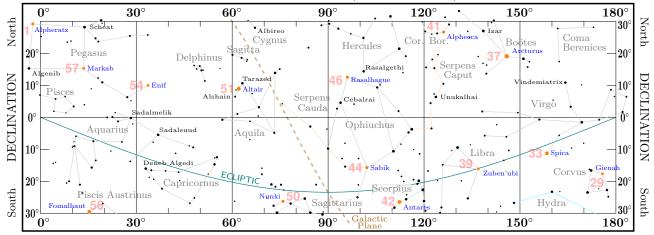
GENERATED USING EPHEM AND SKYFIELD

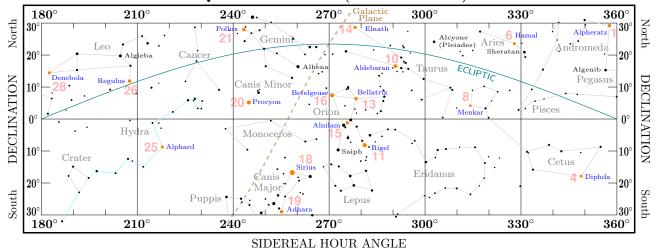
http://rhodesmill.org/skyfield/





SIDEREAL HOUR ANGLE

EQUATORIAL STARS (SHA 180° to 360°)



THE NAUTICAL ALMANAC

from 27.6.2021

Author: Andrew Bauer
Original concept from: Enno Rodegerdts

April 11, 2021

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars	
Sun	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA	Dec
0	$275^{\circ}19.5$	153°01.2 N21°44.4	143°00.0 N19°04.8	300°51.2 S 11°38.7	320°03.5 \$17°42.6	Alpheratz 357°37.7	29°12.3
1	290°21.9	168°00.4 43.8	158°00.9 04.3	315°53.7 38.7	335°06.1 42.7	'	-42°11.2
2	305°24.4	182°59.7 43.2	173°01.8 03.9	330°56.2 38.8	350°08.7 42.7	Schedar 349°34.3	56°38.9
3 4	320°26.9 335°29.3	197°59.0 · · 42.6 212°58.3 42.0	188°02.7 · · 03.5 203°03.6	345°58.7 · · 38.8 1°01.2 38.8	5°11.3 · · · 42.8 20°13.9	Diphda 348°50.2	-17°52.1
5	350°31.8	212 56.5 42.0 227°57.5 41.4	218° 04.5 02.6	1°01.2 38.8 16°03.7 38.8	20°13.9 42.8 35°16.5 42.8		-57°07.5
6	5°34.2	242°56.8 N21°40.8	233°05.4 N19°02.2	31°06.3 S11°38.9	50°19.1 S17°42.9	Hamal 327°54.6	23°33.6
7	20°36.7	257°56.1 40.1	248°06.2 01.8	46°08.8 38.9	65°21.7 42.9	Polaris 315°39.0 Acamar 315°14.3	89°20.9 -40°13.0
8	35°39.2	272°55.3 39.5	263°07.1 01.4	61°11.3 38.9	80°24.2 43.0	Menkar 314°09.4	4°10.3
9	50°41.6	287°54.6 · · 38.9	278°08.0 · · 00.9	76°13.8 · · 39.0	95°26.8 · · 43.0	Mirfak 308°32.7	49°56.0
10 11	65°44.1 80°46.6	302°53.9 38.3 317°53.1 37.7	293°08.9 00.5 308°09.8 19°00.1	91°16.3 39.0 106°18.8 39.0	110°29.4 43.0 125°32.0 43.1	Aldebaran 290°43.2	16°33.0
12	95°49.0	332°52.4 N21°37.0	323°10.7 N18°59.6	121°21.3 \$11°39.1	140°34.6 S17°43.1	Rigel 281°07.0	-8°10.6
13	110°51.5	347°51.7 36.4	338°11.6 59.2	136°23.8 39.1	155°37.2 43.2	Capella 280°26.6	46°01.0
14	125°54.0	2°51.0 35.8	353°12.5 58.8	151°26.3 39.1	170°39.8 43.2	Bellatrix 278°26.3 Elnath 278°05.9	6°22.1 28°37.4
15	140°56.4	17°50.2 · · 35.2	8°13.4 · · 58.4	166°28.9 · · 39.2	185°42.4 · · 43.2	Alnilam 275°41.0	-1°11.3
16	155°58.9	32°49.5 34.5	23°14.3 57.9	181°31.4 39.2	200°45.0 43.3	Betelgeuse 270°55.5	7°24.6
17 18	171°01.4 186°03.8	47°48.8 33.9 62°48.1 N21°33.3	38°15.2 57.5 53°16.1 N18°57.1	196°33.9 39.2 211°36.4 \$11°39.2	215°47.6 43.3 230°50.2 \$17°43.4		-52°42.4
19	201°06.3	77°47.3 32.7	68°16.9 56.6	226°38.9 39.3	245°52.8 43.4	1	-16°44.7
20	216°08.7	92°46.6 32.0	83°17.8 56.2	241°41.4 39.3	260°55.4 43.5		-29°00.1
21	231°11.2	107°45.9 · · 31.4	98°18.7 · · 55.8	256°43.9 · · 39.3	275°58.0 · · 43.5	Procyon 244°54.2 Pollux 243°21.2	5°10.2 27°58.5
22	246°13.7	122°45.2 30.8	113°19.6 55.4	271°46.5 39.4	291°00.5 43.5	1	-59°34.8
23	261°16.1	137°44.4 30.1	128°20.5 54.9	286°49.0 39.4	306°03.1 43.6	1	-43°31.2
Mer.p	ass.:05:38	v-0.7 d-0.6 m-3.8	v0.9 d-0.4 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4	Miaplacidus 221°39.5	-69°48.5
						Alphard 217°50.8	-8°45.1
Mon	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Regulus 207°37.7	11°51.9
0	276°18.6	152°43.7 N21°29.5	143°21.4 N18°54.5	301°51.5 S 11°39.4	321°05.7 S 17°43.6	Dubhe 193°44.9 Denebola 182°28.0	61°38.5 14°27.3
1	291°21.1	167°43.0 28.9	158°22.3 54.1	316°54.0 39.5	336°08.3 43.7		-17°39.7
2	306°23.5	182°42.3 28.2	173°23.2 53.6	331°56.5 39.5	351°10.9 43.7	1	-63°13.3
3	321°26.0	197°41.6 · · 27.6	188°24.1 · · 53.2	346°59.0 · · 39.5	6°13.5 · · 43.8	Gacrux 171°54.7	-57°14.2
4 5	336°28.5 351°30.9	212°40.8 27.0 227°40.1 26.3	203°25.0 52.8 218°25.9 52.3	2°01.6 39.6 17°04.1 39.6	21°16.1 43.8 36°18.7 43.8	Alioth 166°15.5	55°51.0
6	6°33.4	242°39.4 N21°25.7	233°26.8 N18°51.9	32°06.6 \$11°39.6	51°21.3 S17°43.9		-11°16.3
7	21°35.9	257°38.7 25.0	248°27.7 51.5	47°09.1 39.7	66°23.9 43.9	Alkaid 152°54.2 Hadar 148°39.7	49°12.7 -60°28.7
8	36°38.3	272°38.0 24.4	263°28.6 51.1	62°11.6 39.7	81°26.5 44.0	1	-36°28.6
9	51°40.8	287°37.3 · · 23.7	278°29.4 · · 50.6	77°14.1 · · 39.7	96°29.1 · · 44.0	Arcturus 145°50.4	19°04.5
10	66°43.2	302°36.5 23.1	293°30.3 50.2	92°16.7 39.8	111°31.7 44.0		-60°55.5
11 12	81°45.7 96°48.2	317°35.8 22.5 332°35.1 N21°21.8	308°31.2 49.8 323°32.1 N18°49.3	107°19.2 39.8 122°21.7 \$11°39.8	126°34.3 44.1 141°36.9 \$17°44.1	Kochab 137°19.2	74°04.4
13	111°50.6	347°34.4 21.2	338°33.0 48.9	137°24.2 39.9	156°39.5 44.2		-16°07.8
14	126°53.1	2°33.7 20.5	353°33.9 48.5	152°26.7 39.9	171°42.1 44.2	Alphecca 126°05.9 Antares 112°19.0	26°38.7 -26°28.7
15	141°55.6	17°33.0 · · 19.9	8°34.8 · · 48.0	167°29.3 · · 39.9	186°44.7 · · 44.3		-69°04.0
16	156°58.0	32°32.3 19.2	23°35.7 47.6	182°31.8 40.0	201°47.3 44.3		-15°45.0
17	172°00.5	47°31.5 18.6	38°36.6 47.2	197°34.3 40.0	216°49.9 44.3	Shaula 96°13.9	-37°07.1
18 19	187°03.0 202°05.4	62°30.8 N21°17.9 77°30.1 17.3	53°37.5 N18°46.7 68°38.4 46.3	212°36.8 \$11°40.0 227°39.4 40.1	231°52.4 S17°44.4 246°55.0 44.4	Rasalhague 96°00.9	12°32.8
20	217°07.9	92°29.4 16.6	83°39.3 45.9	242°41.9 40.1	261°57.6 44.5	Eltanin 90°43.0	51°29.2
21	232°10.4	107°28.7 · · 15.9	98°40.2 · · 45.4	257°44.4 · · 40.1	277°00.2 · · 44.5	Kaus Aust. 83°35.9 Vega 80°34.7	-34°22.4 38°48.2
22	247°12.8	122°28.0 15.3	113°41.1 45.0	272°46.9 40.2	292°02.8 44.6		-26°16.1
23	262°15.3	137°27.3 14.6	128° 42.0 44.6	287°49.4 40.2	307°05.4 44.6	Altair 62°02.4	8°55.5
Mer.p	ass.:05:34	v-0.7 d-0.6 m-3.8	v0.9 d-0.4 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4	Peacock 53°09.8	-56°39.8
						Deneb 49°27.3	45°21.3
Tue	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Enif 33°41.4	9°58.3
0	277°17.7	152°26.6 N21°14.0	143°42.9 N18°44.1	302°52.0 \$11°40.2	322°08.0 \$17°44.6	1	-46°51.3 -29°30.4
1	$292^{\circ}20.2$	167°25.9 13.3	158° 43.8 43.7	317°54.5 40.3	337°10.6 44.7	Scheat 13°47.8	28°11.7
2	307°22.7	182°25.2 12.6	173° 44.7 43.3	332°57.0 40.3	352°13.2 44.7	Markab 13°32.6	15°19.1
3	322°25.1	197°24.4 · · 12.0	188° 45.6 · · 42.8	347°59.5 · · 40.3	7°15.8 · · 44.8		
4 5	337°27.6 352°30.1	212°23.7 11.3 227°23.0 10.7	203°46.5 42.4 218°47.3 41.9	3°02.1 40.4 18°04.6 40.4	22°18.4 44.8 37°21.0 44.9	Jun 27 Sun SHA Venus 237°41.7	Mer.pass 13:49
6	7°32.5	242°22.3 N21°10.0	233° 48.2 N18° 41.5	33°07.1 S11°40.4	52°23.6 S17°44.9	Mars 227°40.5	14:27
7	22°35.0	257°21.6 09.3	248°49.1 41.1	48°09.6 40.5	67°26.2 44.9	Jupiter 25°31.7	03:56
8	$37^{\circ}37.5$	272°20.9 08.7	263°50.0 40.6	63°12.2 40.5	82°28.8 45.0	Saturn 44°44.1	02:39
9	52°39.9	287°20.2 · · 08.0	278°50.9 · · 40.2	78°14.7 · · 40.5	97°31.4 · · 45.0	Jun 28 Mon SHA	Mer.pass
10	67°42.4	302°19.5 07.3	293°51.8 39.8	93°17.2 40.6	112°34.0 45.1	Venus 236°25.1	13:50
11 12	82°44.8 97°47.3	317°18.8 06.6 332°18.1 N21°06.0	308°52.7 39.3 323°53.6 N18°38.9	108°19.7 40.6 123°22.3 \$11°40.7	127°36.6 45.1 142°39.2 \$17°45.2	Mars 227°02.8	14:26
13	97 47.3 112°49.8	347°17.4 05.3	338° 54.5 38.4	138°24.8 40.7	157°41.8 45.2	Jupiter 25°32.9	03:52
14	127°52.2	2°16.7 04.6	353°55.4 38.0	153°27.3 40.7	172°44.4 45.2	Saturn 44°47.1	02:35
15	$142^{\circ}54.7$	17°16.0 · · 04.0	8°56.3 · · 37.6	168°29.9 · · 40.8	187°47.0 · · 45.3	Jun 29 Tue SHA	Mer.pass
16	157°57.2	32°15.3 03.3	23°57.2 37.1	183°32.4 40.8	202°49.6 45.3	Venus 235°08.8	13:51
17	172°59.6	47°14.6 02.6	38°58.1 36.7	198°34.9 40.8	217° 52.2 45.4	Mars 226°25.1	14:24
18 19	188°02.1 203°04.6	62°13.9 N21°01.9 77°13.2 01.2	53°59.0 N18°36.3 68°59.9 35.8	213°37.4 \$11°40.9 228°40.0 40.9	232°54.8 S17°45.4 247°57.4 45.5	Jupiter 25°34.2	03:48
20	203 04.6 218°07.0	92°12.5 21°00.6	84°00.8 35.4	243°42.5 41.0	263°00.0 45.5	Saturn 44°50.3	02:31
21	233°09.5	107°11.8 20°59.9	99°01.7 · · 34.9	258° 45.0 · · 41.0	278°02.6 · · 45.6	Horizontal parallax	
22	248°12.0	122°11.1 59.2	114°02.6 34.5	273°47.6 41.0	293°05.2 45.6	Venus:	0.1
23	263°14.4	137°10.4 58.5	129°03.5 34.1	288°50.1 41.1	308°07.8 45.6	Mars:	0.1
Mer.p	ass.:05:30	v-0.7 d-0.7 m-3.8	v0.9 d-0.4 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4		

