W M Karesh

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VOL. V

TABLES OF COMPUTED ALTITUDE AND AZIMUTH

LATITUDES 40° — 49°, INCLUSIVE

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(3) SOLUTION FOR LINE OF POSITION FROM THE DEAD RECKONING POSITION USING Δd, Δt, AND ΔL

If the navigator desires to plot the sight from the dead reckoning position, in addition to the Δd and Δt corrections, a correction to the altitude for latitude (called the ΔL correction) must be applied. If the nearest whole degree of latitude is used for entering the table, it will be necessary to correct for as much as 30′ difference in latitude between the integral degree with which the table is entered and the dead reckoning latitude. On pages 262 and 263 of this book is given a ΔL multiplication table from which corrections for minutes of latitude can be taken directly by inspection. The values in this table are the product of the ΔL value times the minutes of latitude. The value ΔL is the natural cosine of the azimuth angle, so that it is necessary to know only the azimuth angle of observation and the difference of latitude between the dead reckoning position and the nearest whole degree, as arguments for entry. In working from the dead reckoning position, corrections are made for Δd and Δt exactly as shown in the previous examples, in addition to the ΔL correction.

The LHA for the dead reckoning longitude is found by applying the dead reckoning longitude to the GHA.

With the nearest whole degree of latitude, the r (H.A.), and declination as arguments, take from the main table Alt., Δd, Δt, and Az. With the arguments azimuth angle and the difference of latitude between the dead reckoning position and the nearest whole degree, take the correction for latitude directly by inspection from the ΔL multiplication table on page 262 or 263. The sign of the ΔL correction is determined as follows:

Azimuth angle greater than 90°:

If DR latitude is greater than selected tabulated latitude, ΔL correction is minus; but for DR latitude less than selected tabulated latitude, the correction is plus.

Azimuth angle less than 90°:

If DR latitude is greater than selected tabulated latitude, ΔL correction is plus; but for DR latitude less than selected tabulated latitude, the correction is minus.

Example 5.—On October 3, 1963, the 1830 dead reckoning position of a ship is lat. 44° 15′ S, long. 31° 43′ E. About this time the navigator observes planet Mars, as follows: watch time (W) 6ʰ 30ᵐ 23ˢ PM, watch error (WE) on zone time 12ˢ slow, height of eye 36 feet, index correction (IC) (-) 1′.3 sextant altitude (hs) 26° 18′.4. Solve the observation for altitude difference (a) and azimuth (Zn), using Δd, Δt, and ΔL.

	MARS (♂)					+	♂	−
W (Oct. 3)	18ʰ 30ᵐ 23ˢ				IC	1′.3		
WE	(S) 12ˢ				Dip			5′.8
ZT	18ʰ 30ᵐ 35ˢ				☆–P			2′.0
ZD	(−) 2ʰ				Additional		0′.1	
GMT (Oct. 3)	16ʰ 30ᵐ 35ˢ				Sum	1′.4		7′.8
GHA ♂ for 16ʰ GMT	29° 45′.6				Correction			(−) 6′.4
Correction for 30ᵐ 35ˢ	7° 38′.8				hs		26° 18′.4	
ν correction	0′.4				Ho		26° 12′.0	
GHA ♂	37° 24′.8	d for 6ʰ GMT		16° 32′.3 S	d			
aλ	31° 43′.0 E	Correction		0′.3	(+) 0.5			
LHA	69° 07′.8	d		16° 32′.6 S		+		−
t (H. A.)	69° 07′.8 W	t diff.	7′.8		t correction			5′.6
d	16° 32′.6 S	d diff.	2′.6		d correction	1′.7		
aL	44° 15′.0 S	L diff.	15′.0		L correction			0′.6
ht (Alt.)	26° 23′.4	Δd (+) 0.66; Δt (−) 0.72			Sum	1′.7		6′.2
Correction	(−) 4′.5				Correction			(−) 4′.5
Hc	26° 18′.9							
Ho	26° 12′.0							
a	6.9 miles away							
Zn	272°.2				Z (Az.)			S 92°.2 W

NOTE.—The Mars line is plotted from lat. 44° 15′.0 S, long. 31° 43′.0 E.

