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No. 11 & 12.] TWO SHILLINGS. [July 1846.

THE
QUARTERLY
CELESTIAL PHILOSOPHER;

OR THE
COMPLETE ARCANA

OF
ASTRO PHILOSOPHY:

COMMENCING WITH
GENETHIOLOGY SIMPLIFIED,

OR THE
PHILOSOPHY OF THE DOCTRINE OF
NATIVITIES.

ALSO
THE ASTRO METEOROLOGIST.

By W. J. SIMMONITE, A.M., M.B.A., PH. MAT.

THIRD YEAR'S IMPRESSION.

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Correspondents.—All Letters must be pointed, perspicuous, and as short, but as complete as possible. They must reach me before the 20th of *August*, else they cannot be inserted in the following Number.

No. 13 will be Published on the 1st of October, 1846.

☞ November 1st, an Ephemeris for 1820—*Price 1s.*

CONTENTS OF THE ARCANA.

Astronomical Problems Page 153

OF THE ASTRO-PHILOSOPHER.

| | |
|-----------------------------------------------------------------------------------|-----|
| Scientific Notices of Comets in General (<i>Continued</i>) | 153 |
| Mortal Disease | 159 |
| A lingering Disease, mortal | 160 |
| Recovery from Sickness | 161 |
| Mortal Disease | 162 |
| Meteorology | 163 |
| How to Mesmerize yourself | 168 |

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N. B.—Persons writing to me will be expected to enclose the fee, else no answer. And those who write on their own requests will enclose a Postage Stamp.

Many of my correspondents remain unanswered, on account of pressure of business, I do request they will remind me, and they may expect to hear from me by return of Post.

What is the Sun's longitude May 24th, at 4h. 4m. 35s. A. M. 1819?

EXAMPLE.

| | | | |
|------------------------------------|---|----|----|
| | o | ' | '' |
| On the noon of the 24th day is.... | 2 | 25 | 32 |
| The Sun at noon on the 23rd is... | 1 | 27 | 53 |
| | | | |
| Moved in 24 hours.... | 0 | 57 | 39 |
| | | | |

Worked by Diurnal Logarithms.

| | |
|-----------------------------------------------------|--------------|
| Add logarithm of ☉'s longitude in 24h. 0° 57' 39" = | 1.4025 |
| To time since noon 23rd is 16h. 4m. 35s. = | .1740 |
| | |
| | 0° 38' 22" = |
| | 1.5765 |

Thus we see, after making all necessary equations, the result for the time given is 2 degrees 6½ minutes for the Sun's place. See PROBLEM XVI. for finding logarithms for degrees, minutes, and seconds.

By Rule of Proportion it may be found thus—If 24 hours give 57 minutes 39 seconds, what will 16 h. 4 m. 35 s. give? *Ans.* 0° 38' 22"
 Add the Sun's place on the 23rd.... 1 27 53 of II
 The Sun's true place is..... 2 6 15 II

Observe—For regular practice say the Sun is in 2 degrees 6 minutes of Gemini, as the 15 seconds will not make any visible or material difference.

EXERCISES.

- | | |
|------------------------------------------------------------------------------|----------------------|
| What is Herschel's longitude at the above time? | <i>Ans.</i> 33 ↑ 20. |
| Find Saturn's longitude. | <i>Ans.</i> 28 ♄ 46. |
| What is Jupiter's longitude? | <i>Ans.</i> 16 ♃ 57. |
| What is the Moon's longitude? | <i>Ans.</i> 3 ♀ 33. |
| What is Mercury's longitude? | <i>Ans.</i> 8 ☿ 15. |
| What is Sol's longitude October 10th, 2 h. P. M. 1830? | <i>Ans.</i> 16 ☉ 44. |
| Where was the Moon at that time? | <i>Ans.</i> 6 ♀ 40. |
| Where was Mercury in the zodiac, 1844, March 17th, 2 h. 34 m. P. M.? | <i>Ans.</i> 8 ♄ 23. |
| What is Mar's longitude 9th November; 1841, at 10 h. 48 m. A. M. | <i>Ans.</i> 12 ♄ 14. |
| November 9th, 1841, at 10 h. 48 m. A. M. what was the longitude of the Moon? | <i>Ans.</i> 29 ♀ 26. |

PROBLEM II.

45. Given the Sun's geocentric longitude and greatest declination (23° 27' 40") to find his Right Ascension.

RULE—Add the cosine of Sol's greatest declination (9.96253) to the tangent of Sun's longitude, and the sum will be the tangent of the Sun's Right Ascension.

46 - 2.26.704

What is the A. R. of the Sun, May 24th, 4 h. 4 m. 35 s. A. M. 1819 ?

EXAMPLE.

Add cosine of $23^{\circ} 28'$ nearly..... 9.96253
To tangent of Sol's longitude $2 \text{ II } 6=62^{\circ} 6'=10.27616$

The Right Ascension of the $\odot = 60^{\circ} 0' = 10.23869$

EXERCISES.

1. What was the A. R. of Sol November 29th, 6 h. 30 m. P. M. 1824 ?

Ans. $245^{\circ} 44'$.

2. What was Sol's A. R. March, 1844, 17th, 2 h. 34 m. P. M. ?

Ans. $327^{\circ} 23'$.

3. What A. R. had Sol 10th October, 2 h. P. M. 1830 ?

Ans. $192^{\circ} 22'$.

46. *Mark well*—If the sun or star be in φ , ξ , or II , the arc thus found, after adding the sine and tangent, will be the A. R. But if the star be in \ominus , δ , or III , the result must be *subtracted* from 180° . If in \sphericalangle , III , or \uparrow , the A. R. must be *added* to 180° . If in V , VI , or X , then the arc must be *subtracted* from 360 degrees.

PROBLEM III.

47. *To convert time into degrees and minutes.*

RULE—Multiply the hours by 15 and divide the minutes of time by 4, which will give *degrees*; then multiply the odd minutes over by 15, and divide the sum by 4 for minutes and seconds, and the result will be the answer.

EXAMPLE.

What are the degrees of an arc of 16 hours, 4 minutes, 32 seconds of time ?

Ans. $241^{\circ} 8' 42''$.

$$\begin{array}{r} 16 \text{ h.} \times 15 = 240 \quad 0 \quad 0 \\ 4 \text{ m.} \div 4 = 1 \quad 0 \quad 0 \\ 32 \text{ seconds} \div \text{by } 4 = 0 \quad 8 \quad 45 \end{array}$$

Ans. 16 h. 4 m. 32 s. = 241 8 45

A more expeditious method will be by the following Table.

N. B. It is particularly requested and highly recommended that the student study every Problem perfectly, and every Exercise worked in each Problem, before he proceeds to the subsequent Problem, by which means he will become complete master of the calculations.

TABLE I.

| For turning Degrees and Minutes into Time, and the contrary. | | | | | | | | | | | | D | M | M | | | | | | |
|--------------------------------------------------------------|---|----|-----|---|----|-----|----|----|-----|----|----|-----|----|------|-----|----|----|----|----|----|
| D | H | M | D | H | M | D | H | M | D | H | M | M | S | Sec. | | | | | | |
| M | M | S | M | M | S | M | M | S | M | M | S | M | S | Thi. | | | | | | |
| 1 | 0 | 4 | 61 | 4 | 4 | 121 | 8 | 4 | 181 | 12 | 4 | 241 | 16 | 4 | 301 | 20 | 4 | 0 | 15 | 1 |
| 2 | 0 | 8 | 62 | 4 | 8 | 122 | 8 | 8 | 182 | 12 | 8 | 242 | 16 | 8 | 302 | 20 | 8 | 0 | 30 | 2 |
| 3 | 0 | 12 | 63 | 4 | 12 | 123 | 8 | 12 | 183 | 12 | 12 | 243 | 16 | 12 | 303 | 20 | 12 | 0 | 45 | 3 |
| 4 | 0 | 16 | 64 | 4 | 16 | 124 | 8 | 16 | 184 | 12 | 16 | 244 | 16 | 16 | 304 | 20 | 16 | 1 | 0 | 4 |
| 5 | 0 | 20 | 65 | 4 | 20 | 125 | 8 | 20 | 185 | 12 | 20 | 245 | 16 | 20 | 305 | 20 | 20 | 1 | 15 | 5 |
| 6 | 0 | 24 | 66 | 4 | 24 | 126 | 8 | 24 | 186 | 12 | 24 | 246 | 16 | 24 | 306 | 20 | 24 | 1 | 30 | 6 |
| 7 | 0 | 28 | 67 | 4 | 28 | 127 | 8 | 28 | 187 | 12 | 28 | 247 | 16 | 28 | 307 | 20 | 28 | 1 | 45 | 7 |
| 8 | 0 | 32 | 68 | 4 | 32 | 128 | 8 | 32 | 188 | 12 | 32 | 248 | 16 | 32 | 308 | 20 | 32 | 2 | 0 | 8 |
| 9 | 0 | 36 | 69 | 4 | 36 | 129 | 8 | 36 | 189 | 12 | 36 | 249 | 16 | 36 | 309 | 20 | 36 | 2 | 15 | 9 |
| 10 | 0 | 40 | 70 | 4 | 40 | 130 | 8 | 40 | 190 | 12 | 40 | 250 | 16 | 40 | 310 | 20 | 40 | 2 | 30 | 10 |
| 11 | 0 | 44 | 71 | 4 | 44 | 131 | 8 | 44 | 191 | 12 | 44 | 251 | 16 | 44 | 311 | 20 | 44 | 2 | 45 | 11 |
| 12 | 0 | 48 | 72 | 4 | 48 | 132 | 8 | 48 | 192 | 12 | 48 | 252 | 16 | 48 | 312 | 20 | 48 | 3 | 0 | 12 |
| 13 | 0 | 52 | 73 | 4 | 52 | 133 | 8 | 52 | 193 | 12 | 52 | 253 | 16 | 52 | 313 | 20 | 52 | 3 | 15 | 13 |
| 14 | 0 | 56 | 74 | 4 | 56 | 134 | 8 | 56 | 194 | 12 | 56 | 254 | 16 | 56 | 314 | 20 | 56 | 3 | 30 | 14 |
| 15 | 0 | 1 | 75 | 5 | 0 | 135 | 9 | 0 | 195 | 13 | 0 | 255 | 17 | 0 | 315 | 21 | 0 | 3 | 45 | 15 |
| 16 | 1 | 4 | 76 | 5 | 4 | 136 | 9 | 4 | 196 | 13 | 4 | 256 | 17 | 4 | 316 | 21 | 4 | 4 | 0 | 16 |
| 17 | 1 | 8 | 77 | 5 | 8 | 137 | 9 | 8 | 197 | 13 | 8 | 257 | 17 | 8 | 317 | 21 | 8 | 4 | 15 | 17 |
| 18 | 1 | 12 | 78 | 5 | 12 | 138 | 9 | 12 | 198 | 13 | 12 | 258 | 17 | 12 | 318 | 21 | 12 | 4 | 30 | 18 |
| 19 | 1 | 16 | 79 | 5 | 16 | 139 | 9 | 16 | 199 | 13 | 16 | 259 | 17 | 16 | 319 | 21 | 16 | 4 | 45 | 19 |
| 20 | 1 | 20 | 80 | 5 | 20 | 140 | 9 | 20 | 200 | 13 | 20 | 260 | 17 | 20 | 320 | 21 | 20 | 5 | 0 | 20 |
| 21 | 1 | 24 | 81 | 5 | 24 | 141 | 9 | 24 | 201 | 13 | 24 | 261 | 17 | 24 | 321 | 21 | 24 | 5 | 15 | 21 |
| 22 | 1 | 28 | 82 | 5 | 28 | 142 | 9 | 28 | 202 | 13 | 28 | 262 | 17 | 28 | 322 | 21 | 28 | 5 | 30 | 22 |
| 23 | 1 | 32 | 83 | 5 | 32 | 143 | 9 | 32 | 203 | 13 | 32 | 263 | 17 | 32 | 323 | 21 | 32 | 5 | 45 | 23 |
| 24 | 1 | 36 | 84 | 5 | 36 | 144 | 9 | 36 | 204 | 13 | 36 | 264 | 17 | 36 | 324 | 21 | 36 | 6 | 0 | 24 |
| 25 | 1 | 40 | 85 | 5 | 40 | 145 | 9 | 40 | 205 | 13 | 40 | 265 | 17 | 40 | 325 | 21 | 40 | 6 | 15 | 25 |
| 26 | 1 | 44 | 86 | 5 | 44 | 146 | 9 | 44 | 206 | 13 | 44 | 266 | 17 | 44 | 326 | 21 | 44 | 6 | 30 | 26 |
| 27 | 1 | 48 | 87 | 5 | 48 | 147 | 9 | 48 | 207 | 13 | 48 | 267 | 17 | 48 | 327 | 21 | 48 | 6 | 45 | 27 |
| 28 | 1 | 52 | 88 | 5 | 52 | 148 | 9 | 52 | 208 | 13 | 52 | 268 | 17 | 52 | 328 | 21 | 52 | 7 | 0 | 28 |
| 29 | 1 | 56 | 89 | 5 | 56 | 149 | 9 | 56 | 209 | 13 | 56 | 269 | 17 | 56 | 329 | 21 | 56 | 7 | 15 | 29 |
| 30 | 2 | 0 | 90 | 6 | 0 | 150 | 10 | 0 | 210 | 14 | 0 | 270 | 18 | 0 | 330 | 22 | 0 | 7 | 30 | 30 |
| 31 | 2 | 4 | 91 | 6 | 4 | 151 | 10 | 4 | 211 | 14 | 4 | 271 | 18 | 4 | 331 | 22 | 4 | 7 | 45 | 31 |
| 32 | 2 | 8 | 92 | 6 | 8 | 152 | 10 | 8 | 212 | 14 | 8 | 272 | 18 | 8 | 332 | 22 | 8 | 8 | 0 | 32 |
| 33 | 2 | 12 | 93 | 6 | 12 | 153 | 10 | 12 | 213 | 14 | 12 | 273 | 18 | 12 | 333 | 22 | 12 | 8 | 15 | 33 |
| 34 | 2 | 16 | 94 | 6 | 16 | 154 | 10 | 16 | 214 | 14 | 16 | 274 | 18 | 16 | 334 | 22 | 16 | 8 | 30 | 34 |
| 35 | 2 | 20 | 95 | 6 | 20 | 155 | 10 | 20 | 215 | 14 | 20 | 275 | 18 | 20 | 335 | 22 | 20 | 8 | 45 | 35 |
| 36 | 2 | 24 | 96 | 6 | 24 | 156 | 10 | 24 | 216 | 14 | 24 | 276 | 18 | 24 | 336 | 22 | 24 | 9 | 0 | 36 |
| 37 | 2 | 28 | 97 | 6 | 28 | 157 | 10 | 28 | 217 | 14 | 28 | 277 | 18 | 28 | 337 | 22 | 28 | 9 | 15 | 37 |
| 38 | 2 | 32 | 98 | 6 | 32 | 158 | 10 | 32 | 218 | 14 | 32 | 278 | 18 | 32 | 338 | 22 | 32 | 9 | 30 | 38 |
| 39 | 2 | 36 | 99 | 6 | 36 | 159 | 10 | 36 | 219 | 14 | 36 | 279 | 18 | 36 | 339 | 22 | 36 | 9 | 45 | 39 |
| 40 | 2 | 40 | 100 | 6 | 40 | 160 | 10 | 40 | 220 | 14 | 40 | 280 | 18 | 40 | 340 | 22 | 40 | 10 | 0 | 40 |
| 41 | 2 | 44 | 101 | 6 | 44 | 161 | 10 | 44 | 221 | 14 | 44 | 281 | 18 | 44 | 341 | 22 | 44 | 10 | 15 | 41 |
| 42 | 2 | 48 | 102 | 6 | 48 | 162 | 10 | 48 | 222 | 14 | 48 | 282 | 18 | 48 | 342 | 22 | 48 | 10 | 30 | 42 |
| 43 | 2 | 52 | 103 | 6 | 52 | 163 | 10 | 52 | 223 | 14 | 52 | 283 | 18 | 52 | 343 | 22 | 52 | 10 | 45 | 43 |
| 44 | 2 | 56 | 104 | 6 | 56 | 164 | 10 | 56 | 224 | 14 | 56 | 284 | 18 | 56 | 344 | 22 | 56 | 11 | 0 | 44 |
| 45 | 3 | 0 | 105 | 7 | 0 | 165 | 11 | 0 | 225 | 15 | 0 | 285 | 19 | 0 | 345 | 23 | 0 | 11 | 15 | 45 |
| 46 | 3 | 4 | 106 | 7 | 4 | 166 | 11 | 4 | 226 | 15 | 4 | 286 | 19 | 4 | 346 | 23 | 4 | 11 | 30 | 46 |
| 47 | 3 | 8 | 107 | 7 | 8 | 167 | 11 | 8 | 227 | 15 | 8 | 287 | 19 | 8 | 347 | 23 | 8 | 11 | 45 | 47 |
| 48 | 3 | 12 | 108 | 7 | 12 | 168 | 11 | 12 | 228 | 15 | 12 | 288 | 19 | 12 | 348 | 23 | 12 | 12 | 0 | 48 |
| 49 | 3 | 16 | 109 | 7 | 16 | 169 | 11 | 16 | 229 | 15 | 16 | 289 | 19 | 16 | 349 | 23 | 16 | 12 | 15 | 49 |
| 50 | 3 | 20 | 110 | 7 | 20 | 170 | 11 | 20 | 230 | 15 | 20 | 290 | 19 | 20 | 350 | 23 | 20 | 12 | 30 | 50 |
| 51 | 3 | 24 | 111 | 7 | 24 | 171 | 11 | 24 | 231 | 15 | 24 | 291 | 19 | 24 | 351 | 23 | 24 | 12 | 45 | 51 |
| 52 | 3 | 28 | 112 | 7 | 28 | 172 | 11 | 28 | 232 | 15 | 28 | 292 | 19 | 28 | 352 | 23 | 28 | 13 | 0 | 52 |
| 53 | 3 | 32 | 113 | 7 | 32 | 173 | 11 | 32 | 233 | 15 | 32 | 293 | 19 | 32 | 353 | 23 | 32 | 13 | 15 | 53 |
| 54 | 3 | 36 | 114 | 7 | 36 | 174 | 11 | 36 | 234 | 15 | 36 | 294 | 19 | 36 | 354 | 23 | 36 | 13 | 30 | 54 |
| 55 | 3 | 40 | 115 | 7 | 40 | 175 | 11 | 40 | 235 | 15 | 40 | 295 | 19 | 40 | 355 | 23 | 40 | 13 | 45 | 55 |
| 56 | 3 | 44 | 116 | 7 | 44 | 176 | 11 | 44 | 236 | 15 | 44 | 296 | 19 | 44 | 356 | 23 | 44 | 14 | 0 | 56 |
| 57 | 3 | 48 | 117 | 7 | 48 | 177 | 11 | 48 | 237 | 15 | 48 | 297 | 19 | 48 | 357 | 23 | 48 | 14 | 15 | 57 |
| 58 | 3 | 52 | 118 | 7 | 52 | 178 | 11 | 52 | 238 | 15 | 52 | 298 | 19 | 52 | 358 | 23 | 52 | 14 | 30 | 58 |
| 59 | 3 | 56 | 119 | 7 | 56 | 179 | 11 | 56 | 239 | 15 | 56 | 299 | 19 | 56 | 359 | 23 | 56 | 14 | 45 | 59 |
| 60 | 4 | 0 | 120 | 8 | 0 | 180 | 12 | 0 | 240 | 16 | 0 | 300 | 20 | 0 | 360 | 24 | 0 | 15 | 0 | 60 |