h	Su	Sun Moon					
Sun	GHA	Dec	GHA	ν	Dec	d	HP
0	179°14.7	$N23^{\circ}19.2$	$325^{\circ}55.9$	5.7'	S 22°58.6	7.2'	59.2'
1	194°14.6	19.1	340°20.7	5.9'	22°51.3	7.3'	59.2'
2	209°14.4 224°14.3	19.0	354°45.6 9°10.6	6.0'	22°43.9 22°36.4	7.5'	59.1' 59.1'
3 4	224°14.3 239°14.2	· · 18.9 18.8	9°10.6 23°35.7	6.1' 6.2'	22°36.4 22°28.7	7.6' 7.7'	59.1' 59.1'
5	254°14.1	18.7	38°01.0	6.3	22°21.0	7.9'	59.1°
6	269°13.9	N23°18.6	52°26.4	6.4	S22°13.0	8.0'	59.0'
7	284°13.8	18.4	$66^{\circ}51.9$	6.6'	22°05.0	8.1'	59.0'
8	299°13.7	18.3	81°17.5	6.7'	21°56.8	8.2'	58.9'
9	314°13.5 329°13.4	• • 18.2	95°43.2	6.8'	21°48.5	8.4'	58.9'
10 11	329°13.4 344°13.3	18.1 18.0	110°09.1 124°35.0	6.9' 7.0'	21°40.0 21°31.5	8.5' 8.6'	58.8' 58.8'
12	359°13.2	N23°17.9	139°01.1	7.2	521°22.8	8.7	58.8'
13	14°13.0	17.8	153°27.3	7.3'	21°14.0	8.9'	58.7'
14	$29^{\circ}12.9$	17.7	$167^{\circ}53.7$	7.4'	$21^{\circ}05.1$	9.0'	58.7'
15	44°12.8	• • 17.6	182°20.1	7.5'	20°56.1	9.1'	58.7'
16 17	59°12.6 74°12.5	17.5 17.4	196°46.7 211°13.4	7.6' 7.8'	20°46.9 20°37.7	9.2' 9.3'	58.6' 58.6'
18	89°12.4	N23°17.2	225°40.2	7.9	\$20°28.3	9.4	58.5
19	104°12.3	17.1	240°07.1	8.0'	20°18.9	9.5'	58.5'
20	$119^{\circ}12.1$	17.0	254°34.2	8.1'	20°09.3	9.6'	58.5'
21	134°12.0	•• 16.9	269°01.4	8.2'	$19^{\circ}59.6$	9.7'	58.4'
22	149°11.9	16.8	283°28.7	8.4'	19°49.8	9.8'	58.4'
23	164°11.8	16.7	297°56.1	8.5'	19°39.9	9.9'	58.4'
	SD.=15.7	d=-0.1		S.	D.=16.0		
Mon	GHA	Dec	GHA	ν	Dec	d	HP
0	179°11.6	N23°16.6	312°23.7	8.6'	\$19°29.9	10.0'	58.3
1	$194^{\circ}11.5$	16.4	$326^{\circ}51.3$	8.7'	$19^{\circ}19.9$	10.1'	58.3'
2	209°11.4	16.3	341°19.1	8.8'	19°09.7	10.2'	58.2'
3	224°11.2	• • 16.2	355°47.0	9.0'	18°59.4	10.3'	58.2'
4 5	239°11.1 254°11.0	16.1 16.0	10°15.0 24°43.2	9.1' 9.2'	18°49.1 18°38.6	10.4' 10.5'	58.2' 58.1'
6	269°10.9	N23°15.8	39°11.4	9.2	\$18°28.1	10.5	58.1
7	284°10.7	15.7	53°39.8	9.4	18°17.4	10.7	58.0'
8	299°10.6	15.6	68°08.3	9.6'	18°06.7	10.8'	58.0'
9	314° 10.5	• • 15.5	82°36.9	9.7'	17°55.9	10.8'	58.0'
10	329°10.4	15.3	97°05.6	9.8'	17°45.0	10.9'	57.9'
11 12	344°10.2 359°10.1	15.2 N23°15.1	111°34.5 126°03.4	9.9' 10.0'	17°34.1 \$17°23.0	11.0' 11.1'	57.9' 57.9'
13	14°10.0	15.0	140°32.5	10.1	17°11.9	11.1	57.9 57.8'
14	29°09.9	14.8	155°01.7	10.2'	17°00.7	11.2'	57.8'
15	44°09.7	• • 14.7	$169^{\circ}31.0$	10.4'	$16^{\circ}49.4$	11.3'	57.7'
16	59°09.6	14.6	184°00.4	10.5'	16°38.1	11.4'	57.7'
17 18	74°09.5 89°09.4	14.5 N23°14.3	198°29.9 212°59.6	10.6' 10.7'	16°26.7 \$16°15.2	11.4' 11.5'	57.7' 57.6'
19	104°09.2	14.2	212 59.0 227°29.3	10.7	16°03.7	11.6'	57.6'
20	119°09.1	14.1	241°59.2	10.9	15°52.0	11.6'	57.5'
21	134°09.0	• • 13.9	$256^{\circ}29.1$	11.0'	15°40.4	11.7'	57.5'
22	149°08.8	13.8	270°59.2	11.1'	15°28.6	11.8'	57.5'
23	164°08.7	13.7	285°29.4	11.2'	15°16.8	11.8'	57.4'
	SD.=15.7	d=-0.1		S.	D.=15.8		
Tue	GHA	Dec	GHA	ν	Dec	d	HP
0	179°08.6	N23°13.5	299°59.7	11.3'	\$15°04.9	11.9'	57.4'
1	194°08.5	13.4	$314^{\circ}30.1$	11.4'	14°53.0	12.0'	57.4'
2	209°08.3	13.3	329°00.5	11.5'	14°41.0	12.0'	57.3'
3	224°08.2 239°08.1	13.1	343°31.1	11.6'	14°29.0 14°16.9	12.1'	57.3'
4 5	239°08.1 254°08.0	13.0 12.9	358°01.8 12°32.6	11.7' 11.8'	14°16.9 14°04.8	12.1' 12.2'	57.2' 57.2'
6	269°07.8	N23°12.7	27°03.5	11.9'	\$13°52.6	12.2'	57.2'
7	284°07.7	12.6	41°34.5	12.0'	13°40.3	12.3'	57.1'
8	299°07.6	12.4	56°05.6	12.1'	13°28.0	12.3'	57.1'
9	314°07.5	• • 12.3	70°36.8	12.2'	13°15.7	12.4'	57.1'
10 11	329°07.4 344°07.2	12.2 12.0	85°08.1 99°39.5	12.3' 12.4'	13°03.3 12°50.8	12.4' 12.5'	57.0' 57.0'
12	359°07.1	N23°11.9	114°10.9	12.5'	\$12°38.3	12.5'	56.9
13	14°07.0	11.7	128°42.5	12.6'	12°25.8	12.5'	56.9'
14	29°06.9	11.6	143°14.2	12.7'	12°13.2	12.6'	56.9'
15	44°06.7	• • 11.4	157°45.9	12.8'	12°00.6	12.6'	56.8'
16 17	59°06.6 74°06.5	11.3 11.1	172°17.7 186°49.7	12.9' 13.0'	11°48.0 11°35.3	12.7' 12.7'	56.8' 56.8'
18	89°06.4	N23°11.0	201°21.7	13.1'	\$11°22.6	12.7'	56.7
19	104°06.2	10.9	215°53.8	13.1	11°09.8	12.8'	56.7
20	$119^{\circ}06.1$	10.7	230°25.9	13.2'	10°57.0	12.8'	56.7'
21	134°06.0	• • 10.6	244°58.2	13.3'	10°44.2	12.8'	56.6'
22	149°05.9	10.4	259°30.5 274°03.0	13.4'	10°31.4 10°18.5	12.9'	56.6'
23	164°05.7	10.3	2/4 03.0	13.5'		12.9'	56.6'
	SD.=15.7	d=-0.1		S.	D.=15.5		

