

KG

11366

1014

CLXII

162



11331

11336

11337





201.78  
15232  
364

70  
23,4830

11331

## Star Measures

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 1    | 20202          | 19692          | 20239          | 20369          |
| 15.9 | 10958          | 18940          | 10616          | 19968          |
| 18.9 | 62             | 42             | 12             | 60             |
|      | 00             | 90             | 27             | 89             |
|      | <u>15.9240</u> | <u>15.9250</u> | <u>18.9613</u> | <u>18.9599</u> |

|      |                |                |               |               |
|------|----------------|----------------|---------------|---------------|
| 2    | 20136          | 19968          | 19588         | 19890         |
| 25.6 | 19282          | 15820          | 10692         | 18753         |
| 6.9  | 78             | 12             | 94            | 59            |
|      | 28             | 58             | 66            | 97            |
|      | <u>25.5852</u> | <u>25.5852</u> | <u>6.8873</u> | <u>6.8865</u> |

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 3    | 20961          | 20512          | 20382          | 20676          |
| 30.5 | 15869          | 15112          | 18180          | 12852          |
| 21.2 | 61             | 10             | 78             | 52             |
|      | 59             | 06             | 80             | 78             |
|      | <u>30.7396</u> | <u>30.4602</u> | <u>21.2202</u> | <u>21.2174</u> |

## Moon Measures

Indefinite  
interaction  
 $\frac{1}{4}$  wt.

|      |                |               |
|------|----------------|---------------|
| 1    | 19.772         | 20222         |
| 23.3 | 19878          | 15022         |
| 15   | 72             | 32            |
| ←    | 78             | 22            |
|      | <u>23.9900</u> | <u>234805</u> |

|      |  |                |                |
|------|--|----------------|----------------|
| 2    |  | 19508          | 19888          |
| 24   |  | 16569          | 12382          |
| 15.4 |  | 78             | 87             |
|      |  | 02             | 72             |
|      |  | <u>15.2936</u> | <u>15.2910</u> |

|      |                |                |                |
|------|----------------|----------------|----------------|
| 3    | 20430          | 18970          | 20270          |
| 24.6 | 14951          | 14368          | 14870          |
| 16   | 42             | 77             | 50             |
|      | 32             | 72             | 60             |
|      | <u>24.5988</u> | <u>24.5400</u> | <u>24.5400</u> |

fairly good



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## Star Measures

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 1    | 20 202         | 19692          | 20 239         | 20369          |
| 15.9 | 10 958         | 18940          | 10616          | 19968          |
| 18.9 | 62             | 92             | 12             | 60             |
|      | 00             | 90             | 27             | 69             |
|      | <u>15 9240</u> | <u>15 9250</u> | <u>18 9613</u> | <u>18 9599</u> |

|      |                |                |               |               |
|------|----------------|----------------|---------------|---------------|
| 2    | 20 136         | 19968          | 19588         | 19890         |
| 25.6 | 19 282         | 15820          | 10692         | 18753         |
| 6.9  | 78             | 12             | 74            | 59            |
|      | 28             | 58             | 66            | 99            |
|      | <u>25 5852</u> | <u>25 5852</u> | <u>6 8873</u> | <u>6 8865</u> |

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 3    | 20 989         | 20512          | 20382          | 20676          |
| 30.5 | 15 869         | 15112          | 18180          | 12852          |
| 21.2 | 68             | 10             | 78             | 52             |
|      | 59             | 06             | 80             | 78             |
|      | <u>30 9396</u> | <u>30 9602</u> | <u>21 2202</u> | <u>21 2174</u> |

## Moon Measures

|      |                |                |
|------|----------------|----------------|
| 1    | 19772          | 20222          |
| 23.3 | 19878          | 15022          |
| 15   | 72             | 32             |
|      | 78             | 22             |
|      | <u>23 9900</u> | <u>23 9805</u> |

Indefinite  
intersections  
 $\frac{1}{4}$  wt.

|      |  |                |                |
|------|--|----------------|----------------|
| 2    |  | 19508          | 19969          |
| 24   |  | 16569          | 12382          |
| 15.9 |  | 78             | 88             |
|      |  | 02             | 72             |
|      |  | <u>15 2936</u> | <u>15 2910</u> |

|      |                |                |                |
|------|----------------|----------------|----------------|
| 3    | 20 430         | 18970          | 20270          |
| 24.6 | 14 951         | 19368          | 19870          |
| 16   | 42             | 77             | 60             |
|      | 32             | 72             | 62             |
|      | <u>24 5959</u> | <u>24 5400</u> | <u>24 5900</u> |



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2

|          |                |                |
|----------|----------------|----------------|
| <u>4</u> | 20458          | 19916          |
| 24.7     | 13408          | 16938          |
| 16.7     | 02             | 42             |
| +X       | 50             | 16             |
|          | <u>24.4097</u> | <u>24.7029</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>3</u> | 19466          | 19897          |
| 24.6     | 12590          | 16772          |
| 17       | 80             | 70             |
|          | 62             | 99             |
|          | <u>24.6889</u> | <u>24.6877</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>6</u> | 19560          | 19818          |
| 24.2     | 17168          | 12209          |
| 18       | 64             | 11             |
|          | 60             | 16             |
|          | <u>24.2394</u> | <u>24.2394</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>7</u> | 20150          | 20370          |
| 24       | 17939          | 12632          |
| 18.2     | 22             | 30             |
|          | 58             | 78             |
|          | <u>18.2220</u> | <u>18.2258</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>8</u> | 19252          | 20260          |
| 22.9     | 12836          | 16682          |
| 18.6     | 40             | 78             |
| 27.7     | 52             | 69             |
|          | <u>18.6414</u> | <u>18.6720</u> |



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2

|          |                |                |
|----------|----------------|----------------|
| <u>4</u> | 20 958         | 199 16         |
| 24.7     | 13 908         | 169 38         |
| 16.7     | 02             | 42             |
| +8       | 50             | 16             |
|          | <u>24.7097</u> | <u>24.7029</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>5</u> | 19 966         | 198 97         |
| 24.6     | 12 590         | 16 772         |
| 17       | 80             | 70             |
|          | 62             | 99             |
|          | <u>24.6889</u> | <u>24.6879</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>6</u> | 19 560         | 198 18         |
| 24.2     | 17 168         | 12 209         |
| 18       | 69             | 11             |
|          | 60             | 16             |
|          | <u>24.2399</u> | <u>24.2379</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>7</u> | 20 150         | 203 70         |
| 29       | 179 39         | 126 32         |
| 18.2     | 22             | 30             |
|          | 58             | 78             |
|          | <u>18.2220</u> | <u>18.2259</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>8</u> | 19 252         | 202 60         |
| 22.9     | 12 836         | 166 82         |
| 18.6     | 20             | 78             |
| +7       | 52             | 69             |
|          | <u>18.6919</u> | <u>18.6720</u> |



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Times Etc

3

Oct 17-1916

|               |   |    |      |          |
|---------------|---|----|------|----------|
| Exp. to stars | 6 | 36 | 6    | 78       |
| " " Moon      | 6 | 71 | 33.7 | 7.1 33.9 |
| clock fast    |   | 10 | 36.0 |          |

|               |    |     |       |                              |
|---------------|----|-----|-------|------------------------------|
| H. Sid. Time  | 6  | 30  | 57.8  | $\phi - \alpha = + 1^h 53^m$ |
| H. Long       | 4  | 7.9 | 31.05 |                              |
| G. Sid. T.    | 11 | 15  | 28.85 |                              |
| Sid. T. M. h. | 13 | 30  | 47.67 |                              |
| Interval      | 21 | 7.9 | 41.21 |                              |
| Reduction     |    | 3   | 33.77 |                              |
| G. M. T.      | 21 | 41  | 07.77 |                              |

|                          |       |                    |
|--------------------------|-------|--------------------|
| From Naut Alman          | P. A. | Dec                |
| Moon 214                 | 8 36  | 23.61 + 25 33 03.1 |
| Motion in 1 <sup>m</sup> | 1     | 37.11 2901         |
| " 41.1245                |       | 2.2884 1 38.7      |
| Tabular Place            | 4 37  | 57.72 + 25 37 41.8 |

Moon's age 18 days

|          |    |         |
|----------|----|---------|
| Parallax | 55 | 26.34   |
| Semid.   | 15 | 07.9    |
| R.       |    | 907.9   |
| Aug.     |    | 13.0    |
| Gr. (6)  |    | -1.1    |
| R.       |    | 919.9   |
| R.       |    | 1,971.9 |
| ap.      |    | -972    |
| (1491)   |    | 1,877.7 |
| R.       |    | 3,525.8 |

934 13.86

$$\begin{array}{r}
 \alpha = -501.9 \\
 + 29 \\
 \hline
 - 477.9
 \end{array}$$



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Lunus Etc

3

Oct 19-1916

|               |    |    |       |                         |
|---------------|----|----|-------|-------------------------|
| Exp. to stars | 6  | 36 | 6     | 98                      |
| " " Moon      | 6  | 91 | 33.7  | 6 9.1 33.9              |
| clock fast    |    | 10 | 36.0  |                         |
| H. sid. time  | 6  | 30 | 57.8  | 6-4-+14 53 <sup>m</sup> |
| H. long.      | 9  | 99 | 31.05 |                         |
| g. sid. J.    | 11 | 15 | 28.55 |                         |
| sid. T.M.H.   | 13 | 30 | 97.69 |                         |
| disturbance   | 21 | 99 | 91.21 |                         |
| reductions    |    | 3  | 33.78 |                         |
| g. M. J.      | 21 | 91 | 07.47 |                         |

|                          |   |      |        |             |
|--------------------------|---|------|--------|-------------|
| From Naut. Alman.        |   | R.A. |        | Dec.        |
| Moon 21 <sup>h</sup>     | 9 | 36   | 23.61  | +25 33 03.1 |
| Motion in 1 <sup>m</sup> |   | 1    | 39.11  | 2.901       |
| " 91.1295                |   |      | 2.2889 | 1 38.7      |
| Tabular Place            | 9 | 37   | 57.72  | +25 34 41.8 |

Moons Age 18 days

|          |    |        |
|----------|----|--------|
| Parallax | 55 | 26.39  |
| Semid.   | 15 | 07.9   |
| H.       |    | 907.9  |
| Aug.     |    | 13.4   |
| Tr. (6)  |    | -1.1   |
| H.       |    | 919.9  |
| H.       |    | 1.9719 |
| alt.     |    | -99.2  |
| (1+alt)  |    | 1.8777 |
| H.       |    | 3.5258 |

939 13.8

a = -501.9

+29

-477.9



## 11331 Plate Center and Constants

| X          | Y            | X           | Y            |
|------------|--------------|-------------|--------------|
| 15.9295    | 18.9606      | 7 32 16.1   | 25 33 28.8   |
| 25.5852    | 6.8869       | 7 38 8.6    | 23 55 50.5   |
| 30.4599    | 21.2188      | 7 41 02.2   | 25 52 59.9   |
| 3) 71.9696 | 77.0663      | 12 111 26.9 | 73 170 139.2 |
| 23.9898    | 15.6888      | 7 37 8.0    | 25 7 26.7    |
| 22         | 18           | -1 3.7      | +17 57.6     |
| -1.9898    | +2.3112      | 7 36 5.3    | 25 25 27.0   |
| <u>32</u>  | <u>466.5</u> |             |              |

Center { A 7 36 05.0  
D 25 25 27.0

$$\begin{array}{rclclcl}
 X-Y & +500X & & -106.9Y & & +1.9X & +1Y \\
 +5650 & +7962 & = +13612 & -2027 & +11585 & +30 & = +11615 + 20 \\
 -790 & +12793 & = 12303 & -735 & -11568 & +49 & = 17 + 1 + 1 \\
 -1395 & +15230 & = 13835 & -2268 & -11567 & +58 & = 15 + 20 \\
 22.8258 & +11713 & & -1792 & & +73 & = 22.6305
 \end{array}$$

$$\begin{array}{rclclcl}
 Y-Y & +500Y & & +107X & & +3.2Y & -10221 \\
 -1029 & +9980 & = 8956 & +1709 & +16160 & +61 & = +10221 0 \\
 +9019 & +3773 & = 7862 & +2737 & +10199 & +22 & = 10221 0 \\
 -3717 & +10609 & = 6895 & +3259 & +10154 & +68 & = 10222 +1 \\
 16.7611 & +8381 & & +2792 & & +37 & = 16.8267
 \end{array}$$

Tables  $a = -1.0$   $e = -8$   $a-e = -2$   $b+d = -1.0$   
 Obs  $= -501.9$   $= -503.2$   $= +1.3$   $= -0.1$

$a-c = -500.9$   $-502.7$   $+0.9$



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## Plate Center and Constants

4

| X       | Y       | X           | Y            |
|---------|---------|-------------|--------------|
| 15.9295 | 18.9606 | 7 32 16.1   | 25 33 28.8   |
| 25.5852 | 6.8869  | 7 38 8.6    | 23 55 50.5   |
| 30.4599 | 21.2188 | 7 71 42.2   | 25 52 59.9   |
| 71.9696 | 77.0663 | 12 111 26.9 | 73 190 139.2 |
| 23.7898 | 15.6888 | 7 37 9.0    | 25 7 26.7    |
| 22      | 18      | -1 3.7      | +17 57.6     |
| -1.9898 | +2.3112 | 7 36 5.3    | 25 25 29.0   |
| 32      | 766.5   |             |              |

Center { A 7 36 05.0  
D 25 25 29.0

-1161

$$\begin{aligned}
 &X-Y + 500X && -106.94 && +1.9X && +17 \\
 &+5650 + 79612 && +13612 && -2027 && +11585 + 30 = +11615 + 2 \\
 &- 990 + 12793 && -12303 && -735 && -11568 + 99 = 17 + 1 \\
 &-1395 + 15230 && -13835 && -2268 && -11567 + 58 = 15 + 2 \\
 &22.8258 + 11913 && && -1792 && +93 && 22.63
 \end{aligned}$$

$$\begin{aligned}
 &Y-Y + 500Y && +107X && +3.2Y && -10221 \\
 &-1029 + 9980 && -8956 + 1709 && +10160 + 61 && +10221 && 0 \\
 &+9019 + 3993 && -7962 + 2737 && +10199 + 22 && 10221 && 0 \\
 &-3717 + 10609 && -6895 + 3259 && +10159 + 68 && 10222 && +1 \\
 &16.7611 + 8381 && +2792 && +57 && 16.8267
 \end{aligned}$$

Tables a = -1.0 e = -3 a-e = -2 b+d = -1.0  
 Obs = -501.9 = -503.2 = +1.3 = -0.1