ALTITUDE CORRECTION FOR D. R. LATITUDE

Az.	1′	2′	3′	4′	5′	6′	7′	8′	9′	10′	11′	12′	13′	14′	15′	Az.	0.1′	0.2′	0.3′	0.4′	0.5′	0.6′	0.7′	0.8′	0.9′	Az.
0 180	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	0 180	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0 180
1 179	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	1 179										1 179
2 178	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	2 178										2 178
3 177	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	3 177										3 177
4 176	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	4 176										4 176
5 175	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	13.9	14.9	5 175	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	5 175
6 174	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	9.9	10.9	11.9	12.9	13.9	14.9	6 174										6 174
7 173	1.0	2.0	3.0	4.0	5.0	6.0	6.9	7.9	8.9	9.9	10.9	11.9	12.9	13.9	14.9	7 173										7 173
8 172	1.0	2.0	3.0	4.0	5.0	5.9	6.9	7.9	8.9	9.9	10.9	11.9	12.9	13.9	14.9	8 172										8 172
9 171	1.0	2.0	3.0	4.0	4.9	5.9	6.9	7.9	8.9	9.9	10.9	11.9	12.8	13.8	14.8	9 171										9 171
10 170	1.0	2.0	3.0	3.9	4.9	5.9	6.9	7.9	8.9	9.8	10.8	11.8	12.8	13.8	14.8	10 170	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	10 170
11 169	1.0	2.0	2.9	3.9	4.9	5.9	6.9	7.9	8.8	9.8	10.8	11.8	12.8	13.7	14.7	11 169										11 169
12 168	1.0	2.0	2.9	3.9	4.9	5.9	6.8	7.8	8.8	9.8	10.8	11.7	12.7	13.7	14.7	12 168										12 168
13 167	1.0	1.9	2.9	3.9	4.9	5.8	6.8	7.8	8.8	9.7	10.7	11.7	12.6	13.6	14.6	13 167										13 167
14 166	1.0	1.9	2.9	3.9	4.9	5.8	6.8	7.8	8.7	9.7	10.7	11.6	12.6	13.6	14.6	14 166										14 166
15 165	1.0	1.9	2.9	3.9	4.8	5.8	6.8	7.7	8.7	9.7	10.6	11.6	12.6	13.5	14.5	15 165	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	15 165
16 164	1.0	1.9	2.9	3.8	4.8	5.8	6.7	7.7	8.7	9.6	10.6	11.5	12.5	13.5	14.4	16 164										16 164
17 163	1.0	1.9	2.9	3.8	4.8	5.7	6.7	7.7	8.6	9.6	10.5	11.5	12.4	13.4	14.3	17 163										17 163
18 162	1.0	1.9	2.9	3.8	4.8	5.7	6.7	7.6	8.6	9.5	10.5	11.4	12.4	13.3	14.3	18 162										18 162
19 161	0.9	1.9	2.8	3.8	4.7	5.7	6.6	7.6	8.5	9.5	10.4	11.3	12.3	13.2	14.2	19 161									0.9	19 161
20 160	0.9	1.9	2.8	3.8	4.7	5.6	6.6	7.5	8.5	9.4	10.3	11.3	12.2	13.2	14.1	20 160	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.8	20 160
21 159	0.9	1.9	2.8	3.7	4.7	5.6	6.5	7.5	8.4	9.3	10.3	11.2	12.1	13.1	14.0	21 159							0.7	0.7		21 159
22 158	0.9	1.9	2.8	3.7	4.6	5.6	6.5	7.4	8.3	9.3	10.2	11.1	12.1	13.0	13.9	22 158							0.6			22 158
23 157	0.9	1.8	2.8	3.7	4.6	5.5	6.4	7.4	8.3	9.2	10.1	11.0	12.0	12.9	13.8	23 157						0.6				23 157
24 156	0.9	1.8	2.7	3.7	4.6	5.5	6.4	7.3	8.2	9.1	10.0	11.0	11.9	12.8	13.7	24 156						0.5				24 156
25 155	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.3	8.2	9.1	10.0	10.9	11.8	12.7	13.6	25 155	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8	25 155
26 154	0.9	1.8	2.7	3.6	4.5	5.4	6.3	7.2	8.1	9.0	9.9	10.8	11.7	12.6	13.5	26 154				0.4						26 154
27 153	0.9	1.8	2.7	3.6	4.5	5.3	6.2	7.1	8.0	8.9	9.8	10.7	11.6	12.5	13.4	27 153										27 153
28 152	0.9	1.8	2.6	3.5	4.4	5.3	6.2	7.1	7.9	8.8	9.7	10.6	11.5	12.4	13.2	28 152				0.4						28 152
29 151	0.9	1.7	2.6	3.5	4.4	5.2	6.1	7.0	7.9	8.7	9.6	10.5	11.4	12.2	13.1	29 151				0.3						29 151
30 150	0.9	1.7	2.6	3.5	4.3	5.2	6.1	7.0	7.8	8.7	9.5	10.4	11.3	12.1	13.0	30 150	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	30 150
31 149	0.9	1.7	2.6	3.4	4.3	5.1	6.0	6.9	7.7	8.6	9.4	10.3	11.1	12.0	12.9	31 149										31 149
32 148	0.8	1.7	2.5	3.4	4.2	5.1	5.9	6.8	7.6	8.5	9.3	10.2	11.0	11.9	12.7	32 148										32 148
33 147	0.8	1.7	2.5	3.4	4.2	5.0	5.9	6.7	7.5	8.4	9.2	10.1	10.9	11.7	12.6	33 147			0.3						0.8	33 147
34 146	0.8	1.7	2.5	3.3	4.1	5.0	5.8	6.6	7.5	8.3	9.1	9.9	10.8	11.6	12.4	34 146			0.2						0.7	34 146
35 145	0.8	1.6	2.5	3.3	4.1	4.9	5.7	6.6	7.4	8.2	9.0	9.8	10.6	11.5	12.3	35 145	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.7	35 145
36 144	0.8	1.6	2.4	3.2	4.0	4.9	5.7	6.5	7.3	8.1	8.9	9.7	10.5	11.3	12.1	36 144								0.6		36 144
37 143	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	10.4	11.2	12.0	37 143										37 143
38 142	0.8	1.6	2.4	3.2	3.9	4.7	5.5	6.3	7.1	7.9	8.7	9.5	10.2	11.0	11.8	38 142							0.6			38 142
39 141	0.8	1.6	2.3	3.1	3.9	4.7	5.4	6.2	7.0	7.8	8.5	9.3	10.1	10.9	11.7	39 141							0.5			39 141
40 140	0.8	1.5	2.3	3.1	3.8	4.6	5.4	6.1	6.9	7.7	8.4	9.2	10.0	10.7	11.5	40 140	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	40 140
41 139	0.8	1.5	2.3	3.0	3.8	4.5	5.3	6.0	6.8	7.5	8.3	9.1	9.8	10.6	11.3	41 139		0.2				0.5				41 139
42 138	0.7	1.5	2.2	3.0	3.7	4.5	5.2	5.9	6.7	7.4	8.2	8.9	9.7	10.4	11.1	42 138		0.1				0.4				42 138
43 137	0.7	1.5	2.2	2.9	3.7	4.4	5.1	5.9	6.6	7.3	8.0	8.8	9.5	10.2	11.0	43 137									0.7	43 137
44 136	0.7	1.4	2.2	2.9	3.6	4.3	5.0	5.8	6.5	7.2	7.9	8.6	9.4	10.1	10.8	44 136									0.6	44 136
45 135	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.7	6.4	7.1	7.8	8.5	9.2	9.9	10.6	45 135	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.6	45 135