Lat.	Twi	light	Sunrise	Sunset	Twi	light
Lat.	Naut.	Civil	Junisc	Juliset	Civil	Naut.
N 72°						
N 70°						
68°						
66°						
64°			01:37	22:29		
62°			02:14	21:52		
60°		00:57	02:40	21:27	23:08	
N 58°		01:45	03:00	21:06	22:21	
56°		02:14	03:16	20:50	21:52	
54°	00:52	02:36	03:30	20:36	21:30	23:13
52°	01:37	02:54	03:43	20:24	21:12	22:29
50°	02:04	03:09	03:53	20:13	20:57	22:02
45°	02:49	03:38	04:16	19:51	20:28	21:17
N 40°	03:19	04:01	04:34	19:33	20:06	20:47
35°	03:42	04:19	04:49	19:18	19:48	20:24
30°	04:01	04:34	05:01	19:05	19:33	20:06
20°	04:30	04:59	05:23	18:43	19:08	19:37
N 10°	04:52	05:19	05:42	18:24	18:47	19:15
0°	05:11	05:37	06:00	18:07	18:29	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	16:11	17:03
S 60°	07:11	80:80	09:05	15:02	15:59	16:56
		Moonris	·o		Moonsot	

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

		Sun		Moon			
Day	Eqn.of Time		Mer.	Mer.Pass.		Age	
,	00 ^h	12 ^h	Pass	Upper	Lower	17-19	
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	90-73%	
27	03:01	03:07	12:03	02:22	14:50		
28	03:13	03:20	12:03	03:17	15:43		
29	03:26	03:32	12:04	04:08	16:32		

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

h	Aries	Venus	Mars	Jupiter	Saturn	Stars
Wed	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	SHA Dec
0	278°16.9	152°09.7 N20°57.8	144°04.4 N18°33.6	303°52.6 S 11°41.1	323°10.4 \$17°45.7	
1	293°19.3	167°09.0 57.2	159°05.3 33.2	318°55.2 41.1	338°13.0 45.7	·
2	308°21.8	182°08.3 56.5	174°06.2 32.7	333°57.7 41.2	353°15.6 45.8	Ankaa 353°10.0 -42°11.2 Schedar 349°34.2 56°38.9
3	323°24.3	197°07.6 · · 55.8	189°07.1 · · 32.3	349°00.2 · · 41.2	8°18.2 · · 45.8	Diphda 348°50.2 -17°52.1
4	338°26.7	212°06.9 55.1	204°08.0 31.9	4°02.8 41.3	23°20.8 45.9	
5	353°29.2	227°06.2 54.4	219°08.9 31.4	19°05.3 41.3	38°23.4 45.9	Achernar 335°22.6 -57°07.5 Hamal 327°54.6 23°33.6
6	8°31.7	242°05.5 N20°53.7	234°09.8 N18°31.0	34°07.8 S 11°41.3	53°26.0 S17°45.9	Polaris 315°37.9 89°20.9
7	23°34.1	257°04.9 53.0	249° 10.7 30.5	49°10.4 41.4	68°28.6 46.0	Acamar 315°14.3 -40°13.0
8	38°36.6	272°04.2 52.3	264°11.6 30.1	64°12.9 41.4	83°31.2 46.0	Menkar 314°09.4 4°10.3
9	53°39.1	287°03.5 · · 51.6	279°12.5 · · 29.7	79°15.4 · · 41.4	98°33.8 · · 46.1	Mirfak 308°32.7 49°56.0
10	68°41.5	302°02.8 51.0	294°13.4 29.2	94°18.0 41.5	113°36.4 46.1	Aldebaran 290°43.2 16°33.0
11	83°44.0	317°02.1 50.3	309°14.3 28.8	109°20.5 41.5	128°39.0 46.2	Rigel 281°07.0 -8°10.6
12	98°46.5	332°01.4 N20°49.6	324°15.2 N18°28.3	124°23.0 \$11°41.6	143°41.6 \$17°46.2	Capella 280°26.6 46°01.0
13	113°48.9	347°00.7 48.9	339°16.1 27.9	139°25.6 41.6	158°44.2 46.3	Bellatrix 278°26.3 6°22.1
14	128°51.4	2°00.0 48.2	354°17.0 27.4	154°28.1 41.6	173°46.8 46.3	Elnath 278°05.9 28°37.4
15	143°53.8	16°59.3 · · 47.5	9°17.9 · · 27.0	169°30.6 · · 41.7	188°49.4 · · 46.3	Alnilam 275°41.0 -1°11.3
16	158°56.3	31°58.6 46.8	24°18.8 26.6	184°33.2 41.7	203°52.0 46.4	Betelgeuse 270°55.5 7°24.6
17	173°58.8	46°58.0 46.1	39°19.7 26.1 54°20.6 N18°25.7	199°35.7 41.8 214°38.2 \$11°41.8	218°54.6 46.4 233°57.2 \$17°46.5	Canopus 263°54.2 -52°42.4
18	189°01.2	61°57.3 N20°45.4				Sirius 258°29.1 -16°44.7
19	204°03.7	76°56.6 44.7	69°21.5 25.2	229°40.8 41.8	248° 59.8 46.5	Adhara 255°08.5 -29°00.1
20	219°06.2	91°55.9 44.0 106°55.2 · · 43.3	84°22.4 24.8 99°23.3 · · 24.3	244°43.3 41.9 259°45.8 •• 41.9	264°02.4 46.6	Procyon 244°54.2 5°10.2
21	234°08.6				279°05.0 · · 46.6 294°07.6 46.6	Pollux 243°21.2 27°58.5
22 23	249°11.1 264°13.6	121°54.5 42.6 136°53.9 41.8	114°24.2 23.9 129°25.1 23.4	274°48.4 42.0 289°50.9 42.0		Avior 234°16.4 -59°34.8
23	204 13.0	136°53.9 41.8	129°25.1 23.4	289°50.9 42.0	309°10.2 46.7	Suhail 222°48.7 -43°31.2
Mer.p	ass.:05:26	v-0.7 d-0.7 m-3.8	v0.9 d-0.4 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4	Miaplacidus 221°39.5 -69°48.4
	·					Alphard 217°50.8 -8°45.1
ть	CHA	CHA Dos	CHA Doo	CHA Doe	CHA Dec	Regulus 207°37.7 11°51.9
Thu 0	GHA 279°16.0	GHA Dec 151°53.2 N20°41.1	GHA Dec 144°26.0 N18°23.0	GHA Dec 304°53.5 S 11°42.0	GHA Dec 324°12.8 S 17°46.7	Dubhe 193°44.9 61°38.5
1	279 10.0 294°18.5	166°52.5 40.4	159° 26.9 22.6	319°56.0 42.1	339°15.4 46.8	Denebola 182°28.0 14°27.3
2	309°20.9	181°51.8 39.7	174° 27.8 22.1	334°58.5 42.1	354°18.0 46.8	Gienah 175°46.6 -17°39.7
3	324°23.4	196°51.1 · · 39.0	189°28.7 · · 21.7	350°01.1 · · 42.2	9°20.6 · · 46.9	Acrux 173°03.2 -63°13.3
4	339°25.9	211°50.4 38.3	204°29.6 21.2	5°03.6 42.2	24°23.2 46.9	Gacrux 171°54.8 -57°14.2