Cur. Cur

| $\xi$ | $\eta$ | $\Delta \xi$ | $-1.7 \eta$ | $+ .7 \eta$ | $- \eta$          |
|-------|--------|--------------|-------------|-------------|-------------------|
| -6.64 | +1.04  | -8           | +11         | = +3        | +0 = +3           |
| +3.63 | -11.52 | +14          | -6          | = +8        | -4 = +4           |
| +8.60 | +3.55  | +18          | -15         | = +3        | +1 = +4           |
| +0.63 | -1.17  | 0            | -1          | 0           | -5 = <u>-0.02</u> |

| $\Delta \eta$ | $-3.3 \eta$ | $+ \eta$    |
|---------------|-------------|-------------|
| +1            | -4          | = -3        |
| -42           | +38         | = -4        |
| +8            | -12         | = -4        |
| 0             | +4          | = +8 = +0.9 |

|                      |      |    |                    |     |    |                    |      |    |          |
|----------------------|------|----|--------------------|-----|----|--------------------|------|----|----------|
| Standard Coordinates |      |    |                    |     |    |                    |      |    |          |
| Cape No 675-m 97.6   |      |    | Cape No 687-m 96.2 |     |    | Cape No 690-m 97.5 |      |    |          |
| C                    | 7    | 31 | 17.71              | 4   | 37 | 10.75              | 4    | 40 | 3.30     |
| L                    |      |    | 17.43              |     |    | 10.46              |      |    | 3.37     |
| C                    |      |    | 17.39              |     |    | 10.71              |      |    | 3.27     |
| Mean                 | 4    | 31 | 17.71              | 4   | 37 | 10.77              | 4    | 40 | 3.30     |
| Prec                 |      |    | 58.69              |     |    | 58.17              |      |    | + 58.92  |
| Q                    | 4    | 32 | 16.10              | 4   | 38 | 08.61              | 4    | 41 | 02.22    |
| A                    | 4    | 36 | 05.00              | 4   | 36 | 05.0               | 4    | 36 | 05.0     |
| -A                   | -    | 3  | 78.90              | +   | 2  | 03.61              | +    | 7  | 57.22    |
| m(A-A)               |      |    | - 228.89           |     |    | + 123.61           |      |    | + 297.20 |
| log                  | 2    | 35 | 963 n              | 2   | 09 | 205                | 2    | 47 | 305      |
| log                  | 9    | 95 | 528                | 9   | 96 | 096                | 9    | 95 | 909      |
| log                  | 0    | 82 | 215 n              | 0   | 56 | 025                | 0    | 93 | 438      |
| log                  | -    | 6  | 6397               | +   | 3  | 6328               | +    | 8  | 5976     |
| log                  |      |    | - 8                |     |    | + 19               |      |    | + 18     |
| log                  | 1    | 5  | 3595               | 2   | 5  | 6342               | 3    | 0  | 5994     |
| log                  | 1    | 5  | 9295               | 2   | 5  | 5852               | 3    | 0  | 7599     |
| -log                 | +    | 5  | 650                | -   |    | 790                | -    | 1  | 395      |
| C                    | + 25 | 31 | 29.7               | 23  | 53 | 57.8               | + 25 | 51 | 11.7     |
| L                    |      |    | 29.7               |     |    | 58.2               |      |    | 11.5     |
| C                    |      |    | 29.5               |     |    | 57.7               |      |    | 11.2     |
| Mean                 | 25   | 31 | 29.7               | 23  | 53 | 57.9               | 25   | 51 | 11.5     |
| Prec                 |      |    | + 1 59.7           |     |    | + 1 52.6           |      |    | + 1 48.7 |
| S                    | 25   | 33 | 28.8               | 23  | 55 | 50.5               | 25   | 52 | 59.9     |
| D                    | + 25 | 25 | 29.0               | 25  | 25 | 29.0               | 25   | 25 | 29.0     |
| -D                   | +    | 8  | 7.8                | - 1 | 29 | 33.3               | +    | 27 | 35.7     |
| S-D                  |      |    | + 487.8            |     |    | - 5374.7           |      |    | + 1655.9 |
| log                  | 2    | 68 | 556                | 3   | 73 | 036 n              | 3    | 24 | 903      |
| log                  | 0    | 01 | 671                | 1   | 06 | 151 n              | 0    | 55 | 018      |
| log                  | 9    | 6  | 796                | 9   | 6  | 472                | 9    | 6  | 859      |
| log                  | 1    | 6  | 443                | 1   | 1  | 205                | 1    | 8  | 688      |
| log                  | 8    | 37 | 773                | 7   | 82 | 11                 | 8    | 60 | 81       |
| log                  | +    | 1  | 0392               | -   | 1  | 15216              | +    | 3  | 5796     |
| log                  | +    | 0  | 0238               | +   | 0  | 0066               | +    | 0  | 0706     |
| log                  | 1    | 90 | 630                | 6   | 48 | 50                 | 2    | 1  | 5902     |
| log                  | 1    | 89 | 606                | 6   | 88 | 69                 | 2    | 1  | 2188     |



| Standard Coordinates |     |    |           |                      |    |           |     |                    |         |
|----------------------|-----|----|-----------|----------------------|----|-----------|-----|--------------------|---------|
| Cape No 675 - m 47.6 |     |    |           | Cape No 687 - m 46.2 |    |           |     | Cape No 693 - m 47 |         |
| C                    | 9   | 31 | 17.91     | 9                    | 37 | 10.95     | 9   | 40                 | 3.30    |
| L                    |     |    | 11.43     |                      |    | 10.46     |     |                    | 3.39    |
| E                    |     |    | 11.39     |                      |    | 10.91     |     |                    | 3.27    |
| Mean                 | 9   | 31 | 17.91     | 9                    | 37 | 10.99     | 9   | 40                 | 3.30    |
| Pre                  |     |    | 58.69     |                      |    | 58.48     |     |                    | 58.72   |
| $\delta$             | 9   | 32 | 16.10     | 9                    | 38 | 08.61     | 9   | 41                 | 02.22   |
| A                    | 9   | 36 | 05.00     | 9                    | 36 | 05.0      | 9   | 36                 | 05.0    |
| 1-A                  | -   | 3  | 98.90     | +                    | 2  | 03.61     | +   | 9                  | 57.22   |
| sin(1-A)             |     |    | -228.89   |                      |    | +123.61   |     |                    | +297.20 |
| log...               |     |    | 2.35948 n |                      |    | 2.09205   |     |                    | 2.47305 |
| cos                  |     |    | 9.95528   |                      |    | 9.96096   |     |                    | 9.95709 |
| $\gamma_0$           |     |    | 0.82215 n |                      |    | 0.56025   |     |                    | 0.93938 |
| $\gamma_0$           | -   |    | 6.6397    | +                    |    | 3.6328    | +   |                    | 85.976  |
| $\gamma_1$           |     |    | -8        |                      |    | +17       |     |                    | +18     |
| $\gamma$             |     |    | 15.3595   |                      |    | 25.6392   |     |                    | 30.5799 |
| $\chi$               |     |    | 15.9295   |                      |    | 25.5852   |     |                    | 30.7599 |
| $\chi - \gamma$      |     |    | +5.650    | -                    |    | 990       | -   |                    | 1395    |
| C                    | +25 | 31 | 29.9      | 23                   | 53 | 57.8      | +25 | 51                 | 11.7    |
| L                    |     |    | 29.9      |                      |    | 58.2      |     |                    | 11.5    |
| E                    |     |    | 29.5      |                      |    | 57.7      |     |                    | 11.2    |
| Mean                 | 25  | 31 | 29.9      | 23                   | 53 | 57.9      | 25  | 51                 | 11.5    |
| Pre                  |     |    | +1 59.9   |                      |    | +1 52.6   |     |                    | +1 48.7 |
| $\delta$             | 25  | 33 | 28.8      | 23                   | 55 | 50.5      | 25  | 52                 | 59.9    |
| D                    | +25 | 25 | 29.0      | 25                   | 25 | 29.0      | 25  | 25                 | 29.0    |
| $\delta - D$         |     |    | +8 9.8    | -1                   |    | 29 33.3   | +   |                    | 27 35.7 |
| tand-D               |     |    | +989.8    |                      |    | -5379.7   |     |                    | +1655.9 |
| log...               |     |    | 2.68556   |                      |    | 3.73036 n |     |                    | 3.24903 |
| $\gamma_0$           |     |    | 0.01671   |                      |    | 1.06751 n |     |                    | 0.55018 |
| logTand              |     |    | 9.6796    |                      |    | 9.6972    |     |                    | 9.6859  |
| $\gamma_0$           |     |    | 1.6493    |                      |    | 1.1205    |     |                    | 1.8688  |
| $\gamma_1$           |     |    | 8.3773    |                      |    | 7.8211    |     |                    | 8.6081  |
| $\gamma_0$           | +   |    | 1.0392    | -                    |    | 11.5216   | +   |                    | 3.5996  |
| $\gamma_1$           | +   |    | 0.0238    | +                    |    | 0.0066    | +   |                    | 0.0406  |
| $\gamma$             |     |    | 19.0630   |                      |    | 6.9850    |     |                    | 21.5902 |
| $\chi$               |     |    | 18.9606   |                      |    | 6.8869    |     |                    | 21.2188 |
| $\chi - \gamma$      |     |    | -0.1024   |                      |    | -0.0981   |     |                    | -0.3714 |

$A = +.6$  $B = 0$

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6.

## Moor's Center

| rank | x       | $x - x_0$ | $\Delta x$ | $(x - x_0)^2$ | $(x - x_0)^2 + (y - y_0)^2$ | O-C  |
|------|---------|-----------|------------|---------------|-----------------------------|------|
| 1    | 23.9817 | +0.6567   | +1         | 0.4313        | 3.5395                      | +137 |
| 2    | 29.0000 | +1.1750   | +4         | 1.3808        | 3.5437                      | +179 |
| 3    | 29.5800 | +1.7150   | +0         | 2.9412        | 3.5234                      | -24  |
| 4    | 29.7035 | +1.8385   | +0         | 3.3287        | 3.5287                      | +29  |
| 5    | 29.6879 | +1.8629   | +0         | 3.4709        | 3.5266                      | +8   |
| 6    | 29.2397 | +1.4177   | +1         | 2.0008        | 3.5310                      | +52  |
| 7    | 29.0000 | +1.1750   | +1         | 1.3808        | 3.5144                      | -117 |
| 8    | 22.8250 | 0.0000    | +4         | 0.0000        | 3.5295                      | +37  |

|   | y       | $y - y_0$ | $\Delta y$ | $(y - y_0)^2$ | $(y - y_0)^2 + (x - x_0)^2$ |        |
|---|---------|-----------|------------|---------------|-----------------------------|--------|
| 1 | 15.0000 | -1.7630   | 0          | 3.1082        | 160                         | -      |
| 2 | 15.2923 | -1.4707   | 0          | 2.1629        | 141                         | -      |
| 3 | 16.0000 | -0.7630   | 0          | 0.5822        | 114                         | -      |
| 4 | 16.7630 | 0.0000    | 0          | 0.0000        | 90                          | -      |
| 5 | 17.0000 | +0.2370   | 0          | 0.0562        | 83                          | -      |
| 6 | 18.0000 | +1.2370   | 0          | 1.5302        | 49                          | -      |
| 7 | 18.2237 | +1.4607   | 0          | 2.1336        | 39                          | -      |
| 8 | 18.6917 | +1.8387   | 8          | 3.5295        | 0                           | - 1600 |

$$x = 29$$

$$y = 15.2923$$

$$18.2237$$

$$33.5160$$

$$y_0 = 16.7580$$

$$y_{max} = 18.6917$$

$$R = 1.8837$$

$$x_{max} = 29.7035$$

$$x_0 = 22.8250$$

$$y_0 = 16.7630$$



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## Morris Center

| $x$ | $h$     | $x - x_0$ | $\Delta x$ | $(x - x_0)^2$ | $(x - x_0)(y - y_0)$ | $O - C$ |
|-----|---------|-----------|------------|---------------|----------------------|---------|
| 1   | 23.9817 | +0.6567   | +1         | 0.4313        | 3.5395               | +1.37   |
| 2   | 29.0000 | +1.1750   | +1         | 1.3808        | 3.5437               | +1.79   |
| 3   | 29.5900 | +1.7150   | +0         | 2.9912        | 3.5239               | -2.9    |
| 4   | 29.7035 | +1.8785   | +0         | 3.5287        | 3.5287               | +2.9    |
| 5   | 29.6879 | +1.8629   | +0         | 3.4709        | 3.5266               | +8      |
| 6   | 29.2397 | +1.4199   | +0         | 2.0008        | 3.5310               | +5.2    |
| 7   | 29.0000 | +1.1750   | +0         | 1.3808        | 3.5199               | -1.17   |
| 8   | 22.8250 | 0.0000    | +4         | 0.0000        | 3.5295               | +3.7    |

3.5258

| $y$ | $y - y_0$ | $\Delta y$ | $(y - y_0)^2$ | $(y - y_0)(x - x_0)$ | $O - C$ |
|-----|-----------|------------|---------------|----------------------|---------|
| 1   | 15.0000   | -1.7630    | 0             | 3.1082               | 160     |
| 2   | 15.2923   | -0.9707    | 0             | 2.1629               | 191.5   |
| 3   | 16.0000   | -0.7630    | 0             | 0.5822               | 119     |
| 4   | 16.7630   | 0.0000     | 0             | 0.0000               | 90      |
| 5   | 17.0000   | +0.2370    | 0             | 0.0562               | 83      |
| 6   | 18.0000   | +1.2370    | 0             | 1.5302               | 99      |
| 7   | 18.2237   | +1.7607    | 0             | 2.1336               | 72      |
| 8   | 18.6917   | +1.8787    | 0             | 3.5295               | 0       |

 $x = 29$  $y = 15.2923$ 

18.2237

33.5160

 $y_0 = 16.7580$  $y_{max} = 18.6917$  $R = 1.8837$  $x_{max} = 29.7035$  $x_0 = 22.8250$  $y_0 = 16.7630$

# Formation of Normals

|          |         |         |
|----------|---------|---------|
| 1 - 116  | + 90.5  | - 271.0 |
| 2 - 172  | + 209.0 | - 263.5 |
| 3 - 130  | - 91.0  | + 18.5  |
| 4 00     | + 54.5  | + 0.0   |
| 5 + 09.5 | + 15.0  | + 19.0  |
| 6 + 17.5 | + 73.5  | + 64.5  |
| 7 + 17.1 | - 133.5 | - 166.5 |
| 8 + 0    | + 0     | + 69.5  |
| + 3.91   | + 942.5 | + 171.5 |
| - 418    | - 177.5 | - 671.0 |
| = 0.27   | + 2680  | - 999.5 |

|        | a    | b   | -53<br>c | new<br>0-c |
|--------|------|-----|----------|------------|
|        | + 22 | - 7 | - 38     | + 22       |
| a + 37 | + 40 | - 6 | - 19     | + 85       |
| b + 7  | + 58 | - 3 | + 2      | - 80       |
| c - 53 | + 67 | + 0 | + 11     | + 8        |
|        | + 63 | + 1 | + 11     | - 3        |
|        | + 48 | + 5 | 0        | + 75       |
|        | + 40 | + 6 | - 7      | - 86       |
|        | + 0  | + 8 | - 45     | - 153      |

checked

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## Conditional Equations.

