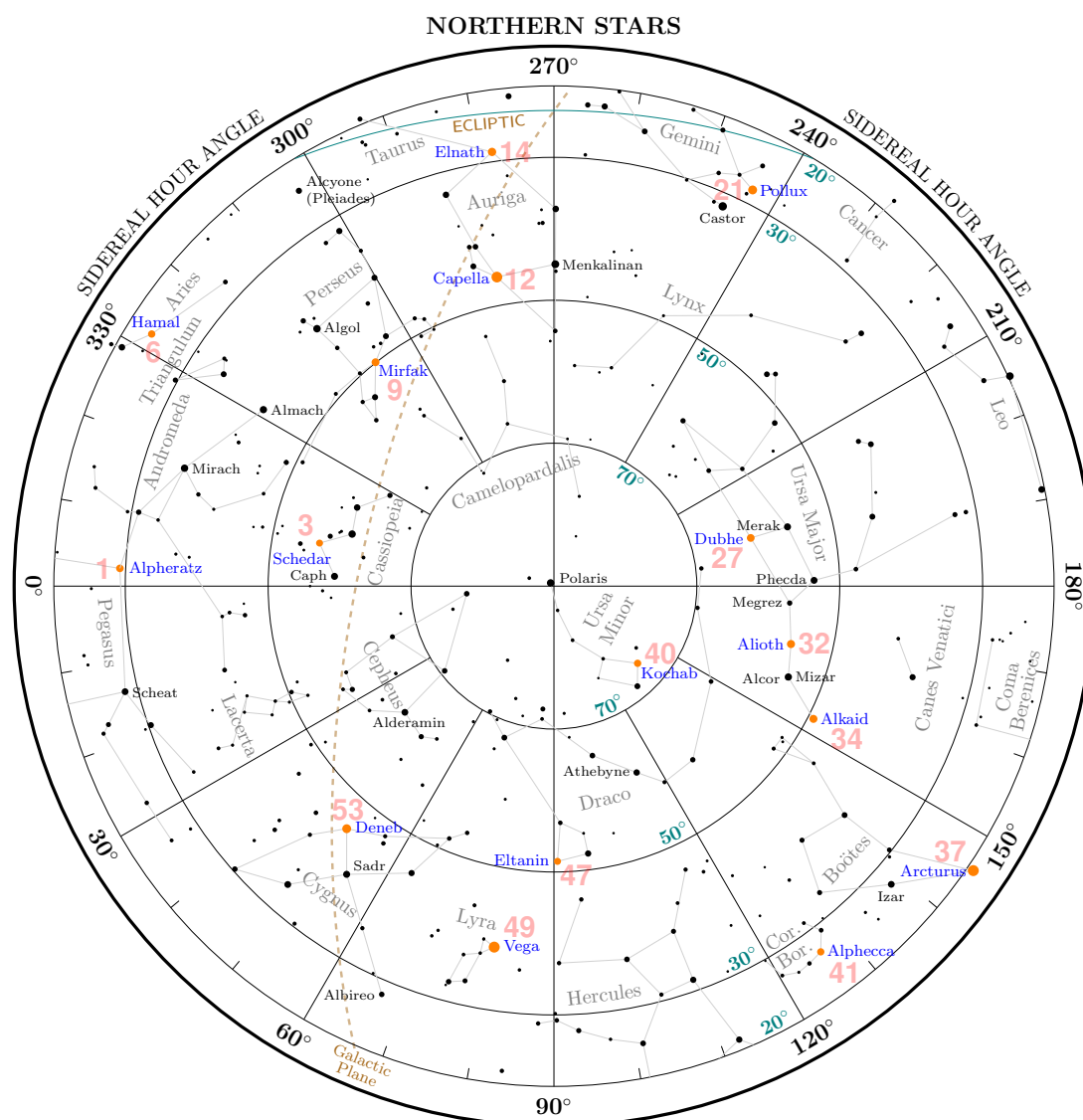


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## THE NAUTICAL ALMANAC

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from 8.7.2020

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*Original concept from:* Enno RODEGERDTS

March 13, 2020

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# July 08, 09, 10 (Wed., Thu., Fri.)

