

KG

11366

K1024

CLXXII

172

Date

12028 Jan. 6. 1917 1

12043 " 11. " 11

12044 " " " 21

12028 June 4 Star Measures

1 19268 16002
 14.8 11519 13750
 13.7 12 50
 9268 02
147749 147748

188 65 16443
 121 92 13112
 94 93 12
 65 43
136672 136669

2 17569 16669
 23.9 8168 16080
 8.8 6466 80
 73 69
239407 239411

17109 16709
 9657 14160
 53 55 60
 13 09
87457 87451

3 17397 16101
 29.8 9120 14372
 19.4 30 25 72
 90 01
298274 298271

17930 16420
 13057 11286
 57 88
 36 20
194875 194867

Moon Measures.

1 16003
 24 7765
 13.9 65
 93
 85 28

16293 16575
 7765 15120
 65 30
 93 85
138528 138540

23 16480 16112
 23.0+ 16028 659085
 15 28 80
 80 20
230452 230465

12028 June 4 Star Measures

1

L 19268 16002
 48 11519 13750
 3.7 12 50
 9268 02
147749 147748

2 17569 16669
 239 8168 16080
 8.8 6466 80
 73 69
239407 239411

3 17397 16101
 29.8 9120 14372
 19.4 30 72
 90 01
298274 298271

18865 1644
 12192 1311
 94 1
 65 4
136672 13666

17888 1670
 9657 1416
 53 61
 13 0
87457 8745

17930 16420
 13057 11286
 57 88
 36 20
194875 194867

Moon Measures.

L 16293
 24 7765
 3.9 65
 93
 8528

23 16480 16112
 230 16028 659085
 15 28 80
 80 20
230452 230465

16293 16575
 7765 151802
 65 30
 93 85
138528 138540

2
1
4
2
1
6
23
17
6
2
1
2
9
1
2
1

12028

Moon Measures

2

3 19386 16758
 22.9 964045 1650001
 15.5 50 02

86 50
22.9741 22.9751

4
 230+ 18706 16422
 16 18360 6865
 60 65
 96 22
23.0436 23.0443

5 18115 16756
 23.8 10748 14148
 17.0 48 48
 15 66
23.7367 23.7382

6
 240
 17.1

18425 17242
 16815 8858
 15 58
 83 42
17.1614 17.1616

7
 247
 17.3

18798 18883
 1527879 1240409
 80 14
 08 91
17.3522 17.3518

8
 25
 17.3

18172 18576
 14713 12038
 13 38
 78 70
17.3461 17.3468

12028

Mean Measure

2

3 19386 16758
 22.9 964045 1650001
 15.5 50 02
 86 50
229741 229751

1.30+ 18706 16422
 6 18360 6865
 60 65
 96 22
230436 230443

18115 16758
 38 10748 14148
 7.0 48 48
 15 66
237367 237382

6
 240
 17.1

18488 17242
 16815 8858
 15 58
 33 42
171618 171616

1
 247
 17.3

18798 18883
 1527879 1240409
 80 14
 08 91
173522 173518

8
 25
 17.3

18172 18576
 14713 12038
 13 38
 78 70
173451 173468

12028

Times Etc -

Date Jan 6, 1917

Exp. to Stars	03	53	✓	04	05	✓
" " Moon	03	58	41.2	✓	03	58 41.4
Clock fast		12	48.6	✓		

H. Sid. Time	03	45	52.7	✓	$\alpha = -2^h 25^m$
H. Long.	04	44	31.05	✓	
b. Sid. Time	08	30	23.75	✓	
b. Sid. Time M.N.	19	01	58.43	✓	
Interval	13	28	25.32	✓	$13^h 43.69$ ✓
Red.		02	12.44		
G.M.T.	13	26	12.88		

From Hunt. Phil.

R.A.

Dec.

Moon 13 ^h	06	09	45.45	+25	02	26.6	✓
motion 1 ^m			2.2039	✓		-3.184	✓
" 26.2147			57.77	✓	-01	23.4	✓
Tabular Place.	06	10	43.22	+25	01	03.2	✓

Moon's Age 13d

934" = 13

$$\begin{array}{r} a = -502.9 \\ +24 \\ \hline -478.9 \end{array}$$

Parallax	54	26.2
Semi-diam	14	51.6
R		891.6
Ang.		11.9
Dist 4		-0.4
R		903.1
R		1.9359
(1+a)R		-927
R		1.8432
R2		3.3073

12028

Times Etc.