EXAMPLES.

| | |
|--------------------------------------------------------------------------|----------|
| Look opposite the 16 hrs. 4 mins. on the <i>left</i> hand, we have | 241 0 0 |
| Look in the last column and you have opposite on left hand for 35 s. | 0 8 45 |
| | 241 8 45 |
| <i>Ans.</i> 16 h. 4 m. 35 ses. = | 241 8 45 |

EXAMPLE 2.

| | |
|--------------------------------------------------------------------------------|-----------|
| Convert 15 h. 43 m. 27 s. into degrees, minutes, &c. <i>Ans.</i> 235° 51' 45'' | 0 / " |
| Look for 15 hrs. 40 min. in the 8th column, equal to | 235 0 0 |
| Then 3 min. in the last column is | 0 45 0 |
| And 27 ses. in the last column, equal to | 0 6 45 |
| | 235 51 45 |
| <i>Ans.</i> for 15 h. 43 m. 27 s. = | 235 51 45 |

- | | |
|------------------------------------------------------|--------------------------|
| 3. Convert 8 hours into degrees. | <i>Ans.</i> 120 degrees. |
| 4. Turn 13 hours into degree. | <i>Ans.</i> 195 degrees. |
| 5. Convert 12 hrs. 16 min into degrees, &c. | <i>Ans.</i> 148 degrees. |
| 6. Convert 20 hrs. 40 min. 30 sec. into degrees, &c. | <i>Ans.</i> 317° 30' |

PROBLEM IV.

48. *To turn degrees and minutes of an Arc into time.*

RULE 1.—Look in the column marked degrees (D) and minutes (M) for the number of degrees required, and opposite to them, in the next column to the *right* hand, will be the *hours* and *minutes*.

RULE 2.—For the minutes of a degree look in the *same* column, and opposite to the minutes on the *right* hand, will be the minutes and seconds of time.

EXAMPLE.

1. What is the time answering to 57 degrees, 26 minutes ?

| | |
|-----------------------------------|-----------------|
| | <i>h. m. s.</i> |
| The number opposite 57 degrees is | 3 48 0 |
| The number opposite 26 minutes is | 0 1 44 |

Ans. 3 49 44

- | | |
|-----------------------------------|------------------------------|
| 2. What time answers to 64° 21' P | <i>Ans.</i> 4 h. 17 m. 24 s. |
| 3. What time answers to 99° 47' P | <i>Ans.</i> 5 h. 59 m. 8 s. |

PROBLEM V.

49. *To find the Right Ascension of the Midheaven, in any latitude at any given time.*

RULE 1.—Add the Sun's sidereal Right Ascension to the time past the preceding noon, and the sum will be the A. R., in time, of the M. C.

RULE 2.—Convert this Time into degrees and minutes, and if the time exceed 24 hours, or 360 degrees, take the excess for the Answer.

EXAMPLE.

1. What is the A. R. of M. C. in Queen Victoria's natus. Born May 23rd, 16 h. 4 m. 35 s., 1819, latitude $51^{\circ} 32'$?

| | | |
|----------------------------------------|-----------------|---------------------|
| | <i>h. m. s.</i> | |
| The \odot A. R. at noon of 23rd | = | 4 0 0 |
| Time afternoon is | | 16 4 35 |
| | | <hr/> |
| A. R. of the M. C. is $301^{\circ} 8'$ | = | <u>20 4 35</u> Ans. |

EXERCISES.

2. What is the A. R. of the M. C. November 29th, $6\frac{1}{2}$ h. P. M. 1824 ?
Ans. $345^{\circ} 59'$.
3. What is the A. R. of M. C. May 13 d. 2 h. 25 m. P. M. 1825 ? *Ans.* $86^{\circ} 17'$.
4. What is the A. R. of M. C. March 17 d. 2 h. 34 m. P. M. 1844 ? *Ans.* $33^{\circ} 48'$.
5. What is the A. R. of M. C. Sept. 29 d. 10 h. 45 m. A. M. 1827 ? *Ans.* $168^{\circ} 45'$.

PROBLEM VI.

50. *The Obliquity of the Ecliptic and the R. A. of the M. C. given, to find the degree of the Ecliptic, on the 10th House, or Meridian.*

RULE.—To the cosine (9.962526) the obliquity of the ecliptic, add the cotangent of the R. A. of the M. C. from the nearest equinox, φ or \sphericalangle , (46) and the sum is the *cotangent* of its longitude from the same equinoctial point.

EXAMPLE.

1. In Queen Victoria's natus, the A. R. of the M. C. is $301^{\circ} 8'$, its nearest equinoctial point is Aries.

| | | |
|----------------------------|------------|-------|
| | $^{\circ}$ | $'$ |
| From the whole circle | 360 | 0 |
| Subtract the A. R. of M. C | 301 | 8 |
| | | <hr/> |
| | 58 | 52 |

| | | |
|------------------------------------|-------------------------|-------------------|
| To cosine of obliquity of Ecliptic | $23^{\circ} 28'$ nearly | 9,962526 |
| Add the cotangent of | <u>58 52</u> | 9,781060 |
| Cotangent from Aries | <u>61 0</u> | = <u>9,743586</u> |

Thus 61 degrees from Aries will leave 29 degrees of φ upon the cusp of the 10th House.

Found thus, 61 added to 180 equals 241, and this subtracted from 360 leaves 119 degrees; because the M. C. is found in *Capricorn*, (46).

EXERCISES.

2. What degree of the Ecliptic is on the M. C. when Right Ascension is $8^{\circ} 21'$?
Ans. $9^{\circ} \varphi 6'$.
3. What sign and degree culminate when the A. R. of M. C. is $214^{\circ} 38'$?
Ans. 7 of Scorpio.
4. What is in the cusp of the 10th when its A. R. is $72^{\circ} 27'$? *Ans.* $14^{\circ} \Pi 38'$.
5. What is culminating when the M. C. has $321^{\circ} 15'$ of A. R. ? *Ans.* 19 Aquarius.
6. What is culminating when the M. C. has $345^{\circ} 59'$ of A. R. ? *Ans.* $14^{\circ} \sphericalangle 46'$.

PROBLEM VII.

51. To find the Oblique Ascension of the Six Eastern Houses.

RULE.—Add 30 degrees to each House from the Mid-heaven, and take the sum, rejecting 360 degrees if it exceed that number.

EXAMPLE.

| | | |
|-------------------------------------------------|-----------|-------|
| In the Queen's natus the A. R. of 10th House is | | 301 8 |
| For the Oblique Ascension for the 11th | add | 30 0 |
| | | 331 8 |
| For the Oblique Ascension of the 12th | add | 30 0 |
| | | 361 8 |
| | Rejecting | 360 0 |
| | | 1 8 |
| Oblique Ascension of the 12th = | | 1 8 |
| For the Oblique Ascension of the Ascendant | add | 30 0 |
| | | 31 8 |
| Oblique Ascension of the 1st = | | 31 8 |
| For the Oblique Ascension of the 2nd | add | 30 0 |
| | | 61 8 |
| Oblique Ascension of the 2nd = | | 61 8 |
| For the Oblique Ascension of the 3rd | add | 30 0 |
| | | 91 8 |
| Oblique Ascension of the 3rd House = | | 91 8 |

PROBLEM VIII.