h	Aries		Venus		Mars		Jupiter		Saturn	
Wed	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	286°24.3		219°15.3	N17°17.2	279°43.0	S00°42.4	351°21.7	S21°45.5	344°36.6	S20°26.6
1	301°26.8		234°16.7	17.3	294°44.1	41.9	6°24.5	45.6	359°39.2	26.7
2	316°29.2		249°18.0	17.4	309°45.3	41.4	21°27.3	45.7	14°41.9	26.7
3	331°31.7		264°19.4	· · 17.5	324°46.4	· · 40.9	36°30.1	· · 45.7	29°44.5	· · 26.7
4	346°34.2		279°20.7	17.6	339°47.5	40.3	51°32.9	45.8	44°47.2	26.8
5	1°36.6		294°22.1	17.7	354°48.6	39.8	66°35.7	45.8	59°49.8	26.8
6	16°39.1		309°23.5	N17°17.8	9°49.8	S00°39.3	81°38.5	S21°45.9	74°52.5	S20°26.9
7	31°41.6		324°24.8	17.9	24°50.9	38.8	96°41.3	46.0	89°55.1	26.9
8	46°44.0		339°26.1	18.0	39°52.0	38.3	111°44.1	46.0	104°57.8	26.9
9	61°46.5		354°27.5	· · 18.1	54°53.2	· · 37.8	126°46.9	· · 46.1	120°00.4	· · 27.0
10	76°48.9		9°28.8	18.2	69°54.3	37.3	141°49.7	46.1	135°03.1	27.0
11	91°51.4		24°30.2	18.3	84°55.4	36.8	156°52.5	46.2	150°05.7	27.1
12	106°53.9		39°31.5	N17°18.4	99°56.5	S00°36.3	171°55.3	S21°46.3	165°08.4	S20°27.1
13	121°56.3		54°32.8	18.5	114°57.7	35.8	186°58.1	46.3	180°11.0	27.1
14	136°58.8		69°34.2	18.6	129°58.8	35.3	202°00.9	46.4	195°13.7	27.2
15	152°01.3		84°35.5	· · 18.7	144°59.9	· · 34.7	217°03.7	· · 46.4	210°16.3	· · 27.2
16	167°03.7		99°36.8	18.8	160°01.1	34.2	232°06.5	46.5	225°19.0	27.3
17	182°06.2		114°38.1	18.9	175°02.2	33.7	247°09.3	46.6	240°21.6	27.3
18	197°08.7		129°39.5	N17°19.0	190°03.3	S00°33.2	262°12.1	S21°46.6	255°24.2	S20°27.4
19	212°11.1		144°40.8	19.1	205°04.5	32.7	277°14.9	46.7	270°26.9	27.4
20	227°13.6		159°42.1	19.2	220°05.6	32.2	292°17.7	46.7	285°29.5	27.4
21	242°16.0		174°43.4	· · 19.3	235°06.7	· · 31.7	307°20.5	· · 46.8	300°32.2	· · 27.5
22	257°18.5		189°44.7	19.4	250°07.9	31.2	322°23.3	46.9	315°34.8	27.5
23	272°21.0		204°46.0	19.5	265°09.0	30.7	337°26.1	46.9	330°37.5	27.6
Mer.pass.:04:53		v1.4 d0.1 m-4.5		v1.1 d0.5 m-0.6		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.1		
Thu	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	287°23.4		219°47.3	N17°19.6	280°10.1	S00°30.2	352°28.9	S21°47.0	345°40.1	S20°27.6
1	302°25.9		234°48.6	19.8	295°11.3	29.7	7°31.7	47.0	0°42.8	27.6
2	317°28.4		249°49.9	19.9	310°12.4	29.2	22°34.5	47.1	15°45.4	27.7
3	332°30.8		264°51.2	· · 20.0	325°13.5	· · 28.7	37°37.3	· · 47.2	30°48.1	· · 27.7
4	347°33.3		279°52.5	20.1	340°14.7	28.2	52°40.1	47.2	45°50.7	27.8
5	2°35.8		294°53.8	20.2	355°15.8	27.7	67°42.9	47.3	60°53.4	27.8
6	17°38.2		309°55.1	N17°20.3	10°17.0	S00°27.1	82°45.7	S21°47.3	75°56.0	S20°27.8
7	32°40.7		324°56.3	20.5	25°18.1	26.6	97°48.5	47.4	90°58.7	27.9
8	47°43.2		339°57.6	20.6	40°19.2	26.1	112°51.3	47.5	106°01.3	27.9
9	62°45.6		354°58.9	· · 20.7	55°20.4	· · 25.6	127°54.1	· · 47.5	121°04.0	· · 28.0
10	77°48.1		10°00.2	20.8	70°21.5	25.1	142°56.9	47.6	136°06.6	28.0
11	92°50.5		25°01.4	20.9	85°22.7	24.6	157°59.7	47.6	151°09.3	28.1