7

|   |       |   |      |   |      | 0 - C      |
|---|-------|---|------|---|------|------------|
| 1 | +0.66 | - | 1.76 | = | +137 | +60        |
| 2 | +1.17 | - | 1.97 | = | +179 | +104       |
| 3 | +1.71 | - | 0.76 | = | -29  | -82        |
| 4 | +1.88 |   | 0.00 | = | +29  | -3         |
| 5 | +1.86 | + | 0.29 | = | +8   | -19        |
| 6 | +1.91 | + | 1.29 | = | +52  | +75        |
| 7 | +1.17 | + | 1.86 | = | -119 | -79        |
| 8 | +0.00 | + | 1.88 | = | +37  | -108       |
|   |       |   |      |   |      | +239 - 286 |

Average 67

$$15.13 - 0.27 = +268.0 + 9.86 \Delta$$

$$-0.27 - 13.10 = -999.5 + 0.83 \Delta$$

$$+ [ ] - .0 = + 9.8$$

$$+ .08 \Delta$$

$$-13.10 = -999.7$$

$$b = -3.7, 8$$

$$15.13 = +268.0 - 10.2 = +257.8$$

$$a = +17.0$$

$$+0.65 \Delta$$

Arc Measured  $160^\circ$ 

$$\frac{p}{h} = 1.19$$

$$\frac{\Sigma V}{h} = -5.87$$

$$I_{126} \quad R \quad 1.88 \quad - \frac{5.87}{1.19} = -31$$

$$\Delta R = -0.7$$

$$-2RC = -2.63$$

$$\text{Corr} +0.7$$

-4

$$\Delta R = -1.1$$

$$\Delta b = -0.21$$

$$\Delta d = -0.11$$

-34

$$\Delta a = -1.71$$

$$\Delta q = -0.06$$



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## Conditional Equations

|   |       |        |        |     |      |       | O.C  |
|---|-------|--------|--------|-----|------|-------|------|
| 1 | +0.66 | - 1.76 | = +137 | +11 | + 66 | - +77 | +60  |
| 2 | +1.17 | - 1.97 | = +179 | +20 | + 55 | - +75 | +104 |
| 3 | +1.71 | - 0.76 | = - 29 | +29 | + 29 | - +58 | -82  |
| 4 | +1.88 | 0.00   | = +29  | +32 | 0    | - +32 | -3   |
| 5 | +1.86 | + 0.29 | = + 8  | +31 | - 9  | - +22 | -19  |
| 6 | +1.91 | + 1.29 | = +32  | +24 | - 97 | -23   | +75  |
| 7 | +1.17 | + 1.76 | = -119 | +20 | - 55 | -35   | -79  |
| 8 | +0.00 | + 1.88 | = +37  | +0  | - 71 | -71   | -108 |
|   |       |        |        |     |      | + 239 | -286 |

Average 67

$$15.13 - 0.27 = +268.0$$

$$- 0.27 - 13.10 = -999.5$$

$$+ [ ] - 0 = + 9.8$$

$$-13.10 = -999.7$$

$$b = -3.7.8$$

$$15.13 = +268.0 - 10.2 = +257.8$$

$$a = +17.0$$

Arc Measured  $160^\circ$ 

$$\frac{P}{h} = 119$$

$$\frac{\Sigma V}{h} = -5.57$$

$$\frac{-5.57}{.190} = -31$$

$$DR = -0.8$$



# Moon's Mean Position

8

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$$\begin{aligned} X_0 & 22.8250'' \\ & + 8'' \\ & 22.8258'' \end{aligned}$$

$$\begin{aligned} Y_0 & 16.7630'' \\ & - 19'' \\ & 16.7611'' \end{aligned}$$

From Plate Constants,

$$X \ 22.6305''$$

$$Y \ 16.8267''$$

$$Z \ +.6305''$$

$$h \ -1.1733''$$

$$\begin{aligned} \log \zeta & 9.79969'' \\ \text{Eust} & 9.95634'' \\ & 8.50729'' \\ & 1.33614'' \end{aligned}$$

$$\begin{aligned} \log \tan \delta & 9.6739'' \\ \zeta & 9.5994'' \\ & 7.0537'' \\ & 6.3267'' \end{aligned}$$

$$\begin{aligned} \alpha & \\ \alpha - A & +21.69'' \end{aligned}$$

$$h_1 \ +.0002''$$

$$A \ 4 \ 36 \ 05.0''$$

$$h_0 \ -1.1728''$$

$$\alpha_0 \ 4 \ 36 \ 26.69''$$

$$\log h_0 \ 0.06978''$$

$$\text{Red} \ +4.88''$$

$$\begin{aligned} & 7.33115'' \\ & 2.73833'' \end{aligned}$$

$$\alpha' \ 4 \ 36 \ 31.57''$$

$$\delta - D \ -9 \ 7.9''$$

$$D \ 25' \ 25'' \ 29.0''$$

$$\delta_0 + 25' \ 16'' \ 16.8''$$

$$\text{Red} \ +12.6''$$

$$\delta' + 25' \ 16'' \ 29.2''$$



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Moon 1 Year Position

8

$$\begin{array}{r} x_0 \quad 22.8250'' \\ \quad \quad + 8'' \\ \hline 22.8258'' \end{array}$$

$$\begin{array}{r} y_0 \quad 16.7630'' \\ \quad \quad - 19'' \\ \hline 16.7611'' \end{array}$$

From Plate Constants,

$$x \quad 22.6305''$$

$$y \quad 16.8249''$$

$$z \quad +1.6305''$$

$$u \quad -1.1733''$$

$$\log z \quad 9.79969''$$

$$\log \tan \delta \quad 9.6739''$$

$$\log z \quad 9.95631''$$

$$z \quad -9.5999''$$

$$8.50729$$

$$7.0539$$

$$1.33619''$$

$$6.3267''$$

x

x-A

$$+21.69''$$

y

$$+0.0002''$$

$$A \quad 9 \quad 36 \quad 05.0''$$

$$u \quad -1.1728''$$

$$x_0 \quad 9 \quad 36 \quad 26.69''$$

$$\log u \quad 0.06998''$$

$$7.33115''$$

Red

$$+9.88''$$

$$2.73833'' \quad u \quad -597.9$$

$$x' \quad 9 \quad 36 \quad 31.57''$$

$$z-D \quad -9 \quad 79''$$

$$D \quad 25'' \quad 25'' \quad 29.0''$$

$$z_0 + 25'' \quad 16'' \quad 16.8''$$

Red

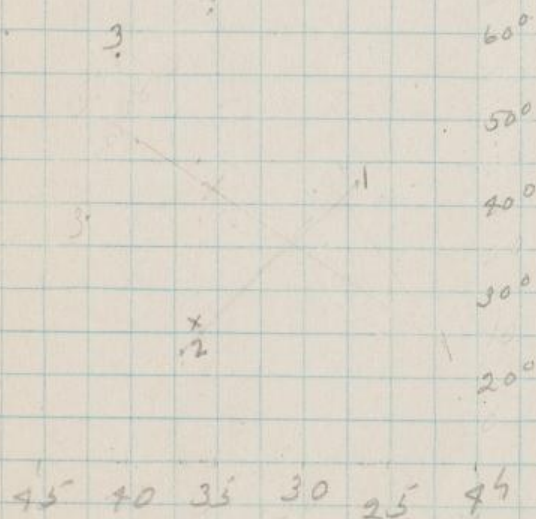
$$+12.6''$$

$$z' + 25'' \quad 16'' \quad 29.2''$$

$$\begin{array}{r}
 4 \quad 27 \quad 35.73 \\
 \underline{30.09} \\
 + 5.69 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 + 42^{\circ} 53' \\
 17.16 \\
 \underline{8.12} \\
 + 9.04
 \end{array}$$

$$\begin{array}{r}
 4 \quad 37 \quad 16.88 \\
 \underline{12.09} \\
 + 4.79 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 + 22^{\circ} 47' \\
 61.58 \\
 \underline{48.28} \\
 + 13.30
 \end{array}$$

$$\begin{array}{r}
 4 \quad 41 \quad 6.81 \\
 \underline{0.02} \\
 + 6.79 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 + 36^{\circ} 36' \\
 37.51 \\
 \underline{33.72} \\
 + 103.79
 \end{array}$$



## 11331 Reduction to Apparent Place

$$\begin{array}{rcl}
 H + \alpha & 9 & 02.4 = 135^\circ 36.0 \quad \delta \quad 25^\circ 16' 17. \\
 H & 9 & 26.0 \\
 \alpha & 9 & 36.4 \\
 Q & 23 & 16.0 \\
 Q + \alpha & 3 & 52.4 = 58^\circ 6.0
 \end{array}
 \quad
 \begin{array}{rcl}
 \log \cos & & 9.9563 \\
 + & & 0.8789 \\
 \hline
 & & 0.8352
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(Q + \alpha) & 9.7230 \\
 g & 1.3415 \\
 \sin & 9.9289 \\
 \tan & 9.6740 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin & 9.6303 \\
 \cos(H + \alpha) & 9.8590 \\
 \hline
 & 1.2792 \\
 \sin(H + \alpha) & 9.8449 \\
 \sec \delta & 0.0437 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log g' & 1.6645 \\
 g & 9.7683
 \end{array}$$

$$\begin{array}{rcl}
 \log h' & 0.7635 \\
 h & 9.9917
 \end{array}$$

$$\begin{array}{rcl}
 f & +3.309 \\
 g & +0.586 \\
 h & +0.981 \\
 & +4.876
 \end{array}$$

$$\begin{array}{rcl}
 g' & +11.60 \\
 h' & -5.801 \\
 i & +6.842 \\
 & +12.641
 \end{array}$$



## 11331 Reduction to Apparent Place

$$\begin{array}{rcl}
 H + L & 9 & 024 = 135^\circ 36.0 \rightarrow 25^\circ 16' 17. \\
 H & 9 & 26.0 \\
 L & 9 & 36.9 \\
 G & 23 & 16.0 \\
 G + L & 32 & 52.9 = 58^\circ 6.0
 \end{array}$$

$$\begin{array}{r}
 \log \cos d - 9.9563 \\
 + 0.8789 \\
 \hline
 = 0.8252
 \end{array}$$

$$\begin{array}{r}
 \log(G+L) 9.7230 \\
 g \quad 1.3915 \\
 \text{Sum} \quad 9.9289 \\
 \text{Land} \quad 9.6790 \\
 \hline
 8.8239
 \end{array}$$

$$\begin{array}{r}
 \log \text{Sum} \quad 9.6303 \\
 \cos(H+L) 9.8590 \\
 L \quad 1.2792 \\
 \text{Sum}(H+L) 9.8999 \\
 \text{Sec } d \quad 0.0437 \\
 \hline
 8.8239
 \end{array}$$

$$\begin{array}{r}
 \log g' 1.0645 \\
 g \quad 9.7683
 \end{array}$$

$$\begin{array}{r}
 \log L 9.7635 \\
 L \quad 9.9917
 \end{array}$$

$$\begin{array}{r}
 f \quad +3.309 \\
 g \quad +0.586 \\
 L \quad +0.981 \\
 \hline
 +4.876
 \end{array}$$

$$\begin{array}{r}
 g' \quad +11.60 \\
 L' \quad +5.890 \\
 L \quad +6.892 \\
 \hline
 +12.681
 \end{array}$$



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Lunar Parallax

10

$\alpha' \quad 7 \quad 36 \quad 31.54''$   
 $+ \quad 6 \quad 30 \quad 57.8''$   
 $\delta - \alpha' + 1 \quad 54 \quad 26.2''$   
 $= +28 \quad 36 \quad 33.0''$   
 $\frac{1}{2}(\alpha' + \delta) \quad 10 \quad 53.16''$   
 $\delta \quad 28 \quad 25 \quad 39.8''$

$\pi \quad 55 \quad 26.37''$

$9.86913$   
 $8.20752''$   
 $9.68019''$   
 $0.07779''$   
 $7.80163''$

$9.95727$   
 $0.00000$   
 $0.03581''$   
 $0.01308''$

$\delta - \alpha' \quad 21 \quad 46.33''$   
 $= +1 \quad 27.09''$

$\delta \quad 45 \quad 51 \quad 43.6''$

$\delta \quad 25 \quad 16 \quad 29.2''$

$\delta - \delta \quad 20 \quad 35 \quad 14.4''$

$9.82640$   
 $8.20752''$   
 $9.57640''$   
 $0.19409''$   
 $7.72409''$

$\delta - \delta' \quad +18 \quad 12.7''$

$\delta \quad 25 \quad 37 \quad 41.8''$

$\text{Eph} \delta + 25 \quad 37 \quad 41.8''$

$\delta - C \quad +0.1$

$\text{Curr Corr} \quad +0.4$

$2^{\text{nd}} \text{ Order Ref} \quad 0.0$

$\text{In Corr} \quad -0.1$

$\delta \quad +25 \quad 37 \quad 41.8''$

$\delta - C \quad 0.0$

$\alpha \quad 4 \quad 37 \quad 58.65''$

$\text{Eph} \alpha \quad 4 \quad 37 \quad 57.72''$

$\delta - C \quad +0.93''$

$-0.02$

$-0.06$

$\alpha \quad 4 \quad 37 \quad 58.65''$

$\text{fair} +0.87$



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Lunar Parallax

10

$\alpha'$  7 36 31.57"  
 $\delta$  6 30 57.8"  
 $\alpha - \alpha' + 1$  59 26.2"  
 $= +28$  3.6 33.0"  
 $\delta(1-1)$  10 53.16"  
 $\delta$  28 25 39.8"

$\pi$  55 26.37"  
 9.86912  
 8.20752"  
 9.68019"  
 0.09979"  


---

 7.80163"

9.95727  
 0.00000  
 0.03581"  
 0.01308"

$\alpha - \alpha'$  21 96.33"  
 $=$  1 27.09"

$\alpha$  45 51 95.6"

$\delta$  25 16 29.2"

$\alpha - \delta$  20 35 66.9"

9.82690  
 8.20752"  
 9.57690"  
 0.19909"  


---

 7.72909"

$\alpha - \delta'$  18 127"

$\delta$  25 39 91.8"

Eph  $\delta$  25 39 91.8"

$\alpha$  9 37 58.65"

Eph  $\alpha$  9 37 57.72"

O-C

+ 0.1

O-C

+ 0.99"

Curve Corr

+ 0.9

- 0.02

2<sup>nd</sup> Order Ref

0.0

1  
11  
13  
2  
3  
2  
3  
3  
1  
2  
3  
1  
3  
2  
1

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## Star Measures

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 1    | 20500          | 20108          | 20232          | 20378          |
| 11.5 | 16127          | 14492          | 18420          | 12167          |
| 13.2 | 16             | 90             | 26             | 63             |
|      | 502            | 20             | 20             | 79             |
|      | <u>11.4381</u> | <u>11.4377</u> | <u>13.1806</u> | <u>13.1790</u> |

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 2    | 19012          | 19878          | 20112          | 17786          |
| 30.6 | 14258          | 14661          | 10692          | 17192          |
| 27.9 | 58             | 61             | 86             | 99             |
|      | 18             | 79             | 10             | 798            |
|      | <u>30.4758</u> | <u>30.4782</u> | <u>27.9422</u> | <u>27.9406</u> |

|      |                |                |               |               |
|------|----------------|----------------|---------------|---------------|
| 3    | 20158          | 20549          | 20362         | 19072         |
| 32.3 | 17110          | 13582          | 12760         | 16670         |
| 9.8  | 06             | 78             | 62            | 64            |
|      | 62             | 59             | 70            | 80            |
|      | <u>32.3059</u> | <u>32.3027</u> | <u>9.7607</u> | <u>9.7593</u> |

## Moon Measures d

|      |                |                |                |
|------|----------------|----------------|----------------|
| 1    | 19820          | 20542          | 19279          |
| 22.9 | 10432          | 19876          | 19892          |
| 15.0 | 26             | 70             | 99             |
|      | 29             | 68             | 9280           |
|      | <u>22.9399</u> | <u>22.9329</u> | <u>22.9349</u> |

|      |  |                |                |
|------|--|----------------|----------------|
| 2    |  | 19059          | 19021          |
| 23   |  | 18812          | 99957          |
| 15.1 |  | 08             | 52             |
|      |  | 78             | 9750           |
|      |  | <u>15.0244</u> | <u>15.0203</u> |

|      |                |       |
|------|----------------|-------|
| 3    | 20159          | 9797  |
| 24.1 | 19892          | 10112 |
| 16   | 38             | 16    |
|      | <u>24.0317</u> |       |
|      | <u>24.0319</u> |       |

Good



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## Star Measures.