Date Jan 6 1917

Exp to Stars

03 53

04 05

" " mean

03 58

41.2

03 58 41.4

Clock fast

12 48.6

H Sid Time

03 45

52.7

 $\alpha - 2^h 25^m$

H Long.

04 44

31.05

b Sid Time

08 30

23.75

b Sid Time M.N.

19 01

58.43

Interval

13 28

25.32

13^h 43.69

Red.

02

12.44

b. M. T.

13 26

12.88

From Naut Alman

R.A.

Dec.

Moon 13^d

06 09

45.45

+ 25

02

26.6

motion 1^m

2.2039

- 3.184

" 26^d 1917

57.77

- 01

23.4

Lunar Place.

06 10

43.22

+ 25

01

03.2

Moon's Age 13^d

934" = 13

a = -502.9

+ 24

-478.9

Parallax
Semi-diam

54 26.2

14 51.6

R

891.6

Ang

11.9

Dist 4

- 0.4

R

903.1

R

1.9359

(1+a)R

- 9.27

R

184.32

R²

3.3973

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100

12028

Plate Constants

4

$$\begin{array}{rcl} X & 14.7748 & 23.9409 & 29.8272 \\ S & 14.1513 & 23.7634 & 29.9801 \end{array}$$

$$\begin{array}{rcl} y & 13.6671 & 8.7454 & 19.7871 \\ n & 13.6719 & 8.4723 & 19.7387 \end{array}$$

$$\begin{array}{rcl} X-S & +500X & +31.6y & +3.6X = -14.07 \\ +6235 + 7387 = & 13622 & +432 = 14054 & +53 = 14107 \\ +1775 + 11970 = & 13745 & +276 = 14021 & +86 = 14107 \\ -1529 + 14914 = & 13385 & +616 = 14001 & +107 = 14108 \\ 24.8182 + 12409 & & +490 & +89 = 24.7063 \checkmark \end{array}$$

$$\begin{array}{rcl} g-n & +500X & -31.6y & +5.7y = -6397 \\ -0048 + 6833 = & 6785 & -466 = 6319 & +78 = 6397 \\ +2731 + 4373 = & 7104 & -756 = 6348 & +50 = 6398 \\ -2516 + 9744 = & 7228 & -942 = 6286 & +111 = 6397 \\ 15.5087 + 7754 & & -784 & +89 = 15.5749 \checkmark \end{array}$$

$$\begin{array}{rcl} \text{Tables} - & 0.7 & -0.4 & -0.3 & +0.3 \\ \text{Obs} - & 503.6 & -505.7 & +2.1 & +0.0 \\ O-C & -502.9 & -505.3 & +2.4 & -0.3 \end{array}$$

12128

Plate Constants

4

X	14.7748	23.9409	29.8272
S	<u>14.1513</u>	<u>23.7634</u>	<u>29.9801</u>

y	13.6671	87454	19.4871
y	13.6719	84723	19.7387

X-S	+500x	+31.6y	+3.6x = -14107
+6235	+7387 =	13622 + 432 =	+4054 + 53 = 14107
+1975	+11970 =	13745 + 276 =	+4021 + 86 = 14107
1529	+14914 =	13385 + 616 =	+4070 + 107 = 14108
24.8182	+12409	+490	+89 = 24.716

-y +500x	-31.6x	+5.7y -6397
2048 + 6833 = 6785	-466 = 6319	+78 = 6397
2731 + 4373 = 7104	-756 = 6348	+50 = 6398
2516 + 9744 = 7228	-942 = 6286	+111 = 6397
15.5787 + 7754	-784	+89 = 15.5749

Tables - 0.4	- 0.4	- -0.3	+0.3
Obs - 503.6	-505.7	+21	+0.0
O-C - 502.9	-505.3	+24	-0.3