12	107°53.0		40°02.7	N17°21.0	100°23.8	S00°24.1	173°02.5	S21°47.7	166°11.9	S20°28.1
13	122°55.5		55°04.0	21.2	115°24.9	23.6	188°05.4	47.7	181°14.6	28.1
14	137°57.9		70°05.2	21.3	130°26.1	23.1	203°08.2	47.8	196°17.2	28.2
15	153°00.4		85°06.5	· · 21.4	145°27.2	· · 22.6	218°11.0	· · 47.9	211°19.9	· · 28.2
16	168°02.9		100°07.8	21.5	160°28.4	22.1	233°13.8	47.9	226°22.5	28.3
17	183°05.3		115°09.0	21.7	175°29.5	21.6	248°16.6	48.0	241°25.2	28.3
18	198°07.8		130°10.3	N17°21.8	190°30.6	S00°21.1	263°19.4	S21°48.0	256°27.8	S20°28.3
19	213°10.3		145°11.5	21.9	205°31.8	20.6	278°22.2	48.1	271°30.5	28.4
20	228°12.7		160°12.8	22.0	220°32.9	20.1	293°25.0	48.2	286°33.1	28.4
21	243°15.2		175°14.0	· · 22.2	235°34.1	· · 19.6	308°27.8	· · 48.2	301°35.8	· · 28.5
22	258°17.7		190°15.2	22.3	250°35.2	19.1	323°30.6	48.3	316°38.4	28.5
23	273°20.1		205°16.5	22.4	265°36.4	18.6	338°33.4	48.3	331°41.1	28.5
Mer.pass.:04:49		v1.3 d0.1 m-4.5		v1.1 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.6 d-0.0 m0.1		
Fri	GHA		GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
0	288°22.6		220°17.7	N17°22.6	280°37.5	S00°18.1	353°36.2	S21°48.4	346°43.7	S20°28.6
1	303°25.0		235°18.9	22.7	295°38.6	17.6	8°39.0	48.5	1°46.4	28.6
2	318°27.5		250°20.2	22.8	310°39.8	17.1	23°41.8	48.5	16°49.0	28.7
3	333°30.0		265°21.4	· · 22.9	325°40.9	· · 16.6	38°44.6	· · 48.6	31°51.7	· · 28.7
4	348°32.4		280°22.6	23.1	340°42.1	16.1	53°47.4	48.6	46°54.3	28.8
5	3°34.9		295°23.9	23.2	355°43.2	15.6	68°50.2	48.7	61°57.0	28.8
6	18°37.4		310°25.1	N17°23.3	10°44.4	S00°15.1	83°53.0	S21°48.8	76°59.6	S20°28.8
7	33°39.8		325°26.3	23.5	25°45.5	14.6	98°55.8	48.8	92°02.3	28.9
8	48°42.3		340°27.5	23.6	40°46.7	14.1	113°58.6	48.9	107°04.9	28.9
9	63°44.8		355°28.7	· · 23.8	55°47.8	· · 13.6	129°01.4	· · 48.9	122°07.6	· · 29.0
10	78°47.2		10°29.9	23.9	70°49.0	13.1	144°04.2	49.0	137°10.2	29.0
11	93°49.7		25°31.1	24.0	85°50.1	12.6	159°07.0	49.1	152°12.9	29.0
12	108°52.1		40°32.3	N17°24.2	100°51.3	S00°12.1	174°09.8	S21°49.1	167°15.5	S20°29.1
13	123°54.6		55°33.5	24.3	115°52.4	11.6	189°12.6	49.2	182°18.2	29.1
14	138°57.1		70°34.7	24.4	130°53.6	11.1	204°15.4	49.2	197°20.8	29.2
15	153°59.5		85°35.9	· · 24.6	145°54.7	· · 10.6	219°18.2	· · 49.3	212°23.5	· · 29.2
16	169°02.0		100°37.1	24.7	160°55.9	10.1	234°21.0	49.4	227°26.1	29.2
17	184°04.5		115°38.3	24.9	175°57.0	09.6	249°23.8	49.4	242°28.8	29.3
18	199°06.9		130°39.5	N17°25.0	190°58.2	S00°09.1	264°26.6	S21°49.5	257°31.5	S20°29.3
19	214°09.4		145°40.7	25.1	205°59.3	08.6	279°29.4	49.5	272°34.1	29.4
20	229°11.9		160°41.9	25.3	221°00.5	08.1	294°32.2	49.6	287°36.8	29.4
21	244°14.3		175°43.1	· · 25.4	236°01.6	· · 07.6	309°35.0	· · 49.6	302°39.4	· · 29.5
22	259°16.8		190°44.2	25.6	251°02.8	07.1	324°37.8	49.7	317°42.1	29.5
23	274°19.3		205°45.4	25.7	266°03.9	06.6	339°40.6	49.8	332°44.7	29.5
Mer.pass.:04:45		v1.2 d0.1 m-4.5		v1.1 d0.5 m-0.7		v2.8 d-0.1 m-2.6		v2.7 d-0.0 m0.1		