52. To find the Oblique Descension of the Six Western Houses.

RULE.—Add 180 degrees to the Oblique Ascension of the opposite Houses, and the sum is the *Descension* required.

EXAMPLES.

In Queen Victoria's Nativity we find—

| | | | | | |
|---------------------------------|-------|---------|-------|-------|----------|
| Oblique Ascension of 10th to be | 301 8 | add 180 | equal | 121 8 | for 4th. |
| Oblique Ascension of 11th to be | 331 8 | add 180 | equal | 151 8 | for 5th. |
| Oblique Ascension of 12th to be | 1 8 | add 180 | equal | 181 8 | for 6th. |
| Oblique Ascension of 1st to be | 31 8 | add 180 | equal | 211 8 | for 7th. |
| Oblique Ascension of 2nd to be | 61 8 | add 180 | equal | 241 8 | for 8th. |
| Oblique Ascension of 3rd to be | 91 8 | add 180 | equal | 271 8 | for 9th. |

The above are the Oblique *Ascensions* and *Descensions* under their own Poles. And as these are so simple we need give no further exercises.

PROBLEM IX.

53. To find the Sun's Ascensial Difference or of the Houses of any Horoscope.

RULE.—Add the *tangent* of the Obliquity of the Ecliptic (9,637496) to the *tangent* of Latitude of Birth Place, and the sum will be the *sine* of the *Ascensial Difference* of the House.

EXAMPLE.

1. What is the Sun's Ascensial Difference in Latitude $51^{\circ} 32' P$
 Tangent of the Obliquity of the Ecliptic $23^{\circ} 28'$ nearly = 9,637496
 Add the tangent of the Latitude $51^{\circ} 32'$ 10,099914
 Gives sine of Ascensial Difference.... $33^{\circ} 7'$ = 9,737410

45. *Observe*—The *Ascensial Difference* in a given latitude (or Polar Elevation) is exactly that which any *body* has, as determined by its distance from the meridian: Ascensial Difference being in both cases the difference between *Right* and *Oblique* Ascension. *We say the Sun because it is the same as House.*

EXERCISES.

2. What is the Ascensial Difference of Sol in the latitude 54 degrees 18 min. P
Ans. $37^{\circ} 10'$.
 3. What is the Ascensial Difference of Sol for the latitude 53 deg. 26 min. P
Ans. $35^{\circ} 48'$.

PROBLEM X.

55. *To find the Pole of the 11th, 5th, 3rd, and 9th Houses.*

RULE—Add the *sine* of $\frac{1}{3}$ rd of the Sun's Ascensial Difference to the cotangent (10,362504) and the sum will be the tangent of the Pole.

EXAMPLE.

1. What is the Pole of these Houses in Queen Victoria's Nativity P
 The Sun's Ascensial Difference is $33^{\circ} 7'$ and $\frac{1}{3}$ is $11^{\circ} 2\frac{1}{2}'$
 The *sine* of $11^{\circ} 2\frac{1}{2}'$ is 9,281897
 The *cotangent* of the Ecliptic is 10,362504
 Tangent required is $23^{\circ} 48'$ = 9,644401

EXERCISES.

2. What is the Pole of 11th house in Latitude $53^{\circ} P$ *Ans.* $25^{\circ} 6'$.
 3. What is the Pole of 5th house in Lat. $48^{\circ} P$ *Ans.* $21^{\circ} 3'$.
 4. What is the Pole of 3rd house in Lat. $53^{\circ} 26' P$ *Ans.* $25^{\circ} 29'$.

PROBLEM XI.

56. *To find the Pole of the 12th, 6th, 2nd, and 8th Houses.*

RULE—Add the *sine* of $\frac{2}{3}$ rds of the Ascensial Difference to the tangent of 10,362504.

EXAMPLE.

- Find the Pole of the 12th house in the latitude of London.
 The Sun's Asc. Diff. is $33^{\circ} 7'$, and $\frac{2}{3}$ rds of $33^{\circ} 7'$ is $22^{\circ} 5'$, the *sine* is = 9,575136
 Cotangent of Ecliptic boundary is = 10,362504
 Tangent of the Pole required is $40^{\circ} 54'$ = 9,937640

EXERCISES.

2. What is the Pole of the 12th house in the latitude of Scarborough, 54 degrees 18 minutes? *Ans. 44° 0'.*

3. What is the Pole of the 6th house in latitude of Sheffield, 53 deg. 26 min.? *Ans. 42° 59'.*

A more expeditious plan, and equally correct, may be obtained by the following Table.

TABLE II.

Of the Poles of the Houses for every degree, from 1 degree to 60 degrees, and every half degree of Latitude in Great Britain.

| Lat. | Pole of 11th and 5th, 3rd and 9th. | Pole of 12th and 6th, 2nd and 8th. | Lat. | Pole of 11th and 5th, 3rd and 9th. | Pole of 12th and 6th, 2nd and 8th. | Lat. | Pole of 11th and 5th, 3rd and 9th. | Pole of 12th and 6th, 2nd and 8th. |
|------|------------------------------------|------------------------------------|------|------------------------------------|------------------------------------|------|------------------------------------|------------------------------------|
| 1 | 0 21 | 0 42 | 25 | 8 54 | 17 22 | 49 | 21 46 | 38 12 |
| 2 | 0 41 | 1 22 | 26 | 9 17 | 18 5 | 50 | 22 33 | 39 14 |
| 3 | 1 0 | 2 0 | 27 | 9 43 | 18 52 | 50½ | 22 57 | 39 46 |
| 4 | 1 21 | 2 41 | 28 | 10 8 | 19 37 | 51 | 23 21 | 40 18 |
| 5 | 1 41 | 3 23 | 29 | 10 32 | 20 21 | 51½ | 23 48 | 40 54 |
| 6 | 2 0 | 4 0 | 30 | 10 59 | 21 9 | 52 | 24 12 | 41 24 |
| 7 | 2 21 | 4 40 | 31 | 11 26 | 21 56 | 52½ | 24 44 | 41 58 |
| 8 | 2 41 | 5 21 | 32 | 11 54 | 22 46 | 53 | 25 6 | 42 32 |
| 9 | 3 2 | 6 2 | 33 | 12 23 | 23 36 | 53½ | 25 30 | 42 59 |
| 10 | 3 23 | 6 43 | 34 | 12 51 | 24 25 | 54 | 25 33 | 43 6 |
| 11 | 3 43 | 7 24 | 35 | 13 26 | 25 15 | 54½ | 26 1 | 43 39 |
| 12 | 4 4 | 8 5 | 36 | 13 51 | 26 5 | 55 | 26 30 | 44 13 |
| 13 | 4 24 | 8 45 | 37 | 14 8 | 26 55 | 55½ | 26 59 | 44 48 |
| 14 | 4 45 | 9 26 | 38 | 14 52 | 27 48 | 56 | 27 29 | 45 24 |
| 15 | 5 7 | 10 10 | 39 | 15 24 | 28 40 | 56½ | 28 1 | 45 59 |
| 16 | 5 29 | 10 50 | 40 | 15 56 | 29 32 | 57 | 28 33 | 46 36 |
| 17 | 5 49 | 11 30 | 41 | 16 29 | 30 25 | 57½ | 29 6 | 47 14 |
| 18 | 6 12 | 12 14 | 42 | 17 5 | 31 20 | 58 | 29 40 | 47 50 |
| 19 | 6 34 | 12 57 | 43 | 17 4 | 32 18 | 58½ | 30 15 | 48 27 |
| 20 | 6 57 | 13 41 | 44 | 18 20 | 33 15 | 59 | 30 47 | 49 5 |
| 21 | 7 20 | 14 24 | 45 | 18 58 | 34 13 | 59½ | 31 29 | 49 44 |
| 22 | 7 43 | 15 7 | 46 | 19 37 | 35 10 | 60 | 32 8 | 50 24 |
| 23 | 8 5 | 15 50 | 47 | 20 19 | 36 10 | 60½ | 32 48 | 51 4 |
| 24 | 8 30 | 16 36 | 48 | 21 3 | 37 12 | | | |

57. EXPLANATION OF THE TABLE OF POLES OF HOUSES.

The first column shews the Poles of the 1st and 7th houses, which is always the latitude of the country; the second column shews the Poles of the 3rd, 5th, 9th, and 11th houses; and the third column the Poles of the 2nd, 6th, 8th, and 12th houses. If the latitude of the place be any where between an even degree and half a degree, a proportion may be readily calculated for the difference: thus, if the latitude be that of Sheffield 53° 25', and it be required to find the pole of the 12th house, say, As 30 miles are to the difference between the poles of the 12th, for 53° and 53° 30', which is 33 minutes, so is the difference of latitude 25 to the difference of pole 27½, to be added to the pole of the 12th for 53 degrees. Hence, the pole of the 12th, at Sheffield, is 42° 59½', which is correct with that found by trigonometry to within ½ a minute, its true pole being 42° 59'.

58. To find the sine, cosine, &c., answering to any given arc expressed in degrees and minutes.

RULE.—If the number of degrees is less than 45, find the number at the top of the page, and the minutes in the left hand column; opposite to the minutes, and under the word sine, cosine, &c., is the logarithm required. If the degrees are 45, or upwards, find the number required at the bottom of the page, and opposite the number of minutes in the right hand column, and under the proper title, will be found the logarithm required.

EXAMPLES.

1. To find the log. sine of $35^{\circ} 45'$.

Under the word sine, in the page marked 35° at the top, and opposite $45'$ in the left hand column, is found 9,766598, the log sine required.

2. Required the log. sine of $23^{\circ} 28'$.

Under the word sine in the page marked 23° at the top, and opposite $28'$ in the left hand column, is 9,600118, the sine required.

3. To find the log. tan. of $57^{\circ} 16'$.

Above the word tan. in the page marked 57° in the bottom, and opposite $16'$ in the right hand column, is found 10,191917, the log. tan. required.

4. What is the cotangent of $55^{\circ} 57'$?

In the page marked 55° , at the bottom, and opposite $57'$ in the right hand side-column, is 9,829805, the cotangent of $55^{\circ} 57'$.

PROBLEM XIII.

59. To find the logarithmic number, between 90 deg. and 180 deg.

RULE 1.—Subtract the given degrees and minutes from 180 deg., and take the logarithm of the difference; or if 90 deg. be subtracted from the given sine, then take the cosine of the remainder, which will give the same.

RULE 2.—To find the cosine of an arc above 90 deg., reject 90 deg. and take the sine of the remainder. The same method may be followed for tangents and secants; cotangents and cosecants.

EXAMPLES.

1. Find the sine of 94 degrees 33 minutes.

Take 180 degrees 0 minute and subtract $94^{\circ} 33'$ therefrom, and the remainder 85 degrees 27 minutes work by the cosine of this remainder, and the proper result will be brought out.

2. Find the tangent of 104 degrees 16 minutes. Subtract the given number from 180° and the remainder is $75^{\circ} 44'$ of the cotangent.

PROBLEM XIV.

60. To find the logarithmic number between 180 deg. and 270 deg.

RULE.—Subtract the given number from 270 degrees and take the log., sine, tangent, &c. of the remainder.

EXAMPLES.

1. What is the *log. sine* of 189 degrees?
Diminish 189 by 180 equals the *log. sine* of 9 degrees.
2. What is the *log. tangent* of 214 degrees 11 minutes?
Subtract $214^{\circ} 11'$ from $270^{\circ} 0'$ and the remainder is the *tangent* $55^{\circ} 49'$.

PROBLEM XV.

61. To find the logarithmic number between 270 and 360 degrees.

RULE.—Subtract the given number from 360 deg. and the remainder will be the *log. sought*.

EXAMPLE.

What is the *sine* of 284 degrees 44 minutes?
Take $284^{\circ} 44'$ from 360° , remain $75^{\circ} 16'$, which is the *cosine*. If it was the *tangent*, the *cotangent* would be the answer, and so on of the rest in this Problem.

PROBLEM XVI.

62. To find the *log. sine, tangent, &c.*, of any arc expressed in degrees, minutes, and seconds.

RULE.—Find the *log. sine, tangent, &c.*, corresponding to the given number of degrees and minutes, as directed in the three last Problems, and take the difference between it and that answering to the next greater minute; multiply this difference by the given number of seconds, and divide the product by 60, then add the quotient to the *log. sine, tangent, &c.*, but subtract it from the *log. cos, log. cot., &c.* of the given degrees and minutes, and the sum or difference will be the *log. required*.

EXAMPLES.

1. Required the *log. sine* of $23^{\circ} 27' 40''$.

Log. sine of $23^{\circ} 27'$ is 9,599827
 $23^{\circ} 28'$ is 9,600118

| | |
|------------|-----|
| Difference | 291 |
| Seconds | 40 |

| | |
|----------|-----|
| 60)11640 | |
| | 194 |

| | |
|-------------------------------|------------|
| Log. sine of $23^{\circ} 27'$ | = 9,599827 |
| Proportional part for $40''$ | 194 |

| | |
|------------------------------------|-------------|
| Log. sine of $23^{\circ} 27' 40''$ | is 9,600021 |
|------------------------------------|-------------|

2. Find the log. cos. of $24^{\circ} 16' 26''$.

| | | |
|---------------------------------------|---|----------|
| Log. cos. for $24^{\circ} 16'$ | = | 9,959825 |
| Log. cos. for $24^{\circ} 17'$ | = | 9,959768 |
| Difference | | 57 |
| Seconds | | 36 |
| | | 60)2052 |
| | | 34 |
| Log. cos. of $24^{\circ} 16'$ | = | 9,959825 |
| Subtract Proportional part for $36''$ | = | 34 |
| | | 9,959791 |

3. What is the *sine* of 26 degrees, 28 minutes, and 32 seconds? *Ans.* 9,649155.
4. What is the *cosine* of 32 degrees, 18 minutes, 26 seconds? *Ans.* 9,926956.
5. Required the *tangent* of 47 degrees, 18 minutes, 20 seconds. *Ans.* 10,034989.
6. What is the *cotangent* of 36 degrees, 29 minutes, 17 seconds? *Ans.* 10,130980.
7. What is the *sine* of 136 degrees, 15 minutes, 24 seconds? *Ans.* 9,839747.
8. Required the *cosine* of 284 degrees, 16 minutes, 12 seconds? *Ans.* 9,391713.
9. What is the *tangent* of 220 degrees, 15 minutes, 10 seconds? *Ans.* 9,927702.
10. What is the *cotangent* of 108 degrees, 16 minutes, 20 seconds? *Ans.* 9,518751.