46 134	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	6.9	7.6	8.3	9.0	9.7	10.4	46 134					0.3			0.6		46 134
47 133	0.7	1.4	2.0	2.7	3.4	4.1	4.8	5.5	6.1	6.8	7.5	8.2	8.9	9.5	10.2	47 133								0.5		47 133
48 132	0.7	1.3	2.0	2.7	3.3	4.0	4.7	5.4	6.0	6.7	7.4	8.0	8.7	9.4	10.0	48 132										48 132
49 131	0.7	1.3	2.0	2.6	3.3	3.9	4.6	5.2	5.9	6.6	7.2	7.9	8.5	9.2	9.8	49 131							0.5			49 131
50 130	0.6	1.3	1.9	2.6	3.2	3.9	4.5	5.1	5.8	6.4	7.1	7.7	8.4	9.0	9.6	50 130	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.5	0.6	50 130
51 129	0.6	1.3	1.9	2.5	3.1	3.8	4.4	5.0	5.7	6.3	6.9	7.6	8.2	8.8	9.4	51 129				0.3						51 129
52 128	0.6	1.2	1.8	2.5	3.1	3.7	4.3	4.9	5.5	6.2	6.8	7.4	8.0	8.6	9.2	52 128				0.2					0.6	52 128
53 127	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2	7.8	8.4	9.0	53 127									0.5	53 127
54 126	0.6	1.2	1.8	2.4	2.9	3.5	4.1	4.7	5.3	5.9	6.5	7.1	7.6	8.2	8.8	54 126						0.4				54 126
55 125	0.6	1.1	1.7	2.3	2.9	3.4	4.0	4.6	5.2	5.7	6.3	6.9	7.5	8.0	8.6	55 125	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	55 125
56 124	0.6	1.1	1.7	2.2	2.8	3.4	3.9	4.5	5.0	5.6	6.2	6.7	7.3	7.8	8.4	56 124								0.4		56 124
57 123	0.5	1.1	1.6	2.2	2.7	3.3	3.8	4.4	4.9	5.4	6.0	6.5	7.1	7.6	8.2	57 123										57 123
58 122	0.5	1.1	1.6	2.1	2.6	3.2	3.7	4.2	4.8	5.3	5.8	6.4	7.0	7.4	7.9	58 122										58 122
59 121	0.5	1.0	1.5	2.1	2.6	3.1	3.6	4.1	4.6	5.2	5.7	6.2	6.7	7.2	7.7	59 121	0.1				0.3				0.5	59 121
60 120	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	60 120	0.0	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.4	60 120
61 119	0.5	1.0	1.5	1.9	2.4	2.9	3.4	3.9	4.4	4.8	5.3	5.8	6.3	6.8	7.3	61 119			0.1				0.3			61 119
62 118	0.5	0.9	1.4	1.9	2.3	2.8	3.3	3.8	4.2	4.7	5.2	5.6	6.1	6.6	7.0	62 118										62 118
63 117	0.5	0.9	1.4	1.8	2.3	2.7	3.2	3.6	4.1	4.5	5.0	5.4	5.9	6.4	6.8	63 117										63 117
64 116	0.4	0.9	1.3	1.8	2.2	2.6	3.1	3.5	3.9	4.4	4.8	5.3	5.7	6.1	6.6	64 116								0.4		64 116
65 115	0.4	0.8	1.3	1.7	2.1	2.5	3.0	3.4	3.8	4.2	4.6	5.1	5.5	5.9	6.3	65 115	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	65 115
66 114	0.4	0.8	1.2	1.6	2.0	2.4	2.8	3.3	3.7	4.1	4.5	4.9	5.3	5.7	6.1	66 114						0.2			0.4	66 114
67 113	0.4	0.8	1.2	1.6	2.0	2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.1	5.5	5.9	67 113				0.2					0.4	67 113
68 112	0.4	0.7	1.1	1.5	1.9	2.2	2.6	3.0	3.4	3.7	4.1	4.5	4.9	5.2	5.6	68 112				0.1					0.3	68 112
69 111	0.4	0.7	1.1	1.4	1.8	2.2	2.5	2.9	3.2	3.6	3.9	4.3	4.7	5.0	5.1	69 111							0.3		0.3	69 111
70 110	0.3	0.7	1.0	1.4	1.7	2.1	2.4	2.7	3.1	3.4	3.8	4.1	4.4	4.8	5.1	70 110	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	70 110
71 109	0.3	0.7	1.0	1.3	1.6	2.0	2.3	2.6	2.9	3.3	3.6	3.9	4.2	4.6	4.9	71 109								0.3		71 109
72 108	0.3	0.6	0.9	1.2	1.5	1.9	2.2	2.5	2.8	3.1	3.4	3.7	4.0	4.3	4.6	72 108					0.2			0.2		72 108
73 107	0.3	0.6	0.9	1.2	1.5	1.8	2.0	2.3	2.6	2.9	3.2	3.5	3.8	4.1	4.4	73 107					0.1					73 107
74 106	0.3	0.6	0.8	1.1	1.4	1.7	1.9	2.2	2.5	2.8	3.0	3.3	3.6	3.9	4.1	74 106									0.3	74 106
75 105	0.3	0.5	0.8	1.0	1.3	1.6	1.8	2.1	2.3	2.6	2.8	3.1	3.4	3.6	3.9	75 105	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	75 105
76 104	0.2	0.5	0.7	1.0	1.2	1.5	1.7	1.9	2.2	2.4	2.7	2.9	3.1	3.4	3.6	76 104		0.0				0.1				76 104
77 103	0.2	0.4	0.7	0.9	1.1	1.3	1.6	1.8	2.0	2.2	2.5	2.7	2.9	3.1	3.4	77 103							0.2			77 103
78 102	0.2	0.4	0.6	0.8	1.0	1.2	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	3.1	78 102							0.1			78 102
79 101	0.2	0.4	0.6	0.8	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.7	2.9	79 101								0.2		79 101
80 100	0.2	0.3	0.5	0.7	0.9	1.0	1.2	1.4	1.6	1.7	1.9	2.1	2.3	2.4	2.6	80 100	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	80 100
81 99	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.3	1.4	1.6	1.7	1.9	2.0	2.2	2.3	81 99			0.0						0.1	81 99
82 98	0.1	0.3	0.4	0.6	0.7	0.8	1.0	1.1	1.3	1.4	1.5	1.7	1.8	1.9	2.1	82 98				0.1						82 98
83 97	0.1	0.2	0.4	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.3	1.5	1.6	1.7	1.8	83 97				0.0						83 97
84 96	0.1	0.2	0.3	0.4	0.6	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.6	84 96					0.1					84 96
85 95	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	85 95	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	85 95
86 94	0.1	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.6	0.7	0.8	0.8	0.9	1.0	1.0	86 94						0.0	0.0	0.1	0.1	86 94
87 93	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.7	0.8	0.8	87 93								0.0	0.0	87 93
88 92	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.5	88 92										88 92
89 91	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	89 91										89 91
90 90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90 90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90 90
Az.	1′	2′	3′	4′	5′	6′	7′	8′	9′	10′	11′	12′	13′	14′	15′	Az.	0.1′	0.2′	0.3′	0.4′	0.5′	0.6′	0.7′	0.8′	0.9′	Az.

