13	14°13.4	18.4	224°08.7	10.7'	26°46.7	4.3'	53.9'
14	29°13.3	18.3	238°38.4	10.6'	26°51.0	4.2'	53.9'
15	44°13.2	· · 18.1	253°08.1	10.6'	26°55.4	4.0'	53.9'
16	59°13.0	18.0	267°37.7	10.6'	26°59.2	3.9'	53.9'
17	74°12.9	17.9	282°07.2	10.5'	27°03.1	3.8'	53.9'
18	89°12.8	N23°17.8	296°36.8	10.5'	S27°06.9	3.7'	53.9'
19	104°12.6	17.7	311°06.3	10.5'	27°10.5	3.5'	53.9'
20	119°12.5	17.6	325°35.7	10.4'	27°14.1	3.4'	53.9'
21	134°12.4	· · 17.5	340°05.1	10.4'	27°17.5	3.3'	53.9'
22	149°12.3	17.4	354°34.5	10.4'	27°20.8	3.1'	53.9'
23	164°12.1	17.3	9°03.9	10.3'	27°23.9	3.0'	53.9'
SD = 15.7'			d = -0.1'		SD = 14.7'		

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°12.0	N23°17.1	23°33.2	10.3'	S27°26.9	2.9'	53.9'
1	194°11.9	17.0	38°02.5	10.3'	27°29.8	2.7'	53.9'
2	209°11.8	16.9	52°31.8	10.2'	27°32.5	2.6'	53.9'
3	224°11.6	· · 16.8	67°01.0	10.2'	27°35.2	2.5'	53.9'
4	239°11.5	16.7	81°30.3	10.2'	27°37.6	2.4'	53.9'
5	254°11.4	16.6	95°59.5	10.2'	27°40.0	2.2'	53.9'
6	269°11.2	N23°16.5	110°28.6	10.1'	S27°42.2	2.1'	53.9'
7	284°11.1	16.3	124°57.8	10.1'	27°44.3	2.0'	53.9'
8	299°11.0	16.2	139°26.9	10.1'	27°46.2	1.8'	53.9'
9	314°10.9	· · 16.1	153°56.0	10.1'	27°48.1	1.7'	53.9'
10	329°10.7	16.0	168°25.1	10.1'	27°49.8	1.6'	53.9'
11	344°10.6	15.9	182°54.1	10.0'	27°51.3	1.4'	53.9'
12	359°10.5	N23°15.7	197°23.2	10.0'	S27°52.7	1.3'	53.9'
13	14°10.4	15.6	211°52.2	10.0'	27°54.0	1.1'	53.9'
14	29°10.2	15.5	226°21.2	10.0'	27°55.2	1.0'	53.9'
15	44°10.1	· · 15.4	240°50.2	10.0'	27°56.2	0.9'	53.9'
16	59°10.0	15.2	255°19.2	10.0'	27°57.0	0.7'	53.9'
17	74°09.8	15.1	269°48.2	10.0'	27°57.8	0.6'	53.9'
18	89°09.7	N23°15.0	284°17.1	10.0'	S27°58.4	0.5'	53.9'
19	104°09.6	14.9	298°46.1	9.9'	27°58.9	0.3'	53.9'
20	119°09.5	14.7	313°15.0	9.9'	27°59.2	0.2'	53.9'
21	134°09.3	· · 14.6	327°44.0	9.9'	27°59.4	0.1'	53.9'
22	149°09.2	14.5	342°12.9	9.9'	27°59.5	-0.1'	53.9'
23	164°09.1	14.3	356°41.8	9.9'	27°59.4	-0.2'	53.9'
SD = 15.7'			d = -0.1'		SD = 14.7'		

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°09.0	N23°14.2	11°10.7	9.9'	S27°59.2	-0.3'	53.9'
1	194°08.8	14.1	25°39.7	9.9'	27°58.8	-0.5'	53.9'
2	209°08.7	13.9	40°08.6	9.9'	27°58.4	-0.6'	53.9'
3	224°08.6	· · 13.8	54°37.5	9.9'	27°57.7	-0.8'	53.9'
4	239°08.5	13.7	69°06.4	9.9'	27°57.0	-0.9'	53.9'
5	254°08.3	13.5	83°35.4	9.9'	27°56.1	-1.0'	53.9'
6	269°08.2	N23°13.4	98°04.3	9.9'	S27°55.1	-1.2'	53.9'
7	284°08.1	13.3	112°33.2	9.9'	27°53.9	-1.3'	54.0'
8	299°08.0	13.1	127°02.2	10.0'	27°52.6	-1.4'	54.0'
9	314°07.8	· · 13.0	141°31.1	10.0'	27°51.2	-1.6'	54.0'
10	329°07.7	12.9	156°00.1	10.0'	27°49.6	-1.7'	54.0'
11	344°07.6	12.7	170°29.1	10.0'	27°47.9	-1.8'	54.0'
12	359°07.5	N23°12.6	184°58.1	10.0'	S27°46.1	-2.0'	54.0'
13	14°07.3	12.4	199°27.1	10.0'	27°44.1	-2.1'	54.0'
14	29°07.2	12.3	213°56.1	10.0'	27°42.0	-2.2'	54.0'
15	44°07.1	· · 12.2	228°25.1	10.0'	27°39.8	-2.4'	54.0'
16	59°07.0	12.0	242°54.2	10.1'	27°37.4	-2.5'	54.0'
17	74°06.8	11.9	257°23.2	10.1'	27°34.9	-2.6'	54.0'
18	89°06.7	N23°11.7	271°52.3	10.1'	S27°32.2	-2.8'	54.0'
19	104°06.6	11.6	286°21.4	10.1'	27°29.5	-2.9'	54.0'
20	119°06.5	11.4	300°50.6	10.2'	27°26.6	-3.0'	54.0'
21	134°06.3	· · 11.3	315°19.7	10.2'	27°23.5	-3.2'	54.0'
22	149°06.2	11.2	329°48.9	10.2'	27°20.3	-3.3'	54.0'
23	164°06.1	11.0	344°18.1	10.2'	27°17.0	-3.4'	54.0'
SD = 15.7'			d = -0.1'		SD = 14.7'		

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

Lat.	Moonrise			Moonset		
	Sat	Sun	Mon	Sat	Sun	Mon
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	☐	☐	☐	☐	☐	☐
62°	21:29	☐	23:10	23:11	☐	☐
60°	20:33	21:41	22:17	· · ·	00:08	00:47
N 58°	20:01	21:04	21:45	00:15	00:40	01:24
56°	19:37	20:37	21:21	00:35	01:05	01:50
54°	19:17	20:17	21:02	00:52	01:25	02:11
52°	19:01	19:59	20:45	01:06	01:41	02:28
50°	18:47	19:44	20:31	01:19	01:55	02:43
45°	18:18	19:14	20:02	01:44	02:24	03:13
N 40°	17:56	18:51	19:40	02:05	02:47	03:36
35°	17:37	18:32	19:21	02:22	03:06	03:56
30°	17:21	18:15	19:05	02:37	03:22	04:12
20°	16:55	17:47	18:38	03:02	03:49	04:40
N 10°	16:32	17:23	18:15	03:24	04:13	05:04
0°	16:10	17:01	17:53	03:44	04:35	05:26
S 10°	15:49	16:39	17:31	04:05	04:57	05:48
20°	15:26	16:15	17:07	04:27	05:20	06:12
30°	15:00	15:47	16:40	04:52	05:48	06:40
35°	14:44	15:31	16:24	05:07	06:04	06:56
40°	14:26	15:12	16:05	05:25	06:23	07:15
45°	14:05	14:49	15:42	05:46	06:46	07:38
S 50°	13:37	14:19	15:13	06:13	07:15	08:08
52°	13:24	14:05	14:59	06:26	07:30	08:22
54°	13:09	13:48	14:42	06:41	07:47	08:39
56°	12:51	13:28	14:22	06:59	08:07	08:59
58°	12:29	13:02	13:57	07:20	08:32	09:24
S 60°	12:01	12:28	13:23	07:48	09:07	09:58

Day	Sun		Mer. Pass	Moon		Age 12-14 92-99%
	Eqn. of Time 00 ^h mm:ss	Time 12 ^h mm:ss		Mer. Pass Upper Lower hh:mm	Mer. Pass Upper Lower hh:mm	
27	03:00	03:06	12:03	22:22	09:57	
28	03:12	03:18	12:03	23:14	10:48	
29	03:24	03:30	12:04	--	11:39	

June 30, 01, 02 UT (Tue., Wed., Thu.)

	Aries			Venus			Mars			Jupiter			Saturn		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	278°04.8	136°00.6	N16°49.5	219°18.6	N20°01.3	155°51.2	N20°35.3	264°08.3	N03°23.1	279°10.7	23.1	309°15.4	23.2		
1	293°07.2	151°00.2	48.6	234°19.2	01.7	170°53.1	35.2	279°10.7	23.1	309°15.4	23.2	324°17.8	23.2		
2	308°09.7	165°59.9	47.6	249°19.8	02.1	185°55.0	35.1	294°13.1	23.1	324°17.8	23.2	339°20.1	23.2		
3	323°12.2	180°59.6	· · 46.6	264°20.4	· · 02.5	200°57.0	· · 35.0	309°15.4	· · 23.2	339°20.1	23.2	354°22.5	N03°23.3		
4	338°14.6	195°59.2	45.7	279°21.0	02.9	215°58.9	34.9	354°22.5	N03°23.3	354°22.5	N03°23.3	369°34.3	23.4		
5	353°17.1	210°58.9	44.7	294°21.6	03.2	231°00.8	34.7	369°34.3	23.4	369°34.3	23.4	384°28.8	N03°23.3		
6	8°19.6	225°58.6	N16°43.8	309°22.3	N20°03.6	246°02.7	N20°34.6	384°28.8	N03°23.3	384°28.8	N03°23.3	399°30.9	23.5		
7	23°22.0	240°58.3	42.8	324°22.9	04.0	261°04.6	34.5	399°30.9	23.5	399°30.9	23.5	414°41.4	23.5		
8	38°24.5	255°58.0	41.8	339°23.5	04.4	276°06.5	34.4	414°41.4	23.5	414°41.4	23.5	429°43.7	· · 23.5		
9	53°26.9	270°57.6	· · 40.9	354°24.1	· · 04.8	291°08.4	· · 34.3	429°43.7	· · 23.5	429°43.7	· · 23.5	444°46.1	23.6		
10	68°29.4	285°57.3	39.9	9°24.7	05.2	306°10.3	34.2	444°46.1	23.6	444°46.1	23.6	459°48.4	23.6		
11	83°31.9	300°57.0	38.9	24°25.3	05.6	321°12.2	34.1	459°48.4	23.6	459°48.4	23.6	474°50.8	N03°23.6		
12	98°34.3	315°56.7	N16°38.0	39°25.9	N20°06.0	336°14.1	N20°34.0	474°50.8	N03°23.6	474°50.8	N03°23.6	489°53.2	23.7		
13	113°36.8	330°56.3	37.0	54°26.6	06.4	351°16.0	33.9	489°53.2	23.7	489°53.2	23.7	504°55.5	23.7		
14	128°39.3	345°56.0	36.0	69°27.2	06.8	6°17.9	33.7	504°55.5	23.7	504°55.5	23.7	519°57.9	· · 23.7		
15	143°41.7	0°55.7	· · 35.1	84°27.8	· · 07.2	21°19.8	· · 33.6	519°57.9	· · 23.7	519°57.9	· · 23.7	534°59.9	23.8		
16	158°44.2	15°55.4	34.1	99°28.4	07.6	36°21.7	33.5	534°59.9	23.8	534°59.9	23.8	549°02.6	23.8		
17	173°46.7	30°55.1	33.1	114°29.0	08.0	51°23.6	33.4	549°02.6	23.8	549°02.6	23.8	564°04.1	23.8		
18	188°49.1	45°54.8	N16°32.2	129°29.6	N20°08.3	66°25.5	N20°33.3	564°04.1	23.8	564°04.1	23.8	579°05.3	N03°23.6		
19	203°51.6	60°54.4	31.2	144°30.3	08.7	81°27.4	33.2	579°05.3	N03°23.6	579°05.3	N03°23.6	594°06.0	23.7		
20	218°54.1	75°54.1	30.2	159°30.9	09.1	96°29.3	33.1	594°06.0	23.7	594°06.0	23.7	609°07.2	23.7		
21	233°56.5	90°53.8	· · 29.3	174°31.5	· · 09.5	111°31.3	· · 33.0	609°07.2	23.7	609°07.2	23.7	624°08.3	23.7		
22	248°59.0	105°53.5	28.3	189°32.1	09.9	126°33.2	32.8	624°08.3	23.7	624°08.3	23.7	639°09.4	23.7		
23	264°01.4	120°53.2	27.3	204°32.7	10.3	141°35.1	32.7	639°09.4	23.7	639°09.4	23.7	654°10.7	23.7		
Mer.pass.	05:27	ν -0.3' d -1.0' m -4.05		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.81		ν 2.4' d 0.0' m 0.78							

Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	279°03.9	135°52.9	N16°26.3	219°33.3	N20°10.7	156°37.0	N20°32.6	265°05.0	N03°23.8
1	294°06.4	150°52.6	25.4	234°34.0	11.1	171°38.9	32.5	280°07.3	23.9
2	309°08.8	165°52.3	24.4	249°34.6	11.5	186°40.8	32.4	295°09.7	23.9
3	324°11.3	180°52.0	· · 23.4	264°35.2	· · 11.8	201°42.7	· · 32.3	310°12.0	· · 23.9
4	339°13.8	195°51.6	22.4	279°35.8	12.2	216°44.6	32.2	325°14.4	24.0
5	354°16.2	210°51.3	21.5	294°36.4	12.6	231°46.5	32.1	340°16.8	24.0
6	9°18.7	225°51.0	N16°20.5	309°37.0	N20°13.0	246°48.4	N20°32.0	355°19.1	N03°24.0
7	24°21.2	240°50.7	19.5	324°37.6	13.4	261°50.3	31.8	370°21.5	24.0
8	39°23.6	255°50.4	18.5	339°38.3	13.8	276°52.2	31.7	385°23.8	24.1
9	54°26.1	270°50.1	· · 17.6	354°38.9	· · 14.2	291°54.1	· · 31.6	40°26.2	· · 24.1
10	69°28.5	285°49.8	16.6	9°39.5	14.5	306°56.0	31.5	55°28.6	24.1
11	84°31.0	300°49.5	15.6	24°40.1	14.9	321°57.9	31.4	70°30.9	24.2
12	99°33.5	315°49.2	N16°14.6	39°40.7	N20°15.3	336°59.8	N20°31.3	85°33.3	N03°24.2
13	114°35.9	330°48.9	13.6	54°41.3	15.7	352°01.7	31.2	100°35.7	24.2
14	129°38.4	345°48.6	12.7	69°41.9	16.1	7°03.6	31.1	115°38.0	24.3
15	144°40.9	0°48.3	· · 11.7	84°42.6	· · 16.5	22°05.5	· · 30.9	130°40.4	· · 24.3
16	159°43.3	15°48.0	10.7	99°43.2	16.8	37°07.4	30.8	145°42.7	24.3
17	174°45.8	30°47.7	09.7	114°43.8	17.2	52°09.3	30.7	160°45.1	24.4
18	189°48.3	45°47.4	N16°08.7	129°44.4	N20°17.6	67°11.3	N20°30.6	175°47.5	N03°24.4
19	204°50.7	60°47.1	07.7	144°45.0	18.0	82°13.2	30.5	190°49.8	24.4
20	219°53.2	75°46.8	06.7	159°45.6	18.4	97°15.1	30.4	205°52.2	24.4
21	234°55.7	90°46.5	· · 05.8	174°46.3	· · 18.7	112°17.0	· · 30.3	220°54.6	· · 24.5
22	249°58.1	105°46.2	04.8	189°46.9	19.1	127°18.9	30.2	235°56.9	24.5
23	265°00.6	120°45.9	03.8	204°47.5	19.5	142°20.8	30.0	250°59.3	24.5
Mer.pass.	05:23	ν -0.3' d -1.0' m -4.05		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.81		ν 2.4' d 0.0' m 0.78	

Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	280°03.0	135°45.6	N16°02.8	219°48.1	N20°19.9	157°22.7	N20°29.9	266°01.6	N03°24.6
1	295°05.5	150°45.3	01.8	234°48.7	20.3	172°24.6	29.8	281°04.0	24.6
2	310°08.0	165°45.0	16°00.8	249°49.3	20.6	187°26.5	29.7	296°06.4	24.6
3	325°10.4	180°44.7	15°59.8	264°49.9	· · 21.0	202°28.4	· · 29.6	311°08.7	· · 24.7
4	340°12.9	195°44.4	58.8	279°50.6	21.4	217°30.3	29.5	326°11.1	24.7
5	355°15.4	210°44.2	57.8	294°51.2	21.8	232°32.2	29.4	341°13.5	24.7
6	10°17.8	225°43.9	N15°56.9	309°51.8	N20°22.2	247°34.1	N20°29.3	356°15.8	N03°24.7
7	25°20.3	240°43.6	55.9	324°52.4	22.5	262°36.0	29.1	371°18.2	24.8
8	40°22.8	255°43.3	54.9	339°53.0	22.9	277°37.9	29.0	386°20.6	24.8
9	55°25.2	270°43.0	· · 53.9	354°53.6	· · 23.3	292°39.8	· · 28.9	41°22.9	· · 24.8
10	70°27.7	285°42.7	52.9	9°54.2	23.7	307°41.7	28.8	56°25.3	24.9
11	85°30.2	300°42.4	51.9	24°54.9	24.0	322°43.6	28.7	71°27.7	24.9
12	100°32.6	315°42.1	N15°50.9	39°55.5	N20°24.4	337°45.5	N20°28.6	86°30.0	N03°24.9
13	115°35.1	330°41.9	49.9	54°56.1	24.8	352°47.4	28.5	101°32.4	24.9
14	130°37.5	345°41.6	48.9	69°56.7	25.2	7°49.3	28.4	116°34.8	25.0
15	145°40.0	0°41.3	· · 47.9	84°57.3	· · 25.5	22°51.2	· · 28.2	131°37.1	· · 25.0
16	160°42.5	15°41.0	46.9	99°57.9	25.9	37°53.1	28.1	146°39.5	25.0
17	175°44.9	30°40.7	45.9	114°58.5	26.3	52°55.0	28.0	161°41.9	25.1
18	190°47.4	45°40.4	N15°44.9	129°59.2	N20°26.7	67°56.9	N20°27.9	176°44.2	N03°25.1
19	205°49.9	60°40.2	43.9	144°59.8	27.0	82°58.8	27.8	191°46.6	25.1
20	220°52.3	75°39.9	42.9	160°00.4	27.4	98°00.7	27.7	206°49.0	25.1
21	235°54.8	90°39.6	· · 41.9	175°01.0	· · 27.8	113°02.6	· · 27.6	221°51.3	· · 25.2
22	250°57.3	105°39.3	40.9	190°01.6	28.2	128°04.6	27.4	236°53.7	25.2
23	265°59.7	120°39.0	39.9	205°02.2	28.5	143°06.5	27.3	251°56.1	25.2
Mer.pass.	05:19	ν -0.3' d -1.0' m -4.06		ν 0.6' d 0.4' m 1.30		ν 1.9' d -0.1' m -1.81		ν 2.4' d 0.0' m 0.77	

	SHA	Dec
Alpheratz	357°33.5	29°14.1
Ankaa	353°05.9	-42°09.4
Schedar	349°29.6	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.5	-57°05.8
Hamal	327°50.0	23°35.2
Polaris	313°42.2	89°22.3
Acamar	315°11.1	-40°11.7
Menkar	314°05.1	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.8	-50°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.8	-69°49.7
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.3	-17°41.5
Acrux	172°58.7	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.8	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigel Kent.	139°38.2	-60°57.0
Kochab	137°19.2	74°03.0
Zuben'ubi	136°54.5	-10°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.3
Peacock	53°03.3	-56°38.8
Deneb	49°24.6</	

Sun			Moon				
h	GHA	Dec	GHA	ν	Dec	d	HP
0	179°06.0	N23°10.9	358°47.3	10.3'	S27°13.6	-3.6'	54.0'
1	194°05.9	10.7	13°16.6	10.3'	27°10.0	-3.7'	54.0'
2	209°05.7	10.6	27°45.8	10.3'	27°06.3	-3.8'	54.1'
3	224°05.6	· · 10.4	42°15.2	10.3'	27°02.5	-4.0'	54.1'
4	239°05.5	10.3	56°44.5	10.4'	26°58.5	-4.1'	54.1'
5	254°05.4	10.1	71°13.9	10.4'	26°54.4	-4.2'	54.1'
6	269°05.2	N23°10.0	85°43.3	10.4'	S26°50.2	-4.4'	54.1'
7	284°05.1	09.8	100°12.7	10.5'	26°45.8	-4.5'	54.1'
8	299°05.0	09.7	114°42.2	10.5'	26°41.3	-4.6'	54.1'
9	314°04.9	· · 09.5	129°11.7	10.5'	26°36.7	-4.7'	54.1'
10	329°04.7	09.3	143°41.2	10.6'	26°32.0	-4.9'	54.1'
11	344°04.6	09.2	158°10.8	10.6'	26°27.1	-5.0'	54.1'
12	359°04.5	N23°09.0	172°40.4	10.7'	S26°22.1	-5.1'	54.1'
13	14°04.4	08.9	187°10.1	10.7'	26°17.0	-5.2'	54.1'
14	29°04.3	08.7	201°39.7	10.7'	26°11.7	-5.4'	54.1'
15	44°04.1	· · 08.6	216°09.5	10.8'	26°06.4	-5.5'	54.2'
16	59°04.0	08.4	230°39.3	10.8'	26°00.9	-5.6'	54.2'
17	74°03.9	08.2	245°09.1	10.9'	25°55.2	-5.7'	54.2'
18	89°03.8	N23°08.1	259°38.9	10.9'	S25°49.5	-5.9'	54.2'
19	104°03.7	07.9	274°08.8	10.9'	25°43.6	-6.0'	54.2'
20	119°03.5	07.8	288°38.8	11.0'	25°37.6	-6.1'	54.2'
21	134°03.4	· · 07.6	303°08.8	11.0'	25°31.5	-6.2'	54.2'
22	149°03.3	07.4	317°38.8	11.1'	25°25.3	-6.4'	54.2'
23	164°03.2	07.3	332°08.9	11.1'	25°18.9	-6.5'	54.2'
SD = 15.7' d = -0.1'			SD = 14.7'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	179°03.0	N23°07.1	346°39.0	11.2'	S25°12.4	-6.6'	54.2'
1	194°02.9	06.9	1°09.2	11.2'	25°05.8	-6.7'	54.2'
2	209°02.8	06.8	15°39.4	11.3'	24°59.1	-6.8'	54.3'
3	224°02.7	· · 06.6	30°09.7	11.3'	24°52.3	-7.0'	54.3'
4	239°02.6	06.4	44°40.0	11.4'	24°45.3	-7.1'	54.3'
5	254°02.4	06.3	59°10.4	11.4'	24°38.3	-7.2'	54.3'
6	269°02.3	N23°06.1	73°40.8	11.5'	S24°31.1	-7.3'	54.3'
7	284°02.2	05.9	88°11.2	11.5'	24°23.8	-7.4'	54.3'
8	299°02.1	05.8	102°41.8	11.6'	24°16.4	-7.5'	54.3'
9	314°02.0	· · 05.6	117°12.3	11.6'	24°08.8	-7.6'	54.3'
10	329°01.8	05.4	131°43.0	11.7'	24°01.2	-7.8'	54.3'
11	344°01.7	05.3	146°13.6	11.7'	23°53.4	-7.9'	54.4'
12	359°01.6	N23°05.1	160°44.4	11.8'	S23°45.6	-8.0'	54.4'
13	14°01.5	04.9	175°15.1	11.8'	23°37.6	-8.1'	54.4'
14	29°01.4	04.7	189°46.0	11.9'	23°29.5	-8.2'	54.4'
15	44°01.2	· · 04.6	204°16.8	11.9'	23°21.3	-8.3'	54.4'
16	59°01.1	04.4	218°47.8	12.0'	23°13.0	-8.4'	54.4'
17	74°01.0	04.2	233°18.8	12.0'	23°04.6	-8.5'	54.4'
18	89°00.9	N23°04.0	247°49.8	12.1'	S22°56.0	-8.6'	54.4'
19	104°00.8	03.9	262°20.9	12.1'	22°47.4	-8.7'	54.5'
20	119°00.7	03.7	276°52.1	12.2'	22°38.7	-8.8'	54.5'
21	134°00.5	· · 03.5	291°23.3	12.3'	22°29.8	-8.9'	54.5'
22	149°00.4	03.3	305°54.5	12.3'	22°20.9	-9.1'	54.5'
23	164°00.3	03.1	320°25.8	12.4'	22°11.8	-9.2'	54.5'
SD = 15.7' d = -0.2'			SD = 14.8'				

Thu	GHA	Dec	GHA	ν	Dec	d	HP
0	179°00.2	N23°03.0	334°57.2	12.4'	S22°02.7	-9.3'	54.5'
1	194°00.1	02.8	349°28.6	12.5'	21°53.4	-9.4'	54.5'
2	208°59.9	02.6	4°00.1	12.5'	21°44.1	-9.5'	54.5'
3	223°59.8	· · 02.4	18°31.6	12.6'	21°34.6	-9.6'	54.6'
4	238°59.7	02.2	33°03.2	12.6'	21°25.0	-9.7'	54.6'
5	253°59.6	02.0	47°34.8	12.7'	21°15.4	-9.8'	54.6'
6	268°59.5	N23°01.9	62°06.5	12.7'	S21°05.6	-9.9'	54.6'
7	283°59.4	01.7	76°38.3	12.8'	20°55.8	-9.9'	54.6'
8	298°59.2	01.5	91°10.1	12.8'	20°45.8	-10.0'	54.6'
9	313°59.1	· · 01.3	105°41.9	12.9'	20°35.8	-10.1'	54.6'
10	328°59.0	01.1	120°13.8	13.0'	20°25.7	-10.2'	54.7'
11	343°58.9	00.9	134°45.8	13.0'	20°15.4	-10.3'	54.7'
12	358°58.8	N23°00.7	149°17.8	13.1'	S20°05.1	-10.4'	54.7'
13	13°58.7	00.5	163°49.8	13.1'	19°54.7	-10.5'	54.7'
14	28°58.5	00.3	178°21.9	13.2'	19°44.2	-10.6'	54.7'
15	43°58.4	· · 00.2	192°54.1	13.2'	19°33.6	-10.7'	54.7'
16	58°58.3	23°00.0	207°26.3	13.3'	19°22.9	-10.8'	54.8'
17	73°58.2	22°59.8	221°58.6	13.3'	19°12.1	-10.9'	54.8'
18	88°58.1	N22°59.6	236°30.9	13.4'	S19°01.3	-11.0'	54.8'
19	103°58.0	59.4	251°03.3	13.4'	18°50.3	-11.0'	54.8'
20	118°57.8	59.2	265°35.7	13.5'	18°39.3	-11.1'	54.8'
21	133°57.7	· · 59.0	280°08.2	13.5'	18°28.1	-11.2'	54.8'
22	148°57.6	58.8	294°40.7	13.6'	18°16.9	-11.3'	54.8'
23	163°57.5	58.6	309°13.2	13.6'	18°05.6	-11.4'	54.9'
SD = 15.7' d = -0.2'			SD = 14.9'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	00:20	23:40	☐	☐
64°	☐	☐	01:41	22:25	☐	☐
62°	☐	☐	02:17	21:50	☐	☐
60°	☐	☐	01:03	02:42	21:25	23:02
N 58°	☐	☐	01:49	03:02	21:05	22:18
56°	☐	☐	02:17	03:18	20:49	21:50
54°	☐	☐	00:58	02:39	03:32	20:35
52°	☐	☐	01:40	02:56	03:44	20:23
50°	☐	☐	02:06	03:11	03:55	20:12
45°	☐	☐	02:51	03:40	04:17	19:50
N 40°	☐	☐	03:21	04:02	04:35	19:33
35°	☐	☐	03:44	04:20	04:50	19:18
30°	☐	☐	04:02	04:35	05:02	19:05
20°	☐	☐	04:31	05:00	05:24	18:44
N 10°	☐	☐	04:53	05:20	05:43	18:25
0°	☐	☐	05:12	05:38	06:00	18:08
S 10°	☐	☐	05:28	05:55	06:17	17:50
20°	☐	☐	05:44	06:12	06:36	17:32
30°	☐	☐	06:00	06:30	06:57	17:11
35°	☐	☐	06:09	06:41	07:09	16:59
40°	☐	☐	06:18	06:52	07:23	16:45
45°	☐	☐	06:28	07:06	07:39	16:29
S 50°	☐	☐	06:40	07:21	08:00	16:08
52°	☐	☐	06:45	07:29	08:09	15:59
54°	☐	☐	06:51	07:37	08:20	15:48
56°	☐	☐	06:57	07:46	08:32	15:35
58°	☐	☐	07:03	07:56	08:47	15:21
S 60°	☐	☐	07:11	08:07	09:04	15:04

Lat.	Moonrise			Moonset		
	Tue	Wed	Thu	Tue	Wed	Thu
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	01:23	☐	☐	02:19
			23:59			
66°	☐	☐	00:04	☐	☐	03:37
			23:33			
64°	23:56	23:27	23:13	☐	02:03	04:13
62°	23:05	23:00	22:56	01:05	02:55	04:39
60°	22:33	22:39	22:42	01:57	03:26	04:59
N 58°	22:09	22:22	22:30	02:29	03:49	05:16
56°	21:49	22:08	22:20	02:53	04:08	05:30
54°	21:33	21:55	22:10	03:12	04:24	05:42
52°	21:19	21:44	22:02	03:28	04:38	05:52
50°	21:07	21:34	21:55	03:42	04:50	06:01
45°	20:42	21:13	21:39	04:10	05:14	06:21
N 40°	20:21	20:56	21:26	04:33	05:34	06:37
35°	20:05	20:42	21:14	04:51	05:50	06:50
30°	19:50	20:30	21:05	05:07	06:04	07:02
20°	19:25	20:08	20:48	05:33	06:28	07:22
N 10°	19:03	19:50	20:33	05:56	06:48	07:39
0°	18:43	19:32	20:19	06:17	07:07	07:55
S 10°	18:23	19:15	20:05	06:38	07:26	08:11
20°	18:01	18:56	19:49	07:01	07:46	08:27
30°	17:36	18:34	19:32	07:27	08:09	08:47
35°	17:21	18:21	19:22	07:43	08:23	08:58
40°	17:04	18:06	19:10	08:00	08:38	09:10
45°	16:43	17:49	18:56	08:22	08:57	09:25
S 50°	16:17	17:27	18:40	08:49	09:20	09:44
52°	16:04	17:16	18:32	09:02	09:31	09:52
54°	15:49	17:04	18:23	09:17	09:43	10:02
56°	15:32	16:50	18:13	09:35	09:58	10:12
58°	15:11	16:34	18:01	09:56	10:14	10:25
S 60°	14:44	16:15	17:48	10:23	10:34	10:39

Day	Sun		Mer. Pass hh:mm	Moon		Age 15-17 100-96%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
30	03:36	03:42	12:04	00:05	12:30	
01	03:48	03:54	12:04	00:55	13:20	☉
02	03:59	04:05	12:04	01:43	14:07	

July 03, 04, 05 UT (Fri., Sat., Sun.)