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 1    | 20500          | 20108          | 20232          | 20378          |
| 11.5 | 16129          | 14492          | 18420          | 12167          |
| 13.2 | 16             | 90             | 26             | 63             |
|      | 502            | 20             | 20             | 79             |
|      | <u>11.4381</u> | <u>11.4377</u> | <u>13.2806</u> | <u>13.1790</u> |

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 2    | 19012          | 19878          | 20112          | 17786          |
| 30.6 | 14258          | 19661          | 10692          | 17192          |
| 27.9 | 58             | 61             | 86             | 99             |
|      | 18             | 79             | 10             | 798            |
|      | <u>30.4758</u> | <u>30.4782</u> | <u>27.9422</u> | <u>27.9406</u> |

|      |                |                |               |               |
|------|----------------|----------------|---------------|---------------|
| 3    | 20158          | 20549          | 20362         | 19072         |
| 32.3 | 17110          | 13582          | 12760         | 16670         |
| 9.8  | 06             | 78             | 62            | 64            |
|      | 62             | 59             | 70            | 80            |
|      | <u>32.3059</u> | <u>32.3027</u> | <u>9.7607</u> | <u>9.7593</u> |

## Moon Measures d

|      |                |                |                |
|------|----------------|----------------|----------------|
| 1    | 19820          | 20542          | 19279          |
| 22.9 | 10432          | 19876          | 19892          |
| 13.0 | 26             | 70             | 99             |
|      | 29             | 68             | 9290           |
|      | <u>22.9399</u> | <u>22.9329</u> | <u>22.9349</u> |

|      |  |                |                |
|------|--|----------------|----------------|
| 2    |  | 19059          | 190274         |
| 23   |  | 18812          | 99987          |
| 15.1 |  | 08             | 52             |
|      |  | 78             | 9780           |
|      |  | <u>15.0244</u> | <u>15.0203</u> |

|      |                |       |
|------|----------------|-------|
| 3    | 20159          | 9797  |
| 24.1 | 19892          | 10112 |
| 16   | 38             | 16    |
|      | <u>24.0317</u> |       |
|      | <u>29.0319</u> |       |



11556

## Moon Measures

|      |                |                |
|------|----------------|----------------|
| 2    | 20 188         | 19250          |
| 24.2 | 18268          | 11177          |
| 16.6 | 64             | 71             |
| 77   | 216            | 64             |
|      | <u>24 1927</u> | <u>24 1911</u> |

|      |                |                |
|------|----------------|----------------|
| 5    | 19202          | 20240          |
| 24.1 | 17458          | 11999          |
| 17   | 98             | 93             |
|      | 30             | 52             |
|      | <u>24 1759</u> | <u>24 1776</u> |

|     |  |                |                |
|-----|--|----------------|----------------|
| 6   |  | 20049          | 19548          |
| 24  |  | 19411          | 15176          |
| 174 |  | 01             | 64             |
|     |  | 44             | 48             |
|     |  | <u>17 5638</u> | <u>17 5622</u> |

|      |                |                |
|------|----------------|----------------|
| 7    | 19932          | 19928          |
| 23.6 | 12968          | 16930          |
| 18   | 64             | 28             |
|      | 62             | 39             |
|      | <u>23 6986</u> | <u>23 6998</u> |

|      |  |                |                |
|------|--|----------------|----------------|
| 8    |  | 20020          | 19303          |
| 23   |  | 15329          | 14016          |
| 18.4 |  | 19             | 28             |
|      |  | 22             | 12             |
|      |  | <u>18 4702</u> | <u>18 4714</u> |



11336

7

## Moon Measures

|      |                |                |
|------|----------------|----------------|
| 2    | 20 188         | 19250          |
| 29.2 | 18268          | 11177          |
| 16.6 | 64             | 71             |
| 77   | 216            | 64             |
|      | <u>24 1927</u> | <u>24,1911</u> |

|      |                |                |
|------|----------------|----------------|
| 3    | 19202          | 20240          |
| 29.1 | 17958          | 11999          |
| 17   | 98             | 93             |
|      | 30             | 52             |
|      | <u>24,1759</u> | <u>24,1796</u> |

|      |  |                |                |
|------|--|----------------|----------------|
| 6    |  | 20049          | 19548          |
| 29   |  | 19911          | 15176          |
| 17.9 |  | 01             | 64             |
|      |  | 49             | 98             |
|      |  | <u>17,5638</u> | <u>17,5622</u> |

|      |                |                |
|------|----------------|----------------|
| 1    | 19932          | 19928          |
| 23.6 | 12968          | 16930          |
| 18   | 64             | 28             |
|      | 62             | 39             |
|      | <u>23,6986</u> | <u>23,6998</u> |

|      |  |                |                |
|------|--|----------------|----------------|
| 8    |  | 20020          | 19303          |
| 23   |  | 15329          | 19016          |
| 18.4 |  | 19             | 28             |
|      |  | 22             | 12             |
|      |  | <u>18,9702</u> | <u>18,9719</u> |

A 0  
B 1,9

11336

Jermas

etc.

13

Oct 17<sup>v</sup>

|               |    |    |                    |     |     |                   |
|---------------|----|----|--------------------|-----|-----|-------------------|
| Epp. to stars | 6  | 23 |                    | 6   | 35  |                   |
| " " Moon      | 6  | 29 | 08.9 <sup>v</sup>  | 6   | 29  | 09.0 <sup>v</sup> |
| Clock fruit   |    | 10 | 39.5               |     |     |                   |
| H. Sid Time   | 6  | 18 | 29.75 <sup>v</sup> | 4-9 | -0h | 58 <sup>m</sup>   |
| H. long       | 4  | 77 | 31.05 <sup>v</sup> |     |     |                   |
| g. Sid J.     | 11 | 03 | 00.50 <sup>v</sup> |     |     |                   |
| Sid J. M. h.  | 13 | 72 | 37.30 <sup>v</sup> |     |     |                   |
| Interval      | 21 | 20 | 23.20 <sup>v</sup> |     |     |                   |
| Reduction     |    | 3  | 29.76 <sup>v</sup> |     |     |                   |
| g. M. J.      | 21 | 16 | 53.77 <sup>v</sup> |     |     |                   |

|                  |                 |    |       |                     |        |                     |
|------------------|-----------------|----|-------|---------------------|--------|---------------------|
| From Mount Allen |                 |    | R. G. |                     | Dec.   |                     |
| Moon             | 21 <sup>h</sup> | 07 | 15    | 42.06               | +22 55 | 51.9 <sup>v</sup>   |
| Motion in h      |                 |    |       | 2.0969 <sup>v</sup> |        | -6.915 <sup>v</sup> |
|                  | 16.8907         |    |       | 3.577               | -1     | 78.1                |
| Tabular Place    | 07              | 16 |       | 17.47 <sup>v</sup>  | +22 57 | 03.8 <sup>v</sup>   |

Moon's age 21 days

|                |    |                     |
|----------------|----|---------------------|
| Parallax       | 57 | 18.33 <sup>v</sup>  |
| Semiid         | 14 | 49.5 <sup>v</sup>   |
| R.             |    | 8895 <sup>v</sup>   |
| ang.           |    | 13.1 <sup>v</sup>   |
| Dist (5)       |    | -0.8 <sup>v</sup>   |
| R              |    | 9018 <sup>v</sup>   |
| R              |    | 1.9331 <sup>v</sup> |
| AR             |    | -925 <sup>v</sup>   |
| 1+R/R          |    | 1.8906 <sup>v</sup> |
| R <sup>2</sup> |    | 3.3878 <sup>v</sup> |

939- 14.47<sup>v</sup>

$$\begin{aligned}
 a &= -502.5^{\circ} \\
 &+ 27^{\circ} \\
 &- 478.5^{\circ}
 \end{aligned}$$



11336 *lunas* Etc.

13

Oct 17

|               |    |    |        |      |      |       |
|---------------|----|----|--------|------|------|-------|
| Epp. To Stars | 6  | 23 |        | 6    | 35   |       |
| " Moon        | 6  | 29 | 08.9"  | 6    | 29   | 09.0" |
| Clock fast    |    | 10 | 39.5"  |      |      |       |
| H. Sid Time   | 6  | 18 | 29.75" | 4.92 | - 0h | 58m   |
| H. long       | 9  | 99 | 31.05" |      |      |       |
| g. Sid T      | 11 | 03 | 00.50" |      |      |       |
| Sid T. M. H.  | 13 | 92 | 37.30" |      |      |       |
| Interval      | 21 | 20 | 23.20" |      |      |       |
| Reduction     |    | 3  | 29.76" |      |      |       |
| g. M. T.      | 21 | 16 | 53.99" |      |      |       |

|                 |         |    |       |         |         |          |
|-----------------|---------|----|-------|---------|---------|----------|
| From Mount Airy |         |    | N. G. |         | blue.   |          |
| Moon            | 21h     | 07 | 15    | 42.06   | +22 55" | 51.9     |
| Motion with     |         |    |       | 2.0969" |         | - 6.915" |
|                 | 16.8908 |    |       | 3.576   | - 1     | 98.1     |
| Jubular Place   | 07      | 16 |       | 17.97"  | +22 57  | 03.8"    |

Moon's age 21 days

|         |    |         |
|---------|----|---------|
| Palatka | 59 | 18.33"  |
| Seruid  | 19 | 99.5"   |
| R.      |    | 889.5"  |
| ang.    |    | 13.1"   |
| EL (5)  |    | - 0.8"  |
| R       |    | 901.8"  |
| R       |    | 1.9331" |
| AR      |    | - 925"  |
| V. A. R |    | 1.8706" |
| R       |    | 3.3878" |

39- 14.47"

a = -502.5"

+27"

- 478.5"



11336.

## Plate Center &amp; Constants

19

| X         | Y       | X     | Y     | X  | Y   | X    | Y |
|-----------|---------|-------|-------|----|-----|------|---|
| 11.4379   | 13.1798 | 7 10  | 32.4  | 22 | 06  | 47.7 |   |
| 30.4770   | 27.9414 | 7 24  | 53.6  | 29 | 5   | 45.7 |   |
| 32.3043   | 9.7600  | 7 22  | 45.3  | 21 | 37  | 4.8  |   |
| 3 74.2192 | 50.8812 | 21 53 | 131.3 | 67 | 48  | 98.2 |   |
| 24.7397   | 16.7607 | 7 18  | 23.4  | 22 | 36  | 32.7 |   |
| 22        | 18      | - 1   | 27.7  |    | +10 | 7.4  |   |
| -2.7397   | +1.2396 | 7 16  | 55.4  | 22 | 46  | 40.1 |   |
| 32        | 490     |       |       |    |     |      |   |

$$\begin{array}{rclclcl}
 X-Z & +500X & & +116.9Y & & +2.5X & & -15670 \\
 +8381 + 5719 & = +14100 & + 1591 & = +15691 & + 29 & = +15670 & 0 \\
 -2910 + 15238 & = +12328 & + 3266 & = 15594 & + 76 & = 15670 & 0 \\
 -1704 + 16152 & = +14448 & + 1191 & = 15589 & + 81 & = 15670 & 0 \\
 22.3512'' & + 11176'' & + 1958'' & & + 56'' & & 22.1032''
 \end{array}$$

$$\begin{array}{rclclcl}
 Y-Z & +500Y & & -116Y & & +3.3Y & & -6930 \\
 +1625 + 6590 & = +8215 & - 1327 & = +6888 & + 93 & = +6931 & +1 \\
 -3598 + 13971 & = 10373 & - 3535 & = 6838 & + 92 & = 6930 & 0 \\
 +5765 + 4880 & = 10645 & - 3797 & = 6848 & + 32 & = 6930 & 0 \\
 16.7465'' & + 8373'' & - 2593'' & & + 55'' & & 16.6370''
 \end{array}$$

$$\begin{array}{rclclcl}
 \text{Tables } a & = -1.0 & e & = -1.0 & a-e & = 0 & b+d & = 0 \\
 \text{Obs } & = -502.5 & = -503.3 & & = +.8 & & & = -.9 \\
 & & & & & & & \\
 a-c & = -501.5 & = -502.3 & & & & & = -0.9
 \end{array}$$



| 11336      |         | Plate Center & Constants |    |       |    |     |      | 19 |
|------------|---------|--------------------------|----|-------|----|-----|------|----|
| X          | Y       | x                        |    | y     |    | s   |      |    |
| 11.9379    | 13.1798 | 7                        | 10 | 32.9  | 22 | 06  | 47.7 |    |
| 30.9770    | 27.9919 | 7                        | 24 | 53.6  | 29 | 5   | 70.7 |    |
| 32.3093    | 9.7600  | 7                        | 22 | 75.3  | 21 | 37  | 9.8  |    |
| 3) 79.2192 | 50.8812 | 21                       | 53 | 131.3 | 67 | 48  | 98.2 |    |
| 29.7397    | 16.7607 | 7                        | 18 | 23.9  | 22 | 36  | 32.7 |    |
| 22         | 18      |                          | -1 | 27.7  |    | +10 | 7.4  |    |
| +2.7397    | +1.2396 | 7                        | 16 | 55.7  | 22 | 46  | 70.1 |    |
| 32         | 790     |                          |    |       |    |     |      |    |

$$\begin{array}{rclcl}
 X-3 & +502X & +116.94 & +2.07X & -15670 \\
 + & -1 + 5719 = +17100 & +1591 = +15691 & +29 = +15670 & 0 \\
 -2910 + 15238 = +12328 & +3266 = 15594 & +76 = 15670 & & 0 \\
 -1709 + 16152 = +14443 & +1191 = 15289 & +81 = 15670 & & 0 \\
 22.3512 & +11176 & +1958 & +56 & 22.103
 \end{array}$$

$$\begin{array}{rclcl}
 Y-4 & +580Y & -116Y & +3.34 & -6930 \\
 +1625 + 6590 = +8215 & -1327 = +6888 & +93 = +6931 & & + \\
 -3598 + 13971 = 10373 & -3535 = 6838 & +92 = 6930 & & 0 \\
 +5765 + 9880 = 10645 & -3797 = 6898 & +32 = 6930 & & 0 \\
 16.7965 + 8373 & -2592 & +55 = 16.6271 & & 
 \end{array}$$

$$\begin{array}{lclcl}
 \text{Tables } a = -1.0 & e = -1.0 & a-e = 0 & b+d = 0 \\
 U_b = -502.5 & -503.3 & = +.8 & = -.9
 \end{array}$$

Cur. Corr

| $\xi$  | $\eta$ | $\Delta \xi$ | $- \Delta \eta$ | $+ \Delta \xi$ | $- \Delta \eta$ |
|--------|--------|--------------|-----------------|----------------|-----------------|
| -11.70 | -5.09  | -44          | +98             | +4             | -1              |
| +8.76  | +10.26 | +38          | -37             | +1             | +2              |
| +10.97 | -8.87  | +49          | -79             | +5             | -2              |
| +0.10  | -1.36  | 0            | 0               | 0              | -3              |
|        |        |              |                 |                | $-3 = -0.01$    |

| $\Delta \xi$ | $- \Delta \eta$ | $+ \Delta \xi$ | $- \Delta \eta$ |
|--------------|-----------------|----------------|-----------------|
| -20          | +23             | +3             | -1              |
| +46          | -46             | 0              | +1              |
| -40          | +40             | 0              | +1              |
| 0            | +6              | 0              | +5              |
|              |                 |                | $+5 = +0.3$     |