LATITUDE DIFFERENCE (minutes of arc)

LAT. DIFF. (tenths of minutes of arc)

Azimuth angle greater than 90°

If DR latitude is greater than selected tabulated latitude, AL correction is *minus*; but for DR latitude less than selected tabulated latitude, the correction is *plus*.

Azimuth angle less than 90°:

If DR latitude is greater than selected tabulated latitude, AL correction is *plus*; but for DR latitude less than selected tabulated latitude, the correction is *minus*.

ALTITUDE CORRECTION FOR D. R. LATITUDE

Az.	LATITUDE DIFFERENCE (minutes of arc)															Az.	LAT. DIFF. (tenths of minutes of arc)									Az.
	16′	17′	18′	19′	20′	21′	22′	23′	24′	25′	26′	27′	28′	29′	30′		0.1′	0.2′	0.3′	0.4′	0.5′	0.6′	0.7′	0.8′	0.9′	
0 180	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	0 180	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0 180
1 179	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	1 179										1 179
2 178	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	2 178										2 178
3 177	16.0	17.0	18.0	19.0	20.0	21.0	22.0	23.0	24.0	25.0	26.0	27.0	28.0	29.0	30.0	3 177										3 177
4 176	16.0	17.0	18.0	19.0	20.0	20.9	21.9	22.9	23.9	24.9	25.9	26.9	27.9	28.9	29.9	4 176										4 176
5 175	15.9	16.9	17.9	18.9	19.9	20.9	21.9	22.9	23.9	24.9	25.9	26.9	27.9	28.9	29.9	5 175	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	5 175
6 174	15.9	16.9	17.9	18.9	19.9	20.9	21.9	22.9	23.9	24.9	25.9	26.9	27.8	28.8	29.8	6 174										6 174
7 173	15.9	16.9	17.9	18.9	19.9	20.8	21.8	22.8	23.8	24.8	25.8	26.8	27.8	28.8	29.8	7 173										7 173
8 172	15.8	16.8	17.8	18.8	19.8	20.8	21.8	22.8	23.8	24.8	25.7	26.7	27.7	28.7	29.7	8 172										8 172
9 171	15.8	16.8	17.8	18.8	19.8	20.7	21.7	22.7	23.7	24.7	25.7	26.7	27.7	28.6	29.6	9 171										9 171
10 170	15.8	16.7	17.7	18.7	19.7	20.7	21.7	22.7	23.6	24.6	25.6	26.6	27.6	28.6	29.5	10 170	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	10 170
11 169	15.7	16.7	17.7	18.7	19.6	20.6	21.6	22.6	23.6	24.5	25.5	26.5	27.5	28.5	29.4	11 169										11 169
12 168	15.7	16.6	17.6	18.6	19.6	20.5	21.5	22.5	23.5	24.5	25.4	26.4	27.4	28.4	29.3	12 168										12 168
13 167	15.6	16.6	17.5	18.5	19.5	20.5	21.4	22.4	23.4	24.4	25.3	26.3	27.3	28.3	29.2	13 167										13 167
14 166	15.5	16.5	17.5	18.4	19.4	20.4	21.3	22.3	23.3	24.3	25.2	26.2	27.2	28.1	29.1	14 166										14 166
15 165	15.5	16.4	17.4	18.4	19.3	20.3	21.3	22.2	23.2	24.1	25.1	26.1	27.0	28.0	29.0	15 165	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	15 165
16 164	15.4	16.3	17.3	18.3	19.2	20.2	21.1	22.1	23.1	24.0	25.0	26.0	26.9	27.9	28.8	16 164										16 164
17 163	15.3	16.3	17.2	18.2	19.1	20.1	21.0	22.0	23.0	23.9	24.9	25.8	26.8	27.7	28.7	17 163										17 163
18 162	15.2	16.2	17.1	18.1	19.0	20.0	20.9	21.9	22.8	23.8	24.7	25.7	26.6	27.6	28.5	18 162										18 162
19 161	15.1	16.1	17.0	18.0	18.9	19.9	20.8	21.7	22.7	23.6	24.6	25.5	26.5	27.4	28.4	19 161									0.9	19 161
20 160	15.0	16.0	16.9	17.9	18.8	19.7	20.7	21.6	22.6	23.5	24.4	25.4	26.3	27.3	28.2	20 160	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.8	20 160
21 159	14.9	15.9	16.8	17.7	18.7	19.6	20.5	21.5	22.4	23.3	24.3	25.2	26.1	27.1	28.0	21 159							0.7	0.7		21 159
22 158	14.8	15.8	16.7	17.6	18.5	19.5	20.4	21.3	22.3	23.2	24.1	25.0	26.0	26.9	27.8	22 158							0.6			22 158
23 157	14.7	15.6	16.6	17.5	18.4	19.3	20.3	21.2	22.1	23.0	23.9	24.9	25.8	26.7	27.6	23 157						0.6				23 157
24 156	14.6	15.5	16.4	17.4	18.3	19.2	20.1	21.0	21.9	22.8	23.8	24.7	25.6	26.5	27.4	24 156						0.5				24 156
25 155	14.5	15.4	16.3	17.2	18.1	19.0	19.9	20.8	21.8	22.7	23.6	24.5	25.4	26.3	27.2	25 155	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.7	0.8	25 155
26 154	14.4	15.3	16.2	17.1	18.0	18.9	19.8	20.7	21.6	22.5	23.4	24.3	25.2	26.1	27.0	26 154					0.4					26 154
27 153	14.3	15.1	16.0	16.9	17.8	18.7	19.6	20.5	21.4	22.3	23.2	24.1	24.9	25.8	26.7	27 153										27 153
28 152	14.1	15.0	15.9	16.8	17.7	18.5	19.4	20.3	21.2	22.1	23.0	23.8	24.7	25.6	26.5	28 152				0.4						28 152
29 151	14.0	14.9	15.7	16.6	17.5	18.4	19.2	20.1	21.0	21.9	22.7	23.6	24.5	25.4	26.2	29 151				0.3						29 151
30 150	13.9	14.7	15.6	16.5	17.3	18.2	19.1	19.9	20.8	21.7	22.5	23.4	24.2	25.1	26.0	30 150	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	30 150
31 149	13.7	14.6	15.4	16.3	17.1	18.0	18.9	19.7	20.6	21.4	22.3	23.1	24.0	24.9	25.7	31 149										31 149
32 148	13.6	14.4	15.3	16.1	17.0	17.8	18.7	19.6	20.4	21.2	22.0	22.9	23.7	24.6	25.4	32 148										32 148
33 147	13.4	14.3	15.1	15.9	16.8	17.6	18.5	19.3	20.1	21.0	21.8	22.6	23.5	24.3	25.2	33 147			0.3						0.8	33 147
34 146	13.3	14.1	14.9	15.8	16.6	17.4	18.2	19.1	19.9	20.7	21.6	22.4	23.2	24.0	24.9	34 146			0.2						0.7	34 146
35 145	13.1	13.9	14.7	15.6	16.4	17.2	18.0	18.8	19.7	20.5	21.3	22.1	22.9	23.8	24.6	35 145	0.1	0.2	0.2	0.3	0.4	0.5	0.6	0.7	0.7	35 145
36 144	12.9	13.8	14.6	15.4	16.2	17.0	17.8	18.6	19.4	20.2	21.0	21.8	22.7	23.5	24.3	36 144								0.6		36 144
37 143	12.8	13.6	14.4	15.2	16.0	16.8	17.6	18.4	19.2	20.0	20.8	21.6	22.4	23.2	24.0	37 143										37 143
38 142	12.6	13.4	14.2	15.0	15.8	16.5	17.3	18.1	18.9	19.7	20.5	21.3	22.1	22.9	23.6	38 142							0.6			38 142
39 141	12.4	13.2	14.0	14.8	15.5	16.3	17.1	17.9	18.7	19.4	20.2	21.0	21.8	22.5	23.3	39 141							0.5			39 141
40 140	12.3	13.0	13.8	14.6	15.3	16.1	16.9	17.6	18.4	19.2	19.9	20.7	21.4	22.2	23.0	40 140	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.6	0.7	40 140
41 139	12.1	12.8	13.6	14.5	15.1	15.8	16.6	17.4	18.1	18.9	19.6	20.4	21.1	21.9	22.6	41 139		0.2				0.5				41 139
