| LAT. | 65° | | | 66° | | | 67° | | | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | H.A. |
| ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° |
| 45 | 39 56 | +55 | 123 | 39 23 | +56 | 123 | 38 50 | +56 | 124 | 38 16 | +56 | 125 | 37 42 | +56 | 125 | 315 |
| 46 | 39 34 | 55 | 122 | 39 03 | 55 | 122 | 38 30 | 56 | 123 | 37 57 | 57 | 124 | 37 24 | 57 | 124 | 314 |
| 47 | 39 13 | 55 | 120 | 38 42 | 55 | 121 | 38 11 | 55 | 122 | 37 39 | 56 | 122 | 37 06 | 57 | 123 | 313 |
| 48 | 38 51 | 54 | 119 | 38 21 | 55 | 120 | 37 51 | 55 | 121 | 37 20 | 56 | 121 | 36 48 | 57 | 122 | 312 |
| 49 | 38 28 | 55 | 118 | 38 00 | 55 | 119 | 37 30 | 56 | 120 | 37 00 | 56 | 120 | 36 30 | 56 | 121 | 311 |
| 50 | 38 06 | +55 | 117 | 37 38 | +55 | 118 | 37 10 | +55 | 119 | 36 41 | +56 | 119 | 36 11 | +57 | 120 | 310 |
| 51 | 37 43 | 55 | 116 | 37 17 | 55 | 117 | 36 49 | 56 | 118 | 36 21 | 56 | 118 | 35 52 | 57 | 119 | 309 |
| 52 | 37 21 | 54 | 115 | 36 55 | 55 | 116 | 36 28 | 56 | 116 | 36 01 | 56 | 117 | 35 34 | 56 | 118 | 308 |
| 53 | 36 57 | 55 | 114 | 36 33 | 54 | 115 | 36 07 | 55 | 115 | 35 41 | 56 | 116 | 35 14 | 57 | 117 | 307 |
| 54 | 36 34 | 54 | 113 | 36 10 | 55 | 114 | 35 46 | 55 | 114 | 35 21 | 56 | 115 | 34 55 | 56 | 116 | 306 |
| 55 | 36 11 | +54 | 112 | 35 48 | +55 | 113 | 35 25 | +55 | 113 | 35 00 | +56 | 114 | 34 36 | +56 | 115 | 305 |
| 56 | 35 47 | 54 | 111 | 35 25 | 55 | 112 | 35 03 | 55 | 112 | 34 40 | 55 | 113 | 34 16 | 56 | 114 | 304 |
| 57 | 35 24 | 53 | 110 | 35 03 | 54 | 111 | 34 41 | 55 | 111 | 34 19 | 56 | 112 | 33 56 | 56 | 113 | 303 |
| 58 | 35 00 | 54 | 109 | 34 40 | 54 | 110 | 34 19 | 55 | 110 | 33 58 | 56 | 111 | 33 36 | 56 | 112 | 302 |
| 59 | 34 36 | 53 | 108 | 34 17 | 54 | 109 | 33 57 | 55 | 109 | 33 37 | 55 | 110 | 33 16 | 56 | 111 | 301 |
| 60 | 34 11 | +54 | 107 | 33 54 | +54 | 108 | 33 35 | +55 | 108 | 33 16 | +55 | 109 | 32 56 | +56 | 110 | 300 |
| 61 | 33 47 | 54 | 106 | 33 30 | 54 | 107 | 33 13 | 54 | 107 | 32 55 | 55 | 108 | 32 36 | 56 | 109 | 299 |
| 62 | 33 23 | 53 | 105 | 33 07 | 54 | 106 | 32 50 | 55 | 106 | 32 33 | 55 | 107 | 32 15 | 56 | 108 | 298 |
| 63 | 32 58 | 54 | 104 | 32 43 | 54 | 105 | 32 28 | 54 | 105 | 32 12 | 55 | 106 | 31 55 | 55 | 107 | 297 |
| 64 | 32 34 | 53 | 103 | 32 20 | 54 | 104 | 32 05 | 55 | 104 | 31 50 | 55 | 105 | 31 34 | 56 | 106 | 296 |
| 65 | 32 09 | +53 | 102 | 31 56 | +54 | 103 | 31 42 | +55 | 103 | 31 28 | +55 | 104 | 31 14 | +55 | 105 | 295 |
| 66 | 31 44 | 53 | 101 | 31 32 | 54 | 102 | 31 20 | 54 | 102 | 31 06 | 55 | 103 | 30 53 | 55 | 104 | 294 |
| 67 | 31 19 | 53 | 100 | 31 08 | 54 | 101 | 30 57 | 54 | 101 | 30 45 | 54 | 102 | 30 32 | 55 | 103 | 293 |
| 68 | 30 54 | 53 | 99 | 30 44 | 54 | 100 | 30 34 | 54 | 100 | 30 23 | 54 | 101 | 30 11 | 55 | 102 | 292 |
| 69 | 30 29 | 53 | 98 | 30 20 | 54 | 99 | 30 11 | 54 | 99 | 30 00 | 55 | 100 | 29 50 | 55 | 101 | 291 |
| 70 | 30 04 | +53 | 97 | 29 56 | +54 | 98 | 29 47 | +55 | 99 | 29 38 | +55 | 99 | 29 29 | +55 | 100 | 290 |
| 71 | 29 39 | 53 | 96 | 29 32 | 54 | 97 | 29 24 | 55 | 98 | 29 16 | 55 | 98 | 29 07 | 56 | 99 | 289 |
| 72 | 29 14 | 53 | 96 | 29 08 | 53 | 96 | 29 01 | 54 | 97 | 28 54 | 55 | 97 | 28 46 | 55 | 98 | 288 |
| 73 | 28 49 | 53 | 95 | 28 43 | 54 | 95 | 28 38 | 54 | 96 | 28 32 | 54 | 96 | 28 25 | 55 | 97 | 287 |
| 74 | 28 23 | 53 | 94 | 28 19 | 54 | 94 | 28 14 | 55 | 95 | 28 09 | 55 | 95 | 28 03 | 56 | 96 | 286 |
| 75 | 27 58 | +53 | 93 | 27 55 | +53 | 93 | 27 51 | +54 | 94 | 27 47 | +54 | 94 | 27 42 | +55 | 95 | 285 |
| 76 | 27 33 | 53 | 92 | 27 30 | 54 | 92 | 27 28 | 54 | 93 | 27 24 | 55 | 93 | 27 21 | 55 | 94 | 284 |
| 77 | 27 07 | 53 | 91 | 27 06 | 54 | 91 | 27 04 | 54 | 92 | 27 02 | 55 | 92 | 26 59 | 55 | 93 | 283 |
| 78 | 26 42 | 53 | 90 | 26 42 | 53 | 91 | 26 41 | 54 | 91 | 26 40 | 54 | 92 | 26 38 | 55 | 92 | 282 |
| 79 | 26 17 | 53 | 89 | 26 17 | 54 | 90 | 26 18 | 54 | 90 | 26 17 | 55 | 91 | 26 16 | 55 | 91 | 281 |
| 80 | 25 51 | +53 | 88 | 25 53 | +54 | 89 | 25 54 | +54 | 89 | 25 55 | +54 | 90 | 25 55 | +55 | 90 | 280 |
| 81 | 25 26 | 53 | 87 | 25 29 | 53 | 88 | 25 31 | 54 | 88 | 25 32 | 55 | 89 | 25 33 | 55 | 89 | 279 |
| 82 | 25 01 | 53 | 86 | 25 04 | 54 | 87 | 25 07 | 54 | 87 | 25 10 | 54 | 88 | 25 12 | 55 | 88 | 278 |
| 83 | 24 36 | 53 | 86 | 24 40 | 54 | 86 | 24 44 | 54 | 86 | 24 47 | 55 | 87 | 24 50 | 55 | 87 | 277 |
| 84 | 24 10 | 53 | 85 | 24 16 | 53 | 85 | 24 21 | 54 | 86 | 24 25 | 55 | 86 | 24 29 | 55 | 86 | 276 |
| 85 | 23 45 | +53 | 84 | 23 51 | +54 | 84 | 23 57 | +54 | 85 | 24 03 | +54 | 85 | 24 08 | +55 | 86 | 275 |
| 86 | 23 20 | 53 | 83 | 23 27 | 54 | 83 | 23 34 | 54 | 84 | 23 40 | 55 | 84 | 23 46 | 55 | 85 | 274 |
| 87 | 22 55 | 53 | 82 | 23 03 | 54 | 82 | 23 11 | 54 | 83 | 23 18 | 55 | 83 | 23 25 | 55 | 84 | 273 |
| 88 | 22 30 | 53 | 81 | 22 39 | 54 | 82 | 22 47 | 55 | 82 | 22 56 | 54 | 82 | 23 03 | 56 | 83 | 272 |
| 89 | 22 05 | 53 | 80 | 22 15 | 54 | 81 | 22 24 | 55 | 81 | 22 33 | 55 | 81 | 22 42 | 55 | 82 | 271 |
| 90 | 21 40 | +53 | 79 | 21 51 | +54 | 80 | 22 01 | +55 | 80 | 22 11 | +55 | 81 | 22 21 | +55 | 81 | 270 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. } See p. 9
{ For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. }

| 65° | | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|
| Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° |
| 21 40+53 | 79 | 21 51+54 | 80 | 22 01+55 | 80 | 22 11+55 | 81 | 22 21+55 | 81 | 270 |
| 21 15 53 | 78 | 21 27 54 | 79 | 21 38 55 | 79 | 21 49 55 | 80 | 22 00 55 | 80 | 269 |
| 20 50 54 | 78 | 21 03 54 | 78 | 21 15 55 | 78 | 21 27 55 | 79 | 21 39 55 | 79 | 268 |
| 20 26 53 | 77 | 20 39 54 | 77 | 20 52 55 | 77 | 21 05 55 | 78 | 21 18 55 | 78 | 267 |
| 20 01 54 | 76 | 20 16 53 | 76 | 20 30 54 | 77 | 20 43 55 | 77 | 20 57 55 | 77 | 266 |
| 19 37+53 | 75 | 19 52+54 | 75 | 20 07+54 | 76 | 20 22+54 | 76 | 20 36+55 | 76 | 265 |
| 19 12 54 | 74 | 19 28 54 | 74 | 19 44 55 | 75 | 20 00 55 | 75 | 20 15 55 | 76 | 264 |
| 18 48 54 | 73 | 19 05 54 | 74 | 19 22 54 | 74 | 19 38 55 | 74 | 19 54 56 | 75 | 263 |
| 18 24 53 | 72 | 18 42 54 | 73 | 18 59 55 | 73 | 19 17 55 | 73 | 19 34 55 | 74 | 262 |
| 18 00 53 | 72 | 18 18 55 | 72 | 18 37 55 | 72 | 18 55 55 | 72 | 19 13 56 | 73 | 261 |
| 17 36+54 | 71 | 17 55+55 | 71 | 18 15+54 | 71 | 18 34+55 | 72 | 18 53+55 | 72 | 260 |
| 17 12 54 | 70 | 17 32 55 | 70 | 17 53 54 | 70 | 18 13 55 | 71 | 18 32 56 | 71 | 259 |
| 16 48 54 | 69 | 17 10 54 | 69 | 17 31 55 | 70 | 17 52 55 | 70 | 18 12 56 | 70 | 258 |
| 16 25 54 | 68 | 16 47 54 | 68 | 17 09 55 | 69 | 17 31 55 | 69 | 17 52 56 | 69 | 257 |
| 16 01 54 | 67 | 16 24 55 | 67 | 16 47 55 | 68 | 17 10 55 | 68 | 17 32 56 | 68 | 256 |
| 15 38+54 | 66 | 16 02+55 | 67 | 16 26+55 | 67 | 16 49+55 | 67 | 17 12+56 | 67 | 255 |
| 15 15 54 | 66 | 15 40 54 | 66 | 16 04 55 | 66 | 16 28 56 | 66 | 16 52 56 | 67 | 254 |
| 14 52 54 | 65 | 15 18 54 | 65 | 15 43 55 | 65 | 16 08 55 | 65 | 16 33 56 | 66 | 253 |
| 14 29 55 | 64 | 14 56 54 | 64 | 15 22 55 | 64 | 15 48 55 | 65 | 16 13 56 | 65 | 252 |
| 14 07 54 | 63 | 14 34 55 | 63 | 15 01 55 | 63 | 15 27 56 | 64 | 15 54 56 | 64 | 251 |
| 13 44+55 | 62 | 14 12+55 | 62 | 14 40+55 | 63 | 15 07+56 | 63 | 15 35+56 | 63 | 250 |
| 13 22 55 | 61 | 13 51 55 | 61 | 14 19 56 | 62 | 14 48 55 | 62 | 15 16 56 | 62 | 249 |
| 13 00 55 | 60 | 13 30 55 | 61 | 13 59 55 | 61 | 14 28 56 | 61 | 14 57 56 | 61 | 248 |
| 12 38 55 | 60 | 13 09 55 | 60 | 13 39 55 | 60 | 14 08 56 | 60 | 14 38 56 | 60 | 247 |
| 12 17 55 | 59 | 12 48 55 | 59 | 13 19 55 | 59 | 13 49 56 | 59 | 14 20 56 | 59 | 246 |
| 11 55+55 | 58 | 12 27+55 | 58 | 12 59+55 | 58 | 13 30+56 | 58 | 14 01+57 | 59 | 245 |
| 11 34 55 | 57 | 12 07 55 | 57 | 12 39 56 | 57 | 13 11 56 | 57 | 13 43 56 | 58 | 244 |
| 11 13 55 | 56 | 11 46 56 | 56 | 12 19 56 | 56 | 12 52 56 | 57 | 13 25 57 | 57 | 243 |
| 10 52 55 | 55 | 11 26 56 | 55 | 12 00 56 | 56 | 12 34 56 | 56 | 13 07 57 | 56 | 242 |
| 10 32 55 | 54 | 11 06 56 | 54 | 11 41 56 | 55 | 12 15 57 | 55 | 12 50 56 | 55 | 241 |
| 10 11+56 | 53 | 10 47+55 | 54 | 11 22+56 | 54 | 11 57+56 | 54 | 12 32+57 | 54 | 240 |
| ... | | 10 27 56 | 53 | 11 03 56 | 53 | 11 39 57 | 53 | 12 15 57 | 53 | 239 |
| ... | | 10 08+56 | 52 | 10 45 56 | 52 | 11 21 57 | 52 | 11 58 57 | 52 | 238 |
| ... | | ... | | 10 27 56 | 51 | 11 04 56 | 51 | 11 41 57 | 51 | 237 |
| ... | | ... | | 10 09+56 | 50 | 10 47 56 | 50 | 11 25 56 | 51 | 236 |
| ... | | ... | | ... | | 10 29+57 | 50 | 11 08+57 | 50 | 235 |
| ... | | ... | | ... | | 10 13+56 | 49 | 10 52 57 | 49 | 234 |
| ... | | ... | | ... | | ... | | 10 36 57 | 48 | 233 |
| ... | | ... | | ... | | ... | | 10 20 57 | 47 | 232 |
| ... | | ... | | ... | | ... | | 10 05+57 | 46 | 231 |
| ... | | ... | | ... | | ... | | ... | | 230 |

th { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. } See p. 90.
es { For argument H.A. on the right, True Azimuth = Tabulated Azimuth. }

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | | 66° | | | 67° | | | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | H.A. |
| ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° |
| 0 | 50 01 | +60 | 180 | 49 01 | +60 | 180 | 48 01 | +60 | 180 | 47 01 | +60 | 180 | 46 01 | +60 | 180 | 360 |
| 1 | 50 00 | 60 | 179 | 49 00 | 60 | 179 | 48 00 | 60 | 179 | 47 00 | 60 | 179 | 46 01 | 60 | 179 | 359 |
| 2 | 49 59 | 60 | 177 | 49 00 | 59 | 177 | 48 00 | 60 | 177 | 47 00 | 60 | 177 | 46 00 | 60 | 177 | 358 |
| 3 | 49 58 | 60 | 176 | 48 58 | 60 | 176 | 47 58 | 60 | 176 | 46 58 | 60 | 176 | 45 59 | 60 | 176 | 357 |
| 4 | 49 56 | 60 | 174 | 48 56 | 60 | 174 | 47 56 | 60 | 175 | 46 57 | 60 | 175 | 45 57 | 60 | 175 | 356 |
| 5 | 49 53 | +60 | 173 | 48 53 | +60 | 173 | 47 54 | +60 | 173 | 46 54 | +60 | 173 | 45 55 | +60 | 173 | 355 |
| 6 | 49 49 | 60 | 172 | 48 50 | 60 | 172 | 47 51 | 60 | 172 | 46 51 | 60 | 172 | 45 52 | 60 | 172 | 354 |
| 7 | 49 45 | 60 | 170 | 48 46 | 60 | 170 | 47 47 | 60 | 171 | 46 48 | 60 | 171 | 45 49 | 60 | 171 | 353 |
| 8 | 49 41 | 60 | 169 | 48 42 | 60 | 169 | 47 43 | 60 | 169 | 46 44 | 60 | 169 | 45 45 | 60 | 170 | 352 |
| 9 | 49 36 | 59 | 167 | 48 37 | 60 | 168 | 47 38 | 60 | 168 | 46 40 | 60 | 168 | 45 41 | 60 | 168 | 351 |
| 10 | 49 30 | +59 | 166 | 48 32 | +59 | 166 | 47 33 | +60 | 167 | 46 35 | +60 | 167 | 45 36 | +60 | 167 | 350 |
| 11 | 49 23 | 60 | 165 | 48 25 | 60 | 165 | 47 27 | 60 | 165 | 46 29 | 60 | 165 | 45 31 | 60 | 166 | 349 |
| 12 | 49 16 | 60 | 163 | 48 19 | 59 | 164 | 47 21 | 60 | 164 | 46 24 | 59 | 164 | 45 26 | 59 | 164 | 348 |
| 13 | 49 09 | 59 | 162 | 48 12 | 59 | 162 | 47 14 | 60 | 163 | 46 17 | 60 | 163 | 45 20 | 59 | 163 | 347 |
| 14 | 49 00 | 60 | 160 | 48 04 | 59 | 161 | 47 07 | 60 | 161 | 46 10 | 60 | 162 | 45 13 | 60 | 162 | 346 |
| 15 | 48 52 | +59 | 159 | 47 56 | +59 | 160 | 46 59 | +60 | 160 | 46 03 | +59 | 160 | 45 06 | +60 | 161 | 345 |
| 16 | 48 42 | 59 | 158 | 47 47 | 59 | 158 | 46 51 | 59 | 159 | 45 55 | 59 | 159 | 44 59 | 59 | 159 | 344 |
| 17 | 48 33 | 58 | 156 | 47 37 | 60 | 157 | 46 42 | 59 | 157 | 45 47 | 59 | 158 | 44 51 | 60 | 158 | 343 |
| 18 | 48 22 | 59 | 155 | 47 28 | 59 | 156 | 46 33 | 59 | 156 | 45 38 | 59 | 156 | 44 43 | 59 | 157 | 342 |
| 19 | 48 11 | 59 | 154 | 47 17 | 59 | 154 | 46 23 | 59 | 155 | 45 29 | 59 | 155 | 44 34 | 60 | 156 | 341 |
| 20 | 48 00 | +58 | 152 | 47 06 | +59 | 153 | 46 13 | +59 | 153 | 45 19 | +59 | 154 | 44 25 | +59 | 154 | 340 |
| 21 | 47 48 | 58 | 151 | 46 55 | 59 | 152 | 46 02 | 59 | 152 | 45 09 | 59 | 153 | 44 16 | 59 | 153 | 339 |
| 22 | 47 35 | 58 | 150 | 46 43 | 59 | 150 | 45 51 | 59 | 151 | 44 59 | 58 | 151 | 44 06 | 59 | 152 | 338 |
| 23 | 47 22 | 58 | 148 | 46 31 | 58 | 149 | 45 39 | 59 | 150 | 44 48 | 58 | 150 | 43 55 | 59 | 151 | 337 |
| 24 | 47 09 | 58 | 147 | 46 18 | 58 | 148 | 45 27 | 59 | 148 | 44 36 | 59 | 149 | 43 45 | 58 | 149 | 336 |
| 25 | 46 55 | +58 | 146 | 46 05 | +58 | 146 | 45 15 | +58 | 147 | 44 24 | +59 | 148 | 43 33 | +59 | 148 | 335 |
| 26 | 46 40 | 58 | 145 | 45 51 | 58 | 145 | 45 02 | 58 | 146 | 44 12 | 58 | 146 | 43 22 | 58 | 147 | 334 |
| 27 | 46 25 | 58 | 143 | 45 37 | 58 | 144 | 44 48 | 58 | 145 | 43 59 | 59 | 145 | 43 10 | 58 | 146 | 333 |
| 28 | 46 10 | 57 | 142 | 45 23 | 57 | 143 | 44 35 | 58 | 143 | 43 46 | 58 | 144 | 42 58 | 58 | 144 | 332 |
| 29 | 45 54 | 58 | 141 | 45 08 | 57 | 141 | 44 20 | 58 | 142 | 43 33 | 58 | 143 | 42 45 | 58 | 143 | 331 |
| 30 | 45 38 | +57 | 140 | 44 52 | +58 | 140 | 44 06 | +58 | 141 | 43 19 | +58 | 141 | 42 32 | +58 | 142 | 330 |
| 31 | 45 21 | 57 | 138 | 44 36 | 58 | 139 | 43 51 | 57 | 140 | 43 05 | 58 | 140 | 42 19 | 58 | 141 | 329 |
| 32 | 45 04 | 57 | 137 | 44 20 | 57 | 138 | 43 36 | 57 | 138 | 42 50 | 58 | 139 | 42 05 | 58 | 140 | 328 |
| 33 | 44 47 | 57 | 136 | 44 04 | 57 | 137 | 43 20 | 57 | 137 | 42 36 | 57 | 138 | 41 51 | 58 | 139 | 327 |
| 34 | 44 29 | 57 | 135 | 43 47 | 57 | 135 | 43 04 | 57 | 136 | 42 20 | 58 | 137 | 41 36 | 58 | 137 | 326 |
| 35 | 44 11 | +56 | 134 | 43 29 | +57 | 134 | 42 47 | +57 | 135 | 42 05 | +57 | 136 | 41 22 | +57 | 136 | 325 |
| 36 | 43 52 | 57 | 132 | 43 12 | 56 | 133 | 42 31 | 56 | 134 | 41 49 | 57 | 134 | 41 07 | 57 | 135 | 324 |
| 37 | 43 34 | 56 | 131 | 42 54 | 56 | 132 | 42 13 | 57 | 133 | 41 33 | 57 | 133 | 40 51 | 58 | 134 | 323 |
| 38 | 43 14 | 56 | 130 | 42 35 | 57 | 131 | 41 56 | 57 | 131 | 41 16 | 57 | 132 | 40 36 | 57 | 133 | 322 |
| 39 | 42 55 | 56 | 129 | 42 17 | 56 | 130 | 41 38 | 57 | 130 | 40 59 | 57 | 131 | 40 20 | 57 | 132 | 321 |
| 40 | 42 35 | +55 | 128 | 41 58 | +56 | 128 | 41 20 | +57 | 129 | 40 42 | +57 | 130 | 40 04 | +57 | 130 | 320 |
| 41 | 42 15 | 55 | 127 | 41 39 | 56 | 127 | 41 02 | 56 | 128 | 40 25 | 56 | 129 | 39 47 | 57 | 129 | 319 |
| 42 | 41 54 | 56 | 125 | 41 19 | 56 | 126 | 40 43 | 57 | 127 | 40 07 | 57 | 128 | 39 30 | 57 | 128 | 318 |
| 43 | 41 33 | 56 | 124 | 40 59 | 56 | 125 | 40 24 | 57 | 126 | 39 49 | 57 | 126 | 39 13 | 57 | 127 | 317 |
| 44 | 41 12 | 55 | 123 | 40 39 | 56 | 124 | 40 05 | 56 | 125 | 39 31 | 56 | 125 | 38 56 | 57 | 126 | 316 |
| 45 | 40 51 | +55 | 122 | 40 19 | +55 | 123 | 39 46 | +56 | 124 | 39 12 | +57 | 124 | 38 38 | +57 | 125 | 315 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