	Aries			Venus			Mars			Jupiter			Saturn		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	281°02.2	135°38.8	N15°38.9	220°02.8	N20°28.9	158°08.4	N20°27.2	266°58.4	N03°25.3						
1	296°04.7	150°38.5	37.9	235°03.4	29.3	173°10.3	27.1	282°00.8	25.3						
2	311°07.1	165°38.2	36.9	250°04.1	29.6	188°12.2	27.0	297°03.2	25.3						
3	326°09.6	180°37.9	· · 35.9	265°04.7	· · 30.0	203°14.1	· · 26.9	312°05.5	· · 25.3						
4	341°12.0	195°37.7	34.9	280°05.3	30.4	218°16.0	26.8	327°07.9	25.4						
5	356°14.5	210°37.4	33.9	295°05.9	30.8	233°17.9	26.7	342°10.3	25.4						
6	11°17.0	225°37.1	N15°32.9	310°06.5	N20°31.1	248°19.8	N20°26.5	357°12.6	N03°25.4						
7	26°19.4	240°36.8	31.9	325°07.1	31.5	263°21.7	26.4	12°15.0	25.4						
8	41°21.9	255°36.6	30.8	340°07.7	31.9	278°23.6	26.3	27°17.4	25.5						
9	56°24.4	270°36.3	· · 29.8	355°08.4	· · 32.2	293°25.5	· · 26.2	42°19.7	· · 25.5						
10	71°26.8	285°36.0	28.8	10°09.0	32.6	308°27.4	26.1	57°22.1	25.5						
11	86°29.3	300°35.8	27.8	25°09.6	33.0	323°29.3	26.0	72°24.5	25.6						
12	101°31.8	315°35.5	N15°26.8	40°10.2	N20°33.3	338°31.2	N20°25.9	87°26.9	N03°25.6						
13	116°34.2	330°35.2	25.8	55°10.8	33.7	353°33.1	25.7	102°29.2	25.6						
14	131°36.7	345°35.0	24.8	70°11.4	34.1	8°35.0	25.6	117°31.6	25.6						
15	146°39.1	0°34.7	· · 23.8	85°12.0	· · 34.4	23°36.9	· · 25.5	132°34.0	· · 25.7						
16	161°41.6	15°34.4	22.8	100°12.6	34.8	38°38.8	25.4	147°36.3	25.7						
17	176°44.1	30°34.2	21.7	115°13.3	35.2	53°40.7	25.3	162°38.7	25.7						
18	191°46.5	45°33.9	N15°20.7	130°13.9	N20°35.5	68°42.6	N20°25.2	177°41.1	N03°25.7						
19	206°49.0	60°33.6	19.7	145°14.5	35.9	83°44.5	25.1	192°43.4	25.8						
20	221°51.5	75°33.4	18.7	160°15.1	36.3	98°46.4	24.9	207°45.8	25.8						
21	236°53.9	90°33.1	· · 17.7	175°15.7	· · 36.6	113°48.3	· · 24.8	222°48.2	· · 25.8						
22	251°56.4	105°32.8	16.7	190°16.3	37.0	128°50.2	24.7	237°50.6	25.9						
23	266°58.9	120°32.6	15.7	205°16.9	37.3	143°52.1	24.6	252°52.9	25.9						
Mer.pass. 05:15 ν -0.3' d -1.0' m -4.06 ν 0.6' d 0.4' m 1.30 ν 1.9' d -0.1' m -1.81 ν 2.4' d 0.0' m 0.77															

Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	282°01.3	135°32.3	N15°14.6	220°17.6	N20°37.7	158°54.0	N20°24.5	267°55.3	N03°25.9
1	297°03.8	150°32.1	13.6	235°18.2	38.1	173°55.9	24.4	282°57.7	25.9
2	312°06.3	165°31.8	12.6	250°18.8	38.4	188°57.8	24.3	298°00.0	26.0
3	327°08.7	180°31.5	· · 11.6	265°19.4	· · 38.8	203°59.7	· · 24.1	313°02.4	· · 26.0
4	342°11.2	195°31.3	10.6	280°20.0	39.2	219°01.6	24.0	328°04.8	26.0
5	357°13.6	210°31.0	09.5	295°20.6	39.5	234°03.5	23.9	343°07.2	26.0
6	12°16.1	225°30.8	N15°08.5	310°21.2	N20°39.9	249°05.4	N20°23.8	358°09.5	N03°26.1
7	27°18.6	240°30.5	07.5	325°21.8	40.2	264°07.3	23.7	13°11.9	26.1
8	42°21.0	255°30.3	06.5	340°22.5	40.6	279°09.2	23.6	28°14.3	26.1
9	57°23.5	270°30.0	· · 05.5	355°23.1	· · 41.0	294°11.1	· · 23.4	43°16.7	· · 26.1
10	72°26.0	285°29.7	04.4	10°23.7	41.3	309°13.0	23.3	58°19.0	26.2
11	87°28.4	300°29.5	03.4	25°24.3	41.7	324°14.9	23.2	73°21.4	26.2
12	102°30.9	315°29.2	N15°02.4	40°24.9	N20°42.0	339°16.8	N20°23.1	88°23.8	N03°26.2
13	117°33.4	330°29.0	01.4	55°25.5	42.4	354°18.7	23.0	103°26.1	26.2
14	132°35.8	345°28.7	15°00.3	70°26.1	42.8	9°20.6	22.9	118°28.5	26.3
15	147°38.3	0°28.5	14°59.3	85°26.7	· · 43.1	24°22.5	· · 22.8	133°30.9	· · 26.3
16	162°40.8	15°28.2	58.3	100°27.4	43.5	39°24.4	22.6	148°33.3	26.3
17	177°43.2	30°28.0	57.3	115°28.0	43.8	54°26.3	22.5	163°35.6	26.3
18	192°45.7	45°27.7	N14°56.2	130°28.6	N20°44.2	69°28.2	N20°22.4	178°38.0	N03°26.4
19	207°48.1	60°27.5	55.2	145°29.2	44.5	84°30.1	22.3	193°40.4	26.4
20	222°50.6	75°27.3	54.2	160°29.8	44.9	99°32.0	22.2	208°42.8	26.4
21	237°53.1	90°27.0	· · 53.1	175°30.4	· · 45.3	114°33.9	· · 22.1	223°45.1	· · 26.4
22	252°55.5	105°26.8	52.1	190°31.0	45.6	129°35.8	22.0	238°47.5	26.5
23	267°58.0	120°26.5	51.1	205°31.6	46.0	144°37.7	21.8	253°49.9	26.5
Mer.pass. 05:11 ν -0.3' d -1.0' m -4.07 ν 0.6' d 0.4' m 1.30 ν 1.9' d -0.1' m -1.81 ν 2.4' d 0.0' m 0.76									

Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	283°00.5	135°26.3	N14°50.0	220°32.3	N20°46.3	159°39.7	N20°21.7	268°52.3	N03°26.5
1	298°02.9	150°26.0	49.0	235°32.9	46.7	174°41.6	21.6	283°54.6	26.5
2	313°05.4	165°25.8	48.0	250°33.5	47.0	189°43.5	21.5	298°57.0	26.6
3	328°07.9	180°25.5	· · 47.0	265°34.1	· · 47.4	204°45.4	· · 21.4	313°59.4	· · 26.6
4	343°10.3	195°25.3	45.9	280°34.7	47.7	219°47.3	21.3	329°01.8	26.6
5	358°12.8	210°25.1	44.9	295°35.3	48.1	234°49.2	21.1	344°04.1	26.6
6	13°15.2	225°24.8	N14°43.8	310°35.9	N20°48.4	249°51.1	N20°21.0	359°06.5	N03°26.7
7	28°17.7	240°24.6	42.8	325°36.5	48.8	264°53.0	20.9	14°08.9	26.7
8	43°20.2	255°24.3	41.8	340°37.1	49.1	279°54.9	20.8	29°11.3	26.7
9	58°22.6	270°24.1	· · 40.7	355°37.8	· · 49.5	294°56.8	· · 20.7	44°13.6	· · 26.7
10	73°25.1	285°23.9	39.7	10°38.4	49.9	309°58.7	20.6	59°16.0	26.8
11	88°27.6	300°23.6	38.7	25°39.0	50.2	325°00.6	20.4	74°18.4	26.8
12	103°30.0	315°23.4	N14°37.6	40°39.6	N20°50.6	340°02.5	N20°20.3	89°20.8	N03°26.8
13	118°32.5	330°23.2	36.6	55°40.2	50.9	355°04.4	20.2	104°23.2	26.8
14	133°35.0	345°22.9	35.6	70°40.8	51.3	10°06.3	20.1	119°25.5	26.9
15	148°37.4	0°22.7	· · 34.5	85°41.4	· · 51.6	25°08.2	· · 20.0	134°27.9	· · 26.9
16	163°39.9	15°22.5	33.5	100°42.0	52.0	40°10.1	19.9	149°30.3	26.9
17	178°42.4	30°22.2	32.4	115°42.7	52.3	55°12.0	19.8	164°32.7	26.9
18	193°44.8	45°22.0	N14°31.4	130°43.3	N20°52.6	70°13.9	N20°19.6	179°35.0	N03°27.0
19	208°47.3	60°21.8	30.3	145°43.9	53.0	85°15.8	19.5	194°37.4	27.0
20	223°49.7	75°21.5	29.3	160°44.5	53.3	100°17.7	19.4	209°39.8	27.0
21	238°52.2	90°21.3	· · 28.3	175°45.1	· · 53.7	115°19.6	· · 19.3	224°42.2	· · 27.0
22	253°54.7	105°21.1	27.2	190°45.7	54.0	130°21.5	19.2	239°44.6	27.1
23	268°57.1	120°20.9	26.2	205°46.3	54.4	145°23.4	19.1	254°46.9	27.1
Mer.pass. 05:07 ν -0.2' d -1.0' m -4.07 ν 0.6' d 0.4' m 1.30 ν 1.9' d -0.1' m -1.80 ν 2.4' d 0.0' m 0.76									

	SHA	Dec
Alpheratz	357°33.4	29°14.1
Ankaa	353°05.9	-42°09.4
Schedar	349°29.6	56°40.7
Diphda	348°46.1	-17°50.3
Achernar	335°19.4	-57°05.8
Hamal	327°49.9	23°35.2
Polaris	313°40.9	89°22.3
Acamar	315°11.1	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.5
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	237°14.8	-59°35.8
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.8	-69°49.7
Alphard	217°46.8	-8°46.5
Regulus	207°33.3	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.6	19°02.7
Rigel Kent.	139°38.3	-60°57.0
Kochab	137°19.2	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.1
Kaus Aust.	83°30.5	-34°22.3
Vega	80°32.0	38°48.5
Nunki	75°45.9	-26°15.8
Altair	61°58.4	8°56.3
Peacock	53°03.2	-56°38.8
Deneb	49°24.5	45°22.4
Enif	33°37.3	9°59.8
Al Na'ir	27°31.1	-46°49.7
Fomalhaut	15°13.0	-29°28.7
Scheat	13°43.8	28°13.5
Markab	13°28.5	15°20.9

Jul 03 Fri	SHA	Mer.pass
Venus	214°36.6	14:58
Mars	299°00.6	09:19
Jupiter	237°06.2	13:26
Saturn	345°56.2	06:11

Jul 04 Sat	SHA	Mer.pass
Venus	213°31.0	14:58
Mars	298°16.2	09:18
Jupiter	236°52.7	13:23
Saturn	345°54.0	06:07

Jul 05 Sun	SHA	Mer.pass
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h	Sun			Moon				
	GHA	Dec		GHA	ν	Dec	d	HP
0	178°57.4	N22°58.4		323°45.9	13.7'	S17°54.3	-11.5'	54.9'
1	193°57.3	58.2		338°18.5	13.7'	17°42.8	-11.5'	54.9'
2	208°57.1	58.0		352°51.2	13.8'	17°31.3	-11.6'	54.9'
3	223°57.0	· · 57.8		7°24.0	13.8'	17°19.6	-11.7'	54.9'
4	238°56.9	57.6		21°56.8	13.8'	17°08.0	-11.8'	55.0'
5	253°56.8	57.4		36°29.6	13.9'	16°56.2	-11.9'	55.0'
6	268°56.7	N22°57.2		51°02.5	13.9'	S16°44.3	-11.9'	55.0'
7	283°56.6	57.0		65°35.5	14.0'	16°32.4	-12.0'	55.0'
8	298°56.5	56.8		80°08.5	14.0'	16°20.4	-12.1'	55.0'
9	313°56.3	· · 56.6		94°41.5	14.1'	16°08.3	-12.2'	55.0'
10	328°56.2	56.4		109°14.5	14.1'	15°56.1	-12.2'	55.1'
11	343°56.1	56.2		123°47.7	14.2'	15°43.9	-12.3'	55.1'
12	358°56.0	N22°56.0		138°20.8	14.2'	S15°31.6	-12.4'	55.1'
13	13°55.9	55.8		152°54.0	14.2'	15°19.2	-12.4'	55.1'
14	28°55.8	55.6		167°27.2	14.3'	15°06.8	-12.5'	55.1'
15	43°55.7	· · 55.3		182°00.5	14.3'	14°54.2	-12.6'	55.2'
16	58°55.5	55.1		196°33.8	14.4'	14°41.7	-12.7'	55.2'
17	73°55.4	54.9		211°07.2	14.4'	14°29.0	-12.7'	55.2'
18	88°55.3	N22°54.7		225°40.6	14.4'	S14°16.3	-12.8'	55.2'
19	103°55.2	54.5		240°14.0	14.5'	14°03.5	-12.9'	55.2'
20	118°55.1	54.3		254°47.5	14.5'	13°50.6	-12.9'	55.3'
21	133°55.0	· · 54.1		269°20.9	14.5'	13°37.7	-13.0'	55.3'
22	148°54.9	53.9		283°54.5	14.6'	13°24.7	-13.1'	55.3'
23	163°54.8	53.7		298°28.0	14.6'	13°11.7	-13.1'	55.3'
SD = 15.7' d = -0.2'			SD = 15.0'					