5	354°28.3	226°49.8 37.6	219° 30.5 20.8	20°06.2 42.2	39°25.8 47.0	Alioth 166°15.5 55°51.0
6	9°30.8	241°49.1 N20°36.9	234°31.4 N18°20.3	35°08.7 \$11°42.3	54°28.4 S17°47.0	Spica 158°25.3 -11°16.3
7	24°33.3	256°48.4 36.2	249°32.3 19.9	50°11.2 42.3	69°31.0 47.0	Alkaid 152°54.2 49°12.7
8	39°35.7	271°47.7 35.4	264° 33.2 19.4	65°13.8 42.4	84°33.6 47.1	Hadar 148°39.7 -60°28.7
9	54°38.2	286°47.0 · · 34.7	279°34.1 · · 19.0	80°16.3 · · 42.4	99°36.2 · · 47.1	Menkent 148°00.8 -36°28.6
10	69°40.7	301°46.4 34.0	294°35.0 18.5	95° 18.9 42.4	114°38.9 47.2	Arcturus 145°50.4 19°04.5
11	84°43.1	316°45.7 33.3	309°35.9 18.1	110°21.4 42.5	129° 41.5 47.2	Rigil Kent. 139°43.8 -60°55.6
12	99°45.6	331°45.0 N20°32.6	324°36.8 N18°17.6	125°24.0 \$11°42.5	144°44.1 \$17°47.3	Kochab 137°19.2 74°04.4
13	114°48.1	346°44.3 31.9	339°37.7 17.2	140°26.5 42.6	159°46.7 47.3	Zuben'ubi 136°59.0 -16°07.8
14	129°50.5	1°43.7 31.1	354°38.6 16.7	155°29.0 42.6	174°49.3 47.4	Alphecca 126°05.9 26°38.8
15	144°53.0	16°43.0 · · 30.4	9°39.5 · · 16.3	170°31.6 · · 42.7	189°51.9 · · 47.4	Antares 112°19.0 -26°28.7
16	159°55.4	31°42.3 29.7	24°40.4 15.8	185°34.1 42.7	204°54.5 47.4	Atria 107°15.3 -69°04.0
17	174°57.9	46°41.6 29.0	39°41.3 15.4	200°36.7 42.7	219°57.1 47.5	Sabik 102°05.8 -15°45.0
18	190°00.4	61°41.0 N20°28.2	54°42.2 N18°15.0	215°39.2 \$11°42.8	234°59.7 \$17°47.5	Shaula 96°13.9 -37°07.1
19	205°02.8	76°40.3 27.5	69°43.1 14.5	230°41.8 42.8	250°02.3 47.6	Rasalhague 96°00.9 12°32.8
20	220°05.3	91°39.6 26.8	84°44.0 14.1	245°44.3 42.9	265°04.9 47.6	Eltanin 90°43.0 51°29.2
21	235°07.8	106°38.9 · · 26.1	99°44.9 · · 13.6	260°46.8 · · 42.9	280°07.5 · · 47.7	Kaus Aust. 83°35.9 -34°22.4
22	250°10.2	121°38.3 25.3	114°45.8 13.2	275°49.4 43.0	295°10.1 47.7	Vega 80°34.7 38°48.2 Nunki 75°51.0 -26°16.1
23	265°12.7	136° 37.6 24.6	129°46.7 12.7	290°51.9 43.0	310°12.7 47.8	
N 4	05.00		00104 10	05.100.05	261000	Altair 62°02.4 8°55.5 Peacock 53°09.8 -56°39.8
ivier.p	ass.:05:22	v-0.7 d-0.7 m-3.8	v0.9 d-0.4 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4	Deneb 49°27.3 45°21.3
						Enif 33°41.4 9°58.3
Fri	GHA	GHA Dec	GHA Dec	GHA Dec	GHA Dec	Al Na'ir 27°36.3 -46°51.3
0	280°15.2	151°36.9 N20°23.9	144°47.6 N18°12.3	305°54.5 S 11°43.0	325°15.3 S 17°47.8	Fomalhaut 15°17.6 -29°30.4
1	295°17.6	166°36.3 23.1	159°48.5 11.8	320°57.0 43.1	340°17.9 47.9	Scheat 13°47.8 28°11.7
2	$310^{\circ}20.1$	181°35.6 22.4	174°49.4 11.4	335°59.6 43.1	355°20.5 47.9	Markab 13°32.6 15°19.1
3	325°22.5	196°34.9 · · 21.7	189°50.3 · · 10.9	351°02.1 · · 43.2	10°23.1 · · 47.9	
4	340°25.0	211°34.3 20.9	204°51.2 10.5	6°04.7 43.2	25°25.7 48.0	Jun 30 Wed SHA Mer.pass
5	355°27.5	226°33.6 20.2	219°52.1 10.0	21°07.2 43.3	40°28.3 48.0	Venus 233°52.8 13:52
6	10°29.9	241°32.9 N20°19.5	234°53.0 N18°09.6	36°09.8 S 11°43.3	55°31.0 S 17°48.1	Mars 225°47.5 14:23
7	25°32.4	256° 32.3 18.7	249°53.9 09.1	51°12.3 43.3	70°33.6 48.1	Jupiter 25°35.7 03:44
8	40°34.9	271°31.6 18.0	264°54.8 08.6	66°14.9 43.4	85°36.2 48.2	Saturn 44°53.5 02:27
9	55°37.3	286°30.9 · · 17.2	279°55.7 · · 08.2	81°17.4 · · 43.4	100°38.8 · · 48.2	Jul 01 Thu SHA Mer.pass
10	70°39.8	301°30.3 16.5	294°56.7 07.7	96°20.0 43.5	115°41.4 48.3	Jul 01 Thu SHA Mer.pass Venus 232°37.1 13:53
11	85°42.3	316°29.6 15.8	309° 57.6 07.3	111°22.5 43.5	130°44.0 48.3	Mars 225°10.0 14:21
12	100°44.7	331°28.9 N20°15.0	324°58.5 N18°06.8	126°25.1 S 11°43.6	145°46.6 \$17°48.3	Jupiter 25°37.4 03:40
13	115°47.2	346°28.3 14.3	339°59.4 06.4	141°27.6 43.6	160°49.2 48.4	Saturn 44°56.8 02:23
14	130°49.7	1°27.6 13.5	355°00.3 05.9	156° 30.2 43.7	175°51.8 48.4	Jatum 44 50.0 02:23
15	145°52.1	16°27.0 · · 12.8	10°01.2 · · 05.5	171°32.7 · · 43.7	190°54.4 · · 48.5	Jul 02 Fri SHA Mer.pass
16	160°54.6	31°26.3 12.0	25°02.1 05.0	186°35.3 43.7	205°57.0 48.5	Venus 231°21.8 13:54
17	175°57.0	46°25.6 11.3	40°03.0 04.6	201°37.8 43.8	220°59.6 48.6	Mars 224°32.5 14:20
18	190°59.5	61°25.0 N20°10.5	55°03.9 N18°04.1	216°40.4 S 11°43.8	236°02.2 S 17°48.6	Jupiter 25°39.3 03:36
19	206°02.0	76°24.3 09.8	70°04.8 03.7	231°42.9 43.9	251°04.8 48.7	Saturn 45°00.2 02:19
20	221°04.4	91°23.7 09.0	85°05.7 03.2	246°45.5 43.9	266°07.4 48.7	Hadaa
21	236°06.9	106°23.0 · · 08.3	100°06.6 · · 02.8	261°48.0 · · 44.0	281°10.1 · · 48.8	Horizontal parallax
22	251°09.4	121°22.3 07.5	115°07.5 02.3	276°50.6 44.0	296°12.7 48.8	Venus: 0.1
23	266°11.8	136°21.7 06.8	130°08.4 01.8	291°53.1 44.1	311°15.3 48.8	Mars: 0.1
Mern	ass.:05:18	v-0.7 d-0.7 m-3.8	v0.9 d-0.5 m1.8	v2.5 d-0.0 m-2.5	v2.6 d-0.0 m0.4	
р						