42 138	11.9	12.6	13.4	14.1	14.9	15.6	16.3	17.1	17.8	18.6	19.3	20.1	20.8	21.6	22.3	42 138		0.1				0.4				42 138
43 137	11.7	12.4	13.2	13.9	14.6	15.4	16.1	16.8	17.6	18.3	19.0	19.7	20.5	21.2	21.9	43 137									0.7	43 137
44 136	11.5	12.2	13.0	13.7	14.4	15.1	15.8	16.5	17.3	18.0	18.7	19.4	20.1	20.9	21.6	44 136									0.6	44 136
45 135	11.3	12.0	12.7	13.4	14.1	14.8	15.6	16.3	17.0	17.7	18.4	19.1	19.8	20.5	21.2	45 135	0.1	0.1	0.2	0.3	0.4	0.4	0.5	0.6	0.6	45 135
46 134	11.1	11.8	12.5	13.2	13.9	14.6	15.3	16.0	16.7	17.4	18.1	18.8	19.5	20.1	20.8	46 134					0.3			0.6		46 134
47 133	10.9	11.6	12.3	13.0	13.6	14.3	15.0	15.7	16.4	17.1	17.7	18.4	19.1	19.8	20.5	47 133								0.5		47 133
48 132	10.7	11.4	12.0	12.7	13.4	14.1	14.7	15.4	16.1	16.7	17.4	18.1	18.7	19.4	20.1	48 132										48 132
49 131	10.5	11.2	11.8	12.5	13.1	13.8	14.4	15.1	15.7	16.4	17.1	17.7	18.4	19.0	19.7	49 131							0.5			49 131
50 130	10.3	10.9	11.6	12.2	12.9	13.5	14.1	14.8	15.4	16.1	16.7	17.4	18.0	18.6	19.3	50 130	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.5	0.6	50 130
51 129	10.1	10.7	11.3	12.0	12.6	13.2	13.8	14.5	15.1	15.7	16.4	17.0	17.6	18.3	18.9	51 129				0.3						51 129
52 128	9.9	10.5	11.1	11.7	12.3	12.9	13.6	14.2	14.8	15.4	16.0	16.6	17.2	17.9	18.5	52 128				0.2					0.6	52 128
53 127	9.6	10.2	10.8	11.4	12.0	12.6	13.3	13.8	14.4	15.0	15.6	16.2	16.9	17.5	18.1	53 127									0.5	53 127
54 126	9.4	10.0	10.6	11.2	11.8	12.3	12.9	13.5	14.1	14.7	15.3	15.9	16.5	17.0	17.6	54 126						0.4				54 126
55 125	9.2	9.8	10.3	10.9	11.5	12.0	12.6	13.2	13.8	14.3	14.9	15.5	16.1	16.6	17.2	55 125	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	55 125
56 124	8.9	9.5	10.1	10.6	11.2	11.7	12.3	12.9	13.4	14.0	14.5	15.1	15.7	16.2	16.8	56 124								0.4		56 124
57 123	8.7	9.3	9.8	10.3	10.9	11.4	12.0	12.5	13.1	13.6	14.2	14.7	15.2	15.8	16.3	57 123										57 123
58 122	8.5	9.0	9.5	10.1	10.6	11.1	11.7	12.2	12.7	13.2	13.8	14.3	14.8	15.4	15.9	58 122										58 122
59 121	8.2	8.8	9.3	9.8	10.3	10.8	11.3	11.8	12.4	12.9	13.4	13.9	14.4	14.9	15.5	59 121	0.1				0.3				0.5	59 121
60 120	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	60 120	0.0	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.4	60 120
61 119	7.8	8.2	8.7	9.2	9.7	10.2	10.7	11.2	11.6	12.1	12.6	13.1	13.6	14.1	14.5	61 119			0.1				0.3			61 119
62 118	7.5	8.0	8.5	8.9	9.4	9.9	10.3	10.8	11.3	11.7	12.2	12.7	13.1	13.6	14.1	62 118										62 118
63 117	7.3	7.7	8.2	8.6	9.1	9.5	10.0	10.4	10.9	11.3	11.8	12.3	12.7	13.2	13.6	63 117										63 117
64 116	7.0	7.5	7.9	8.3	8.8	9.2	9.6	10.1	10.5	11.0	11.4	11.8	12.3	12.7	13.2	64 116								0.4		64 116
65 115	6.8	7.2	7.6	8.0	8.5	8.9	9.3	9.7	10.1	10.6	11.0	11.4	11.8	12.3	12.7	65 115	0.0	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.4	65 115
66 114	6.5	6.9	7.3	7.7	8.1	8.5	8.9	9.4	9.8	10.2	10.6	11.0	11.4	11.8	12.2	66 114						0.2				66 114
67 113	6.3	6.6	7.0	7.4	7.8	8.2	8.6	9.0	9.4	9.8	10.2	10.5	10.9	11.3	11.7	67 113				0.2					0.4	67 113
68 112	6.0	6.4	6.7	7.1	7.5	7.9	8.2	8.6	9.0	9.4	9.7	10.1	10.5	10.9	11.2	68 112				0.1					0.3	68 112
69 111	5.7	6.1	6.5	6.8	7.2	7.5	7.9	8.2	8.6	9.0	9.3	9.7	10.0	10.4	10.8	69 111							0.3			69 111
70 110	5.5	5.8	6.2	6.5	6.8	7.2	7.5	7.9	8.2	8.6	9.0	9.2	9.6	9.9	10.3	70 110	0.0	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	70 110
71 109	5.2	5.5	5.9	6.2	6.5	6.8	7.2	7.5	7.8	8.1	8.5	8.8	9.1	9.4	9.8	71 109								0.3		71 109
72 108	4.9	5.3	5.6	5.9	6.2	6.5	6.8	7.1	7.4	7.7	8.0	8.3	8.7	9.0	9.3	72 108					0.2			0.2		72 108
73 107	4.7	5.0	5.3	5.6	5.8	6.1	6.4	6.7	7.0	7.3	7.6	7.9	8.2	8.5	8.8	73 107					0.1				0.3	73 107
74 106	4.4	4.7	5.0	5.2	5.5	5.8	6.1	6.3	6.6	6.9	7.2	7.4	7.7	8.0	8.3	74 106									0.2	74 106
75 105	4.1	4.4	4.7	4.9	5.2	5.4	5.7	6.0	6.2	6.5	6.7	7.0	7.2	7.5	7.8	75 105	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	75 105
76 104	3.9	4.1	4.4	4.6	4.8	5.1	5.3	5.6	5.8	6.0	6.3	6.5	6.8	7.0	7.3	76 104		0.0				0.1				76 104
77 103	3.6	3.8	4.0	4.3	4.5	4.7	5.0	5.2	5.4	5.6	5.8	6.1	6.3	6.5	6.7	77 103							0.2			77 103
78 102	3.3	3.5	3.7	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.4	5.6	5.8	6.0	6.2	78 102							0.1			78 102
79 101	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.4	4.6	4.8	5.0	5.2	5.3	5.5	5.7	79 101								0.2		79 101
80 100	2.8	3.0	3.1	3.3	3.5	3.6	3.8	4.0	4.2	4.3	4.5	4.7	4.9	5.0	5.2	80 100	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	80 100
81 99	2.5	2.7	2.8	3.0	3.1	3.3	3.4	3.6	3.8	3.9	4.1	4.2	4.4	4.5	4.7	81 99			0.0						0.1	81 99
82 98	2.2	2.4	2.5	2.6	2.8	2.9	3.1	3.2	3.3	3.5	3.6	3.8	3.9	4.0	4.2	82 98				0.1						82 98
83 97	1.9	2.1	2.2	2.3	2.4	2.6	2.7	2.8	2.9	3.0	3.2	3.3	3.4	3.5	3.7	83 97				0.0						83 97
84 96	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	84 96					0.1					84 96
85 95	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.4	2.5	2.6	85 95	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	85 95
86 94	1.1	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.0	2.1	86 94						0.0	0.0	0.1	0.1	86 94
87 93	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5	1.6	87 93								0.0	0.0	87 93
88 92	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	88 92										88 92
89 91	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	89 91										89 91
90 90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90 90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90 90
Az.	16′	17′	18′	19′	20′	21′	22′	23′	24′	25′	26′	27′	28′	29′	30′	Az.	0.1′	0.2′	0.3′	0.4′	0.5′	0.6′	0.7′	0.8′	0.9′	Az.