| LAT. | 65° | | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° | ° , d | ° | ° , d | ° | ° , d | ° | ° , d | ° | ° , d | ° | ° |
| 45 | 40 51+55 | 122 | 40 19+55 | 123 | 39 46+56 | 124 | 39 12+57 | 124 | 38 38+57 | 125 | 315 |
| 46 | 40 29 55 | 121 | 39 58 55 | 122 | 39 26 56 | 122 | 38 54 56 | 123 | 38 21 56 | 124 | 314 |
| 47 | 40 08 54 | 120 | 39 37 56 | 121 | 39 06 56 | 121 | 38 35 56 | 122 | 38 03 56 | 123 | 313 |
| 48 | 39 45 55 | 119 | 39 16 55 | 120 | 38 46 56 | 120 | 38 16 56 | 121 | 37 45 56 | 122 | 312 |
| 49 | 39 23 55 | 118 | 38 55 55 | 118 | 38 26 55 | 119 | 37 56 56 | 120 | 37 26 56 | 121 | 311 |
| 50 | 39 01+54 | 117 | 38 33+55 | 117 | 38 05+56 | 118 | 37 37+56 | 119 | 37 08+56 | 119 | 310 |
| 51 | 38 38 54 | 116 | 38 12 54 | 116 | 37 45 55 | 117 | 37 17 56 | 118 | 36 49 56 | 118 | 309 |
| 52 | 38 15 54 | 115 | 37 50 54 | 115 | 37 24 55 | 116 | 36 57 56 | 117 | 36 30 56 | 117 | 308 |
| 53 | 37 52 54 | 114 | 37 27 55 | 114 | 37 02 56 | 115 | 36 37 55 | 116 | 36 11 56 | 116 | 307 |
| 54 | 37 28 54 | 113 | 37 05 55 | 113 | 36 41 55 | 114 | 36 17 55 | 115 | 35 51 56 | 115 | 306 |
| 55 | 37 05+54 | 112 | 36 43+54 | 112 | 36 20+55 | 113 | 35 56+55 | 114 | 35 32+56 | 114 | 305 |
| 56 | 36 41 54 | 110 | 36 20 54 | 111 | 35 58 55 | 112 | 35 35 56 | 113 | 35 12 56 | 113 | 304 |
| 57 | 36 17 54 | 109 | 35 57 54 | 110 | 35 36 55 | 111 | 35 15 55 | 112 | 34 52 56 | 112 | 303 |
| 58 | 35 54 53 | 108 | 35 34 54 | 109 | 35 14 55 | 110 | 34 54 55 | 110 | 34 32 56 | 111 | 302 |
| 59 | 35 29 54 | 107 | 35 11 54 | 108 | 34 52 55 | 109 | 34 32 56 | 109 | 34 12 56 | 110 | 301 |
| 60 | 35 05+54 | 106 | 34 48+54 | 107 | 34 30+54 | 108 | 34 11+55 | 108 | 33 52+55 | 109 | 300 |
| 61 | 34 41 53 | 105 | 34 24 55 | 106 | 34 07 55 | 107 | 33 50 55 | 107 | 33 32 55 | 108 | 299 |
| 62 | 34 16 54 | 104 | 34 01 54 | 105 | 33 45 54 | 106 | 33 28 55 | 106 | 33 11 56 | 107 | 298 |
| 63 | 33 52 53 | 104 | 33 37 54 | 104 | 33 22 55 | 105 | 33 07 55 | 105 | 32 50 56 | 106 | 297 |
| 64 | 33 27 53 | 103 | 33 14 54 | 103 | 33 00 54 | 104 | 32 45 55 | 104 | 32 30 55 | 105 | 296 |
| 65 | 33 02+54 | 102 | 32 50+54 | 102 | 32 37+54 | 103 | 32 23+55 | 103 | 32 09+55 | 104 | 295 |
| 66 | 32 37 54 | 101 | 32 26 54 | 101 | 32 14 54 | 102 | 32 01 55 | 102 | 31 48 55 | 103 | 294 |
| 67 | 32 12 54 | 100 | 32 02 54 | 100 | 31 51 54 | 101 | 31 39 55 | 102 | 31 27 55 | 102 | 293 |
| 68 | 31 47 54 | 99 | 31 38 54 | 99 | 31 28 54 | 100 | 31 17 55 | 101 | 31 06 55 | 101 | 292 |
| 69 | 31 22 54 | 98 | 31 14 54 | 98 | 31 05 54 | 99 | 30 55 55 | 100 | 30 45 55 | 100 | 291 |
| 70 | 30 57+53 | 97 | 30 50+53 | 97 | 30 42+54 | 98 | 30 33+55 | 99 | 30 24+55 | 99 | 290 |
| 71 | 30 32 53 | 96 | 30 26 53 | 96 | 30 19 54 | 97 | 30 11 54 | 98 | 30 03 55 | 98 | 289 |
| 72 | 30 07 53 | 95 | 30 01 54 | 96 | 29 55 54 | 96 | 29 49 54 | 97 | 29 41 55 | 97 | 288 |
| 73 | 29 42 53 | 94 | 29 37 54 | 95 | 29 32 54 | 95 | 29 26 55 | 96 | 29 20 55 | 96 | 287 |
| 74 | 29 16 53 | 93 | 29 13 53 | 94 | 29 09 54 | 94 | 29 04 54 | 95 | 28 59 55 | 95 | 286 |
| 75 | 28 51+53 | 92 | 28 48+54 | 93 | 28 45+54 | 93 | 28 41+55 | 94 | 28 37+55 | 94 | 285 |
| 76 | 28 26 53 | 91 | 28 24 54 | 92 | 28 22 54 | 92 | 28 19 55 | 93 | 28 16 55 | 93 | 284 |
| 77 | 28 00 53 | 90 | 28 00 53 | 91 | 27 58 54 | 91 | 27 57 54 | 92 | 27 54 55 | 93 | 283 |
| 78 | 27 35 53 | 89 | 27 35 54 | 90 | 27 35 54 | 91 | 27 34 55 | 91 | 27 33 55 | 92 | 282 |
| 79 | 27 10 53 | 89 | 27 11 53 | 89 | 27 12 54 | 90 | 27 12 54 | 90 | 27 11 55 | 91 | 281 |
| 80 | 26 44+53 | 88 | 26 47+53 | 88 | 26 48+54 | 89 | 26 49+55 | 89 | 26 50+55 | 90 | 280 |
| 81 | 26 19 53 | 87 | 26 22 54 | 87 | 26 25 54 | 88 | 26 27 54 | 88 | 26 28 55 | 89 | 279 |
| 82 | 25 54 53 | 86 | 25 58 53 | 86 | 26 01 54 | 87 | 26 04 55 | 87 | 26 07 55 | 88 | 278 |
| 83 | 25 29 53 | 85 | 25 34 53 | 85 | 25 38 54 | 86 | 25 42 55 | 86 | 25 45 56 | 87 | 277 |
| 84 | 25 03 53 | 84 | 25 09 54 | 85 | 25 15 54 | 85 | 25 20 54 | 86 | 25 24 55 | 86 | 276 |
| 85 | 24 38+53 | 83 | 24 45+54 | 84 | 24 51+54 | 84 | 24 57+55 | 85 | 25 03+55 | 85 | 275 |
| 86 | 24 13 53 | 82 | 24 21 53 | 83 | 24 28 54 | 83 | 24 35 55 | 84 | 24 41 55 | 84 | 274 |
| 87 | 23 48 53 | 81 | 23 57 53 | 82 | 24 05 54 | 82 | 24 13 54 | 83 | 24 20 55 | 83 | 273 |
| 88 | 23 23 53 | 81 | 23 33 53 | 81 | 23 42 54 | 81 | 23 50 55 | 82 | 23 59 55 | 82 | 272 |
| 89 | 22 58 53 | 80 | 23 09 53 | 80 | 23 19 54 | 81 | 23 28 55 | 81 | 23 37 55 | 81 | 271 |
| 90 | 22 33+53 | 79 | 22 45+53 | 79 | 22 56+54 | 80 | 23 06+55 | 80 | 23 16+55 | 81 | 270 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | | 66° | | | 67° | | | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | H.A. |
| ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° |
| 90 | 22 33 | +53 | 79 | 22 45 | +53 | 79 | 22 56 | +54 | 80 | 23 06 | +55 | 80 | 23 16 | +55 | 81 | 270 |
| 91 | 22 08 | 54 | 78 | 22 21 | 53 | 78 | 22 33 | 54 | 79 | 22 44 | 55 | 79 | 22 55 | 55 | 80 | 269 |
| 92 | 21 44 | 53 | 77 | 21 57 | 54 | 78 | 22 10 | 54 | 78 | 22 22 | 55 | 78 | 22 34 | 55 | 79 | 268 |
| 93 | 21 19 | 53 | 76 | 21 33 | 54 | 77 | 21 47 | 54 | 77 | 22 00 | 55 | 77 | 22 13 | 55 | 78 | 267 |
| 94 | 20 55 | 53 | 75 | 21 09 | 54 | 76 | 21 24 | 54 | 76 | 21 38 | 55 | 77 | 21 52 | 55 | 77 | 266 |
| 95 | 20 30 | +54 | 75 | 20 46 | +54 | 75 | 21 01 | +55 | 75 | 21 16 | +55 | 76 | 21 31 | +55 | 76 | 265 |
| 96 | 20 06 | 53 | 74 | 20 22 | 54 | 74 | 20 39 | 54 | 74 | 20 55 | 55 | 75 | 21 10 | 56 | 75 | 264 |
| 97 | 19 42 | 53 | 73 | 19 59 | 54 | 73 | 20 16 | 55 | 73 | 20 33 | 55 | 74 | 20 50 | 55 | 74 | 263 |
| 98 | 19 17 | 54 | 72 | 19 36 | 54 | 72 | 19 54 | 54 | 73 | 20 12 | 55 | 73 | 20 29 | 55 | 73 | 262 |
| 99 | 18 53 | 54 | 71 | 19 13 | 54 | 71 | 19 32 | 54 | 72 | 19 50 | 55 | 72 | 20 09 | 55 | 72 | 261 |
| 100 | 18 30 | +53 | 70 | 18 50 | +54 | 71 | 19 09 | +55 | 71 | 19 29 | +55 | 71 | 19 48 | +56 | 72 | 260 |
| 101 | 18 06 | 54 | 69 | 18 27 | 54 | 70 | 18 47 | 55 | 70 | 19 08 | 55 | 70 | 19 28 | 55 | 71 | 259 |
| 102 | 17 42 | 54 | 68 | 18 04 | 54 | 69 | 18 26 | 54 | 69 | 18 47 | 55 | 69 | 19 08 | 55 | 70 | 258 |
| 103 | 17 19 | 54 | 68 | 17 41 | 55 | 68 | 18 04 | 55 | 68 | 18 26 | 55 | 69 | 18 48 | 55 | 69 | 257 |
| 104 | 16 55 | 54 | 67 | 17 19 | 54 | 67 | 17 42 | 55 | 67 | 18 05 | 55 | 68 | 18 28 | 55 | 68 | 256 |
| 105 | 16 32 | +54 | 66 | 16 57 | +54 | 66 | 17 21 | +55 | 66 | 17 44 | +56 | 67 | 18 08 | +56 | 67 | 255 |
| 106 | 16 09 | 54 | 65 | 16 34 | 55 | 65 | 16 59 | 55 | 66 | 17 24 | 55 | 66 | 17 48 | 56 | 66 | 254 |
| 107 | 15 46 | 55 | 64 | 16 12 | 55 | 64 | 16 38 | 55 | 65 | 17 03 | 56 | 65 | 17 29 | 55 | 65 | 253 |
| 108 | 15 24 | 54 | 63 | 15 50 | 55 | 64 | 16 17 | 55 | 64 | 16 43 | 56 | 64 | 17 09 | 56 | 64 | 252 |
| 109 | 15 01 | 55 | 62 | 15 29 | 55 | 63 | 15 56 | 55 | 63 | 16 23 | 56 | 63 | 16 50 | 56 | 64 | 251 |
| 110 | 14 39 | +54 | 62 | 15 07 | +55 | 62 | 15 35 | +56 | 62 | 16 03 | +56 | 62 | 16 31 | +56 | 63 | 250 |
| 111 | 14 17 | 54 | 61 | 14 46 | 55 | 61 | 15 15 | 55 | 61 | 15 43 | 56 | 61 | 16 12 | 56 | 62 | 249 |
| 112 | 13 55 | 55 | 60 | 14 25 | 55 | 60 | 14 54 | 56 | 60 | 15 24 | 56 | 61 | 15 53 | 56 | 61 | 248 |
| 113 | 13 33 | 55 | 59 | 14 04 | 55 | 59 | 14 34 | 56 | 60 | 15 04 | 56 | 60 | 15 34 | 57 | 60 | 247 |
| 114 | 13 12 | 54 | 58 | 13 43 | 55 | 58 | 14 14 | 56 | 59 | 14 45 | 56 | 59 | 15 16 | 56 | 59 | 246 |
| 115 | 12 50 | +55 | 57 | 13 22 | +56 | 58 | 13 54 | +56 | 58 | 14 26 | +56 | 58 | 14 58 | +56 | 58 | 245 |
| 116 | 12 29 | 55 | 57 | 13 02 | 55 | 57 | 13 35 | 55 | 57 | 14 07 | 56 | 57 | 14 39 | 57 | 57 | 244 |
| 117 | 12 08 | 55 | 56 | 12 42 | 55 | 56 | 13 15 | 56 | 56 | 13 48 | 57 | 56 | 14 22 | 56 | 56 | 243 |
| 118 | 11 47 | 56 | 55 | 12 22 | 55 | 55 | 12 56 | 56 | 55 | 13 30 | 56 | 55 | 14 04 | 56 | 56 | 242 |
| 119 | 11 27 | 55 | 54 | 12 02 | 55 | 54 | 12 37 | 56 | 54 | 13 12 | 56 | 54 | 13 46 | 57 | 55 | 241 |
| 120 | 11 07 | +55 | 53 | 11 42 | +56 | 53 | 12 18 | +56 | 53 | 12 53 | +57 | 54 | 13 29 | +56 | 54 | 240 |
| 121 | 10 47 | 55 | 52 | 11 23 | 56 | 52 | 11 59 | 56 | 53 | 12 36 | 56 | 53 | 13 12 | 56 | 53 | 239 |
| 122 | 10 27 | 55 | 51 | 11 04 | 56 | 52 | 11 41 | 56 | 52 | 12 18 | 56 | 52 | 12 55 | 56 | 52 | 238 |
| 123 | 10 07 | +56 | 51 | 10 45 | 56 | 51 | 11 23 | 56 | 51 | 12 00 | 57 | 51 | 12 38 | 57 | 51 | 237 |
| 124 | ... | | | 10 26 | 56 | 50 | 11 05 | 56 | 50 | 11 43 | 57 | 50 | 12 21 | 57 | 50 | 236 |
| 125 | ... | | | 10 08 | +56 | 49 | 10 47 | +56 | 49 | 11 26 | +57 | 49 | 12 05 | +57 | 49 | 235 |
| 126 | ... | | | ... | | | 10 30 | 56 | 48 | 11 09 | 57 | 48 | 11 49 | 57 | 48 | 234 |
| 127 | ... | | | ... | | | 10 12 | +57 | 47 | 10 53 | 57 | 47 | 11 33 | 57 | 48 | 233 |
| 128 | ... | | | ... | | | ... | | | 10 36 | 57 | 47 | 11 17 | 57 | 47 | 232 |
| 129 | ... | | | ... | | | ... | | | 10 20 | 57 | 46 | 11 02 | 57 | 46 | 231 |
| 130 | ... | | | ... | | | ... | | | 10 04 | +57 | 45 | 10 47 | +57 | 45 | 230 |
| 131 | ... | | | ... | | | ... | | | ... | | | 10 32 | 57 | 44 | 229 |
| 132 | ... | | | ... | | | ... | | | ... | | | 10 17 | 57 | 43 | 228 |
| 133 | ... | | | ... | | | ... | | | ... | | | 10 02 | +58 | 42 | 227 |
| 134 | ... | | | ... | | | ... | | | ... | | | ... | | | 226 |
| 135 | ... | | | ... | | | ... | | | ... | | | ... | | | 225 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° |
| 0 | 51 01+60 | 180 | 50 01+60 | 180 | 49 01+60 | 180 | 48 01+60 | 180 | 47 01+60 | 180 | 360 |
| 1 | 51 00 60 | 179 | 50 00 60 | 179 | 49 00 60 | 179 | 48 00 60 | 179 | 47 01 59 | 179 | 359 |
| 2 | 50 59 60 | 177 | 49 59 60 | 177 | 49 00 60 | 177 | 48 00 60 | 177 | 47 00 60 | 177 | 358 |
| 3 | 50 58 60 | 176 | 49 58 60 | 176 | 48 58 60 | 176 | 47 58 60 | 176 | 46 59 59 | 176 | 357 |
| 4 | 50 56 60 | 174 | 49 56 60 | 174 | 48 56 60 | 175 | 47 57 59 | 175 | 46 57 60 | 175 | 356 |
| 5 | 50 53+60 | 173 | 49 53+60 | 173 | 48 54+60 | 173 | 47 54+60 | 173 | 46 55+59 | 173 | 355 |
| 6 | 50 49 60 | 171 | 49 50 60 | 172 | 48 51 60 | 172 | 47 51 60 | 172 | 46 52 60 | 172 | 354 |
| 7 | 50 45 60 | 170 | 49 46 60 | 170 | 48 47 60 | 170 | 47 48 60 | 171 | 46 49 60 | 171 | 353 |
| 8 | 50 41 59 | 169 | 49 42 59 | 169 | 48 43 60 | 169 | 47 44 60 | 169 | 46 45 60 | 169 | 352 |
| 9 | 50 35 60 | 167 | 49 37 59 | 167 | 48 38 60 | 168 | 47 40 59 | 168 | 46 41 60 | 168 | 351 |
| 10 | 50 29+60 | 166 | 49 31+60 | 166 | 48 33+60 | 166 | 47 35+59 | 167 | 46 36+60 | 167 | 350 |
| 11 | 50 23 59 | 164 | 49 25 60 | 165 | 48 27 60 | 165 | 47 29 60 | 165 | 46 31 60 | 166 | 349 |
| 12 | 50 16 59 | 163 | 49 18 60 | 163 | 48 21 59 | 164 | 47 23 60 | 164 | 46 25 60 | 164 | 348 |
| 13 | 50 08 59 | 162 | 49 11 59 | 162 | 48 14 59 | 162 | 47 17 59 | 163 | 46 19 60 | 163 | 347 |
| 14 | 50 00 59 | 160 | 49 03 59 | 161 | 48 07 59 | 161 | 47 10 59 | 161 | 46 13 59 | 162 | 346 |
| 15 | 49 51+59 | 159 | 48 55+59 | 159 | 47 59+59 | 160 | 47 02+60 | 160 | 46 06+59 | 160 | 345 |
| 16 | 49 41 59 | 157 | 48 46 59 | 158 | 47 50 59 | 158 | 46 54 60 | 159 | 45 58 60 | 159 | 344 |
| 17 | 49 31 59 | 156 | 48 37 58 | 157 | 47 41 59 | 157 | 46 46 59 | 157 | 45 51 59 | 158 | 343 |
| 18 | 49 21 59 | 155 | 48 27 58 | 155 | 47 32 59 | 156 | 46 37 59 | 156 | 45 42 59 | 157 | 342 |
| 19 | 49 10 58 | 153 | 48 16 59 | 154 | 47 22 59 | 154 | 46 28 59 | 155 | 45 34 59 | 155 | 341 |
| 20 | 48 58+59 | 152 | 48 05+59 | 153 | 47 12+59 | 153 | 46 18+59 | 154 | 45 24+59 | 154 | 340 |
| 21 | 48 46 58 | 151 | 47 54 58 | 151 | 47 01 59 | 152 | 46 08 59 | 152 | 45 15 59 | 153 | 339 |
| 22 | 48 33 59 | 149 | 47 42 58 | 150 | 46 50 58 | 151 | 45 57 59 | 151 | 45 05 59 | 152 | 338 |
| 23 | 48 20 58 | 148 | 47 29 59 | 149 | 46 38 58 | 149 | 45 46 59 | 150 | 44 54 59 | 150 | 337 |
| 24 | 48 07 58 | 147 | 47 16 58 | 147 | 46 26 58 | 148 | 45 35 58 | 149 | 44 43 59 | 149 | 336 |
| 25 | 47 53+57 | 146 | 47 03+58 | 146 | 46 13+58 | 147 | 45 23+58 | 147 | 44 32+59 | 148 | 335 |
| 26 | 47 38 58 | 144 | 46 49 58 | 145 | 46 00 58 | 145 | 45 10 59 | 146 | 44 20 59 | 147 | 334 |
| 27 | 47 23 57 | 143 | 46 35 58 | 144 | 45 46 58 | 144 | 44 58 58 | 145 | 44 08 59 | 145 | 333 |
| 28 | 47 07 58 | 142 | 46 20 58 | 142 | 45 33 57 | 143 | 44 44 59 | 144 | 43 56 58 | 144 | 332 |
| 29 | 46 52 57 | 140 | 46 05 58 | 141 | 45 18 58 | 142 | 44 31 58 | 142 | 43 43 58 | 143 | 331 |
| 30 | 46 35+57 | 139 | 45 50+57 | 140 | 45 04+57 | 140 | 44 17+58 | 141 | 43 30+58 | 142 | 330 |
| 31 | 46 18 57 | 138 | 45 34 57 | 139 | 44 48 58 | 139 | 44 03 57 | 140 | 43 17 58 | 141 | 329 |
| 32 | 46 01 57 | 137 | 45 17 57 | 137 | 44 33 57 | 138 | 43 48 58 | 139 | 43 03 58 | 139 | 328 |
| 33 | 45 44 56 | 135 | 45 01 57 | 136 | 44 17 57 | 137 | 43 33 58 | 138 | 42 49 57 | 138 | 327 |
| 34 | 45 26 56 | 134 | 44 44 56 | 135 | 44 01 57 | 136 | 43 18 57 | 136 | 42 34 58 | 137 | 326 |
| 35 | 45 07+57 | 133 | 44 26+57 | 134 | 43 44+57 | 134 | 43 02+57 | 135 | 42 19+58 | 136 | 325 |
| 36 | 44 49 56 | 132 | 44 08 57 | 133 | 43 27 57 | 133 | 42 46 57 | 134 | 42 04 58 | 135 | 324 |
| 37 | 44 30 56 | 131 | 43 50 57 | 131 | 43 10 57 | 132 | 42 30 57 | 133 | 41 49 57 | 133 | 323 |
| 38 | 44 10 56 | 130 | 43 32 56 | 130 | 42 53 56 | 131 | 42 13 57 | 132 | 41 33 57 | 132 | 322 |
| 39 | 43 51 55 | 128 | 43 13 56 | 129 | 42 35 56 | 130 | 41 56 57 | 131 | 41 17 57 | 131 | 321 |
| 40 | 43 30+56 | 127 | 42 54+56 | 128 | 42 17+56 | 129 | 41 39+57 | 129 | 41 01+57 | 130 | 320 |
| 41 | 43 10 56 | 126 | 42 35 55 | 127 | 41 58 57 | 128 | 41 21 57 | 128 | 40 44 57 | 129 | 319 |
| 42 | 42 50 55 | 125 | 42 15 56 | 126 | 41 40 56 | 126 | 41 04 56 | 127 | 40 27 57 | 128 | 318 |
| 43 | 42 29 55 | 124 | 41 55 55 | 125 | 41 21 56 | 125 | 40 46 56 | 126 | 40 10 57 | 127 | 317 |
| 44 | 42 07 55 | 123 | 41 35 55 | 123 | 41 01 56 | 124 | 40 27 57 | 125 | 39 53 56 | 126 | 316 |
| 45 | 41 46+55 | 122 | 41 14+56 | 122 | 40 42+56 | 123 | 40 09+56 | 124 | 39 35+57 | 124 | 315 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

| LAT. | 65° | | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° | ° , d | ° | ° , d | ° | ° , d | ° | ° , d | ° | ° , d | ° | ° |
| 45 | 41 46+55 | 122 | 41 14+56 | 122 | 40 42+56 | 123 | 40 09+56 | 124 | 39 35+57 | 124 | 315 |
| 46 | 41 24 55 | 120 | 40 53 56 | 121 | 40 22 56 | 122 | 39 50 56 | 123 | 39 17 57 | 123 | 314 |
| 47 | 41 02 55 | 119 | 40 33 55 | 120 | 40 02 56 | 121 | 39 31 56 | 122 | 38 59 57 | 122 | 313 |
| 48 | 40 40 55 | 118 | 40 11 55 | 119 | 39 42 55 | 120 | 39 12 56 | 120 | 38 41 56 | 121 | 312 |
| 49 | 40 18 54 | 117 | 39 50 55 | 118 | 39 21 56 | 119 | 38 52 56 | 119 | 38 22 57 | 120 | 311 |
| 50 | 39 55+54 | 116 | 39 28+55 | 117 | 39 01+55 | 118 | 38 33+55 | 118 | 38 04+56 | 119 | 310 |
| 51 | 39 32 54 | 115 | 39 06 55 | 116 | 38 40 55 | 117 | 38 13 55 | 117 | 37 45 56 | 118 | 309 |
| 52 | 39 09 54 | 114 | 38 44 55 | 115 | 38 19 55 | 116 | 37 53 55 | 116 | 37 26 56 | 117 | 308 |
| 53 | 38 46 54 | 113 | 38 22 55 | 114 | 37 58 55 | 114 | 37 32 56 | 115 | 37 07 56 | 116 | 307 |
| 54 | 38 22 54 | 112 | 38 00 54 | 113 | 37 36 55 | 113 | 37 12 55 | 114 | 36 47 56 | 115 | 306 |
| 55 | 37 59+54 | 111 | 37 37+54 | 112 | 37 15+54 | 112 | 36 51+56 | 113 | 36 28+55 | 114 | 305 |
| 56 | 37 35 54 | 110 | 37 14 55 | 111 | 36 53 55 | 111 | 36 31 55 | 112 | 36 08 56 | 113 | 304 |
| 57 | 37 11 54 | 109 | 36 51 55 | 110 | 36 31 55 | 110 | 36 10 55 | 111 | 35 48 56 | 112 | 303 |
| 58 | 36 47 54 | 108 | 36 28 55 | 109 | 36 09 55 | 109 | 35 49 55 | 110 | 35 28 56 | 111 | 302 |
| 59 | 36 23 54 | 107 | 36 05 54 | 108 | 35 47 54 | 108 | 35 28 55 | 109 | 35 08 55 | 110 | 301 |
| 60 | 35 59+53 | 106 | 35 42+54 | 107 | 35 24+55 | 107 | 35 06+55 | 108 | 34 47+56 | 109 | 300 |
| 61 | 35 34 54 | 105 | 35 19 53 | 106 | 35 02 54 | 106 | 34 45 55 | 107 | 34 27 55 | 108 | 299 |
| 62 | 35 10 53 | 104 | 34 55 54 | 105 | 34 39 55 | 105 | 34 23 55 | 106 | 34 07 55 | 107 | 298 |
| 63 | 34 45 53 | 103 | 34 31 54 | 104 | 34 17 54 | 104 | 34 02 54 | 105 | 33 46 55 | 106 | 297 |
| 64 | 34 20 54 | 102 | 34 08 53 | 103 | 33 54 54 | 103 | 33 40 55 | 104 | 33 25 55 | 105 | 296 |
| 65 | 33 56+53 | 101 | 33 44+53 | 102 | 33 31+54 | 102 | 33 18+55 | 103 | 33 04+56 | 104 | 295 |
| 66 | 33 31 53 | 100 | 33 20 53 | 101 | 33 08 54 | 101 | 32 56 55 | 102 | 32 43 56 | 103 | 294 |
| 67 | 33 06 53 | 99 | 32 56 53 | 100 | 32 45 54 | 100 | 32 34 55 | 101 | 32 22 56 | 102 | 293 |
| 68 | 32 41 53 | 98 | 32 32 53 | 99 | 32 22 54 | 99 | 32 12 55 | 100 | 32 01 55 | 101 | 292 |
| 69 | 32 16 52 | 97 | 32 08 53 | 98 | 31 59 54 | 98 | 31 50 55 | 99 | 31 40 55 | 100 | 291 |
| 70 | 31 50+53 | 96 | 31 43+54 | 97 | 31 36+54 | 98 | 31 28+54 | 98 | 31 19+55 | 99 | 290 |
| 71 | 31 25 53 | 95 | 31 19 54 | 96 | 31 13 54 | 97 | 31 05 55 | 97 | 30 58 55 | 98 | 289 |
| 72 | 31 00 53 | 94 | 30 55 53 | 95 | 30 49 54 | 96 | 30 43 55 | 96 | 30 36 55 | 97 | 288 |
| 73 | 30 35 53 | 94 | 30 31 53 | 94 | 30 26 54 | 95 | 30 21 54 | 95 | 30 15 55 | 96 | 287 |
| 74 | 30 09 53 | 93 | 30 06 54 | 93 | 30 03 54 | 94 | 29 58 55 | 94 | 29 54 55 | 95 | 286 |
| 75 | 29 44+53 | 92 | 29 42+53 | 92 | 29 39+54 | 93 | 29 36+55 | 93 | 29 32+55 | 94 | 285 |
| 76 | 29 19 53 | 91 | 29 18 53 | 91 | 29 16 54 | 92 | 29 14 54 | 92 | 29 11 55 | 93 | 284 |
| 77 | 28 53 53 | 90 | 28 53 54 | 90 | 28 52 54 | 91 | 28 51 55 | 92 | 28 49 55 | 92 | 283 |
| 78 | 28 28 53 | 89 | 28 29 53 | 90 | 28 29 54 | 90 | 28 29 54 | 91 | 28 28 55 | 91 | 282 |
| 79 | 28 03 53 | 88 | 28 04 54 | 89 | 28 06 54 | 89 | 28 06 55 | 90 | 28 06 55 | 90 | 281 |
| 80 | 27 37+53 | 87 | 27 40+54 | 88 | 27 42+54 | 88 | 27 44+54 | 89 | 27 45+55 | 89 | 280 |
| 81 | 27 12 53 | 86 | 27 16 53 | 87 | 27 19 54 | 87 | 27 21 55 | 88 | 27 23 55 | 88 | 279 |
| 82 | 26 47 53 | 85 | 26 51 54 | 86 | 26 55 54 | 86 | 26 59 54 | 87 | 27 02 55 | 87 | 278 |
| 83 | 26 22 53 | 84 | 26 27 54 | 85 | 26 32 54 | 85 | 26 37 54 | 86 | 26 41 54 | 86 | 277 |
| 84 | 25 56 53 | 84 | 26 03 53 | 84 | 26 09 54 | 85 | 26 14 55 | 85 | 26 19 55 | 86 | 276 |
| 85 | 25 31+53 | 83 | 25 39+53 | 83 | 25 45+54 | 84 | 25 52+54 | 84 | 25 58+55 | 85 | 275 |
| 86 | 25 06 53 | 82 | 25 14 54 | 82 | 25 22 54 | 83 | 25 30 54 | 83 | 25 36 55 | 84 | 274 |
| 87 | 24 41 53 | 81 | 24 50 54 | 81 | 24 59 54 | 82 | 25 07 55 | 82 | 25 15 55 | 83 | 273 |
| 88 | 24 16 53 | 80 | 24 26 54 | 81 | 24 36 54 | 81 | 24 45 55 | 81 | 24 54 55 | 82 | 272 |
| 89 | 23 51 53 | 79 | 24 02 54 | 80 | 24 13 54 | 80 | 24 23 54 | 81 | 24 32 56 | 81 | 271 |
| 90 | 23 26+54 | 78 | 23 38+54 | 79 | 23 50+54 | 79 | 24 01+54 | 80 | 24 11+55 | 80 | 270 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° | ° , d | ° | ° , d | ° | ° , d | ° | ° , d | ° | ° , d | ° | ° |
| 90 | 23 26+54 | 78 | 23 38+54 | 79 | 23 50+54 | 79 | 24 01+54 | 80 | 24 11+55 | 80 | 270 |
| 91 | 23 02 53 | 77 | 23 14 54 | 78 | 23 27 54 | 78 | 23 39 54 | 79 | 23 50 55 | 79 | 269 |
| 92 | 22 37 53 | 77 | 22 51 53 | 77 | 23 04 54 | 77 | 23 17 54 | 78 | 23 29 55 | 78 | 268 |
| 93 | 22 12 54 | 76 | 22 27 54 | 76 | 22 41 54 | 77 | 22 55 55 | 77 | 23 08 55 | 77 | 267 |
| 94 | 21 48 53 | 75 | 22 03 54 | 75 | 22 18 55 | 76 | 22 33 55 | 76 | 22 47 55 | 76 | 266 |
| 95 | 21 24+53 | 74 | 21 40+54 | 74 | 21 56+54 | 75 | 22 11+55 | 75 | 22 26+56 | 76 | 265 |
| 96 | 20 59 54 | 73 | 21 16 54 | 74 | 21 33 55 | 74 | 21 50 54 | 74 | 22 06 55 | 75 | 264 |
| 97 | 20 35 54 | 72 | 20 53 54 | 73 | 21 11 54 | 73 | 21 28 55 | 73 | 21 45 55 | 74 | 263 |
| 98 | 20 11 54 | 71 | 20 30 54 | 72 | 20 48 55 | 72 | 21 07 55 | 73 | 21 24 56 | 73 | 262 |
| 99 | 19 47 54 | 71 | 20 07 54 | 71 | 20 26 55 | 71 | 20 45 55 | 72 | 21 04 55 | 72 | 261 |
| 100 | 19 23+54 | 70 | 19 44+54 | 70 | 20 04+55 | 70 | 20 24+55 | 71 | 20 44+55 | 71 | 260 |
| 101 | 19 00 53 | 69 | 19 21 54 | 69 | 19 42 55 | 70 | 20 03 55 | 70 | 20 23 56 | 70 | 259 |
| 102 | 18 36 54 | 68 | 18 58 55 | 68 | 19 20 55 | 69 | 19 42 55 | 69 | 20 03 56 | 69 | 258 |
| 103 | 18 13 54 | 67 | 18 36 54 | 67 | 18 59 54 | 68 | 19 21 55 | 68 | 19 43 56 | 68 | 257 |
| 104 | 17 49 54 | 66 | 18 13 55 | 67 | 18 37 55 | 67 | 19 00 56 | 67 | 19 23 56 | 68 | 256 |
| 105 | 17 26+54 | 65 | 17 51+55 | 66 | 18 16+54 | 66 | 18 40+55 | 66 | 19 04+55 | 67 | 255 |
| 106 | 17 03 55 | 65 | 17 29 55 | 65 | 17 54 55 | 65 | 18 19 56 | 65 | 18 44 56 | 66 | 254 |
| 107 | 16 41 54 | 64 | 17 07 55 | 64 | 17 33 55 | 64 | 17 59 55 | 65 | 18 24 56 | 65 | 253 |
| 108 | 16 18 54 | 63 | 16 45 55 | 63 | 17 12 55 | 63 | 17 39 55 | 64 | 18 05 56 | 64 | 252 |
| 109 | 15 56 54 | 62 | 16 24 54 | 62 | 16 51 55 | 63 | 17 19 55 | 63 | 17 46 56 | 63 | 251 |
| 110 | 15 33+55 | 61 | 16 02+55 | 61 | 16 31+55 | 62 | 16 59+55 | 62 | 17 27+56 | 62 | 250 |
| 111 | 15 11 55 | 60 | 15 41 55 | 61 | 16 10 55 | 61 | 16 39 56 | 61 | 17 08 56 | 61 | 249 |
| 112 | 14 50 54 | 60 | 15 20 55 | 60 | 15 50 55 | 60 | 16 20 55 | 60 | 16 49 56 | 60 | 248 |
| 113 | 14 28 55 | 59 | 14 59 55 | 59 | 15 30 55 | 59 | 16 00 56 | 59 | 16 31 56 | 60 | 247 |
| 114 | 14 06 55 | 58 | 14 38 55 | 58 | 15 10 55 | 58 | 15 41 56 | 58 | 16 12 56 | 59 | 246 |
| 115 | 13 45+55 | 57 | 14 18+55 | 57 | 14 50+55 | 57 | 15 22+56 | 58 | 15 54+56 | 58 | 245 |
| 116 | 13 24 55 | 56 | 13 57 56 | 56 | 14 30 56 | 57 | 15 03 56 | 57 | 15 36 56 | 57 | 244 |
| 117 | 13 03 55 | 55 | 13 37 56 | 55 | 14 11 56 | 56 | 14 45 56 | 56 | 15 18 56 | 56 | 243 |
| 118 | 12 43 55 | 54 | 13 17 56 | 55 | 13 52 56 | 55 | 14 26 56 | 55 | 15 00 57 | 55 | 242 |
| 119 | 12 22 55 | 54 | 12 57 56 | 54 | 13 33 56 | 54 | 14 08 56 | 54 | 14 43 56 | 54 | 241 |
| 120 | 12 02+55 | 53 | 12 38+56 | 53 | 13 14+56 | 53 | 13 50+56 | 53 | 14 25+57 | 53 | 240 |
| 121 | 11 42 55 | 52 | 12 19 56 | 52 | 12 55 57 | 52 | 13 32 56 | 52 | 14 08 57 | 53 | 239 |
| 122 | 11 22 56 | 51 | 12 00 56 | 51 | 12 37 56 | 51 | 13 14 57 | 52 | 13 51 57 | 52 | 238 |
| 123 | 11 03 55 | 50 | 11 41 56 | 50 | 12 19 56 | 50 | 12 57 56 | 51 | 13 35 57 | 51 | 237 |
| 124 | 10 44 55 | 49 | 11 22 56 | 49 | 12 01 56 | 50 | 12 40 56 | 50 | 13 18 57 | 50 | 236 |
| 125 | 10 25+55 | 48 | 11 04+56 | 49 | 11 43+57 | 49 | 12 23+56 | 49 | 13 02+57 | 49 | 235 |
| 126 | 10 06+56 | 48 | 10 46 56 | 48 | 11 26 57 | 48 | 12 06 57 | 48 | 12 46 57 | 48 | 234 |
| 127 | ... | | 10 28 56 | 47 | 11 09 56 | 47 | 11 50 56 | 47 | 12 30 57 | 47 | 233 |
| 128 | ... | | 10 11+56 | 46 | 10 52 57 | 46 | 11 33 57 | 46 | 12 14 58 | 46 | 232 |
| 129 | ... | | ... | | 10 35 57 | 45 | 11 17 57 | 45 | 11 59 57 | 46 | 231 |
| 130 | ... | | ... | | 10 19+57 | 44 | 11 01+57 | 45 | 11 44+57 | 45 | 230 |
| 131 | ... | | ... | | 10 03+57 | 44 | 10 46 57 | 44 | 11 29 57 | 44 | 229 |
| 132 | ... | | ... | | ... | | 10 31 57 | 43 | 11 14 58 | 43 | 228 |
| 133 | ... | | ... | | ... | | 10 16 57 | 42 | 11 00 57 | 42 | 227 |
| 134 | ... | | ... | | ... | | 10 01+57 | 41 | 10 46 57 | 41 | 226 |
| 135 | ... | | ... | | ... | | ... | | 10 32+57 | 40 | 225 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