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°54.6	N22°53.4	313°01.6	14.6'	S12°58.5	-13.2'	55.3'
1	193°54.5	53.2	327°35.3	14.7'	12°45.4	-13.2'	55.4'
2	208°54.4	53.0	342°08.9	14.7'	12°32.1	-13.3'	55.4'
3	223°54.3	· · 52.8	356°42.6	14.7'	12°18.8	-13.4'	55.4'
4	238°54.2	52.6	11°16.3	14.7'	12°05.5	-13.4'	55.4'
5	253°54.1	52.4	25°50.1	14.8'	11°52.1	-13.5'	55.4'
6	268°54.0	N22°52.1	40°23.8	14.8'	S11°38.6	-13.5'	55.5'
7	283°53.9	51.9	54°57.6	14.8'	11°25.1	-13.6'	55.5'
8	298°53.8	51.7	69°31.5	14.8'	11°11.5	-13.6'	55.5'
9	313°53.6	· · 51.5	84°05.3	14.9'	10°57.8	-13.7'	55.5'
10	328°53.5	51.3	98°39.2	14.9'	10°44.1	-13.8'	55.5'
11	343°53.4	51.0	113°13.1	14.9'	10°30.4	-13.8'	55.6'
12	358°53.3	N22°50.8	127°47.0	14.9'	S10°16.6	-13.9'	55.6'
13	13°53.2	50.6	142°20.9	15.0'	10°02.7	-13.9'	55.6'
14	28°53.1	50.4	156°54.9	15.0'	09°48.8	-14.0'	55.6'
15	43°53.0	· · 50.1	171°28.9	15.0'	09°34.9	-14.0'	55.7'
16	58°52.9	49.9	186°02.9	15.0'	09°20.9	-14.1'	55.7'
17	73°52.8	49.7	200°36.9	15.0'	09°06.8	-14.1'	55.7'
18	88°52.6	N22°49.5	215°10.9	15.0'	S08°52.7	-14.1'	55.7'
19	103°52.5	49.2	229°45.0	15.1'	08°38.6	-14.2'	55.8'
20	118°52.4	49.0	244°19.0	15.1'	08°24.4	-14.2'	55.8'
21	133°52.3	· · 48.8	258°53.1	15.1'	08°10.1	-14.3'	55.8'
22	148°52.2	48.5	273°27.2	15.1'	07°55.8	-14.3'	55.8'
23	163°52.1	48.3	288°01.3	15.1'	07°41.5	-14.4'	55.9'
SD = 15.7' d = -0.2'			SD = 15.1'				

Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	178°52.0	N22°48.1	302°35.4	15.1'	S07°27.1	-14.4'	55.9'
1	193°51.9	47.8	317°09.5	15.1'	07°12.7	-14.5'	55.9'
2	208°51.8	47.6	331°43.6	15.1'	06°58.3	-14.5'	55.9'
3	223°51.7	· · 47.4	346°17.7	15.1'	06°43.8	-14.5'	56.0'
4	238°51.6	47.2	0°51.8	15.1'	06°29.3	-14.6'	56.0'
5	253°51.4	46.9	15°26.0	15.1'	06°14.7	-14.6'	56.0'
6	268°51.3	N22°46.7	30°00.1	15.1'	S06°00.1	-14.6'	56.0'
7	283°51.2	46.4	44°34.2	15.1'	05°45.4	-14.7'	56.1'
8	298°51.1	46.2	59°08.4	15.1'	05°30.7	-14.7'	56.1'
9	313°51.0	· · 46.0	73°42.5	15.1'	05°16.0	-14.7'	56.1'
10	328°50.9	45.7	88°16.6	15.1'	05°01.3	-14.8'	56.1'
11	343°50.8	45.5	102°50.8	15.1'	04°46.5	-14.8'	56.2'
12	358°50.7	N22°45.3	117°24.9	15.1'	S04°31.7	-14.8'	56.2'
13	13°50.6	45.0	131°59.0	15.1'	04°16.8	-14.9'	56.2'
14	28°50.5	44.8	146°33.1	15.1'	04°02.0	-14.9'	56.2'
15	43°50.4	· · 44.5	161°07.3	15.1'	03°47.1	-14.9'	56.3'
16	58°50.3	44.3	175°41.4	15.1'	03°32.1	-15.0'	56.3'
17	73°50.2	44.0	190°15.4	15.1'	03°17.2	-15.0'	56.3'
18	88°50.1	N22°43.8	204°49.5	15.1'	S03°02.2	-15.0'	56.3'
19	103°49.9	43.6	219°23.6	15.1'	02°47.1	-15.0'	56.4'
20	118°49.8	43.3	233°57.6	15.0'	02°32.1	-15.1'	56.4'
21	133°49.7	· · 43.1	248°31.7	15.0'	02°17.0	-15.1'	56.4'
22	148°49.6	42.8	263°05.7	15.0'	02°01.9	-15.1'	56.5'
23	163°49.5	42.6	277°39.7	15.0'	01°46.8	-15.1'	56.5'
SD = 15.7' d = -0.2'			SD = 15.2'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	--	--	00:41	23:22	--	--
64°	--	--	01:47	22:20	--	--
62°	--	--	02:21	21:47	--	--
60°	--	01:11	02:46	21:22	22:55	--
N 58°	--	01:53	03:05	21:03	22:14	--
56°	--	02:21	03:21	20:47	21:47	--
54°	01:05	02:42	03:35	20:34	21:27	23:01
52°	01:44	02:59	03:47	20:22	21:10	22:24
50°	02:10	03:13	03:57	20:11	20:55	21:58
45°	02:53	03:42	04:19	19:50	20:27	21:15
N 40°	03:23	04:04	04:36	19:32	20:05	20:46
35°	03:45	04:22	04:51	19:18	19:47	20:23
30°	04:03	04:36	05:04	19:05	19:32	20:05
20°	04:32	05:01	05:25	18:44	19:08	19:37
N 10°	04:54	05:21	05:44	18:25	18:48	19:15
0°	05:12	05:38	06:01	18:08	18:31	18:57
S 10°	05:29	05:55	06:18	17:51	18:14	18:40
20°	05:45	06:12	06:36	17:33	17:57	18:24
30°	06:01	06:30	06:56	17:13	17:39	18:08
35°	06:09	06:41	07:09	17:01	17:29	18:00
40°	06:18	06:52	07:22	16:47	17:17	17:51
45°	06:28	07:05	07:39	16:30	17:04	17:41
S 50°	06:39	07:21	07:59	16:10	16:49	17:30
52°	06:44	07:28	08:08	16:01	16:41	17:25
54°	06:50	07:36	08:19	15:50	16:34	17:19
56°	06:56	07:44	08:31	15:38	16:25	17:13
58°	07:02	07:54	08:45	15:24	16:15	17:07
S 60°	07:09	08:05	09:02	15:07	16:04	17:00

Lat.	Moonrise			Moonset		
	Fri	Sat	Sun	Fri	Sat	Sun
N 72°	01:43	00:10 23:27	22:53	03:38	06:43	08:58
N 70°	00:36 23:47	23:16	22:50	04:43	07:04	09:06
68°	23:29	23:07	22:48	05:18	07:20	09:12
66°	23:14	23:00	22:47	05:43	07:33	09:17
64°	23:02	22:53	22:45	06:03	07:44	09:22
62°	22:52	22:48	22:44	06:18	07:53	09:26
60°	22:43	22:43	22:43	06:31	08:01	09:29
N 58°	22:35	22:39	22:42	06:42	08:08	09:32
56°	22:28	22:35	22:41	06:52	08:14	09:35
54°	22:22	22:31	22:40	07:00	08:19	09:37
52°	22:16	22:28	22:39	07:08	08:24	09:39
50°	22:11	22:25	22:38	07:15	08:28	09:41
45°	22:00	22:19	22:37	07:29	08:37	09:45
N 40°	21:51	22:14	22:36	07:41	08:45	09:49
35°	21:43	22:09	22:34	07:51	08:52	09:52
30°	21:36	22:05	22:34	08:00	08:57	09:55
20°	21:24	21:58	22:32	08:15	09:07	09:59
N 10°	21:13	21:52	22:30	08:28	09:16	10:03
0°	21:03	21:46	22:29	08:40	09:24	10:07
S 10°	20:53	21:40	22:28	08:52	09:32	10:10
20°	20:42	21:34	22:26	09:05	09:40	10:14
30°	20:30	21:27	22:24	09:20	09:50	10:18
35°	20:23	21:23	22:23	09:28	09:55	10:21
40°	20:14	21:18	22:22	09:38	10:01	10:24
45°	20:05	21:13	22:21	09:49	10:09	10:27
S 50°	19:53	21:06	22:20	10:02	10:17	10:30
52°	19:47	21:03	22:19	10:08	10:21	10:32
54°	19:41	21:00	22:18	10:15	10:25	10:34
56°	19:35	20:56	22:17	10:23	10:30	10:36
58°	19:27	20:52	22:16	10:31	10:35	10:38
S 60°	19:18	20:47	22:15	10:41	10:41	10:41

Day	Sun		Mer. Pass	Moon		Age 18-20 92-78%
	Eqn.of Time 00 ^h mm:ss	12 ^h mm:ss		Upper Mer.Pass. hh:mm	Lower Mer.Pass. hh:mm	
03	04:10	04:16	12:04	02:29	14:52	
04	04:21	04:27	12:04	03:14	15:35	
05	04:32	04:37	12:05	03:56	16:18	

July 06, 07, 08 UT (Mon., Tue., Wed.)

	Aries			Venus			Mars			Jupiter			Saturn		
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	283°59.6	135°20.6	N14°25.1	220°46.9	N20°54.7	160°25.3	N20°18.9	269°49.3	N03°27.1						
1	299°02.1	150°20.4	24.1	235°47.5	55.1	175°27.2	18.8	284°51.7	27.1						
2	314°04.5	165°20.2	23.0	250°48.2	55.4	190°29.1	18.7	299°54.1	27.1						
3	329°07.0	180°20.0	· · 22.0	265°48.8	· · 55.8	205°31.0	· · 18.6	314°56.4	· · 27.2						
4	344°09.5	195°19.7	20.9	280°49.4	56.1	220°32.9	18.5	329°58.8	27.2						
5	359°11.9	210°19.5	19.9	295°50.0	56.5	235°34.8	18.4	345°01.2	27.2						
6	14°14.4	225°19.3	N14°18.9	310°50.6	N20°56.8	250°36.7	N20°18.2	0°03.6	N03°27.2						
7	29°16.9	240°19.1	17.8	325°51.2	57.1	265°38.6	18.1	15°06.0	27.3						
8	44°19.3	255°18.8	16.8	340°51.8	57.5	280°40.5	18.0	30°08.3	27.3						
9	59°21.8	270°18.6	· · 15.7	355°52.4	· · 57.8	295°42.4	· · 17.9	45°10.7	· · 27.3						
10	74°24.2	285°18.4	14.7	10°53.0	58.2	310°44.3	17.8	60°13.1	27.3						
11	89°26.7	300°18.2	13.6	25°53.7	58.5	325°46.2	17.7	75°15.5	27.4						
12	104°29.2	315°18.0	N14°12.6	40°54.3	N20°58.9	340°48.1	N20°17.5	90°17.9	N03°27.4						
13	119°31.6	330°17.7	11.5	55°54.9	59.2	355°50.0	17.4	105°20.2	27.4						
14	134°34.1	345°17.5	10.5	70°55.5	59.5	10°51.9	17.3	120°22.6	27.4						
15	149°36.6	0°17.3	· · 09.4	85°56.1	20°59.9	25°53.8	· · 17.2	135°25.0	· · 27.4						
16	164°39.0	15°17.1	08.3	100°56.7	21°00.2	40°55.7	17.1	150°27.4	27.5						
17	179°41.5	30°16.9	07.3	115°57.3	00.6	55°57.6	17.0	165°29.8	27.5						
18	194°44.0	45°16.7	N14°06.2	130°57.9	N21°00.9	70°59.5	N20°16.8	180°32.2	N03°27.5						
19	209°46.4	60°16.5	05.2	145°58.5	01.2	86°01.4	16.7	195°34.5	27.5						
20	224°48.9	75°16.2	04.1	160°59.2	01.6	101°03.3	16.6	210°36.9	27.6						
21	239°51.3	90°16.0	· · 03.1	175°59.8	· · 01.9	116°05.2	· · 16.5	225°39.3	· · 27.6						
22	254°53.8	105°15.8	02.0	191°00.4	02.3	131°07.1	16.4	240°41.7	27.6						
23	269°56.3	120°15.6	01.0	206°01.0	02.6	146°09.0	16.3	255°44.1	27.6						
Mer.pass.	05:03	ν -0.2' d -1.0' m -4.08		ν 0.6' d 0.3' m 1.30		ν 1.9' d -0.1' m -1.80		ν 2.4' d 0.0' m 0.75							

	Aries			Venus			Mars			Jupiter			Saturn		
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	284°58.7	135°15.4	N13°59.9	221°01.6	N21°02.9	161°10.9	N20°16.1	270°46.4	N03°27.6						
1	300°01.2	150°15.2	58.8	236°02.2	03.3	176°12.8	16.0	285°48.8	27.7						
2	315°03.7	165°15.0	57.8	251°02.8	03.6	191°14.7	15.9	300°51.2	27.7						
3	330°06.1	180°14.8	· · 56.7	266°03.4	· · 04.0	206°16.6	· · 15.8	315°53.6	· · 27.7						
4	345°08.6	195°14.6	55.7	281°04.0	04.3	221°18.5	15.7	330°56.0	27.7						
5	0°11.1	210°14.4	54.6	296°04.7	04.6	236°20.4	15.5	345°58.4	27.7						
6	15°13.5	225°14.1	N13°53.5	311°05.3	N21°05.0	251°22.3	N20°15.4	1°00.7	N03°27.8						
7	30°16.0	240°13.9	52.5	326°05.9	05.3	266°24.2	15.3	16°03.1	27.8						
8	45°18.5	255°13.7	51.4	341°06.5	05.6	281°26.1	15.2	31°05.5	27.8						
9	60°20.9	270°13.5	· · 50.4	356°07.1	· · 06.0	296°28.0	· · 15.1	46°07.9	· · 27.8						
10	75°23.4	285°13.3	49.3	11°07.7	06.3	311°29.9	15.0	61°10.3	27.9						
11	90°25.8	300°13.1	48.2	26°08.3	06.6	326°31.8	14.8	76°12.7	27.9						
12	105°28.3	315°12.9	N13°47.2	41°08.9	N21°07.0	341°33.7	N20°14.7	91°15.0	N03°27.9						
13	120°30.8	330°12.7	46.1	56°09.5	07.3	356°35.6	14.6	106°17.4	27.9						
14	135°33.2	345°12.5	45.0	71°10.2	07.6	11°37.5	14.5	121°19.8	27.9						
15	150°35.7	0°12.3	· · 44.0	86°10.8	· · 08.0	26°39.4	· · 14.4	136°22.2	· · 28.0						
16	165°38.2	15°12.1	42.9	101°11.4	08.3	41°41.2	14.3	151°24.6	28.0						
17	180°40.6	30°11.9	41.8	116°12.0	08.6	56°43.1	14.1	166°27.0	28.0						
18	195°43.1	45°11.7	N13°40.8	131°12.6	N21°09.0	71°45.0	N20°14.0	181°29.4	N03°28.0						
19	210°45.6	60°11.5	39.7	146°13.2	09.3	86°46.9	13.9	196°31.7	28.0						
20	225°48.0	75°11.3	38.6	161°13.8	09.6	101°48.8	13.8	211°34.1	28.1						
21	240°50.5	90°11.1	· · 37.6	176°14.4	· · 10.0	116°50.7	· · 13.7	226°36.5	· · 28.1						
22	255°53.0	105°10.9	36.5	191°15.0	10.3	131°52.6	13.5	241°38.9	28.1						
23	270°55.4	120°10.7	35.4	206°15.6	10.6	146°54.5	13.4	256°41.3	28.1						
Mer.pass.	04:59	ν -0.2' d -1.1' m -4.08		ν 0.6' d 0.3' m 1.30		ν 1.9' d -0.1' m -1.80		ν 2.4' d 0.0' m 0.75							