	SHA	Dec
Alpheratz	357°38.4	29°12.0
Ankaa	353°10.7	-42°11.5
Schedar	349°34.9	56°38.6
Diphda	348°50.9	-17°52.4
Achernar	335°23.1	-57°07.8
Hamal	327°55.3	23°33.3
Polaris	315°52.8	89°20.6
Acamar	315°14.8	-40°13.2
Menkar	314°10.1	4°10.1
Mirfak	308°33.7	49°55.7
Aldebaran	290°44.1	16°32.9
Rigel	281°07.7	-8°10.7
Capella	280°27.7	46°00.9
Bellatrix	278°27.1	6°22.0
Elnath	278°06.8	28°37.3
Alnilam	275°41.7	-1°11.4
Betelgeuse	270°56.3	7°24.6
Canopus	263°54.5	-52°42.4
Sirius	258°29.8	-16°44.7
Adhara	255°09.1	-29°00.0
Procyon	244°55.0	5°10.3
Pollux	243°22.1	27°58.6
Avior	234°16.7	-59°34.6
Suhail	222°49.3	-43°31.0
Miaplacidus	221°39.6	-69°48.2
Alphard	217°51.6	-8°44.8
Regulus	207°38.6	11°52.2
Dubhe	193°46.0	61°38.8
Denebola	182°28.8	14°27.7
Gienah	175°47.4	-17°39.3
Acrux	173°04.1	-63°12.9
Gacrux	171°55.6	-57°13.8
Alioth	166°16.3	55°51.3
Spica	158°26.1	-11°16.0
Alkaid	152°54.9	49°13.1
Hadar	148°40.8	-60°28.4
Menkent	148°01.7	-36°28.3
Arcturus	145°51.2	19°04.8
Rigel Kent.	139°44.9	-60°55.3
Kochab	137°19.5	74°04.7
Zuben'ubi	136°59.9	-16°07.5
Alphecca	126°06.6	26°39.0
Antares	112°20.0	-26°28.6
Atria	107°16.9	-69°03.9
Sabik	102°06.6	-15°44.9
Shaula	96°14.9	-37°07.0
Rasalhague	96°01.6	12°32.9
Eltanin	90°43.3	51°29.3
Kaus Aust.	83°36.9	-34°22.4
Vega	80°35.2	38°48.3
Nunki	75°51.9	-26°16.2
Altair	62°03.1	8°55.4
Peacock	53°10.9	-56°40.0
Deneb	49°27.7	45°21.1
Enif	33°42.1	9°58.1
Al Na'ir	27°37.2	-46°51.5
Fomalhaut	15°18.4	-29°30.7
Scheat	13°48.5	28°11.5
Markab	13°33.3	15°18.8
Jul 08 Wed	SHA	Mer.pass
Venus	292°51.0	09:22
Mars	353°18.7	05:21
Jupiter	64°57.4	00:34
Saturn	58°12.3	01:01
Jul 09 Thu	SHA	Mer.pass
Venus	292°23.9	09:20
Mars	352°46.7	05:19
Jupiter	65°05.5	00:30
Saturn	58°16.7	00:57
Jul 10 Fri	SHA	Mer.pass
Venus	291°55.1	09:18
Mars	352°14.9	05:17
Jupiter	65°13.6	00:26
Saturn	58°21.2	00:53
Horizontal parallax		
Venus:	0.3	
Mars:	0.2	