1
2
3
4
5
6
7
8

1
2
3
4
5
6
7
8

12028

Mass Center

5

 $R - X_0^2$

O - C

1	24.0000	-0.8170	+2	0.6671	34015	+	42
2	23.0458	-1.7712	+1	3.1368	3.3938	-	35
3 x	22.9746	-1.8424	+0	3.3944	3.3944	-	29
4	23.0440	-1.7730	-1	3.1439	3.3869	-	104
5	23.7375	-1.0795	-2	1.1657	3.3947	-	26
6	24.0000	-0.8170	-2	0.6678	34051	+	78
7	24.8170	0.0000	-2	0.0000	34040	+	67
8	25.0000	+0.1890	-2	0.0334	14168	+	195
					3.3973		

 $Y - Y_0^2$

1	13.8534	-1.6536	+0	2.7344	206	✓
2	15.0000	-0.5070	+0	0.2570	254	✓
3	15.5070	0.0000	+0	0.0000	270	✓
4	16.0000	+0.4930	-0	0.2430	285	✓
5	17.0000	+1.4930	-0	2.2290	324	✓
6	17.1615	+1.6545	-0	2.7373	334	✓
7	17.3520	+1.8450	-0	34040	360	✓
8 y	17.3464	+1.8394	-0	3.3834	6	✓

Arc 160

$$X = 24 \quad Y = 13.8534$$

$$17.1615$$

$$31.0149$$

$$Y_0 = 15.5074$$

$$Y_{\max} = 17.3464$$

$$R = 1.8390$$

$$O_{\max} R = 1.8432$$

$$X_{\min} = 22.9746$$

$$X_0$$

$$\left. \begin{array}{l} X_0 = 24.8170 \\ Y_0 = 15.5070 \end{array} \right\} \text{Mass Center}$$

2028

Moor's Center

5

 $R - Y_0$

O - C

1	24 0000	-08170 +2	0.6671	34015 +	42
2	23.0458	-1.7242 +1	3.1368	33938 -	35
3	22.9746	-1.8424 +0	3.3944	33944 -	29
4	23.0440	-1.7730 -1	3.1430	33869 -	104
5	23.7375	-1.0795 -2	1.1657	33947 -	26
6	24.0000	-08170 -2	0.6678	34051 +	78
7	24.8170	00000 -2	0.0000	34040 +	61
8	25.0000	+0.1830 -2	0.0334	14168 +	195
				33973	

 $14 - Y_0$

1	13.8534	-1.6536 +0	2.7344	2'0.6"
2	15.0000	-0.5070 +0	0.2570	254
3	15.5074	0.0000 +0	0.0000	270
4	16.0000	+0.4930 -0	0.2430	285
5	17.0000	+1.4870 -0	2.2290	324
6	17.1615	+1.6545 -0	2.7373	334
7	17.3520	+1.8450 -0	3.4040	360
8	17.3464	+1.8394 -0	3.3834	6

Arc 160'

$$X = 24 \quad Y = 13.8534$$

$$17.1615$$

$$31.0149$$

$$Y_0 = 15.5074$$

$$Y_{\max} = 17.3464$$

$$R = 1.8390$$

$$\text{Corr } R = 1.8432$$

$$X_{\min} = 22.9746$$

$$X_0$$

$$\left. \begin{array}{l} \text{Moor's Center} \\ X_0 = 24.8170 \\ Y_0 = 15.5070 \end{array} \right\}$$

Formation of Normals

1 + 1.35	- 34	- 69.3
2 + 0.90	+ 62	+ 18.0
3 + 0.00	+ 53.4	+ 0.0
4 - 0.86	+ 184.0	- 52.0
5 - 1.61	+ 28.0	- 39.0
6 - 1.36	- 64	+ 128.5
7 - 0.00	- 0.0	+ 123.0
8 + 0.33	+ 35	+ 358.0
+ 2.58	+ 362.4	+ 627.5
- 3.83	- 98.0	- 160.3
- 1.25	+ 264.4	+ 467.2

	a	b	c	0 - c
a = - 24	+ 20	- 20	- 39	+ 78
b = + 12	+ 43	- 6	- 2	+ 24
c = - 39	+ 44	- 0	+ 5	+ 20
	+ 43	+ 6	+ 10	- 34
	+ 26	+ 18	+ 5	- 44
	+ 20	+ 20	+ 1	+ 44
	+ 0	+ 22	- 17	- 10
	+ 4	+ 22	- 13	+ 125