| LAT. | 65° | 66° | 67° | 68° | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|
| H.A. | | | | | Alt. | | Az. | H.A. |
| | | | | | ° ′ | d | ° | ° |
| 135 | ... | ... | ... | ... | 10 32 | +57 | 40 | 225 |
| 136 | ... | ... | ... | ... | 10 18 | 58 | 39 | 224 |
| 137 | ... | ... | ... | ... | 10 05 | +57 | 38 | 223 |
| 138 | ... | ... | ... | ... | ... | | | 222 |
| 139 | ... | ... | ... | ... | ... | | | 221 |
| 140 | ... | ... | ... | ... | ... | | | 220 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | | 66° | | | 67° | | | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | H.A. |
| ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° |
| 0 | 52 01 | +60 | 180 | 51 01 | +60 | 180 | 50 01 | +60 | 180 | 49 01 | +60 | 180 | 48 01 | +60 | 180 | 360 |
| 1 | 52 00 | 60 | 179 | 51 00 | 60 | 179 | 50 00 | 60 | 179 | 49 00 | 60 | 179 | 48 00 | 60 | 179 | 359 |
| 2 | 51 59 | 60 | 177 | 50 59 | 60 | 177 | 50 00 | 60 | 177 | 49 00 | 60 | 177 | 48 00 | 60 | 177 | 358 |
| 3 | 51 58 | 60 | 176 | 50 58 | 60 | 176 | 49 58 | 60 | 176 | 48 58 | 60 | 176 | 47 58 | 60 | 176 | 357 |
| 4 | 51 56 | 59 | 174 | 50 56 | 60 | 174 | 49 56 | 60 | 174 | 48 56 | 60 | 175 | 47 57 | 60 | 175 | 356 |
| 5 | 51 53 | +60 | 173 | 50 53 | +60 | 173 | 49 54 | +59 | 173 | 48 54 | +60 | 173 | 47 54 | +60 | 173 | 355 |
| 6 | 51 49 | 60 | 171 | 50 50 | 60 | 172 | 49 51 | 59 | 172 | 48 51 | 60 | 172 | 47 52 | 60 | 172 | 354 |
| 7 | 51 45 | 60 | 170 | 50 46 | 60 | 170 | 49 47 | 60 | 170 | 48 48 | 60 | 171 | 47 49 | 59 | 171 | 353 |
| 8 | 51 40 | 60 | 168 | 50 41 | 60 | 169 | 49 43 | 59 | 169 | 48 44 | 60 | 169 | 47 45 | 60 | 169 | 352 |
| 9 | 51 35 | 60 | 167 | 50 36 | 60 | 167 | 49 38 | 60 | 168 | 48 39 | 60 | 168 | 47 41 | 59 | 168 | 351 |
| 10 | 51 29 | +59 | 166 | 50 31 | +59 | 166 | 49 33 | +59 | 166 | 48 34 | +60 | 166 | 47 36 | +60 | 167 | 350 |
| 11 | 51 22 | 60 | 164 | 50 25 | 59 | 165 | 49 27 | 59 | 165 | 48 29 | 59 | 165 | 47 31 | 59 | 165 | 349 |
| 12 | 51 15 | 59 | 163 | 50 18 | 59 | 163 | 49 20 | 60 | 163 | 48 23 | 59 | 164 | 47 25 | 60 | 164 | 348 |
| 13 | 51 07 | 60 | 161 | 50 10 | 60 | 162 | 49 13 | 60 | 162 | 48 16 | 60 | 162 | 47 19 | 60 | 163 | 347 |
| 14 | 50 59 | 59 | 160 | 50 02 | 60 | 160 | 49 06 | 59 | 161 | 48 09 | 60 | 161 | 47 12 | 60 | 162 | 346 |
| 15 | 50 50 | +59 | 159 | 49 54 | +59 | 159 | 48 58 | +59 | 159 | 48 02 | +59 | 160 | 47 05 | +60 | 160 | 345 |
| 16 | 50 40 | 59 | 157 | 49 45 | 59 | 158 | 48 49 | 60 | 158 | 47 54 | 59 | 159 | 46 58 | 59 | 159 | 344 |
| 17 | 50 30 | 59 | 156 | 49 35 | 59 | 156 | 48 40 | 60 | 157 | 47 45 | 59 | 157 | 46 50 | 59 | 158 | 343 |
| 18 | 50 20 | 58 | 154 | 49 25 | 59 | 155 | 48 31 | 59 | 155 | 47 36 | 59 | 156 | 46 41 | 60 | 156 | 342 |
| 19 | 50 08 | 59 | 153 | 49 15 | 59 | 154 | 48 21 | 59 | 154 | 47 27 | 59 | 155 | 46 33 | 59 | 155 | 341 |
| 20 | 49 57 | +58 | 152 | 49 04 | +58 | 152 | 48 11 | +58 | 153 | 47 17 | +59 | 153 | 46 23 | +59 | 154 | 340 |
| 21 | 49 44 | 59 | 150 | 48 52 | 59 | 151 | 48 00 | 58 | 152 | 47 07 | 59 | 152 | 46 14 | 59 | 153 | 339 |
| 22 | 49 32 | 58 | 149 | 48 40 | 58 | 150 | 47 48 | 59 | 150 | 46 56 | 59 | 151 | 46 04 | 58 | 151 | 338 |
| 23 | 49 18 | 58 | 148 | 48 28 | 58 | 148 | 47 36 | 59 | 149 | 46 45 | 58 | 149 | 45 53 | 59 | 150 | 337 |
| 24 | 49 05 | 57 | 146 | 48 14 | 59 | 147 | 47 24 | 58 | 148 | 46 33 | 59 | 148 | 45 42 | 59 | 149 | 336 |
| 25 | 48 50 | +58 | 145 | 48 01 | +58 | 146 | 47 11 | +58 | 146 | 46 21 | +58 | 147 | 45 31 | +58 | 148 | 335 |
| 26 | 48 36 | 57 | 144 | 47 47 | 58 | 144 | 46 58 | 58 | 145 | 46 09 | 58 | 146 | 45 19 | 58 | 146 | 334 |
| 27 | 48 20 | 58 | 143 | 47 33 | 57 | 143 | 46 44 | 58 | 144 | 45 56 | 58 | 144 | 45 07 | 58 | 145 | 333 |
| 28 | 48 05 | 57 | 141 | 47 18 | 57 | 142 | 46 30 | 58 | 143 | 45 43 | 58 | 143 | 44 54 | 59 | 144 | 332 |
| 29 | 47 49 | 57 | 140 | 47 03 | 57 | 141 | 46 16 | 58 | 141 | 45 29 | 58 | 142 | 44 41 | 59 | 143 | 331 |
| 30 | 47 32 | +57 | 139 | 46 47 | +57 | 139 | 46 01 | +58 | 140 | 45 15 | +58 | 141 | 44 28 | +58 | 141 | 330 |
| 31 | 47 15 | 57 | 137 | 46 31 | 57 | 138 | 45 46 | 57 | 139 | 45 00 | 58 | 140 | 44 15 | 58 | 140 | 329 |
| 32 | 46 58 | 57 | 136 | 46 14 | 57 | 137 | 45 30 | 58 | 138 | 44 46 | 57 | 138 | 44 01 | 57 | 139 | 328 |
| 33 | 46 40 | 57 | 135 | 45 58 | 56 | 136 | 45 14 | 57 | 136 | 44 31 | 57 | 137 | 43 46 | 58 | 138 | 327 |
| 34 | 46 22 | 56 | 134 | 45 40 | 57 | 135 | 44 58 | 57 | 135 | 44 15 | 57 | 136 | 43 32 | 57 | 137 | 326 |
| 35 | 46 04 | +56 | 133 | 45 23 | +56 | 133 | 44 41 | +57 | 134 | 43 59 | +58 | 135 | 43 17 | +57 | 135 | 325 |
| 36 | 45 45 | 56 | 131 | 45 05 | 56 | 132 | 44 24 | 57 | 133 | 43 43 | 57 | 134 | 43 02 | 57 | 134 | 324 |
| 37 | 45 26 | 55 | 130 | 44 47 | 56 | 131 | 44 07 | 57 | 132 | 43 27 | 57 | 132 | 42 46 | 57 | 133 | 323 |
| 38 | 45 06 | 56 | 129 | 44 28 | 56 | 130 | 43 49 | 57 | 131 | 43 10 | 57 | 131 | 42 30 | 57 | 132 | 322 |
| 39 | 44 46 | 56 | 128 | 44 09 | 56 | 129 | 43 31 | 57 | 129 | 42 53 | 57 | 130 | 42 14 | 57 | 131 | 321 |
| 40 | 44 26 | +55 | 127 | 43 50 | +56 | 127 | 43 13 | +56 | 128 | 42 36 | +56 | 129 | 41 58 | +57 | 130 | 320 |
| 41 | 44 06 | 55 | 126 | 43 30 | 56 | 126 | 42 55 | 56 | 127 | 42 18 | 57 | 128 | 41 41 | 57 | 128 | 319 |
| 42 | 43 45 | 55 | 124 | 43 11 | 55 | 125 | 42 36 | 56 | 126 | 42 00 | 57 | 127 | 41 24 | 57 | 127 | 318 |
| 43 | 43 24 | 55 | 123 | 42 50 | 56 | 124 | 42 17 | 55 | 125 | 41 42 | 56 | 126 | 41 07 | 57 | 126 | 317 |
| 44 | 43 02 | 55 | 122 | 42 30 | 55 | 123 | 41 57 | 56 | 124 | 41 24 | 56 | 124 | 40 49 | 57 | 125 | 316 |
| 45 | 42 41 | +55 | 121 | 42 10 | +55 | 122 | 41 38 | +55 | 123 | 41 05 | +56 | 123 | 40 32 | +56 | 124 | 315 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

| LAT. | 65° | | | 66° | | | 67° | | | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | H.A. |
| ° | ° , | | ° | ° , | | ° | ° , | | ° | ° , | | ° | ° , | | ° | ° |
| 45 | 42 41 | +55 | 121 | 42 10 | +55 | 122 | 41 38 | +55 | 123 | 41 05 | +56 | 123 | 40 32 | +56 | 124 | 315 |
| 46 | 42 19 | 55 | 120 | 41 49 | 55 | 121 | 41 18 | 55 | 121 | 40 46 | 56 | 122 | 40 14 | 56 | 123 | 314 |
| 47 | 41 57 | 54 | 119 | 41 28 | 55 | 120 | 40 58 | 55 | 120 | 40 27 | 56 | 121 | 39 56 | 56 | 122 | 313 |
| 48 | 41 35 | 54 | 118 | 41 06 | 55 | 119 | 40 37 | 56 | 119 | 40 08 | 55 | 120 | 39 37 | 57 | 121 | 312 |
| 49 | 41 12 | 54 | 117 | 40 45 | 55 | 117 | 40 17 | 55 | 118 | 39 48 | 56 | 119 | 39 19 | 56 | 120 | 311 |
| 50 | 40 49 | +54 | 116 | 40 23 | +55 | 116 | 39 56 | +55 | 117 | 39 28 | +56 | 118 | 39 00 | +56 | 119 | 310 |
| 51 | 40 26 | 54 | 115 | 40 01 | 55 | 115 | 39 35 | 55 | 116 | 39 08 | 56 | 117 | 38 41 | 56 | 118 | 309 |
| 52 | 40 03 | 54 | 114 | 39 39 | 54 | 114 | 39 14 | 55 | 115 | 38 48 | 56 | 116 | 38 22 | 56 | 116 | 308 |
| 53 | 39 40 | 54 | 112 | 39 17 | 54 | 113 | 38 53 | 54 | 114 | 38 28 | 55 | 115 | 38 03 | 55 | 115 | 307 |
| 54 | 39 16 | 54 | 111 | 38 54 | 54 | 112 | 38 31 | 55 | 113 | 38 07 | 56 | 114 | 37 43 | 56 | 114 | 306 |
| 55 | 38 53 | +53 | 110 | 38 31 | +55 | 111 | 38 09 | +55 | 112 | 37 47 | +55 | 113 | 37 23 | +56 | 113 | 305 |
| 56 | 38 29 | 53 | 109 | 38 09 | 54 | 110 | 37 48 | 54 | 111 | 37 26 | 55 | 112 | 37 04 | 55 | 112 | 304 |
| 57 | 38 05 | 53 | 108 | 37 46 | 54 | 109 | 37 26 | 54 | 110 | 37 05 | 55 | 111 | 36 44 | 55 | 111 | 303 |
| 58 | 37 41 | 53 | 107 | 37 23 | 53 | 108 | 37 04 | 54 | 109 | 36 44 | 55 | 110 | 36 24 | 55 | 110 | 302 |
| 59 | 37 17 | 53 | 106 | 36 59 | 54 | 107 | 36 41 | 55 | 108 | 36 23 | 55 | 108 | 36 03 | 56 | 109 | 301 |
| 60 | 36 52 | +53 | 105 | 36 36 | +54 | 106 | 36 19 | +54 | 107 | 36 01 | +55 | 107 | 35 43 | +55 | 108 | 300 |
| 61 | 36 28 | 53 | 104 | 36 12 | 54 | 105 | 35 56 | 55 | 106 | 35 40 | 55 | 106 | 35 22 | 56 | 107 | 299 |
| 62 | 36 03 | 53 | 103 | 35 49 | 53 | 104 | 35 34 | 54 | 105 | 35 18 | 55 | 105 | 35 02 | 55 | 106 | 298 |
| 63 | 35 38 | 53 | 102 | 35 25 | 54 | 103 | 35 11 | 54 | 104 | 34 56 | 55 | 104 | 34 41 | 55 | 105 | 297 |
| 64 | 35 14 | 53 | 101 | 35 01 | 54 | 102 | 34 48 | 54 | 103 | 34 35 | 54 | 103 | 34 20 | 56 | 104 | 296 |
| 65 | 34 49 | +53 | 100 | 34 37 | +54 | 101 | 34 25 | +55 | 102 | 34 13 | +54 | 102 | 34 00 | +55 | 103 | 295 |
| 66 | 34 24 | 53 | 100 | 34 13 | 54 | 100 | 34 02 | 55 | 101 | 33 51 | 54 | 102 | 33 39 | 55 | 102 | 294 |
| 67 | 33 59 | 53 | 99 | 33 49 | 54 | 99 | 33 39 | 54 | 100 | 33 29 | 54 | 101 | 33 18 | 55 | 101 | 293 |
| 68 | 33 34 | 52 | 98 | 33 25 | 54 | 98 | 33 16 | 54 | 99 | 33 07 | 54 | 100 | 32 56 | 55 | 100 | 292 |
| 69 | 33 08 | 53 | 97 | 33 01 | 54 | 97 | 32 53 | 54 | 98 | 32 45 | 54 | 99 | 32 35 | 55 | 99 | 291 |
| 70 | 32 43 | +53 | 96 | 32 37 | +53 | 96 | 32 30 | +54 | 97 | 32 22 | +55 | 98 | 32 14 | +55 | 98 | 290 |
| 71 | 32 18 | 53 | 95 | 32 13 | 53 | 95 | 32 07 | 54 | 96 | 32 00 | 54 | 97 | 31 53 | 55 | 97 | 289 |
| 72 | 31 53 | 53 | 94 | 31 48 | 54 | 95 | 31 43 | 54 | 95 | 31 38 | 54 | 96 | 31 31 | 55 | 96 | 288 |
| 73 | 31 28 | 52 | 93 | 31 24 | 53 | 94 | 31 20 | 54 | 94 | 31 15 | 55 | 95 | 31 10 | 55 | 95 | 287 |
| 74 | 31 02 | 53 | 92 | 31 00 | 53 | 93 | 30 57 | 53 | 93 | 30 53 | 54 | 94 | 30 49 | 54 | 94 | 286 |
| 75 | 30 37 | +53 | 91 | 30 35 | +54 | 92 | 30 33 | +54 | 92 | 30 31 | +54 | 93 | 30 27 | +55 | 94 | 285 |
| 76 | 30 12 | 52 | 90 | 30 11 | 53 | 91 | 30 10 | 54 | 91 | 30 08 | 54 | 92 | 30 06 | 55 | 93 | 284 |
| 77 | 29 46 | 53 | 89 | 29 47 | 53 | 90 | 29 46 | 54 | 90 | 29 46 | 54 | 91 | 29 44 | 55 | 92 | 283 |
| 78 | 29 21 | 53 | 88 | 29 22 | 54 | 89 | 29 23 | 54 | 90 | 29 23 | 55 | 90 | 29 23 | 55 | 91 | 282 |
| 79 | 28 56 | 52 | 88 | 28 58 | 53 | 88 | 29 00 | 53 | 89 | 29 01 | 54 | 89 | 29 01 | 55 | 90 | 281 |
| 80 | 28 30 | +53 | 87 | 28 34 | +53 | 87 | 28 36 | +54 | 88 | 28 38 | +55 | 88 | 28 40 | +55 | 89 | 280 |
| 81 | 28 05 | 53 | 86 | 28 09 | 53 | 86 | 28 13 | 54 | 87 | 28 16 | 54 | 87 | 28 18 | 55 | 88 | 279 |
| 82 | 27 40 | 53 | 85 | 27 45 | 53 | 85 | 27 49 | 54 | 86 | 27 53 | 55 | 86 | 27 57 | 55 | 87 | 278 |
| 83 | 27 15 | 52 | 84 | 27 21 | 53 | 84 | 27 26 | 54 | 85 | 27 31 | 54 | 86 | 27 35 | 55 | 86 | 277 |
| 84 | 26 49 | 53 | 83 | 26 56 | 54 | 84 | 27 03 | 54 | 84 | 27 09 | 54 | 85 | 27 14 | 55 | 85 | 276 |
| 85 | 26 24 | +53 | 82 | 26 32 | +54 | 83 | 26 39 | +54 | 83 | 26 46 | +55 | 84 | 26 53 | +55 | 84 | 275 |
| 86 | 25 59 | 53 | 81 | 26 08 | 53 | 82 | 26 16 | 54 | 82 | 26 24 | 54 | 83 | 26 31 | 55 | 83 | 274 |
| 87 | 25 34 | 53 | 80 | 25 44 | 53 | 81 | 25 53 | 54 | 81 | 26 02 | 54 | 82 | 26 10 | 55 | 82 | 273 |
| 88 | 25 09 | 53 | 80 | 25 20 | 53 | 80 | 25 30 | 54 | 81 | 25 40 | 54 | 81 | 25 49 | 55 | 81 | 272 |
| 89 | 24 44 | 53 | 79 | 24 56 | 53 | 79 | 25 07 | 54 | 80 | 25 17 | 55 | 80 | 25 28 | 54 | 81 | 271 |
| 90 | 24 20 | +53 | 78 | 24 32 | +54 | 78 | 24 44 | +54 | 79 | 24 55 | +55 | 79 | 25 06 | +55 | 80 | 270 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° |
| 90 | 24 20+53 | 78 | 24 32+54 | 78 | 24 44+54 | 79 | 24 55+55 | 79 | 25 06+55 | 80 | 270 |
| 91 | 23 55 53 | 77 | 24 08 54 | 77 | 24 21 54 | 78 | 24 33 55 | 78 | 24 45 55 | 79 | 269 |
| 92 | 23 30 53 | 76 | 23 44 54 | 77 | 23 58 54 | 77 | 24 11 55 | 77 | 24 24 55 | 78 | 268 |
| 93 | 23 06 53 | 75 | 23 21 53 | 76 | 23 35 55 | 76 | 23 50 54 | 77 | 24 03 55 | 77 | 267 |
| 94 | 22 41 54 | 74 | 22 57 54 | 75 | 23 13 54 | 75 | 23 28 54 | 76 | 23 42 56 | 76 | 266 |
| 95 | 22 17+53 | 74 | 22 34+54 | 74 | 22 50+54 | 74 | 23 06+55 | 75 | 23 22+55 | 75 | 265 |
| 96 | 21 53 53 | 73 | 22 10 54 | 73 | 22 28 54 | 73 | 22 44 55 | 74 | 23 01 55 | 74 | 264 |
| 97 | 21 29 53 | 72 | 21 47 54 | 72 | 22 05 55 | 73 | 22 23 55 | 73 | 22 40 56 | 73 | 263 |
| 98 | 21 05 53 | 71 | 21 24 54 | 71 | 21 43 54 | 72 | 22 02 54 | 72 | 22 20 55 | 72 | 262 |
| 99 | 20 41 53 | 70 | 21 01 54 | 70 | 21 21 54 | 71 | 21 40 55 | 71 | 21 59 56 | 72 | 261 |
| 100 | 20 17+54 | 69 | 20 38+54 | 70 | 20 59+54 | 70 | 21 19+55 | 70 | 21 39+55 | 71 | 260 |
| 101 | 19 53 54 | 68 | 20 15 54 | 69 | 20 37 54 | 69 | 20 58 55 | 69 | 21 19 55 | 70 | 259 |
| 102 | 19 30 54 | 68 | 19 53 54 | 68 | 20 15 55 | 68 | 20 37 55 | 69 | 20 59 55 | 69 | 258 |
| 103 | 19 07 53 | 67 | 19 30 54 | 67 | 19 53 55 | 67 | 20 16 55 | 68 | 20 39 55 | 68 | 257 |
| 104 | 18 43 54 | 66 | 19 08 54 | 66 | 19 32 55 | 66 | 19 56 55 | 67 | 20 19 56 | 67 | 256 |
| 105 | 18 20+54 | 65 | 18 46+54 | 65 | 19 10+55 | 66 | 19 35+55 | 66 | 19 59+56 | 66 | 255 |
| 106 | 17 58 54 | 64 | 18 24 54 | 64 | 18 49 55 | 65 | 19 15 55 | 65 | 19 40 55 | 65 | 254 |
| 107 | 17 35 54 | 63 | 18 02 54 | 64 | 18 28 55 | 64 | 18 54 56 | 64 | 19 20 56 | 65 | 253 |
| 108 | 17 12 55 | 62 | 17 40 55 | 63 | 18 07 55 | 63 | 18 34 56 | 63 | 19 01 56 | 64 | 252 |
| 109 | 16 50 54 | 62 | 17 18 55 | 62 | 17 46 56 | 62 | 18 14 56 | 62 | 18 42 56 | 63 | 251 |
| 110 | 16 28+54 | 61 | 16 57+55 | 61 | 17 26+55 | 61 | 17 54+56 | 62 | 18 23+56 | 62 | 250 |
| 111 | 16 06 54 | 60 | 16 36 55 | 60 | 17 05 56 | 60 | 17 35 55 | 61 | 18 04 56 | 61 | 249 |
| 112 | 15 44 55 | 59 | 16 15 55 | 59 | 16 45 56 | 60 | 17 15 56 | 60 | 17 45 56 | 60 | 248 |
| 113 | 15 23 54 | 58 | 15 54 55 | 58 | 16 25 56 | 59 | 16 56 56 | 59 | 17 27 56 | 59 | 247 |
| 114 | 15 01 55 | 57 | 15 33 55 | 58 | 16 05 56 | 58 | 16 37 56 | 58 | 17 08 57 | 58 | 246 |
| 115 | 14 40+55 | 57 | 15 13+55 | 57 | 15 45+56 | 57 | 16 18+56 | 57 | 16 50+56 | 58 | 245 |
| 116 | 14 19 55 | 56 | 14 53 55 | 56 | 15 26 56 | 56 | 15 59 56 | 56 | 16 32 57 | 57 | 244 |
| 117 | 13 58 55 | 55 | 14 33 55 | 55 | 15 07 55 | 55 | 15 41 56 | 56 | 16 14 57 | 56 | 243 |
| 118 | 13 38 55 | 54 | 14 13 55 | 54 | 14 48 55 | 54 | 15 22 56 | 55 | 15 57 56 | 55 | 242 |
| 119 | 13 17 56 | 53 | 13 53 56 | 53 | 14 29 56 | 54 | 15 04 56 | 54 | 15 39 57 | 54 | 241 |
| 120 | 12 57+56 | 52 | 13 34+55 | 53 | 14 10+56 | 53 | 14 46+56 | 53 | 15 22+57 | 53 | 240 |
| 121 | 12 37 56 | 51 | 13 15 55 | 52 | 13 52 56 | 52 | 14 28 57 | 52 | 15 05 57 | 52 | 239 |
| 122 | 12 18 55 | 51 | 12 56 55 | 51 | 13 33 56 | 51 | 14 11 56 | 51 | 14 48 57 | 51 | 238 |
| 123 | 11 58 56 | 50 | 12 37 56 | 50 | 13 15 56 | 50 | 13 53 57 | 50 | 14 32 56 | 51 | 237 |
| 124 | 11 39 56 | 49 | 12 18 56 | 49 | 12 57 57 | 49 | 13 36 57 | 49 | 14 15 57 | 50 | 236 |
| 125 | 11 20+56 | 48 | 12 00+56 | 48 | 12 40+56 | 48 | 13 19+57 | 49 | 13 59+57 | 49 | 235 |
| 126 | 11 02 56 | 47 | 11 42 56 | 47 | 12 23 56 | 48 | 13 03 57 | 48 | 13 43 57 | 48 | 234 |
| 127 | 10 43 56 | 46 | 11 24 57 | 47 | 12 05 57 | 47 | 12 46 57 | 47 | 13 27 57 | 47 | 233 |
| 128 | 10 25 56 | 46 | 11 07 56 | 46 | 11 49 56 | 46 | 12 30 57 | 46 | 13 12 57 | 46 | 232 |
| 129 | 10 07+57 | 45 | 10 50 56 | 45 | 11 32 57 | 45 | 12 14 57 | 45 | 12 56 58 | 45 | 231 |
| 130 | ... | | 10 33+56 | 44 | 11 16+56 | 44 | 11 58+58 | 44 | 12 41+57 | 44 | 230 |
| 131 | ... | | 10 16 57 | 43 | 11 00 56 | 43 | 11 43 57 | 43 | 12 26 58 | 44 | 229 |
| 132 | ... | | 10 00+56 | 42 | 10 44 57 | 42 | 11 28 57 | 42 | 12 12 57 | 43 | 228 |
| 133 | ... | | ... | | 10 28 57 | 41 | 11 13 57 | 42 | 11 57 58 | 42 | 227 |
| 134 | ... | | ... | | 10 13+57 | 41 | 10 58 57 | 41 | 11 43 58 | 41 | 226 |
| 135 | ... | | ... | | ... | | 10 44+57 | 40 | 11 29+58 | 40 | 225 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