PROBLEM XVII.

63. *To find the Arithmetical Complement of a Logarithm.*

RULE.—Subtract the Logarithm from 10, an integer, or subtract the right hand figure from 9.

EXAMPLE.

1. What is the Arithmetical complement of the proportional logarithm of 24 degrees, or 24 hours?

| | |
|------------------------------------|---------|
| Place, according to rule | 10,0000 |
| Proportional logarithm of 24 is | ,8751 |
| Arithmetical complement of 24 is = | 9,1249 |

EXERCISES.

2. What is the Arithmetical complement of the tangent of 17 degrees 18 min.? *Ans.* ,506590.
3. What is the Arithmetical complement of the sign of 24 degrees 11 min.? *Ans.* 0,387579.
4. What is the Arithmetical complement of 2,730459? *Ans.* 7,269541.
5. What is the Arithmetical complement of the circle 360 degrees? *Ans.* 7,443697.

PROBLEM XVIII.

64.—*To find the log. sine, tangent, &c., of an arc less than 3 deg., and also of one greater than 87 degrees.*

RULE 1.—To find the *sine*. Add the constant number 4,685575 to the *log.* of the *arc in seconds*, and subtract one-third of the Arithmetical complement of the *log. cosine* from the sum, the remainder will give the *log. sine* of the given arc.

RULE 2.—To find the *tangent*. To the constant number 4,685575, add the *log.* of the *arc in seconds*, and also $\frac{2}{3}$ rds of the Arithmetical complement of the *cosine*; the sum is the *log. tangent* of the given arc.

Note.—For the *log. cos.*, and *cot.* take the *log. sine*, and *tan.* of the complement of the given arc.

EXAMPLES.

1. To find the *log. sine* of 1 degree, 2 minutes, 12.5 seconds.

$$\begin{array}{r} \text{Constant number} = 4,685575 \\ \text{Log. of } 3732.5 \text{ sec.} = 3,572000 \\ \hline 8,257575 \\ \text{3rd Arith. com. cos. 1 deg. 2 min. 12.5 sec.} \quad 24 \\ \hline \text{Log. sine of 1 deg. 2 min. 12.5 sec.} = 8,257551 \end{array}$$

2. To find the *log. tan.* of 0 degree 24 minutes, 15.3 seconds.

$$\begin{array}{r} \text{Constant number} \quad 4,685575 \\ \text{Log. of } 1455.3 \text{ sec.} = 3,162952 \\ \text{3rds Arith. com. cos. 24 min. 15.3 sec.} = 0,000007 \\ \hline \text{Log. tan. of 0 deg. 24 min. 15.3 sec.} = 7,848534 \end{array}$$

PROBLEM XIX.

65. To find the degrees, minutes, and seconds, answering to any given *log. sine* or *tangent*.

RULE.—In its respective column find its nearest sine, tangent, &c., to that given; and take the degrees from the top or bottom of the page, according as the quantity is found in a column, with the proper title at the top or bottom; and the minute is found in the same horizontal line, in the left or right hand marginal columns, according as the quantity is found in a column titled at the top or bottom of the page (58 and 59).

EXAMPLES.

1. Required the arc or degrees and minutes corresponding to the *log. sine* 9,584665.

This is found in a column marked sine at the top under 22 degrees, and opposite 36 minutes, or 1 hour 30 minutes, and 24 seconds of time.

2. What are the degrees, minutes, and seconds answering *log. tangent* 9.538764.

$$\begin{array}{r} \text{Given } \log. \text{ tangent } 9,538764 \\ \text{Log. tangent } 19^\circ 4' = 9,538611 \\ \hline 153 \text{ Log. tangent } 19^\circ 5' = 9,539020 \\ \hline 409 \end{array}$$

Then $153 \times 60 \div 409 = 9180 \div 409 = 22.4$. Hence 9,538764 is the *log. tangent* of $19^\circ 4' 22.4''$

3. To find the degrees, minutes, and seconds answering to *log. cosine* 9,568421.

$$\begin{array}{r} \text{Given } \log. \text{ cosine } 9,568421 \\ \text{Log. cosine } 68^\circ 17' = 9,568222 \\ \hline \cdot \cdot \cdot 199 \text{ Log. cosine } 68^\circ 16' = 9,568519 \\ \text{Multiply by } 60 \\ \hline 31711940(37.7 \\ \quad 951 \\ \quad 2430 \\ \quad 2219 \\ \quad \cdot 2110 \end{array}$$

$\therefore 9,568421$ is the *log. cosine* answering to $68^\circ 17' - 37.7'' = 68^\circ 16' 22.3''$.

NOTE.—Instead of taking the *log. cosine* or *log. tangent* next less, we may take that next greater, when the seconds, found as before, must be added to the arc, thus,

| | | |
|--------------------------------|---------------------------------------|------------|
| LOG. COSINE 68° 16' = 9,568539 | | = 9,568539 |
| Given LOG. COSINE = 9,568421 | | |
| ... 118 | | |
| Multiply by 60 | Log. cosine 68° 17' = | 9,568222 |
| 317)17080 | | 317 |
| 22·3 | Hence 68° 16' 22·3 the arc as before. | |

EXERCISES.

- | | |
|-------------------------------------------------------------|---------------------|
| 4. What is the arc answering to <i>log. sine</i> 9,574486 ? | Ans. 22° 2' 47·7'' |
| 5. Required the arc of <i>log. cosine</i> 9,534876 ? | Ans. 69° 57' 37·3'' |
| 6. What is the <i>log. tangent</i> of 10,400864 ? | Ans. 68° 19' 52·7'' |
| 7. Required the <i>cotangent</i> of 10,076543 ? | Ans. 39° 58' 36·6'' |
| 8. What is the <i>log. cosine</i> of 9,823456 ? | Ans. 48° 14' 35·1'' |

PROBLEM XX.

66. To find the degrees, minutes, and seconds, answering to the logarithmic sine or tangent of an arc under 3 deg. and above 87 deg.

RULE 1.—To find the arc answering to a given logarithmic *sine*. Add together the given logarithmic *sine*, the constant number 5,314425, and one-third of the supplement of the corresponding *cosine*, the sum will be the logarithm of the number of seconds in the required arc.

RULE 2.—To find the arc corresponding to a given logarithmic *tangent*. Add together the given logarithmic *tangent* and the constant number 5,314425, and from the sum take two-thirds of the supplement of the corresponding *cosine*, the remainder is the logarithm of the arc in seconds.

NOTE. For the arc answering to the logarithmic *cosine* and *cotangent*, take the complement of the arc answering to the logarithmic *sine* and *tangent*.

1. To find the arc whose *log. sine* is 8,257551

| | | |
|-----------------------------------|----------|----------|
| Constant number | 5,314425 | |
| 1/3rd Arith. com. cosine 9,999929 | = | 0,000024 |

3732·5'' log. = 3,572000

Or 1° 2' 12·5''.

2. To find the arc whose *log. tan.* is 7,848534

| | | |
|-----------------|----------|--|
| Constant number | 5,314425 | |
|-----------------|----------|--|

3,162959

1/3rd Arith. com. cosine 9,999989 = 0,000007

1455·3'' log. 3,162952

Or 0° 24' 15·3''.

PROBLEM XXI.

67. To perform Multiplication by Logarithms.

RULE 1.—Add the logarithms of the multiplier and multiplicand, and the sum is the logarithm of the product.

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multiply 76 Log. = 1,88081 by 54 Log. = 1,73239 <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> Product 4104 = 3,61320 | Multiply 98 Log. = 1,99123 by 76 Log. = 1,88081 <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> 7448 Logarithm 3,87204 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Multiply 76,4 Log. = 1,88309 by 5,4 Log. = 0,73239 <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> 412,56 = 2,61548 | Multiply 7825 Log. = 3,893484 by 873 Log. = 2,941014 <hr style="border: 0; border-top: 1px solid black; margin: 5px 0;"/> Log.6831218·8 = 6,834498 their sum. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Observe, The correct product is 6831225, or 6·2 greater than that found by the logarithms; but when there are various operations, the final error is scarcely appreciable, as the slight inaccuracy of one operation generally balances that of another.

RULE 2.—A negative index must be subtracted when the logarithm is added, and added when the logarithm is subtracted.

Multiply 786 by ·0073.

| | |
|-------------------------------------------|-------------------------------------------|
| Log. 786 = 2,895423 | or 2,895423 |
| Log. ·0073 = 3,863323 | 7,863323 |
| <hr style="width: 50%; margin: 0 auto;"/> | <hr style="width: 50%; margin: 0 auto;"/> |
| 0,758746 | 0·758746 |

RULE 3.—When the positive index is used, in adding we reject 10 from the index, but in subtracting we borrow 10.

EXERCISES.

| | |
|----------------------------|------------------------|
| Multiply 78,36 by 8,5. | <i>Ans.</i> 666,06. |
| Multiply 486,95 by 2,0087. | <i>Ans.</i> 978,1364. |
| Multiply 210,4 by 00372. | <i>Ans.</i> 7826875. |
| Multiply 21896 by 274,35. | <i>Ans.</i> 6007166,7. |

PROBLEM XXII.

68. *To perform Division by Logarithms.*

RULE.—From the logarithm of the dividend subtract the logarithm of the divisor, the remainder is the logarithm of the quotient.

EXAMPLES.

| | |
|------------------|-----------------------------|
| 1. Divide 78634 | Log. = 4,895610 |
| by 27 | Log. = 1,431364 |
| Quotient 2912,37 | Log. = 3,464246 difference. |

| | |
|-----------------------|-----------------|
| 2. Divide 5486 by 96. | |
| Dividend 5486 | Log. = 3,739256 |
| Divisor 96 | Log. = 1,982271 |
| Quotient 57,146 | 1,756985 |
| | 40 |
| | 45 |

3. Divide 0,07856 by 0,003482
 Dividend = 0,07856 Log. = 2,895201
 Divisor = 0,00342 Log. = 3,541829

| | |
|------------------|----------|
| Quotient 22,5617 | 1,353372 |
| | 39 |
| | — |
| | 33 |
| | 19 |
| | — |
| | 14 |
| | — |

4. Divide 7856 = 3,895201 or 3,895201
 by ,0053 = 3,724276 or 7,724276

Quotient 1482263 = 6,170925 or 6,170925

PROBLEM XXIII.

69. *To work a Proportion, or the Rule of Three by Logarithms.*

RULE.—Add together the Arithmetical complement (63) of the Logarithm of the first term, and the Logarithms of the second and third terms, the sum is the Logarithm for the Answer.

EXAMPLE.

1. If 27 give 45 what will 63 require ?

| | | | |
|---------|------------|---------------------------|----------|
| As : | Log. of 27 | Arithmetical complement = | 8,568636 |
| is to : | Log. of 45 | = | 1,653213 |
| so is : | Log. of 63 | = | 1,799341 |

Ans. Log. 105. = 2,021190

EXERCISES.

- | | |
|---------------------------------------------|----------|
| 2. If 12 require 16 what will 24 require ? | Ans. 8. |
| 3. If 36 require 84 what will 112 require ? | Ans. 48. |

PROBLEM XXIV.

70. *To find the degree of the Ecliptic on the 11th, 12th, 1st, 2nd, 3rd Houses in any Latitude.*

RULE 1.—Add the cosine of the Oblique Ascension of the cusp of the house to the cotangent of the Pole of the House : the sum is the cotangent of the first angle, which call the angle A.

RULE 2.—If the Oblique Ascension of the House be less than 90 degrees, or more than 270 degrees, add 23 deg. 28 min. to angle A, and the sum will be the second angle, or angle B. When these are added and exceed 90 deg. then subtract it from 180 degrees. But if the Oblique Ascension of the House exceed 90 degrees, or be less than 270 degrees, then subtract 23 deg. 28 min. and the remainder is angle B.

When angle B is less than 90 degrees, the longitude must be reckoned from the same equinoctial point from which the Oblique Ascension was taken.

RULE 3.—Add together the Arithmetical complement of the *cosine* of B; the *cosine* of A and the *tangent* of the Oblique Ascension of the House: the sum is the *tangent* of its longitude, from the equinoctial point Aries or Libra, according as it was nearest to either by Oblique Ascension. If between Cancer and Libra subtract from 180 degrees (46).

EXAMPLE I.

What is the cusp of the 11th house on the 24th of May, 4 h. 4 m. 35 s. A.M. 1819?