12028

Conditional Equations, 0-c 6

1 - 0.82	- 1.65 = +42.	- 20	- 55	- 75	+ 117
2 - 1.77	- 0.51 = - 35	- 44	- 17	- 61	+ 26
3 - 1.84	- 0.00 = - 29	- 46	- 0	- 46	+ 15
4 - 1.77	+ 0.49 = - 104	- 44	+ 16	- 68	- 44
5 - 1.08	+ 1.49 = - 96	- 27	+ 50	+ 23	- 49
6 - 0.82	+ 1.65 = + 78	- 20	+ 55	+ 35	+ 43
7 - 0.00	+ 1.84 = + 67	- 0	+ 61	+ 61	+ 7
8 + 0.18	+ 1.84 = + 195	- 4	+ 61	+ 57	+ 138
	+ 7.81				
	216				
				+ 346	- 93
				or 53-	

$$+12.20 - 1.25 = +264.4 - 8.28$$

$$-1.25 + 14.90 = +467.2 + 5.65$$

$$+ () - 0.13 = + 27.0 - 0.85$$

$$+ 14.86 = + 494.2 + 4.80$$

$$+ 0.32$$

$$+ 33.84$$

$$+12.20 = +264.4 + 41.6 = +306.0$$

$$a. +25.0$$

$$- 0.64$$

$$\text{Arc} = 160^\circ$$

$$\frac{P}{n} = .22$$

$$\Delta R = \frac{+1.44}{.81} = +1.8$$

$$\frac{\Sigma V}{n} = +31.7$$

$$\text{Corr (4)} + 0.5$$

$$\frac{+31.7}{22}$$

$$\text{True } \Delta R = +1.3$$

$$R = 1.84$$

$$-2RC = -1.84$$

$$\Delta t = - 0.59$$

$$\Delta \delta = - 0.3$$

$$\Delta a = + 1.18$$

$$\Delta \alpha = + 0.04$$

12028

Conditional Equations. O - C b

1 - 0.82	- 1.65 = +42	- 20	- 55	- 75	+ 117	+ 78
2 - 1.77	- 0.51 = - 35	- 44	- 17	- 61	+ 26	+ 24
3 - 1.84	- 0.01 = - 29	- 46	- 0	- 46	+ 15	+ 20
4 - 1.77	+ 0.49 = - 104	- 44	+ 16	- 61	- 44	+ 27
5 - 1.08	+ 1.49 = - 26	- 27	+ 50	+ 23	- 49	+ 21
6 - 0.82	+ 1.65 = + 78	- 20	+ 55	+ 35	+ 43	+ 27
7 - 0.00	+ 1.84 = + 67	- 0	+ 61	+ 61	+ 7	+ 10
8 + 0.18	+ 1.84 = + 195	- 4	+ 61	+ 57	+ 138	+ 25

+346 - 93

or 55-

$$+12.20 - 1.25 = +264.4 - 8.28$$

$$-1.25 + 14.98 = +467.2 + 5.65$$

$$+ () - 0.13 = + 27.0 - 0.85$$

$$+ 14.86 = + 494.2 + 4.80$$

$$+ 0.3$$

$$b = +33.86$$

$$+12.20 = +264.4 + 41.6 = +306.0$$

$$a = +25.8$$

$$- 0.69$$

$$\text{Arc} = 16.0$$

$$\frac{P}{n} = .22$$

$$\Delta R = \frac{+1.91}{.22} = +1.8$$

$$\frac{\Sigma v}{n} = +31.7$$

$$\text{Corr. (9)} = +0.5$$

$$\frac{+31.7}{.22}$$

$$\text{True } \Delta R = +1.3$$

$$R = 1.84$$

$$-2RC = -1.84$$

$$\Delta t = -0.59$$

$$\Delta \delta = -0.3$$

$$\Delta a = +1.18$$

$$\Delta x = +0.04$$

12028

Moon's Mean Position

7

$$\begin{array}{r} \lambda_0 \quad 24.8170 \\ \quad + 12 \\ \hline 24.8182 \end{array}$$

$$\begin{array}{r} \eta_0 \quad 15.5070 \\ \quad + 17 \\ \hline 15.5087 \end{array}$$