19°0.56 N.23°10.1 288°3.55 13.5′ S10°0.66 12.9′ S6 1 194°0.5.5 10.0 303°0.81 13.6′ 09°5.2.6 13.0′ 5.6 2 209°0.5.4 09.8 317°40.7 13.7′ 09°3.7 13.0′ 5.6 3 224°0.5.1 09.5 346°46.3 13.8′ 09°2.6.7 13.0′ 5.6 5 254°0.5.0 09.3 1°19.2 13.9′ 09°0.0.6 13.1′ 5.6 6 269°0.4.9 N.23°0.02 15°5.21 14.0′ 508°47.5 13.1′ 5.6 6 269°0.4.9 N.23°0.2 15°5.21 14.0′ 508°47.5 13.1′ 5.6 8 269°0.4.6 08.9 44°5.8 2 14.1′ 08°3.4 4 13.1′ 5.6 9 314°0.4.5 · 08.7 59°31.4 14.2′ 08°0.8 2 13.1′ 5.6 11 344°0.4.3 08.4 88°3.8.0 14.3′ 07°5.5 13.2′ 5.6 11 344°0.3 08.4 88°3.8.0 14.3′ 07°5.5 13.2′ 5.6 15 59°0.4.1 N.23°0.2 103°11.3 14.4′ 507°2.8 7 13.2′ 5.6 15 6 59°0.3 7 07.6 161°2.5.4 14.6′ 06°3.8 13.2′ 5.6 16 59°0.3 7 07.6 161°2.5.4 14.6′ 06°3.8 13.2′ 5.6 17 74°0.3 07.4 175°5.1 14.7′ 06°2.2 5 13.3′ 5.6 18 89°0.4 N.23°0.7 3 190°3.2 14.8′ 506°0.3 13.3′ 5.5 19 104°0.3 07.1 205°0.6 14.8′ 05°5.0 13.3′ 5.5 10 170°0.2 09.9 210°40.5 14.9′ 05°2.2 13.3′ 5.5 11 344°0.2 8 06.4 263°2.2 15.0′ 05°0.2 13.3′ 5.5 24 109°0.2 00.6 248°4.4 15.0′ 05°0.2 13.3′ 5.5 25 254°0.2 00.6 236°4.5 14.9′ 05°2.2 13.3′ 5.5 25 254°0.1 00.8 234°1.4 14.9′ 05°2.2 13.3′ 5.5 25 254°0.1 00.8 234°1.4 14.9′ 05°2.2 13.3′ 5.5 26 20 20°0.2 N23°0.5 2 5°5.9 307°0.4 15.5′ 30°4.9 13.3′ 5.5 25 254°0.1 00.8 234°1.4 14.9′ 05°2.2 13.3′ 5.5 25 254°0.1 00.8 234°1.4 14.9′ 05°2.2 13.3′ 5.5′ 254°0.1 10°3.0 110°3.2 0.6 21° 40°5.1 13.3′ 5.5′ 1.1 04°0.2 0.6 248°4.4 15.0′ 05°0.2 13.3′ 5.5′ 254°0.1 10° 110° 110° 110° 110° 110° 110° 1	h	Su	n			Moon		
1 194°05.5 10.0 303°08.1 13.6° 09°52.6 13.0° 56° 2 209°05.4 0.98 317°40.7 13.7° 09°39.7 13.0° 56° 324°05.2 0.96 332°13.5 13.8° 09°39.7 13.0° 56° 254°05.1 095.3 346°46.3 13.8° 09°30.6 13.1° 56° 254°05.0 09.3 1°19.2 13.9° 09°0.6 13.1° 56° 256°04.9 N23°09.2 15°52.1 14.1° 08°34.5 13.1° 56° 26°04.9 N23°09.2 15°52.1 14.1° 08°34.4 13.1° 56° 29°04.6 08.9 44°58.2 14.1° 08°34.4 13.1° 56° 21° 24°04.5 08.7 59°34.1 14.2° 08°34.4 13.1° 56° 21° 24° 24° 24° 24° 24° 24° 24° 24° 24° 24	Wed	GHA	Dec	GHA	ν	Dec	d	HP
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22	20	119°03.2	06.9	219°40.5	14.9'	05°42.7	13.3'	55.9'
22	21	134°03.1	• • 06.8	234°14.4	14.9'	05°29.4	13.3'	55.8'
Thu GHA		149°02.9	06.6	248°48.4		05°16.1	13.3'	55.8'
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4 239°02.2 05.6 336°13.2 15.3′ 03°56.2 13.3′ 55 5 254°02.1 05.4 350°47.5 15.3′ 03°42.9 13.3′ 55 6 269°02.0 N23°05.2 5°21.8 15.4′ 503°29.5 13.3′ 55 7 284°01.9 05.1 19°56.2 15.4′ 03°16.2 13.3′ 55 8 299°01.7 04.9 34°30.6 15.4′ 03°02.9 13.3′ 55 10 329°01.5 04.6 63°39.6 15.5′ 02°36.2 13.3′ 55 11 344°01.4 04.4 78°14.1 15.6′ 02°22.9 13.3′ 55 11 344°01.4 04.4 78°14.1 15.6′ 02°22.9 13.3′ 55 12 359°01.3 N23°04.2 92°48.7 15.6′ 502°0.6 13.3′ 55 13 14°01.1 04.0 107°23.3 15.6′ 01°56.3 13.3′ 55 14 29°01.0 03.8 121°58.0 15.7′ 01°42.9 13.3′ 55 15 44°00.9 ·· 03.7 136°32.6 15.7′ 01°42.9 13.3′ 55 16 59°00.8 03.5 151°07.4 15.7′ 01°42.9 13.3′ 55 17 74°00.7 03.3 165°42.1 15.8′ 500°36.5 13.3′ 55 18 89°00.5 N23°03.1 180°16.9 15.8′ 500°49.8 13.3′ 55 19 104°00.4 02.9 194°51.7 15.8′ 500°49.8 13.3′ 55 21 134°00.2 ·· 02.6 224°01.4 15.9′ 500°10.0 13.2′ 55 21 134°00.2 ·· 02.6 224°01.4 15.9′ 500°10.0 13.2′ 55 22 149°00.1 02.4 238°36.3 15.9′ N00°03.3 13.2′ 55 22 149°00.1 02.4 238°36.3 15.9′ N00°03.3 13.2′ 55 3 223°59.5 ·· 01.5 311°31.0 16.0′ 01°42.9 13.2′ 55 4 238°59.4 01.3 326°06.0 16.0′ 00°42.9 13.2′ 55 2 253°59.2 01.1 340°41.0 16.0′ 01°09.3 13.2′ 55 6 268°59.1 N23°00.9 355°16.1 16.1′ 00°41.9 13.2′ 55 6 268°59.1 N23°00.9 355°16.1 16.1′ 00°41.9 13.1′ 54 2 238°58.4 01.3 326°06.0 16.0′ 01°09.3 13.2′ 55 6 268°59.1 N23°00.9 355°16.1 16.1′ 00°41.9 13.1′ 54 2 238°59.0 00.7 9°51.1 16.1′ 02°14.9 13.1′ 54 10 338°58.8 ·· 00.3 33°01.3 16.1′ 02°14.9 13.1′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°24.1 13.0′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°41.1 13.0′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°41.1 13.0′ 54 12 358°58.4 N22°58.6 170°17.7 16.1′ 03°33.1 13.0′ 55 14 28°58.2 59.4 111°56.9 16.1′ 03°33.1 13.0′ 54 15 43°58.1 ·· 59.2 126°32.0 16.1′ 03°40.0 12.9′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°01.8 13.1′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°01.8 13.1′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°01.8 13.1′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°01.8 13.1′ 54 11 343°58.5 23°00.0 68°1.5 16.1′ 03°33.1 13.0′ 54 11 33°57.6 58.4 188°26.6 16.2′ 04°30.4 12.8′ 54								55.7'
5 254°02.1 05.4 350°47.5 15.3' 03°42.9 13.3' 55°7 6 269°02.0 N23°05.2 5°21.8 15.4' 503°29.5 13.3' 55°7 7 284°01.9 05.1 19°56.2 15.4' 03°16.2 13.3' 55°8 8 299°01.7 04.9 34°30.6 15.5' 02°49.5 13.3' 55°10 9 314°01.6 0.04.7 49°05.1 15.5' 02°49.5 13.3' 55°11 10 329°01.3 N23°04.2 92°48.7 15.6' 502°09.6 13.3' 55°11 13 14°01.1 04.0 107°23.3 15.6' 01°56.3 13.3' 55°14 29°01.0 03.8 121°58.0 15.7' 01°42.9 13.3' 55°16 44°00.9 03.7 136°32.6 15.7' 01°42.9 13.3' 55°16 59°00.8 03.5 151°07.4 15.7' 01°16.3 13.3' 55°16 13.3' 55°26 16°00.7 03°8.2 <td< td=""><th>3</th><td></td><td>• • 05.8</td><td></td><td>15.2'</td><td></td><td>13.3'</td><td>55.7'</td></td<>	3		• • 05.8		15.2'		13.3'	55.7'