| LAT. | 65° | 66° | 67° | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | | | | Alt. | | Az. | Alt. | | Az. | H.A. |
| ° | | | | ° ′ | d | ° | ° ′ | d | ° | ° |
| 135 | ... | ... | ... | 10 44 | +57 | 40 | 11 29 | +58 | 40 | 225 |
| 136 | ... | ... | ... | 10 29 | 58 | 39 | 11 16 | 57 | 39 | 224 |
| 137 | ... | ... | ... | 10 16 | 57 | 38 | 11 02 | 58 | 38 | 223 |
| 138 | ... | ... | ... | 10 02 | +58 | 37 | 10 49 | 58 | 37 | 222 |
| 139 | ... | ... | ... | ... | | | 10 36 | 58 | 36 | 221 |
| 140 | ... | ... | ... | ... | | | 10 24 | +58 | 36 | 220 |
| 141 | ... | ... | ... | ... | | | 10 12 | 58 | 35 | 219 |
| 142 | ... | ... | ... | ... | | | 10 00 | +58 | 34 | 218 |
| 143 | ... | ... | ... | ... | | | ... | | | 217 |
| 144 | ... | ... | ... | ... | | | ... | | | 216 |
| 145 | ... | ... | ... | ... | | | ... | | | 215 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | | 66° | | | 67° | | | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | H.A. |
| ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° |
| 0 | 53 01 | +60 | 180 | 52 01 | +60 | 180 | 51 01 | +60 | 180 | 50 01 | +60 | 180 | 49 01 | +60 | 180 | 360 |
| 1 | 53 00 | 60 | 179 | 52 00 | 60 | 179 | 51 00 | 60 | 179 | 50 00 | 60 | 179 | 49 00 | 60 | 179 | 359 |
| 2 | 52 59 | 60 | 177 | 51 59 | 60 | 177 | 51 00 | 59 | 177 | 50 00 | 60 | 177 | 49 00 | 60 | 177 | 358 |
| 3 | 52 58 | 60 | 176 | 51 58 | 60 | 176 | 50 58 | 60 | 176 | 49 58 | 60 | 176 | 48 58 | 60 | 176 | 357 |
| 4 | 52 55 | 60 | 174 | 51 56 | 60 | 174 | 50 56 | 60 | 174 | 49 56 | 60 | 175 | 48 57 | 60 | 175 | 356 |
| 5 | 52 53 | +59 | 173 | 51 53 | +60 | 173 | 50 53 | +60 | 173 | 49 54 | +60 | 173 | 48 54 | +60 | 173 | 355 |
| 6 | 52 49 | 60 | 171 | 51 50 | 60 | 171 | 50 50 | 60 | 172 | 49 51 | 60 | 172 | 48 52 | 60 | 172 | 354 |
| 7 | 52 45 | 60 | 170 | 51 46 | 60 | 170 | 50 47 | 59 | 170 | 49 48 | 59 | 170 | 48 48 | 60 | 171 | 353 |
| 8 | 52 40 | 60 | 168 | 51 41 | 60 | 169 | 50 42 | 60 | 169 | 49 44 | 59 | 169 | 48 45 | 59 | 169 | 352 |
| 9 | 52 35 | 59 | 167 | 51 36 | 60 | 167 | 50 38 | 59 | 167 | 49 39 | 60 | 168 | 48 40 | 60 | 168 | 351 |
| 10 | 52 28 | +60 | 165 | 51 30 | +60 | 166 | 50 32 | +60 | 166 | 49 34 | +60 | 166 | 48 36 | +59 | 167 | 350 |
| 11 | 52 22 | 59 | 164 | 51 24 | 60 | 164 | 50 26 | 60 | 165 | 49 28 | 60 | 165 | 48 30 | 60 | 165 | 349 |
| 12 | 52 14 | 60 | 163 | 51 17 | 60 | 163 | 50 20 | 59 | 163 | 49 22 | 60 | 164 | 48 25 | 59 | 164 | 348 |
| 13 | 52 07 | 59 | 161 | 51 10 | 59 | 162 | 50 13 | 59 | 162 | 49 16 | 59 | 162 | 48 19 | 59 | 163 | 347 |
| 14 | 51 58 | 59 | 160 | 51 02 | 59 | 160 | 50 05 | 60 | 161 | 49 09 | 59 | 161 | 48 12 | 59 | 161 | 346 |
| 15 | 51 49 | +59 | 158 | 50 53 | +59 | 159 | 49 57 | +59 | 159 | 49 01 | +59 | 160 | 48 05 | +59 | 160 | 345 |
| 16 | 51 39 | 59 | 157 | 50 44 | 59 | 157 | 49 49 | 59 | 158 | 48 53 | 59 | 158 | 47 57 | 59 | 159 | 344 |
| 17 | 51 29 | 59 | 156 | 50 34 | 59 | 156 | 49 40 | 59 | 156 | 48 44 | 60 | 157 | 47 49 | 59 | 157 | 343 |
| 18 | 51 18 | 59 | 154 | 50 24 | 59 | 155 | 49 30 | 59 | 155 | 48 35 | 59 | 156 | 47 41 | 59 | 156 | 342 |
| 19 | 51 07 | 58 | 153 | 50 14 | 58 | 153 | 49 20 | 59 | 154 | 48 26 | 59 | 154 | 47 32 | 59 | 155 | 341 |
| 20 | 50 55 | +58 | 151 | 50 02 | +59 | 152 | 49 09 | +59 | 153 | 48 16 | +59 | 153 | 47 22 | +59 | 154 | 340 |
| 21 | 50 43 | 58 | 150 | 49 51 | 58 | 151 | 48 58 | 59 | 151 | 48 06 | 58 | 152 | 47 13 | 58 | 152 | 339 |
| 22 | 50 30 | 58 | 149 | 49 38 | 59 | 149 | 48 47 | 58 | 150 | 47 55 | 58 | 150 | 47 02 | 59 | 151 | 338 |
| 23 | 50 16 | 58 | 147 | 49 26 | 58 | 148 | 48 35 | 58 | 149 | 47 43 | 59 | 149 | 46 52 | 58 | 150 | 337 |
| 24 | 50 02 | 58 | 146 | 49 13 | 58 | 147 | 48 22 | 58 | 147 | 47 32 | 58 | 148 | 46 41 | 58 | 148 | 336 |
| 25 | 49 48 | +58 | 145 | 48 59 | +58 | 145 | 48 09 | +58 | 146 | 47 19 | +59 | 147 | 46 29 | +59 | 147 | 335 |
| 26 | 49 33 | 58 | 143 | 48 45 | 58 | 144 | 47 56 | 58 | 145 | 47 07 | 58 | 145 | 46 17 | 59 | 146 | 334 |
| 27 | 49 18 | 57 | 142 | 48 30 | 58 | 143 | 47 42 | 58 | 143 | 46 54 | 58 | 144 | 46 05 | 58 | 145 | 333 |
| 28 | 49 02 | 57 | 141 | 48 15 | 58 | 142 | 47 28 | 58 | 142 | 46 41 | 57 | 143 | 45 53 | 58 | 143 | 332 |
| 29 | 48 46 | 57 | 140 | 48 00 | 57 | 140 | 47 14 | 57 | 141 | 46 27 | 58 | 142 | 45 40 | 58 | 142 | 331 |
| 30 | 48 29 | +57 | 138 | 47 44 | +57 | 139 | 46 59 | +57 | 140 | 46 13 | +57 | 140 | 45 26 | +58 | 141 | 330 |
| 31 | 48 12 | 57 | 137 | 47 28 | 57 | 138 | 46 43 | 58 | 138 | 45 58 | 58 | 139 | 45 13 | 57 | 140 | 329 |
| 32 | 47 55 | 56 | 136 | 47 11 | 57 | 137 | 46 28 | 57 | 137 | 45 43 | 58 | 138 | 44 58 | 58 | 139 | 328 |
| 33 | 47 37 | 56 | 135 | 46 54 | 57 | 135 | 46 11 | 57 | 136 | 45 28 | 57 | 137 | 44 44 | 58 | 137 | 327 |
| 34 | 47 18 | 57 | 133 | 46 37 | 56 | 134 | 45 55 | 57 | 135 | 45 12 | 58 | 136 | 44 29 | 58 | 136 | 326 |
| 35 | 47 00 | +56 | 132 | 46 19 | +57 | 133 | 45 38 | +57 | 134 | 44 57 | +57 | 134 | 44 14 | +58 | 135 | 325 |
| 36 | 46 41 | 56 | 131 | 46 01 | 56 | 132 | 45 21 | 57 | 132 | 44 40 | 57 | 133 | 43 59 | 57 | 134 | 324 |
| 37 | 46 21 | 56 | 130 | 45 43 | 56 | 130 | 45 04 | 56 | 131 | 44 24 | 57 | 132 | 43 43 | 58 | 133 | 323 |
| 38 | 46 02 | 55 | 128 | 45 24 | 56 | 129 | 44 46 | 56 | 130 | 44 07 | 57 | 131 | 43 27 | 58 | 132 | 322 |
| 39 | 45 42 | 55 | 127 | 45 05 | 56 | 128 | 44 28 | 56 | 129 | 43 50 | 56 | 130 | 43 11 | 57 | 130 | 321 |
| 40 | 45 21 | +56 | 126 | 44 46 | +55 | 127 | 44 09 | +56 | 128 | 43 32 | +57 | 128 | 42 55 | +57 | 129 | 320 |
| 41 | 45 01 | 55 | 125 | 44 26 | 56 | 126 | 43 51 | 56 | 127 | 43 15 | 56 | 127 | 42 38 | 57 | 128 | 319 |
| 42 | 44 40 | 55 | 124 | 44 06 | 56 | 125 | 43 32 | 56 | 125 | 42 57 | 56 | 126 | 42 21 | 57 | 127 | 318 |
| 43 | 44 19 | 55 | 123 | 43 46 | 55 | 124 | 43 12 | 56 | 124 | 42 38 | 57 | 125 | 42 04 | 56 | 126 | 317 |
| 44 | 43 57 | 55 | 122 | 43 25 | 56 | 122 | 42 53 | 56 | 123 | 42 20 | 56 | 124 | 41 46 | 56 | 125 | 316 |
| 45 | 43 36 | +54 | 120 | 43 05 | +55 | 121 | 42 33 | +56 | 122 | 42 01 | +56 | 123 | 41 28 | +57 | 124 | 315 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

| LAT. | 65° | | | 66° | | | 67° | | | 68° | | | 69° | | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | Alt. | d | Az. | H.A. |
| ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° ′ | | ° | ° |
| 45 | 43 36 | +54 | 120 | 43 05 | +55 | 121 | 42 33 | +56 | 122 | 42 01 | +56 | 123 | 41 28 | +57 | 124 | 315 |
| 46 | 43 14 | 54 | 119 | 42 44 | 55 | 120 | 42 13 | 56 | 121 | 41 42 | 56 | 122 | 41 10 | 56 | 122 | 314 |
| 47 | 42 51 | 55 | 118 | 42 23 | 54 | 119 | 41 53 | 55 | 120 | 41 23 | 56 | 121 | 40 52 | 56 | 121 | 313 |
| 48 | 42 29 | 54 | 117 | 42 01 | 55 | 118 | 41 33 | 55 | 119 | 41 03 | 56 | 120 | 40 34 | 56 | 120 | 312 |
| 49 | 42 06 | 54 | 116 | 41 40 | 54 | 117 | 41 12 | 55 | 118 | 40 44 | 55 | 118 | 40 15 | 56 | 119 | 311 |
| 50 | 41 43 | +54 | 115 | 41 18 | +54 | 116 | 40 51 | +55 | 117 | 40 24 | +55 | 117 | 39 56 | +56 | 118 | 310 |
| 51 | 41 20 | 54 | 114 | 40 56 | 54 | 115 | 40 30 | 55 | 116 | 40 04 | 55 | 116 | 39 37 | 56 | 117 | 309 |
| 52 | 40 57 | 54 | 113 | 40 33 | 55 | 114 | 40 09 | 55 | 114 | 39 44 | 55 | 115 | 39 18 | 56 | 116 | 308 |
| 53 | 40 34 | 53 | 112 | 40 11 | 54 | 113 | 39 47 | 55 | 113 | 39 23 | 55 | 114 | 38 58 | 56 | 115 | 307 |
| 54 | 40 10 | 54 | 111 | 39 48 | 54 | 112 | 39 26 | 55 | 112 | 39 03 | 55 | 113 | 38 39 | 55 | 114 | 306 |
| 55 | 39 46 | +54 | 110 | 39 26 | +54 | 111 | 39 04 | +55 | 111 | 38 42 | +55 | 112 | 38 19 | +56 | 113 | 305 |
| 56 | 39 22 | 54 | 109 | 39 03 | 54 | 110 | 38 42 | 55 | 110 | 38 21 | 55 | 111 | 37 59 | 56 | 112 | 304 |
| 57 | 38 58 | 54 | 108 | 38 40 | 54 | 109 | 38 20 | 55 | 109 | 38 00 | 55 | 110 | 37 39 | 56 | 111 | 303 |
| 58 | 38 34 | 53 | 107 | 38 16 | 54 | 108 | 37 58 | 54 | 108 | 37 39 | 55 | 109 | 37 19 | 55 | 110 | 302 |
| 59 | 38 10 | 53 | 106 | 37 53 | 54 | 107 | 37 36 | 54 | 107 | 37 18 | 54 | 108 | 36 59 | 55 | 109 | 301 |
| 60 | 37 45 | +53 | 105 | 37 30 | +53 | 106 | 37 13 | +54 | 106 | 36 56 | +55 | 107 | 36 38 | +56 | 108 | 300 |
| 61 | 37 21 | 53 | 104 | 37 06 | 54 | 105 | 36 51 | 54 | 105 | 36 35 | 54 | 106 | 36 18 | 55 | 107 | 299 |
| 62 | 36 56 | 53 | 103 | 36 42 | 54 | 104 | 36 28 | 54 | 104 | 36 13 | 55 | 105 | 35 57 | 55 | 106 | 298 |
| 63 | 36 31 | 53 | 102 | 36 19 | 53 | 103 | 36 05 | 54 | 103 | 35 51 | 55 | 104 | 35 36 | 55 | 105 | 297 |
| 64 | 36 07 | 52 | 101 | 35 55 | 53 | 102 | 35 42 | 54 | 102 | 35 29 | 55 | 103 | 35 16 | 55 | 104 | 296 |
| 65 | 35 42 | +52 | 100 | 35 31 | +53 | 101 | 35 20 | +53 | 101 | 35 07 | +55 | 102 | 34 55 | +55 | 103 | 295 |
| 66 | 35 17 | 52 | 99 | 35 07 | 53 | 100 | 34 57 | 53 | 100 | 34 45 | 55 | 101 | 34 34 | 55 | 102 | 294 |
| 67 | 34 52 | 52 | 98 | 34 43 | 53 | 99 | 34 33 | 54 | 99 | 34 23 | 55 | 100 | 34 13 | 54 | 101 | 293 |
| 68 | 34 26 | 53 | 97 | 34 19 | 53 | 98 | 34 10 | 54 | 98 | 34 01 | 55 | 99 | 33 51 | 55 | 100 | 292 |
| 69 | 34 01 | 53 | 96 | 33 55 | 53 | 97 | 33 47 | 54 | 97 | 33 39 | 54 | 98 | 33 30 | 55 | 99 | 291 |
| 70 | 33 36 | +53 | 95 | 33 30 | +54 | 96 | 33 24 | +54 | 96 | 33 17 | +54 | 97 | 33 09 | +55 | 98 | 290 |
| 71 | 33 11 | 52 | 94 | 33 06 | 53 | 95 | 33 01 | 53 | 96 | 32 54 | 55 | 96 | 32 48 | 54 | 97 | 289 |
| 72 | 32 46 | 52 | 93 | 32 42 | 53 | 94 | 32 37 | 54 | 95 | 32 32 | 54 | 95 | 32 26 | 55 | 96 | 288 |
| 73 | 32 20 | 53 | 92 | 32 17 | 54 | 93 | 32 14 | 54 | 94 | 32 10 | 54 | 94 | 32 05 | 55 | 95 | 287 |
| 74 | 31 55 | 52 | 91 | 31 53 | 53 | 92 | 31 50 | 54 | 93 | 31 47 | 55 | 93 | 31 43 | 55 | 94 | 286 |
| 75 | 31 30 | +52 | 91 | 31 29 | +53 | 91 | 31 27 | +54 | 92 | 31 25 | +54 | 92 | 31 22 | +55 | 93 | 285 |
| 76 | 31 04 | 53 | 90 | 31 04 | 53 | 90 | 31 04 | 53 | 91 | 31 02 | 55 | 91 | 31 01 | 54 | 92 | 284 |
| 77 | 30 39 | 52 | 89 | 30 40 | 53 | 89 | 30 40 | 54 | 90 | 30 40 | 54 | 91 | 30 39 | 55 | 91 | 283 |
| 78 | 30 14 | 52 | 88 | 30 16 | 53 | 88 | 30 17 | 54 | 89 | 30 18 | 54 | 90 | 30 18 | 54 | 90 | 282 |
| 79 | 29 48 | 53 | 87 | 29 51 | 53 | 88 | 29 53 | 54 | 88 | 29 55 | 54 | 89 | 29 56 | 55 | 89 | 281 |
| 80 | 29 23 | +53 | 86 | 29 27 | +53 | 87 | 29 30 | +54 | 87 | 29 33 | +54 | 88 | 29 35 | +54 | 88 | 280 |
| 81 | 28 58 | 52 | 85 | 29 02 | 54 | 86 | 29 07 | 53 | 86 | 29 10 | 54 | 87 | 29 13 | 55 | 87 | 279 |
| 82 | 28 33 | 52 | 84 | 28 38 | 53 | 85 | 28 43 | 54 | 85 | 28 48 | 54 | 86 | 28 52 | 54 | 86 | 278 |
| 83 | 28 07 | 53 | 83 | 28 14 | 53 | 84 | 28 20 | 54 | 84 | 28 25 | 55 | 85 | 28 30 | 55 | 86 | 277 |
| 84 | 27 42 | 53 | 83 | 27 50 | 53 | 83 | 27 57 | 53 | 84 | 28 03 | 54 | 84 | 28 09 | 55 | 85 | 276 |
| 85 | 27 17 | +53 | 82 | 27 26 | +53 | 82 | 27 33 | +54 | 83 | 27 41 | +54 | 83 | 27 48 | +54 | 84 | 275 |
| 86 | 26 52 | 53 | 81 | 27 01 | 54 | 81 | 27 10 | 54 | 82 | 27 18 | 55 | 82 | 27 26 | 55 | 83 | 274 |
| 87 | 26 27 | 53 | 80 | 26 37 | 54 | 80 | 26 47 | 54 | 81 | 26 56 | 55 | 81 | 27 05 | 55 | 82 | 273 |
| 88 | 26 02 | 53 | 79 | 26 13 | 54 | 80 | 26 24 | 54 | 80 | 26 34 | 54 | 81 | 26 44 | 55 | 81 | 272 |
| 89 | 25 37 | 53 | 78 | 25 49 | 54 | 79 | 26 01 | 54 | 79 | 26 12 | 54 | 80 | 26 22 | 55 | 80 | 271 |
| 90 | 25 13 | +53 | 77 | 25 26 | +53 | 78 | 25 38 | +54 | 78 | 25 50 | +54 | 79 | 26 01 | +55 | 79 | 270 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

| LAT. | 65° | | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° |
| 90 | 25 13+53 | 77 | 25 26+53 | 78 | 25 38+54 | 78 | 25 50+54 | 79 | 26 01+55 | 79 | 270 |
| 91 | 24 48 53 | 76 | 25 02 53 | 77 | 25 15 54 | 77 | 25 28 54 | 78 | 25 40 55 | 78 | 269 |
| 92 | 24 23 53 | 76 | 24 38 54 | 76 | 24 52 54 | 76 | 25 06 55 | 77 | 25 19 55 | 77 | 268 |
| 93 | 23 59 53 | 75 | 24 14 54 | 75 | 24 30 54 | 76 | 24 44 55 | 76 | 24 58 55 | 77 | 267 |
| 94 | 23 35 53 | 74 | 23 51 54 | 74 | 24 07 54 | 75 | 24 22 55 | 75 | 24 38 55 | 76 | 266 |
| 95 | 23 10+53 | 73 | 23 28+53 | 73 | 23 44+55 | 74 | 24 01+54 | 74 | 24 17+55 | 75 | 265 |
| 96 | 22 46 53 | 72 | 23 04 54 | 73 | 23 22 54 | 73 | 23 39 55 | 73 | 23 56 55 | 74 | 264 |
| 97 | 22 22 53 | 71 | 22 41 54 | 72 | 23 00 54 | 72 | 23 18 55 | 73 | 23 36 55 | 73 | 263 |
| 98 | 21 58 54 | 70 | 22 18 54 | 71 | 22 37 55 | 71 | 22 56 55 | 72 | 23 15 55 | 72 | 262 |
| 99 | 21 34 54 | 70 | 21 55 54 | 70 | 22 15 55 | 70 | 22 35 55 | 71 | 22 55 55 | 71 | 261 |
| 100 | 21 11+53 | 69 | 21 32+54 | 69 | 21 53+55 | 70 | 22 14+55 | 70 | 22 34+56 | 70 | 260 |
| 101 | 20 47 54 | 68 | 21 09 55 | 68 | 21 31 55 | 69 | 21 53 55 | 69 | 22 14 56 | 69 | 259 |
| 102 | 20 24 53 | 67 | 20 47 54 | 67 | 21 10 54 | 68 | 21 32 55 | 68 | 21 54 56 | 69 | 258 |
| 103 | 20 00 54 | 66 | 20 24 55 | 67 | 20 48 55 | 67 | 21 11 55 | 67 | 21 34 56 | 68 | 257 |
| 104 | 19 37 54 | 65 | 20 02 54 | 66 | 20 27 54 | 66 | 20 51 55 | 66 | 21 15 55 | 67 | 256 |
| 105 | 19 14+54 | 65 | 19 40+54 | 65 | 20 05+55 | 65 | 20 30+55 | 66 | 20 55+55 | 66 | 255 |
| 106 | 18 52 54 | 64 | 19 18 55 | 64 | 19 44 55 | 64 | 20 10 55 | 65 | 20 35 56 | 65 | 254 |
| 107 | 18 29 54 | 63 | 18 56 55 | 63 | 19 23 55 | 63 | 19 50 55 | 64 | 20 16 56 | 64 | 253 |
| 108 | 18 07 54 | 62 | 18 35 54 | 62 | 19 02 55 | 63 | 19 30 55 | 63 | 19 57 56 | 63 | 252 |
| 109 | 17 44 55 | 61 | 18 13 55 | 61 | 18 42 55 | 62 | 19 10 55 | 62 | 19 38 55 | 62 | 251 |
| 110 | 17 22+55 | 60 | 17 52+55 | 61 | 18 21+55 | 61 | 18 50+56 | 61 | 19 19+56 | 62 | 250 |
| 111 | 17 00 55 | 60 | 17 31 55 | 60 | 18 01 55 | 60 | 18 30 56 | 60 | 19 00 56 | 61 | 249 |
| 112 | 16 39 54 | 59 | 17 10 55 | 59 | 17 41 55 | 59 | 18 11 56 | 59 | 18 41 56 | 60 | 248 |
| 113 | 16 17 55 | 58 | 16 49 55 | 58 | 17 21 55 | 58 | 17 52 56 | 59 | 18 23 56 | 59 | 247 |
| 114 | 15 56 55 | 57 | 16 28 56 | 57 | 17 01 55 | 57 | 17 33 56 | 58 | 18 05 56 | 58 | 246 |
| 115 | 15 35+55 | 56 | 16 08+55 | 56 | 16 41+56 | 57 | 17 14+56 | 57 | 17 46+57 | 57 | 245 |
| 116 | 15 14 55 | 55 | 15 48 55 | 56 | 16 22 55 | 56 | 16 55 56 | 56 | 17 29 56 | 56 | 244 |
| 117 | 14 53 55 | 54 | 15 28 55 | 55 | 16 02 56 | 55 | 16 37 56 | 55 | 17 11 56 | 55 | 243 |
| 118 | 14 33 55 | 54 | 15 08 56 | 54 | 15 43 56 | 54 | 16 18 57 | 54 | 16 53 57 | 55 | 242 |
| 119 | 14 13 55 | 53 | 14 49 55 | 53 | 15 25 56 | 53 | 16 00 57 | 53 | 16 36 56 | 54 | 241 |
| 120 | 13 53+55 | 52 | 14 29+56 | 52 | 15 06+56 | 52 | 15 42+57 | 53 | 16 19+56 | 53 | 240 |
| 121 | 13 33 55 | 51 | 14 10 56 | 51 | 14 48 56 | 52 | 15 25 56 | 52 | 16 02 56 | 52 | 239 |
| 122 | 13 13 56 | 50 | 13 51 56 | 50 | 14 29 57 | 51 | 15 07 57 | 51 | 15 45 57 | 51 | 238 |
| 123 | 12 54 56 | 49 | 13 33 56 | 50 | 14 11 57 | 50 | 14 50 57 | 50 | 15 28 57 | 50 | 237 |
| 124 | 12 35 56 | 49 | 13 14 56 | 49 | 13 54 56 | 49 | 14 33 57 | 49 | 15 12 57 | 49 | 236 |
| 125 | 12 16+56 | 48 | 12 56+56 | 48 | 13 36+57 | 48 | 14 16+57 | 48 | 14 56+57 | 48 | 235 |
| 126 | 11 58 56 | 47 | 12 38 57 | 47 | 13 19 57 | 47 | 14 00 56 | 47 | 14 40 57 | 48 | 234 |
| 127 | 11 39 56 | 46 | 12 21 56 | 46 | 13 02 57 | 46 | 13 43 57 | 47 | 14 24 57 | 47 | 233 |
| 128 | 11 21 56 | 45 | 12 03 57 | 45 | 12 45 57 | 46 | 13 27 57 | 46 | 14 09 57 | 46 | 232 |
| 129 | 11 04 56 | 44 | 11 46 57 | 44 | 12 29 56 | 45 | 13 11 57 | 45 | 13 54 57 | 45 | 231 |
| 130 | 10 46+56 | 44 | 11 29+57 | 44 | 12 12+57 | 44 | 12 56+57 | 44 | 13 38+58 | 44 | 230 |
| 131 | 10 29 56 | 43 | 11 13 56 | 43 | 11 56 57 | 43 | 12 40 57 | 43 | 13 24 57 | 43 | 229 |
| 132 | 10 12+56 | 42 | 10 56 57 | 42 | 11 41 57 | 42 | 12 25 57 | 42 | 13 09 58 | 42 | 228 |
| 133 | ... | | 10 40 57 | 41 | 11 25 57 | 41 | 12 10 57 | 41 | 12 55 57 | 41 | 227 |
| 134 | ... | | 10 25 56 | 40 | 11 10 57 | 40 | 11 55 58 | 40 | 12 41 57 | 41 | 226 |
| 135 | ... | | 10 09+57 | 39 | 10 55+57 | 39 | 11 41+58 | 40 | 12 27+58 | 40 | 225 |

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

| LAT. | 65° | 66° | | 67° | | 68° | | 69° | | LAT. |
|---|---|---|---|---|---|---|---|---|---|---|
| H.A. | | Alt. | Az. | Alt. | Az. | Alt. | Az. | Alt. | Az. | H.A. |
| ° | | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° ′ d | ° | ° |
| 135 | ... | 10 09+57 | 39 | 10 55+57 | 39 | 11 41+58 | 40 | 12 27+58 | 40 | 225 |
| 136 | ... | ... | | 10 40 58 | 39 | 11 27 57 | 39 | 12 13 58 | 39 | 224 |
| 137 | ... | ... | | 10 26 57 | 38 | 11 13 58 | 38 | 12 00 58 | 38 | 223 |
| 138 | ... | ... | | 10 12+57 | 37 | 11 00 57 | 37 | 11 47 58 | 37 | 222 |
| 139 | ... | ... | | ... | | 10 46 58 | 36 | 11 34 58 | 36 | 221 |
| 140 | ... | ... | | ... | | 10 33+58 | 35 | 11 22+58 | 35 | 220 |
| 141 | ... | ... | | ... | | 10 20 58 | 34 | 11 10 58 | 34 | 219 |
| 142 | ... | ... | | ... | | 10 08+58 | 34 | 10 58 58 | 34 | 218 |
| 143 | ... | ... | | ... | | .. | | 10 46 58 | 33 | 217 |
| 144 | ... | ... | | ... | | ... | | 10 35 58 | 32 | 216 |
| 145 | ... | ... | | ... | | ... | | 10 23+59 | 31 | 215 |
| 146 | ... | ... | | ... | | ... | | 10 13 58 | 30 | 214 |
| 147 | ... | ... | | ... | | ... | | 10 02+58 | 29 | 213 |
| 148 | ... | ... | | ... | | ... | | ... | | 212 |
| 149 | ... | ... | | ... | | ... | | ... | | 211 |
| 150 | ... | ... | | ... | | ... | | ... | | 210 |

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

# EXPLANATION

By agreement with the Admiralty, the *Astronomical Navigation Tables* are produced by H.M. Nautical Almanac Office to the general requirements of the Air Ministry.

These tables are designed to give, in a simple and direct manner, the solution of the astronomical spherical triangle that occurs in navigational practice. They have been planned for use with the *Air Almanac* (Air Publication 1602) and are consequently designed primarily to meet the requirements of modern air navigation: their use can however be extended to surface navigation, as in the case of the *Air Almanac*, within the limitations of the precision of the tabulated altitude and azimuth.

The general object of the *Astronomical Navigation Tables* is to facilitate the calculation of the Altitude and Azimuth of an observed heavenly body, as seen from some position close to that of the observer. This information, together with the observed altitude, allows to be plotted on the chart a position line upon which the observer must lie; two such position lines serve in general to determine the position of the observer. The tables have been arranged with special relation to the determination of the altitude and azimuth when an assumed position is adopted such that the latitude and hour angle are both integral degrees; interpolation in this case is consequently restricted to interpolation to the declination of the body observed, and provision has been made for this to be done in a simple manner. The precision of the tabulated data is consistent with that adopted for the *Air Almanac*, namely that the altitudes are given to the nearest minute of arc, and so are correct to within 0'·5; this standard of precision is sufficient for all purposes of air navigation and, in fact, is at present (1938) considerably greater than the precision obtainable in an altitude observed with a bubble sextant. Although these tables have been prepared in conjunction with the *Air Almanac*, they are equally applicable for use with any other almanac from which the Greenwich Hour Angle and Declination of the body observed can be found for the time of observation; it is intended, however, that the two publications should provide, in the most convenient form, all the material for a rapid solution of the navigator's problem, for all practical observations.

The *Astronomical Navigation Tables* consist of main tables and auxiliary tables. The main tables give the Tabulated Altitude, to the nearest minute of arc, and the Tabulated Azimuth, to the nearest degree, with the three arguments:—

Latitude —each integral degree from S.69° to N.69°.

Declination—for 22 selected stars for the epoch 1940 and each integral degree from S.28° to N.28°.

Hour Angle—each integral degree for which the altitude is greater than 10°* and less than 80°.

Thus for every combination of an integral degree of latitude, declination and hour angle in the above ranges, the tables give immediately the quantities required.

* The limit is decreased for declinations appropriate to the Sun (0°–23°) in latitudes above 55°, where the Sun may be at low altitudes for long periods of each day, and in latitudes below 30°, where the Sun rises rapidly, and the azimuth at low altitudes is required for checking compasses.

## EXPLANATION

In the case of the separate tabulations for the 22 stars, the values of the declinations used in the tables are those of the stars themselves at the middle of 1940; the declinations of the stars change slowly owing to precession and to other causes, but the effect of these changes can be allowed for by means of a simple correcting term, which although smaller, is catered for in a similar way to the interpolation for the declination of other bodies. The stars have been selected for their brightness and their distribution in the sky, and are the same in both name and number as stars Nos. 1-22 in the *Air Almanac*. The tables for integral degrees of declination are applicable to observations of the Sun, Moon and planets, as well as for all stars with declinations between S.29° and N.29°; a list of 13 such stars is given in the *Air Almanac* (Nos. 23-35). It is only for stars outside these limits of declination, in particular stars Nos. 36-50 in the *Air Almanac*, that these tables are not applicable, some other method of obtaining the altitude and azimuth must then be employed. The 22 stars catered for separately may however be regarded as generally sufficient for all practical purposes of air navigation; with the 13 additional stars to be used in exceptional circumstances, reference to other methods should be unnecessary.

The interpolation of tables with three arguments is both laborious and difficult, and should be avoided wherever possible; no provision has therefore been made for interpolation other than for declination, and the navigator should not interpolate for latitude and hour angle, but should use an assumed position so that this may be avoided. The arrangement of the tables, however, allows for interpolation for latitude and hour angle without, in general, the necessity for the comparison of figures on different pages, and the tables may therefore be interpolated for these arguments for the solution of special problems.

The tabulated altitude includes the effect of atmospheric refraction, and is thus directly comparable with the corrected sextant reading; it is in fact the altitude of the body as would be measured by an observer. The refraction included is based on the mean value of the refraction at a height of 5,000 feet in normal conditions, and it is unlikely that at heights in that neighbourhood the refraction will differ by more than 0'·5 from that used. Table VI on page 222 gives the adjustment necessary at heights that differ materially from the basic height adopted; the values in this table should only be applied in extreme cases, and where great accuracy is necessary.

The tabulated azimuth is measured from the elevated pole either to the east or to the west. This can be converted to true azimuth, measured always from the north through east, either by the rules given at the foot of each page, or by the use of Table III on pages 90 and 91.

For the greater convenience of the user, the tables are issued in fourteen volumes, each of which caters for a belt of latitude, 5° in width, in both the northern and southern hemispheres. In each volume tabulations are given for five integral degrees of latitude; working from an assumed position, whose latitude is taken to be the nearest integral degree to that of the D.R. (or estimated) position of the observer, each tabular latitude suffices to cover observations from positions within 0° 30′ of the integral degree used. The Explanation and auxiliary tables are reprinted in each volume.

Each volume consists of two main parts, pages 2–89 giving the tabulations for the selected 22 stars and pages 94–209 those for declinations 0°–28°. Each part is



(427/2/15839) (ASTRONOMICAL NAVIGATION, VOL. B)

divided into sections of four pages, covering one star or one whole degree of declination; separate indexes on the margin enable immediate reference to be made to the first opening of each section. Throughout, the arrangement of the tabulations in each section is generally the same; the five values of latitude (LAT.) are given across the page and the values of the hour angle (H.A.) down the page. For the stars, the tabulations for NORTH latitudes precede those for SOUTH latitudes, and for the integral degrees of declination, those for the SAME name as the latitude precede those for CONTRARY name. The amount of tabulation varies in each case with different stars and declinations, and in some cases there are no tabulations either in north or in south latitudes, as the star or a body of the given declination does not reach an altitude which makes it suitable for observation in those latitudes; occasionally it has been necessary to continue the tabulation from one page on to the previous page, and for one or two stars, in south latitudes, on to two pages before.

For the stars, each column refers to a given latitude, and contains for all applicable values of the hour angle, the altitude (Alt.), its variation with time (*t*) and the azimuth (Az.). For the degrees of declination, the variation *t* is replaced by the difference (*d*) between the altitude given and that for the following degree. The procedure of entering and interpolating the tables is not appreciably different in the two cases.

An assumed position is taken close to the D.R. position so that the latitude is an integral degree, while the longitude is chosen so that the hour angle, formed by the combination of longitude (*added* if *east*, *subtracted* if *west*) with the G.H.A., taken from the *Air Almanac*, is also an integral degree. The appropriate part (star or degree of declination) is chosen, and the correct section obtained by the marginal index, using the star number, or the integral degree numerically *less* than the declination of the observed body as found from the *Air Almanac*. In this section, the column is chosen corresponding to the assumed latitude, care being taken to select the correct hemisphere. In this column, the values of Alt., *t*, and Az. can be read off for the stars, corresponding to the particular integral hour angle; for a degree of declination, the values of Alt., *d* and Az. are similarly found.