Lunar Plate Constants

$$\begin{array}{r} S_0 \quad 24.7063 \\ \quad 22. \\ \hline + 2.7063 \end{array}$$

$$\begin{array}{r} 15.5749 \\ \quad 18 \\ \hline -2.4251 \end{array}$$

$$\log S_0 \quad 0.49238$$

$$\log \cos S_0 \quad 9.95837$$

$$8.50724$$

$$\log \sin(\alpha - A) \quad 1.96677$$

$$\sin(\alpha - A) \quad 92.63$$

$$(\alpha - A) \quad +01 \quad 32.63$$

$$A \quad 06 \quad 10 \quad 54.97$$

$$\alpha_0 \quad 06 \quad 12 \quad 27.80$$

$$\text{Red.} \quad +2.76$$

$$\alpha \quad 06 \quad 12 \quad 30.36$$

$$\log \tan \delta \quad 9.6624$$

$$\log S_0^2 \quad 0.8647$$

$$7.0534$$

$$\log \eta_1 \quad 7.5805$$

$$\eta_1 \quad 0.0038$$

$$\eta_0 \quad -2.4289$$

$$\log \eta_0 \quad 0.38541$$

$$7.33115$$

$$\log \tan(\delta - \delta_0) \quad 3.05426$$

$$\delta - \delta_0 \quad -11.33.1$$

$$-18 \quad 53.1$$

$$\delta \quad +25 \quad 00 \quad 16.6$$

$$\delta_0 \quad +24 \quad 41 \quad 23.5$$

$$\text{Red.} \quad +2.0$$

$$\delta \quad +24 \quad 41 \quad 25.5$$

12128

Moons Mean Position

7

$$\begin{array}{r} \gamma_0 \quad 24.8170 \\ \quad + 12 \\ \hline 24.8182 \end{array}$$

$$\begin{array}{r} \gamma_0 \quad 15.5070 \\ \quad + 17 \\ \hline 15.5087 \end{array}$$

Frame Plate Constants

$$\begin{array}{r} \gamma_0 \quad 24.7063 \\ \quad 22. \\ \hline + 2.7063 \end{array}$$

$$\begin{array}{r} 15.5749 \\ \quad 18 \\ \hline -2.4251 \end{array}$$

$$\begin{array}{r} \log S_0 \quad 0.43238 \\ \log \cos S_0 \quad 9.95837 \\ \quad 8.50724 \\ \log \sin(x-A) \quad 1.98677 \end{array}$$

$$\begin{array}{r} \log \tan S \quad 9.6624 \\ \log S_0^2 \quad 0.8647 \\ \quad 7.0534 \\ \log \eta_0 \quad 7.5805 \end{array}$$

$$\sin(x-A) \quad 92.63$$

$$\begin{array}{r} \eta_0 \quad 0.0038 \\ \eta_0 \quad -2.4289 \end{array}$$

$$(x-A) \quad +01 \quad 32.63$$

$$A \quad 06 \quad 10 \quad 54.97$$

$$\alpha_0 \quad 06 \quad 12 \quad 27.60$$

$$\text{Red} \quad +2.76$$

$$\alpha' \quad 06 \quad 12 \quad 30.36$$

$$\log \eta_0 \quad 0.38541 \sim$$

$$\log \tan \delta-E \quad 7.33115$$

$$\log \tan \delta-E \quad 3.05426$$

$$S.E. \quad -11.33.1$$

$$\begin{array}{r} -18 \quad 53.1 \\ \text{Red} \quad +25 \quad 00 \quad 16.6 \end{array}$$

$$S_0 \quad +24 \quad 41 \quad 23.5$$

$$\text{Red} \quad +2.0$$

$$S_0 \quad +24 \quad 41 \quad 25.4$$

12028

Lunar Parallax.