According to PROBLEM VIII. you find the Oblique Ascension of the 11th house $331^{\circ} 8'$ from Aries, being more than 270° subtract this from 360 degrees, the remainder is $28^{\circ} 52'$ from Aries (46).

| | | | |
|--------------------------------------|---------------------|---|-----------|
| To the cosine of Ob. Asc. of 11th | 28 52 | = | 9,942378 |
| Add cotangent of Pole of 11th house | 23 48 | = | 10,355510 |
| <hr/> | | | |
| Cotangent of angle A | 26 44 | = | 10,297888 |
| Being nearest Aries add | 23 28 | = | <hr/> |
| The second angle, or angle B | 50 12 | = | <hr/> |
| Add cosine of angle B | 50 12 (Arith. com.) | = | 0,193746 |
| To cosine of Angle A | 26 44 | = | 9,950905 |
| And tang. of Ob. Asc. from φ | 28 52 | = | 9,741365 |
| <hr/> | | | |
| Sum is tang. of long. from φ | 37 34 | = | 9,886016 |

As the angle B was less than 90 degrees we must subtract this from the first of Aries, from which we took it, which leaves $22^{\circ} 26'$ for the cusp of the 11th house.

EXAMPLE 2.

What degree of the Ecliptic occupies the 12th house?

According to PROBLEM VIII. the Oblique Ascension of the 12th is $1^{\circ} \varphi 8'$.

| | | | |
|-----------------------------------------|-----------------|---|-----------|
| Cosine of Oblique Ascension | 1 8 | = | 9,999915 |
| Cotangent of Pole of 12th | 40 54 | = | 10,062368 |
| <hr/> | | | |
| Cotangent of angle A | 40 54 | = | 10,062283 |
| Being nearest φ Add | 23 28 | = | <hr/> |
| Cosine of angle B | 64 22 (Ar. co.) | = | 0,364903 |
| Cosine of angle A | 40 54 | = | 9,878438 |
| Tang. of Ob. Asc. 12th | 1 φ 8 | = | 8,296292 |
| <hr/> | | | |
| Tangent of 1 degree 59 minutes of Aries | | = | 8,539633 |

As both the Oblique Ascension of the house and angle B are less than 90 degrees, we take the tangent of Rule 3rd from the 1st point of Aries, (46), because the Oblique Ascension of the cusp of the 12th is nearest Aries.

EXAMPLE 3.

What degree of the Ecliptic occupies the Ascendant whose Oblique Ascension is $31^{\circ} 8'$.

$$\begin{aligned} \text{Cos. of the Obl. Asc. of the Ascendant } 31^{\circ} 8' &= 9,932457 \\ \text{Add cot. of Pole of Ascen. } 51 32 &= 9,900087 \end{aligned}$$

$$\begin{aligned} \text{Cot. of the angle A } 55 47 &= 9,832544 \\ \text{Add } 23 28 & \end{aligned}$$

$$\text{Angle B } 79 15$$

$$\begin{aligned} \text{Cos. of Angle B } 79^{\circ} 15' \text{ (Ar. co.)} &= 0,279265 \\ \text{Cos. of Angle A } 55^{\circ} 47' &= 9,749987 \\ \text{Tang. Obl. Asc. of 1st } 41^{\circ} 8' &= 9,781060 \end{aligned}$$

$$\text{Tangent of Long. of the Asc. } 61^{\circ} 14' = 10,260312$$

On the Ascendant $61^{\circ} 14'$ equal to $1 \text{ II } 14$.

EXAMPLE 4.

What point of the Ecliptic occupies the 2nd House, its Pole being always the same as the 12th, and its Oblique Ascension being 61 degrees 8 minutes?

$$\begin{aligned} \text{Cos. of } 61^{\circ} 8' &= 9,683743 \\ \text{Add cot. of the 2nd Pole } 40 55' &= 10,062368 \end{aligned}$$

$$\begin{aligned} \text{Cot. of the angle A. } 60 52 &= 9,746111 \\ \text{Add } 23 28 & \end{aligned}$$

$$\begin{aligned} \text{Cos. of angle B } 84 20 \text{ (Ar. co.)} &= 1,005503 \\ \text{Cos. of angle A } 60 52 &= 9,687389 \\ \text{Tan. of Obl. Asc. of 2nd } 61 8 &= 10,258635 \end{aligned}$$

$$83 37 = 10,951527$$

On the 2nd is $83^{\circ} 37'$ equal to $23 \text{ II } 37$.

EXAMPLE 5.

What point of the Ecliptic occupies the 3rd House, whose Pole is always the same as the 11th House?

Note.—The pole of the 3rd house is $23^{\circ} 48'$, its oblique Ascension is $91^{\circ} 8'$, as may be seen in Problem 7, and as it falls nearest to Libra it must be worked from that point, according to the 2nd part of the Rule, 2nd in this Problem $91,8 - 180 = 88^{\circ} 52'$, from the first point of Libra (46).

$$\begin{aligned} \text{EXAMPLE—To the cosine of Obl. Asc. from } \sphericalcap 88^{\circ} 52' &= 8,296207 \\ \text{Add cotang. of Pole of 3rd } 23 48' &= 10,355510 \end{aligned}$$

$$\begin{aligned} \text{Cotang. of angle A } 87 26 &= 8,651717 \\ \text{Subtract when nearest } \sphericalcap 23 28 & \end{aligned}$$

$$\begin{aligned} \text{Angle B } 63 58 \\ \text{As cosine of angle B } 63^{\circ} 58' &= \text{(Ar. co.) } 357640 \\ \text{Is to cosine of angle A } 87 26 &= 8,651102 \\ \text{So is tangent of Obl. Asc. 3rd } 88 52 &= 11,703708 \end{aligned}$$

$$\text{Tang. of long. from } \sphericalcap 79 0 = 10,711450$$

Or, the 3rd is $79^{\circ} 0'$ equal to $11 \text{ III } 0$, when subtracted from 180 degrees $101^{\circ} 0'$, or $11 \text{ III } 0$, or the cusp of the 3rd house, or the Point of the Ecliptic where the circle of Position cuts it.

Thus have I given the method of erecting a Figure by the Doctrine of Triangles. You need only to calculate for the six houses herein shewn; for the cusps of the other six are always the same degree and minute of the opposite sign. The figure of heaven at the Birth of Queen Victoria.

The foregoing Rules will serve for *South Latitude* by adding $23^{\circ} 28'$ instead of subtracting; and *subtracting* where it requires adding in *North Latitude*, or by putting the opposite signs in the opposite houses.

PROBLEM XXV.

71. To erect a Figure of the Heavens by the "TABLE of HOUSES" at any given moment.

RULE 1.—Find the Sun's Right Ascension, the *previous noon* to the time given, in hours, minutes, and seconds. (After proportion is made for the Sun's A. R.)

RULE 2.—To this A. R. *add* the time given from the preceding noon, this sum will be the A. R. of the 10th house required, after allowing the A. R. of M. C. for the hours which have elapsed since noon preceding.

Note.—If the result exceed 24 hours, take the excess of 24 hours, and find that for the M. C., &c.

RULE 3.—Find the longitude answering to the R. A. in the column of the "Table of Houses," for the latitude of Birth, headed, "*time from noon*," thus found the number required, in the *next* right hand column will be the degree occupying the 10th house.

RULE 4.—In the line with this is found the longitudes on the *cusps* of the first six houses, namely, the 11th, 12th, 1st, (*Asc.*) 2nd, and 3rd.

Having thus completed the *six eastern* houses, find the signs and degrees, exactly opposite to each of them, and enter the degrees on the cusps of the opposite, or western six houses. The *opposite* houses and signs to these, (which are always the same) are,

| HOUSES. | | HOUSES. | SIGNS. | | SIGNS. |
|---------|-----------------|---------|--------|-----------------|--------|
| 10th | <i>opposite</i> | 4th | ♈ | <i>opposite</i> | ♏ |
| 11th | <i>do.</i> | 5th | ♉ | <i>do.</i> | ♍ |
| 12th | <i>do.</i> | 6th | ♊ | <i>do.</i> | ♋ |
| 1st | <i>do.</i> | 7th | ♌ | <i>do.</i> | ♎ |
| 2nd | <i>do.</i> | 8th | ♍ | <i>do.</i> | ♏ |
| 3rd | <i>do.</i> | 9th | ♎ | <i>do.</i> | ♌ |

What is the face of the heavens December 14th, 3 h 25 m. P. M., 1844, for the latitude of Sheffield?

The Right Ascension of Sun, noon 14th = 17 33 1
 Add the time after noon = 3 25 0

The Right Ascension of Midheaven = 20 58 1

The longitude nearly equal to this, casting away the odd second, is $12^{\circ} 33'$, which I place on the 10th house, and the same degree of the opposite sign ♏, on the 4th.

In the (3rd) next column, I find $9^{\circ} 36'$, which must be placed on the 11th house, and the same degree of the opposite sign ♍, on the 5th.

In the 4th column I find $26^{\circ} 0'$ of ♊, place this on the 12th, and the opposite $26^{\circ} 0'$, on the 6th house.

In the 5th column I find $20^{\circ} 27'$ of ♌, on the 1st, and then $20^{\circ} 27'$ of ♎ on the 7th or opposite house.

In the 6th are $7^{\circ} 0'$ of ♍, on the 2nd, and $7^{\circ} 0'$ of ♏ place on the 8th.

In the 7th column I see $23^{\circ} 0'$ of ♎ on the 3rd house, and $23^{\circ} 0'$ of ♌ must be placed on the 9th house.

The Figure now exhibits the Signs of the Zodiac at the aforementioned time of Birth.