	Aries			Venus			Mars			Jupiter			Saturn		
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	285°57.9	135°10.5	N13°34.4	221°16.3	N21°10.9	161°56.4	N20°13.3	271°43.7	N03°28.1						
1	301°00.3	150°10.4	33.3	236°16.9	11.3	176°58.3	13.2	286°46.1	28.2						
2	316°02.8	165°10.2	32.2	251°17.5	11.6	192°00.2	13.1	301°48.4	28.2						
3	331°05.3	180°10.0	· · 31.2	266°18.1	· · 11.9	207°02.1	· · 13.0	316°50.8	· · 28.2						
4	346°07.7	195°09.8	30.1	281°18.7	12.3	222°04.0	12.8	331°53.2	28.2						
5	1°10.2	210°09.6	29.0	296°19.3	12.6	237°05.9	12.7	346°55.6	28.2						
6	16°12.7	225°09.4	N13°27.9	311°19.9	N21°12.9	252°07.8	N20°12.6	1°58.0	N03°28.3						
7	31°15.1	240°09.2	26.9	326°20.5	13.2	267°09.7	12.5	17°00.4	28.3						
8	46°17.6	255°09.0	25.8	341°21.1	13.6	282°11.6	12.4	32°02.8	28.3						
9	61°20.1	270°08.8	· · 24.7	356°21.7	· · 13.9	297°13.5	· · 12.2	47°05.2	· · 28.3						
10	76°22.5	285°08.6	23.6	11°22.4	14.2	312°15.4	12.1	62°07.5	28.3						
11	91°25.0	300°08.5	22.6	26°23.0	14.5	327°17.3	12.0	77°09.9	28.4						
12	106°27.4	315°08.3	N13°21.5	41°23.6	N21°14.9	342°19.2	N20°11.9	92°12.3	N03°28.4						
13	121°29.9	330°08.1	20.4	56°24.2	15.2	357°21.1	11.8	107°14.7	28.4						
14	136°32.4	345°07.9	19.3	71°24.8	15.5	12°23.0	11.6	122°17.1	28.4						
15	151°34.8	0°07.7	· · 18.3	86°25.4	· · 15.8	27°24.9	· · 11.5	137°19.5	· · 28.4						
16	166°37.3	15°07.5	17.2	101°26.0	16.2	42°26.8	11.4	152°21.9	28.5						
17	181°39.8	30°07.4	16.1	116°26.6	16.5	57°28.7	11.3	167°24.3	28.5						
18	196°42.2	45°07.2	N13°15.0	131°27.2	N21°16.8	72°30.6	N20°11.2	182°26.6	N03°28.5						
19	211°44.7	60°07.0	13.9	146°27.9	17.1	87°32.5	11.1	197°29.0	28.5						
20	226°47.2	75°06.8	12.9	161°28.5	17.5	102°34.4	10.9	212°31.4	28.5						
21	241°49.6	90°06.6	· · 11.8	176°29.1	· · 17.8	117°36.3	· · 10.8	227°33.8	· · 28.5						
22	256°52.1	105°06.5	10.7	191°29.7	18.1	132°38.2	10.7	242°36.2	28.6						
23	271°54.6	120°06.3	09.6	206°30.3	18.4	147°40.1	10.6	257°38.6	28.6						
Mer.pass.	04:55	ν -0.2' d -1.1' m -4.09		ν 0.6' d 0.3' m 1.30		ν 1.9' d -0.1' m -1.80		ν 2.4' d 0.0' m 0.75							

	SHA	Dec
Alpheratz	357°33.4	29°14.1
Ankaa	353°05.9	-42°09.4
Schedar	349°29.6	56°40.8
Diphda	348°46.0	-17°50.3
Achernar	335°19.4	-57°05.8
Hamal	327°49.9	23°35.2
Polaris	313°39.7	89°22.3
Acamar	315°11.1	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.9	6°22.4
Elnath	278°00.7	28°37.7
Alnilam	275°36.8	-1°11.1
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.4
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.8
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.8	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.8	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°20.9	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.7
Arcturus	145°46.7	19°02.2
Rigel Kent.	139°38.3	-60°57.0
Kochab	137°19.2	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.4	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07

Sun				Moon			
h	GHA	Dec	GHA	ν	Dec	d	HP
0	178°49.4	N22°42.3	292°13.7	15.0'	S01°31.7	-15.2'	56.5'
1	193°49.3	42.1	306°47.6	14.9'	01°16.5	-15.2'	56.5'
2	208°49.2	41.8	321°21.6	14.9'	01°01.4	-15.2'	56.6'
3	223°49.1	· · 41.6	335°55.5	14.9'	00°46.2	-15.2'	56.6'
4	238°49.0	41.3	350°29.4	14.9'	00°31.0	-15.2'	56.6'
5	253°48.9	41.1	5°03.3	14.8'	00°15.7	-15.2'	56.7'
6	268°48.8	N22°40.8	19°37.1	14.8'	S00°00.5	-15.3'	56.7'
7	283°48.7	40.6	34°10.9	14.8'	N00°14.8	15.3'	56.7'
8	298°48.6	40.3	48°44.7	14.8'	00°30.0	15.3'	56.7'
9	313°48.5	· · 40.1	63°18.5	14.7'	00°45.3	15.3'	56.8'
10	328°48.4	39.8	77°52.2	14.7'	01°00.6	15.3'	56.8'
11	343°48.3	39.6	92°25.9	14.7'	01°15.9	15.3'	56.8'
12	358°48.2	N22°39.3	106°59.6	14.6'	N01°31.2	15.3'	56.9'
13	13°48.1	39.0	121°33.2	14.6'	01°46.6	15.3'	56.9'
14	28°48.0	38.8	136°06.8	14.5'	02°01.9	15.3'	56.9'
15	43°47.9	· · 38.5	150°40.3	14.5'	02°17.3	15.3'	56.9'
16	58°47.7	38.3	165°13.8	14.5'	02°32.6	15.4'	57.0'
17	73°47.6	38.0	179°47.3	14.4'	02°48.0	15.4'	57.0'
18	88°47.5	N22°37.8	194°20.7	14.4'	N03°03.3	15.4'	57.0'
19	103°47.4	37.5	208°54.1	14.3'	03°18.7	15.4'	57.1'
20	118°47.3	37.2	223°27.4	14.3'	03°34.0	15.4'	57.1'
21	133°47.2	· · 37.0	238°00.7	14.2'	03°49.4	15.4'	57.1'
22	148°47.1	36.7	252°33.9	14.2'	04°04.8	15.4'	57.2'
23	163°47.0	36.4	267°07.1	14.1'	04°20.1	15.4'	57.2'
SD = 15.7'		d = -0.2'	SD = 15.4'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°46.9	N22°36.2	281°40.3	14.1'	N04°35.5	15.4'	57.2'
1	193°46.8	35.9	296°13.3	14.0'	04°50.8	15.4'	57.3'
2	208°46.7	35.6	310°46.4	14.0'	05°06.2	15.3'	57.3'
3	223°46.6	· · 35.4	325°19.4	13.9'	05°21.5	15.3'	57.3'
4	238°46.5	35.1	339°52.3	13.9'	05°36.9	15.3'	57.3'
5	253°46.4	34.8	354°25.1	13.8'	05°52.2	15.3'	57.4'
6	268°46.3	N22°34.6	8°57.9	13.7'	N06°07.5	15.3'	57.4'
7	283°46.2	34.3	23°30.7	13.7'	06°22.8	15.3'	57.4'
8	298°46.1	34.0	38°03.4	13.6'	06°38.1	15.3'	57.5'
9	313°46.0	· · 33.8	52°36.0	13.6'	06°53.4	15.3'	57.5'
10	328°45.9	33.5	67°08.5	13.5'	07°08.7	15.3'	57.5'
11	343°45.8	33.2	81°41.0	13.4'	07°24.0	15.2'	57.6'
12	358°45.7	N22°33.0	96°13.4	13.3'	N07°39.2	15.2'	57.6'
13	13°45.6	32.7	110°45.8	13.3'	07°54.4	15.2'	57.6'
14	28°45.5	32.4	125°18.1	13.2'	08°09.6	15.2'	57.7'
15	43°45.4	· · 32.1	139°50.3	13.1'	08°24.8	15.2'	57.7'
16	58°45.3	31.9	154°22.4	13.1'	08°40.0	15.1'	57.7'
17	73°45.2	31.6	168°54.5	13.0'	08°55.1	15.1'	57.8'
18	88°45.1	N22°31.3	183°26.4	12.9'	N09°10.2	15.1'	57.8'
19	103°45.0	31.0	197°58.3	12.8'	09°25.3	15.1'	57.8'
20	118°44.9	30.8	212°30.2	12.7'	09°40.4	15.0'	57.9'
21	133°44.8	· · 30.5	227°01.9	12.7'	09°55.4	15.0'	57.9'
22	148°44.7	30.2	241°33.6	12.6'	10°10.4	15.0'	57.9'
23	163°44.6	29.9	256°05.1	12.5'	10°25.4	14.9'	58.0'
SD = 15.7'		d = -0.3'	SD = 15.6'				

Wed	GHA	Dec	GHA	ν	Dec	d	HP
0	178°44.5	N22°29.6	270°36.6	12.4'	N10°40.3	14.9'	58.0'
1	193°44.4	29.4	285°08.0	12.3'	10°55.2	14.9'	58.0'
2	208°44.3	29.1	299°39.4	12.2'	11°10.1	14.8'	58.1'
3	223°44.2	· · 28.8	314°10.6	12.1'	11°24.9	14.8'	58.1'
4	238°44.1	28.5	328°41.7	12.0'	11°39.7	14.8'	58.1'
5	253°44.0	28.2	343°12.8	12.0'	11°54.5	14.7'	58.2'
6	268°43.9	N22°27.9	357°43.7	11.9'	N12°09.2	14.7'	58.2'
7	283°43.8	27.7	12°14.6	11.8'	12°23.9	14.6'	58.2'
8	298°43.7	27.4	26°45.3	11.7'	12°38.5	14.6'	58.3'
9	313°43.7	· · 27.1	41°16.0	11.6'	12°53.1	14.5'	58.3'
10	328°43.6	26.8	55°46.6	11.5'	13°07.6	14.5'	58.3'
11	343°43.5	26.5	70°17.0	11.4'	13°22.1	14.4'	58.4'
12	358°43.4	N22°26.2	84°47.4	11.3'	N13°36.6	14.4'	58.4'
13	13°43.3	25.9	99°17.7	11.2'	13°50.9	14.3'	58.4'
14	28°43.2	25.6	113°47.8	11.1'	14°05.3	14.3'	58.5'
15	43°43.1	· · 25.4	128°17.9	10.9'	14°19.5	14.2'	58.5'
16	58°43.0	25.1	142°47.8	10.8'	14°33.8	14.2'	58.5'
17	73°42.9	24.8	157°17.6	10.7'	14°47.9	14.1'	58.6'
18	88°42.8	N22°24.5	171°47.4	10.6'	N15°02.0	14.0'	58.6'
19	103°42.7	24.2	186°17.0	10.5'	15°16.1	14.0'	58.6'
20	118°42.6	23.9	200°46.5	10.4'	15°30.0	13.9'	58.7'
21	133°42.5	· · 23.6	215°15.9	10.3'	15°44.0	13.8'	58.7'
22	148°42.4	23.3	229°45.2	10.2'	15°57.8	13.8'	58.7'
23	163°42.3	23.0	244°14.3	10.0'	16°11.6	13.7'	58.8'
SD = 15.7'		d = -0.3'	SD = 15.8'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	--	--	00:58	23:08	--	--
64°	--	--	01:54	22:14	--	--
62°	--	--	02:26	21:42	--	--
60°	--	01:20	02:50	21:19	22:48	--
N 58°	--	01:59	03:09	21:00	22:10	--
56°	--	02:25	03:24	20:45	21:44	--
54°	01:13	02:45	03:38	20:32	21:24	22:54
52°	01:49	03:02	03:49	20:20	21:07	22:19
50°	02:14	03:16	04:00	20:10	20:53	21:55
45°	02:56	03:44	04:21	19:49	20:25	21:13
N 40°	03:25	04:06	04:38	19:31	20:04	20:45
35°	03:47	04:23	04:53	19:17	19:46	20:23
30°	04:05	04:38	05:05	19:05	19:32	20:05
20°	04:33	05:02	05:26	18:44	19:08	19:37
N 10°	04:55	05:22	05:44	18:25	18:48	19:15
0°	05:13	05:39	06:01	18:09	18:31	18:57
S 10°	05:29	05:55	06:18	17:52	18:15	18:41
20°	05:45	06:12	06:36	17:34	17:58	18:25
30°	06:00	06:30	06:56	17:14	17:40	18:10
35°	06:09	06:40	07:08	17:02	17:30	18:01
40°	06:18	06:51	07:22	16:49	17:19	17:53
45°	06:27	07:04	07:38	16:33	17:06	17:43
S 50°	06:38	07:19	07:57	16:13	16:51	17:32
52°	06:43	07:26	08:07	16:04	16:44	17:27
54°	06:49	07:34	08:17	15:53	16:36	17:22
56°	06:54	07:43	08:29	15:41	16:27	17:16
58°	07:01	07:52	08:43	15:27	16:18	17:10
S 60°	07:08	08:03	08:59	15:11	16:07	17:03

Lat.	Moonrise			Moonset		
	Mon	Tue	Wed	Mon	Tue	Wed
N 72°	22:20	21:42	20:43	11:05	13:18	15:58
N 70°	22:26	21:57	21:18	11:03	13:05	15:25
68°	22:30	22:10	21:43	11:02	12:56	15:02
66°	22:34	22:20	22:03	11:00	12:47	14:44
64°	22:37	22:29	22:19	11:00	12:41	14:29
62°	22:40	22:36	22:32	10:59	12:35	14:17
60°	22:42	22:43	22:44	10:58	12:30	14:07
N 58°	22:45	22:48	22:54	10:57	12:25	13:58
56°	22:47	22:53	23:02	10:57	12:21	13:50
54°	22:48	22:58	23:10	10:56	12:18	13:44
52°	22:50	23:02	23:17	10:56	12:15	13:38
50°	22:52	23:06	23:23	10:55	12:12	13:32
45°	22:55	23:14	23:37	10:54	12:06	13:20
N 40°	22:58	23:21	23:48	10:54	12:00	13:10
35°	23:00	23:27	23:58	10:53	11:56	13:02
30°	23:02	23:33	· · ·	10:52	11:52	12:55
20°	23:06	23:42	· · ·	10:51	11:45	12:42
N 10°	23:09	23:50	· · ·	10:50	11:39	12:31
0°	23:12	23:58	· · ·	10:49	11:34	12:21
S 10°	23:16	· · ·	00:06	10:49	11:28	12:11
20°	23:19	· · ·	00:14	10:48	11:22	12:00
30°	23:23	· · ·	00:24	10:47	11:16	11:48
35°	23:25	· · ·	00:30	10:46	11:12	11:41
40°	23:28	· · ·	00:36	10:45	11:08	11:33
45°	23:31	· · ·	00:44	10:44	11:03	11:23
S 50°	23:35	· · ·	00:53	10:43	10:57	11:12
52°	23:37	· · ·	00:57	10:43	10:54	11:07
54°	23:38	· · ·	01:02	10:42	10:51	11:01
56°	23:41	· · ·	01:07	10:42	10:48	10:55
58°	23:43	· · ·	01:13	10:41	10:44	10:48
S 60°	23:45	· · ·	01:20	10:41	10:40	10:40

Day	Sun		Mer. Pass	Moon		Age 21-23 69-48%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Mer. Pass. Upper hh:mm	Lower hh:mm	
06	04:42	04:47	12:05	04:39	17:01	
07	04:52	04:57	12:05	05:23	17:46	
08	05:02	05:07	12:05	06:09	18:34	

July 09, 10, 11 UT (Thu., Fri., Sat.)