6								55.6'
7	5	254°02.1	05.4	350°47.5	15.3'	03°42.9	13.3'	55.6'
8	6	269°02.0	N23°05.2	5°21.8	15.4'	S03°29.5	13.3'	55.6'
9	7	284°01.9	05.1	19°56.2	15.4'	03°16.2	13.3'	55.5'
10	8	299°01.7	04.9	34°30.6	15.4'	03°02.9	13.3'	55.5'
11	9	314°01.6	• • 04.7	49°05.1	15.5'	02°49.5	13.3'	55.5'
12	10	329°01.5	04.6	63°39.6	15.5'	02°36.2	13.3'	55.5'
13 14°01.1 04.0 107°23.3 15.6' 01°56.3 13.3' 55 14 29°01.0 03.8 121°58.0 15.7' 01°42.9 13.3' 55 15 44°00.9 · 03.7 136°32.6 15.7' 01°42.9 13.3' 55 16 59°00.8 03.5 151°07.4 15.7' 01°16.3 13.3' 55 17 74°00.7 03.3 165°42.1 15.8' 01°03.0 13.3' 55 18 89°00.5 N23°03.1 180°16.9 15.8' S00°49.8 13.3' 55 19 104°00.4 02.9 194°51.7 15.8' 00°36.5 13.3' 55 20 119°00.3 02.8 209°26.5 15.8' 00°36.5 13.3' 55 21 134°00.2 · 02.6 224°01.4 15.9' S00°10.0 13.2' 55 22 149°00.1 02.4 238°36.3 15.9' N00°03.3 13.2' 55 23 163°59.9 02.2 253°11.2 15.9' 00°16.5 13.2' 55 24 193°59.7 01.8 282°21.0 16.0' 00°42.9 13.2' 55 25 208°59.6 01.7 296°56.0 16.0' 00°42.9 13.2' 55 2 208°59.6 01.7 296°56.0 16.0' 00°42.9 13.2' 55 2 23 238°59.2 01.1 340°41.0 16.0' 01°09.3 13.2' 55 2 523°59.2 01.1 340°41.0 16.0' 01°35.6 13.1' 55 6 268°59.1 N23°0.9 355°16.1 16.1' N01°48.7 13.1' 54 2 288°59.0 00.7 9°51.1 16.1' 02°01.8 13.1' 54 2 298°58.9 00.5 24°26.2 16.1' 02°14.9 13.1' 54 3 298°58.9 00.5 24°26.2 16.1' 02°14.9 13.1' 54 9 313°58.8 · 00.3 39°01.3 16.1' 02°24.0 13.1' 54 10 328°58.7 00.1 53°36.4 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°41.1 13.0' 54 12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°33.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.8 59.0 114°07.2 16.1' 03°33.1 13.0' 54 16 58°58.0 59.0 141°07.2 16.1' 03°33.1 13.0' 54 16 58°58.0 59.0 141°07.2 16.1' 03°33.1 13.0' 54 16 58°58.0 59.0 141°07.2 16.1' 03°33.1 13.0' 54 17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°50.4 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 04°50.4 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 04°50.4 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°03.2 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54	11	344°01.4	04.4	78°14.1	15.6'	02°22.9	13.3'	55.4'
14	12	359°01.3	N23°04.2	92°48.7	15.6'	502°09.6	13.3'	55.4'
14		14°01.1	04.0	107°23.3		01°56.3		55.4'
15		29°01.0	03.8	121°58.0		01°42.9		55.3'
16 59°00.8 03.5 151°07.4 15.7′ 01°16.3 13.3′ 55 17 74°00.7 03.3 165°42.1 15.8′ 01°03.0 13.3′ 55 18 89°00.5 N23°03.1 180°16.9 15.8′ S00°49.8 13.3′ 55 19 104°00.4 02.9 194°51.7 15.8′ 00°36.5 13.3′ 55 20 119°00.3 02.8 209°26.5 15.8′ 00°32.2 13.3′ 55 21 134°00.2 ·· 02.6 224°01.4 15.9′ S00°10.0 13.2′ 55 22 149°00.1 02.4 238°36.3 15.9′ N00°03.3 13.2′ 55 23 163°59.9 02.2 253°11.2 15.9′ 00°16.5 13.2′ 55 24 193°59.7 01.8 282°21.0 16.0′ 00°42.9 13.2′ 55 3 223°59.5 ·· 01.5 311°31.0 16.0′ 01°09.3 13.2′ 55 25 253°59.2 01.1 340°41.0 16.0′ 01°35.6 13.1′ 55 26 268°59.1 N23°00.9 355°16.1 16.1′ 02°01.8 13.1′ 55 27 283°59.9 00.7 9°51.1 16.1′ 02°01.8 13.1′ 54 288°58.9 00.5 24°26.2 16.1′ 02°41.1 13.0′ 54 10 328°58.7 00.1 53°36.4 16.1′ 02°24.1 13.0′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°54.1 13.0′ 54 11 343°58.5 23°00.0 68°11.5 16.1′ 02°54.1 13.0′ 54 12 358°58.4 N22°59.8 82°46.6 16.1′ 03°33.1 13.0′ 54 14 28°58.2 59.4 111°66.9 16.1′ 03°35.6 13.1′ 54 15 43°58.1 ·· 59.2 126°32.0 16.1′ 03°35.1 13.0′ 54 16 58°58.0 59.0 141°07.2 16.1′ 03°40.0 12.9′ 54 16 58°58.0 59.0 141°07.2 16.1′ 03°46.0 12.9′ 54 16 58°58.0 59.0 141°07.2 16.1′ 03°46.0 12.9′ 54 18 88°57.7 N22°58.6 170°17.5 16.2′ N04°24.7 12.9′ 54 18 88°57.5 58.2 199°27.8 16.2′ 04°37.6 12.8′ 54 20 118°57.5 58.2 199°27.8 16.2′ 04°37.6 12.8′ 54 21 133°57.4 ·· 58.0 214°02.9 16.2′ 05°03.2 12.8′ 54 22 148°57.3 57.8 228°38.1 16.2′ 05°16.0 12.8′ 54 23 163°57.1 57.6 243°13.2 16.1′ 05°28.7 12.7′ 54			03.7					55.3'
17 74°00.7 03.3 165°42.1 15.8' 01°03.0 13.3' 55 18 89°00.5 N23°03.1 180°16.9 15.8' S00°49.8 13.3' 55 19 104°00.4 02.9 194°51.7 15.8' 00°36.5 13.3' 55 20 119°00.3 02.8 209°26.5 15.8' 00°23.2 13.3' 55 21 134°00.2 ·· 02.6 224°01.4 15.9' S00°10.0 13.2' 55 22 149°00.1 02.4 238°36.3 15.9' N00°03.3 13.2' 55 23 163°59.9 02.2 253°11.2 15.9' 00°16.5 13.2' 55 SD.=15.7 d=-0.2 S.D.=15.1 Fri GHA Dec GHA ν Dec 0 178°59.8 N23°02.0 267°46.1 15.9' N00°29.7 13.2' 55 1 193°59.7 01.8 282°21.0 16.0' 00°42.9 13.2' 55 2 208°59.6 01.7 296°56.0 16.0' 00°42.9 13.2' 55 3 223°59.5 ·· 01.5 311°31.0 16.0' 01°09.3 13.2' 55 4 238°59.4 01.3 326°06.0 16.0' 01°09.3 13.2' 55 5 253°59.2 01.1 340°41.0 16.0' 01°35.6 13.1' 55 6 268°59.1 N23°00.9 355°16.1 16.1' N01°48.7 13.1' 55 6 268°59.1 N23°00.9 355°16.1 16.1' 02°41.9 13.1' 54 9 313°58.8 ·· 00.3 39°01.3 16.1' 02°28.0 13.1' 54 10 328°58.7 00.1 53°36.4 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°41.1 13.0' 54 12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°33.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°46.0 12.9' 54 15 43°58.1 ·· 59.2 126°32.0 16.1' 03°46.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 ·· 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 04°50.4 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 04°50.4 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54		59°00.8						55.3'