| SOL in ARIES and TAURUS. | | | | | | | SOL in GEMINI and CANCER. | | | | | | |
|--------------------------|----|----|----|--------|----|----|---------------------------|----|----|----|--------|----|----|
| Time from Noon. | 10 | 11 | 12 | Ascen. | 2 | 3 | Time from Noon. | 10 | 11 | 12 | Ascen. | 2 | 3 |
| <i>h. m.</i> | ♏ | ♏ | ♏ | ♈ | ♏ | ♏ | <i>h. m.</i> | ♊ | ♊ | ♊ | ♊ | ♊ | ♊ |
| 0 0 | 0 | 9 | 22 | 26 42 | 12 | 3 | 3 51 | 0 | 8 | 11 | 7 22 | 28 | 25 |
| 0 4 | 1 | 10 | 23 | 27 22 | 13 | 3 | 3 55 | 1 | 9 | 12 | 8 6 | 29 | 26 |
| 0 7 | 2 | 11 | 24 | 28 1 | 14 | 4 | 4 0 | 2 | 10 | 12 | 8 50 | 30 | 27 |
| 0 11 | 3 | 12 | 25 | 28 41 | 15 | 5 | 4 4 | 3 | 10 | 13 | 9 34 | 1 | 28 |
| 0 15 | 4 | 13 | 25 | 29 21 | 15 | 6 | 4 8 | 4 | 11 | 14 | 10 18 | 2 | 29 |
| 0 18 | 5 | 14 | 26 | 0 1 | 16 | 7 | 4 12 | 5 | 12 | 15 | 11 3 | 2 | ♏ |
| 0 22 | 6 | 15 | 27 | 0 40 | 17 | 8 | 4 16 | 6 | 13 | 16 | 11 47 | 3 | 1 |
| 0 26 | 7 | 16 | 28 | 1 20 | 18 | 8 | 4 21 | 7 | 14 | 17 | 12 31 | 4 | 2 |
| 0 29 | 8 | 17 | 29 | 2 0 | 18 | 9 | 4 25 | 8 | 15 | 17 | 13 16 | 5 | 3 |
| 0 32 | 9 | 18 | ♁ | 2 39 | 19 | 10 | 4 29 | 9 | 16 | 18 | 14 1 | 6 | 4 |
| 0 36 | 10 | 19 | 1 | 3 19 | 20 | 11 | 4 33 | 10 | 17 | 19 | 14 46 | 7 | 5 |
| 0 40 | 11 | 20 | 1 | 3 59 | 20 | 12 | 4 38 | 11 | 18 | 20 | 15 31 | 8 | 6 |
| 0 44 | 12 | 22 | 2 | 4 38 | 21 | 13 | 4 42 | 12 | 19 | 21 | 16 16 | 8 | 7 |
| 0 48 | 13 | 23 | 3 | 5 17 | 22 | 14 | 4 46 | 13 | 20 | 21 | 17 1 | 9 | 8 |
| 0 51 | 14 | 24 | 4 | 5 57 | 23 | 15 | 4 51 | 14 | 21 | 22 | 17 46 | 10 | 9 |
| 0 55 | 15 | 25 | 5 | 6 36 | 23 | 15 | 4 55 | 15 | 22 | 23 | 18 31 | 11 | 10 |
| 0 59 | 16 | 26 | 6 | 7 15 | 24 | 16 | 4 59 | 16 | 23 | 24 | 19 17 | 12 | 11 |
| 1 3 | 17 | 27 | 6 | 7 55 | 25 | 17 | 5 3 | 17 | 24 | 25 | 20 3 | 13 | 11 |
| 1 6 | 18 | 28 | 7 | 8 35 | 26 | 18 | 5 8 | 18 | 25 | 26 | 20 49 | 14 | 13 |
| 1 10 | 19 | 29 | 8 | 9 14 | 26 | 19 | 5 12 | 19 | 25 | 27 | 21 35 | 14 | 14 |
| 1 14 | 20 | ♏ | 9 | 9 53 | 27 | 19 | 5 16 | 20 | 26 | 28 | 22 20 | 15 | 14 |
| 1 18 | 21 | 1 | 10 | 10 33 | 28 | 20 | 5 21 | 21 | 27 | 28 | 23 6 | 16 | 15 |
| 1 21 | 22 | 2 | 10 | 11 12 | 28 | 21 | 5 25 | 22 | 28 | 29 | 23 51 | 17 | 16 |
| 1 25 | 23 | 3 | 11 | 11 52 | 29 | 22 | 5 29 | 23 | 29 | ♏ | 24 37 | 18 | 17 |
| 1 29 | 24 | 4 | 12 | 12 32 | ♏ | 23 | 5 34 | 24 | ♏ | 1 | 25 23 | 19 | 18 |
| 1 33 | 25 | 5 | 13 | 13 12 | 1 | 24 | 5 38 | 25 | 1 | 2 | 26 9 | 20 | 19 |
| 1 36 | 26 | 6 | 14 | 13 52 | 1 | 25 | 5 43 | 26 | 2 | 3 | 26 55 | 20 | 20 |
| 1 40 | 27 | 7 | 14 | 14 32 | 2 | 25 | 5 47 | 27 | 3 | 4 | 27 41 | 21 | 21 |
| 1 44 | 28 | 7 | 15 | 15 12 | 3 | 26 | 5 51 | 28 | 4 | 4 | 28 27 | 22 | 22 |
| 1 48 | 29 | 8 | 16 | 15 51 | 4 | 27 | 5 56 | 29 | 5 | 5 | 29 13 | 23 | 23 |
| 1 52 | ♏ | 9 | 17 | 16 31 | 4 | 28 | 6 0 | ♁ | 6 | 6 | 0 0 | 24 | 24 |
| 1 55 | 1 | 10 | 18 | 17 11 | 5 | 29 | 6 4 | 1 | 7 | 7 | 0 47 | 25 | 25 |
| 1 59 | 2 | 11 | 19 | 17 51 | 6 | 30 | 6 9 | 2 | 8 | 8 | 1 33 | 26 | 26 |
| 2 3 | 3 | 12 | 19 | 18 31 | 7 | 1 | 6 13 | 3 | 9 | 9 | 2 19 | 27 | 27 |
| 2 7 | 4 | 13 | 20 | 19 12 | 8 | 2 | 6 17 | 4 | 10 | 10 | 3 5 | 27 | 28 |
| 2 11 | 5 | 14 | 21 | 19 52 | 9 | 3 | 6 22 | 5 | 11 | 10 | 3 51 | 28 | 29 |
| 2 15 | 6 | 15 | 22 | 20 32 | 9 | 3 | 6 26 | 6 | 12 | 11 | 4 37 | 29 | ♏ |
| 2 19 | 7 | 16 | 22 | 21 13 | 10 | 4 | 6 31 | 7 | 13 | 12 | 5 23 | ♏ | 1 |
| 2 23 | 8 | 17 | 23 | 21 54 | 11 | 5 | 6 35 | 8 | 14 | 13 | 6 9 | 1 | 2 |
| 2 26 | 9 | 18 | 24 | 22 35 | 11 | 6 | 6 39 | 9 | 15 | 14 | 6 55 | 2 | 3 |
| 2 30 | 10 | 19 | 25 | 23 16 | 12 | 7 | 6 44 | 10 | 16 | 15 | 7 40 | 2 | 4 |
| 2 34 | 11 | 20 | 25 | 23 57 | 13 | 8 | 6 48 | 11 | 16 | 16 | 8 26 | 3 | 4 |
| 2 38 | 12 | 21 | 26 | 24 38 | 14 | 9 | 6 52 | 12 | 17 | 16 | 9 12 | 4 | 5 |
| 2 42 | 13 | 22 | 27 | 25 19 | 14 | 10 | 6 57 | 13 | 18 | 17 | 9 57 | 5 | 6 |
| 2 46 | 14 | 23 | 28 | 26 0 | 15 | 11 | 7 1 | 14 | 19 | 18 | 10 42 | 6 | 7 |
| 2 50 | 15 | 24 | 29 | 26 42 | 16 | 12 | 7 5 | 15 | 20 | 19 | 11 28 | 7 | 8 |
| 2 54 | 16 | 25 | 29 | 27 24 | 17 | 12 | 7 9 | 16 | 21 | 20 | 12 14 | 8 | 9 |
| 2 58 | 17 | 26 | ♏ | 28 6 | 18 | 13 | 7 14 | 17 | 22 | 21 | 12 59 | 8 | 10 |
| 3 2 | 18 | 26 | 1 | 28 48 | 18 | 14 | 7 18 | 18 | 23 | 22 | 13 45 | 9 | 11 |
| 3 6 | 19 | 27 | 2 | 29 30 | 19 | 15 | 7 22 | 19 | 24 | 22 | 14 30 | 10 | 12 |
| 3 10 | 20 | 28 | 3 | ♏ 13 | 20 | 16 | 7 27 | 20 | 25 | 23 | 15 14 | 11 | 13 |
| 3 14 | 21 | 29 | 3 | 0 55 | 21 | 17 | 7 31 | 21 | 26 | 24 | 15 59 | 12 | 14 |
| 3 18 | 22 | ♁ | 4 | 1 37 | 22 | 18 | 7 35 | 22 | 27 | 25 | 16 44 | 13 | 15 |
| 3 22 | 23 | 1 | 5 | 2 20 | 22 | 19 | 7 40 | 23 | 28 | 26 | 17 29 | 13 | 16 |
| 3 26 | 24 | 2 | 6 | 3 3 | 23 | 20 | 7 44 | 24 | 29 | 27 | 18 14 | 14 | 17 |
| 3 31 | 25 | 3 | 7 | 3 46 | 24 | 21 | 7 48 | 25 | ♏ | 28 | 18 59 | 15 | 18 |
| 3 35 | 26 | 4 | 7 | 4 29 | 25 | 22 | 7 52 | 26 | 1 | 28 | 19 44 | 16 | 19 |
| 3 39 | 27 | 5 | 8 | 5 12 | 26 | 23 | 7 56 | 27 | 2 | 29 | 20 26 | 17 | 20 |
| 3 43 | 28 | 6 | 9 | 5 55 | 27 | 24 | 8 0 | 28 | 3 | ♁ | 21 12 | 18 | 20 |
| 3 47 | 29 | 7 | 10 | 6 39 | 27 | 25 | 8 5 | 29 | 4 | 1 | 21 55 | 18 | 21 |

| SOL in LEO and VIRGO. | | | | | | | SOL in LIBRA and SCORPIO. | | | | | | |
|-----------------------|----|----|----|--------|----|----|---------------------------|----|----|----|--------|----|----|
| Time from Noon. | 10 | 11 | 12 | Ascen. | 2 | 3 | Time from Noon. | 10 | 11 | 12 | Ascen. | 2 | 3 |
| <i>h. m.</i> | ♏ | ♎ | ♍ | ♌ | ♋ | ♊ | <i>h. m.</i> | ♏ | ♎ | ♍ | ♌ | ♋ | ♊ |
| 8 9 | 0 | 5 | 2 | 22 38 | 19 | 22 | 12 0 | 0 | 27 | 17 | 3 19 | 8 | 21 |
| 8 13 | 1 | 5 | 3 | 23 22 | 20 | 23 | 12 4 | 1 | 28 | 18 | 3 59 | 9 | 22 |
| 8 17 | 2 | 6 | 3 | 24 5 | 21 | 24 | 12 7 | 2 | 29 | 19 | 4 49 | 10 | 24 |
| 8 21 | 3 | 7 | 4 | 24 48 | 22 | 25 | 12 11 | 3 | ♎ | 20 | 5 20 | 11 | 25 |
| 8 25 | 4 | 8 | 5 | 25 32 | 23 | 26 | 12 15 | 4 | 1 | 20 | 6 1 | 12 | 26 |
| 8 29 | 5 | 9 | 6 | 26 16 | 23 | 27 | 12 18 | 5 | 1 | 21 | 6 43 | 13 | 27 |
| 8 34 | 6 | 10 | 7 | 26 59 | 24 | 28 | 12 22 | 6 | 2 | 22 | 7 24 | 14 | 28 |
| 8 38 | 7 | 11 | 8 | 27 42 | 25 | 29 | 12 26 | 7 | 3 | 23 | 8 5 | 15 | 29 |
| 8 42 | 8 | 12 | 8 | 28 24 | 26 | ♍ | 12 29 | 8 | 4 | 23 | 8 46 | 16 | ♋ |
| 8 46 | 9 | 13 | 9 | 29 6 | 27 | 1 | 12 33 | 9 | 5 | 24 | 9 28 | 17 | 2 |
| 8 50 | 10 | 14 | 10 | 29 48 | 27 | 2 | 12 37 | 10 | 6 | 25 | 10 10 | 18 | 3 |
| 8 54 | 11 | 15 | 11 | 0m30 | 28 | 3 | 12 40 | 11 | 6 | 25 | 10 52 | 19 | 4 |
| 8 58 | 12 | 16 | 12 | 1 12 | 29 | 4 | 12 44 | 12 | 7 | 26 | 11 35 | 20 | 5 |
| 9 2 | 13 | 17 | 12 | 1 54 | ♋ | 5 | 12 48 | 13 | 8 | 27 | 12 18 | 21 | 6 |
| 9 6 | 14 | 18 | 13 | 2 36 | 1 | 4 | 12 51 | 14 | 9 | 28 | 13 0 | 22 | 7 |
| 9 10 | 15 | 18 | 14 | 3 18 | 2 | 6 | 12 55 | 15 | 10 | 28 | 13 43 | 23 | 9 |
| 9 14 | 16 | 19 | 15 | 4 0 | 2 | 7 | 12 59 | 16 | 11 | 29 | 14 26 | 24 | 10 |
| 9 18 | 17 | 20 | 16 | 4 41 | 3 | 8 | 13 3 | 17 | 11 | ♋ | 15 10 | 25 | 11 |
| 9 22 | 18 | 21 | 16 | 5 22 | 4 | 9 | 13 6 | 18 | 12 | 1 | 15 54 | 26 | 12 |
| 9 26 | 19 | 22 | 17 | 6 4 | 5 | 10 | 13 10 | 19 | 13 | 1 | 16 39 | 27 | 13 |
| 9 30 | 20 | 23 | 18 | 6 45 | 5 | 11 | 13 14 | 20 | 14 | 2 | 17 23 | 28 | 15 |
| 9 34 | 21 | 24 | 18 | 7 26 | 6 | 12 | 13 18 | 21 | 15 | 3 | 18 8 | 29 | 16 |
| 9 38 | 22 | 25 | 19 | 8 7 | 7 | 13 | 13 21 | 22 | 16 | 4 | 18 54 | ♎ | 17 |
| 9 41 | 23 | 26 | 20 | 8 47 | 8 | 14 | 13 25 | 23 | 16 | 4 | 19 40 | 1 | 18 |
| 9 45 | 24 | 27 | 21 | 9 28 | 9 | 15 | 13 29 | 24 | 17 | 5 | 20 26 | 2 | 20 |
| 9 49 | 25 | 28 | 22 | 10 8 | 9 | 16 | 13 33 | 25 | 18 | 6 | 21 14 | 4 | 21 |
| 9 53 | 26 | 28 | 23 | 10 48 | 10 | 17 | 13 36 | 26 | 19 | 7 | 22 1 | 5 | 22 |
| 9 57 | 27 | 29 | 23 | 11 29 | 11 | 18 | 13 40 | 27 | 20 | 7 | 22 49 | 6 | 23 |
| 10 1 | 28 | ♎ | 24 | 12 9 | 12 | 19 | 13 44 | 28 | 21 | 8 | 23 37 | 7 | 25 |
| 10 5 | 29 | 1 | 25 | 12 50 | 12 | 20 | 13 48 | 29 | 21 | 9 | 24 26 | 8 | 26 |
| 10 8 | ♎ | 2 | 26 | 13 30 | 13 | 20 | 13 52 | ♎ | 22 | 10 | 25 15 | 10 | 27 |
| 10 12 | 1 | 3 | 26 | 14 9 | 14 | 21 | 13 55 | 1 | 23 | 11 | 26 4 | 11 | 28 |
| 10 16 | 2 | 4 | 27 | 14 49 | 15 | 22 | 13 59 | 2 | 24 | 11 | 26 55 | 12 | ♍ |
| 10 20 | 3 | 5 | 28 | 15 29 | 16 | 23 | 14 3 | 3 | 25 | 12 | 27 47 | 14 | 1 |
| 10 24 | 4 | 5 | 29 | 16 9 | 16 | 24 | 14 7 | 4 | 26 | 13 | 28 39 | 15 | 2 |
| 10 28 | 5 | 6 | 29 | 16 48 | 17 | 25 | 14 11 | 5 | 26 | 14 | 29 31 | 16 | 4 |
| 10 31 | 6 | 7 | ♎ | 17 28 | 18 | 26 | 14 15 | 6 | 27 | 15 | 0♎24 | 18 | 5 |
| 10 35 | 7 | 8 | 1 | 18 8 | 19 | 27 | 14 19 | 7 | 28 | 15 | 1 18 | 19 | 6 |
| 10 39 | 8 | 9 | 2 | 18 48 | 20 | 28 | 14 22 | 8 | 29 | 16 | 2 13 | 20 | 8 |
| 10 42 | 9 | 10 | 2 | 19 28 | 20 | 29 | 14 26 | 9 | ♋ | 17 | 3 10 | 22 | 9 |
| 10 46 | 10 | 11 | 3 | 20 8 | 21 | ♎ | 14 30 | 10 | 1 | 18 | 4 6 | 23 | 10 |
| 10 50 | 11 | 11 | 4 | 20 48 | 22 | 1 | 14 34 | 11 | 2 | 19 | 5 3 | 25 | 11 |
| 10 54 | 12 | 12 | 4 | 21 27 | 23 | 2 | 14 38 | 12 | 2 | 20 | 6 1 | 26 | 13 |
| 10 57 | 13 | 13 | 5 | 22 6 | 24 | 3 | 14 42 | 13 | 3 | 20 | 7 0 | 28 | 14 |
| 11 1 | 14 | 14 | 6 | 22 45 | 24 | 4 | 14 46 | 14 | 4 | 21 | 8 0 | 29 | 15 |
| 11 5 | 15 | 15 | 7 | 23 24 | 25 | 5 | 14 50 | 15 | 5 | 22 | 9 2 | ♋ | 17 |
| 11 9 | 16 | 16 | 7 | 24 4 | 26 | 6 | 14 54 | 16 | 6 | 23 | 10 5 | 3 | 18 |
| 11 12 | 17 | 17 | 8 | 24 43 | 27 | 8 | 14 58 | 17 | 7 | 24 | 11 9 | 4 | 19 |
| 11 16 | 18 | 17 | 9 | 25 23 | 28 | 9 | 15 2 | 18 | 8 | 25 | 12 14 | 6 | 21 |
| 11 20 | 19 | 18 | 10 | 26 2 | 29 | 10 | 15 6 | 19 | 9 | 26 | 13 21 | 8 | 22 |
| 11 23 | 20 | 19 | 10 | 26 41 | ♍ | 11 | 15 10 | 20 | 9 | 27 | 14 29 | 9 | 23 |
| 11 27 | 21 | 20 | 11 | 27 21 | 0 | 12 | 15 14 | 21 | 10 | 27 | 15 37 | 11 | 24 |
| 11 31 | 22 | 21 | 12 | 28 1 | 1 | 13 | 15 18 | 22 | 11 | 28 | 16 47 | 13 | 26 |
| 11 34 | 23 | 22 | 13 | 28 40 | 2 | 14 | 15 22 | 23 | 12 | 29 | 17 58 | 14 | 27 |
| 11 38 | 24 | 23 | 13 | 29 20 | 3 | 15 | 15 26 | 24 | 13 | ♎ | 19 11 | 16 | 28 |
| 11 42 | 25 | 23 | 14 | 29 59 | 4 | 16 | 15 31 | 25 | 14 | 1 | 20 26 | 17 | 29 |
| 11 45 | 26 | 24 | 15 | 0♋39 | 5 | 17 | 15 35 | 26 | 15 | 2 | 21 43 | 19 | ♋ |
| 11 49 | 27 | 25 | 15 | 1 19 | 5 | 18 | 15 39 | 27 | 16 | 3 | 23 3 | 21 | 2 |
| 11 53 | 28 | 26 | 16 | 1 59 | 6 | 19 | 15 43 | 28 | 17 | 4 | 24 24 | 22 | 3 |
| 11 56 | 29 | 26 | 17 | 2 39 | 7 | 20 | 15 47 | 29 | 18 | 5 | 25 46 | 24 | 5 |