The tabulated altitude must now be corrected, in the case of the 22 stars, for the effect of precession, and for other bodies, interpolated to the true declination. Table I on the inside front cover gives the correction to be applied to the altitude of the stars for all years to 2000 for values of *t*; this correction must be added or subtracted according to the sign prefixed to *t*. For each star a limiting year is given before which this correction cannot exceed 1′, and there is therefore no need to apply it until after that date. Similarly, the inside back cover and its facing page contain Table XV, with arguments *d* and the minutes of the declination of the body, giving the correction to be applied to the tabulated altitude taken out for an integral degree; this correction is to be applied to the tabulated altitude with the same sign as that of *d*.

It is unnecessary to correct the tabulated azimuth in any way, but it must of course be converted to true azimuth before being used to plot a position line.

Having thus obtained the corrected tabulated altitude and the true azimuth, the position line is drawn in the usual manner. The intercept is obtained from the difference between the corrected sextant reading and the corrected tabulated altitude, and is set off from the assumed position either *towards* the direction given

by the true azimuth or in the opposite direction (*away* from), according to the following rules:

Corr. Tab. Alt. *less* than Corr. Sext. Rdg., intercept *towards*;
Corr. Tab. Alt. *greater* than Corr. Sext. Rdg., intercept *away*.

The position line is then drawn at right angles to the intercept through the point so obtained. The expression corrected sextant reading is used conveniently for the observed altitude to emphasize that this quantity is the altitude as measured by the sextant, corrected only for sextant errors and for dome refraction if applicable. As the atmospheric refraction is catered for in the tabulated altitude, no correction for this should be applied to the sextant reading.

If the assumed position is close to the true position, a slight inaccuracy in plotting the tabulated azimuth is unimportant; when the tabulated azimuth is near 0° or 180° advantage may be taken of this to draw the position line simply as part of a parallel of latitude. A double border rule, given when the azimuth is within a few degrees of the meridian, indicates the portions of the tables where this can be done without great error; the limit of azimuth has been varied slightly in different volumes, according to the latitude, so as to reduce the error due to this simplified procedure. The accuracy of this method depends upon the error in the assumed longitude; for an error of 20 miles in the D.R. longitude, the maximum error introduced into the deduced latitude is about 2 miles, while the remaining error (due to the use of an assumed position) may reach a maximum of 2 miles in the worst case. This method should therefore only be adopted either when errors up to about 4 miles can be tolerated, or when the D.R. longitude is known to be fairly accurate; if the D.R. position is liable to much greater error than 20 miles, this method should not be used. An assumed position is taken and the tables entered in exactly the same way (whether for stars or other bodies) as for an ordinary observation, but there is now no necessity to take out the azimuth or to convert to true azimuth. The tabulated altitude is corrected by Table I or Table XV as necessary, and the intercept formed by the usual rules. The intercept is then set off from the assumed position *towards* or *away* from the direction of the object observed, this direction being taken as true north or true south; the position line is thus drawn in as a parallel of latitude. Although the procedure of entering the tables is exactly the same, this method saves a considerable amount of work in the plotting of the position line.

A list of the auxiliary tables is given in the list of contents; in general the titles of these tables are self-explanatory and their use either self-evident or explained on the page concerned.

Tables VII, VIII, IX, X, XI and XIII are arranged as critical tables, so that the result is obtained immediately without interpolation. The argument is divided into intervals, successive intervals corresponding to successive values of the result; for any values of the argument, inside one of these intervals, the corresponding result is the quantity opposite that interval and has in general a maximum error of less than half a unit in the last figure given; when successive values of the result are not consecutive integers, this error can rise to half the difference between successive values. The tabulated values of the argument correspond to half-way values of the result, and these are always chosen so that when the argument is exactly equal to one of the tabulated values, the nearest value of the result is the one corresponding to the previous interval. Thus the rule to be followed is:

When the argument is an exact tabulated value, the *upper* of the two possible values of the result should be taken.

# ILLUSTRATIONS

*Example* 1.—On 1941 March 31, local date, about two hours after sunset, in dead reckoning position latitude 68° 17′ N., longitude 125° 20′ W., star number 16 (Procyon) was observed to obtain a position line. Corrected sextant reading 24° 23′: G.M.T. of observation $05^h\ 08^m\ 14^s$.

From Table IV, page 92:

Long. 120° W. (approx.)

| Approx. | Hrs. | Date |
|---|---|---|
| L.M.T. | 2100 | Mar. 31 |
| G.M.T. | 0500 | Apr. 1 |

From *Air Almanac*, 1941 Apr. 1:

| | | ° | ′ |
|---|---|---|---|
| G.H.A. ♈ | ($05^h\ 00^m$) | 264 | 10 |
| Increment | ($8^m\ 14^s$) | 2 | 04 |
| S.H.A. | (No. 16) | 245 | 57 |
| G.H.A. of star | | 512 | 11 |
| Long. of ass. position | | −125 | 11 |
| | | 387 | 00 |
| | | −360 | |

From page 62:

Lat. of ass. position 68° NORTH — Star No. 16 — H.A. 27°

| | ° | ′ |
|---|---|---|
| Tab. Alt. | 24 | 49 |
| Correction | | — |
| Corr. Tab. Alt. | 24 | 49 |
| Corr. Sext. Rdg. | 24 | 23 |
| Intercept | 26′ *away* | |

No correction for date is necessary in 1941.

Tab. Az. 150°

Assumed position: Lat. 68° N. Long. 125° 11′ W.

From Table III, page 90: True Az. 210° T.

*Example* 2.—On 1950 August 17, Greenwich date, in dead reckoning position latitude 65° 52′ S., longitude 26° 29′ E., star number 13 (Fomalhaut) was observed to obtain a position line. From the *Almanac* of that date it was found that the G.H.A. of the star corresponding to the G.M.T. of observation was 355° 14′. Corrected sextant reading 51° 39′.

| | ° | ′ |
|---|---|---|
| G.H.A. of star | 355 | 14 |
| Long. of ass. position | + 26 | 46 |
| | 382 | 00 |
| | −360 | |

From page 50:

Lat. of ass. position 66° SOUTH — Star No. 13 — H.A. 22°

| | ° | ′ |
|---|---|---|
| Tab. Alt. | 51 | 31 |
| Correction (Table I) | − | 3 |
| Corr. Tab. Alt. | 51 | 28 |
| Corr. Sext. Rdg. | 51 | 39 |
| Intercept | 11′ *towards* | |

*t* . . −19 — Year . 1950

Tab. Az. 149°

Assumed position: Lat. 66° S. Long. 26° 46′ E.

From Table III, page 91: True Az. 329° T.

*Example* 3.—On 1941 April 1, local date, at approximate local noon, in dead reckoning position latitude 68° 40′ N., longitude 49° 47′ W., the Sun was observed to obtain a position line. Corrected sextant reading 25° 51′; G.M.T. of observation $15^h\ 11^m\ 27^s$.

From Table IV, page 92:

Long. 45° W. (approx.)

| Approx. | Hrs. | Date |
|---|---|---|
| L.M.T. | 1200 | Apr. 1 |
| G.M.T. | 1500 | Apr. 1 |

From *Air Almanac*, 1941 Apr. 1:

| | | ° | ′ |
|---|---|---|---|
| G.H.A. | ($15^h\ 10^m$) | 46 | 31 |
| Increment | ($1^m\ 27^s$) | 0 | 22 |
| G.H.A. of Sun | | 46 | 53 |
| Long. of ass. position | | − 49 | 53 |
| | | − 3 | 00 |
| | | +360 | |

From page 110:

Lat. of ass. position 69° N. Dec. 4° 33′ N. SAME name H.A. 357°

| | | | |
|---|---|---|---|
| Tab. Alt. | 25° | 00′ | *d* +60 |
| Correction (Table XV) | + | 33 | Minutes of dec. 33 |
| Corr. Tab. Alt. | 25 | 33 | |
| Corr. Sext. Rdg. | 25 | 51 | |
| Intercept | 18′ *towards* | | |

Tab. Az. 177°

Assumed position: Lat. 69° N. Long. 49° 53′ W.

From Table III, page 90: True Az. 177° T.

Since there is a double border rule opposite the entry on page 110, this observation may be reduced by the method described on page 213. In this case the intercept is set off from the assumed position *towards* the Sun (i.e. southwards), and the position line drawn as a parallel of latitude. There is then no necessity to take out the tabulated azimuth.

*Example* 4.—On 1941 April 2, local date, shortly before sunrise, in dead reckoning position latitude 64° 38′ S., longitude 147° 58′ E., Mars was observed to obtain a position line. Corrected sextant reading 44° 31′; G.M.T. of observation $20^h\ 28^m\ 17^s$.

From Table IV, page 93:

Long. 150° E. (approx.)

| Approx. | Hrs. | Date |
|---|---|---|
| L.M.T. | 0600 | Apr. 2 |
| G.M.T. | *2000* | *Apr. 1* |

From *Air Almanac*, 1941 Apr. 1:

| | | ° | ′ |
|---|---|---|---|
| G.H.A. | ($20^h$) | 187 | 51 |
| Increment | ($28^m\ 17^s$) | 7 | 05 |
| G.H.A. of Mars | | 194 | 56 |
| Long. of ass. position | | +148 | 04 |

From page 178:

Lat. of ass. position 65° S. Dec. 21° 11′ S. SAME name H.A. 343°

| | | | |
|---|---|---|---|
| Tab. Alt. | 44° | 37′ | *d* +59 |
| Correction (Table XV) | + | 11 | Minutes of dec. 11 |
| Corr. Tab. Alt. | 44 | 48 | |
| Corr. Sext. Rdg. | 44 | 31 | |
| Intercept | 17′ *away* | | |

Tab. Az. 157°

Assumed position: Lat. 65° S. Long. 148° 04′ E.

From Table III, page 91: True Az. 023° T.

## IVa.—CHANGE OF SEXTANT READING WITH TIME

Due to motion of body observed

| True Azimuth of body | Latitude 65° | Latitude 67° | Latitude 69° | True Azimuth of body |
|---|---|---|---|---|
| 090° | +19′ | +18′ | +16′ | 090° |
| 095 | 19 | 18 | 16 | 085 |
| 100 | 19 | 17 | 16 | 080 |
| 105 | 18 | 17 | 16 | 075 |
| 110 | 18 | 17 | 15 | 070 |
| 115 | 17 | 16 | 15 | 065 |
| 120 | +16 | +15 | +14 | 060 |
| 125 | 16 | 14 | 13 | 055 |
| 130 | 15 | 13 | 12 | 050 |
| 135 | 13 | 12 | 11 | 045 |
| 140 | 12 | 11 | 10 | 040 |
| 145 | 11 | 10 | 9 | 035 |
| 150 | +10 | +9 | +8 | 030 |
| 155 | 8 | 7 | 7 | 025 |
| 160 | 7 | 6 | 6 | 020 |
| 165 | 5 | 5 | 4 | 015 |
| 170 | 3 | 3 | 3 | 010 |
| 175 | +2 | +2 | +1 | 005 |
| 180 | 0 | 0 | 0 | 000 |
| 185 | −2 | −2 | −1 | 355 |
| 190 | 3 | 3 | 3 | 350 |
| 195 | 5 | 5 | 4 | 345 |
| 200 | 7 | 6 | 6 | 340 |
| 205 | 8 | 7 | 7 | 335 |
| 210 | −10 | −9 | −8 | 330 |
| 215 | 11 | 10 | 9 | 325 |
| 220 | 12 | 11 | 10 | 320 |
| 225 | 13 | 12 | 11 | 315 |
| 230 | 15 | 13 | 12 | 310 |
| 235 | 16 | 14 | 13 | 305 |
| 240 | −16 | −15 | −14 | 300 |
| 245 | 17 | 16 | 15 | 295 |
| 250 | 18 | 17 | 15 | 290 |
| 255 | 18 | 17 | 16 | 285 |
| 260 | 19 | 17 | 16 | 280 |
| 265 | 19 | 18 | 16 | 275 |
| 270 | −19 | −18 | −16 | 270 |

Due to motion of observer

| Difference between True Az. of body and Track | Ground speed in m.p.h. 100 | 130 | 160 | 190 | 220 | 250 | 280 | 310 | 340 | Difference between True Az. of body and Track |
|---|---|---|---|---|---|---|---|---|---|---|
| 000° | +4′ | +6′ | +7′ | +8′ | +10′ | +11′ | +12′ | +13′ | +15′ | 360° |
| 005 | 4 | 6 | 7 | 8 | 10 | 11 | 12 | 13 | 15 | 355 |
| 010 | 4 | 6 | 7 | 8 | 9 | 11 | 12 | 13 | 15 | 350 |
| 015 | 4 | 5 | 7 | 8 | 9 | 10 | 12 | 13 | 14 | 345 |
| 020 | 4 | 5 | 7 | 8 | 9 | 10 | 11 | 13 | 14 | 340 |
| 025 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 335 |
| 030 | +4 | +5 | +6 | +7 | +8 | +9 | +11 | +12 | +13 | 330 |
| 035 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 325 |
| 040 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 320 |
| 045 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 10 | 315 |
| 050 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | 9 | 310 |
| 055 | 2 | 3 | 4 | 5 | 5 | 6 | 7 | 8 | 8 | 305 |
| 060 | +2 | +3 | +3 | +4 | +5 | +5 | +6 | +7 | +7 | 300 |
| 065 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 6 | 295 |
| 070 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 290 |
| 075 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 285 |
| 080 | +1 | +1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 280 |
| 085 | 0 | 0 | +1 | +1 | +1 | +1 | +1 | +1 | +1 | 275 |
| 090 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 270 |
| 095 | 0 | 0 | −1 | −1 | −1 | −1 | −1 | −1 | −1 | 265 |
| 100 | −1 | −1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 260 |
| 105 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 255 |
| 110 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 250 |
| 115 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 6 | 245 |
| 120 | −2 | −3 | −3 | −4 | −5 | −5 | −6 | −7 | −7 | 240 |
| 125 | 2 | 3 | 4 | 5 | 5 | 6 | 7 | 8 | 8 | 235 |
| 130 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | 9 | 230 |
| 135 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 10 | 225 |
| 140 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 220 |
| 145 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 215 |
| 150 | −4 | −5 | −6 | −7 | −8 | −9 | −11 | −12 | −13 | 210 |
| 155 | 4 | 5 | 6 | 7 | 9 | 10 | 11 | 12 | 13 | 205 |
| 160 | 4 | 5 | 7 | 8 | 9 | 10 | 11 | 13 | 14 | 200 |
| 165 | 4 | 5 | 7 | 8 | 9 | 10 | 12 | 13 | 14 | 195 |
| 170 | 4 | 6 | 7 | 8 | 9 | 11 | 12 | 13 | 15 | 190 |
| 175 | 4 | 6 | 7 | 8 | 10 | 11 | 12 | 13 | 15 | 185 |
| 180 | −4 | −6 | −7 | −8 | −10 | −11 | −12 | −13 | −15 | 180 |

The theoretical change of sextant reading in any interval of time depends partly on the motion of the body observed across the sky and partly on the motion of the observer over the Earth's surface.

The two tables above give this change, in an interval of three minutes of time, due to each of these causes; a + sign denotes that the sextant reading is increasing, and a − sign that it is decreasing. The theoretical change of sextant reading in three minutes of time is obtained by combining the appropriate entries from each table.

# IVb.—CHANGE OF SEXTANT READING WITH TIME

| Interval of time | Change in 3m (from Table IVa) | | | | | | | | | | | | | | | | | | Interval of time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0′ | 3′ | 6′ | 9′ | 12′ | 15′ | 18′ | 21′ | 24′ | 27′ | 30′ | 33′ | 36′ | 39′ | 42′ | 45′ | 48′ | 51′ | 54′ | 57′ | 60′ | |
| m s | ′ | ″ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | m s |
| 0 00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 00 |
| 05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 05 |
| 10 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 10 |
| 15 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 15 |
| 20 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 20 |
| 25 | 0 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 8 | 25 |
| 0 30 | 0 | 0 | 1 | 2 | 2 | 2 | 3 | 4 | 4 | 4 | 5 | 6 | 6 | 6 | 7 | 8 | 8 | 8 | 9 | 10 | 10 | 0 30 |
| 35 | 0 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 12 | 35 |
| 40 | 0 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 40 |
| 45 | 0 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 12 | 13 | 14 | 14 | 15 | 45 |
| 50 | 0 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 12 | 13 | 14 | 15 | 16 | 17 | 50 |
| 0 55 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 16 | 17 | 18 | 0 55 |
| 1 00 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 1 00 |
| 05 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 20 | 21 | 22 | 05 |
| 10 | 0 | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 | 13 | 14 | 15 | 16 | 18 | 19 | 20 | 21 | 22 | 23 | 10 |
| 15 | 0 | 1 | 2 | 4 | 5 | 6 | 8 | 9 | 10 | 11 | 12 | 14 | 15 | 16 | 18 | 19 | 20 | 21 | 22 | 24 | 25 | 15 |
| 20 | 0 | 1 | 3 | 4 | 5 | 7 | 8 | 9 | 11 | 12 | 13 | 15 | 16 | 17 | 19 | 20 | 21 | 23 | 24 | 25 | 27 | 20 |
| 25 | 0 | 1 | 3 | 4 | 6 | 7 | 8 | 10 | 11 | 13 | 14 | 16 | 17 | 18 | 20 | 21 | 23 | 24 | 26 | 27 | 28 | 25 |
| 1 30 | 0 | 2 | 3 | 4 | 6 | 8 | 9 | 10 | 12 | 14 | 15 | 16 | 18 | 20 | 21 | 22 | 24 | 26 | 27 | 28 | 30 | 1 30 |
| 35 | 0 | 2 | 3 | 5 | 6 | 8 | 10 | 11 | 13 | 14 | 16 | 17 | 19 | 21 | 22 | 24 | 25 | 27 | 28 | 30 | 32 | 35 |
| 40 | 0 | 2 | 3 | 5 | 7 | 8 | 10 | 12 | 13 | 15 | 17 | 18 | 20 | 22 | 23 | 25 | 27 | 28 | 30 | 32 | 33 | 40 |
| 45 | 0 | 2 | 4 | 5 | 7 | 9 | 10 | 12 | 14 | 16 | 18 | 19 | 21 | 23 | 24 | 26 | 28 | 30 | 32 | 33 | 35 | 45 |
| 50 | 0 | 2 | 4 | 6 | 7 | 9 | 11 | 13 | 15 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 29 | 31 | 33 | 35 | 37 | 50 |
| 1 55 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 34 | 36 | 38 | 1 55 |
| 2 00 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 2 00 |
| 05 | 0 | 2 | 4 | 6 | 8 | 10 | 12 | 15 | 17 | 19 | 21 | 23 | 25 | 27 | 29 | 31 | 33 | 35 | 38 | 40 | 42 | 05 |
| 10 | 0 | 2 | 4 | 6 | 9 | 11 | 13 | 15 | 17 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 35 | 37 | 39 | 41 | 43 | 10 |
| 15 | 0 | 2 | 4 | 7 | 9 | 11 | 14 | 16 | 18 | 20 | 22 | 25 | 27 | 29 | 32 | 34 | 36 | 38 | 40 | 43 | 45 | 15 |
| 20 | 0 | 2 | 5 | 7 | 9 | 12 | 14 | 16 | 19 | 21 | 23 | 26 | 28 | 30 | 33 | 35 | 37 | 40 | 42 | 44 | 47 | 20 |
| 25 | 0 | 2 | 5 | 7 | 10 | 12 | 14 | 17 | 19 | 22 | 24 | 27 | 29 | 31 | 34 | 36 | 39 | 41 | 44 | 46 | 48 | 25 |
| 2 30 | 0 | 2 | 5 | 8 | 10 | 12 | 15 | 18 | 20 | 22 | 25 | 28 | 30 | 32 | 35 | 38 | 40 | 42 | 45 | 48 | 50 | 2 30 |
| 35 | 0 | 3 | 5 | 8 | 10 | 13 | 16 | 18 | 21 | 23 | 26 | 28 | 31 | 34 | 36 | 39 | 41 | 44 | 46 | 49 | 52 | 35 |
| 40 | 0 | 3 | 5 | 8 | 11 | 13 | 16 | 19 | 21 | 24 | 27 | 29 | 32 | 35 | 37 | 40 | 43 | 45 | 48 | 51 | 53 | 40 |
| 45 | 0 | 3 | 6 | 8 | 11 | 14 | 16 | 19 | 22 | 25 | 28 | 30 | 33 | 36 | 38 | 41 | 44 | 47 | 50 | 52 | 55 | 45 |
| 50 | 0 | 3 | 6 | 8 | 11 | 14 | 17 | 20 | 23 | 26 | 28 | 31 | 34 | 37 | 40 | 42 | 45 | 48 | 51 | 54 | 57 | 50 |
| 2 55 | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 20 | 23 | 26 | 29 | 32 | 35 | 38 | 41 | 44 | 47 | 50 | 52 | 55 | 58 | 2 55 |
| 3 00 | 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 | 30 | 33 | 36 | 39 | 42 | 45 | 48 | 51 | 54 | 57 | 60 | 3 00 |

This table gives the theoretical change of sextant reading in any interval of time up to 3m, in terms of the change in 3m obtained from the tables on the opposite page. If the interval is greater than 3m, it may be split into multiples of 3m and a residue, and the corresponding entries from the table added together.

A knowledge of this change enables sights on different objects taken at slightly different times to be adjusted to a specified exact time, which may be either the exact time of one of them or a moment when a fix is required for a particular reason.

## V.—DIFFERENCE BETWEEN RHUMB LINE AND GREAT CIRCLE DISTANCES

**N. 65°-69°** **S. 65°-69°**

| Latitude of Destination | Change of Longitude | | | | | | | | | | | | | | | | | | Latitude of Destination |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° | 75° | 80° | 85° | 90° | |
| N. 60° | 0 | 1 | 1 | 3 | 5 | 8 | 13 | 19 | 26 | 36 | 47 | 61 | 77 | 96 | 118 | 143 | 172 | 204 | S. 60° |
| 55 | 0 | 1 | 2 | 4 | 6 | 10 | 15 | 21 | 29 | 39 | 51 | 66 | 83 | 103 | 126 | 153 | 183 | 217 | 55 |
| 50 | 0 | 1 | 2 | 4 | 7 | 11 | 17 | 24 | 32 | 43 | 56 | 71 | 89 | 110 | 134 | 162 | 193 | 228 | 50 |
| 45 | 0 | 1 | 3 | 5 | 9 | 13 | 19 | 26 | 35 | 47 | 60 | 76 | 94 | 116 | 141 | 169 | 202 | 238 | 45 |
| 40 | 0 | 1 | 3 | 6 | 10 | 14 | 21 | 28 | 38 | 50 | 64 | 80 | 99 | 121 | 147 | 176 | 209 | 246 | 40 |
| N. 35 | 0 | 2 | 4 | 6 | 10 | 16 | 22 | 30 | 40 | 52 | 67 | 84 | 103 | 126 | 152 | 181 | 215 | 253 | S. 35 |
| 30 | 0 | 2 | 4 | 7 | 11 | 17 | 24 | 32 | 42 | 55 | 69 | 86 | 106 | 129 | 156 | 185 | 219 | 257 | 30 |
| 25 | 0 | 2 | 4 | 7 | 12 | 17 | 25 | 33 | 44 | 56 | 71 | 88 | 109 | 132 | 158 | 188 | 222 | 260 | 25 |
| 20 | 0 | 2 | 4 | 8 | 12 | 18 | 25 | 34 | 45 | 58 | 72 | 90 | 110 | 133 | 159 | 189 | 223 | 261 | 20 |
| 15 | 0 | 2 | 4 | 8 | 13 | 18 | 26 | 35 | 46 | 58 | 73 | 90 | 110 | 133 | 159 | 189 | 223 | 261 | 15 |
| N. 10 | 0 | 2 | 4 | 8 | 13 | 19 | 26 | 35 | 46 | 58 | 73 | 90 | 110 | 132 | 158 | 188 | 221 | 258 | S. 10 |
| N. 5 | 0 | 2 | 4 | 8 | 13 | 19 | 26 | 35 | 45 | 58 | 72 | 89 | 108 | 131 | 156 | 184 | 217 | 253 | S. 5 |
| 0 | 0 | 2 | 4 | 8 | 13 | 18 | 26 | 34 | 45 | 57 | 71 | 87 | 106 | 128 | 152 | 180 | 211 | 247 | 0 |
| S. 5 | 0 | 2 | 4 | 8 | 12 | 18 | 25 | 34 | 44 | 55 | 69 | 85 | 103 | 124 | 147 | 174 | 204 | 239 | N. 5 |
| 10 | 0 | 2 | 4 | 8 | 12 | 18 | 24 | 32 | 42 | 53 | 67 | 82 | 99 | 119 | 141 | 167 | 196 | 229 | 10 |
| S. 15 | 0 | 2 | 4 | 7 | 11 | 17 | 23 | 31 | 40 | 51 | 64 | 78 | 94 | 113 | 134 | 159 | 186 | 217 | N. 15 |
| 20 | 0 | 2 | 4 | 7 | 11 | 16 | 22 | 29 | 38 | 48 | 60 | 73 | 89 | 107 | 127 | 149 | 175 | 204 | 20 |
| 25 | 0 | 2 | 4 | 6 | 10 | 15 | 21 | 28 | 36 | 45 | 56 | 69 | 83 | 99 | 118 | 139 | 162 | 189 | 25 |
| 30 | 0 | 1 | 3 | 6 | 10 | 14 | 19 | 26 | 33 | 42 | 52 | 63 | 76 | 91 | 108 | 127 | 149 | 173 | 30 |
| 35 | 0 | 1 | 3 | 6 | 9 | 13 | 18 | 23 | 30 | 38 | 47 | 58 | 70 | 83 | 98 | 116 | 135 | 157 | 35 |
| S. 40 | 0 | 1 | 3 | 5 | 8 | 12 | 16 | 21 | 27 | 34 | 43 | 52 | 63 | 75 | 88 | 104 | 121 | 140 | N. 40 |
| 45 | 0 | 1 | 3 | 5 | 7 | 10 | 14 | 19 | 25 | 31 | 38 | 47 | 56 | 66 | 78 | 92 | 107 | 124 | 45 |
| 50 | 0 | 1 | 2 | 4 | 7 | 9 | 13 | 17 | 22 | 28 | 34 | 42 | 50 | 59 | 70 | 81 | 94 | 109 | 50 |
| 55 | 0 | 1 | 2 | 4 | 6 | 9 | 12 | 16 | 20 | 25 | 31 | 38 | 45 | 53 | 62 | 72 | 84 | 96 | 55 |
| S. 60 | 0 | 1 | 2 | 4 | 6 | 8 | 11 | 15 | 19 | 24 | 29 | 35 | 42 | 50 | 58 | 67 | 77 | 88 | N. 60 |

This table gives the difference, in nautical miles, between the distance from one place to another by the Rhumb Line track and the distance by the Great Circle track. It is based on a *Latitude of Departure* of 67°, but may be used for any place of departure between latitudes 65° and 69°. Of the two argument columns headed *Latitude of Destination*, the one on the left is to be used when the place of departure lies between N. 65° and N. 69°, and the one on the right when the place of departure lies between S. 65° and S. 69°.

The table is intended to give only the approximate difference of distance between the two tracks. For intermediate values of the arguments *Latitude of Destination* and *Change of Longitude*, the figures in the table should be interpolated by inspection. If the *Latitude of Departure* differs by the maximum of 2½° from that on which the table is based, the error in the result will not exceed 6 miles up to a *Change of Longitude* of 50°, but may reach 12 miles for a change of 70°, and 20 miles for a change of 90°.

*Example.*—Required the difference in distance between the Rhumb Line track and the Great Circle track from Obdorsk (Lat. 66° 30′ N., Long. 67° 20′ E.) to Lerwick (Lat. 60° 10′ N., Long. 1° 10′ W.).

Entering the argument column on the left with the *Latitude of Destination* of 60° 10′ N., and interpolating by inspection for the *Change of Longitude* of 68° 30′, it will be seen that the difference in distance is about 90 nautical miles.

## VI.—ADJUSTMENT TO REFRACTION IN SPECIAL CONDITIONS

| Height in feet | Observed Altitude | | | | | | | | | Height in metres |
|---|---|---|---|---|---|---|---|---|---|---|
| | 4° | 6° | 8° | 10° | 15° | 20° | 30° | 45° | 60° | |
| | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | ′ | |
| 0 | −2 | −1 | −1 | −1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 5000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1500 |
| 10000 | +1 | +1 | +1 | +1 | 0 | 0 | 0 | 0 | 0 | 3000 |
| 15000 | 2 | 2 | 2 | 1 | +1 | +1 | 0 | 0 | 0 | 4600 |
| 20000 | 3 | 2 | 2 | 2 | 1 | 1 | +1 | 0 | 0 | 6100 |
| 25000 | 4 | 3 | 2 | 2 | 1 | 1 | 1 | 0 | 0 | 7600 |
| 30000 | 4 | 3 | 3 | 3 | 2 | 1 | 1 | 0 | 0 | 9100 |
| 35000 | 5 | 4 | 3 | 3 | 2 | 1 | 1 | +1 | 0 | 10700 |
| 40000 | +5 | +4 | +3 | +3 | +2 | +2 | +1 | +1 | 0 | 12200 |

This table gives the additional correction for refraction to be applied to the *observed* altitude beyond that already included in the altitude tabulated in the main tables. It is only intended for use by an observer at great heights, and when special accuracy is required.

## VII.—TRUE AZIMUTH OF THE POLE STAR

| 1940–1960 | | 1960–1980 | | 1980–2000 | |
|---|---|---|---|---|---|
| L.H.A. ♈ | True Azimuth | L.H.A. ♈ | True Azimuth | L.H.A. ♈ | True Azimuth |
| ° | | ° | | ° | |
| 0 | ° | 0 | ° | 0 | ° |
| 15 | 001 | 17 | 001 | 20 | 001 |
| 38 | 000 | 43 | 000 | 49 | 000 |
| 64 | 359 | 72 | 359 | 83 | 359 |
| 170 | 358 | 168 | 358 | 166 | 358 |
| 195 | 359 | 197 | 359 | 200 | 359 |
| 218 | 000 | 223 | 000 | 229 | 000 |
| 244 | 001 | 252 | 001 | 263 | 001 |
| 350 | 002 | 348 | 002 | 346 | 002 |
| 360 | 001 | 360 | 001 | 360 | 001 |

These tables give the True Azimuth of the Pole Star, over various periods of time, for an observer between latitudes N. 65° and N. 69°. The argument L.H.A. ♈ is obtained from G.H.A. ♈ by *subtracting west* longitude or *adding east* longitude.