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Fri GHA Dec GHA ν Dec d H 0 178° 59.8 N23° 02.0 267° 46.1 15.9' N00° 29.7 13.2' 55 1 193° 59.7 01.8 282° 21.0 16.0' 00° 42.9 13.2' 55 2 208° 59.6 01.7 296° 56.0 16.0' 00° 42.9 13.2' 55 3 223° 59.5 · · 01.5 311° 31.0 16.0' 01° 09.3 13.2' 55 4 238° 59.4 01.3 326° 06.0 16.0' 01° 22.4 13.2' 55 5 253° 59.2 01.1 340° 41.0 16.0' 01° 35.6 13.1' 55 6 268° 59.1 N23° 00.9 355° 16.1 16.1' N01° 48.7 13.1' 55 7 283° 59.0 00.7 9° 51.1 16.1' 02° 01.8 13.1' 54 9 313° 58.8 · 00.3 39° 01.3 16.1' 02° 14.9 13.1' 54	25						19.4	55.1
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7 283°59.0 00.7 9°51.1 16.1' 02°01.8 13.1' 54 8 298°58.9 00.5 24°26.2 16.1' 02°14.9 13.1' 54 9 313°58.8 · 00.3 39°01.3 16.1' 02°28.0 13.1' 54 10 328°58.7 00.1 53°36.4 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°54.1 13.0' 54 12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 · 59.2 126°32.0 16.1' 03°46.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 <tr< td=""><th></th><td></td><td></td><td></td><td></td><td></td><td></td><td>55.0'</td></tr<>								55.0'
8 298°58.9 00.5 24°26.2 16.1' 02°14.9 13.1' 54 9 313°58.8 · 00.3 39°01.3 16.1' 02°28.0 13.1' 54 10 328°58.7 00.1 53°36.4 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°54.1 13.0' 54 12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 · 59.2 126°32.0 16.1' 03°46.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 <	6		N23°00.9		16.1'		13.1'	55.0'
9 313°58.8 ·· 00.3 39°01.3 16.1' 02°28.0 13.1' 54 10 328°58.7 00.1 53°36.4 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°54.1 13.0' 54 12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 ·· 59.2 126°32.0 16.1' 03°36.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 ·· 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54	7		00.7		16.1'		13.1'	54.9'
10 328°58.7 00.1 53°36.4 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°54.1 13.0' 54 12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 · 59.2 126°32.0 16.1' 03°46.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 03°58.9 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54	8	298°58.9	00.5	24°26.2	16.1'	02°14.9	13.1'	54.9'
10 328°58.7 00.1 53°36.4 16.1' 02°41.1 13.0' 54 11 343°58.5 23°00.0 68°11.5 16.1' 02°54.1 13.0' 54 12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 · 59.2 126°32.0 16.1' 03°46.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 03°58.9 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54	9	313°58.8	• • 00.3	39°01.3	16.1'	02°28.0	13.1'	54.9'
12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 · 59.2 126°32.0 16.1' 03°36.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 · 58.0 214°02.9 16.2' 05°03.2 12.8' 54 <th>10</th> <td>328°58.7</td> <td>00.1</td> <td>53°36.4</td> <td>16.1'</td> <td>02°41.1</td> <td>13.0'</td> <td>54.9'</td>	10	328°58.7	00.1	53°36.4	16.1'	02°41.1	13.0'	54.9'
12 358°58.4 N22°59.8 82°46.6 16.1' N03°07.1 13.0' 54 13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 · 59.2 126°32.0 16.1' 03°36.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 · 58.0 214°02.9 16.2' 05°03.2 12.8' 54 <th>11</th> <td>343°58.5</td> <td>23°00.0</td> <td>68°11.5</td> <td>16.1'</td> <td>02°54.1</td> <td>13.0'</td> <td>54.9'</td>	11	343°58.5	23°00.0	68°11.5	16.1'	02°54.1	13.0'	54.9'
13 13°58.3 59.6 97°21.7 16.1' 03°20.1 13.0' 54 14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 59.2 126°32.0 16.1' 03°46.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54		358°58.4	N22°59.8	82°46.6	16.1'	N03°07.1	13.0'	54.8'
14 28°58.2 59.4 111°56.9 16.1' 03°33.1 13.0' 54 15 43°58.1 · · 59.2 126°32.0 16.1' 03°46.0 12.9' 54 16 58°58.0 59.0 141°07.2 16.1' 03°58.9 12.9' 54 17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 · · 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54 </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th>54.8'</th>								54.8'
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17 73°57.8 58.8 155°42.3 16.1' 04°11.8 12.9' 54 18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 · · 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54								54.8'
18 88°57.7 N22°58.6 170°17.5 16.2' N04°24.7 12.9' 54 19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 · 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54								54.7'
19 103°57.6 58.4 184°52.6 16.2' 04°37.6 12.8' 54 20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 • 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54								54.7
20 118°57.5 58.2 199°27.8 16.2' 04°50.4 12.8' 54 21 133°57.4 • 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54								54.7'
21 133°57.4 · · · 58.0 214°02.9 16.2' 05°03.2 12.8' 54 22 148°57.3 57.8 228°38.1 16.2' 05°16.0 12.8' 54 23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54								54.7'
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23 163°57.1 57.6 243°13.2 16.1' 05°28.7 12.7' 54								54.7'
								54.6'
SD.=15.7 d=-0.2 S.D.=14.9	23			243 13.2			12.7	54.6'
		CD 15.7	-1 00		c	D _140		