8

α' 06 12 30.36
 θ 03 45 52.70 ✓
 $\theta - \alpha'$ -02 26 37.66
 $=$ -36 39 24.90 ✓
 $\frac{1}{2}(\alpha - \alpha')$ - 18 16.00
 $(\theta - \alpha') - \frac{1}{2}$ -36 26 08.90 ✓

Π 54' 26.2 ✓

$\log \sin \Pi$ 9.86013-
 $\log \sin(\theta - \alpha')$ 8.19960-
 $\log \sec \delta'$ 0.04278 ✓
 $\sin(\alpha - \alpha')$ 7.88750 m

$\log \cos \frac{1}{2}(\alpha - \alpha')$ 9.95727
 $\log \tan \gamma$ 0.05173 ✓
 $\log \sec \gamma$ 0.09446 ✓

$(\alpha - \alpha')$ -26' 32.00

$=$ -1^m 46.13 ✓

γ 48 24 16.3

$\delta + 24$ 41 25.5

$\gamma - \delta' + 23$ 42 50.8

$\log \sin \Pi$ 9.82640
 $\log \sin \gamma - \delta'$ 8.19960 ✓
 $\log \sec \gamma$ 9.60442 ✓
 $\log \sin(\delta - \delta')$ 0.12619
 $\sin(\delta - \delta')$ 7.75661

$\delta - \delta'$ +19 37.7

$\delta + 25$ 01 03.1

$\gamma - \delta$ 25 01 03.2 ✓

$\theta - \epsilon$ -0.1 ✓

$\cos \gamma$ +0.2 ✓

2nd Clad. Ref. - 0.0

$\delta - + 25$ 01 03.3

$\theta - \epsilon -$ +0.1

α 06 10 44.28 -

$\gamma - \alpha$ 06 10 43.22 ✓

$\theta - \epsilon$ +1.01 ✓

$\cos \gamma$ -0.01 ✓

$\alpha -$ 06 10 44.22

$\theta - \epsilon -$ +1.00

12028

Lunar Parallax.

8

α' 06 12 30.36
 θ 03 45 52.70
 $\theta - \alpha'$ - 02 26 37.66
 $=$ - 3.6 30 24.90
 $(\alpha - \alpha')$ - 13 16 00
 $(\alpha') - \frac{1}{2}''$ - 36 26 08.90

9.95727
 $\log \frac{1}{2}(\alpha - \alpha')$ 0.00000
 $\log \frac{1}{2}(\theta - \alpha')$ 0.09446
 $\log \tan \gamma$ 0.05173

γ 48 24 16.3

$\delta' + 24241$ 254

$\gamma - \delta'$ + 23 42 50.8

9.82640
 $\log \sin \Pi$ 8.19960
 $\gamma - \delta'$ 9.68442
 $\sec \gamma$ 0.12619
 $(\delta - \delta')$ 7.75661

$\delta - \delta'$ + 19 37.7

δ + 25 01 03.1

eph δ 25 01 03.2

$\theta - \epsilon$ - 0.0

corr + 0.2

2nd Chd Ref. - 0.0

δ + 25 01 03.3

$\theta - \epsilon$ + 0.1

Π 54 26.2

9.86913
 $\log \sin \Pi$ 8.19960
 $\log \sin(\theta - \alpha')$ 9.77599
 $\log \sec \delta'$ 0.04278
 $\sin(\alpha - \alpha')$ 7.88750