	Aries			Venus			Mars			Jupiter			Saturn		
Thu	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	286°57.0	135°06.1	N13°08.5	221°30.9	N21°18.7	162°42.0	N20°10.5	272°41.0	N03°28.6						
1	301°59.5	150°05.9	07.5	236°31.5	19.1	177°43.9	10.3	287°43.4	28.6						
2	317°01.9	165°05.7	06.4	251°32.1	19.4	192°45.8	10.2	302°45.8	28.6						
3	332°04.4	180°05.6	· · 05.3	266°32.7	· · 19.7	207°47.7	· · 10.1	317°48.2	· · 28.7						
4	347°06.9	195°05.4	04.2	281°33.3	20.0	222°49.6	10.0	332°50.5	28.7						
5	2°09.3	210°05.2	03.1	296°33.9	20.3	237°51.5	09.9	347°52.9	28.7						
6	17°11.8	225°05.0	N13°02.0	311°34.6	N21°20.7	252°53.4	N20°09.7	2°55.3	N03°28.7						
7	32°14.3	240°04.9	13°00.9	326°35.2	21.0	267°55.3	09.6	17°57.7	28.7						
8	47°16.7	255°04.7	12°59.9	341°35.8	21.3	282°57.2	09.5	33°00.1	28.7						
9	62°19.2	270°04.5	· · 58.8	356°36.4	· · 21.6	297°59.1	· · 09.4	48°02.5	· · 28.8						
10	77°21.7	285°04.4	57.7	11°37.0	21.9	313°01.0	09.3	63°04.9	28.8						
11	92°24.1	300°04.2	56.6	26°37.6	22.2	328°02.9	09.1	78°07.3	28.8						
12	107°26.6	315°04.0	N12°55.5	41°38.2	N21°22.6	343°04.8	N20°09.0	93°09.7	N03°28.8						
13	122°29.1	330°03.8	54.4	56°38.8	22.9	358°06.7	08.9	108°12.1	28.8						
14	137°31.5	345°03.7	53.3	71°39.4	23.2	13°08.6	08.8	123°14.5	28.9						
15	152°34.0	0°03.5	· · 52.3	86°40.0	· · 23.5	28°10.5	· · 08.7	138°16.9	· · 28.9						
16	167°36.4	15°03.3	51.2	101°40.7	23.8	43°12.4	08.5	153°19.2	28.9						
17	182°38.9	30°03.2	50.1	116°41.3	24.1	58°14.3	08.4	168°21.6	28.9						
18	197°41.4	45°03.0	N12°49.0	131°41.9	N21°24.5	73°16.2	N20°08.3	183°24.0	N03°28.9						
19	212°43.8	60°02.8	47.9	146°42.5	24.8	88°18.1	08.2	198°26.4	28.9						
20	227°46.3	75°02.7	46.8	161°43.1	25.1	103°20.0	08.1	213°28.8	29.0						
21	242°48.8	90°02.5	· · 45.7	176°43.7	· · 25.4	118°21.9	· · 07.9	228°31.2	· · 29.0						
22	257°51.2	105°02.4	44.6	191°44.3	25.7	133°23.7	07.8	243°33.6	29.0						
23	272°53.7	120°02.2	43.5	206°44.9	26.0	148°25.6	07.7	258°36.0	29.0						
Mer.pass.	04:51	ν -0.2' d -1.1' m -4.10		ν 0.6' d 0.3' m 1.30		ν 1.9' d -0.1' m -1.80		ν 2.4' d 0.0' m 0.74							

	Aries			Venus			Mars			Jupiter			Saturn		
Fri	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	287°56.2	135°02.0	N12°42.4	221°45.5	N21°26.3	163°27.5	N20°07.6	273°38.4	N03°29.0						
1	302°58.6	150°01.9	41.3	236°46.1	26.7	178°29.4	07.5	288°40.8	29.0						
2	318°01.1	165°01.7	40.2	251°46.8	27.0	193°31.3	07.3	303°43.2	29.1						
3	333°03.5	180°01.6	· · 39.1	266°47.4	· · 27.3	208°33.2	· · 07.2	318°45.6	· · 29.1						
4	348°06.0	195°01.4	38.0	281°48.0	27.6	223°35.1	07.1	333°48.0	29.1						
5	3°08.5	210°01.2	37.0	296°48.6	27.9	238°37.0	07.0	348°50.4	29.1						
6	18°10.9	225°01.1	N12°35.9	311°49.2	N21°28.2	253°38.9	N20°06.9	3°52.8	N03°29.1						
7	33°13.4	240°00.9	34.8	326°49.8	28.5	268°40.8	06.7	18°55.2	29.1						
8	48°15.9	255°00.8	33.7	341°50.4	28.8	283°42.7	06.6	33°57.5	29.2						
9	63°18.3	270°00.6	· · 32.6	356°51.0	· · 29.1	298°44.6	· · 06.5	48°59.9	· · 29.2						
10	78°20.8	285°00.5	31.5	11°51.6	29.4	313°46.5	06.4	64°02.3	29.2						
11	93°23.3	300°00.3	30.4	26°52.2	29.8	328°48.4	06.3	79°04.7	29.2						
12	108°25.7	315°00.1	N12°29.3	41°52.8	N21°30.1	343°50.3	N20°06.1	94°07.1	N03°29.2						
13	123°28.2	330°00.0	28.2	56°53.5	30.4	358°52.2	06.0	109°09.5	29.2						
14	138°30.7	344°59.8	27.1	71°54.1	30.7	13°54.1	05.9	124°11.9	29.3						
15	153°33.1	359°59.7	· · 26.0	86°54.7	· · 31.0	28°56.0	· · 05.8	139°14.3	· · 29.3						
16	168°35.6	14°59.5	24.9	101°55.3	31.3	43°57.9	05.7	154°16.7	29.3						
17	183°38.0	29°59.4	23.8	116°55.9	31.6	58°59.8	05.5	169°19.1	29.3						
18	198°40.5	44°59.2	N12°22.7	131°56.5	N21°31.9	74°01.7	N20°05.4	184°21.5	N03°29.3						
19	213°43.0	59°59.1	21.6	146°57.1	32.2	89°03.6	05.3	199°23.9	29.3						
20	228°45.4	74°58.9	20.5	161°57.7	32.5	104°05.5	05.2	214°26.3	29.3						
21	243°47.9	89°58.8	· · 19.4	176°58.3	· · 32.8	119°07.4	· · 05.1	229°28.7	· · 29.4						
22	258°50.4	104°58.6	18.3	191°58.9	33.1	134°09.3	04.9	244°31.1	29.4						
23	273°52.8	119°58.5	17.2	206°59.6	33.4	149°11.2	04.8	259°33.5	29.4						
Mer.pass.	04:47	ν -0.2' d -1.1' m -4.10		ν 0.6' d 0.3' m 1.30		ν 1.9' d -0.1' m -1.80		ν 2.4' d 0.0' m 0.74							

	Aries			Venus			Mars			Jupiter			Saturn		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	288°55.3	134°58.4	N12°16.0	222°00.2	N21°33.7	164°13.1	N20°04.7	274°35.9	N03°29.4						
1	303°57.8	149°58.2	14.9	237°00.8	34.0	179°15.0	04.6	289°38.3	29.4						
2	319°00.2	164°58.1	13.8	252°01.4	34.3	194°16.9	04.5	304°40.7	29.4						
3	334°02.7	179°57.9	· · 12.7	267°02.0	· · 34.6	209°18.8	· · 04.3	319°43.1	· · 29.5						
4	349°05.2	194°57.8	11.6	282°02.6	34.9	224°20.7	04.2	334°45.5	29.5						
5	4°07.6	209°57.6	10.5	297°03.2	35.2	239°22.6	04.1	349°47.9	29.5						
6	19°10.1	224°57.5	N12°09.4	312°03.8	N21°35.5	254°24.5	N20°04.0	4°50.3	N03°29.5						
7	34°12.5	239°57.4	08.3	327°04.4	35.9	269°26.3	03.8	19°52.7	29.5						
8	49°15.0	254°57.2	07.2	342°05.0	36.2	284°28.2	03.7	34°55.1	29.5						
9	64°17.5	269°57.1	· · 06.1	357°05.6	· · 36.5	299°30.1	· · 03.6	49°57.5	· · 29.5						
10	79°19.9	284°56.9	05.0	12°06.3	36.8	314°32.0	03.5	64°59.9	29.6						
11	94°22.4	299°56.8	03.9	27°06.9	37.1	329°33.9	03.4	80°02.3	29.6						
12	109°24.9	314°56.7	N12°02.8	42°07.5	N21°37.4	344°35.8	N20°03.2	95°04.7	N03°29.6						
13	124°27.3	329°56.5	01.7	57°08.1	37.7	359°37.7	03.1	110°07.1	29.6						
14	139°29.8	344°56.4	12°00.5	72°08.7	38.0	14°39.6	03.0	125°09.5	29.6						
15	154°32.3	359°56.2	11°59.4	87°09.3	· · 38.2	29°41.5	· · 02.9	140°11.9	· · 29.6						
16	169°34.7	14°56.1	58.3	102°09.9	38.5	44°43.4	02.8	155°14.3	29.6						
17	184°37.2	29°56.0	57.2	117°10.5	38.8	59°45.3	02.6	170°16.7	29.7						
18	199°39.7	44°55.8	N11°56.1	132°11.1	N21°39.1	74°47.2	N20°02.5	185°19.1	N03°29.7						
19	214°42.1	59°55.7	55.0	147°11.7	39.4	89°49.1	02.4	200°21.5	29.7						
20	229°44.6	74°55.6	53.9	162°12.3	39.7	104°51.0	02.3	215°23.9	29.7						
21	244°47.0	89°55.4	· · 52.8	177°13.0	· · 40.0	119°52.9	· · 02.1	230°26.3	· · 29.7						
22	259°49.5	104°55.3	51.6	192°13.6	40.3	134°54.8	02.0	245°28.7	29.7						
23	274°52.0	119°55.2	50.5	207°14.2	40.6	149°56.7	01.9	260°31.1	29.7						
Mer.pass.	04:44	ν -0.1' d -1.1' m -4.11		ν 0.6' d 0.3' m 1.30		ν 1.9' d -0.1' m -1.80		ν 2.4' d 0.0' m 0.73							

	SHA	Dec
Alpheratz	357°33.4	29°14.1
Ankaa	353°05.8	-42°09.4
Schedar	349°29.5	56°40.8
Diphda	348°46.0	-17°50.3
Achernar	335°19.4	-57°05.8
Hamal	327°49.9	23°35.2
Polaris	313°38.1	89°22.2
Acamar	315°11.0	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.8	49°57.1
Aldebaran	290°38.5	16°33.7
Rigel	281°03.0	-8°10.2
Capella	280°20.5	46°01.4
Bellatrix	278°21.8	6°22.4
Elnath	278°00.6	28°37.7
Anilam	275°36.8	-1°11.0
Betelgeuse	270°51.1	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.4
Procyon	244°49.9	5°09.4
Pollux	243°16.2	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.9	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.3	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°21.0	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.0	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.7	19°02.7
Rigel Kent.	139°38.3	-60°57.0
Kochab	137°19.3	74°03.0
Zuben'ubi	136°54.5	-16°09.2
Alphecca	126°02.5	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6

h	Sun			Moon				
	GHA	Dec		GHA	ν	Dec	d	HP
0	178°42.2	N22°22.7		258°43.4	9.9'	N16°25.3	13.6'	58.8'
1	193°42.1	22.4		273°12.3	9.8'	16°38.9	13.6'	58.8'
2	208°42.0	22.1		287°41.1	9.7'	16°52.5	13.5'	58.9'
3	223°41.9	· · 21.8		302°09.8	9.6'	17°05.9	13.4'	58.9'
4	238°41.8	21.5		316°38.4	9.4'	17°19.3	13.3'	58.9'
5	253°41.8	21.2		331°06.8	9.3'	17°32.7	13.2'	59.0'
6	268°41.7	N22°20.9		345°35.2	9.2'	N17°45.9	13.2'	59.0'
7	283°41.6	20.6		0°03.4	9.1'	17°59.1	13.1'	59.0'
8	298°41.5	20.3		14°31.4	9.0'	18°12.1	13.0'	59.1'
9	313°41.4	· · 20.0		28°59.4	8.8'	18°25.1	12.9'	59.1'
10	328°41.3	19.7		43°27.2	8.7'	18°38.0	12.8'	59.1'
11	343°41.2	19.4		57°54.9	8.6'	18°50.8	12.7'	59.2'
12	358°41.1	N22°19.1		72°22.5	8.4'	N19°03.5	12.6'	59.2'
13	13°41.0	18.8		86°49.9	8.3'	19°16.1	12.5'	59.2'
14	28°40.9	18.5		101°17.2	8.2'	19°28.6	12.4'	59.3'
15	43°40.8	· · 18.2		115°44.4	8.1'	19°41.1	12.3'	59.3'
16	58°40.7	17.9		130°11.5	7.9'	19°53.4	12.2'	59.3'
17	73°40.6	17.6		144°38.4	7.8'	20°05.6	12.1'	59.4'
18	88°40.6	N22°17.3		159°05.2	7.7'	N20°17.7	12.0'	59.4'
19	103°40.5	16.9		173°31.8	7.5'	20°29.7	11.9'	59.4'
20	118°40.4	16.6		187°58.4	7.4'	20°41.6	11.8'	59.4'
21	133°40.3	· · 16.3		202°24.7	7.3'	20°53.4	11.7'	59.5'
22	148°40.2	16.0		216°51.0	7.1'	21°05.0	11.5'	59.5'
23	163°40.1	15.7		231°17.1	7.0'	21°16.6	11.4'	59.5'
SD = 15.7'			$d = -0.3'$	SD = 16.0'				

Fri	GHA	Dec	GHA	ν	Dec	d	HP
0	178°40.0	N22°15.4	245°43.1	6.9'	N21°28.0	11.3'	59.6'
1	193°39.9	15.1	260°09.0	6.7'	21°39.3	11.2'	59.6'
2	208°39.8	14.8	274°34.7	6.6'	21°50.5	11.1'	59.6'
3	223°39.7	· · 14.4	289°00.3	6.4'	22°01.6	10.9'	59.7'
4	238°39.7	14.1	303°25.7	6.3'	22°12.5	10.8'	59.7'
5	253°39.6	13.8	317°51.0	6.2'	22°23.3	10.7'	59.7'
6	268°39.5	N22°13.5	332°16.2	6.0'	N22°34.0	10.5'	59.7'
7	283°39.4	13.2	346°41.2	5.9'	22°44.5	10.4'	59.8'
8	298°39.3	12.9	1°06.1	5.8'	22°54.9	10.3'	59.8'
9	313°39.2	· · 12.5	15°30.9	5.6'	23°05.2	10.1'	59.8'
10	328°39.1	12.2	29°55.5	5.5'	23°15.3	10.0'	59.9'
11	343°39.0	11.9	44°20.1	5.4'	23°25.3	9.8'	59.9'
12	358°38.9	N22°11.6	58°44.4	5.2'	N23°35.2	9.7'	59.9'
13	13°38.9	11.3	73°08.7	5.1'	23°44.9	9.6'	59.9'
14	28°38.8	10.9	87°32.8	5.0'	23°54.4	9.4'	60.0'
15	43°38.7	· · 10.6	101°56.7	4.8'	24°03.8	9.3'	60.0'
16	58°38.6	10.3	116°20.6	4.7'	24°13.1	9.1'	60.0'
17	73°38.5	10.0	130°44.3	4.6'	24°22.2	8.9'	60.1'
18	88°38.4	N22°09.6	145°07.9	4.5'	N24°31.1	8.8'	60.1'
19	103°38.3	09.3	159°31.3	4.3'	24°39.9	8.6'	60.1'
20	118°38.2	09.0	173°54.7	4.2'	24°48.5	8.5'	60.1'
21	133°38.2	· · 08.7	188°17.9	4.1'	24°57.0	8.3'	60.2'
22	148°38.1	08.3	202°40.9	3.9'	25°05.3	8.1'	60.2'
23	163°38.0	08.0	217°03.9	3.8'	25°13.4	8.0'	60.2'
SD = 15.7'			$d = -0.3'$	SD = 16.2'			