 $- .5 = p M$

11336

## Standard Coordinates

15

| Cape Nr 1030 Mg 7.7 |     |        |          | Cape Nr 1048 Mg 9.0 |      |         |  | Cape Nr 1050 Mg 6.3 |     |         |  |
|---------------------|-----|--------|----------|---------------------|------|---------|--|---------------------|-----|---------|--|
| C                   | 7   | 9      | 37.93    | 7                   | 20   | 55.75   |  | 7                   | 21  | 48.27   |  |
| L                   |     | WpM    | 35.00    |                     | WpM  | 55.51   |  |                     | Pm  | 48.26   |  |
| E                   |     |        | 37.93    |                     |      | 55.75   |  |                     | 3.2 | 48.23   |  |
| Mean                | 7   | 9      | 37.93    | 7                   | 20   | 55.77   |  | 7                   | 21  | 48.27   |  |
| Psec                |     |        | 57.95    |                     |      | 58.13   |  |                     |     | 57.07   |  |
| $\alpha$            | 7   | 10     | 32.70    | 7                   | 21   | 53.60   |  | 7                   | 22  | 45.28   |  |
| A                   | 7   | 16     | 55.0     | 7                   | 16   | 55.0    |  | 7                   | 16  | 55.0    |  |
| $\alpha-A$          | -6  |        | 22.60    | +7                  |      | 58.60   |  | +05                 |     | 50.28   |  |
| Sum( $\alpha-A$ )   |     |        | -382.55  |                     |      | +298.58 |  |                     |     | +350.24 |  |
| log $\alpha$        | 2   | 58     | 268      | 2                   | 7    | 506     |  | 2                   | 59  | 737     |  |
| log $\beta$         | 9   | 96     | 682      | 9                   | 96   | 091     |  | 9                   | 96  | 833     |  |
| log $\gamma$        | 1   | 05     | 674      | 0                   | 97   | 271     |  | 1                   | 01  | 994     |  |
| $\Sigma$            | -11 | 39     | 58       | +8                  | 76   | 72      |  | +10                 | 76  | 98      |  |
| $\Sigma$            |     | -7     | 4        |                     | +3   | 8       |  |                     | +4  | 9       |  |
| $\Sigma$            | 10  | 58     | 98       | 30                  | 76   | 80      |  | 32                  | 77  | 77      |  |
| $\Sigma$            | 11  | 73     | 79       | 30                  | 77   | 70      |  | 32                  | 30  | 73      |  |
| $\Sigma-\Sigma$     | +8  | 38     | 81       | -                   | 29   | 10      |  | -                   | 17  | 04      |  |
|                     |     |        |          |                     |      |         |  |                     |     |         |  |
| C                   | +22 | 08     | 27.8     | +27                 | 7    | 37.6    |  | +21                 | 38  | 58.5    |  |
| L                   |     | (p.m.) | 25.0     |                     | p.m. | 37.7    |  |                     |     | 59.0    |  |
| E                   |     |        | 27.7     |                     |      | 37.6    |  |                     |     | 58.8    |  |
| Mean                | 22  | 08     | 27.8     | 27                  | 7    | 37.6    |  | 21                  | 38  | 58.8    |  |
| Psec                |     | -1     | 37.0     |                     | -1   | 51.9    |  |                     | -1  | 57.0    |  |
| $\delta$            | 22  | 6      | 47.8     | 27                  | 5    | 45.7    |  | 21                  | 37  | 04.8    |  |
| D                   | 22  | 78     | 0        | 22                  | 76   | 00      |  | 22                  | 76  | 00.0    |  |
| $\delta-D$          | -   | 39     | 12.2     | +1                  | 19   | 45.7    |  | -1                  | 08  | 55.2    |  |
| tan( $\delta-D$ )   |     |        | -23.52.3 |                     |      | +4786.5 |  |                     |     | -7135.8 |  |
| log $\alpha$        | 3   | 37     | 199      | 3                   | 68   | 001     |  | 3                   | 61  | 656     |  |
| log $\beta$         | 0   | 70     | 264      | 1                   | 01   | 116     |  | 0                   | 94  | 771     |  |
| log $\gamma$        | 9   | 60     | 89       | 9                   | 65   | 05      |  | 9                   | 59  | 80      |  |
| log $\delta$        | 2   | 11     | 34       | 1                   | 88   | 54      |  | 2                   | 03  | 99      |  |
| log $\eta$          | 8   | 77     | 57       | 8                   | 58   | 93      |  | 8                   | 69  | 13      |  |
| $\eta_0$            | -5  | 04     | 29       | +10                 | 26   | 27      |  | -8                  | 86  | 56      |  |
| $\eta_1$            | +0  | 05     | 97       | +0                  | 38   | 8       |  | +0                  | 49  | 1       |  |
| $\eta$              | 13  | 01     | 73       | 28                  | 30   | 12      |  | 9                   | 18  | 35      |  |
| $\eta$              | 13  | 17     | 98       | 27                  | 97   | 17      |  | 9                   | 76  | 00      |  |
| $\eta-\eta$         | +16 | 25     |          | -                   | 35   | 98      |  | +5                  | 76  | 5       |  |



| Standard Coordinates |         |      |       |                     |         |       |      |                     |         |  |  |                     | 5 |
|----------------------|---------|------|-------|---------------------|---------|-------|------|---------------------|---------|--|--|---------------------|---|
| 11336                |         |      |       | Cape Mr 1030 Mr 7.9 |         |       |      | Cape Mr 1048 Mr 9.0 |         |  |  | Cape Mr 1050 Mr 5.3 |   |
| C                    | 7       | 9    | 39.73 | 7                   | 20      | 55.95 | 7    | 21                  | 98.29   |  |  |                     |   |
| L                    | ruph.   |      |       | 35.00               | ruph.   |       |      | 55.51               | ruph.   |  |  | 98.26               |   |
| E                    |         |      |       | 39.73               |         |       |      | 55.75               |         |  |  | 98.23               |   |
| Mean                 | 7       | 9    | 39.75 | 7                   | 20      | 55.97 | 7    | 21                  | 98.29   |  |  |                     |   |
| Pre                  |         |      |       | 57.95               |         |       |      | 58.13               |         |  |  | 57.09               |   |
| $\alpha$             | 7       | 10   | 32.90 | 7                   | 21      | 33.60 | 7    | 22                  | 45.28   |  |  |                     |   |
| A                    | 7       | 16   | 55.0  | 7                   | 16      | 55.0  | 7    | 16                  | 55.0    |  |  |                     |   |
| A-A                  | -6      | 22   | 60    | +7                  | 58      | 60    | +05  | 50                  | 28      |  |  |                     |   |
| Sum(A)               |         |      |       | -382.55             |         |       |      | +298.58             |         |  |  | +350.24             |   |
| log                  | 2       | 58   | 268   | 2                   | 97      | 506   | 2    | 59                  | 137     |  |  |                     |   |
| log                  | 9       | 96   | 682   | 9                   | 96      | 091   | 9    | 96                  | 832     |  |  |                     |   |
| log                  | 1       | 05   | 674   | 0                   | 99      | 271   | 1    | 01                  | 994     |  |  |                     |   |
| $\Sigma$             | -11     | 39   | 58    | +8                  | 76      | 72    | +10  | 76                  | 78      |  |  |                     |   |
| $\Sigma$             |         |      |       | -74                 |         |       |      | +38                 |         |  |  | +79                 |   |
| $\Sigma$             | 10      | 59   | 98    | 30                  | 76      | 80    | 32   | 77                  | 77      |  |  |                     |   |
| $\Sigma$             | 11      | 73   | 79    | 30                  | 97      | 70    | 32   | 30                  | 93      |  |  |                     |   |
| A-3                  | +8      | 38   | 81    | -2                  | 91      | 0     | -1   | 70                  | 9       |  |  |                     |   |
| C                    | +22     | 08   | 29.8  | +29                 | 7       | 37.6  | +21  | 38                  | 58.3    |  |  |                     |   |
| L                    | (ruph.) |      |       | 25.0                | (ruph.) |       |      | 37.7                | (ruph.) |  |  | 57.6                |   |
| E                    |         |      |       | 29.7                |         |       |      | 37.6                |         |  |  | 58.2                |   |
| Mean                 | 22      | 08   | 29.8  | 29                  | 7       | 37.6  | 21   | 38                  | 58.8    |  |  |                     |   |
| Pre                  |         |      |       | -1                  | 37.5    | -1    | 51.9 | -2                  | 59.6    |  |  |                     |   |
| $\alpha$             | 22      | 6    | 47.8  | 29                  | 5       | 45.7  | 21   | 37                  | 04.8    |  |  |                     |   |
| D                    | 22      | 98   | 0     | 22                  | 98      | 00    | 22   | 98                  | 00      |  |  |                     |   |
| $\Sigma$ -D          | -39     | 12.2 | +1    | 19                  | 45.7    | -1    | 08   | 55.2                |         |  |  |                     |   |
| Sum(D)               |         |      |       | -2352.3             |         |       |      | +4786.5             |         |  |  | -7135.8             |   |
| log                  | 3       | 37   | 199   | 3                   | 68      | 001   | 3    | 61                  | 656     |  |  |                     |   |
| log                  | 0       | 70   | 269   | 1                   | 01      | 116   | 0    | 94                  | 771     |  |  |                     |   |
| log                  | 9       | 60   | 89    | 9                   | 65      | 05    | 9    | 59                  | 80      |  |  |                     |   |
| $\Sigma$             | 2       | 11   | 39    | 1                   | 88      | 59    | 2    | 03                  | 99      |  |  |                     |   |
| $\Sigma$             | 8       | 77   | 57    | 8                   | 58      | 93    | 8    | 69                  | 13      |  |  |                     |   |
| $\Sigma$             | -5      | 09   | 29    | +10                 | 26      | 29    | -8   | 86                  | 56      |  |  |                     |   |
| $\Sigma$             | +0      | 05   | 97    | +0                  | 38      | 8     | +0   | 99                  | 1       |  |  |                     |   |
| $\Sigma$             | 13      | 01   | 73    | 28                  | 30      | 12    | 9    | 18                  | 34      |  |  |                     |   |
| $\Sigma$             | 13      | 17   | 98    | 27                  | 99      | 19    | 9    | 76                  | 00      |  |  |                     |   |
| $\Sigma$ - $\Sigma$  | +16     | 25   | -3    | 59                  | 8       | +5    | 76   | 5                   |         |  |  |                     |   |



11336

Moon's Center

16

| $X$         | $x - x_0$ | $\Delta X$ | $(x - x_0)^2$ | $(x - x_0) + (y - y_0)$ | $O - C$ |
|-------------|-----------|------------|---------------|-------------------------|---------|
| 1 22 93 39  | + 0.5829  | 0          | 0.3398        | 3.3884                  | + 6     |
| 2 23 00 00  | + 0.6490  | 0          | 0.4212        | 3.3923                  | + 7.5   |
| 3 24 03 18  | + 1.6808  | 0          | 2.8251        | 3.3816                  | - 62    |
| 4 +24 19 19 | + 1.8409  | 0          | 3.3889        | 3.3889                  | + 11    |
| 5 24 17 50  | + 1.8240  | 0          | 3.3270        | 3.3915                  | + 37    |
| 6 24 00 00  | + 1.6490  | 0          | 2.7192        | 3.3867                  | - 11    |
| 7 23 69 92  | + 1.3482  | 0          | 1.8176        | 3.3901                  | + 23    |
| 8 23 00 00  | + 0.6490  | 0          | 0.4212        | 3.3961                  | + 83    |

| $Y$        | $y - y_0$ | $\Delta Y$ | $(y - y_0)^2$ | $R^2$ | $L$     |
|------------|-----------|------------|---------------|-------|---------|
| 1 15 00 00 | - 1.7460  | - 1        | 3.0486        | 16.2  | -       |
| 2 15 02 24 | - 1.7236  | - 1        | 2.9711        | 15.9  | -       |
| 3 16 00 00 | - 0.7460  | - 0        | 0.5565        | 11.4  | -       |
| 4 16 74 60 | 0.0000    | 0          | 0.0000        | 9.0   | -       |
| 5 17 00 00 | + 0.2540  | + 0        | 0.0645        | 8.2   | -       |
| 6 17 56 30 | + 0.8170  | + 0        | 0.6675        | 6.4   | -       |
| 7 18 00 00 | + 1.2540  | + 0        | 1.5725        | 4.7   | -       |
| 8 18 47 08 | + 1.7248  | + 1        | 2.9749        | 2.1   | - 1.41° |

$$Y = 23$$

$$Y = 15.0224$$

$$18.4708$$

$$23.4932$$

$$16.7766$$

$$\text{comp. } R \quad 1.8406$$

$$X_{\text{max}} \quad 24.1919$$

$$X_0 \quad 22.3513$$

$$\text{Center } x_0 \quad 22.3510$$

$$y_0 \quad 16.7460$$



11336

Moon's center

16

|   | $x$      | $x - x_0$ | $\Delta x$ | $(x - x_0)^2$ | $(x - x_0) / (y - y_0)$ | $O - C$ |
|---|----------|-----------|------------|---------------|-------------------------|---------|
| 1 | 22.9339  | +0.5829   | 0          | 0.3398        | 3.3884                  | +6      |
| 2 | 23.0000  | +0.6490   | 0          | 0.4212        | 3.3923                  | +9.5    |
| 3 | 29.0318  | +1.6808   | 0          | 2.8251        | 3.3816                  | -62     |
| 4 | +29.1919 | +1.8409   | 0          | 3.3889        | 3.3889                  | +11     |
| 5 | 29.1750  | +1.8240   | 0          | 3.3270        | 3.3915                  | +37     |
| 6 | 29.0000  | +1.6490   | 0          | 2.7192        | 3.3867                  | -11     |
| 7 | 23.6992  | +1.3782   | 0          | 1.8176        | 3.3901                  | +23     |
| 8 | 23.0000  | +0.6490   | 0          | 0.4212        | 3.3961                  | +83     |

|   | $y$     | $y - y_0$ | $\Delta y$ | $(y - y_0)^2$ | $\bar{x} = 3.3878$ | $\bar{y}$ |
|---|---------|-----------|------------|---------------|--------------------|-----------|
| 1 | 15.0000 | -1.7460   | -1         | 3.0486        | 16.2               |           |
| 2 | 15.0224 | -1.7236   | -1         | 2.9711        | 15.9               |           |
| 3 | 16.0000 | -0.7460   | -0         | 0.5565        | 11.4               |           |
| 4 | 16.7960 | 0.0000    | 0          | 0.0000        | 9.0                |           |
| 5 | 17.0000 | +0.2590   | +0         | 0.0645        | 8.2                |           |
| 6 | 17.5630 | +0.8170   | +0         | 0.6675        | 6.4                |           |
| 7 | 18.0000 | +1.2590   | +0         | 1.5725        | 4.7                |           |
| 8 | 18.9708 | +1.7298   | +1         | 2.9749        | 2.1                | 191°      |