$(\alpha - \alpha')$ - 26 32.00

$=$ - 1 46.13

α 06 10 44.23

eph α 06 10 43.22

$\theta - \epsilon$ + 1.01

corr - 0.01

α 06 10 44.22

$\theta - \epsilon$ + 1.00

15
122
19
242
33
15

4

2

1
23.8
122
24
13

12044

Star Measures

11

1 18757 17242
 15.1 17816 8194⁹⁵
 10.1 16 96
 57 7242
15.0941 15.0953

18219 18615
 17206⁰¹ 9627
 96 27
 19 15
10.1018 10.1012

2 17001 18404
 19.2 15165 10248
 24.0 65 48
 01 04
19.1836 19.1844

18579 17652
 17855 18384⁸¹
 55 78
 79 52
24.0724 24.0729

3 16955 16375
 33.9 7868 15450⁵⁵
 15.3 68 60
 55 75
33.9087 33.9080

18307 18710
 14446 12585¹
 46 85
 07 8710
15.3861 15.3875

4 18640 18803
 17478⁷⁶ 9957⁶⁰
 74 63
 40 8803
25.1164 25.1157

18161 16460
 8810 15822
 10 22
 61 60
4.9351 4.9362

Moon Measures

1 17252
 23.8 8288
 12.9 4
 52
 9661

17852 17318
 8788⁹¹ 16375
 94 75
 52 22
12.9061 12.9053

2 16680 16552
 24.3 11880 11355⁵⁶
 13 80 57
 80 42
24.4800 24.4809

1
15
102
19
243
33
154
38
242
24
13

12044

Star Measures

11

1 18757 17242
 151 17816 18194 95-
 10.1 16 96
 57 7242
15.0941 15.0959

18219 18615
 17206 01 9627
 96 27
 19 15
10.1018 10.1012

2 17001 18404
 19.2 15165 10248
 240 65 48
 01 04
19.1836 19.1844

18579 17652
 17855 1838481
 55 78
 79 52
24.0724 24.0729

3 16955 16375
 33.9 7868 15450 55-
 153 68 60
 55 75
33.9087 33.9081

18307 18710
 14446 125835
 46 85
 07 8710
15.3861 15.3875

18640 18803
 17478 76 9957 60
 74 63
 40 8803
5.1164 25.1157

18161 16460
 8810 15822
 10 22
 61 60
4.9351 4.9362

Moon Measures

1 17852
 3.8 17884
 2.9 94
 52
 9061

17852 17318
 878891 16375
 94 75
 52 22
12.9061 12.9053

2 16680 16552
 243 11880 11355 56
 13 80 57
 80 42
24.4800 24.4809

2
26
193

4
26
14

5
26
14

6
26
15

7
26
16

8
25
16.2

12044

Uran Measures

12

3
25
133

1 6 0 7 2	1 6 4 0 0
1 3 4 3 2	9 0 3 5 3
3 4 33	3 1
7 2	0 0
<u>1 3 2 6 3 9</u>	<u>1 9 2 6 3 3</u>

4	1 7 1 7 0	1 6 5 1 8
25.6	1 1 2 5 0	1 2 4 3 3
15.0	6 0	3 3
	7 0	1 8

<u>2 5 5 9 1 5</u>	<u>2 5 5 9 1 5</u>
--------------------	--------------------

5	1 7 1 8 0	1 6 5 0 5
25.7	9 6 8 6 87	1 4 0 0 3 02
14.5	8 8	0 1
	8 0	0 5

<u>2 5 7 4 9 3</u>	<u>2 5 7 4 9 7</u>
--------------------	--------------------

6	1 7 1 9 0	1 6 0 0 7
25.6	9 8 6 7 6 9	1 3 3 1 8
15	7 1	1 8
	9 0	0 7

<u>2 5 7 3 2 1</u>	<u>2 5 7 3 1 1</u>
--------------------	--------------------

7	1 6 4 8 2	1 6 9 7 7
25.2	1 3 9 8 6 9 1	9 4 6 0
16	9 6	6 0
	8 2	6 9 7 7

<u>2 5 2 4 9 1</u>	<u>2 5 2 4 8 3</u>
--------------------	--------------------

8	1 7 7 6 8	1 7 2 2 2
25	1 5 5 5 4	9 4 4 5 41
16.2	5 4	3 7
	6 8	2 2
	<u>1 6 2 2 1 4</u>	<u>1 6 2 2 1 9</u>

3

±

3.

4.

5

13.

4.