Sat	GHA	Dec	GHA	ν	Dec	d	HP
0	178°37.9	N22°07.7	231°26.7	3.7'	N25°21.4	7.8'	60.2'
1	193°37.8	07.4	245°49.4	3.6'	25°29.2	7.6'	60.3'
2	208°37.7	07.0	260°12.0	3.5'	25°36.8	7.4'	60.3'
3	223°37.6	· · 06.7	274°34.5	3.3'	25°44.2	7.3'	60.3'
4	238°37.6	06.4	288°56.8	3.2'	25°51.5	7.1'	60.3'
5	253°37.5	06.0	303°19.0	3.1'	25°58.6	6.9'	60.4'
6	268°37.4	N22°05.7	317°41.2	3.0'	N26°05.5	6.7'	60.4'
7	283°37.3	05.4	332°03.2	2.9'	26°12.2	6.5'	60.4'
8	298°37.2	05.0	346°25.1	2.8'	26°18.7	6.4'	60.4'
9	313°37.1	· · 04.7	0°46.9	2.7'	26°25.1	6.2'	60.4'
10	328°37.1	04.4	15°08.5	2.6'	26°31.3	6.0'	60.5'
11	343°37.0	04.0	29°30.1	2.5'	26°37.2	5.8'	60.5'
12	358°36.9	N22°03.7	43°51.6	2.4'	N26°43.0	5.6'	60.5'
13	13°36.8	03.3	58°13.0	2.3'	26°48.6	5.4'	60.5'
14	28°36.7	03.0	72°34.3	2.2'	26°54.0	5.2'	60.5'
15	43°36.6	· · 02.7	86°55.5	2.1'	26°59.2	5.0'	60.6'
16	58°36.6	02.3	101°16.6	2.0'	27°04.2	4.8'	60.6'
17	73°36.5	02.0	115°37.6	1.9'	27°09.1	4.6'	60.6'
18	88°36.4	N22°01.7	129°58.5	1.8'	N27°13.7	4.4'	60.6'
19	103°36.3	01.3	144°19.3	1.8'	27°18.1	4.2'	60.6'
20	118°36.2	01.0	158°40.1	1.7'	27°22.3	4.0'	60.7'
21	133°36.1	· · 00.6	173°00.8	1.6'	27°26.3	3.8'	60.7'
22	148°36.1	22°00.3	187°21.4	1.5'	27°30.1	3.6'	60.7'
23	163°36.0	21°59.9	201°41.9	1.5'	27°33.6	3.4'	60.7'
SD = 15.7'			$d = -0.3'$	SD = 16.4'			

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	--	--	01:12	22:54	--	--
64°	--	--	02:01	22:07	--	--
62°	--	--	02:32	21:37	--	--
60°	--	01:29	02:55	21:15	22:39	--
N 58°	--	02:05	03:13	20:57	22:05	--
56°	--	02:30	03:28	20:42	21:40	--
54°	01:22	02:49	03:41	20:29	21:21	22:47
52°	01:55	03:05	03:52	20:18	21:04	22:15
50°	02:18	03:19	04:02	20:08	20:51	21:52
45°	02:59	03:47	04:23	19:47	20:23	21:11
N 40°	03:27	04:08	04:40	19:30	20:03	20:43
35°	03:49	04:25	04:54	19:16	19:45	20:21
30°	04:07	04:39	05:06	19:04	19:31	20:04
20°	04:34	05:03	05:27	18:43	19:08	19:37
N 10°	04:56	05:22	05:45	18:26	18:48	19:15
0°	05:13	05:39	06:02	18:09	18:31	18:57
S 10°	05:29	05:56	06:18	17:53	18:15	18:41
20°	05:45	06:12	06:36	17:35	17:59	18:26
30°	06:00	06:30	06:56	17:15	17:41	18:11
35°	06:08	06:39	07:07	17:04	17:32	18:03
40°	06:17	06:50	07:21	16:50	17:21	17:54
45°	06:26	07:03	07:36	16:35	17:08	17:45
S 50°	06:37	07:18	07:56	16:16	16:53	17:34
52°	06:42	07:25	08:05	16:06	16:46	17:29
54°	06:47	07:32	08:15	15:56	16:39	17:24
56°	06:52	07:41	08:26	15:45	16:31	17:19
58°	06:59	07:50	08:40	15:31	16:21	17:13
S 60°	07:05	08:01	08:55	15:16	16:11	17:06

Lat.	Moonrise			Moonset		
	Thu	Fri	Sat	Thu	Fri	Sat
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	20:53	☐	☐	17:42	☐	☐
66°	21:36	☐	☐	17:00	☐	☐
64°	22:06	21:41	☐	16:31	18:58	☐
62°	22:29	22:26	22:25	16:10	18:14	20:28
60°	22:47	22:55	23:18	15:52	17:45	19:35
N 58°	23:02	23:18	23:51	15:38	17:23	19:03
56°	23:15	23:37	· · ·	15:25	17:04	18:39
54°	23:27	23:53	· · ·	15:15	16:49	18:20
52°	23:37	· · ·	00:06	15:05	16:36	18:03
50°	23:46	· · ·	00:19	14:57	16:24	17:49
45°	· · ·	00:06	00:43	14:39	16:00	17:21
N 40°	· · ·	00:22	01:04	14:24	15:41	16:58
35°	· · ·	00:35	01:20	14:12	15:25	16:40
30°	00:07	00:47	01:35	14:01	15:12	16:24
20°	00:22	01:07	02:00	13:43	14:48	15:57
N 10°	00:35	01:25	02:21	13:27	14:28	15:34
0°	00:47	01:42	02:42	13:12	14:09	15:12
S 10°	01:00	01:59	03:02	12:58	13:51	14:51
20°	01:13	02:17	03:24	12:42	13:31	14:27
30°	01:29	02:38	03:50	12:24	13:08	14:01
35°	01:38	02:50	04:05	12:14	12:55	13:45
40°	01:48	03:05	04:22	12:02	12:39	13:27
45°	02:01	03:22	04:44	11:48	12:21	13:05
S 50°	02:16	03:43	05:11	11:32	11:58	12:37
52°	02:23	03:53	05:24	11:24	11:48	12:23
54°	02:31	04:05	05:39	11:15	11:35	12:08
56°	02:40	04:18	05:57	11:05	11:22	11:49
58°	02:50	04:33	06:19	10:54	11:05	11:27
S 60°	03:02	04:52	06:48	10:42	10:46	10:58

Day	Sun		Mer. Pass	Moon		Age 24-26 37-17%
	Eqn. of Time 00 ^h mm:ss	12 ^h mm:ss		Upper hh:mm	Lower hh:mm	
09	05:11	05:16	12:05	07:00	19:27	
10	05:20	05:24	12:05	07:55	20:25	
11	05:28	05:32	12:06	08:57	21:29	

July 12, 13, 14 UT (Sun., Mon., Tue.)

	Aries			Venus			Mars			Jupiter			Saturn		
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		
0	289°54.4	134°55.1	N11°49.4	222°14.8	N21°40.9	164°58.6	N20°01.8	275°33.5	N03°29.8						
1	304°56.9	149°54.9	48.3	237°15.4	41.2	180°00.5	01.7	290°35.9	29.8						
2	319°59.4	164°54.8	47.2	252°16.0	41.5	195°02.4	01.5	305°38.3	29.8						
3	335°01.8	179°54.7	· · 46.1	267°16.6	· · 41.8	210°04.3	· · 01.4	320°40.7	· · 29.8						
4	350°04.3	194°54.5	44.9	282°17.2	42.1	225°06.2	01.3	335°43.1	29.8						
5	5°06.8	209°54.4	43.8	297°17.8	42.4	240°08.1	01.2	350°45.5	29.8						
6	20°09.2	224°54.3	N11°42.7	312°18.4	N21°42.7	255°10.0	N20°01.0	5°47.9	N03°29.8						
7	35°11.7	239°54.2	41.6	327°19.1	43.0	270°11.9	00.9	20°50.3	29.8						
8	50°14.2	254°54.0	40.5	342°19.7	43.3	285°13.8	00.8	35°52.7	29.9						
9	65°16.6	269°53.9	· · 39.4	357°20.3	· · 43.6	300°15.6	· · 00.7	50°55.1	· · 29.9						
10	80°19.1	284°53.8	38.2	12°20.9	43.9	315°17.5	00.6	65°57.5	29.9						
11	95°21.5	299°53.7	37.1	27°21.5	44.1	330°19.4	00.4	80°59.9	29.9						
12	110°24.0	314°53.5	N11°36.0	42°22.1	N21°44.4	345°21.3	N20°00.3	96°02.3	N03°29.9						
13	125°26.5	329°53.4	34.9	57°22.7	44.7	0°23.2	00.2	111°04.7	29.9						
14	140°28.9	344°53.3	33.8	72°23.3	45.0	15°25.1	20°00.1	126°07.1	29.9						
15	155°31.4	359°53.2	· · 32.6	87°23.9	· · 45.3	30°27.0	19°59.9	141°09.5	· · 30.0						
16	170°33.9	14°53.1	31.5	102°24.5	45.6	45°28.9	59.8	156°11.9	30.0						
17	185°36.3	29°52.9	30.4	117°25.1	45.9	60°30.8	59.7	171°14.3	30.0						
18	200°38.8	44°52.8	N11°29.3	132°25.8	N21°46.2	75°32.7	N19°59.6	186°16.7	N03°30.0						
19	215°41.3	59°52.7	28.1	147°26.4	46.5	90°34.6	59.5	201°19.1	30.0						
20	230°43.7	74°52.6	27.0	162°27.0	46.7	105°36.5	59.3	216°21.5	30.0						
21	245°46.2	89°52.5	· · 25.9	177°27.6	· · 47.0	120°38.4	· · 59.2	231°23.9	· · 30.0						
22	260°48.7	104°52.4	24.8	192°28.2	47.3	135°40.3	59.1	246°26.4	30.0						
23	275°51.1	119°52.2	23.7	207°28.8	47.6	150°42.2	59.0	261°28.8	30.0						
Mer.pass.	04:40	ν -0.1' d -1.1' m -4.11		ν 0.6' d 0.3' m 1.31		ν 1.9' d -0.1' m -1.80		ν 2.4' d 0.0' m 0.73							

Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	290°53.6	134°52.1	N11°22.5	222°29.4	N21°47.9	165°44.1	N19°58.8	276°31.2	N03°30.1
1	305°56.0	149°52.0	21.4	237°30.0	48.2	180°46.0	58.7	291°33.6	30.1
2	320°58.5	164°51.9	20.3	252°30.6	48.5	195°47.9	58.6	306°36.0	30.1
3	336°01.0	179°51.8	· · 19.2	267°31.2	· · 48.8	210°49.8	· · 58.5	321°38.4	· · 30.1
4	351°03.4	194°51.7	18.0	282°31.8	49.0	225°51.7	58.4	336°40.8	30.1
5	6°05.9	209°51.6	16.9	297°32.5	49.3	240°53.6	58.2	351°43.2	30.1
6	21°08.4	224°51.5	N11°15.8	312°33.1	N21°49.6	255°55.5	N19°58.1	6°45.6	N03°30.1
7	36°10.8	239°51.3	14.6	327°33.7	49.9	270°57.4	58.0	21°48.0	30.1
8	51°13.3	254°51.2	13.5	342°34.3	50.2	285°59.3	57.9	36°50.4	30.2
9	66°15.8	269°51.1	· · 12.4	357°34.9	· · 50.5	301°01.1	· · 57.7	51°52.8	· · 30.2
10	81°18.2	284°51.0	11.3	12°35.5	50.7	316°03.0	57.6	66°55.2	30.2
11	96°20.7	299°50.9	10.1	27°36.1	51.0	331°04.9	57.5	81°57.6	30.2
12	111°23.2	314°50.8	N11°09.0	42°36.7	N21°51.3	346°06.8	N19°57.4	97°00.0	N03°30.2
13	126°25.6	329°50.7	07.9	57°37.3	51.6	1°08.7	57.2	112°02.4	30.2
14	141°28.1	344°50.6	06.7	72°37.9	51.9	16°10.6	57.1	127°04.9	30.2
15	156°30.5	359°50.5	· · 05.6	87°38.5	· · 52.2	31°12.5	· · 57.0	142°07.3	· · 30.2
16	171°33.0	14°50.4	04.5	102°39.2	52.4	46°14.4	56.9	157°09.7	30.2
17	186°35.5	29°50.3	03.3	117°39.8	52.7	61°16.3	56.8	172°12.1	30.3
18	201°37.9	44°50.2	N11°02.2	132°40.4	N21°53.0	76°18.2	N19°56.6	187°14.5	N03°30.3
19	216°40.4	59°50.1	11°01.1	147°41.0	53.3	91°20.1	56.5	202°16.9	30.3
20	231°42.9	74°50.0	10°59.9	162°41.6	53.6	106°22.0	56.4	217°19.3	30.3
21	246°45.3	89°49.9	· · 58.8	177°42.2	· · 53.8	121°23.9	· · 56.3	232°21.7	· · 30.3
22	261°47.8	104°49.8	57.7	192°42.8	54.1	136°25.8	56.1	247°24.1	30.3
23	276°50.3	119°49.7	56.5	207°43.4	54.4	151°27.7	56.0	262°26.5	30.3
Mer.pass.	04:36	ν -0.1' d -1.1' m -4.12		ν 0.6' d 0.3' m 1.31		ν 1.9' d -0.1' m -1.79		ν 2.4' d 0.0' m 0.72	

Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	291°52.7	134°49.6	N10°55.4	222°44.0	N21°54.7	166°29.6	N19°55.9	277°28.9	N03°30.3
1	306°55.2	149°49.5	54.3	237°44.6	54.9	181°31.5	55.8	292°31.3	30.3
2	321°57.7	164°49.4	53.1	252°45.3	55.2	196°33.4	55.6	307°33.8	30.3
3	337°00.1	179°49.3	· · 52.0	267°45.9	· · 55.5	211°35.3	· · 55.5	322°36.2	· · 30.4
4	352°02.6	194°49.2	50.9	282°46.5	55.8	226°37.2	55.4	337°38.6	30.4
5	7°05.0	209°49.1	49.7	297°47.1	56.1	241°39.1	55.3	352°41.0	30.4
6	22°07.5	224°49.0	N10°48.6	312°47.7	N21°56.3	256°40.9	N19°55.1	7°43.4	N03°30.4
7	37°10.0	239°48.9	47.5	327°48.3	56.6	271°42.8	55.0	22°45.8	30.4
8	52°12.4	254°48.8	46.3	342°48.9	56.9	286°44.7	54.9	37°48.2	30.4
9	67°14.9	269°48.7	· · 45.2	357°49.5	· · 57.2	301°46.6	· · 54.8	52°50.6	· · 30.4
10	82°17.4	284°48.6	44.0	12°50.1	57.4	316°48.5	54.7	67°53.0	30.4
11	97°19.8	299°48.5	42.9	27°50.7	57.7	331°50.4	54.5	82°55.4	30.4
12	112°22.3	314°48.4	N10°41.8	42°51.3	N21°58.0	346°52.3	N19°54.4	97°57.9	N03°30.4
13	127°24.8	329°48.4	40.6	57°52.0	58.3	1°54.2	54.3	113°00.3	30.5
14	142°27.2	344°48.3	39.5	72°52.6	58.5	16°56.1	54.2	128°02.7	30.5
15	157°29.7	359°48.2	· · 38.4	87°53.2	· · 58.8	31°58.0	· · 54.0	143°05.1	· · 30.5
16	172°32.2	14°48.1	37.2	102°53.8	59.1	46°59.9	53.9	158°07.5	30.5
17	187°34.6	29°48.0	36.1	117°54.4	59.3	62°01.8	53.8	173°09.9	30.5
18	202°37.1	44°47.9	N10°34.9	132°55.0	N21°59.6	77°03.7	N19°53.7	188°12.3	N03°30.5
19	217°39.5	59°47.8	33.8	147°55.6	21°59.9	92°05.6	53.5	203°14.7	30.5
20	232°42.0	74°47.7	32.6	162°56.2	22°00.2	107°07.5	53.4	218°17.2	30.5
21	247°44.5	89°47.7	· · 31.5	177°56.8	· · 00.4	122°09.4	· · 53.3	233°19.6	· · 30.5
22	262°46.9	104°47.6	30.4	192°57.4	00.7	137°11.3	53.2	248°22.0	30.5
23	277°49.4	119°47.5	29.2	207°58.1	01.0	152°13.2	53.0	263°24.4	30.5
Mer.pass.	04:32	ν -0.1' d -1.1' m -4.13		ν 0.6' d 0.3' m 1.31		ν 1.9' d -0.1' m -1.79		ν 2.4' d 0.0' m 0.72	