Azimuth angle greater than 90°:
If DR latitude is greater than selected tabulated latitude, ΔL correction is minus; but for DR latitude less than selected tabulated latitude, the correction is plus.
Azimuth angle less than 90°:
If DR latitude is greater than selected tabulated latitude, ΔL correction is plus, but for DR latitude less than selected tabulated latitude, the correction is minus.

Lat. 43°

H.A.	20° 00′			20° 30′			21° 00′			21° 30′			22° 00′			22° 30′			23° 00′		
	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.
	° ′	d	°	° ′	d	°	° ′	d	°	° ′	d	°	° ′	d	°	° ′	d	°	° ′	d	°
00	67 00.0	1.0 02	180.0	67 30.0	1.0 02	180.0	68 00.0	1.0 02	180.0	68 30.0	1.0 02	180.0	69 00.0	1.0 02	180.0	69 30.0	1.0 02	180.0	70 00.0	1.0 02	180.0
1	66 59.1	1.0 05	177.6	67 29.1	1.0 05	177.6	67 59.0	1.0 05	177.5	68 29.0	1.0 05	177.5	68 59.0	1.0 06	177.4	69 29.0	1.0 05	177.4	69 59.0	1.0 05	177.3
2	66 56.3	1.0 08	175.2	67 26.3	1.0 08	175.1	67 56.2	1.0 08	175.0	68 26.1	1.0 08	174.9	68 56.0	1.0 08	174.8	69 26.0	1.0 08	174.7	69 55.9	1.0 09	174.6
3	66 51.7	1.0 11	172.8	67 21.6	1.0 11	172.7	67 51.4	99 11	172 6	68 21.3	99 11	172.4	68 51.1	99 11	172.3	69 20.9	99 12	172.1	69 50.8	99 12	172.0
4	66 45.3	99 14	170.4	67 15.1	99 14	170.3	67 44.8	99 14	170.1	68 14.5	99 14	169.9	68 44.2	99 15	169.7	69 13.9	99 15	169.5	69 43.6	99 15	169.3
05	66 37.2	99 17	168.1	67 06.8	99 17	167 9	67 36.4	99 17	167.7	68 05.9	99 17	167.4	68 35.5	98 18	167.2	69 05.0	98 18	167.0	69 34.5	98 18	166.7
6	66 27.2	98 19	165.8	66 56.7	98 20	165 5	67 26.1	98 20	165 3	67 55.5	98 20	165.0	68 24.8	98 21	164.7	68 54.2	98 21	164.4	69 23.5	98 22	164.1
7	66 15.6	98 22	163 5	66 44.8	97 23	163.2	67 14.1	97 23	162.9	67 43.2	97 23	162.6	68 12.4	97 24	162.3	68 41.5	97 24	162.0	69 10.5	97 25	161.6
8	66 02.3	97 25	161.2	66 31.3	97 25	160.9	67 00.3	97 26	160.6	67 29.2	96 26	160.2	67 58.1	96 27	159.9	68 27.0	96 27	159.5	68 55.8	96 28	159.1
9	65 47.4	96 28	159.0	66 16.1	96 28	158.6	66 44.9	96 28	158.3	67 13.6	96 29	157.9	67 42.2	96 29	157.5	68 10.8	95 30	157.1	68 39.3	95 30	156.7
10	65 30.9	95 30	156.8	65 59.4	95 30	156.4	66 27.9	95 31	156.0	66 56.3	95 31	155.6	67 24.6	94 32	155.2	67 52.9	94 32	154.8	68 21.1	94 33	154.3
1	65 12.8	94 32	154 7	65 41.1	94 33	154 3	66 09.3	94 33	153 9	66 37.4	94 34	153.4	67 05.4	93 34	153 0	67 33.4	93 35	152.5	68 01.3	93 36	152.0
2	64 53.3	93 35	152.6	65 21.3	93 35	152.2	65 49.2	93 36	151.7	66 17.0	93 36	151.3	66 44.7	92 37	150.8	67 12.4	92 37	150.3	67 39.9	92 38	149.8
3	64 32.4	92 37	150.5	65 00.1	92 38	150.1	65 27 7	92 38	149.6	65 55.2	92 39	149.1	66 22.6	91 39	148.6	66 49.9	91 40	148.1	67 17.1	90 10	147.6
4	64 10.2	91 39	148.5	64 37.6	91 40	148.1	65 04.8	91 40	147.6	65 32.0	90 41	147.1	65 59.1	90 42	146.6	66 26.0	110 42	146.0	66 52.9	89 43	145.4
15	63 46.7	90 41	146.0	64 13.7	90 42	146.1	64 40.7	90 42	145.6	65 07.5	89 43	145.1	65 34.3	89 43	141 5	66 00.9	88 44	114.0	66 27.4	88 45	143.4
6	63 21.9	89 43	144.7	63 48.7	89 44	144.2	64 15.3	89 44	143.7	64 41.8	88 45	143.1	65 08.2	88 45	142.6	65 34.4	87 46	142.0	66 00.6	87 47	141.4
7	62 56.0	88 45	142.9	63 22.4	88 46	142.3	63 48.7	87 46	141.8	64 14.9	87 47	141.2	64 40.9	87 47	140.7	65 06.8	86 48	140 1	65 32.6	86 48	139 5
8	62 28.9	87 47	141.1	62 55.0	87 47	140.5	63 21.0	86 48	140.0	63 46.9	86 49	139.4	64 12.6	85 49	138.8	64 38.1	85 50	138.2	65 03.5	84 50	137.6
9	62 00.8	86 48	139.3	62 26.6	86 49	138.8	62 52.3	85 50	138.2	63 17.8	85 50	137.6	63 43.2	84 51	137.0	64 08.4	84 51	136.4	64 33.4	83 52	135.8
20	61 31.7	85 50	137 6	61 57.2	85 51	137.1	62 22.5	84 51	136.5	62 47.7	84 52	135.9	63 12.8	83 52	135.3	63 37.6	83 53	134.7	64 02.3	82 53	134.0
1	61 01.7	84 52	136.0	61 26.8	84 52	135.4	61 51.9	83 53	134.8	62 16.7	83 53	134.2	62 41.4	82 54	133.6	63 06.0	82 54	133.0	63 30.3	81 55	132.3
2	60 30.7	83 53	134.3	60 55.6	83 54	133.6	61 20.3	83 54	133.2	61 44.8	82 55	132.6	62 09.2	81 55	132.0	62 33.4	80 56	131.3	62 57.5	80 56	130.7
3	59 58.9	82 54	132.8	60 23.5	82 55	133.2	60 47.9	81 55	131.6	61 12.1	81 56	131.0	61 36.2	80 56	130.4	62 00.1	79 57	129.7	62 23.8	79 57	129.1
4	59 26.3	81 56	131.3	59 50.6	81 56	130.7	60 14.7	80 57	130.1	60 38.6	79 57	129.5	61 02.4	79 58	128.8	61 26.0	78 59	128.2	61 49.4	78 59	127 5
25	58 53.0	80 57	129.8	59 17.0	80 57	129.2	59 40.8	79 58	128.6	60 04.4	78 58	128.0	60 27.9	78 59	127.4	60 51.1	77 59	126.7	61 14.2	77 60	126.1
6	58 18.9	79 59	128.3	58 42.6	79 58	127.8	59 06.1	78 59	127.2	59 29.5	78 59	126.5	59 52.6	77 60	125.9	60 15.6	76 60	125.3	60 38.4	76 61	124.6