h		Sun		Moon			
Wed	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°43.6	N22°26.5	322°12.1	11.2'	S18°34.0	8.5'	56.0'
1	193°43.5	26.2	336°42.3	11.3'	18°25.4	8.6'	56.0'
2	208°43.4	25.9	351°12.6	11.4'	18°16.7	8.7'	56.0'
3	223°43.3	· · 25.6	5°43.0	11.4'	18°08.0	8.8'	55.9'
4	238°43.2	25.3	20°13.5	11.5'	17°59.2	8.9'	55.9'
5	253°43.1	25.1	34°44.1	11.6'	17°50.3	8.9'	55.9'
6	268°43.0	N22°24.8	49°14.7	11.7'	S17°41.3	9.0'	55.8'
7	283°42.9	24.5	63°45.5	11.8'	17°32.2	9.1'	55.8'
8	298°42.8	24.2	78°16.3	11.9'	17°23.1	9.2'	55.8'
9	313°42.7	· · 23.9	92°47.2	12.0'	17°13.9	9.2'	55.8'
10	328°42.6	23.6	107°18.2	12.0'	17°04.6	9.3'	55.7'
11	343°42.5	23.3	121°49.3	12.1'	16°55.3	9.4'	55.7'
12	358°42.5	N22°23.0	136°20.5	12.2'	S16°45.9	9.5'	55.7'
13	13°42.4	22.7	150°51.7	12.3'	16°36.4	9.5'	55.7'
14	28°42.3	22.4	165°23.0	12.4'	16°26.8	9.6'	55.6'
15	43°42.2	· · 22.1	179°54.5	12.5'	16°17.2	9.7'	55.6'
16	58°42.1	21.8	194°25.9	12.5'	16°07.5	9.7'	55.6'
17	73°42.0	21.5	208°57.5	12.6'	15°57.7	9.8'	55.6'
18	88°41.9	N22°21.2	223°29.2	12.7'	S15°47.9	9.9'	55.5'
19	103°41.8	20.9	238°00.9	12.8'	15°38.0	9.9'	55.5'
20	118°41.7	20.6	252°32.7	12.8'	15°28.1	10.0'	55.5'
21	133°41.6	· · 20.3	267°04.6	12.9'	15°18.1	10.0'	55.5'
22	148°41.5	20.0	281°36.6	13.0'	15°08.0	10.1'	55.5'
23	163°41.4	19.7	296°08.6	13.1'	14°57.9	10.2'	55.4'
SD.=15.7		d=-0.3	S.D.=15.3				
Thu	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°41.4	N22°19.4	310°40.7	13.2'	S14°47.7	10.2'	55.4'
1	193°41.3	19.1	325°12.9	13.2'	14°37.5	10.3'	55.4'
2	208°41.2	18.8	339°45.2	13.3'	14°27.2	10.3'	55.4'
3	223°41.1	· · 18.5	354°17.5	13.4'	14°16.8	10.4'	55.3'
4	238°41.0	18.2	8°49.9	13.5'	14°06.4	10.4'	55.3'
5	253°40.9	17.9	23°22.4	13.5'	13°56.0	10.5'	55.3'
6	268°40.8	N22°17.6	37°55.0	13.6'	S13°45.5	10.5'	55.3'
7	283°40.7	17.3	52°27.6	13.7'	13°34.9	10.6'	55.2'
8	298°40.6	16.9	67°00.3	13.7'	13°24.3	10.6'	55.2'
9	313°40.5	· · 16.6	81°33.1	13.8'	13°13.7	10.7'	55.2'
10	328°40.5	16.3	96°05.9	13.9'	13°03.0	10.7'	55.2'
11	343°40.4	16.0	110°38.9	13.9'	12°52.2	10.8'	55.2'
12	358°40.3	N22°15.7	125°11.8	14.0'	S12°41.4	10.8'	55.1'
13	13°40.2	15.4	139°44.9	14.1'	12°30.6	10.9'	55.1'
14	28°40.1	15.1	154°18.0	14.1'	12°19.7	10.9'	55.1'
15	43°40.0	· · 14.8	168°51.2	14.2'	12°08.8	10.9'	55.1'
16	58°39.9	14.5	183°24.4	14.3'	11°57.8	11.0'	55.1'
17	73°39.8	14.1	197°57.7	14.3'	11°46.8	11.0'	55.0'
18	88°39.7	N22°13.8	212°31.1	14.4'	S11°35.7	11.1'	55.0'
19	103°39.7	13.5	227°04.5	14.5'	11°24.7	11.1'	55.0'
20	118°39.6	13.2	241°38.0	14.5'	11°13.5	11.1'	55.0'
21	133°39.5	· · 12.9	256°11.5	14.6'	11°02.4	11.2'	55.0'
22	148°39.4	12.6	270°45.1	14.6'	10°51.2	11.2'	54.9'
23	163°39.3	12.2	285°18.8	14.7'	10°39.9	11.3'	54.9'
SD.=15.7		d=-0.3	S.D.=15.1				
Fri	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°39.2	N22°11.9	299°52.5	14.8'	S10°28.6	11.3'	54.9'
1	193°39.1	11.6	314°26.3	14.8'	10°17.3	11.3'	54.9'
2	208°39.0	11.3	329°00.1	14.9'	10°06.0	11.4'	54.9'
3	223°39.0	· · 11.0	343°34.0	14.9'	09°54.6	11.4'	54.8'
4	238°38.9	10.6	358°08.0	15.0'	09°43.2	11.4'	54.8'
5	253°38.8	10.3	12°42.0	15.0'	09°31.8	11.5'	54.8'
6	268°38.7	N22°10.0	27°16.0	15.1'	S09°20.3	11.5'	54.8'
7	283°38.6	09.7	41°50.1	15.1'	09°08.8	11.5'	54.8'
8	298°38.5	09.3	56°24.3	15.2'	08°57.3	11.5'	54.8'
9	313°38.4	· · 09.0	70°58.5	15.2'	08°45.7	11.6'	54.7'
10	328°38.4	08.7	85°32.7	15.3'	08°34.1	11.6'	54.7'
11	343°38.3	08.4	100°07.0	15.3'	08°22.5	11.6'	54.7'
12	358°38.2	N22°08.0	114°41.3	15.4'	S08°10.9	11.6'	54.7'
13	13°38.1	07.7	129°15.7	15.4'	07°59.2	11.7'	54.7'
14	28°38.0	07.4	143°50.2	15.5'	07°47.5	11.7'	54.7'
15	43°37.9	· · 07.0	158°24.6	15.5'	07°35.8	11.7'	54.6'
16	58°37.9	06.7	172°59.1	15.5'	07°24.1	11.7'	54.6'
17	73°37.8	06.4	187°33.7	15.6'	07°12.3	11.8'	54.6'
18	88°37.7	N22°06.1	202°08.3	15.6'	S07°00.6	11.8'	54.6'
19	103°37.6	05.7	216°42.9	15.7'	06°48.8	11.8'	54.6'
20	118°37.5	05.4	231°17.6	15.7'	06°36.9	11.8'	54.6'
21	133°37.4	· · 05.1	245°52.3	15.7'	06°25.1	11.8'	54.6'
22	148°37.4	04.7	260°27.1	15.8'	06°13.3	11.9'	54.6'
23	163°37.3	04.4	275°01.9	15.8'	06°01.4	11.9'	54.5'
SD.=15.7		d=-0.3	S.D.=15.0				