 $y = 23$  $y = 15.0224$ 

18.9708

32.9932

 $y_0$  16.7966

Comp. R 11.8906

 $x_{max}$  29.1919 $x_0$  22.3513center  $x_0$  22.3510 $y_0$  16.7960

# Formation of Normals

|          |   |       |   |       |
|----------|---|-------|---|-------|
| 1 - 1.02 | + | 3.5   | - | 10.5  |
| 2 - 1.12 | + | 29.2  | - | 77.5  |
| 3 - 1.26 | - | 109.0 | + | 46.5  |
| 4 - 1.0  | + | 20.0  |   | 0     |
| 5 + 0.45 | + | 67.5  | + | 9.0   |
| 6 + 1.35 | - | 18.2  | - | 9.0   |
| 7 + 1.69 | + | 31.0  | + | 29.0  |
| 8 + 1.12 | + | 54.0  | + | 143.0 |
| + 4.61   | + | 205.2 | + | 227.5 |
| - 3.90   | - | 122.2 | - | 97.0  |
| + 1.21   | + | 83.0  | + | 130.5 |

|   |      | a    | b   | c    | new<br>a-c ✓ |
|---|------|------|-----|------|--------------|
|   |      | + 14 | + 2 | - 21 | 0            |
|   |      | + 16 | + 2 | - 19 | + 81         |
| a | + 25 | + 42 | + 1 | + 6  | - 56         |
| b | - 1  | + 46 | 0   | + 9  | + 12         |
| c | - 37 | + 45 | - 0 | + 8  | + 37         |
|   |      | + 41 | - 1 | + 3  | - 25         |
|   |      | + 34 | - 1 | - 4  | - 1          |
|   |      | + 16 | - 2 | - 23 | + 39 ✓       |

11336

## Conditional Equations

|                       |                |         |
|-----------------------|----------------|---------|
| 1 + 0.58 - 1.75 = +6  | + 3 - 18 = -15 | 6-C +21 |
| 2 + 0.65 - 1.72 = +45 | + 3 - 18 = -15 | + 60    |
| 3 + 1.68 - 0.75 = -62 | + 8 - 8 = 0    | -62     |
| 4 + 1.84 0.00 = +11   | + 8 0 = +8     | + 3     |
| 5 + 1.82 + 0.25 = +37 | + 8 + 3 = +11  | +26     |
| 6 + 1.65 + 0.82 = -11 | + 8 + 9 = +17  | -28     |
| 7 + 1.35 + 1.25 = +23 | + 6 + 19 = +20 | + 3     |
| 8 + 0.65 + 1.72 = +83 | + 3 + 18 = +21 | +62     |
|                       | + 175 = 90     |         |

$$15.26 + 1.21 = +83.0 + 0.22 \Delta \text{age } 33$$

$$+ 1.21 + 11.85 = +130.5 - 0.18 \Delta$$

$$+ [ ] + 1.0 = + 6.6$$

$$-0.25 \Delta$$

$$+ 11.75 = +123.9$$

$$A = + 10.5$$

$$15.26 = +83.0 - 12.7 = +70.3$$

$$A = + 7.6$$

$$+ 0.67 \Delta$$

Arc Measured  $171^\circ$ 

$$\frac{P}{n} = .115$$

$$\frac{\Sigma V}{n} = +10.6$$

$$\text{In } 5 - R 1.84$$

$$\frac{+10.6}{.115} = +92$$

$$\Delta R = +1.2$$

$$-2RC = -1.84$$

$$\text{Cor } +0.5$$

$$\Delta b = +0.05$$

$$\Delta d = 0.0$$

$$\Delta P = +0.7$$

$$\Delta q = -1.23$$

$$\Delta \gamma = -0.09$$



11336

## Conditional Equations

|   |       |       |   |     |    |     | 6-C       |
|---|-------|-------|---|-----|----|-----|-----------|
| 1 | +0.58 | -1.75 | = | +6  | +3 | -18 | = -15 +21 |
| 2 | +0.65 | -1.72 | = | +93 | +3 | -18 | = -15 +60 |
| 3 | +1.68 | -0.75 | = | -62 | +8 | -8  | = 0 -62   |
| 4 | +1.89 | 0.00  | = | +11 | +8 | 0   | = +8 +3   |
| 5 | +1.82 | +0.25 | = | +37 | +8 | +3  | = +11 +26 |
| 6 | +1.65 | +0.82 | = | -11 | +8 | +9  | = +17 -28 |
| 7 | +1.35 | +1.25 | = | +23 | +6 | +19 | = +20 +3  |
| 8 | +0.65 | +1.72 | = | +83 | +3 | +18 | = +21 +62 |
|   |       |       |   |     |    |     | +175 -90  |

$$15.26 + 1.21 = +83.0$$

Average 33

$$+1.21 + 11.85 = +130.5$$

$$+ [ ] + .40 = +6.6$$

$$+11.75 = +123.9$$

$$t = +10.5$$

$$15.26 = +83.0 - 12.7 = +70.3$$

$$a = +9.6$$

Are Measured 191°

$$\frac{p}{h} = .115$$

$$\frac{\Sigma V}{h} = +10.6$$

$$\frac{+10.6}{.115} = +92$$

$$\Delta R = +1.2$$



## 11336 Moon's Mean Position

18

$$\chi_0 \ 22.3510''$$

$$+2''$$

$$\gamma_0 \ 16.7760''$$

$$+5''$$

## From Plate Constants

$$\chi \ 22.1032''$$

$$\gamma \ 16.6370''$$

$$\xi \ +.1032''$$

$$\eta \ -1.3630''$$

$$\log \zeta \ 9.01368''$$

$$\cos \delta \ 9.96533''$$

$$8.50727''$$

$$0.54911''$$

$$\log \tan \delta \ 9.6194''$$

$$\zeta'' \ 8.0279''$$

$$7.0537''$$

$$4.7002''$$

$$\delta - A \ 3.78''$$

$$\eta_1 \ 0''$$

$$A \ 7 \ 16 \ 55.0''$$

$$\log h_0 \ 0.13450''$$

$$\delta_0 \ 7 \ 16 \ 58.98''$$

$$7.33115''$$

$$2.80333'' - 635.8''$$

$$\text{Red} \ +4.12''$$

$$\delta - D \ -10 \ 35.8''$$

$$\delta' \ 7 \ 17 \ 02.60''$$

$$D \ 22 \ 46 \ 00.0''$$

$$\delta_0 \ 22 \ 35 \ 24.2''$$

$$\text{Red} \ -3.7''$$

$$\delta' \ 22 \ 35 \ 20.5''$$



## 11326 Moon's Mean Position

18

$$\lambda_0 \ 22.3510''$$

$$+ 2''$$

$$y_0 \ 16.7960''$$

$$+ 5''$$

## From Plate Constants

$$\lambda \ 22.1032''$$

$$y \ 16.6370''$$

$$z \ +.1032''$$

$$n \ -1.2630''$$

$$\log 39.01368''$$

$$\cos 29.96533''$$

$$8.50729$$

$$0.59911''$$

$$\log \tan 2 \ 9.6199$$

$$5'' \ 8.0279''$$

$$7.0539$$

$$9.7002''$$

$$\lambda - A \ 39.8''$$

$$n \ 0$$

$$A \ 7 \ 16 \ 55.0''$$

$$\log n_0 \ 0.13750''$$

$$\lambda_0 \ 7 \ 16 \ 58.98''$$

$$7.33115''$$

$$2.803334'' - 635.8''$$

$$\text{Red} \ +9.12$$

$$\lambda - D \ -10 \ 35.8''$$

$$\lambda' \ 7 \ 17 \ 02.60''$$

$$D \ 22 \ 96 \ 00.0''$$

$$\lambda_0 \ 22 \ 35 \ 29.2''$$

$$\text{Red} \ -3.7$$

$$\lambda' \ 22 \ 35 \ 20.5''$$

$$\begin{array}{r}
 7 \quad 15 \quad 10.61 \\
 \underline{6.50} \\
 + 7.11
 \end{array}$$

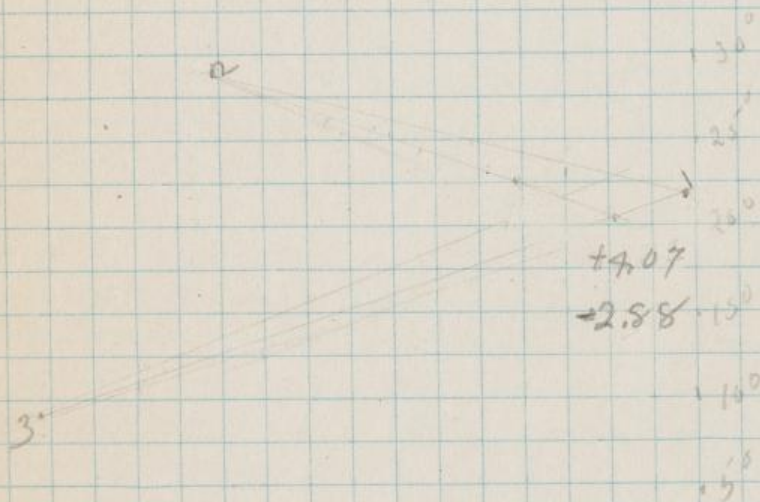
$$\begin{array}{r}
 22 \quad 08 \quad 13.58 \\
 \underline{16.82} \\
 - 3.28
 \end{array}$$

$$\begin{array}{r}
 7 \quad 20 \quad 34.96 \\
 \underline{30.71} \\
 + 4.25
 \end{array}$$

$$\begin{array}{r}
 27 \quad 57 \quad 51.83 \\
 \underline{57.79} \\
 - 5.96
 \end{array}$$

$$\begin{array}{r}
 7 \quad 22 \quad 39.47 \\
 \underline{35.79} \\
 + 3.68
 \end{array}$$

$$\begin{array}{r}
 8 \quad 27 \quad 39.80 \\
 \underline{39.07} \\
 + 0.76
 \end{array}$$



3 2 20 19 18 17 16 15

11336

## Reduction to Apparent Place

$$\begin{array}{rcl}
 H + \alpha & 11 & 305 = 172 \ 37.5 \ \delta \quad 22 \ 35.7 \\
 H & 7 & 13.5 \\
 \alpha & 27 & 17.0 \\
 G & 23 & 16.8 \\
 G + \alpha & 6 & 338 \quad 98 \ 27.0
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos \delta & & 9.9653 \\
 & + & 0.8693 \\
 & & 0.8346
 \end{array}$$

$$\begin{array}{rcl}
 \cos(G + \alpha) & 9.16724 \\
 q & 1.3756 \\
 \sin \delta & 9.9953 \\
 \tan \delta & 9.6191 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin \delta & & 9.5845 \\
 \cos(H + \alpha) & 9.99644 \\
 h & 1.2807 \\
 \sin(H + \alpha) & 9.1084 \\
 \sec \delta & 0.0347 \\
 & 8.8239
 \end{array}$$

$$\begin{array}{rcl}
 \log q' & 0.51284 \\
 q & 9.7839
 \end{array}$$

$$\begin{array}{rcl}
 h' & 0.86164 \\
 h & 9.2777
 \end{array}$$

$$\begin{array}{rcl}
 f & +3.331 \\
 q & +0.608 \\
 h & +0.177 \\
 & +7.116
 \end{array}$$

$$\begin{array}{rcl}
 q' & -3.257 \\
 h' & -7.271 \\
 i & +6.833 \\
 & -3.695
 \end{array}$$



11336

## Reduction to Apparent Place

|              |    |      |    |          |          |         |
|--------------|----|------|----|----------|----------|---------|
| H + $\alpha$ | 14 | 30.5 | =  | 172 37.5 | $\delta$ | 22 35.9 |
| H            | 9  | 13.5 |    |          |          |         |
| $\alpha$     | 27 | 17.0 |    |          |          |         |
| G            | 23 | 16.8 |    |          |          |         |
| G + $\alpha$ | 6  | 33.8 | 98 | 27.0     |          |         |

log cos  $\delta$  9.9653  
 $\alpha$  + 0.8693  
 $\alpha$  0.8346

cos (G +  $\alpha$ ) 9.1672 n  
 $\alpha$  1.3756  
 sum " 9.9953  
 tan  $\delta$  9.6191  
 8.8239

log sum  $\delta$  9.5895  
 cos (H +  $\alpha$ ) 9.9967 n  
 $\alpha$  1.2807  
 sum (H +  $\alpha$ ) 9.1089  
 sec  $\delta$  0.0247  
 8.8239

log  $q'$  0.5128 n  
 $q$  9.7839

$h'$  0.8616 n  
 $h$  9.2977

$f$  + 3.331  
 $g$  + 0.608  
 $h$  + 0.177  
 + 4.116

$q'$  - 3.257  
 $h'$  - 7.271  
 $\alpha$  + 6.833  
 - 3.695



11306

## Lunar Parallax

20

$\alpha$  1 7 17 02.60<sup>v</sup>  
 $\delta$  6 18 29.95<sup>v</sup>  
 $\delta - \alpha$  40 38 33.15<sup>v</sup>  
 $= -18 38 17.25<sup>v</sup>$   
 $\alpha (1-\alpha)$  - 5 30.67<sup>v</sup>  
 $\delta - 14 32 46.68<sup>v</sup>$

$\pi$  57 18.33<sup>v</sup>  
 $9.86913$   
 $8.19855<sup>v</sup>$   
 $9.80263<sup>v</sup>$   
 $0.03565<sup>v</sup>$   
 $7.50596<sup>v</sup>$

$9.95727$   
 $0.00000$   
 $0.01415<sup>v</sup>$   
 $9.97142<sup>v</sup>$

$\delta - \alpha$  - 11 01.28<sup>v</sup>  
 $= -77.09$

$\delta$  43 6 57.6<sup>v</sup>  
 $\delta$  22 35 20.5<sup>v</sup>  
 $\delta - \alpha$  20 31 37.1<sup>v</sup>

$9.82640$   
 $8.19855<sup>v</sup>$   
 $9.54487<sup>v</sup>$   
 $0.16528<sup>v</sup>$   
 $7.73510<sup>v</sup>$

$\delta - \alpha$  + 18 40.8<sup>v</sup>

$\delta$  22 54 01.3<sup>v</sup>       $\delta$  07 16 18.51<sup>v</sup>

$\text{Ephd} + 22 57 03.8<sup>v</sup>$        $\text{Ephd. } 07 16 17.77<sup>v</sup>$

$O-C$  - 2.5<sup>v</sup>       $O-C$  + 1.07

$\text{Circ Cor}$  + 0.3       $=$  - 0.01

$2^{\text{nd}} \text{ Order Ref.}$  0.0

$\text{Im Cor}$  0.0      - 0.07

$\delta + 22 57 01.3$        $\delta$  07 16 18.77

$O-C$  - 2.5<sup>v</sup>      + 1.00



11326

## Lunar Parallax

20

$\lambda' \quad 7 \quad 17 \quad 02.60''$   
 $\phi \quad 6 \quad 18 \quad 29.75''$   
 $\delta - \lambda' 40 \quad 58 \quad 33.15''$   
 $= -19 \quad 38 \quad 17.25''$   
 $\lambda (1-\lambda') - 5 \quad 30.69''$   
 $\times -14 \quad 32 \quad 96.66''$

$\pi \quad 59 \quad 18.33''$   
 $9.86913$   
 $8.19855''$   
 $9.90263''$   
 $0.03565''$   
 $7.50596''$

$9.95727$   
 $0.00000$   
 $0.01915''$   
 $9.97142''$

$\lambda - \lambda' - 11 \quad 02.28''$   
 $= -99.09$

$\lambda \quad 43 \quad 6 \quad 57.6''$   
 $\delta \quad 22 \quad 35 \quad 20.5''$   
 $\delta - \lambda \quad 20 \quad 31 \quad 37.1''$