7	57 44.2	78 59	126.9	58 07.6	78 59	126.4	58 30.8	77 60	125.8	58 53.9	77 60	125.1	59 16.8	76 61	124.5	59 39.5	75 61	123.9	60 02.0	76 62	123.2
8	57 08.8	77 60	125.6	57 31.9	77 60	125.0	57 54.9	76 61	124.4	58 17.7	76 61	123.8	58 40.3	75 62	123.2	59 02.8	74 62	122.5	59 25.0	74 63	121 9
9	56 32.8	77 61	124.3	56 55.7	76 61	123.7	57 18.4	75 62	123.1	57 41.0	75 62	122.5	58 03.3	74 63	121.8	58 25.5	74 63	121.2	58 47.5	73 63	120 5
30	55 56.3	76 62	123.0	56 18.9	75 62	122.4	56 41.4	75 63	121.8	57 03.7	74 63	121.2	57 25.8	73 63	120.6	57 47.7	73 64	119.9	58 09.4	72 64	119.3
1	55 19.2	75 63	121.7	55 41.6	74 63	121.1	56 03.8	74 63	120 5	56 25.9	73 64	119.9	56 47.8	73 64	119.3	57 09.4	72 66	118 7	57 30.9	71 65	118.0
2	54 41.6	74 63	120.5	55 03.8	74 64	119.9	55 25.8	73 64	119 3	55 47.6	72 64	118.7	56 09.3	72 66	118 1	56 30.7	71 65	117.5	56 52.0	71 66	116.8
3	54 03.6	73 64	119.3	54 25.5	73 64	118 7	54 47.3	72 65	118.1	55 08.9	72 65	117.5	55 30.3	71 66	116.9	55 51.6	70 66	116.3	56 12.6	70 68	115.7
4	53 25.1	73 65	118.2	53 46.9	72 66	117.6	54 08.4	72 66	117.0	54 29.8	71 66	116.4	54 51.0	70 66	115.8	55 12.0	70 68	115.1	55 32.9	70 67	114.5
35	52 46.2	72 66	117.0	53 07.8	72 66	116.4	53 29.1	71 66	115.9	53 50.3	70 66	115.3	54 11.3	70 67	114.6	54 32.1	69 67	114.0	54 52.8	69 67	113.4
6	52 06.9	71 66	115.9	52 28.3	71 66	115.3	52 49.4	70 67	114.8	53 10.4	70 67	114.2	53 31.3	69 67	113.6	53 51.9	68 68	112.9	54 12.3	68 68	112.3
7	51 27.3	71 67	114.8	51 48.4	70 67	114.3	52 09.4	70 67	113.7	52 30.2	69 68	113.1	52 50.9	68 68	112.5	53 11.3	68 68	111.9	53 31.6	67 69	111.3
8	50 47.3	70 67	113.8	51 08.3	70 67	113.2	51 29.1	69 68	112.6	51 49.7	68 68	112.0	52 10.2	68 68	111.5	52 30.5	67 69	110.8	52 50.6	67 69	110.2
9	50 07.0	70 68	112 7	50 27.8	69 68	112.2	50 48.4	68 68	111.6	51 08.9	68 68	111.0	51 29.2	67 69	110.4	51 49.3	67 69	109.8	52 09.2	66 69	109.2
40	49 26.4	69 68	111.7	49 47.0	69 68	111.2	50 07.5	68 69	110.6	50 27.8	67 69	110.0	50 48.0	67 70	109.4	51 07.9	66 69	108 9	51 27.7	66 70	108.3
1	48 45.5	69 69	110 7	49 06.0	68 69	110.2	49 26.3	67 69	109.6	49 46.5	67 69	109.1	50 06.4	66 70	108.5	50 26.3	66 70	107.9	50 45.9	65 70	107.3
2	48 04.3	69 70	109.8	48 24.7	68 69	109 2	48 44.8	67 69	108.7	49 04.9	66 70	108.1	49 24.7	65 70	107.5	49 44.4	65 70	106.9	50 03.9	65 70	106.4
3	47 22.9	68 69	108.8	47 43.1	67 70	108.3	48 03.2	67 70	107.7	48 23.0	66 70	107.2	48 42.8	66 70	106.6	49 02.3	65 70	106.0	49 21.7	64 71	105.4
4	46 41.2	67 70	107.9	47 01.3	67 70	107.4	47 21.2	66 70	106.8	47 41.0	66 70	106.3	48 00.6	65 71	105.7	48 20.1	64 71	105.1	48 39.3	64 71	104.5
45	45 59.4	67 70	107.0	46 19.3	66 70	106.5	46 39.1	66 70	105.9	46 58.8	65 71	105.4	47 18.3	65 71	104.8	47 37.6	64 71	104 2	47 56.8	64 71	103.7
6	45 17.3	66 70	106 1	45 37.2	66 71	105.6	45 56.9	65 71	105.0	46 16.4	65 71	104.h	46 35.8	64 71	103.9	46 55.0	64 71	103.4	47 14.0	63 71	102.8
7	44 35.1	66 71	105.2	44 54.8	66 71	104.7	45 14.4	65 71	104.2	45 33.8	65 71	103.6	45 53.1	64 71	103.1	46 12.2	63 72	102.5	46 31.2	63 72	101.9
8	43 52.6	66 71	104.4	44 12.3	65 71	103.8	44 31.8	65 71	103.3	44 51.1	64 71	102.8	45 10.3	64 72	102 2	45 29.3	63 72	101.7	45 48.2	63 72	101.1
9	43 10.0	65 71	103.5	43 29.6	65 71	103.0	43 49.0	64 72	102.5	44 08.2	64 72	101.9	44 27.3	63 72	101.4	44 46.3	63 72	100.8	45 05.4	62 72	100.3
50	42 27.3	65 71	102.7	42 46.8	65 72	102.2	43 06.1	64 72	101.6	43 25.2	64 72	101.1	43 44.2	63 72	100.6	44 03.1	63 72	100 0	44 21.8	63 73	99 5
1	41 44.4	65 72	101 8	42 03.8	64 72	101.3	42 23.0	64 72	100.8	42 42.1	63 72	100.3	43 01.1	63 72	99.8	43 19.9	62 72	99.2	43 38.5	62 72	98.7
2	41 01.4	65 72	101.0	41 20.7	64 72	100.5	41 39.9	64 72	100.0	41 58.9	63 72	99.5	42 17.8	63 72	99.0	42 36.5	62 72	98.4	42 55.1	62 73	97.9
3	40 18.3	64 72	100.2	40 37.5	64 72	99.7	40 56.6	63 72	99.2	41 15.6	63 72	98.7	41 34.4	62 72	98.2	41 53.0	62 73	97.7	42 11.6	62 73	97.1
4	39 35.1	64 72	99.5	39 54.2	64 73	99.0	40 13.2	63 73	98.4	40 32.1	63 72	97.9	40 50.9	62 73	97.4	41 09.5	62 73	96.9	41 28.0	61 73	96.4
55	38 51.7	64 73	98.7	39 10.8	63 72	98.2	39 29.8	63 73	97.7	39 48.6	63 73	97.2	40 07.3	62 73	96.7	40 25.9	62 73	96.1	40 44.4	61 73	95.6
8	38 08.3	64 73	97.9	38 27.3	63 73	97.4	38 46.3	63 73	96.9	39 05.1	62 73	96.4	39 23.7	62 73	95.9	39 42.3	62 73	95 4	40 00.7	61 73	94.9
7	37 24.8	64 73	97.2	37 43.8	63 73	96.7	38 02.7	63 73	96.2	38 21.4	62 73	95.7	38 40.1	62 73	95.2	38 58.6	61 73	94.7	39 16.9	61 73	94.2