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

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

Day	Sun		Mer. Pass hh:mm	Moon	
	Eqn.of Time 00 <sup>h</sup> mm:ss	12 <sup>h</sup> mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm
08	05:06	05:10	12:05	02:36	15:00
09	05:15	05:19	12:05	03:24	15:46
10	05:23	05:27	12:05	04:08	16:29

July 11, 12, 13 (Sat., Sun., Mon.)

	Aries			Venus			Mars			Jupiter			Saturn			Stars		
Sat	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec		SHA	Dec		
0	289°21.7	220°46.6	N17°25.9	281°05.1	S00°06.1	354°43.5	S21°49.8	347°47.4	S20°29.6					Alpheratz	357°38.3	29°12.0		
1	304°24.2	235°47.8	26.0	296°06.2	05.6	9°46.3	49.9	2°50.0	29.6					Ankaa	353°10.7	-42°11.5		
2	319°26.6	250°48.9	26.2	311°07.4	05.1	24°49.1	49.9	17°52.7	29.7					Schedar	349°34.9	56°38.6		
3	334°29.1	265°50.1	· · 26.3	326°08.5	· · 04.6	39°51.9	· · 50.0	32°55.3	· · 29.7					Diphda	348°50.9	-17°52.4		
4	349°31.6	280°51.3	26.5	341°09.7	04.1	54°54.7	50.1	47°58.0	29.7					Achernar	335°23.1	-57°07.8		
5	4°34.0	295°52.4	26.6	356°10.8	03.6	69°57.5	50.1	63°00.6	29.8					Hamal	327°55.3	23°33.3		
6	19°36.5	310°53.6	N17°26.8	11°12.0	S00°03.1	85°00.3	S21°50.2	78°03.3	S20°29.8					Polaris	315°51.5	89°20.6		
7	34°39.0	325°54.7	26.9	26°13.2	02.6	100°03.1	50.2	93°05.9	29.9					Acamar	315°14.8	-40°13.2		
8	49°41.4	340°55.9	27.1	41°14.3	02.1	115°05.9	50.3	108°08.6	29.9					Menkar	314°10.1	4°10.1		
9	64°43.9	355°57.0	· · 27.2	56°15.5	· · 01.6	130°08.7	· · 50.4	123°11.2	· · 29.9					Mirfak	308°33.6	49°55.7		
10	79°46.4	10°58.2	27.4	71°16.6	01.1	145°11.5	50.4	138°13.9	30.0					Aldebaran	290°44.0	16°32.9		
11	94°48.8	25°59.3	27.5	86°17.8	00.6	160°14.3	50.5	153°16.5	30.0					Rigel	281°07.6	-8°10.7		
12	109°51.3	41°00.5	N17°27.7	101°18.9	S00°00.1	175°17.1	S21°50.5	168°19.2	S20°30.1					Capella	280°27.6	46°00.9		
13	124°53.8	56°01.6	27.8	116°20.1	N00°00.4	190°19.9	50.6	183°21.8	30.1					Bellatrix	278°27.1	6°22.0		
14	139°56.2	71°02.7	28.0	131°21.3	00.8	205°22.7	50.7	198°24.5	30.2					Elnath	278°06.8	28°37.3		
15	154°58.7	86°03.9	· · 28.1	146°22.4	· · 01.3	220°25.5	· · 50.7	213°27.1	· · 30.2					Alnilam	275°41.7	-1°11.4		
16	170°01.1	101°05.0	28.3	161°23.6	01.8	235°28.3	50.8	228°29.8	30.2					Betelgeuse	270°56.3	7°24.6		
17	185°03.6	116°06.1	28.5	176°24.7	02.3	250°31.1	50.8	243°32.4	30.3					Canopus	263°54.5	-52°42.4		
18	200°06.1	131°07.3	N17°28.6	191°25.9	N00°02.8	265°33.9	S21°50.9	258°35.1	S20°30.3					Sirius	258°29.8	-16°44.7		
19	215°08.5	146°08.4	28.8	206°27.1	03.3	280°36.7	50.9	273°37.7	30.4					Adhara	255°09.1	-29°00.0		
20	230°11.0	161°09.5	28.9	221°28.2	03.8	295°39.5	51.0	288°40.4	30.4					Procyon	244°55.0	5°10.3		
21	245°13.5	176°10.6	· · 29.1	236°29.4	· · 04.3	310°42.3	· · 51.1	303°43.0	· · 30.4					Pollux	243°22.1	27°58.6		
22	260°15.9	191°11.8	29.3	251°30.5	04.8	325°45.1	51.1	318°45.7	30.5					Avior	234°16.7	-59°34.6		
23	275°18.4	206°12.9	29.4	266°31.7	05.3	340°47.9	51.2	333°48.4	30.5					Suhail	222°49.3	-43°31.0		
Mer.pass.:04:41			v1.2 d0.1 m-4.5			v1.2 d0.5 m-0.7			v2.8 d-0.1 m-2.6			v2.7 d-0.0 m0.1						
Sun	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	290°20.9	221°14.0	N17°29.6	281°32.9	N00°05.8	355°50.8	S21°51.2	348°51.0	S20°30.6					Denebola	182°28.8	14°27.7		
1	305°23.3	236°15.1	29.7	296°34.0	06.3	10°53.6	51.3	3°53.7	30.6					Gienah	175°47.4	-17°39.3		