## VIII.—DIP OF THE SEA HORIZON

| Height in feet | Dip | Height in metres | Height in feet | Dip | Height in metres | Height in feet | Dip | Height in metres | Height in feet | Dip | Height in metres | Height in feet | Dip | Height in metres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ′ | | | ′ | | | ′ | | | ′ | | | ′ | |
| 0 | 1 | 0 | 437 | 21 | 133 | 1700 | 41 | 520 | 3810 | 61 | 1160 | 6740 | 81 | 2050 |
| 2 | 2 | | 481 | 22 | 146 | 1790 | 42 | 546 | 3930 | 62 | 1200 | 6910 | 82 | 2100 |
| 6 | 3 | 1 | 527 | 23 | 160 | 1880 | 43 | 573 | 4060 | 63 | 1230 | 7080 | 83 | 2160 |
| 12 | 4 | 3 | 575 | 24 | 175 | 1970 | 44 | 600 | 4190 | 64 | 1270 | 7250 | 84 | 2210 |
| 21 | 5 | 6 | 625 | 25 | 190 | 2060 | 45 | 628 | 4330 | 65 | 1320 | 7430 | 85 | 2260 |
| 31 | 6 | 9 | 677 | 26 | 206 | 2150 | 46 | 657 | 4460 | 66 | 1360 | 7610 | 86 | 2320 |
| 43 | 7 | 13 | 731 | 27 | 222 | 2250 | 47 | 686 | 4600 | 67 | 1400 | 7790 | 87 | 2370 |
| 58 | 8 | 17 | 787 | 28 | 240 | 2340 | 48 | 716 | 4740 | 68 | 1440 | 7970 | 88 | 2420 |
| 75 | 9 | 22 | 845 | 29 | 257 | 2440 | 49 | 746 | 4880 | 69 | 1480 | 8150 | 89 | 2480 |
| 93 | 10 | 28 | 906 | 30 | 276 | 2550 | 50 | 777 | 5020 | 70 | 1530 | 8340 | 90 | 2540 |
| 114 | 11 | 34 | 968 | 31 | 295 | 2650 | 51 | 809 | 5170 | 71 | 1570 | 8520 | 91 | 2590 |
| 137 | 12 | 41 | 1030 | 32 | 314 | 2760 | 52 | 841 | 5320 | 72 | 1620 | 8710 | 92 | 2650 |
| 162 | 13 | 49 | 1090 | 33 | 335 | 2860 | 53 | 874 | 5470 | 73 | 1660 | 8900 | 93 | 2710 |
| 189 | 14 | 57 | 1160 | 34 | 356 | 2980 | 54 | 908 | 5620 | 74 | 1710 | 9100 | 94 | 2770 |
| 218 | 15 | 66 | 1230 | 35 | 377 | 3090 | 55 | 942 | 5770 | 75 | 1760 | 9290 | 95 | 2830 |
| 250 | 16 | 76 | 1310 | 36 | 399 | 3200 | 56 | 977 | 5930 | 76 | 1800 | 9490 | 96 | 2890 |
| 283 | 17 | 86 | 1380 | 37 | 422 | 3320 | 57 | 1010 | 6090 | 77 | 1850 | 9690 | 97 | 2950 |
| 318 | 18 | 97 | 1460 | 38 | 446 | 3440 | 58 | 1040 | 6250 | 78 | 1900 | 9890 | 98 | 3010 |
| 356 | 19 | 108 | 1540 | 39 | 470 | 3560 | 59 | 1080 | 6410 | 79 | 1950 | 10100 | 99 | 3070 |
| 395 | 20 | 120 | 1620 | 40 | 495 | 3680 | 60 | 1120 | 6580 | 80 | 2000 | 10300 | 100 | 3140 |
| 437 | | 133 | 1700 | | 520 | 3810 | | 1160 | 6740 | | 2050 | 10500 | | 3200 |

This table gives the dip of the sea horizon, in minutes of arc, with argument height of eye of the observer in feet or in metres. It is only required when the altitude is measured from the sea horizon. The dip is to be *subtracted* from the observed altitude.

## IX.—DISTANCE TO THE SEA HORIZON IN NAUTICAL MILES

| Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 0 | 287 | | 87 | 1120 | | 341 | 2500 | | 762 | 4420 | | 1340 | 6890 | | 2100 |
| | 1 | | 317 | 20 | 96 | 1170 | 39 | 359 | 2580 | 58 | 788 | 4540 | 77 | 1380 | 7040 | 96 | 2140 |
| 1 | | | | 21 | | | 40 | | 2670 | 59 | 815 | 4650 | 78 | 1420 | 7180 | 97 | 2190 |
| | 2 | | 349 | | 106 | 1240 | | 378 | 2760 | 60 | 843 | 4770 | 79 | 1450 | 7330 | 98 | 2230 |
| 4 | | 1 | 382 | 22 | 116 | 1300 | 41 | 396 | 2850 | 61 | 871 | 4900 | 80 | 1490 | 7480 | 99 | 2280 |
| | 3 | | | 23 | | | 42 | | | | | | | | | 100 | |
| 9 | | 2 | 417 | | 127 | 1360 | | 416 | 2950 | 62 | 900 | 5020 | 81 | 1530 | 7630 | | 2320 |
| | 4 | | | 24 | | | 43 | | | 63 | | | 82 | | | 101 | |
| 15 | | 4 | 453 | | 138 | 1430 | | 436 | 3040 | | 929 | 5140 | | 1560 | 7780 | | 2370 |
| | 5 | | | 25 | | | 44 | | | 64 | | | 83 | | | 102 | |
| 22 | | 6 | 491 | | 149 | 1490 | | 456 | 3140 | | 958 | 5270 | | 1600 | 7940 | | 2420 |
| | 6 | | | 26 | | | 45 | | | 65 | | | 84 | | | 103 | |
| 31 | | 9 | 531 | | 161 | 1560 | | 477 | 3240 | | 988 | 5390 | | 1640 | 8100 | | 2460 |
| | 7 | | | 27 | | | 46 | | | 66 | | | 85 | | | 104 | |
| 42 | | 12 | 571 | | 174 | 1630 | | 498 | 3340 | | 1010 | 5520 | | 1680 | 8250 | | 2510 |
| | 8 | | | 28 | | | 47 | | | 67 | | | 86 | | | 105 | |
| 54 | | 16 | 614 | | 187 | 1700 | | 520 | 3440 | | 1050 | 5650 | | 1720 | 8410 | | 2560 |
| | 9 | | | 29 | | | 48 | | | 68 | | | 87 | | | 106 | |
| 68 | | 20 | 658 | | 200 | 1770 | | 542 | 3540 | | 1080 | 5780 | | 1760 | 8570 | | 2610 |
| | 10 | | | 30 | | | 49 | | | 69 | | | 88 | | | 107 | |
| 83 | | 25 | 703 | | 214 | 1850 | | 564 | 3650 | | 1110 | 5920 | | 1800 | 8730 | | 2660 |
| | 11 | | | 31 | | | 50 | | | 70 | | | 89 | | | 108 | |
| 100 | | 30 | 750 | | 228 | 1920 | | 587 | 3750 | | 1140 | 6050 | | 1840 | 8900 | | 2710 |
| | 12 | | | 32 | | | 51 | | | 71 | | | 90 | | | 109 | |
| 118 | | 36 | 798 | | 243 | 2000 | | 611 | 3860 | | 1170 | 6190 | | 1880 | 9060 | | 2760 |
| | 13 | | | 33 | | | 52 | | | 72 | | | 91 | | | 110 | |
| 137 | | 42 | 848 | | 258 | 2080 | | 635 | 3970 | | 1210 | 6330 | | 1920 | 9230 | | 2810 |
| | 14 | | | 34 | | | 53 | | | 73 | | | 92 | | | 111 | |
| 158 | | 48 | 900 | | 274 | 2160 | | 659 | 4080 | | 1240 | 6460 | | 1970 | 9400 | | 2860 |
| | 15 | | | 35 | | | 54 | | | 74 | | | 93 | | | 112 | |
| 181 | | 55 | 953 | | 290 | 2240 | | 684 | 4190 | | 1270 | 6610 | | 2010 | 9560 | | 2910 |
| | 16 | | | 36 | | | 55 | | | 75 | | | 94 | | | 113 | |
| 205 | | 62 | 1000 | | 307 | 2320 | | 709 | 4310 | | 1310 | 6750 | | 2050 | 9740 | | 2960 |
| | 17 | | | 37 | | | 56 | | | 76 | | | 95 | | | 114 | |
| 231 | | 70 | 1060 | | 324 | 2410 | | 735 | 4420 | | 1340 | 6890 | | 2100 | 9910 | | 3020 |
| | 18 | | | 38 | | | 57 | | | | | | | | | | |
| 258 | | 78 | | | | | | | | | | | | | | | |
| 287 | 19 | 87 | 1120 | | 341 | 2500 | | 762 | | | | | | | | | |

## IX.—DISTANCE TO THE SEA HORIZON IN STATUTE MILES

| Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres | Height in feet | Dist. | Height in metres |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | 0 | 288 | | 87 | 1120 | | 344 | 2520 | | 768 | 4460 | | 1360 | 6960 | | 2120 |
| | 1 | | 314 | 23 | 95 | 1180 | 45 | 359 | 2590 | 67 | 791 | 4560 | 89 | 1390 | 7080 | 111 | 2160 |
| 1 | | | | 24 | | | 46 | | 2670 | 68 | 815 | 4670 | 90 | 1420 | 7210 | 112 | 2190 |
| | 2 | | 342 | | 104 | 1230 | | 375 | 2750 | 69 | 839 | 4770 | 91 | 1450 | 7340 | 113 | 2230 |
| 3 | | 1 | | 25 | | | 47 | | | 70 | | | | | | 114 | |
| | 3 | | 370 | | 113 | 1280 | | 392 | 2830 | | 863 | 4870 | 92 | 1480 | 7470 | | 2270 |
| 6 | | 2 | | 26 | | | 48 | | | 71 | | | | | | 115 | |
| | 4 | | 400 | | 122 | 1340 | | 408 | 2910 | | 888 | 4980 | 93 | 1510 | 7600 | | 2310 |
| 11 | | 3 | | 27 | | | 49 | | | 72 | | | | | | 116 | |
| | 5 | | 431 | | 131 | 1390 | | 425 | 2990 | | 913 | 5090 | 94 | 1550 | 7730 | | 2350 |
| 17 | | 5 | | 28 | | | 50 | | | 73 | | | | | | 117 | |
| | 6 | | 463 | | 141 | 1450 | | 443 | 3080 | | 938 | 5200 | 95 | 1580 | 7870 | | 2390 |
| 24 | | 7 | | 29 | | | 51 | | | 74 | | | | | | 118 | |
| | 7 | | 496 | | 151 | 1510 | | 460 | 3160 | | 964 | 5310 | 96 | 1610 | 8000 | | 2440 |
| 32 | | 9 | | 30 | | | 52 | | | 75 | | | | | | 119 | |
| | 8 | | 530 | | 161 | 1570 | | 479 | 3250 | | 990 | 5420 | 97 | 1650 | 8140 | | 2480 |
| 41 | | 12 | | 31 | | | 53 | | | 76 | | | | | | 120 | |
| | 9 | | 565 | | 172 | 1630 | | 497 | 3330 | | 1010 | 5530 | 98 | 1680 | 8280 | | 2520 |
| 51 | | 15 | | 32 | | | 54 | | | 77 | | | | | | 121 | |
| | 10 | | 602 | | 183 | 1690 | | 516 | 3420 | | 1040 | 5640 | 99 | 1720 | 8410 | | 2560 |
| 62 | | 19 | | 33 | | | 55 | | | 78 | | | | | | 122 | |
| | 11 | | 639 | | 195 | 1750 | | 535 | 3510 | | 1070 | 5750 | 100 | 1750 | 8550 | | 2600 |
| 75 | | 22 | | 34 | | | 56 | | | 79 | | | | | | 123 | |
| | 12 | | 678 | | 206 | 1820 | | 554 | 3600 | | 1090 | 5870 | 101 | 1790 | 8690 | | 2650 |
| 89 | | 27 | | 35 | | | 57 | | | 80 | | | | | | 124 | |
| | 13 | | 718 | | 219 | 1880 | | 574 | 3690 | | 1120 | 5990 | 102 | 1820 | 8830 | | 2690 |
| 103 | | 31 | | 36 | | | 58 | | | 81 | | | | | | 125 | |
| | 14 | | 759 | | 231 | 1950 | | 594 | 3780 | | 1150 | 6100 | 103 | 1860 | 8980 | | 2730 |
| 119 | | 36 | | 37 | | | 59 | | | 82 | | | | | | 126 | |
| | 15 | | 801 | | 244 | 2010 | | 615 | 3880 | | 1180 | 6220 | 104 | 1890 | 9120 | | 2780 |
| 137 | | 41 | | 38 | | | 60 | | | 83 | | | | | | 127 | |
| | 16 | | 845 | | 257 | 2080 | | 636 | 3970 | | 1210 | 6340 | 105 | 1930 | 9270 | | 2820 |
| 155 | | 47 | | 39 | | | 61 | | | 84 | | | | | | 128 | |
| | 17 | | 889 | | 271 | 2150 | | 657 | 4070 | | 1240 | 6460 | 106 | 1970 | 9410 | | 2870 |
| 174 | | 53 | | 40 | | | 62 | | | 85 | | | | | | 129 | |
| | 18 | | 935 | | 285 | 2220 | | 678 | 4160 | | 1270 | 6580 | 107 | 2000 | 9560 | | 2910 |
| 195 | | 59 | | 41 | | | 63 | | | 86 | | | | | | 130 | |
| | 19 | | 982 | | 299 | 2290 | | 700 | 4260 | | 1300 | 6710 | 108 | 2040 | 9710 | | 2960 |
| 216 | | 66 | | 42 | | | 64 | | | 87 | | | | | | 131 | |
| | 20 | | 1030 | | 313 | 2370 | | 723 | 4360 | | 1330 | 6830 | 109 | 2080 | 9860 | | 3000 |
| 239 | | 73 | | 43 | | | 65 | | | 88 | | | | | | 132 | |
| | 21 | | 1070 | | 328 | 2440 | | 745 | 4460 | | 1360 | 6960 | 110 | 2120 | 10000 | | 3050 |
| 263 | | 80 | | 44 | | | 66 | | | | | | | | | | |
| 288 | 22 | 87 | 1120 | | 344 | 2520 | | 768 | | | | | | | | | |

These tables give the distance to the sea horizon, in nautical miles and in statute miles, with argument height of eye of the observer in feet or in metres.

At the moment when an object of known height is just appearing or disappearing over the sea horizon, its distance may be found by adding the distance corresponding to its height to the distance corresponding to the height of eye of the observer.

## X.—TABLE OF RANGES IN NAUTICAL MILES

The tables below and on the opposite page give the distance, to the nearest 5 nautical miles, of an object, whose height is known and is *greater* than the height of the observer. The arguments of the table are the observed *angle of elevation* to the object, and the *difference in height* between the object and the observer, expressed in feet or in metres.

*Example.*—An observer, whose height is 1,500 feet, finds that the angle of elevation to the summit of a mountain, whose height is known to be 7,000 feet, is 0° 48′. Required the distance away of the mountain.

The difference in height between the mountain and the observer is 7,000 − 1,500 = 5,500 feet. Entering on the opposite page the column headed 0° 50′ (the nearest tabulated value to 0° 48′), and choosing the left-hand of the two argument columns since the height is measured in feet, it is seen that 5,500 lies in the interval between 5,130 and 5,910, so that the distance of the mountain, to the nearest 5 miles, is 45 nautical miles.

The tables on pages 226 to 228 give the distance of an object, whose height is known, and is *less* than the height of the observer. The arguments of the table are the observed *angle of depression* to the object, and the *difference in height* between the observer and the object, expressed in feet or in metres. The distance is given to the nearest mile up to 10 nautical miles, and to the nearest 5 miles from 10 to 60 nautical miles.

*Example.*—An observer, whose height is 1,500 metres, finds that the angle of depression to a ship is 5° 37′. Required the distance away of the ship.

Entering on page 228 the column headed 5° 30′, and choosing the right-hand of the two argument columns, it is seen that 1,500 is an exact tabulated value, so that the distance away of the ship is 8 nautical miles.

On page 226, figures in *italics* represent the difference in height, ***when the object observed is beyond the sea horizon.*** If it is uncertain whether the object is beyond the horizon or not, and the two parts of the table give widely different results, there should be no doubt which is the correct one, while in doubtful cases the error will not be serious.

These tables are intended to give only the approximate range. They should prove a more reliable guide for large angles of elevation and depression than for small ones.

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Height of object *greater* than height of observer

| Angle of elevation | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4° 00′ | | | 3° 40′ | | | 3° 20′ | | | 3° 00′ | | | 2° 40′ | | | 2° 20′ | | |
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| 1060 | 0 | 325 | 978 | 0 | 298 | 890 | 0 | 271 | 801 | 0 | 244 | 712 | 0 | 217 | 624 | 0 | 190 |
| 3230 | 5 | 985 | 2960 | 5 | 904 | 2690 | 5 | 822 | 2430 | 5 | 741 | 2160 | 5 | 660 | 1900 | 5 | 579 |
| 5430 | 10 | 1650 | 4990 | 10 | 1520 | 4540 | 10 | 1380 | 4100 | 10 | 1250 | 3650 | 10 | 1110 | 3210 | 10 | 980 |
| 7670 | 15 | 2330 | 7050 | 15 | 2140 | 6430 | 15 | 1960 | 5810 | 15 | 1770 | 5190 | 15 | 1580 | 4570 | 15 | 1390 |
| 9950 | 20 | 3030 | 9150 | 20 | 2790 | 8350 | 20 | 2540 | 7550 | 20 | 2300 | 6750 | 20 | 2050 | 5960 | 20 | 1810 |
| 12200 | 25 | 3740 | 11200 | 25 | 3440 | 10300 | 25 | 3140 | 9340 | 25 | 2840 | 8360 | 25 | 2540 | 7390 | 25 | 2250 |
| 14600 | 30 | 4450 | 13400 | 30 | 4100 | 12300 | 30 | 3750 | 11100 | 30 | 3400 | 10000 | 30 | 3050 | 8850 | 30 | 2690 |
| 17000 | 35 | 5180 | 15600 | 35 | 4780 | 14300 | 35 | 4370 | 13000 | 35 | 3960 | 11600 | 35 | 3560 | 10300 | 35 | 3150 |
| 19400 | 40 | 5920 | 17900 | 40 | 5460 | 16400 | 40 | 5000 | 14900 | 40 | 4540 | 13400 | 40 | 4080 | 11900 | 40 | 3620 |
| 21900 | 45 | 6680 | 20200 | 45 | 6160 | 18500 | 45 | 5650 | 16800 | 45 | 5130 | 15100 | 45 | 4620 | 13400 | 45 | 4110 |
| 24400 | 50 | 7440 | 22500 | 50 | 6870 | 20600 | 50 | 6300 | 18800 | 50 | 5730 | 16900 | 50 | 5170 | 15100 | 50 | 4600 |
| 26900 | 55 | 8210 | 24900 | 55 | 7590 | 22800 | 55 | 6970 | 20800 | 55 | 6350 | 18800 | 55 | 5730 | 16700 | 55 | 5100 |
| 29500 | 60 | 9000 | 27300 | 60 | 8320 | 25100 | 60 | 7650 | 22800 | 60 | 6970 | 20600 | 60 | 6300 | 18400 | 60 | 5620 |

# X.—TABLE OF RANGES IN NAUTICAL MILES

## Height of object *greater* than height of observer

### Angle of elevation

| 2° 00′ | | | 1° 50′ | | | 1° 40′ | | | 1° 30′ | | | 1° 20′ | | | 1° 10′ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 535 | 5 | 163 | 491 | 5 | 149 | 447 | 5 | 136 | 402 | 5 | 122 | 358 | 5 | 109 | 314 | 5 | 95 |
| 1630 | 10 | 498 | 1500 | 10 | 458 | 1370 | 10 | 417 | 1230 | 10 | 377 | 1100 | 10 | 336 | 971 | 10 | 296 |
| 2770 | 15 | 845 | 2550 | 15 | 777 | 2330 | 15 | 710 | 2100 | 15 | 643 | 1880 | 15 | 575 | 1660 | 15 | 508 |
| 3940 | 20 | 1200 | 3630 | 20 | 1100 | 3320 | 20 | 1010 | 3020 | 20 | 920 | 2710 | 20 | 826 | 2400 | 20 | 731 |
| 5160 | 25 | 1570 | 4760 | 25 | 1450 | 4360 | 25 | 1330 | 3960 | 25 | 1200 | 3570 | 25 | 1080 | 3170 | 25 | 966 |
| 6410 | 30 | 1950 | 5920 | 30 | 1800 | 5440 | 30 | 1650 | 4950 | 30 | 1510 | 4460 | 30 | 1360 | 3980 | 30 | 1210 |
| 7700 | 35 | 2340 | 7130 | 35 | 2170 | 6550 | 35 | 1990 | 5970 | 35 | 1820 | 5400 | 35 | 1640 | 4820 | 35 | 1470 |
| 9030 | 40 | 2750 | 8360 | 40 | 2550 | 7700 | 40 | 2340 | 7040 | 40 | 2140 | 6370 | 40 | 1940 | 5710 | 40 | 1740 |
| 10400 | 45 | 3160 | 9640 | 45 | 2940 | 8890 | 45 | 2710 | 8140 | 45 | 2480 | 7390 | 45 | 2250 | 6630 | 45 | 2020 |
| 11800 | 50 | 3590 | 10900 | 50 | 3340 | 10100 | 50 | 3080 | 9280 | 50 | 2820 | 8440 | 50 | 2570 | 7590 | 50 | 2310 |
| 13200 | 55 | 4030 | 12300 | 55 | 3750 | 11300 | 55 | 3470 | 10400 | 55 | 3180 | 9520 | 55 | 2900 | 8590 | 55 | 2620 |
| 14700 | 60 | 4480 | 13700 | 60 | 4170 | 12600 | 60 | 3860 | 11600 | 60 | 3550 | 10600 | 60 | 3240 | 9630 | 60 | 2930 |
| 16200 | | 4950 | 15100 | | 4610 | 14000 | | 4270 | 12900 | | 3930 | 11800 | | 3600 | 10700 | | 3260 |

### Angle of elevation

| 1° 00′ | | | 0° 55′ | | | 0° 50′ | | | 0° 45′ | | | 0° 40′ | | | 0° 35′ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 270 | 5 | 82 | 247 | 5 | 75 | 225 | 5 | 68 | 203 | 5 | 62 | 181 | 5 | 55 | 159 | 5 | 48 |
| 839 | 10 | 255 | 772 | 10 | 235 | 706 | 10 | 215 | 640 | 10 | 195 | 573 | 10 | 174 | 507 | 10 | 154 |
| 1440 | 15 | 440 | 1330 | 15 | 406 | 1220 | 15 | 373 | 1110 | 15 | 339 | 1000 | 15 | 305 | 893 | 15 | 272 |
| 2090 | 20 | 637 | 1930 | 20 | 590 | 1780 | 20 | 542 | 1620 | 20 | 495 | 1470 | 20 | 448 | 1310 | 20 | 401 |
| 2770 | 25 | 845 | 2570 | 25 | 784 | 2370 | 25 | 724 | 2170 | 25 | 663 | 1970 | 25 | 602 | 1770 | 25 | 542 |
| 3490 | 30 | 1060 | 3250 | 30 | 991 | 3000 | 30 | 916 | 2760 | 30 | 842 | 2520 | 30 | 768 | 2270 | 30 | 694 |
| 4250 | 35 | 1290 | 3960 | 35 | 1200 | 3670 | 35 | 1120 | 3390 | 35 | 1030 | 3100 | 35 | 945 | 2810 | 35 | 858 |
| 5050 | 40 | 1530 | 4710 | 40 | 1430 | 4380 | 40 | 1330 | 4050 | 40 | 1230 | 3720 | 40 | 1130 | 3390 | 40 | 1030 |
| 5880 | 45 | 1790 | 5500 | 45 | 1670 | 5130 | 45 | 1560 | 4750 | 45 | 1450 | 4380 | 45 | 1330 | 4000 | 45 | 1220 |
| 6750 | 50 | 2060 | 6330 | 50 | 1930 | 5910 | 50 | 1800 | 5490 | 50 | 1670 | 5070 | 50 | 1540 | 4650 | 50 | 1410 |
| 7670 | 55 | 2330 | 7200 | 55 | 2190 | 6740 | 55 | 2050 | 6270 | 55 | 1910 | 5810 | 55 | 1770 | 5340 | 55 | 1620 |
| 8610 | 60 | 2620 | 8100 | 60 | 2470 | 7600 | 60 | 2310 | 7090 | 60 | 2160 | 6580 | 60 | 2000 | 6070 | 60 | 1850 |
| 9600 | | 2920 | 9050 | | 2750 | 8500 | | 2590 | 7940 | | 2420 | 7390 | | 2250 | 6840 | | 2080 |

### Angle of elevation

| 0° 30′ | | | 0° 25′ | | | 0° 20′ | | | 0° 15′ | | | 0° 10′ | | | 0° 05′ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 137 | 5 | 41 | 115 | 5 | 35 | 93 | 5 | 28 | 71 | 5 | 21 | 48 | 5 | 14 | 26 | 5 | 8 |
| 440 | 10 | 134 | 374 | 10 | 114 | 308 | 10 | 93 | 241 | 10 | 73 | 175 | 10 | 53 | 109 | 10 | 33 |
| 782 | 15 | 238 | 671 | 15 | 204 | 561 | 15 | 171 | 450 | 15 | 137 | 339 | 15 | 103 | 229 | 15 | 69 |
| 1160 | 20 | 354 | 1000 | 20 | 306 | 852 | 20 | 259 | 697 | 20 | 212 | 542 | 20 | 165 | 387 | 20 | 118 |
| 1570 | 25 | 481 | 1380 | 25 | 420 | 1180 | 25 | 360 | 982 | 25 | 299 | 783 | 25 | 238 | 584 | 20 | 178 |
| 2030 | 30 | 620 | 1790 | 30 | 546 | 1540 | 30 | 471 | 1300 | 30 | 397 | 1060 | 25 | 323 | 818 | 25 | 249 |
| 2520 | 35 | 770 | 2240 | 35 | 683 | 1950 | 35 | 595 | 1660 | 30 | 507 | 1370 | 30 | 420 | 1090 | 30 | 332 |
| 3060 | 40 | 932 | 2720 | 40 | 831 | 2390 | 40 | 730 | 2060 | 35 | 629 | 1730 | 35 | 528 | 1400 | 35 | 427 |
| 3620 | 45 | 1100 | 3250 | 45 | 991 | 2870 | 45 | 877 | 2500 | 40 | 762 | 2120 | 40 | 648 | 1750 | 40 | 533 |
| 4230 | 50 | 1290 | 3810 | 50 | 1160 | 3390 | 50 | 1030 | 2970 | 45 | 907 | 2550 | 45 | 779 | 2130 | 45 | 651 |
| 4880 | 55 | 1480 | 4410 | 55 | 1340 | 3950 | 55 | 1200 | 3480 | 50 | 1060 | 3020 | 50 | 922 | 2560 | 50 | 780 |
| 5560 | 60 | 1690 | 5050 | 60 | 1540 | 4540 | 60 | 1380 | 4040 | 55 | 1230 | 3530 | 55 | 1070 | 3020 | 55 | 921 |
| 6280 | | 1910 | 5730 | | 1740 | 5180 | | 1570 | 4620 | 60 | 1410 | 4070 | 60 | 1240 | 3520 | 60 | 1070 |

# X.—TABLE OF RANGES IN NAUTICAL MILES

Height of object *less* than height of observer

## Angle of depression

| 0° 05′ | | | 0° 10′ | | | 0° 15′ | | | 0° 20′ | | | 0° 25′ | | | 0° 30′ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 1 | 1 | 9 | 1 | 2 | 13 | 1 | 4 | 17 | 1 | 5 | 21 | 1 | 6 | 26 | 1 | 8 |
| 11 | 2 | 3 | 24 | 2 | 7 | 38 | 2 | 11 | 51 | 2 | 15 | 64 | 2 | 19 | 77 | 2 | 23 |
| 17 | 3 | 5 | 39 | 3 | 12 | 61 | 3 | 18 | 83 | 3 | 25 | 106 | 3 | 32 | 127 | 3 | 39 |
| 21 | 4 | 6 | 52 | 4 | 15 | 83 | 4 | 25 | 114 | 4 | 34 | 145 | 4 | 44 | 176 | 4 | 53 |
| 24 | 5 | 7 | 64 | 5 | 19 | 103 | 5 | 31 | 143 | 5 | 43 | 183 | 5 | 55 | 223 | 5 | 68 |
| 25 | 6 | | 74 | 6 | 22 | 122 | 6 | 37 | 171 | 6 | 52 | 220 | 6 | 67 | 268 | 6 | 81 |
| *26* | | *8* | 82 | | 25 | 140 | | 42 | 197 | | 60 | 255 | | 77 | 312 | | 95 |
| *24* | 7 | | 89 | 7 | 27 | 156 | 7 | 47 | 222 | 7 | 67 | 288 | 7 | 88 | 355 | 7 | 108 |
| *21* | 8 | *7* | 95 | 8 | 29 | 170 | 8 | 52 | 245 | 8 | 74 | 320 | 8 | 97 | 396 | 8 | 120 |
| *16* | 9 | *5* | 99 | 9 | 30 | 183 | 9 | 55 | 267 | 9 | 81 | 351 | 9 | 107 | 435 | 9 | 132 |
| *0* | 10 | *0* | *103* | 10 | *32* | 212 | 10 | 64 | 323 | 10 | 98 | 434 | 10 | 132 | 544 | 10 | 166 |
| | | | *77* | 15 | *24* | 231 | 15 | 70 | 386 | 15 | 117 | 541 | 15 | 164 | 695 | 15 | 212 |
| | | | *13* | 20 | *4* | *213* | 20 | *65* | 411 | 20 | 125 | 609 | 20 | 185 | 808 | 20 | 246 |
| | | | *0* | 25 | *0* | *155* | 25 | *48* | *398* | 25 | *122* | 640 | 25 | 195 | 884 | 25 | 269 |
| | | | | | | *59* | 30 | *18* | *346* | 30 | *106* | *634* | 30 | *194* | 921 | 30 | 280 |
| | | | | | | *0* | 35 | *0* | *258* | 35 | *79* | *590* | 35 | *180* | *921* | 35 | *281* |
| | | | | | | | | | *130* | 40 | *40* | *506* | 40 | *155* | *882* | 40 | *269* |
| | | | | | | | | | *0* | 45 | *0* | *385* | 45 | *118* | *805* | 45 | *246* |
| | | | | | | | | | | | | *226* | 50 | *69* | *690* | 50 | *211* |
| | | | | | | | | | | | | *28* | 55 | *9* | *537* | 55 | *164* |
| | | | | | | | | | | | | *0* | 60 | *0* | *346* | 60 | *106* |

## Angle of depression

| 0° 35′ | | | 0° 40′ | | | 0° 45′ | | | 0° 50′ | | | 0° 55′ | | | 1° 00′ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30 | 1 | 9 | 35 | 1 | 10 | 39 | 1 | 12 | 44 | 1 | 13 | 48 | 1 | 14 | 52 | 1 | 16 |
| 91 | 2 | 27 | 104 | 2 | 31 | 117 | 2 | 35 | 130 | 2 | 39 | 144 | 2 | 43 | 157 | 2 | 47 |
| 150 | 3 | 45 | 172 | 3 | 52 | 194 | 3 | 59 | 216 | 3 | 65 | 238 | 3 | 72 | 260 | 3 | 79 |
| 207 | 4 | 63 | 238 | 4 | 72 | 269 | 4 | 82 | 300 | 4 | 91 | 331 | 4 | 100 | 362 | 4 | 110 |
| 263 | 5 | 80 | 302 | 5 | 92 | 342 | 5 | 104 | 382 | 5 | 116 | 422 | 5 | 128 | 462 | 5 | 140 |
| 317 | 6 | 96 | 366 | 6 | 111 | 414 | 6 | 126 | 463 | 6 | 141 | 512 | 6 | 156 | 560 | 6 | 170 |
| 370 | 7 | 112 | 427 | 7 | 130 | 485 | 7 | 147 | 542 | 7 | 165 | 600 | 7 | 182 | 657 | 7 | 200 |
| 421 | 8 | 128 | 488 | 8 | 148 | 554 | 8 | 168 | 620 | 8 | 189 | 687 | 8 | 209 | 753 | 8 | 229 |
| 471 | 9 | 143 | 546 | 9 | 166 | 621 | 9 | 189 | 696 | 9 | 212 | 772 | 9 | 235 | 847 | 9 | 258 |
| 519 | 10 | 158 | 603 | 10 | 183 | 687 | 10 | 209 | 771 | 10 | 235 | 855 | 10 | 260 | 939 | 10 | 286 |
| 655 | 15 | 199 | 765 | 15 | 233 | 876 | 15 | 267 | 986 | 15 | 300 | 1090 | 15 | 334 | 1200 | 15 | 368 |
| 850 | 20 | 259 | 1000 | 20 | 306 | 1160 | 20 | 353 | 1310 | 20 | 400 | 1470 | 20 | 448 | 1620 | 20 | 495 |
| 1000 | 25 | 307 | 1200 | 25 | 367 | 1400 | 25 | 428 | 1600 | 25 | 489 | 1800 | 25 | 549 | 2000 | 25 | 610 |
| 1120 | 30 | 343 | 1370 | 30 | 417 | 1610 | 30 | 491 | 1850 | 30 | 566 | 2100 | 30 | 640 | 2340 | 30 | 714 |
| 1200 | 35 | 368 | 1490 | 35 | 456 | 1780 | 35 | 543 | 2070 | 35 | 631 | 2350 | 35 | 719 | 2640 | 35 | 806 |
| 1250 | 40 | 381 | 1580 | 40 | 482 | 1910 | 40 | 583 | 2240 | 40 | 685 | 2570 | 40 | 786 | 2910 | 40 | 887 |
| *1260* | 45 | *384* | 1630 | 45 | 497 | 2000 | 45 | 612 | 2380 | 45 | 727 | 2760 | 45 | 841 | 3130 | 45 | 956 |
| *1230* | 50 | *374* | *1650* | 50 | *502* | 2060 | 50 | 629 | 2480 | 50 | 757 | 2900 | 50 | 885 | 3320 | 50 | 1010 |
| *1160* | 55 | *352* | *1620* | 55 | *494* | 2080 | 55 | 634 | 2540 | 55 | 776 | 3010 | 55 | 918 | 3470 | 55 | 1050 |
| *1050* | 60 | *319* | *1560* | 60 | *474* | *2070* | 60 | *629* | 2570 | 60 | 783 | 3080 | 60 | 938 | 3580 | 60 | 1090 |
| *899* | | *274* | *1460* | | *443* | *2010* | | *611* | *2560* | | *780* | 3110 | | 947 | 3660 | | 1110 |

For explanation, see page 224.