8	36 41.2	63 73	96.4	37 00.2	63 73	95.9	37 19.0	63 73	95.4	37 37.7	62 73	94.9	37 56.3	62 73	94.4	38 14.8	61 73	93 9	38 33.1	61 73	93.4
9	35 57.6	63 73	95.7	36 16.5	63 73	95.2	36 35.3	62 73	94.7	36 54.0	62 73	94.2	37 12.6	62 73	93 7	37 31.0	61 73	93.2	37 49.3	61 73	92.7
60	35 13.9	63 73	94.9	35 32.8	63 73	94.5	35 51.6	62 73	94.0	36 10.2	62 73	93.5	36 28.8	62 73	93 0	36 47.2	61 73	92 5	37 05.5	61 73	92.0
1	34 30.1	63 73	94.2	34 49.0	63 73	93.7	35 07.8	62 73	93.3	35 26.4	62 73	92.8	35 44.9	62 73	92 3	36 03.3	61 73	91.8	36 21.6	61 73	91.3
2	33 46.4	63 73	93.5	34 05.2	63 73	93.0	34 23.9	62 73	92.6	34 42.6	62 73	92.1	35 01.1	61 73	91 6	35 19.5	61 73	91.1	35 37.7	61 73	90.6
3	33 02.6	63 73	92.8	33 21.4	63 73	92.3	33 40.1	62 73	91.9	33 58.7	62 73	91.4	34 17.2	61 73	90.9	34 35.6	61 73	90.4	34 53.9	61 73	89.9
4	32 18.7	63 73	92.1	32 37.5	63 73	91.6	32 56.2	62 73	91.2	33 14.8	62 73	90.7	33 33.3	61 73	90.2	33 51.7	61 73	89.7	34 10.0	61 73	89.3
65	31 34.8	63 73	91.4	31 53.6	63 73	90.9	32 12.3	62 73	90.5	32 30.9	62 73	90.0	32 49.4	61 73	89.5	33 07.8	61 73	89.1	33 26.1	61 73	88.6
6	30 51.0	63 73	90.7	31 09.8	62 73	90.2	31 28.5	62 73	89.8	31 47.1	62 73	89.3	32 05.6	61 73	88.9	32 23.9	61 73	88.4	32 42.2	61 73	87.9
7	30 07.1	63 73	90.0	30 25.9	63 73	89 6	30 44.6	62 73	89.1	31 03.2	62 73	88.7	31 21.7	62 73	88.2	31 40.1	61 73	87 7	31 58.4	61 73	87 3
8	29 23.2	63 73	89.3	29 42.0	63 73	88.9	30 00.7	62 73	88 4	30 19.3	62 73	88.0	30 37.8	62 73	87.5	30 56.3	61 73	87.1	31 14.6	61 73	86.6
9	28 39.3	63 73	88.7	28 58.1	63 73	88.2	29 16.9	62 73	87.8	29 35.5	62 73	87.3	29 54.0	62 73	86.9	30 12.4	61 73	86.4	30 30.8	61 73	86.0
70	27 55.5	63 73	88.0	28 14.3	63 73	87.6	28 33.0	62 73	87.1	28 51.7	62 73	86.7	29 10.2	62 73	86.2	29 28.7	61 73	85.8	29 47.0	61 73	85.3
1	27 11.6	63 73	87.3	27 30.5	63 73	86.9	27 49.2	62 73	86.4	28 07.9	62 73	86.0	28 26.4	62 73	85.6	28 44.9	61 73	85.1	29 03.3	61 73	84 7
2	26 27.8	63 73	86.7	26 46.7	63 73	86.2	27 05.4	62 73	85.8	27 24.1	62 73	85.4	27 42.7	62 73	84.9	28 01.2	62 73	84.5	28 19.7	61 73	84.0
3	25 44.0	63 73	86.0	26 02.9	63 73	85.6	26 21.7	62 73	85.1	26 40.4	62 73	84.7	26 59.0	62 73	84 3	27 17.6	62 73	83.8	27 36.0	61 73	83.4
4	25 00.3	63 73	85.3	25 19.2	63 73	84.9	25 38.0	63 73	84.5	25 56.7	62 73	84.1	26 15.4	62 73	83.6	26 34.0	62 73	83.2	26 52.5	62 72	82.7
75	24 16.6	63 73	84.7	24 35.5	63 73	84 3	24 54.3	63 73	83.8	25 13.1	62 73	83.4	25 31.8	62 73	83.0	25 50.4	62 72	82.5	26 09.0	62 72	82 1
6	23 32.9	63 73	84.0	23 51.8	63 73	83.6	24 10.7	63 73	83.2	24 29.5	63 72	82.8	24 48.3	62 72	82 3	25 07.0	62 73	81 9	25 25.6	62 72	81.5
7	22 49.3	63 73	83.4	23 08.3	63 73	83.0	23 27.2	63 72	82.6	23 46.0	63 72	82.1	24 04.8	62 72	81.7	24 23.5	62 72	81.3	24 42.2	62 72	80.8
8	22 05.7	64 72	83.8	22 24.7	63 72	82.3	22 43.7	63 72	81 9	23 02.6	63 72	81.5	23 21.4	63 72	81.1	23 40.2	62 72	80.6	23 58.9	62 72	80.2
9	21 22.2	64 72	82.1	21 41.3	63 73	81.7	22 00.3	63 72	81.3	22 19.2	63 72	80.9	22 38.1	63 72	80 4	22 57.0	63 72	80.0	23 15.7	62 72	79.6
80	20 38.8	64 72	81.5	20 57.9	64 72	81.1	21 17.0	63 72	80.6	21 36.0	63 72	80.2	21 54.9	63 72	79.8	22 13.8	63 72	79.4	22 32.6	63 72	79.0
1	19 55.4	64 72	80.8	20 14.6	64 72	80.4	20 33.7	64 72	80.0	20 52.8	63 72	79.6	21 11.8	63 73	79.2	21 30.7	63 72	78.8	21 49.6	63 72	78.3
2	19 12.1	64 72	80.2	19 31.4	64 73	79.8	19 50.5	64 72	79.4	20 09.6	64 72	79.0	20 28.7	63 72	78.6	20 47.7	63 71	78.1	21 06.6	63 71	77.7
3	18 28.9	64 73	79.5	18 48.2	64 72	79.1	19 07.4	64 72	78.7	19 26.6	64 72	78.3	19 45.7	64 71	77.9	20 04.8	63 71	77 5	20 23.8	63 71	77.1
4	17 45.8	65 72	78.9	18 05.2	64 72	78.5	18 24.5	64 72	78.1	18 43.7	64 71	77.7	19 02.9	64 71	77.3	19 22.0	64 71	76.9	19 41.1	63 71	76.5
85	17 02.8	65 72	78.3	17 22.2	65 71	77.9	17 41.6	64 71	77.5	18 00.9	64 71	77.1	18 20.1	64 71	76.7	18 39.3	64 71	76.3	18 58.5	64 71	75.9
6	16 19.9	65 71	77.6	16 39.4	65 71	77 2	16 58.8	65 71	76 8	17 18.2	65 71	76.4	17 37.5	64 71	76.0	17 56.8	64 71	75.6	18 16.0	64 71	75.2
7	15 37.1	65 71	77.0	15 56.6	65 71	76.6	16 16.1	65 71	76.2	16 35.6	65 71	75.8	16 55.0	65 71	75.4	17 14.3	64 71	75 0	17 33.6	64 70	74 6
8	14 54.4	65 71	76.4	15 14.0	65 71	76.0	15 33.6	65 71	75.6	15 53.1	65 71	75.2	16 12.6	65 70	74.8	16 32.0	65 70	74 4	16 51.4	65 70	74.0
9	14 11.8	65 71	75.7	14 31.5	65 71	75.3	14 51.1	65 71	75.0	15 10.7	65 70	74 6	15 30.3	65 70	74.2	15 49.8	65 70	73.8	16 09.3	65 70	73.4
90	13 29.3	66 71	75.1	13 49.1	66 70	74.7	14 08.8	66 70	74.3	14 28.5	66 70	73.9	14 48.1	65 70	73.5	15 07.7	65 70	73.1	15 27.3	65 70	72.8

TIME