| SOL in SAGIT. and CAPRICORN | | | | | | | SOL in AQUARIUS and PISCES. | | | | | | |
|-----------------------------|----|----|----|-------------------|----|----|-----------------------------|----|----|----|-------------------|----|----|
| Time from Noon. | 10 | 11 | 12 | Ascen. | 2 | 3 | Time from Noon. | 10 | 11 | 12 | Ascen. | 2 | 3 |
| <i>h. m.</i> | ♄ | ♅ | ♆ | ♎ | ♏ | ♐ | <i>h. m.</i> | ♋ | ♌ | ♍ | ♎ | ♏ | ♐ |
| 15 51 | 0 | 18 | 5 | 27 10 | 26 | 6 | 20 9 | 0 | 24 | 4 | 2 50 | 25 | 12 |
| 15 55 | 1 | 19 | 6 | 28 37 | 28 | 7 | 20 13 | 1 | 25 | 5 | 4 14 | 26 | 13 |
| 16 0 | 2 | 20 | 7 | 0 [♋] 6 | ♏ | 9 | 20 17 | 2 | 27 | 7 | 5 37 | 27 | 14 |
| 16 4 | 3 | 21 | 8 | 1 37 | 2 | 10 | 20 21 | 3 | 28 | 9 | 6 58 | 28 | 15 |
| 16 8 | 4 | 22 | 10 | 3 11 | 3 | 11 | 20 25 | 4 | 29 | 11 | 8 17 | 28 | 16 |
| 16 12 | 5 | 23 | 11 | 4 48 | 5 | 12 | 20 29 | 5 | ♃ | 12 | 9 33 | 29 | 16 |
| 16 16 | 6 | 24 | 12 | 6 27 | 7 | 14 | 20 34 | 6 | 2 | 14 | 10 49 | ♁ | 17 |
| 16 21 | 7 | 25 | 13 | 8 8 | 9 | 15 | 20 38 | 7 | 3 | 16 | 12 3 | 1 | 18 |
| 16 25 | 8 | 26 | 14 | 9 52 | 11 | 16 | 20 42 | 8 | 4 | 18 | 13 16 | 2 | 19 |
| 16 29 | 9 | 27 | 15 | 11 46 | 12 | 17 | 20 46 | 9 | 6 | 19 | 14 26 | 3 | 20 |
| 16 33 | 10 | 28 | 16 | 12 39 | 14 | 19 | 20 50 | 10 | 7 | 21 | 15 34 | 4 | 21 |
| 16 38 | 11 | 29 | 18 | 15 22 | 16 | 20 | 20 54 | 11 | 8 | 23 | 16 41 | 5 | 22 |
| 16 42 | 12 | ♃ | 19 | 17 16 | 18 | 21 | 20 58 | 12 | 10 | 24 | 17 48 | 6 | 23 |
| 16 46 | 13 | 1 | 21 | 19 15 | 20 | 22 | 21 2 | 13 | 11 | 26 | 18 53 | 7 | 24 |
| 16 51 | 14 | 2 | 22 | 21 17 | 21 | 23 | 21 6 | 14 | 13 | 28 | 19 56 | 8 | 24 |
| 16 55 | 15 | 3 | 23 | 23 22 | 23 | 25 | 21 10 | 15 | 14 | 29 | 20 58 | 8 | 25 |
| 16 59 | 16 | 4 | 24 | 25 32 | 25 | 26 | 21 14 | 16 | 15 | ♃ | 22 0 | 9 | 26 |
| 17 4 | 17 | 5 | 26 | 27 44 | 26 | 27 | 21 18 | 17 | 16 | 2 | 23 0 | 10 | 27 |
| 17 8 | 18 | 7 | 27 | 29 58 | 28 | 28 | 21 22 | 18 | 17 | 4 | 24 0 | 11 | 28 |
| 17 12 | 19 | 8 | 28 | 2 [♃] 17 | 29 | 29 | 21 26 | 19 | 19 | 5 | 24 58 | 12 | 29 |
| 17 16 | 20 | 9 | 29 | 4 38 | ♃ | ♁ | 21 30 | 20 | 20 | 7 | 25 55 | 13 | 29 |
| 17 20 | 21 | 10 | ♋ | 7 0 | 2 | 2 | 21 34 | 21 | 21 | 8 | 26 51 | ♁ | ♁ |
| 17 25 | 22 | 11 | 1 | 9 24 | 3 | 3 | 21 38 | 22 | 22 | 10 | 27 47 | 14 | ♁ |
| 17 30 | 23 | 12 | 2 | 11 52 | 5 | 4 | 21 41 | 23 | 24 | 11 | 28 41 | 15 | 2 |
| 17 34 | 24 | 13 | 4 | 14 23 | 7 | 5 | 21 45 | 24 | 25 | 12 | 29 36 | 16 | 3 |
| 17 38 | 25 | 14 | 5 | 16 59 | 8 | 6 | 21 49 | 25 | 26 | 14 | 0 [♁] 29 | 17 | 4 |
| 17 43 | 26 | 15 | 6 | 19 32 | 10 | 7 | 21 53 | 26 | 28 | 15 | 1 22 | 18 | 5 |
| 17 47 | 27 | 16 | 8 | 22 5 | 11 | 9 | 21 57 | 27 | 29 | 17 | 2 14 | 18 | 5 |
| 17 51 | 28 | 17 | 9 | 24 39 | 13 | 10 | 22 1 | 28 | ♏ | 18 | 3 5 | 19 | 6 |
| 17 56 | 29 | 18 | 11 | 27 20 | 15 | 11 | 22 5 | 29 | 1 | 19 | 3 56 | 20 | 7 |
| 18 0 | ♃ | 19 | 12 | ♏ | 16 | 12 | 22 8 | ♃ | 3 | 21 | 4 45 | 21 | 8 |
| 18 4 | 1 | 20 | 14 | 2 37 | 19 | 13 | 22 12 | 1 | 4 | 22 | 5 35 | 22 | 9 |
| 18 9 | 2 | 21 | 15 | 5 19 | 21 | 14 | 22 16 | 2 | 5 | 23 | 6 23 | 22 | 10 |
| 18 13 | 3 | 22 | 17 | 7 55 | 22 | 15 | 22 20 | 3 | 7 | 24 | 7 12 | 23 | 10 |
| 18 17 | 4 | 23 | 19 | 10 29 | 24 | 16 | 22 24 | 4 | 8 | 26 | 8 0 | 24 | 11 |
| 18 22 | 5 | 24 | 20 | 13 2 | 25 | 17 | 22 27 | 5 | 9 | 27 | 8 48 | 25 | 12 |
| 18 26 | 6 | 25 | 22 | 15 37 | 26 | 18 | 22 31 | 6 | 10 | 28 | 9 35 | 25 | 13 |
| 18 30 | 7 | 26 | 23 | 18 7 | 28 | 19 | 22 35 | 7 | 12 | 29 | 10 22 | 26 | 14 |
| 18 35 | 8 | 27 | 25 | 20 35 | 29 | 20 | 22 39 | 8 | 13 | ♁ | 11 7 | 27 | 15 |
| 18 39 | 9 | 28 | 27 | 23 0 | ♁ | 21 | 22 42 | 9 | 14 | 1 | 11 52 | 28 | 16 |
| 18 44 | 10 | 29 | 28 | 25 22 | 2 | 22 | 22 46 | 10 | 15 | 2 | 12 37 | 28 | 16 |
| 18 48 | 11 | ♋ | ♃ | 27 43 | 3 | 23 | 22 50 | 11 | 17 | 4 | 13 23 | 29 | 17 |
| 18 52 | 12 | 2 | 2 | 0 8 | 4 | 24 | 22 54 | 12 | 18 | 5 | 14 8 | 29 | 18 |
| 18 57 | 13 | 3 | 3 | 2 16 | 6 | 25 | 22 57 | 13 | 19 | 6 | 14 54 | ♁ | 19 |
| 19 1 | 14 | 4 | 5 | 4 27 | 7 | 26 | 23 1 | 14 | 20 | 7 | 15 35 | 1 | 19 |
| 19 5 | 15 | 5 | 7 | 6 33 | 8 | 27 | 23 5 | 15 | 21 | 8 | 16 17 | 2 | 20 |
| 19 9 | 16 | 7 | 9 | 8 39 | 9 | 28 | 23 8 | 16 | 23 | 9 | 17 1 | 3 | 21 |
| 19 14 | 17 | 8 | 10 | 10 43 | 11 | 29 | 23 12 | 17 | 24 | 10 | 17 44 | 3 | 22 |
| 19 18 | 18 | 9 | 12 | 12 42 | 12 | ♁ | 23 16 | 18 | 25 | 11 | 18 26 | 4 | 23 |
| 19 22 | 19 | 10 | 14 | 14 40 | 13 | 1 | 23 20 | 19 | 26 | 12 | 19 9 | 5 | 24 |
| 19 27 | 20 | 11 | 16 | 16 31 | 14 | 2 | 23 23 | 20 | 27 | 13 | 19 52 | 6 | 24 |
| 19 31 | 21 | 13 | 18 | 18 20 | 15 | 3 | 23 27 | 21 | 28 | 14 | 20 33 | 6 | 25 |
| 19 35 | 22 | 14 | 19 | 20 7 | 16 | 4 | 23 31 | 22 | 29 | 15 | 21 15 | 7 | 26 |
| 19 39 | 23 | 15 | 21 | 21 52 | 17 | 5 | 23 34 | 23 | ♃ | 16 | 21 56 | 8 | 27 |
| 19 44 | 24 | 16 | 23 | 23 33 | 18 | 6 | 23 38 | 24 | 2 | 17 | 22 37 | 8 | 28 |
| 19 48 | 25 | 18 | 25 | 25 13 | 19 | 7 | 23 42 | 25 | 3 | 18 | 23 18 | 9 | 28 |
| 19 52 | 26 | 19 | 27 | 26 49 | 20 | 8 | 23 45 | 26 | 4 | 19 | 24 59 | 10 | 29 |
| 19 56 | 27 | 20 | 28 | 28 22 | 22 | 9 | 23 49 | 27 | 5 | 20 | 24 30 | 11 | ♁ |
| 20 0 | 28 | 21 | ♏ | 29 53 | 23 | 10 | 23 53 | 28 | 6 | 21 | 25 21 | 11 | 1 |
| 20 5 | 29 | 23 | 2 | 1 [♁] 23 | 24 | 11 | 23 56 | 29 | 8 | 22 | 26 2 | 12 | 2 |

PROBLEM XXVI.