# X.—TABLE OF RANGES IN NAUTICAL MILES

## Height of object *less* than height of observer

### Angle of depression

| 1° 10′ | | | 1° 20′ | | | 1° 30′ | | | 1° 40′ | | | 1° 50′ | | | 2° 00′ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| 61 | 0 | 18 | 70 | 0 | 21 | 79 | 0 | 24 | 88 | 0 | 26 | 97 | 0 | 29 | 106 | 0 | 32 |
| 183 | 1 | 56 | 210 | 1 | 64 | 237 | 1 | 72 | 263 | 1 | 80 | 290 | 1 | 88 | 316 | 1 | 96 |
| 305 | 2 | 92 | 349 | 2 | 106 | 393 | 2 | 119 | 437 | 2 | 133 | 481 | 2 | 146 | 526 | 2 | 160 |
| 424 | 3 | 129 | 486 | 3 | 148 | 548 | 3 | 167 | 610 | 3 | 185 | 672 | 3 | 204 | 734 | 3 | 223 |
| 541 | 4 | 165 | 621 | 4 | 189 | 701 | 4 | 213 | 780 | 4 | 238 | 860 | 4 | 262 | 940 | 4 | 286 |
| 658 | 5 | 200 | 755 | 5 | 230 | 852 | 5 | 259 | 950 | 5 | 289 | 1040 | 5 | 319 | 1140 | 5 | 349 |
| 772 | 6 | 235 | 887 | 6 | 270 | 1000 | 6 | 305 | 1110 | 6 | 340 | 1230 | 6 | 375 | 1340 | 6 | 410 |
| 886 | 7 | 270 | 1010 | 7 | 310 | 1150 | 7 | 351 | 1280 | 7 | 391 | 1410 | 7 | 432 | 1550 | 7 | 472 |
| 997 | 8 | 304 | 1140 | 8 | 350 | 1290 | 8 | 395 | 1440 | 8 | 441 | 1590 | 8 | 487 | 1750 | 8 | 533 |
| 1100 | 9 | 337 | 1270 | 9 | 388 | 1440 | 9 | 440 | 1610 | 9 | 491 | 1780 | 9 | 542 | 1940 | 9 | 594 |
| 1430 | 10 | 435 | 1650 | 10 | 503 | 1870 | 10 | 570 | 2090 | 10 | 638 | 2310 | 10 | 705 | 2530 | 10 | 772 |
| 1930 | 15 | 589 | 2240 | 15 | 684 | 2550 | 15 | 778 | 2860 | 15 | 872 | 3170 | 15 | 967 | 3480 | 15 | 1060 |
| 2400 | 20 | 732 | 2790 | 20 | 853 | 3190 | 20 | 974 | 3590 | 20 | 1090 | 3990 | 20 | 1210 | 4390 | 20 | 1330 |
| 2830 | 25 | 862 | 3310 | 25 | 1010 | 3800 | 25 | 1150 | 4290 | 25 | 1300 | 4770 | 25 | 1450 | 5260 | 25 | 1600 |
| 3220 | 30 | 982 | 3790 | 30 | 1150 | 4370 | 30 | 1330 | 4940 | 30 | 1500 | 5520 | 30 | 1680 | 6090 | 30 | 1850 |
| 3570 | 35 | 1080 | 4230 | 35 | 1290 | 4900 | 35 | 1490 | 5560 | 35 | 1690 | 6230 | 35 | 1890 | 6890 | 35 | 2100 |
| 3880 | 40 | 1180 | 4640 | 40 | 1410 | 5390 | 40 | 1640 | 6140 | 40 | 1870 | 6890 | 40 | 2100 | 7650 | 40 | 2330 |
| 4160 | 45 | 1270 | 5000 | 45 | 1520 | 5840 | 45 | 1780 | 6680 | 45 | 2030 | 7530 | 45 | 2290 | 8370 | 45 | 2550 |
| 4400 | 50 | 1340 | 5330 | 50 | 1620 | 6260 | 50 | 1900 | 7190 | 50 | 2190 | 8120 | 50 | 2470 | 9050 | 50 | 2750 |
| 4600 | 55 | 1400 | 5620 | 55 | 1710 | 6640 | 55 | 2020 | 7660 | 55 | 2330 | 8670 | 55 | 2640 | 9690 | 55 | 2950 |
| 4760 | 60 | 1450 | 5870 | 60 | 1790 | 6980 | 60 | 2120 | 8080 | 60 | 2460 | 9190 | 60 | 2800 | 10300 | 60 | 3140 |

### Angle of depression

| 2° 20′ | | | 2° 40′ | | | 3° 00′ | | | 3° 20′ | | | 3° 40′ | | | 4° 00′ | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres |
| 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 |
| 123 | 0 | 37 | 141 | 0 | 43 | 159 | 0 | 48 | 176 | 0 | 53 | 194 | 0 | 59 | 212 | 0 | 64 |
| 369 | 1 | 112 | 422 | 1 | 128 | 476 | 1 | 145 | 529 | 1 | 161 | 582 | 1 | 177 | 636 | 1 | 193 |
| 614 | 2 | 187 | 703 | 2 | 214 | 792 | 2 | 241 | 880 | 2 | 268 | 969 | 2 | 295 | 1050 | 2 | 322 |
| 858 | 3 | 261 | 982 | 3 | 299 | 1100 | 3 | 337 | 1230 | 3 | 375 | 1350 | 3 | 412 | 1470 | 3 | 450 |
| 1090 | 4 | 335 | 1250 | 4 | 383 | 1410 | 4 | 432 | 1570 | 4 | 481 | 1730 | 4 | 529 | 1890 | 4 | 578 |
| 1340 | 5 | 408 | 1530 | 5 | 467 | 1730 | 5 | 527 | 1920 | 5 | 586 | 2120 | 5 | 646 | 2310 | 5 | 706 |
| 1570 | 6 | 481 | 1800 | 6 | 551 | 2040 | 6 | 621 | 2270 | 6 | 692 | 2500 | 6 | 762 | 2730 | 6 | 832 |
| 1810 | 7 | 553 | 2080 | 7 | 634 | 2340 | 7 | 715 | 2610 | 7 | 796 | 2880 | 7 | 877 | 3140 | 7 | 959 |
| 2050 | 8 | 625 | 2350 | 8 | 717 | 2650 | 8 | 809 | 2950 | 8 | 901 | 3250 | 8 | 993 | 3560 | 8 | 1080 |
| 2280 | 9 | 696 | 2620 | 9 | 799 | 2950 | 9 | 902 | 3290 | 9 | 1000 | 3630 | 9 | 1100 | 3970 | 9 | 1210 |
| 2970 | 10 | 908 | 3420 | 10 | 1040 | 3860 | 10 | 1170 | 4300 | 10 | 1310 | 4750 | 10 | 1440 | 5190 | 10 | 1580 |
| 4100 | 15 | 1250 | 4720 | 15 | 1430 | 5340 | 15 | 1620 | 5960 | 15 | 1810 | 6580 | 15 | 2000 | 7200 | 15 | 2190 |
| 5190 | 20 | 1580 | 5980 | 20 | 1820 | 6780 | 20 | 2060 | 7580 | 20 | 2310 | 8380 | 20 | 2550 | 9180 | 20 | 2790 |
| 6230 | 25 | 1900 | 7210 | 25 | 2190 | 8180 | 25 | 2490 | 9160 | 25 | 2790 | 10100 | 25 | 3090 | 11100 | 25 | 3380 |
| 7250 | 30 | 2210 | 8400 | 30 | 2560 | 9550 | 30 | 2910 | 10700 | 30 | 3260 | 11800 | 30 | 3610 | 13000 | 30 | 3960 |
| 8220 | 35 | 2500 | 9550 | 35 | 2910 | 10800 | 35 | 3310 | 12200 | 35 | 3720 | 13500 | 35 | 4120 | 14800 | 35 | 4530 |
| 9150 | 40 | 2790 | 10600 | 40 | 3250 | 12100 | 40 | 3710 | 13600 | 40 | 4170 | 15100 | 40 | 4620 | 16700 | 40 | 5090 |
| 10000 | 45 | 3060 | 11700 | 45 | 3570 | 13400 | 45 | 4090 | 15100 | 45 | 4600 | 16700 | 45 | 5120 | 18400 | 45 | 5630 |
| 10900 | 50 | 3320 | 12700 | 50 | 3890 | 14600 | 50 | 4460 | 16400 | 50 | 5020 | 18300 | 50 | 5590 | 20200 | 50 | 6160 |
| 11700 | 55 | 3570 | 13700 | 55 | 4190 | 15800 | 55 | 4810 | 17800 | 55 | 5440 | 19900 | 55 | 6060 | 21900 | 55 | 6680 |
| 12500 | 60 | 3810 | 14700 | 60 | 4490 | 16900 | 60 | 5160 | 19100 | 60 | 5840 | 21300 | 60 | 6510 | 23600 | 60 | 7190 |

For explanation, see page 224.

# X.—TABLE OF RANGES IN NAUTICAL MILES

## Height of object *less* than height of observer

| Angle of depression | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4° 30′ | | | 5° 00′ | | | 5° 30′ | | | 6° 00′ | | | |
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 238 | 1 | 72 | 265 | 1 | 81 | 292 | 1 | 89 | 319 | 1 | 97 | |
| 716 | 2 | 218 | 796 | 2 | 242 | 876 | 2 | 267 | 956 | 2 | 291 | |
| 1190 | 3 | 363 | 1320 | 3 | 404 | 1450 | 3 | 444 | 1590 | 3 | 485 | |
| 1660 | 4 | 507 | 1850 | 4 | 564 | 2040 | 4 | 621 | 2220 | 4 | 679 | |
| 2130 | 5 | 651 | 2370 | 5 | 725 | 2610 | 5 | 798 | 2860 | 5 | 872 | |
| 2600 | 6 | 795 | 2900 | 6 | 885 | 3190 | 6 | 974 | 3490 | 6 | 1060 | |
| 3070 | 7 | 938 | 3420 | 7 | 1040 | 3770 | 7 | 1150 | 4120 | 7 | 1250 | |
| 3540 | 8 | 1080 | 3940 | 8 | 1200 | 4340 | 8 | 1320 | 4750 | 8 | 1440 | |
| 4010 | 9 | 1220 | 4460 | 9 | 1360 | 4920 | 9 | 1500 | 5370 | 9 | 1630 | |
| 4470 | 10 | 1360 | 4980 | 10 | 1510 | 5490 | 10 | 1670 | 6000 | 10 | 1830 | |
| 5860 | 15 | 1780 | 6530 | 15 | 1990 | 7200 | 15 | 2190 | 7870 | 15 | 2390 | |
| 8140 | 20 | 2480 | 9070 | 20 | 2760 | 10000 | 20 | 3050 | 10900 | 20 | 3330 | |
| 10300 | 25 | 3160 | 11500 | 25 | 3530 | 12700 | 25 | 3890 | 14000 | 25 | 4260 | |
| 12500 | 30 | 3830 | 14000 | 30 | 4280 | 15500 | 30 | 4730 | 16900 | 30 | 5180 | |
| 14700 | 35 | 4490 | 16400 | 35 | 5020 | 18200 | 35 | 5550 | 19900 | 35 | 6080 | |
| 16800 | 40 | 5140 | 18800 | 40 | 5750 | 20800 | 40 | 6360 | 22800 | 40 | 6980 | |
| 18900 | 45 | 5780 | 21200 | 45 | 6470 | 23500 | 45 | 7160 | 25800 | 45 | 7860 | |
| 21000 | 50 | 6400 | 23500 | 50 | 7180 | 26000 | 50 | 7950 | 28600 | 50 | 8730 | |
| 23000 | 55 | 7020 | 25800 | 55 | 7870 | 28600 | 55 | 8730 | 31400 | 55 | 9590 | |
| 25000 | 60 | 7620 | 28000 | 60 | 8550 | 31100 | 60 | 9490 | 34200 | 60 | 10400 | |
| 26900 | | 8210 | 30200 | | 9230 | 33600 | | 10200 | 36900 | | 11200 | |

| Angle of depression | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6° 30′ | | | 7° 00′ | | | 7° 30′ | | | 8° 00′ | | | |
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 346 | 1 | 105 | 373 | 1 | 113 | 399 | 1 | 121 | 427 | 1 | 130 | |
| 1030 | 2 | 316 | 1110 | 2 | 340 | 1190 | 2 | 365 | 1270 | 2 | 390 | |
| 1720 | 3 | 526 | 1860 | 3 | 567 | 1990 | 3 | 608 | 2130 | 3 | 649 | |
| 2410 | 4 | 736 | 2600 | 4 | 793 | 2790 | 4 | 851 | 2980 | 4 | 909 | |
| 3100 | 5 | 945 | 3340 | 5 | 1010 | 3580 | 5 | 1090 | 3830 | 5 | 1160 | |
| 3780 | 6 | 1150 | 4080 | 6 | 1240 | 4380 | 6 | 1330 | 4670 | 6 | 1420 | |
| 4470 | 7 | 1360 | 4820 | 7 | 1460 | 5170 | 7 | 1570 | 5520 | 7 | 1680 | |
| 5150 | 8 | 1570 | 5550 | 8 | 1690 | 5960 | 8 | 1810 | 6360 | 8 | 1940 | |
| 5830 | 9 | 1770 | 6290 | 9 | 1910 | 6750 | 9 | 2050 | 7210 | 9 | 2190 | |
| 6510 | 10 | 1980 | 7020 | 10 | 2140 | 7530 | 10 | 2290 | 8050 | 10 | 2450 | |
| 8540 | 15 | 2600 | 9210 | 15 | 2800 | 9880 | 15 | 3010 | 10500 | 15 | 3220 | |
| 11800 | 20 | 3620 | 12800 | 20 | 3910 | 13700 | 20 | 4200 | 14700 | 20 | 4480 | |
| 15200 | 25 | 4630 | 16400 | 25 | 5000 | 17600 | 25 | 5370 | 18800 | 25 | 5740 | |
| 18400 | 30 | 5630 | 19900 | 30 | 6080 | 21400 | 30 | 6530 | 22900 | 30 | 6980 | |
| 21700 | 35 | 6620 | 23400 | 35 | 7150 | 25200 | 35 | 7680 | 26900 | 35 | 8220 | |
| 24900 | 40 | 7590 | 26900 | 40 | 8210 | 28900 | 40 | 8820 | 30900 | 40 | 9440 | |
| 28000 | 45 | 8550 | 30300 | 45 | 9250 | 32600 | 45 | 9950 | 34900 | 45 | 10600 | |
| 31100 | 50 | 9510 | 33700 | 50 | 10200 | 36300 | 50 | 11000 | 38800 | 50 | 11800 | |
| 34200 | 55 | 10400 | 37100 | 55 | 11300 | 39900 | 55 | 12100 | 42700 | 55 | 13000 | |
| 37300 | 60 | 11300 | 40400 | 60 | 12300 | 43500 | 60 | 13200 | 46600 | 60 | 14200 | |
| 40300 | | 12200 | 43600 | | 13300 | 47000 | | 14300 | 50400 | | 15300 | |

| Angle of depression | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8° 30′ | | | 9° 00′ | | | 9° 30′ | | | 10° 00′ | | | |
| Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | Height in feet | Range | Height in metres | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 454 | 1 | 138 | 481 | 1 | 146 | 508 | 1 | 154 | 535 | 1 | 163 | |
| 1360 | 2 | 415 | 1440 | 2 | 439 | 1520 | 2 | 464 | 1600 | 2 | 489 | |
| 2260 | 3 | 691 | 2400 | 3 | 732 | 2540 | 3 | 774 | 2670 | 3 | 815 | |
| 3170 | 4 | 966 | 3360 | 4 | 1020 | 3550 | 4 | 1080 | 3740 | 4 | 1140 | |
| 4070 | 5 | 1240 | 4310 | 5 | 1310 | 4560 | 5 | 1390 | 4810 | 5 | 1460 | |
| 4970 | 6 | 1510 | 5270 | 6 | 1600 | 5570 | 6 | 1690 | 5870 | 6 | 1790 | |
| 5870 | 7 | 1790 | 6220 | 7 | 1890 | 6580 | 7 | 2000 | 6930 | 7 | 2110 | |
| 6770 | 8 | 2060 | 7180 | 8 | 2180 | 7580 | 8 | 2310 | 8000 | 8 | 2430 | |
| 7670 | 9 | 2330 | 8130 | 9 | 2470 | 8590 | 9 | 2610 | 9060 | 9 | 2760 | |
| 8560 | 10 | 2610 | 9080 | 10 | 2760 | 9600 | 10 | 2920 | 10100 | 10 | 3080 | |
| 11200 | 15 | 3420 | 11900 | 15 | 3630 | 12600 | 15 | 3840 | 13200 | 15 | 4050 | |
| 15600 | 20 | 4770 | 16600 | 20 | 5060 | 17500 | 20 | 5350 | 18500 | 20 | 5640 | |
| 20000 | 25 | 6110 | 21200 | 25 | 6480 | 22500 | 25 | 6860 | 23700 | 25 | 7230 | |
| 24400 | 30 | 7440 | 25900 | 30 | 7890 | 27400 | 30 | 8350 | 28900 | 30 | 8810 | |
| 28700 | 35 | 8760 | 30500 | 35 | 9290 | 32200 | 35 | 9830 | 34000 | 35 | 10300 | |
| 33000 | 40 | 10000 | 35000 | 40 | 10600 | 37000 | 40 | 11300 | 39100 | 40 | 11900 | |
| 37200 | 45 | 11300 | 39500 | 45 | 12000 | 41800 | 45 | 12700 | 44200 | 45 | 13400 | |
| 41400 | 50 | 12600 | 44000 | 50 | 13400 | 46600 | 50 | 14200 | 49200 | 50 | 15000 | |
| 45600 | 55 | 13900 | 48400 | 55 | 14700 | 51300 | 55 | 15600 | 54200 | 55 | 16500 | |
| 49700 | 60 | 15100 | 52800 | 60 | 16100 | 56000 | 60 | 17000 | 59100 | 60 | 18000 | |
| 53800 | | 16400 | 57200 | | 17400 | 60600 | | 18400 | 64000 | | 19500 | |

For explanation, see page 224.

## XI.—TEMPERATURE CONVERSION

### FAHRENHEIT AND CENTIGRADE

| °F | °C | °F | °C | °F | °C | °F | °C | °F | °C | °F | °C | °F | °C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| −52 | −46 | −14 | −25 | +23 | −4 | +61 | +17 | +99 | +38 | +137 | +59 | +175 | +80 |
| 50 | 45 | 13 | 24 | 25 | 3 | 63 | 18 | 101 | 39 | 139 | 60 | 176 | 81 |
| 49 | 44 | 11 | 23 | 27 | 2 | 65 | 19 | 103 | 40 | 140 | 61 | 178 | 82 |
| 47 | 43 | 9 | 22 | 29 | −1 | 67 | 20 | 104 | 41 | 142 | 62 | 180 | 83 |
| 45 | 42 | 7 | 21 | 31 | 0 | 68 | 21 | 106 | 42 | 144 | 63 | 182 | 84 |
| 43 | 41 | 5 | 20 | 32 | +1 | 70 | 22 | 108 | 43 | 146 | 64 | 184 | 85 |
| 41 | 40 | 4 | 19 | 34 | 2 | 72 | 23 | 110 | 44 | 148 | 65 | 185 | 86 |
| 40 | 39 | −2 | 18 | 36 | 3 | 74 | 24 | 112 | 45 | 149 | 66 | 187 | 87 |
| 38 | 38 | 0 | 17 | 38 | 4 | 76 | 25 | 113 | 46 | 151 | 67 | 189 | 88 |
| 36 | 37 | +2 | 16 | 40 | 5 | 77 | 26 | 115 | 47 | 153 | 68 | 191 | 89 |
| 34 | 36 | 4 | 15 | 41 | 6 | 79 | 27 | 117 | 48 | 155 | 69 | 193 | 90 |
| 32 | 35 | 5 | 14 | 43 | 7 | 81 | 28 | 119 | 49 | 157 | 70 | 194 | 91 |
| 31 | 34 | 7 | 13 | 45 | 8 | 83 | 29 | 121 | 50 | 158 | 71 | 196 | 92 |
| 29 | 33 | 9 | 12 | 47 | 9 | 85 | 30 | 122 | 51 | 160 | 72 | 198 | 93 |
| 27 | 32 | 11 | 11 | 49 | 10 | 86 | 31 | 124 | 52 | 162 | 73 | 200 | 94 |
| 25 | 31 | 13 | 10 | 50 | 11 | 88 | 32 | 126 | 53 | 164 | 74 | 202 | 95 |
| 23 | 30 | 14 | 9 | 52 | 12 | 90 | 33 | 128 | 54 | 166 | 75 | 203 | 96 |
| 22 | 29 | 16 | 8 | 54 | 13 | 92 | 34 | 130 | 55 | 167 | 76 | 205 | 97 |
| 20 | 28 | 18 | 7 | 56 | 14 | 94 | 35 | 131 | 56 | 169 | 77 | 207 | 98 |
| 18 | 27 | 20 | 6 | 58 | 15 | 95 | 36 | 133 | 57 | 171 | 78 | 209 | 99 |
| 16 | −26 | 22 | −5 | 59 | +16 | 97 | +37 | 135 | +58 | 173 | +79 | 211 | +100 |
| −14 | | +23 | | +61 | | +99 | | +137 | | +175 | | +212 | |

## XII.—CONVERSION FACTORS

| Conversion | Ratio | Factor | Reciprocal |
|---|---|---|---|
| **DISTANCE** | | | |
| Statute Miles to Nautical Miles ... | 66 to 76 | 0·8684 | 1·1515 |
| Statute Miles „ Kilometres ... ... | 66 „ 41 | 1·6093 | 0·6214 |
| Nautical Miles „ Kilometres ... ... | 76 „ 41 | 1·8531 | 0·5396 |
| Feet „ Metres ... ... | 25 „ 82 | 0·3048 | 3·2808 |
| Yards „ Metres ... ... | 32 „ 35 | 0·9144 | 1·0936 |
| Fathoms „ Feet ... ... | 6 „ 1 | 6·0 | 0·1667 |
| **SPEED** | | | |
| Miles per hour to Knots ... ... | 66 to 76 | 0·8684 | 1·1515 |
| Miles per hour „ Metres per second ... | 38 „ 85 | 0·4470 | 2·2369 |
| Knots „ Metres per second ... | 35 „ 68 | 0·5148 | 1·9426 |
| Miles per hour „ Feet per second ... | 22 „ 15 | 1·4667 | 0·6818 |
| **LIQUID MEASURE** | | | |
| Gallons to Litres ... ... ... | 50 to 11 | 4·5460 | 0·2200 |
| **WEIGHT** | | | |
| Pounds to Kilograms ... ... ... | 44 to 97 | 0·4536 | 2·2046 |
| **PRESSURE** | | | |
| Inches of Mercury to Millibars ... | 2100 to 62 | 33·87 | 0·02953 |

# XIII.—CONVERSION OF TIME TO ARC

## For Intervals of 10m

| h m | ° ′ | h m | ° ′ | h m | ° ′ |
|---|---|---|---|---|---|
| 00 00 | 0 00 | 08 00 | 120 00 | 16 00 | 240 00 |
| 10 | 2 30 | 10 | 122 30 | 10 | 242 30 |
| 20 | 5 00 | 20 | 125 00 | 20 | 245 00 |
| 30 | 7 30 | 30 | 127 30 | 30 | 247 30 |
| 40 | 10 00 | 40 | 130 00 | 40 | 250 00 |
| 50 | 12 30 | 50 | 132 30 | 50 | 252 30 |
| 01 00 | 15 00 | 09 00 | 135 00 | 17 00 | 255 00 |
| 10 | 17 30 | 10 | 137 30 | 10 | 257 30 |
| 20 | 20 00 | 20 | 140 00 | 20 | 260 00 |
| 30 | 22 30 | 30 | 142 30 | 30 | 262 30 |
| 40 | 25 00 | 40 | 145 00 | 40 | 265 00 |
| 50 | 27 30 | 50 | 147 30 | 50 | 267 30 |
| 02 00 | 30 00 | 10 00 | 150 00 | 18 00 | 270 00 |
| 10 | 32 30 | 10 | 152 30 | 10 | 272 30 |
| 20 | 35 00 | 20 | 155 00 | 20 | 275 00 |
| 30 | 37 30 | 30 | 157 30 | 30 | 277 30 |
| 40 | 40 00 | 40 | 160 00 | 40 | 280 00 |
| 50 | 42 30 | 50 | 162 30 | 50 | 282 30 |
| 03 00 | 45 00 | 11 00 | 165 00 | 19 00 | 285 00 |
| 10 | 47 30 | 10 | 167 30 | 10 | 287 30 |
| 20 | 50 00 | 20 | 170 00 | 20 | 290 00 |
| 30 | 52 30 | 30 | 172 30 | 30 | 292 30 |
| 40 | 55 00 | 40 | 175 00 | 40 | 295 00 |
| 50 | 57 30 | 50 | 177 30 | 50 | 297 30 |
| 04 00 | 60 00 | 12 00 | 180 00 | 20 00 | 300 00 |
| 10 | 62 30 | 10 | 182 30 | 10 | 302 30 |
| 20 | 65 00 | 20 | 185 00 | 20 | 305 00 |
| 30 | 67 30 | 30 | 187 30 | 30 | 307 30 |
| 40 | 70 00 | 40 | 190 00 | 40 | 310 00 |
| 50 | 72 30 | 50 | 192 30 | 50 | 312 30 |
| 05 00 | 75 00 | 13 00 | 195 00 | 21 00 | 315 00 |
| 10 | 77 30 | 10 | 197 30 | 10 | 317 30 |
| 20 | 80 00 | 20 | 200 00 | 20 | 320 00 |
| 30 | 82 30 | 30 | 202 30 | 30 | 322 30 |
| 40 | 85 00 | 40 | 205 00 | 40 | 325 00 |
| 50 | 87 30 | 50 | 207 30 | 50 | 327 30 |
| 06 00 | 90 00 | 14 00 | 210 00 | 22 00 | 330 00 |
| 10 | 92 30 | 10 | 212 30 | 10 | 332 30 |
| 20 | 95 00 | 20 | 215 00 | 20 | 335 00 |
| 30 | 97 30 | 30 | 217 30 | 30 | 337 30 |
| 40 | 100 00 | 40 | 220 00 | 40 | 340 00 |
| 50 | 102 30 | 50 | 222 30 | 50 | 342 30 |
| 07 00 | 105 00 | 15 00 | 225 00 | 23 00 | 345 00 |
| 10 | 107 30 | 10 | 227 30 | 10 | 347 30 |
| 20 | 110 00 | 20 | 230 00 | 20 | 350 00 |
| 30 | 112 30 | 30 | 232 30 | 30 | 352 30 |
| 40 | 115 00 | 40 | 235 00 | 40 | 355 00 |
| 50 | 117 30 | 50 | 237 30 | 50 | 357 30 |

## Interpolation Table

| m s | ° ′ |
|---|---|
| 00 00 | 0 00 |
| 02 | 0 01 |
| 05 | 0 02 |
| 10 | 0 03 |
| 13 | 0 04 |
| 18 | 0 05 |
| 21 | 0 06 |
| 26 | 0 07 |
| 29 | 0 08 |
| 34 | 0 09 |
| 37 | 0 10 |
| 42 | 0 11 |
| 45 | 0 12 |
| 50 | 0 13 |
| 53 | 0 14 |
| 00 58 | 0 15 |
| 01 01 | 0 16 |
| 06 | 0 17 |
| 09 | 0 18 |
| 14 | 0 19 |
| 17 | 0 20 |
| 22 | 0 21 |
| 25 | 0 22 |
| 30 | 0 23 |
| 33 | 0 24 |
| 38 | 0 25 |
| 41 | 0 26 |
| 46 | 0 27 |
| 49 | 0 28 |
| 54 | 0 29 |
| 01 57 | 0 30 |
| 02 02 | 0 31 |
| 05 | 0 32 |
| 10 | 0 33 |
| 13 | 0 34 |
| 18 | 0 35 |
| 21 | 0 36 |
| 26 | 0 37 |
| 29 | 0 38 |
| 34 | 0 39 |
| 37 | 0 40 |
| 42 | 0 41 |
| 45 | 0 42 |
| 50 | 0 43 |
| 53 | 0 44 |
| 02 58 | 0 45 |
| 03 01 | 0 46 |
| 06 | 0 47 |
| 09 | 0 48 |
| 14 | 0 49 |
| 17 | 0 50 |
| 03 22 | 0 51 |
| 25 | 0 52 |
| 30 | 0 53 |
| 33 | 0 54 |
| 38 | 0 55 |
| 41 | 0 56 |
| 46 | 0 57 |
| 49 | 0 58 |
| 54 | 0 59 |
| 03 57 | 1 00 |
| 04 02 | 1 01 |
| 05 | 1 02 |
| 10 | 1 03 |
| 13 | 1 04 |
| 18 | 1 05 |
| 21 | 1 06 |
| 26 | 1 07 |
| 29 | 1 08 |
| 34 | 1 09 |
| 37 | 1 10 |
| 42 | 1 11 |
| 45 | 1 12 |
| 50 | 1 13 |
| 53 | 1 14 |
| 04 58 | 1 15 |
| 05 01 | 1 16 |
| 06 | 1 17 |
| 09 | 1 18 |
| 14 | 1 19 |
| 17 | 1 20 |
| 22 | 1 21 |
| 25 | 1 22 |
| 30 | 1 23 |
| 33 | 1 24 |
| 38 | 1 25 |
| 41 | 1 26 |
| 46 | 1 27 |
| 49 | 1 28 |
| 54 | 1 29 |
| 05 57 | 1 30 |
| 06 02 | 1 31 |
| 05 | 1 32 |
| 10 | 1 33 |
| 13 | 1 34 |
| 18 | 1 35 |
| 21 | 1 36 |
| 26 | 1 37 |
| 29 | 1 38 |
| 34 | 1 39 |
| 37 | 1 40 |
| 06 42 | 1 41 |
| 06 37 | 1 40 |
| 42 | 1 41 |
| 45 | 1 42 |
| 50 | 1 43 |
| 53 | 1 44 |
| 06 58 | 1 45 |
| 07 01 | 1 46 |
| 06 | 1 47 |
| 09 | 1 48 |
| 14 | 1 49 |
| 17 | 1 50 |
| 22 | 1 51 |
| 25 | 1 52 |
| 30 | 1 53 |
| 33 | 1 54 |
| 38 | 1 55 |
| 41 | 1 56 |
| 46 | 1 57 |
| 49 | 1 58 |
| 54 | 1 59 |
| 07 57 | 2 00 |
| 08 02 | 2 01 |
| 05 | 2 02 |
| 10 | 2 03 |
| 13 | 2 04 |
| 18 | 2 05 |
| 21 | 2 06 |
| 26 | 2 07 |
| 29 | 2 08 |
| 34 | 2 09 |
| 37 | 2 10 |
| 42 | 2 11 |
| 45 | 2 12 |
| 50 | 2 13 |
| 53 | 2 14 |
| 08 58 | 2 15 |
| 09 01 | 2 16 |
| 06 | 2 17 |
| 09 | 2 18 |
| 14 | 2 19 |
| 17 | 2 20 |
| 22 | 2 21 |
| 25 | 2 22 |
| 30 | 2 23 |
| 33 | 2 24 |
| 38 | 2 25 |
| 41 | 2 26 |
| 46 | 2 27 |
| 49 | 2 28 |
| 54 | 2 29 |
| 09 57 | 2 30 |
| 10 00 | |

When the argument is an exact tabulated value, the *upper* of the two possible values of the result should be taken.