	SHA	Dec
Alpheratz	357°33.4	29°14.2
Ankaa	353°05.8	-42°09.4
Schedar	349°29.5	56°40.8
Diphda	348°46.0	-17°50.3
Achernar	335°19.3	-57°05.8
Hamal	327°49.8	23°35.2
Polaris	313°36.3	89°22.2
Acamar	315°11.0	-40°11.6
Menkar	314°05.0	4°11.7
Mirfak	308°26.7	49°57.1
Aldebaran	290°38.4	16°33.7
Rigel	281°02.9	-8°10.2
Capella	280°20.4	46°01.4
Bellatrix	278°21.8	6°22.5
Elnath	278°00.6	28°37.7
Alnilam	275°36.8	-1°11.0
Betelgeuse	270°51.0	7°24.7
Canopus	263°52.4	-52°42.5
Sirius	258°25.5	-16°45.1
Adhara	255°05.3	-29°00.4
Procyon	244°49.9	5°09.4
Pollux	243°16.1	27°57.7
Avior	234°14.9	-59°35.7
Suhail	222°45.8	-43°32.5
Miaplacidus	221°38.9	-69°49.7
Alphard	217°46.8	-8°46.4
Regulus	207°33.4	11°50.3
Dubhe	193°39.9	61°36.7
Denebola	182°23.8	14°25.5
Gienah	175°42.4	-17°41.5
Acrux	172°58.8	-63°15.1
Gacrux	171°50.4	-57°16.0
Alioth	166°11.9	55°49.2
Spica	158°21.0	-11°18.1
Alkaid	152°50.9	49°11.1
Hadar	148°34.1	-60°30.3
Menkent	147°56.0	-36°30.2
Arcturus	145°46.7	19°02.8
Rigel Kent.	139°38.3	-60°57.0
Kochab	137°19.4	74°03.0
Zuben'ubi	136°54.5	-59°09.2
Alphecca	126°02.5	26°37.6
Antares	112°14.0	-26°29.5
Atria	107°06.6	-69°04.6
Sabik	102°01.0	-15°45.5
Shaula	96°08.3	-37°07.4
Rasalhague	95°57.1	12°32.5
Eltanin	90°41.1	51°29.2
Kaus Aust.	83°30.4	-34°22.3
Vega	80°31.9	38°48.5
Nunki	75°45.8	-26°15.8
Altair	61°58.4	8°56.4
Peacock	53°03.2	-56°38.8
Deneb	49°24.5	45°22.5
Enif	33°37.3	9°59.9
Al Na'ir	27°31.0	-46°49.7
Fomalhaut	15°12.9	-29°28.7
Scheat	13°43.8	28°13.6
Markab	13°28.5	25°20.9

Jul 12 Sun	SHA	Mer.pass
Venus	205°00.6	15:00
Mars	292°20.3	09:11
Jupiter	235°04.1	12:58
Saturn	345°39.0	05:37

Jul 13 Mon	SHA	Mer.pass
Venus	203°58.6	15:01
Mars	291°35.8	09:10
Jupiter	234°50.5	12:55
Saturn	345°37.6	05:33

Jul

Sun			Moon				
h	GHA	Dec	GHA	ν	Dec	d	HP
0	178°35.9	N21°59.6	216°02.4	1.4'	N27°37.0	3.2'	60.7'
1	193°35.8	59.3	230°22.8	1.3'	27°40.2	3.0'	60.7'
2	208°35.7	58.9	244°43.1	1.3'	27°43.1	2.7'	60.8'
3	223°35.7	· · 58.6	259°03.4	1.2'	27°45.9	2.5'	60.8'
4	238°35.6	58.2	273°23.6	1.2'	27°48.4	2.3'	60.8'
5	253°35.5	57.9	287°43.8	1.1'	27°50.7	2.1'	60.8'
6	268°35.4	N21°57.5	302°03.9	1.1'	N27°52.8	1.9'	60.8'
7	283°35.3	57.2	316°23.9	1.0'	27°54.7	1.7'	60.8'
8	298°35.3	56.8	330°44.0	1.0'	27°56.4	1.5'	60.8'
9	313°35.2	· · 56.5	345°03.9	0.9'	27°57.9	1.2'	60.8'
10	328°35.1	56.1	359°23.9	0.9'	27°59.1	1.0'	60.9'
11	343°35.0	55.8	13°43.8	0.9'	28°00.1	0.8'	60.9'
12	358°34.9	N21°55.4	28°03.7	0.9'	N28°00.9	0.6'	60.9'
13	13°34.9	55.1	42°23.5	0.8'	28°01.5	0.4'	60.9'
14	28°34.8	54.7	56°43.4	0.8'	28°01.9	0.1'	60.9'
15	43°34.7	· · 54.4	71°03.2	0.8'	28°02.0	-0.1'	60.9'
16	58°34.6	54.0	85°23.0	0.8'	28°02.0	-0.3'	60.9'
17	73°34.5	53.6	99°42.8	0.8'	28°01.7	-0.5'	60.9'
18	88°34.5	N21°53.3	114°02.6	0.8'	N28°01.2	-0.7'	60.9'
19	103°34.4	52.9	128°22.4	0.8'	28°00.4	-1.0'	60.9'
20	118°34.3	52.6	142°42.1	0.8'	27°59.5	-1.2'	60.9'
21	133°34.2	· · 52.2	157°01.9	0.8'	27°58.3	-1.4'	61.0'
22	148°34.2	51.9	171°21.7	0.8'	27°56.9	-1.6'	61.0'
23	163°34.1	51.5	185°41.5	0.8'	27°55.3	-1.8'	61.0'
SD = 15.7' d = -0.3'			SD = 16.6'				

Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	178°34.0	N21°51.1	200°01.3	0.8'	N27°53.4	-2.1'	61.0'
1	193°33.9	50.8	214°21.2	0.9'	27°51.4	-2.3'	61.0'
2	208°33.9	50.4	228°41.0	0.9'	27°49.1	-2.5'	61.0'
3	223°33.8	· · 50.0	243°00.9	0.9'	27°46.6	-2.7'	61.0'
4	238°33.7	49.7	257°20.8	0.9'	27°43.9	-2.9'	61.0'
5	253°33.6	49.3	271°40.8	1.0'	27°41.0	-3.1'	61.0'
6	268°33.6	N21°49.0	286°00.7	1.0'	N27°37.9	-3.4'	61.0'
7	283°33.5	48.6	300°20.7	1.1'	27°34.5	-3.6'	61.0'
8	298°33.4	48.2	314°40.8	1.1'	27°30.9	-3.8'	61.0'
9	313°33.3	· · 47.9	329°00.9	1.2'	27°27.1	-4.0'	61.0'
10	328°33.3	47.5	343°21.1	1.2'	27°23.1	-4.2'	61.0'
11	343°33.2	47.1	357°41.3	1.3'	27°18.9	-4.4'	61.0'
12	358°33.1	N21°46.8	12°01.5	1.3'	N27°14.5	-4.6'	61.0'
13	13°33.0	46.4	26°21.9	1.4'	27°09.9	-4.8'	61.0'
14	28°33.0	46.0	40°42.2	1.4'	27°05.0	-5.1'	61.0'
15	43°32.9	· · 45.7	55°02.7	1.5'	27°00.0	-5.3'	61.0'
16	58°32.8	45.3	69°23.2	1.6'	26°54.7	-5.5'	61.0'
17	73°32.7	44.9	83°43.8	1.7'	26°49.2	-5.7'	61.0'
18	88°32.7	N21°44.5	98°04.4	1.7'	N26°43.5	-5.9'	61.0'
19	103°32.6	44.2	112°25.2	1.8'	26°37.7	-6.1'	61.0'
20	118°32.5	43.8	126°46.0	1.9'	26°31.6	-6.3'	60.9'
21	133°32.4	· · 43.4	141°06.9	2.0'	26°25.3	-6.5'	60.9'
22	148°32.4	43.0	155°27.9	2.1'	26°18.8	-6.7'	60.9'
23	163°32.3	42.7	169°49.0	2.2'	26°12.2	-6.9'	60.9'
SD = 15.7' d = -0.4'			SD = 16.6'				

Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	178°32.2	N21°42.3	184°10.1	2.3'	N26°05.3	-7.1'	60.9'
1	193°32.2	41.9	198°31.4	2.4'	25°58.2	-7.3'	60.9'
2	208°32.1	41.5	212°52.7	2.5'	25°51.0	-7.4'	60.9'
3	223°32.0	· · 41.2	227°14.2	2.6'	25°43.5	-7.6'	60.9'
4	238°31.9	40.8	241°35.7	2.7'	25°35.9	-7.8'	60.9'
5	253°31.9	40.4	255°57.4	2.8'	25°28.1	-8.0'	60.9'
6	268°31.8	N21°40.0	270°19.2	2.9'	N25°20.1	-8.2'	60.9'
7	283°31.7	39.6	284°41.0	3.0'	25°11.9	-8.4'	60.8'
8	298°31.7	39.3	299°03.0	3.1'	25°03.5	-8.6'	60.8'
9	313°31.6	· · 38.9	313°25.1	3.2'	24°55.0	-8.7'	60.8'
10	328°31.5	38.5	327°47.3	3.3'	24°46.2	-8.9'	60.8'
11	343°31.5	38.1	342°09.6	3.4'	24°37.3	-9.1'	60.8'
12	358°31.4	N21°37.7	356°32.0	3.5'	N24°28.3	-9.2'	60.8'
13	13°31.3	37.4	10°54.5	3.7'	24°19.0	-9.4'	60.8'
14	28°31.3	37.0	25°17.2	3.8'	24°09.6	-9.6'	60.7'
15	43°31.2	· · 36.6	39°40.0	3.9'	24°00.0	-9.7'	60.7'
16	58°31.1	36.2	54°02.9	4.0'	23°50.3	-9.9'	60.7'
17	73°31.0	35.8	68°25.9	4.1'	23°40.3	-10.1'	60.7'
18	88°31.0	N21°35.4	82°49.0	4.3'	N23°30.3	-10.2'	60.7'
19	103°30.9	35.0	97°12.3	4.4'	23°20.0	-10.4'	60.7'
20	118°30.8	34.6	111°35.7	4.5'	23°09.7	-10.5'	60.6'
21	133°30.8	· · 34.3	125°59.2	4.6'	22°59.1	-10.7'	60.6'
22	148°30.7	33.9	140°22.8	4.8'	22°48.4	-10.8'	60.6'
23	163°30.6	33.5	154°46.6	4.9'	22°37.6	-11.0'	60.6'
SD = 15.7' d = -0.4'			SD = 16.6'				

Lat.	Twilight		Sunrise	Sunset	Twilight	
	Naut.	Civil			Civil	Naut.
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	☐	☐	☐	☐	☐	☐
62°	☐	☐	☐	☐	☐	☐
60°	☐	☐	☐	☐	☐	☐
N 58°	☐	☐	☐	☐	☐	☐
56°	☐	☐	☐	☐	☐	☐
54°	☐	☐	☐	☐	☐	☐
52°	☐	☐	☐	☐	☐	☐
50°	☐	☐	☐	☐	☐	☐
45°	☐	☐	☐	☐	☐	☐
N 40°	☐	☐	☐	☐	☐	☐
35°	☐	☐	☐	☐	☐	☐
30°	☐	☐	☐	☐	☐	☐
20°	☐	☐	☐	☐	☐	☐
N 10°	☐	☐	☐	☐	☐	☐
0°	☐	☐	☐	☐	☐	☐
S 10°	☐	☐	☐	☐	☐	☐
20°	☐	☐	☐	☐	☐	☐
30°	☐	☐	☐	☐	☐	☐
35°	☐	☐	☐	☐	☐	☐
40°	☐	☐	☐	☐	☐	☐
45°	☐	☐	☐	☐	☐	☐
S 50°	☐	☐	☐	☐	☐	☐
52°	☐	☐	☐	☐	☐	☐
54°	☐	☐	☐	☐	☐	☐
56°	☐	☐	☐	☐	☐	☐
58°	☐	☐	☐	☐	☐	☐
S 60°	☐	☐	☐	☐	☐	☐

Lat.	Moonrise			Moonset		
	Sun	Mon	Tue	Sun	Mon	Tue
N 72°	☐	☐	☐	☐	☐	☐
N 70°	☐	☐	☐	☐	☐	☐
68°	☐	☐	☐	☐	☐	☐
66°	☐	☐	☐	☐	☐	☐
64°	☐	☐	☐	☐	☐	☐
62°	☐	☐	☐	☐	☐	☐
60°	☐	☐	☐	☐	☐	☐
N 58°	☐	☐	☐	☐	☐	☐
56°	☐	☐	☐	☐	☐	☐
54°	☐	☐	☐	☐	☐	☐
52°	☐	☐	☐	☐	☐	☐
50°	☐	☐	☐	☐	☐	☐
45°	☐	☐	☐	☐	☐	☐
N 40°	☐	☐	☐	☐	☐	☐
35°	☐	☐	☐	☐	☐	☐
30°	☐	☐	☐	☐	☐	☐
20°	☐	☐	☐	☐	☐	☐
N 10°	☐	☐	☐	☐	☐	☐
0°	☐	☐	☐	☐	☐	☐
S 10°	☐	☐	☐	☐	☐	☐
20°	☐	☐	☐	☐	☐	☐
30°	☐	☐	☐	☐	☐	☐
35°	☐	☐	☐	☐	☐	☐
40°	☐	☐	☐	☐	☐	☐
45°	☐	☐	☐	☐	☐	☐
S 50°	☐	☐	☐	☐	☐	☐
52°	☐	☐	☐	☐	☐	☐
54°	☐	☐	☐	☐	☐	☐
56°	☐	☐	☐	☐	☐	☐
58°	☐	☐	☐	☐	☐	☐
S 60°	☐	☐	☐	☐	☐	☐

Day	Sun		Mer. Pass	Moon		Age 27-0 9-0%
	Eqn. of Time 00 ^h mm:ss	Time 12 ^h mm:ss		Mer. Pass. Upper hh:mm	Mer. Pass. Lower hh:mm	
12	05:36	05:40	12:06	10:03	22:36	☉
13	05:44	05:48	12:06	11:10	23:43	☉
14	05:51	05:54	12:06	12:14	---	☉