72. *To find the Planets' places at any given time from the Ephemeris (44).*

RULE 1.—Find, in the Ephemeris, the amount of longitude the Planet moves from the preceding noon and succeeding noon.

RULE 2.—Then look in Diurnal Logarithms for the log answering to that daily motion, and add the log of the time given, and the sum will give the log. of longitude for that time.

RULE 3.—Add the result to that Planet's longitude at the preceding noon, and the amount is its true place.

Note.—If the planet be *retrograding* SUBTRACT the result from the planet's place at the preceding noon.

What is the Moon's place in the Queen's nativity, on May 23rd, 16 hours 5 min. 1819?

EXAMPLE—May 23rd the Moon in $25^{\circ} 8' 12''$
On the 24th she moved to $7^{\circ} 11' 39''$ $37 \quad 39$

Moon moved in 24 h. = $12 \quad 27$

Add log. of Moon's longitude in 24 h. $12^{\circ} 27' = 28504$

To time since noon 16 h. 5 m. = 17384

Moved in 16 h. 5 m. = $8^{\circ} 21' = 45888$

Noon of 23rd $25 \quad 8 \quad 12$
Add $8 \quad 21$

Amount $33 \quad 33 \quad - \quad 30 = 3^{\circ} 11' 33''$

EXERCISES.

1. What is the longitude of Sol May 24th, 4 h. 5 m., A. M., 1819? *Ans.* $2^{\circ} 11' 6''$.
2. The longitude of Herschel? *Ans.* $23^{\circ} 4' 20''$ R.
3. The longitude of Saturn? *Ans.* $28^{\circ} 46'$.
4. The longitude of Jupiter? *Ans.* $16^{\circ} 57'$.
5. The longitude of Mars? *Ans.* $17^{\circ} 38'$.
6. The longitude of Venus? *Ans.* $26^{\circ} 35'$.
7. The longitude of Mercury? *Ans.* $8^{\circ} 15'$.

PROBLEM XXVII.

73. *To find the Planets' Latitude in the Ephemeris at any given time.*

This is given in the Ephemeris for every day at noon for the Moon; and the proportional part may be found as the longitudes

The Sun is never considered to have latitude. The other Planets' latitude is given for every sixth day, and the proportion may be found by the golden Rule of Three.

EXAMPLE.

Mercury on May 19th, 1819, is $3^{\circ} 17'$
 On the 25th of May $3 \quad 38$

Difference $0 \quad 21$

As 6 days by Diurnal log. (Ar. Com.) 9,3979
 Is to $21'$, the 6 days' motion 1,8361
 So is 4 days 16 hours ,7501

Movement to add $0^{\circ} 15'$ 1,9841
 Add on the 19th $3 \quad 17$

Mercury's latitude of $3 \text{ s } 32$ on the 24th day.

Generally only the Moon, Mercury, and Venus, will need calculating, the other planets' may be seen by inspection.

Observe.—If the Planets pass from North to South, or from South to North, so that they cross the ecliptic, *add* the amount of motion to find the *difference*.

EXERCISES.

1. What is Herschel's latitude? *Ans.* 0 degree 8 minutes South.
2. What is the latitude of Saturn? *Ans.* 2 degrees 6 minutes South.
3. What is the latitude of Jupiter? *Ans.* 0 degree 39 minutes South.
4. What is the latitude of Mars? *Ans.* 1 degree 10 minutes South.
5. What is the latitude of Venus? *Ans.* 1 degree 56 minutes South.
6. What is the latitude of the Moon? *Ans.* 3 degrees 33 minutes North.

PROBLEM XXVIII.

74. To find the Declination of the Planets from the Ephemeris, when they are given daily.

RULE.—Find the distance they move from one period to another, and equate as you did in the *latitudes* for the declination at the given time. (73)

EXAMPLE.

What is the Sun's declination in the Queen's nativity at birth?

Sun on the 24th day (increasing) is $20^{\circ} 40'$
 Sun on the 23rd day is $20 \quad 29$

Sun moved in 24 hours $0 \quad 11$

By Diurnal Logarithms, 11 min. give 2,11697
 Add the log. of 16 hrs. 5 min. afternoon 17384

The sum of log. give $0^{\circ} 7'$ = 2,29081
 Add Sun's dec. on 23rd $20 \quad 29$

Sun's dec. required = $20 \quad 36$

EXERCISES.

1. What is the declination of Herschel? *Ans.* 23 degs. 26 mins. South.
2. What is Saturn's declination? *Ans.* 2 degs. 26 min. South.

- | | |
|-----------------------------------------|--------------------------------------|
| 3. What is Jupiter's declination ? | <i>Ans.</i> 16 degs. 24 mins. South. |
| 4. What is the declination of Mars ? | <i>Ans.</i> 5 degs. 51 mins. North. |
| 5. What is the declination of Venus ? | <i>Ans.</i> 8 degs. 28 mins. North. |
| 6. What is the declination of Luna ? | <i>Ans.</i> 24 degs. 23 mins. North. |
| 7. What is the declination of Mercury ? | <i>Ans.</i> 11 degs. 19 mins. North. |

PROBLEM XXIX.

75. *To find the Declination of a Star from the Ephemeris, when given at intervals of days.*

RULE.—Find the distance the body moves, and equate by Proportional Logarithms for the time required.

EXAMPLE.

What is Mercury's declination in Queen Victoria's horoscope ?

| | |
|-------------------------------|---------|
| Mercury on the 25th of May is | 11° 18' |
| Mercury on the 19th of May is | 10 45 |

| | |
|---------|------|
| 6 days. | 0 33 |
|---------|------|

By Proportional Logarithms.

| | |
|--------------------------------------|--------|
| As 6 days by Diurnal Log. (Ar. Com.) | 9,3979 |
| Is to 33 minutes, the 6 days' motion | 1,6398 |
| So is 4 days 16 hours | 0,7501 |

| | | |
|-----------------|----------|--------|
| Movement to add | 0° 24' = | 1,7878 |
| Add on the 19th | 10 45 | |

Mercury's declination 11 9 on the 24th

2. What is Jupiter's declination in the Queen's horoscope ?

| | |
|----------------------------|---------|
| Jupiter on the 19th day is | 16° 26' |
| Jupiter on the 25th day is | 16 23 |

| | |
|-----------------|-----|
| Moved in 6 days | 0 3 |
|-----------------|-----|

| | |
|-------------------------------------|--------|
| As 6 days by Diurnal Log. (Ar. Co.) | 9,3979 |
| Is to 3 minutes, the 6 days' motion | 2,6812 |
| So is 4 days 16 hours | 0,7501 |

Answer, 2 minutes nearly = 2,8292

These 2 minutes to be subtracted from 16° 26' equal 16 degrees 24 seconds.

PROBLEM XXX.

76. *To find the Declination of a Star from the "Tables" prepared for that purpose.*

RULE.—Find the proportional part for the Longitude and Latitude by the Rule of Three.

EXAMPLE 1.

The Sun is in 2 degrees 6 minutes of Gemini, the declination of 2 degree is 20° 35', that of 3° is 20° 47', difference 12 minutes; then say, as 60 minutes are to 6 minutes, so are 12 minutes to 1 minute, which added to the declination of 2 deg., as the Sun is *increasing* in declination, and the Sun's declination will be 20 degrees 36 minutes, and as he is in a northern sign the declination is *north*.

EXAMPLE 2.

Find the declination of the Moon in Queen Victoria's nativity.

The Moon is in 3° 33' of Π , with 3° 33' of north latitude. Under 3° of Gemini, opposite 3 degrees of longitude, are found 23° 42'; and in the same column opposite 4 degrees of longitude are found 23° 54', the difference is 12 minutes, then say, 60 : 22 :: 33 : 7' *plus*. Next look for the difference between 3 deg. and 4 deg. of latitude, and 4 degrees opposite the 3 deg. of long. is 24° 41', then say, as 60 is to 59, the difference between 3° and 4° lat., so is 33 minutes to 31, *plus*.

Note, As both corrections are plus we must add them thus, for 3° long. & lat. 23° 42'

| | |
|-----------------------------------------|------|
| For the 33 minutes more add | 0 7 |
| And for 33 minutes more of latitude add | 0 31 |

The Moon's declination is 24 20

77. *Observe*.—If both corrections be *plus*, or both *minus*, add them together to find the true correction, which if *plus* add to, and if *minus* take from the number opposite to the *even degrees* of longitude and latitude which the planet has *just passed* (82).

EXERCISES.

In the Queen's Nativity,

- | | |
|------------------------------------------|----------------------|
| 1. What is the declination of Herschel ? | <i>Ans.</i> 23 S 26. |
| 2. What is the declination of Saturn ? | <i>Ans.</i> 2 S 26. |
| 3. What is the declination of Jupiter ? | <i>Ans.</i> 16 S 24. |
| 4. What is the declination of Mars ? | <i>Ans.</i> 5 N 51. |
| 5. What is the declination of Venus ? | <i>Ans.</i> 8 N 28. |
| 6. What is the declination of Mercury ? | <i>Ans.</i> 11 N 9. |

PROBLEM XXXI.

78. *To find the declination of the Planets without latitude by Trigonometry.*

RULE.—To the *sine* log. 9,600002 *add* the *sine* of the planet's distance from the nearest equinoctial point, (46) and the sum is the *sine* of the declination required.

EXAMPLE.

What is the Sun's declination in the Queen's nativity, the Sun is in 2 Π 6, or 62° 6' from φ .

| | |
|-----------------------------|------------|
| To the sine 23° 28' | = 9,600002 |
| Add the sine 62° 6' | 9,946337 |
| Sum is sine of dec. 20° 36' | = 9,546339 |

EXAMPLES.

1. What is Mercury's Right Ascension, his longitude $63^{\circ} 25'$, latitude $3^{\circ} 45'$, and his declination $17^{\circ} 11'$ P

| | | |
|-----|-----------------------------------------------------|---------|
| Add | { Cosine of declination $17^{\circ} 11'$ its secant | 0,01983 |
| | { Cosine of longitude $63^{\circ} 25'$ its log. | 9,65079 |
| | { Cosine of latitude $3^{\circ} 45'$ its log. | 9,99907 |

The sum is cosine of Mercury's Right Ascension $62^{\circ} 8' = 9,66969$

Note.—As this 62 degrees 8 minutes is less than 90 degrees, it is in the first quadrant (32) of the heavens, we have no need either to add or subtract, but merely to take the result of the cosine found.

2. What is Saturn's Right Ascension in the Queen's natus, being in $28^{\circ} \text{ } \frac{1}{2}$ $46'$, with south latitude $2^{\circ} 6'$, and declination $2^{\circ} 25'$ P

Saturn's being nearest *Aries* we subtract $358^{\circ} 26'$, which are equal to 28 degrees 46 minutes of Pisces. Here 360, from which take $358^{\circ} 26'$ equal to $1^{\circ} 14'$.

| | | |
|-----|------------------------------------------------------------------|----------|
| Add | { Saturn's cosine of declination $2^{\circ} 25'$ (Arith. Com.) | 0,000386 |
| | { Cosine of longitudinal distance $1^{\circ} 14'$ from φ | 9,999899 |
| | { Cosine of latitude $2^{\circ} 6'$ its log. | 9,999708 |

The sum of log. cosine is $0^{\circ} 19'$ the A. R. from $\varphi = 9,999993$

This $0^{\circ} 19'$ must be subtracted from 360° and it will leave the A. R. of Saturn to be $359^{\circ} 41'$.

3. The Right Ascension of Herschel is required in the Queen's natus.

| | |
|-----------------------------------------------------------------------|---------|
| As cosine of Herschel's declination $23^{\circ} 26'$ (Ar. Com.) | 0,03738 |
| Is to cosine of his longitude $83^{\circ} 20'$ from \sphericalangle | 9,06481 |
| So is cosine of his latitude $0^{\circ} S. 8'$ its log. | 9,99999 |

The sum is the cosine from \sphericalangle Herschel's A. R. $82^{\circ} 44' = 9,10218$

This must be *added* to 180 degrees, the distance $82^{\circ} 44'$, and the sum is 262 degrees 44 minutes the Right Ascension of Herschel.

PROBLEM XXXV.

82. *Given the Longitude and Latitude of a Star to find its Right Ascension by the Tables.*

RULE.—Find the A. R. of the Planet for the equal degree of longitude and latitude, then take the proportional parts for the odd minutes: observing if the R. A. be *less* than 180 degrees the latitude ought to be *North*, if *more* than 180 degrees, then it is generally *South* (77).

EXAMPLE.

1. What is the Right Ascension of Venus when in 26 degrees 35 minutes of φ , with 1 degree 56 minutes South latitude P

Look in the Tables of R. A. under *one* degree of latitude, and opposite to 26 degrees of Aries are $24^{\circ} 28'$, and under the same latitude, opposite to 27 degrees, are $25^{\circ} 25'$, the difference is 57 minutes. Then say, as $60' : 57' :: 35' : 33\frac{1}{2}'$ plus, as the A. R. is *increasing*. Next look for the difference between 1 and 2 degrees of latitude, which is 32 minutes plus: then say, as 60' is to 32' so is 56' to 21' the answer.

| | |
|-----------------------------------------|------------------|
| Found thus, for 26 degrees of Aries are | $24^{\circ} 28'$ |
| And for 35 minutes add | 0 33 |
| For the plus of latitude add | 0 21 |

The sum is the Right Ascension of Venus = $25^{\circ} 22'$



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