# XIV.—CONVERSION OF ARC TO TIME

| DEGREES | | | | | | | | | | | | MINUTES | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ° | h m | ° | h m | ° | h m | ° | h m | ° | h m | ° | h m | ′ | m s |
| 0 | 0 00 | 60 | 4 00 | 120 | 8 00 | 180 | 12 00 | 240 | 16 00 | 300 | 20 00 | 0 | 0 00 |
| 1 | 0 04 | 61 | 4 04 | 121 | 8 04 | 181 | 12 04 | 241 | 16 04 | 301 | 20 04 | 1 | 0 04 |
| 2 | 0 08 | 62 | 4 08 | 122 | 8 08 | 182 | 12 08 | 242 | 16 08 | 302 | 20 08 | 2 | 0 08 |
| 3 | 0 12 | 63 | 4 12 | 123 | 8 12 | 183 | 12 12 | 243 | 16 12 | 303 | 20 12 | 3 | 0 12 |
| 4 | 0 16 | 64 | 4 16 | 124 | 8 16 | 184 | 12 16 | 244 | 16 16 | 304 | 20 16 | 4 | 0 16 |
| 5 | 0 20 | 65 | 4 20 | 125 | 8 20 | 185 | 12 20 | 245 | 16 20 | 305 | 20 20 | 5 | 0 20 |
| 6 | 0 24 | 66 | 4 24 | 126 | 8 24 | 186 | 12 24 | 246 | 16 24 | 306 | 20 24 | 6 | 0 24 |
| 7 | 0 28 | 67 | 4 28 | 127 | 8 28 | 187 | 12 28 | 247 | 16 28 | 307 | 20 28 | 7 | 0 28 |
| 8 | 0 32 | 68 | 4 32 | 128 | 8 32 | 188 | 12 32 | 248 | 16 32 | 308 | 20 32 | 8 | 0 32 |
| 9 | 0 36 | 69 | 4 36 | 129 | 8 36 | 189 | 12 36 | 249 | 16 36 | 309 | 20 36 | 9 | 0 36 |
| 10 | 0 40 | 70 | 4 40 | 130 | 8 40 | 190 | 12 40 | 250 | 16 40 | 310 | 20 40 | 10 | 0 40 |
| 11 | 0 44 | 71 | 4 44 | 131 | 8 44 | 191 | 12 44 | 251 | 16 44 | 311 | 20 44 | 11 | 0 44 |
| 12 | 0 48 | 72 | 4 48 | 132 | 8 48 | 192 | 12 48 | 252 | 16 48 | 312 | 20 48 | 12 | 0 48 |
| 13 | 0 52 | 73 | 4 52 | 133 | 8 52 | 193 | 12 52 | 253 | 16 52 | 313 | 20 52 | 13 | 0 52 |
| 14 | 0 56 | 74 | 4 56 | 134 | 8 56 | 194 | 12 56 | 254 | 16 56 | 314 | 20 56 | 14 | 0 56 |
| 15 | 1 00 | 75 | 5 00 | 135 | 9 00 | 195 | 13 00 | 255 | 17 00 | 315 | 21 00 | 15 | 1 00 |
| 16 | 1 04 | 76 | 5 04 | 136 | 9 04 | 196 | 13 04 | 256 | 17 04 | 316 | 21 04 | 16 | 1 04 |
| 17 | 1 08 | 77 | 5 08 | 137 | 9 08 | 197 | 13 08 | 257 | 17 08 | 317 | 21 08 | 17 | 1 08 |
| 18 | 1 12 | 78 | 5 12 | 138 | 9 12 | 198 | 13 12 | 258 | 17 12 | 318 | 21 12 | 18 | 1 12 |
| 19 | 1 16 | 79 | 5 16 | 139 | 9 16 | 199 | 13 16 | 259 | 17 16 | 319 | 21 16 | 19 | 1 16 |
| 20 | 1 20 | 80 | 5 20 | 140 | 9 20 | 200 | 13 20 | 260 | 17 20 | 320 | 21 20 | 20 | 1 20 |
| 21 | 1 24 | 81 | 5 24 | 141 | 9 24 | 201 | 13 24 | 261 | 17 24 | 321 | 21 24 | 21 | 1 24 |
| 22 | 1 28 | 82 | 5 28 | 142 | 9 28 | 202 | 13 28 | 262 | 17 28 | 322 | 21 28 | 22 | 1 28 |
| 23 | 1 32 | 83 | 5 32 | 143 | 9 32 | 203 | 13 32 | 263 | 17 32 | 323 | 21 32 | 23 | 1 32 |
| 24 | 1 36 | 84 | 5 36 | 144 | 9 36 | 204 | 13 36 | 264 | 17 36 | 324 | 21 36 | 24 | 1 36 |
| 25 | 1 40 | 85 | 5 40 | 145 | 9 40 | 205 | 13 40 | 265 | 17 40 | 325 | 21 40 | 25 | 1 40 |
| 26 | 1 44 | 86 | 5 44 | 146 | 9 44 | 206 | 13 44 | 266 | 17 44 | 326 | 21 44 | 26 | 1 44 |
| 27 | 1 48 | 87 | 5 48 | 147 | 9 48 | 207 | 13 48 | 267 | 17 48 | 327 | 21 48 | 27 | 1 48 |
| 28 | 1 52 | 88 | 5 52 | 148 | 9 52 | 208 | 13 52 | 268 | 17 52 | 328 | 21 52 | 28 | 1 52 |
| 29 | 1 56 | 89 | 5 56 | 149 | 9 56 | 209 | 13 56 | 269 | 17 56 | 329 | 21 56 | 29 | 1 56 |
| 30 | 2 00 | 90 | 6 00 | 150 | 10 00 | 210 | 14 00 | 270 | 18 00 | 330 | 22 00 | 30 | 2 00 |
| 31 | 2 04 | 91 | 6 04 | 151 | 10 04 | 211 | 14 04 | 271 | 18 04 | 331 | 22 04 | 31 | 2 04 |
| 32 | 2 08 | 92 | 6 08 | 152 | 10 08 | 212 | 14 08 | 272 | 18 08 | 332 | 22 08 | 32 | 2 08 |
| 33 | 2 12 | 93 | 6 12 | 153 | 10 12 | 213 | 14 12 | 273 | 18 12 | 333 | 22 12 | 33 | 2 12 |
| 34 | 2 16 | 94 | 6 16 | 154 | 10 16 | 214 | 14 16 | 274 | 18 16 | 334 | 22 16 | 34 | 2 16 |
| 35 | 2 20 | 95 | 6 20 | 155 | 10 20 | 215 | 14 20 | 275 | 18 20 | 335 | 22 20 | 35 | 2 20 |
| 36 | 2 24 | 96 | 6 24 | 156 | 10 24 | 216 | 14 24 | 276 | 18 24 | 336 | 22 24 | 36 | 2 24 |
| 37 | 2 28 | 97 | 6 28 | 157 | 10 28 | 217 | 14 28 | 277 | 18 28 | 337 | 22 28 | 37 | 2 28 |
| 38 | 2 32 | 98 | 6 32 | 158 | 10 32 | 218 | 14 32 | 278 | 18 32 | 338 | 22 32 | 38 | 2 32 |
| 39 | 2 36 | 99 | 6 36 | 159 | 10 36 | 219 | 14 36 | 279 | 18 36 | 339 | 22 36 | 39 | 2 36 |
| 40 | 2 40 | 100 | 6 40 | 160 | 10 40 | 220 | 14 40 | 280 | 18 40 | 340 | 22 40 | 40 | 2 40 |
| 41 | 2 44 | 101 | 6 44 | 161 | 10 44 | 221 | 14 44 | 281 | 18 44 | 341 | 22 44 | 41 | 2 44 |
| 42 | 2 48 | 102 | 6 48 | 162 | 10 48 | 222 | 14 48 | 282 | 18 48 | 342 | 22 48 | 42 | 2 48 |
| 43 | 2 52 | 103 | 6 52 | 163 | 10 52 | 223 | 14 52 | 283 | 18 52 | 343 | 22 52 | 43 | 2 52 |
| 44 | 2 56 | 104 | 6 56 | 164 | 10 56 | 224 | 14 56 | 284 | 18 56 | 344 | 22 56 | 44 | 2 56 |
| 45 | 3 00 | 105 | 7 00 | 165 | 11 00 | 225 | 15 00 | 285 | 19 00 | 345 | 23 00 | 45 | 3 00 |
| 46 | 3 04 | 106 | 7 04 | 166 | 11 04 | 226 | 15 04 | 286 | 19 04 | 346 | 23 04 | 46 | 3 04 |
| 47 | 3 08 | 107 | 7 08 | 167 | 11 08 | 227 | 15 08 | 287 | 19 08 | 347 | 23 08 | 47 | 3 08 |
| 48 | 3 12 | 108 | 7 12 | 168 | 11 12 | 228 | 15 12 | 288 | 19 12 | 348 | 23 12 | 48 | 3 12 |
| 49 | 3 16 | 109 | 7 16 | 169 | 11 16 | 229 | 15 16 | 289 | 19 16 | 349 | 23 16 | 49 | 3 16 |
| 50 | 3 20 | 110 | 7 20 | 170 | 11 20 | 230 | 15 20 | 290 | 19 20 | 350 | 23 20 | 50 | 3 20 |
| 51 | 3 24 | 111 | 7 24 | 171 | 11 24 | 231 | 15 24 | 291 | 19 24 | 351 | 23 24 | 51 | 3 24 |
| 52 | 3 28 | 112 | 7 28 | 172 | 11 28 | 232 | 15 28 | 292 | 19 28 | 352 | 23 28 | 52 | 3 28 |
| 53 | 3 32 | 113 | 7 32 | 173 | 11 32 | 233 | 15 32 | 293 | 19 32 | 353 | 23 32 | 53 | 3 32 |
| 54 | 3 36 | 114 | 7 36 | 174 | 11 36 | 234 | 15 36 | 294 | 19 36 | 354 | 23 36 | 54 | 3 36 |
| 55 | 3 40 | 115 | 7 40 | 175 | 11 40 | 235 | 15 40 | 295 | 19 40 | 355 | 23 40 | 55 | 3 40 |
| 56 | 3 44 | 116 | 7 44 | 176 | 11 44 | 236 | 15 44 | 296 | 19 44 | 356 | 23 44 | 56 | 3 44 |
| 57 | 3 48 | 117 | 7 48 | 177 | 11 48 | 237 | 15 48 | 297 | 19 48 | 357 | 23 48 | 57 | 3 48 |
| 58 | 3 52 | 118 | 7 52 | 178 | 11 52 | 238 | 15 52 | 298 | 19 52 | 358 | 23 52 | 58 | 3 52 |
| 59 | 3 56 | 119 | 7 56 | 179 | 11 56 | 239 | 15 56 | 299 | 19 56 | 359 | 23 56 | 59 | 3 56 |

# XV.—CORRECTION TO TABULATED ALTITUDE FOR MINUTES OF DECLINATION

| d ′ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | d ′ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 00 | 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 | 00 |
| 01 | 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 | 01 |
| 02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 02 |
| 03 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 03 |
| 04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 04 |
| 05 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 05 |
| 06 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 06 |
| 07 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 07 |
| 08 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 08 |
| 09 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 09 |
| 10 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 10 |
| 11 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 11 |
| 12 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 12 |
| 13 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 13 |
| 14 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 14 |
| 15 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 15 |
| 16 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 16 |
| 17 | 0 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 17 |
| 18 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 9 | 9 | 18 |
| 19 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 10 | 19 |
| 20 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 10 | 10 | 20 |
| 21 | 0 | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 9 | 10 | 10 | 10 | 21 |
| 22 | 0 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 22 |
| 23 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 23 |
| 24 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 12 | 24 |
| 25 | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 12 | 12 | 25 |
| 26 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 13 | 26 |
| 27 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 13 | 14 | 27 |
| 28 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 13 | 14 | 14 | 28 |
| 29 | 0 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 13 | 14 | 14 | 14 | 29 |
| 30 | 0 | 1 | 2 | 2 | 2 | 3 | 4 | 4 | 4 | 5 | 6 | 6 | 6 | 7 | 8 | 8 | 8 | 9 | 10 | 10 | 10 | 11 | 12 | 12 | 12 | 13 | 14 | 14 | 14 | 15 | 30 |
| 31 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 13 | 14 | 14 | 15 | 16 | 31 |
| 32 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 9 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 13 | 14 | 14 | 15 | 15 | 16 | 32 |
| 33 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 33 |
| 34 | 1 | 1 | 2 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 11 | 12 | 12 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 17 | 34 |
| 35 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 13 | 14 | 15 | 15 | 16 | 16 | 17 | 18 | 35 |
| 36 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 5 | 6 | 7 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | 14 | 15 | 16 | 16 | 17 | 17 | 18 | 36 |
| 37 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 7 | 8 | 9 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 14 | 14 | 15 | 15 | 16 | 16 | 17 | 18 | 18 | 37 |
| 38 | 1 | 1 | 2 | 3 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | 15 | 15 | 16 | 16 | 17 | 18 | 18 | 19 | 38 |
| 39 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 14 | 14 | 15 | 16 | 16 | 17 | 18 | 18 | 19 | 20 | 39 |
| 40 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 13 | 14 | 15 | 15 | 16 | 17 | 17 | 18 | 19 | 19 | 20 | 40 |
| 41 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 14 | 14 | 15 | 16 | 16 | 17 | 18 | 18 | 19 | 20 | 20 | 41 |
| 42 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 12 | 13 | 13 | 14 | 15 | 15 | 16 | 17 | 18 | 18 | 19 | 20 | 20 | 21 | 42 |
| 43 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 14 | 15 | 16 | 16 | 17 | 18 | 19 | 19 | 20 | 21 | 22 | 43 |
| 44 | 1 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 7 | 8 | 9 | 10 | 10 | 11 | 12 | 12 | 13 | 14 | 15 | 15 | 16 | 17 | 18 | 18 | 19 | 20 | 21 | 21 | 22 | 44 |
| 45 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 11 | 12 | 13 | 14 | 14 | 15 | 16 | 16 | 17 | 18 | 19 | 20 | 20 | 21 | 22 | 22 | 45 |
| 46 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 12 | 13 | 14 | 15 | 15 | 16 | 17 | 18 | 18 | 19 | 20 | 21 | 21 | 22 | 23 | 46 |
| 47 | 1 | 2 | 2 | 3 | 4 | 5 | 5 | 6 | 7 | 8 | 9 | 9 | 10 | 11 | 12 | 13 | 13 | 14 | 15 | 16 | 16 | 17 | 18 | 19 | 20 | 20 | 21 | 22 | 23 | 24 | 47 |
| 48 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 10 | 10 | 11 | 12 | 13 | 14 | 14 | 15 | 16 | 17 | 18 | 18 | 19 | 20 | 21 | 22 | 22 | 23 | 24 | 48 |
| 49 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 7 | 8 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 15 | 16 | 16 | 17 | 18 | 19 | 20 | 20 | 21 | 22 | 23 | 24 | 24 | 49 |
| 50 | 1 | 2 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 18 | 19 | 20 | 21 | 22 | 22 | 23 | 24 | 25 | 50 |
| 51 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 51 |
| 52 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 23 | 24 | 25 | 26 | 52 |
| 53 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 26 | 53 |
| 54 | 1 | 2 | 3 | 4 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 22 | 23 | 24 | 25 | 26 | 27 | 54 |
| 55 | 1 | 2 | 3 | 4 | 5 | 6 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 55 |
| 56 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 56 |
| 57 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 28 | 57 |
| 58 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 58 |
| 59 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 59 |

# XV.—CORRECTION TO TABULATED ALTITUDE FOR MINUTES OF DECLINATION

| d | 31 32 33 | 34 35 36 | 37 38 39 | 40 41 42 | 43 44 45 | 46 47 48 | 49 50 51 | 52 53 54 | 55 56 57 | 58 59 60 | d |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ′ | | | | | | | | | | | ′ |
| 00 | 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 | 00 |
| 01 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 01 |
| 02 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 1 | 1 1 2 | 2 2 2 | 2 2 2 | 2 2 2 | 2 2 2 | 2 2 2 | 02 |
| 03 | 2 2 2 | 2 2 2 | 2 2 2 | 2 2 2 | 2 2 2 | 2 2 2 | 2 2 3 | 3 3 3 | 3 3 3 | 3 3 3 | 03 |
| 04 | 2 2 2 | 2 2 2 | 2 3 3 | 3 3 3 | 3 3 3 | 3 3 3 | 3 3 3 | 3 4 4 | 4 4 4 | 4 4 4 | 04 |
| 05 | 3 3 3 | 3 3 3 | 3 3 3 | 3 3 4 | 4 4 4 | 4 4 4 | 4 4 4 | 4 4 4 | 5 5 5 | 5 5 5 | 05 |
| 06 | 3 3 3 | 3 4 4 | 4 4 4 | 4 4 4 | 4 4 4 | 5 5 5 | 5 5 5 | 5 5 5 | 6 6 6 | 6 6 6 | 06 |
| 07 | 4 4 4 | 4 4 4 | 4 4 5 | 5 5 5 | 5 5 5 | 5 5 6 | 6 6 6 | 6 6 6 | 6 7 7 | 7 7 7 | 07 |
| 08 | 4 4 4 | 5 5 5 | 5 5 5 | 5 5 6 | 6 6 6 | 6 6 6 | 7 7 7 | 7 7 7 | 7 7 8 | 8 8 8 | 08 |
| 09 | 5 5 5 | 5 5 5 | 6 6 6 | 6 6 6 | 6 7 7 | 7 7 7 | 7 8 8 | 8 8 8 | 8 8 9 | 9 9 9 | 09 |
| 10 | 5 5 6 | 6 6 6 | 6 6 6 | 7 7 7 | 7 7 8 | 8 8 8 | 8 8 8 | 9 9 9 | 9 9 10 | 10 10 10 | 10 |
| 11 | 6 6 6 | 6 6 7 | 7 7 7 | 7 8 8 | 8 8 8 | 8 9 9 | 9 9 9 | 10 10 10 | 10 10 10 | 11 11 11 | 11 |
| 12 | 6 6 7 | 7 7 7 | 7 8 8 | 8 8 8 | 9 9 9 | 9 9 10 | 10 10 10 | 10 11 11 | 11 11 11 | 12 12 12 | 12 |
| 13 | 7 7 7 | 7 8 8 | 8 8 8 | 9 9 9 | 9 10 10 | 10 10 10 | 11 11 11 | 11 11 12 | 12 12 12 | 13 13 13 | 13 |
| 14 | 7 7 8 | 8 8 8 | 9 9 9 | 9 10 10 | 10 10 10 | 11 11 11 | 11 12 12 | 12 12 13 | 13 13 13 | 14 14 14 | 14 |
| 15 | 8 8 8 | 8 9 9 | 9 10 10 | 10 10 10 | 11 11 11 | 12 12 12 | 12 12 13 | 13 13 14 | 14 14 14 | 14 15 15 | 15 |
| 16 | 8 9 9 | 9 9 10 | 10 10 10 | 11 11 11 | 11 12 12 | 12 13 13 | 13 13 14 | 14 14 14 | 15 15 15 | 15 16 16 | 16 |
| 17 | 9 9 9 | 10 10 10 | 10 11 11 | 11 12 12 | 12 12 13 | 13 13 14 | 14 14 14 | 15 15 15 | 16 16 16 | 16 17 17 | 17 |
| 18 | 9 10 10 | 10 10 11 | 11 11 12 | 12 12 13 | 13 13 14 | 14 14 14 | 15 15 15 | 16 16 16 | 16 17 17 | 17 18 18 | 18 |
| 19 | 10 10 10 | 11 11 11 | 12 12 12 | 13 13 13 | 14 14 14 | 15 15 15 | 16 16 16 | 16 17 17 | 17 18 18 | 18 19 19 | 19 |
| 20 | 10 11 11 | 11 12 12 | 12 13 13 | 13 14 14 | 14 15 15 | 15 16 16 | 16 17 17 | 17 18 18 | 18 19 19 | 19 20 20 | 20 |
| 21 | 11 11 12 | 12 12 13 | 13 13 14 | 14 14 15 | 15 15 16 | 16 16 17 | 17 18 18 | 18 19 19 | 19 20 20 | 20 21 21 | 21 |
| 22 | 11 12 12 | 12 13 13 | 14 14 14 | 15 15 15 | 16 16 16 | 17 17 18 | 18 18 19 | 19 19 20 | 20 21 21 | 21 22 22 | 22 |
| 23 | 12 12 13 | 13 13 14 | 14 15 15 | 15 16 16 | 16 17 17 | 18 18 18 | 19 19 20 | 20 20 21 | 21 21 22 | 22 23 23 | 23 |
| 24 | 12 13 13 | 14 14 14 | 15 15 16 | 16 16 17 | 17 18 18 | 18 19 19 | 20 20 20 | 21 21 22 | 22 22 23 | 23 24 24 | 24 |
| 25 | 13 13 14 | 14 15 15 | 15 16 16 | 17 17 18 | 18 18 19 | 19 20 20 | 20 21 21 | 22 22 22 | 23 23 24 | 24 25 25 | 25 |
| 26 | 13 14 14 | 15 15 16 | 16 16 17 | 17 18 18 | 19 19 20 | 20 20 21 | 21 22 22 | 23 23 23 | 24 24 25 | 25 26 26 | 26 |
| 27 | 14 14 15 | 15 16 16 | 17 17 18 | 18 18 19 | 19 20 20 | 21 21 22 | 22 22 23 | 23 24 24 | 25 25 26 | 26 27 27 | 27 |
| 28 | 14 15 15 | 16 16 17 | 17 18 18 | 19 19 20 | 20 21 21 | 21 22 22 | 23 23 24 | 24 25 25 | 26 26 27 | 27 28 28 | 28 |
| 29 | 15 15 16 | 16 17 17 | 18 18 19 | 19 20 20 | 21 21 22 | 22 23 23 | 24 24 25 | 25 26 26 | 27 27 28 | 28 29 29 | 29 |
| 30 | 16 16 16 | 17 18 18 | 18 19 20 | 20 20 21 | 22 22 22 | 23 24 24 | 24 25 26 | 26 26 27 | 28 28 28 | 29 30 30 | 30 |
| 31 | 16 17 17 | 18 18 19 | 19 20 20 | 21 21 22 | 22 23 23 | 24 24 25 | 25 26 26 | 27 27 28 | 28 29 29 | 30 30 31 | 31 |
| 32 | 17 17 18 | 18 19 19 | 20 20 21 | 21 22 22 | 23 23 24 | 25 25 26 | 26 27 27 | 28 28 29 | 29 30 30 | 31 31 32 | 32 |
| 33 | 17 18 18 | 19 19 20 | 20 21 21 | 22 23 23 | 24 24 25 | 25 26 26 | 27 28 28 | 29 29 30 | 30 31 31 | 32 32 33 | 33 |
| 34 | 18 18 19 | 19 20 20 | 21 22 22 | 23 23 24 | 24 25 26 | 26 27 27 | 28 28 29 | 29 30 31 | 31 32 32 | 33 33 34 | 34 |
| 35 | 18 19 19 | 20 20 21 | 22 22 23 | 23 24 24 | 25 26 26 | 27 27 28 | 29 29 30 | 30 31 32 | 32 33 33 | 34 34 35 | 35 |
| 36 | 19 19 20 | 20 21 22 | 22 23 23 | 24 25 25 | 26 26 27 | 28 28 29 | 29 30 31 | 31 32 32 | 33 34 34 | 35 35 36 | 36 |
| 37 | 19 20 20 | 21 22 22 | 23 23 24 | 25 25 26 | 27 27 28 | 28 29 30 | 30 31 31 | 32 33 33 | 34 35 35 | 36 36 37 | 37 |
| 38 | 20 20 21 | 22 22 23 | 23 24 25 | 25 26 27 | 27 28 28 | 29 30 30 | 31 32 32 | 33 34 34 | 35 35 36 | 37 37 38 | 38 |
| 39 | 20 21 21 | 22 23 23 | 24 25 25 | 26 27 27 | 28 29 29 | 30 31 31 | 32 32 33 | 34 34 35 | 36 36 37 | 38 38 39 | 39 |
| 40 | 21 21 22 | 23 23 24 | 25 25 26 | 27 27 28 | 29 29 30 | 31 31 32 | 33 33 34 | 35 35 36 | 37 37 38 | 39 39 40 | 40 |
| 41 | 21 22 23 | 23 24 25 | 25 26 27 | 27 28 29 | 29 30 31 | 31 32 33 | 33 34 35 | 36 36 37 | 38 38 39 | 40 40 41 | 41 |
| 42 | 22 22 23 | 24 24 25 | 26 27 27 | 28 29 29 | 30 31 32 | 32 33 34 | 34 35 36 | 36 37 38 | 38 39 40 | 41 41 42 | 42 |
| 43 | 22 23 24 | 24 25 26 | 27 27 28 | 29 29 30 | 31 32 32 | 33 34 34 | 35 36 37 | 37 38 39 | 39 40 41 | 42 42 43 | 43 |
| 44 | 23 23 24 | 25 26 26 | 27 28 29 | 29 30 31 | 32 32 33 | 34 34 35 | 36 37 37 | 38 39 40 | 40 41 42 | 43 43 44 | 44 |
| 45 | 23 24 25 | 26 26 27 | 28 28 29 | 30 31 32 | 32 33 34 | 34 35 36 | 37 38 38 | 39 40 40 | 41 42 43 | 44 44 45 | 45 |
| 46 | 24 25 25 | 26 27 28 | 28 29 30 | 31 31 32 | 33 34 34 | 35 36 37 | 38 38 39 | 40 41 41 | 42 43 44 | 44 45 46 | 46 |
| 47 | 24 25 26 | 27 27 28 | 29 30 31 | 31 32 33 | 34 34 35 | 36 37 38 | 38 39 40 | 41 42 42 | 43 44 45 | 45 46 47 | 47 |
| 48 | 25 26 26 | 27 28 29 | 30 30 31 | 32 33 34 | 34 35 36 | 37 38 38 | 39 40 41 | 42 42 43 | 44 45 46 | 46 47 48 | 48 |
| 49 | 25 26 27 | 28 29 29 | 30 31 32 | 33 33 34 | 35 36 37 | 38 38 39 | 40 41 42 | 42 43 44 | 45 46 47 | 47 48 49 | 49 |
| 50 | 26 27 28 | 28 29 30 | 31 32 32 | 33 34 35 | 36 37 38 | 38 39 40 | 41 42 42 | 43 44 45 | 46 47 48 | 48 49 50 | 50 |
| 51 | 26 27 28 | 29 30 31 | 31 32 33 | 34 35 36 | 37 37 38 | 39 40 41 | 42 42 43 | 44 45 46 | 47 48 48 | 49 50 51 | 51 |
| 52 | 27 28 29 | 29 30 31 | 32 33 34 | 35 36 36 | 37 38 39 | 40 41 42 | 42 43 44 | 45 46 47 | 48 49 49 | 50 51 52 | 52 |
| 53 | 27 28 29 | 30 31 32 | 33 34 34 | 35 36 37 | 38 39 40 | 41 42 42 | 43 44 45 | 46 47 48 | 49 49 50 | 51 52 53 | 53 |
| 54 | 28 29 30 | 31 32 32 | 33 34 35 | 36 37 38 | 39 40 40 | 41 42 43 | 44 45 46 | 47 48 49 | 50 50 51 | 52 53 54 | 54 |
| 55 | 28 29 30 | 31 32 33 | 34 35 36 | 37 38 38 | 39 40 41 | 42 43 44 | 45 46 47 | 48 49 50 | 50 51 52 | 53 54 55 | 55 |
| 56 | 29 30 31 | 32 33 34 | 35 35 36 | 37 38 39 | 40 41 42 | 43 44 45 | 46 47 48 | 49 49 50 | 51 52 53 | 54 55 56 | 56 |
| 57 | 29 30 31 | 32 33 34 | 35 36 37 | 38 39 40 | 41 42 43 | 44 45 46 | 47 48 48 | 49 50 51 | 52 53 54 | 55 56 57 | 57 |
| 58 | 30 31 32 | 33 34 35 | 36 37 38 | 39 40 41 | 42 43 44 | 44 45 46 | 47 48 49 | 50 51 52 | 53 54 55 | 56 57 58 | 58 |
| 59 | 30 31 32 | 33 34 35 | 36 37 38 | 39 40 41 | 42 43 44 | 45 46 47 | 48 49 50 | 51 52 53 | 54 55 56 | 57 58 59 | 59 |