$9.82640$   
 $8.19855''$   
 $9.99987''$   
 $0.16528''$   
 $7.73510''$

$\delta - \lambda' \quad 18 \quad 40.8''$

$\delta \quad 22 \quad 59 \quad 01.3''$

$\lambda \quad 01 \quad 16 \quad 18.51''$

$\text{Ephed} + 22 \quad 59 \quad 03.8''$

$\text{Ephed} \quad 07 \quad 16 \quad 17.97''$

$O-C \quad -2.5''$

$O-C \quad +4.09$

$\text{curr Corr} \quad +0.3$

$-0.01$

$2^{\text{nd}} \text{ Alden Ref} \quad 0.0$



11337

Star Measures

9

Poor plate

11

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 1    | 19880          | 20568          | 19960          | 20020          |
| 11   | 18826          | 11624          | 16292          | 13688          |
| 13A  | 28             | 38             | 88             | 86             |
|      | 72             | 62             | 66             | 32             |
|      | <u>11.1052</u> | <u>11.1069</u> | <u>13.3672</u> | <u>13.3660</u> |
| 2    | 19692          | 20082          | 20792          | 19669          |
| 30.3 | 27102          | 12690          | 11016          | 19422          |
| 27.9 | 06             | 92             | 28             | 20             |
|      | 98             | 76             | 94             | 58             |
|      | <u>30.2589</u> | <u>30.2613</u> | <u>27.9776</u> | <u>27.9758</u> |
| 3    | 20572          | 20388          | 19468          | 19828          |
| 31.9 | 11192          | 19800          | 11616          | 17680          |
| 9.8  | 34             | 98             | 12             | 64             |
|      | 72             | 88             | 62             | 38             |
|      | <u>31.9434</u> | <u>31.9411</u> | <u>9.7848</u>  | <u>9.7836</u>  |

Moon Measures

|      |  |                |                  |                |
|------|--|----------------|------------------|----------------|
| 1    |  |                | 19788            | 19451          |
| 22.5 |  |                | 11302            | 17950          |
| 14.9 |  |                | 18               | 44             |
| 4    |  |                | 98               | 62             |
|      |  |                | <u>14.8982</u>   | <u>14.8999</u> |
| 2    |  |                |                  |                |
| 23   |  | 19722          | <del>18268</del> | 20493          |
| 14.9 |  | 10699          | <del>9228</del>  | 19580          |
|      |  | 02             | <del>638</del>   | 980            |
|      |  | 26             | <del>68</del>    | 502            |
|      |  | <u>14.9028</u> | <u>14.9035</u>   | <u>14.8985</u> |
| 3    |  |                |                  |                |
| 24   |  | 20430          | 19638            | 19600          |
| 15.6 |  | 15022          | 14252            | 14982          |
|      |  | 36             | 74               | 56             |
|      |  | 30             | 50               | 587            |
|      |  |                | <u>15.5396</u>   | <u>15.5356</u> |

fairly good



11337

## Star Measures

9

Poor plate

11

|      |               |               |               |               |
|------|---------------|---------------|---------------|---------------|
| 1    | 19880         | 20568         | 19960         | 20020         |
| 11.1 | 18826         | 11624         | 16292         | 13688         |
| 13.9 | 28            | 38            | 88            | 88            |
|      | 72            | 62            | 66            | 32            |
|      | <u>111052</u> | <u>111064</u> | <u>133672</u> | <u>133660</u> |

|      |                |                |                |                |
|------|----------------|----------------|----------------|----------------|
| 2    | 19692          | 20082          | 20792          | 19669          |
| 30.3 | 17102          | 12690          | 11016          | 19422          |
| 27.9 | 06             | 92             | 28             | 20             |
|      | 98             | 76             | 94             | 58             |
|      | <u>30.2589</u> | <u>30.2613</u> | <u>27.9776</u> | <u>27.9758</u> |

|      |                |                |               |               |
|------|----------------|----------------|---------------|---------------|
| 3    | 2057.2         | 20388          | 19962         | 19828         |
| 31.9 | 11192          | 19800          | 11616         | 17680         |
| 9.8  | 39             | 98             | 12            | 64            |
|      | 72             | 88             | 62            | 38            |
|      | <u>31.9934</u> | <u>31.9911</u> | <u>9.7848</u> | <u>9.7836</u> |

## Moon Measures

|      |  |  |                |                |
|------|--|--|----------------|----------------|
| 1    |  |  | 19788          | 19951          |
| 22.5 |  |  | 11302          | 17950          |
| 19.9 |  |  | 18             | 44             |
| -4   |  |  | 92             | 62             |
|      |  |  | <u>19.8982</u> | <u>19.8999</u> |

|      |  |               |                  |                |
|------|--|---------------|------------------|----------------|
| 2    |  | 19722         | <del>18268</del> | 20993          |
| 23   |  | 10699         | <del>9228</del>  | 19480          |
| 19.9 |  | 02            | <del>938</del>   | 980            |
|      |  | 26            | <del>68</del>    | 502            |
|      |  | <u>149028</u> | <u>199035</u>    | <u>14.8985</u> |

|      |  |       |                |                |
|------|--|-------|----------------|----------------|
| 2    |  | 20930 | 19638          | 19690          |
| 29   |  | 15022 | 14252          | 19980          |
| 15.6 |  | 36    | 94             | 56             |
|      |  | 30    | 50             | 589            |
|      |  |       | <u>15.5396</u> | <u>15.5356</u> |



11337

Moon Measure

12

|      |                |                |
|------|----------------|----------------|
| 2    | 20 420         | 19704          |
| 24.3 | 17738          | 12406          |
| 16   | 28             | 04             |
|      | 18             | 06             |
|      | <u>24.2687</u> | <u>24.2699</u> |

|      |                |                |
|------|----------------|----------------|
| 5    | 20462          | 19658          |
| 24.4 | 16286          | 13728          |
| 16.7 | 82             | 28             |
| 18   | 62             | 59             |
|      | <u>24.9078</u> | <u>24.9070</u> |

|      |                |                |
|------|----------------|----------------|
| 6    | 19490          | 20639          |
| 24.3 | 15692          | 14440          |
| 17   | 88             | 42             |
|      | 92             | 40             |
|      | <u>24.3801</u> | <u>24.3801</u> |

|      |                |                |
|------|----------------|----------------|
| 7    | 19660          | 19602          |
| 23.9 | 11032          | 18208          |
| 18   | 36             | 209            |
|      | 76             | 03             |
|      | <u>23.8639</u> | <u>23.8603</u> |

|      |                |                |
|------|----------------|----------------|
| 8    | 20082          | 19162          |
| 23.0 | 15222          | 19018          |
| 18.4 | 20             | 08             |
|      | 89             | 72             |
|      | <u>18.4862</u> | <u>18.4896</u> |



11337

Moon Measure

12

|          |                |                |
|----------|----------------|----------------|
| <u>4</u> | 20 420         | 19 709         |
| 29.3     | 1 7738         | 1 2906         |
| 16       | 28             | 09             |
|          | 18             | 06             |
|          | <u>29.2687</u> | <u>29.2699</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>5</u> | 20 462         | 19 658         |
| 29.9     | 16 286         | 13 728         |
| 16.7     | 82             | 28             |
| 48       | 62             | 59             |
|          | <u>29.9078</u> | <u>29.9070</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>6</u> | 19 490         | 20 639         |
| 29.3     | 15 692         | 14 990         |
| 17       | 88             | 92             |
|          | 92             | 90             |
|          | <u>24.3801</u> | <u>24.3801</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>7</u> | 19 660         | 19 602         |
| 23.9     | 11 032         | 18 208         |
| 18       | 36             | 209            |
|          | 76             | 03             |
|          | <u>23.8639</u> | <u>23.8603</u> |

|          |                |                |
|----------|----------------|----------------|
| <u>8</u> | 20 082         | 19 162         |
| 23.0     | 15 222         | 19 018         |
| 18.9     | 20             | 08             |
|          | 89             | 72             |
|          | <u>18.9862</u> | <u>18.9896</u> |



11337

Times Etc

13

Oct 17

Exp. to stars

6 37

6 49

" " Moon

6 42 38.8

6 42 39.1

Clock fast

10 39.5

H. Sid Time

6 31

59.75

4-4 = - 04 45.4

H Long

4 44

31.05

G. Sid T.

11

16

30.50

Sid T. M.M.

13

42

37.30

Interval

21

33

53.20

Reduction

3

31.97

G. M. T.

21

30

21.23

From Naut. Alman.

R. A.

Dec.

Moon 21<sup>h</sup>

7

15

72.06

+22

55

51.9

Motion in 1<sup>h</sup>

1

3.0961

6.412

" " 30.3538

1

3.63

-3

14.6

Tabular Place

7

16

45.69

+22

52

37.3

Moon's Age 21 days -

Pallat

54

18.25

Semi-d.

14

49.5

R.

889.5

Aug.

13.2

X<sub>h</sub> (4)

-0.6

R.

902.1

R.

1.9337

aR

-928

(1+4)/P

1.8409

R<sup>2</sup>

3.3889

934 19.59

a = -5.04

+27

-480



11337 Times Etc

A

Oct 17

|               |   |    |       |   |          |
|---------------|---|----|-------|---|----------|
| App. to stars | 6 | 37 |       | 6 | 99       |
| " " Moon      | 6 | 92 | 38.8" | 6 | 92 39.1" |
| Clock fast    |   | 10 | 39.5" |   |          |

|              |    |    |        |     |       |       |
|--------------|----|----|--------|-----|-------|-------|
| H. 2nd Time  | 6  | 31 | 57.95" | 4.8 | - 0.4 | 75.4" |
| H. Long      | 9  | 99 | 31.05" |     |       |       |
| G. 2nd Y.    | 11 | 16 | 30.50" |     |       |       |
| Sec 7. H. H. | 13 | 92 | 37.30" |     |       |       |
| Interval     | 21 | 33 | 53.20" |     |       |       |
| Reduction    |    | 3  | 31.98" |     |       |       |
| G. M. Y.     | 21 | 30 | 21.23" |     |       |       |

| Trans. Hant. Alms.       |   |    | R. G.   |     | Use. |        |
|--------------------------|---|----|---------|-----|------|--------|
| Moon 21"                 | 7 | 13 | 72.06"  | +22 | 55   | 51.9"  |
| Motion in 1 <sup>m</sup> |   | 1  | 20.961" |     |      | 6.912" |
| " " 30.3538              |   | 1  | 3.63    |     | -3   | 19.6   |
| Tatular Place            | 7 | 16 | 75.69"  | 722 | 52   | 37.3"  |

Mercuria Age 21 days -

|                |    |         |
|----------------|----|---------|
| Parallax       | 59 | 18.26"  |
| Secid.         | 19 | 99.5"   |
| R              |    | 889.5"  |
| Aug            |    | 13.2"   |
| Xhr. 111       |    | -0.6"   |
| R              |    | 902.1"  |
| R              |    | 1.9337" |
| AR             |    | -92.8"  |
| (1+9)/R        |    | 1.8909" |
| R <sup>2</sup> |    | 3.3889" |

939 19.59

$$\begin{array}{r}
 a = -5.09 \\
 + 2.9 \\
 \hline
 -9.80
 \end{array}$$



11337

## Plate Constants

29

|       |         |         |         |
|-------|---------|---------|---------|
| $x$   | 11.1058 | 30.2601 | 31.9922 |
| $y$   | 10.5998 | 30.7680 | 32.9797 |
| $x-y$ | +5060   | -5079   | -5325   |

|            |         |         |        |
|------------|---------|---------|--------|
| $\eta$     | 13.3666 | 27.9767 | 9.7892 |
| $\xi$      | 130173  | 283012  | 91835  |
| $\eta-\xi$ | +3493   | -3245   | +6007  |

$$\begin{array}{rcll}
 x-z & +500x & +33.1y & +9x & -11099 \\
 +5060 + 5553 & = +10613 & + 942 & = +11055 & + 99 = +11099 & 0 \\
 -5079 + 15130 & = 10051 & + 926 & = 10977 & + 121 = 11098 & -1 \\
 -5325 + 15971 & = 10646 & + 325 & = 10971 & + 128 = 11099 & 0 \\
 22.5658 & + 11283 & + 552 & + 90 & 22.6989
 \end{array}$$

$$\begin{array}{rcll}
 \eta-\xi & +500y & -33.6x & +5.5y & -9880 \\
 +3493 + 6683 & = +10176 & -372 & = +9804 & + 75 = +9879 & -1 \\
 -3245 + 13988 & = 10743 & -1017 & = 9726 & + 159 = 9880 & 0 \\
 +6007 + 9892 & = 10899 & -1073 & = 9826 & + 59 = 9880 & 0 \\
 16.6919 & + 8346 & - 758 & + 92 & 16.9719
 \end{array}$$

Tables

$$\begin{array}{rcll}
 a = -7.0 & e = -1.0 & a-e = 0 & b+d = 0 \\
 \text{Obs} & -509 & = -505.5 & = +1.5 & = +0.5 \\
 0-c & -503.0 & -507.5 & & +0.5
 \end{array}$$



11357

## Plate Constants

29

|     |         |         |         |
|-----|---------|---------|---------|
| 1   | 11.1058 | 30.2601 | 31.9922 |
| 3   | 10.5998 | 30.7680 | 32.9797 |
| 1-3 | +5060   | -5079   | -5325   |

|     |         |         |        |
|-----|---------|---------|--------|
| 4   | 13.3666 | 27.9767 | 9.7892 |
| 4   | 130178  | 28.3012 | 9.1835 |
| 4-4 | +3493   | -3295   | +6007  |

$$\begin{array}{rcll}
 1-3 & +500A & +33.14 & +9K & -11099 \\
 +5060 + 5553 & = +10613 + 942 & = +11055 + 99 & = +11099 & 0 \\
 -5079 + 15130 & = 10051 + 926 & = 10977 + 121 & = 11098 & -1 \\
 -5325 + 15971 & = 10646 + 325 & = 10971 + 128 & = 11099 & 0 \\
 225658 & +11283 & +552 & +90 & 22.6989
 \end{array}$$

$$\begin{array}{rcll}
 4-4 & +5004 & -33.6A & +554 & -988 \\
 +3493 + 6683 & = +10176 - 372 & = +9804 + 75 & = +9879 & - \\
 -3295 + 13988 & = 10793 - 1017 & = 9726 + 159 & = 9885 & - \\
 +6007 + 4892 & = 10899 - 1073 & = 9826 + 59 & = 9885 & - \\
 16.6919 & +8396 & -758 & +93 & 16.9715
 \end{array}$$

Tables  $a = -1.0$   $e = -1.0$   $a-e = 0$   $b+d = 0$   
 (lbs)  $-509$   $-505.5$   $+1.5$   $+0.5$

$\lambda = 0$   
 $B = +, \lambda$

11337

Moon's Center

25

|   | X       | X - X <sub>0</sub> | ΔX | (X - X <sub>0</sub> ) <sup>2</sup> | (X - X <sub>0</sub> ) + (Y - Y <sub>0</sub> ) <sup>2</sup> | O - C |
|---|---------|--------------------|----|------------------------------------|------------------------------------------------------------|-------|
| 1 | 22.5660 | 0.0000             | 0  | 0.0000                             | 3.4018                                                     | +125" |
| 2 | 23.0000 | +0.4340            | 0  | 0.1884                             | 3.4011                                                     | +122  |
| 3 | 24.0000 | +1.4340            | 0  | 2.0564                             | 3.3913                                                     | +29   |
| 4 | 24.2693 | +1.7033            | 0  | 2.9012                             | 3.3814                                                     | -75   |
| 5 | 24.4074 | +1.8414            | 0  | 3.3908                             | 3.3908                                                     | +19   |
| 6 | 24.3801 | +1.8141            | 0  | 3.2910                             | 3.3852                                                     | -37   |
| 7 | 23.8621 | +1.2961            | 0  | 1.6799                             | 3.3884                                                     | -5    |
| 8 | 23.0000 | +0.4340            | 0  | 0.1884                             | 3.4014                                                     | +125  |