2	320°25.8	251°16.2	29.9	311°35.2	06.8	25°56.4	51.4	18°56.3	30.7					Acrux	173°04.1	-63°12.9		
3	335°28.2	266°17.3	· · 30.1	326°36.4	· · 07.3	40°59.2	· · 51.4	33°59.0	· · 30.7					Gacrux	171°55.6	-57°13.8		
4	350°30.7	281°18.4	30.2	341°37.5	07.7	56°02.0	51.5	49°01.6	30.7					Alioth	166°16.4	55°51.3		
5	5°33.2	296°19.5	30.4	356°38.7	08.2	71°04.8	51.5	64°04.3	30.8					Spica	158°26.1	-11°16.0		
6	20°35.6	311°20.6	N17°30.6	11°39.9	N00°08.7	86°07.6	S21°51.6	79°06.9	S20°30.8					Alkaid	152°54.9	49°13.1		
7	35°38.1	326°21.7	30.7	26°41.0	09.2	101°10.4	51.7	94°09.6	30.9					Hadar	148°40.8	-60°28.4		
8	50°40.6	341°22.8	30.9	41°42.2	09.7	116°13.2	51.7	109°12.2	30.9					Menkent	148°01.7	-36°28.3		
9	65°43.0	356°23.9	· · 31.1	56°43.4	· · 10.2	131°16.0	· · 51.8	124°14.9	· · 30.9					Arcturus	145°51.2	19°04.8		
10	80°45.5	11°25.0	31.2	71°44.5	10.7	146°18.8	51.8	139°17.5	31.0					Rigel Kent.	139°44.9	-60°55.3		
11	95°48.0	26°26.1	31.4	86°45.7	11.2	161°21.6	51.9	154°20.2	31.0					Kochab	137°19.5	74°04.7		
12	110°50.4	41°27.1	N17°31.6	101°46.9	N00°11.7	176°24.4	S21°51.9	169°22.8	S20°31.1					Zuben'ubi	136°59.9	-16°07.5		
13	125°52.9	56°28.2	31.7	116°48.0	12.2	191°27.2	52.0	184°25.5	31.1					Alphecca	126°06.6	26°39.0		
14	140°55.4	71°29.3	31.9	131°49.2	12.7	206°30.0	52.1	199°28.1	31.1					Antares	112°20.0	-26°28.6		
15	155°57.8	86°30.4	· · 32.1	146°50.4	· · 13.1	221°32.8	· · 52.1	214°30.8	· · 31.2					Atria	107°16.9	-69°03.9		
16	171°00.3	101°31.4	32.2	161°51.5	13.6	236°35.6	52.2	229°33.4	31.2					Sabik	102°06.6	-15°44.9		
17	186°02.7	116°32.5	32.4	176°52.7	14.1	251°38.4	52.2	244°36.1	31.3					Shaula	96°14.9	-37°07.0		
18	201°05.2	131°33.6	N17°32.6	191°53.9	N00°14.6	266°41.2	S21°52.3	259°38.8	S20°31.3					Rasalhague	96°01.6	12°32.9		
19	216°07.7	146°34.6	32.8	206°55.1	15.1	281°44.0	52.4	274°41.4	31.4					Eltanin	90°43.4	51°29.4		
20	231°10.1	161°35.7	32.9	221°56.2	15.6	296°46.9	52.4	289°44.1	31.4					Kaus Aust.	83°36.9	-34°22.4		
21	246°12.6	176°36.8	· · 33.1	236°57.4	· · 16.1	311°49.7	· · 52.5	304°46.7	· · 31.4					Vega	80°35.2	38°48.3		
22	261°15.1	191°37.8	33.3	251°58.6	16.6	326°52.5	52.5	319°49.4	31.5					Nunki	75°51.9	-26°16.2		
23	276°17.5	206°38.9	33.4	266°59.7	17.1	341°55.3	52.6	334°52.0	31.5					Altair	62°03.1	8°55.4		
Mer.pass.:04:37			v1.1 d0.2 m-4.5			v1.2 d0.5 m-0.7			v2.8 d-0.1 m-2.6			v2.7 d-0.0 m0.1						
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec					
0	291°20.0	221°39.9	N17°33.6	282°00.9	N00°17.5	356°58.1	S21°52.7	349°54.7	S20°31.6					Peacock	53°10.9	-56°40.0		
1	306°22.5	236°41.0	33.8	297°02.1	18.0	12°00.9	52.7	4°57.3	31.6					Deneb	49°27.7	45°21.1		
2	321°24.9	251°42.0	34.0	312°03.3	18.5	27°03.7	52.8	20°00.0	31.6					Enif	33°42.1	9°58.1		
3	336°27.4	266°43.1	· · 34.1	327°04.4	· · 19.0	42°06.5	· · 52.8	35°02.6	· · 31.7					Al Na'ir	27°37.2	-46°51.5		
4	351°29.8	281°44.1	34.3	342°05.6	19.5	57°09.3	52.9	50°05.3	31.7					Fomalhaut	15°18.3	-29°30.7		
5	6°32.3	296°45.2	34.5	357°06.8	20.0	72°12.1	52.9	65°07.9	31.8					Scheat	13°48.4	28°11.5		
6	21°34.8	311°46.2	N17°34.7	12°08.0	N00°20.5	87°14.9	S21°53.0	80°10.6	S20°31.8					Markab	13°33.3	15°18.8		
7	36°37.2	326°47.2	34.9	27°09.1	21.0	102°17.7	53.1	95°13.2	31.9									
8	51°39.7	341°48.3	35.0	42°10.3	21.4	117°20.5	53.1	110°15.9	31.9									
9	66°42																	