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

l at		Moonris	e	Moonset			
Lat.	Wed	Thu	Fri	Wed	Thu	Fri	
N 72°	00:59	00:29	00:04 23:39	09:17	11:18	13:11	
N 70°	00:44	00:23	00:05 23:47	09:30	11:21	13:07	
68°	00:31	00:17	00:05 23:53	09:41	11:24	13:03	
66°	00:21	00:13	00:05 23:58	09:49	11:26	13:00	
64°	00:12	00:09	00:06	09:56	11:28	12:57	
62°	00:05	00:06	00:06	10:02	11:30	12:55	
60°	-:-	00:03	00:06	10:07	11:31	12:53	
N 58°	-:-	00:00	00:07	10:12	11:33	12:51	
56°	23:58	-:-	00:07	10:16	11:34	12:49	
54°	23:56	-:-	00:07	10:20	11:35	12:48	
52°	23:54	-:-	00:07	10:23	11:36	12:46	
50°	23:52	-:-	00:07	10:26	11:37	12:45	
45°	23:48	-:-	80:00	10:33	11:39	12:43	
N 40°	23:45	-:-	00:08	10:38	11:40	12:40	
35°	23:42	-:-	80:00	10:42	11:41	12:39	
30°	23:40	-:-	80:00	10:47	11:43	12:37	
20°	23:35	-:-	00:09	10:53	11:45	12:34	
N 10°	23:31	-:-	00:09	11:00	11:46	12:32	
0°	23:28	-:-	00:10	11:05	11:48	12:29	
S 10°	23:24	-:-	00:10	11:11	11:50	12:27	
20°	23:20	-:-	00:10	11:17	11:51	12:24	
30°	23:16	-:-	00:11	11:23	11:53	12:22	
35°	23:13	-:-	00:11	11:27	11:54	12:20	
40°	23:11	-:-	00:12	11:31	11:55	12:18	
45°	23:07	-:-	00:12	11:36	11:57	12:16	
S 50°	23:03	-:-	00:12	11:42	11:58	12:14	
52°	23:01	-:-	00:13	11:45	11:59	12:12	
54°	22:59	-:-	00:13	11:48	12:00	12:11	
56°	22:57	-:-	00:13	11:51	12:01	12:10	
58°	22:55	-:-	00:14	11:55	12:02	12:08	
S 60°	22:52	-:-	00:14	11:59	12:03	12:06	

		Sun			Moon	
Day	Eqn.of	Time	Mer.	Mer.	Pass.	Age
	00 ^h	12 ^h	Pass	Upper	Lower	20-22
	mm:ss	mm:ss	hh:mm	hh:mm	hh:mm	64-44%
30	03:38	03:43	12:04	04:55	17:17	
01	03:49	03:55	12:04	05:38	17:59	
02	04:01	04:06	12:04	06:19	18:40	