R<sup>2</sup> 3.3889

|   | Y        | Y - Y <sub>0</sub> | ΔY | (Y - Y <sub>0</sub> ) <sup>2</sup> | L       |
|---|----------|--------------------|----|------------------------------------|---------|
| 1 | -14.8488 | -1.8442            | -1 | 3.4018                             | 1800    |
| 2 | 14.9007  | -1.7923            | -1 | 3.2127                             | 166     |
| 3 | 15.5376  | -1.1554            | 0  | 1.3349                             | 129     |
| 4 | 16.0000  | -0.6930            | 0  | 0.4802                             | 112     |
| 5 | 16.6930  | 0.0000             | 0  | 0.0000                             | 90      |
| 6 | 17.0000  | +0.3070            | 0  | 0.0942                             | 80      |
| 7 | 18.0000  | +1.3070            | +1 | 1.7085                             | 75      |
| 8 | 18.8854  | +1.7924            | +1 | 3.2130                             | 14 166° |

X = 23

Y 14.9007

18.8854

3.3861

Y<sub>0</sub> 16.6930Y<sub>max</sub> 18.8488

R 1.8442 1.8409

X<sub>max</sub> 24.4074X<sub>0</sub> 22.5632

Center { X<sub>0</sub> 22.5660  
 Y<sub>0</sub> 16.6930



11337

Moon's Center

|   | X       | X - $x_0$ | $\Delta x$ | $(X - x_0)^2$ | $(X - x_0) + (Y - y_0) = O - C$ |      |
|---|---------|-----------|------------|---------------|---------------------------------|------|
| 1 | 22.5660 | 0.0000    | 0          | 0.0000        | 3.9018                          | +125 |
| 2 | 23.0000 | +0.4340   | 0          | 0.1884        | 3.9011                          | +122 |
| 3 | 29.0000 | +1.4340   | 0          | 2.0564        | 3.3913                          | +29  |
| 4 | 29.2693 | +1.7033   | 0          | 2.9012        | 3.3819                          | -75  |
| 5 | 29.4079 | +1.8419   | 0          | 3.3908        | 3.3908                          | +19  |
| 6 | 29.3801 | +1.8141   | 0          | 3.2910        | 3.3852                          | -37  |
| 7 | 23.8621 | +1.2961   | 0          | 1.6799        | 3.3884                          | -5   |
| 8 | 23.0000 | +0.4340   | 0          | 0.1884        | 3.9014                          | +125 |

R 3.3889

|   | Y        | Y - $y_0$ | $\Delta y$ | $(Y - y_0)^2$ |      |      |
|---|----------|-----------|------------|---------------|------|------|
| 1 | -19.8988 | -1.8992   | -1         | 3.9018        | 1800 |      |
| 2 | -19.9007 | -1.7923   | -1         | 3.2127        | 166  |      |
| 3 | -15.5376 | -1.1559   | 0          | 1.3399        | 129  |      |
| 4 | -16.0000 | -0.6930   | 0          | 0.4802        | 112  |      |
| 5 | -16.6930 | 0.0000    | 0          | 0.0000        | 90   |      |
| 6 | -17.0000 | +0.3070   | 0          | 0.0942        | 80   |      |
| 7 | -18.0000 | +1.3070   | +1         | 1.7085        | 95   |      |
| 8 | -18.9859 | +1.7929   | +1         | 3.2130        | 14   | 1660 |

X = 23

Y 19.7007

18.9859

3.3861

Y 16.6930

Y max 19.8988

R 1.8992

X max 29.4079

X 22.5632

Center {  $x_0$  22.5660  
 {  $y_0$  16.6930

# Formation of Normal.

|   |              |          |              |          |              |
|---|--------------|----------|--------------|----------|--------------|
| 1 | -0.0         | +        | 0.0          | -        | 230.0        |
| 2 | -0.77        | +        | 52.5         | -        | 218.5        |
| 3 | -1.64        | +        | 34.5         | -        | 27.5         |
| 4 | -1.17        | -        | 127.5        | +        | 51.5         |
| 5 | 0.0          | +        | 35.0         |          | 0.0          |
| 6 | +0.56        | -        | 67.0         | -        | 11.5         |
| 7 | +1.70        | -        | 6.5          | -        | 6.5          |
| 8 | +0.77        | +        | 58.0         | +        | 22.5         |
|   | <u>+3.03</u> | <u>+</u> | <u>176.0</u> | <u>+</u> | <u>74.0</u>  |
|   | <u>-3.58</u> | <u>-</u> | <u>201.0</u> | <u>-</u> | <u>99.0</u>  |
|   | <u>-0.55</u> | <u>-</u> | <u>25.0</u>  | <u>-</u> | <u>420.0</u> |

|   |     |      |     |     |         |
|---|-----|------|-----|-----|---------|
|   |     | + 0a | + b | c   | new     |
|   |     | + 4  | + 5 | -10 | 0-c     |
|   |     | + 14 | + 3 | -6  | +57     |
| a | +10 | + 17 | + 2 | +2  | +61     |
| b | -3  | + 18 | 0   | +3  | -6      |
| c | -15 | + 18 | -1  | +2  | -88     |
|   |     | + 13 | -4  | -6  | +22' 28 |
|   |     | + 7  | -5  | -16 | -9      |
|   |     | +    |     |     | +36     |
|   |     |      |     |     | +163    |

1.070

$$-0.55 + 13.77 = -2.06 \Delta$$

$$+ \square - 0.02 = +0.36 \Delta$$

$$+13.72 = -1.70 \Delta$$

$$+13.69 = +8.97 \Delta - .07 \Delta = +8.87 \Delta$$

11337

## Conditional Equations

2%  
0 - C

|   |        |       |        |             |      |       |      |
|---|--------|-------|--------|-------------|------|-------|------|
| 1 | 0      | -1.89 | = +125 | 0           | + 58 | = +58 | +67  |
| 2 | + 0.43 | -1.79 | = +122 | -1          | + 56 | = +55 | +67  |
| 3 | + 1.43 | -1.15 | = +24  | -4          | + 36 | = +32 | -8   |
| 4 | + 1.70 | -0.69 | = -75  | -5          | + 22 | = +17 | -92  |
| 5 | + 1.89 | 0.00  | = +19  | -6          | 0    | = -6  | +25  |
| 6 | + 1.81 | +0.31 | = -37  | -6          | - 10 | = -16 | -11  |
| 7 | + 1.30 | +1.31 | = -5   | -4          | - 41 | = -45 | +40  |
| 8 | + 0.43 | +1.79 | = +125 | -1          | - 56 | = -57 | +181 |
|   |        |       |        | + 380 = 111 |      |       |      |
|   |        |       |        | Average 47  |      |       |      |

$$13.69 - 0.55 = -25.0 \quad + 8.99 \Delta$$

$$-0.55 + 13.49 = -420.0 \quad - 206 \Delta$$

$$+12.7 - .02 = -1.0$$

$$-0.13 \Delta$$

$$+13.42 = -421.0$$

$$b = -31.3$$

$$+13.69 = -25.0 - 17.2 = -42.2$$

$$a = -3.08$$

$$+0.65 \Delta$$

are measured  $166^\circ$ 

$$\frac{P}{4} = 23$$

$$\frac{\Sigma V}{2} = +33.6$$

$$\ln 7 \quad R = 1.89$$

$$+ \frac{33.6}{23} = +1.46$$

$$\Delta R = +1.8$$

$$-2RC = -0.79$$

$$\text{Corr} +0.2$$

$$\Delta \delta = +0''.17$$

$$\Delta \delta = +0''.1$$

$$\Delta R = +1.6$$

$$\Delta a = +0''.8$$

$$\Delta \gamma = -0''.02$$



11337

## Conditional Equations

26  
0 - 6

|   |        |       |        |    |      |       |      |
|---|--------|-------|--------|----|------|-------|------|
| 1 | 0      | -1.89 | = +125 | 0  | + 58 | = +58 | +67  |
| 2 | + 0.93 | -1.79 | = +122 | -1 | + 56 | = +55 | +67  |
| 3 | + 1.43 | -1.15 | = +29  | -4 | + 36 | = +32 | -8   |
| 4 | + 1.70 | -0.69 | = -75  | -5 | + 22 | = +17 | -92  |
| 5 | + 1.89 | 0.00  | = +19  | -6 | 0    | = -6  | +25  |
| 6 | + 1.81 | +0.31 | = -37  | -6 | - 10 | = -16 | -11  |
| 7 | + 1.30 | +1.31 | = -5   | -9 | - 91 | = -95 | +90  |
| 8 | + 0.93 | +1.79 | = +125 | -1 | - 56 | = -57 | +181 |

+ 380 = 111  
Average 97

$$13.69 - 0.55 = -25.0$$

$$-0.55 + 12.79 = -920.0$$

$$+ [ ] - .02 = -1.0$$

$$+ 13.92 = -921.0$$

$$t = -31.3$$

$$+ 13.69 = -25.0 - 17.2 = -92.2$$

$$a = -3.08$$

are Measured 166°

$$\frac{P}{h} = 22$$

$$\frac{\Sigma V}{h} = +33.6$$

$$\frac{+33.6}{.23} = +146 \quad \Delta P = +1.8$$



## 11337 Moons Mean Position

27

$$\alpha_0 \ 22.5660''$$

$$\gamma_0 \ 16.6930''$$

$$-2''$$

$$-16''$$

$$22.5638''$$

$$16.6914''$$

## From Plate Constants

$$\alpha \ 22.6989''$$

$$\gamma \ 16.9715''$$

$$\delta \ +.6989''$$

$$\eta \ -1.5285''$$

$$\log \epsilon \ 9.81189''$$

$$\log \tan \delta \ 9.6190''$$

$$\log \epsilon \ 9.96540''$$

$$\epsilon \ 96237''$$

$$8.50724''$$

$$7.0534''$$

$$1.33920''$$

$$6.2961''$$

$$\alpha - A \ +21.89''$$

$$\eta \ +.0002''$$

$$A \ 7 \ 16 \ 55.0''$$

$$\log h_0 \ 0.18432''$$

$$7.33115''$$

$$\gamma_0 \ 7 \ 17 \ 16.84''$$

$$2.853174 - 713.1''$$

$$Red \ +8.12''$$

$$S-D \ -11 \ 53.1''$$

$$\alpha' \ 7 \ 17 \ 20.96''$$

$$D \ 2.2 \ 46 \ 00.0''$$

$$S_0 \ 2.2 \ 34 \ 06.9''$$

$$Red \ -3.9''$$

$$S'' \ 2.2 \ 34 \ 32''$$



## 11337 Moons Mean Position

27

$$\begin{array}{r} \gamma_0 \quad 22.5660'' \\ \quad \quad -2'' \\ \hline 22.5658'' \end{array}$$

$$\begin{array}{r} \gamma_0 \quad 16.6930'' \\ \quad \quad -16'' \\ \hline 16.6914'' \end{array}$$

## From Plate Constants

$$\lambda \quad 22.6989''$$

$$\gamma \quad 16.9715''$$

$$\lambda \quad +.6989''$$

$$\gamma \quad -1.5285''$$

$$\begin{array}{r} \log \lambda \quad 9.81189'' \\ \log \gamma \quad 9.96540'' \\ \quad \quad 8.50729'' \\ \quad \quad 1.33920'' \end{array}$$

$$\begin{array}{r} \log \tan \delta \quad 9.6190'' \\ \quad \quad \quad \quad 7.6237'' \\ \quad \quad \quad \quad 7.0539'' \\ \quad \quad \quad \quad 6.2961'' \end{array}$$

$$\lambda - A \quad +21.89''$$

$$\gamma_1 \quad +0.002''$$

$$A \quad 7 \quad 16 \quad 55.0''$$

$$\log h_0 \quad 0.18432''$$

$$7.33115''$$

$$\gamma_0 \quad 7 \quad 17 \quad 16.89''$$

$$2.853174 - 713.1$$

$$\text{Red} \quad +7.12''$$

$$S-D \quad -11 \quad 53.1''$$

$$\lambda' \quad 7 \quad 17 \quad 20.96''$$

$$D \quad 22 \quad 46 \quad 00.0''$$

$$S_0 \quad 22 \quad 39 \quad 06.9''$$

$$\text{Red} \quad -3.7''$$

$$S' \quad 22 \quad 39 \quad 32''$$



11337

Lunar Parallax

28

$\alpha^1$  7 17 20.96<sup>✓</sup>  $\pi$  59 18.26<sup>✓</sup>  
 $\delta$  6 31 59.95<sup>✓</sup>  
 $\delta - \alpha^1 - 0$  45 21.51<sup>✓</sup> 9.86913<sup>✓</sup>  
 $-$  11 20 22.65<sup>✓</sup> 8.19855<sup>✓</sup>  
 $\delta(1+1)$  - 4 17.20<sup>✓</sup> 9.29364<sup>✓</sup>  
 $2$  - 11 16 5.4<sup>✓</sup> 0.03558<sup>✓</sup>  
 7.39698<sup>✓</sup>

9.95727

0.00000

0.00875<sup>✓</sup>9.96572<sup>✓</sup> $\delta - \alpha^1$  - 8 34.73= - 37.29<sup>✓</sup> $\delta$  72 44 27.6<sup>✓</sup> $\delta$  22 39 32<sup>✓</sup> $\delta - \alpha$  20 10 24.4<sup>✓</sup>

9.82670

8.19855<sup>✓</sup>9.53767<sup>✓</sup>0.16833<sup>✓</sup>7.73095<sup>✓</sup> $\delta - \delta^1$  + 18 30.1<sup>✓</sup> $\delta$  22 52 33.3<sup>✓</sup> $\alpha$  7 16 46.67<sup>✓</sup>Eph. 5 +22 52 37.3<sup>✓</sup>Eph. 4 7 16 45.69<sup>✓</sup>O-C -4.0<sup>✓</sup>O-C +0.98<sup>✓</sup>

Cum Corr +0.3

-0.01

2nd Order Ref. 0.0

Inv Corr +0.1

-0.02

 $\delta$  +22 52 33.4 $\alpha$  7 16 46.65<sup>✓</sup>

O-C -3.9

+0.96



11337

Lunar Parallax

23

$$\begin{array}{rcl}
 1' & 7 & 17 \quad 20.96'' \\
 & 6 & 31 \quad 59.95'' \\
 6-11-0 & 45 & 21.51'' \\
 & -11 & 20 \quad 22.65'' \\
 1/2(1-1) & - & 4 \quad 17.20'' \\
 & -11 & 16 \quad 59'' \\
 & & 7.396901''
 \end{array}$$

9.95727

0.00000

0.00875

9.96572

1-1'

-8

39.93

=

-39.29

8 72 44 27.6

8 22 39 3.2

8-2 20 10 24.4

9.82690

8.19855

9.53767

0.16833

7.73095

2-0' 18 30.1

+ 22 52 33.3

Eph 5 +22 52 37.3

8 7 16 96.67

Eph 4 7 16 95.69

O-C -1.0

O-C

+0.98

Crown Corr +0.3

-0.01

2nd Order Ref 0.0

Inv Corr +0.1

-0.02

+22 52 33.9

8 7 16 96.65

-C -3.9

+0.96