h		Sun		Moon			
Sat	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°37.2	N22°04.0	289°36.7	15.8'	S05°49.5	11.9'	54.5'
1	193°37.1	03.7	304°11.5	15.9'	05°37.6	11.9'	54.5'
2	208°37.0	03.4	318°46.4	15.9'	05°25.7	11.9'	54.5'
3	223°37.0	· · 03.0	333°21.4	15.9'	05°13.7	11.9'	54.5'
4	238°36.9	02.7	347°56.3	16.0'	05°01.8	12.0'	54.5'
5	253°36.8	02.4	2°31.3	16.0'	04°49.8	12.0'	54.5'
6	268°36.7	N22°02.0	17°06.3	16.0'	S04°37.9	12.0'	54.5'
7	283°36.6	01.7	31°41.3	16.1'	04°25.9	12.0'	54.4'
8	298°36.5	01.3	46°16.4	16.1'	04°13.9	12.0'	54.4'
9	313°36.5	· · 01.0	60°51.5	16.1'	04°01.9	12.0'	54.4'
10	328°36.4	00.7	75°26.6	16.1'	03°49.8	12.0'	54.4'
11	343°36.3	00.3	90°01.8	16.2'	03°37.8	12.0'	54.4'
12	358°36.2	N22°00.0	104°36.9	16.2'	S03°25.8	12.0'	54.4'
13	13°36.1	21°59.6	119°12.1	16.2'	03°13.7	12.1'	54.4'
14	28°36.1	59.3	133°47.3	16.2'	03°01.7	12.1'	54.4'
15	43°36.0	· · 58.9	148°22.5	16.2'	02°49.6	12.1'	54.4'
16	58°35.9	58.6	162°57.8	16.3'	02°37.5	12.1'	54.4'
17	73°35.8	58.2	177°33.0	16.3'	02°25.5	12.1'	54.4'
18	88°35.7	N21°57.9	192°08.3	16.3'	S02°13.4	12.1'	54.3'
19	103°35.7	57.6	206°43.6	16.3'	02°01.3	12.1'	54.3'
20	118°35.6	57.2	221°18.9	16.3'	01°49.2	12.1'	54.3'
21	133°35.5	· · 56.9	235°54.3	16.3'	01°37.1	12.1'	54.3'
22	148°35.4	56.5	250°29.6	16.3'	01°25.0	12.1'	54.3'
23	163°35.4	56.2	265°04.9	16.4'	01°12.9	12.1'	54.3'
SD.=15.7		d=-0.3	S.D.=14.9				
Sun	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°35.3	N21°55.8	279°40.3	16.4'	S01°00.8	12.1'	54.3'
1	193°35.2	55.4	294°15.7	16.4'	00°48.7	12.1'	54.3'
2	208°35.1	55.1	308°51.1	16.4'	00°36.6	12.1'	54.3'
3	223°35.0	· · 54.7	323°26.5	16.4'	00°24.5	12.1'	54.3'
4	238°35.0	54.4	338°01.8	16.4'	00°12.4	12.1'	54.3'
5	253°34.9	54.0	352°37.3	16.4'	S00°00.4	12.1'	54.3'
6	268°34.8	N21°53.7	7°12.7	16.4'	N00°11.7	12.1'	54.3'
7	283°34.7	53.3	21°48.1	16.4'	00°23.8	12.1'	54.3'
8	298°34.7	53.0	36°23.5	16.4'	00°35.9	12.1'	54.3'
9	313°34.6	· · 52.6	50°58.9	16.4'	00°48.0	12.1'	54.3'
10	328°34.5	52.3	65°34.3	16.4'	01°00.1	12.1'	54.3'
11	343°34.4	51.9	80°09.7	16.4'	01°12.2	12.1'	54.3'
12	358°34.4	N21°51.5	94°45.1	16.4'	N01°24.2	12.1'	54.3'
13	13°34.3	51.2	109°20.6	16.4'	01°36.3	12.1'	54.3'
14	28°34.2	50.8	123°56.0	16.4'	01°48.3	12.1'	54.3'
15	43°34.1	· · 50.5	138°31.4	16.4'	02°00.4	12.0'	54.2'
16	58°34.1	50.1	153°06.8	16.4'	02°12.4	12.0'	54.2'
17	73°34.0	49.7	167°42.2	16.4'	02°24.4	12.0'	54.2'
18	88°33.9	N21°49.4	182°17.6	16.4'	N02°36.5	12.0'	54.2'
19	103°33.8	49.0	196°52.9	16.4'	02°48.5	12.0'	54.2'
20	118°33.8	48.6	211°28.3	16.4'	03°00.5	12.0'	54.2'
21	133°33.7	· · 48.3	226°03.7	16.4'	03°12.5	12.0'	54.2'
22	148°33.6	47.9	240°39.0	16.3'	03°24.4	12.0'	54.2'
23	163°33.5	47.5	255°14.4	16.3'	03°36.4	12.0'	54.2'
SD.=15.7		d=-0.4	S.D.=14.8				
Mon	GHA	Dec	GHA	$\nu$	Dec	d	HP
0	178°33.5	N21°47.2	269°49.7	16.3'	N03°48.4	11.9'	54.3'
1	193°33.4	46.8	284°25.0	16.3'	04°00.3	11.9'	54.3'
2	208°33.3	46.4	299°00.3	16.3'	04°12.2	11.9'	54.3'
3	223°33.3	· · 46.1	313°35.6	16.3'	04°24.1	11.9'	54.3'
4	238°33.2	45.7	328°10.8	16.3'	04°36.0	11.9'	54.3'
5	253°33.1	45.3	342°46.1	16.2'	04°47.9	11.9'	54.3'
6	268°33.0	N21°45.0	357°21.3	16.2'	N04°59.8	11.9'	54.3'
7	283°33.0	44.6	11°56.5	16.2'	05°11.6	11.8'	54.3'
8	298°32.9	44.2	26°31.7	16.2'	05°23.4	11.8'	54.3'
9	313°32.8	· · 43.8	41°06.9	16.2'	05°35.2	11.8'	54.3'
10	328°32.8	43.5	55°42.0	16.1'	05°47.0	11.8'	54.3'
11	343°32.7	43.1	70°17.1	16.1'	05°58.8	11.8'	54.3'
12	358°32.6	N21°42.7	84°52.2	16.1'	N06°10.5	11.7'	54.3'
13	13°32.5	42.4	99°27.3	16.1'	06°22.3	11.7'	54.3'
14	28°32.5	42.0	114°02.3	16.0'	06°34.0	11.7'	54.3'
15	43°32.4	· · 41.6	128°37.4	16.0'	06°45.7	11.7'	54.3'
16	58°32.3	41.2	143°12.3	16.0'	06°57.3	11.6'	54.3'
17	73°32.3	40.8	157°47.3	15.9'	07°09.0	11.6'	54.3'
18	88°32.2	N21°40.5	172°22.2	15.9'	N07°20.6	11.6'	54.3'
19	103°32.1	40.1	186°57.1	15.9'	07°32.2	11.6'	54.3'
20	118°32.1	39.7	201°32.0	15.8'	07°43.7	11.5'	54.3'
21	133°32.0	· · 39.3	216°06.8	15.8'	07°55.2	11.5'	54.3'
22	148°31.9	38.9	230°41.6	15.8'	08°06.8	11.5'	54.4'
23	163°31.9	38.6	245°16.4	15.7'	08°18.2	11.5'	54.4'
SD.=15.7		d=-0.4	S.D.=14.8				

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

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

Day	Sun		Mer. Pass hh:mm	Moon		Age
	Eqn.of Time 00 <sup>h</sup> mm:ss	12 <sup>h</sup> mm:ss		Mer.Pass. Upper hh:mm	Lower hh:mm	
11	05:31	05:35	12:06	04:50	17:10	20(64%)
12	05:39	05:43	12:06	05:30	17:51	21(55%)
13	05:46	05:50	12:06	06:11	18:31	22(45%)