±

25

15

7

15.2

16

±

25

15.2

12044

Uran Measures

12

33

1 6 0 7 2

1 6 4 0 0

1 3 4 3 2

9 0 3 5 3

3 4 83

3 1

7 2

0 0

1 3 2 6 3 71 9 2 6 3 3

± 1 7 1 7 0 1 6 5 1 8

3.6 1 1 2 5 0 55 1 2 4 3 3

4.0 6 0 3 3

7 0 1 8

2 5 5 9 1 5 2 5 5 9 1 5

5 1 7 1 8 0 1 6 5 0 5

23.7 9 6 8 6 87 1 4 0 0 3 0 2

4.5 8 8 0 1

8 0 0 5

2 5 7 4 9 3 2 5 7 4 9 7

± 1 7 1 9 0 1 6 0 0 7

25.6 9 8 6 7 6 9 1 3 3 1 8

1.5 7 1 1 8

9 0 0 7

2 5 7 3 2 1 2 5 7 3 1 1

7 1 6 4 8 2 1 6 9 7 8

15.2 1 3 9 8 6 8 5 9 4 6 0

1.6 8 8 6 0

8 2 6 9 7 8

2 5 7 4 9 1 2 5 2 4 8 3

± 1 7 7 6 8

1 7 2 2 2

25 1 5 5 5 4

9 4 5 0 41

16.2 5 4

3 7

6 8

2 2

1 6 2 2 1 91 6 2 2 1 9

12043

Times Etc

Date Jan. 11, 1917

Exp to Stars	10	29		10	41
Exp to Moon	10	35	08.3	10	35 08.5
Clock just		12	58.2		
H. Sid. Time	10	22	10.2		
H. Long.	04	44	31.05	$\phi =$	$+14 1^m$
L. Sid. Time	15	06	41.25		
" " Time M.N.	19	21	41.22		
Interval	19	45	00.03		
Red.		03	14.13		
G. M. T.	19	41	45.90		19. 6961

From Naut. Almanac

			R.A.		Dec.
Moon 19 ^h	10	19	45.14	$\checkmark + 6^{\circ}$	25 04.2
Motion 1 ^m			1.8054		-12.531
" 41.765		01	15.40		-08 43.3
Lunar Place	10	21	00.54	$\checkmark + 6^{\circ}$	16 20.9

Moon's Age 18

934" = 12.6"

Parallax	54	10.83
Semi-diam	14	47.4
R		887.4
Aug		11.4
Sun (A)		-0.4
R		898.4
R		1.9258
(+a)R		-919
R		1.8339
R 2		3.3632

$$+ a = -501.2$$

$$+ 24.$$

$$- 477.2$$

Times for plate 12043 pages 21-31

12043

Junes Etc

Date Jan. 11, 1917

Exp. Stars	10	29		10	41
Exp. Moon	10	35	08.3	10	35 08.5
Clock just		12	58.2		

H. Sid Time	10	22	10.2		
H. Long.	04	44	31.05	$\epsilon = +1^h 1^m$	
S. Sid Time	15	06	41.25		
" Time M.N.	19	21	41.22		
Interval	19	45	00.03		
Red		03	14.13		
G. M.T.	19	41	45.90	19.6961	

From Haut Alimanga

			R.A.		Dec.
Upper 19 ^h	10	19	45.14	+06°	25 04.2
Lower 1 ^m			1.8054		-12.531
" 41.765"		01	15.40		08 43.3
Tabular Place	10	21	00.54	+06	1.6 20.9

Moon's Age 18

5

934" = 12.6

Parallax	54	10.83
Semi-diam	14	47.4
R		887.4
Ang		11.0
Dist		-0.4
R		898.0
R		1.925.0
1+2/R		-919
R		1.8339
R2		3.3632

+ 2 = -571.2

+ 24.

- 477.2

S	η_0	ΔS	-3.673	-1η	-5^v
-7.16	-8.58	-23	+26 = +3	+1 =	+4
-2.79	+6.07	-3	+10 = +7	-1 =	+6
+3.32	-14.07	+18	-12 = +6	+1 =	+7
+12.62	-3.16	+50	-4.6 = +4	+0 =	+4
$m+2.13$	-3.76		-8	+0	<u>-13</u> = -0.04 ^v

$\Delta \eta_0$	-3.77η	$+36S$	-7
-27	+32 = +5	-3 =	+2
+7	-23 = -16	-1 =	-17
-71	+53 = -18	+1 =	-17
-14	+12 = -2	+5 =	+3
	+14	+1 =	<u>+8</u> = +0.4

12044

Plate Constants & Center

14

19.1840	24.0726	10	18	39.92 + 06	57	51.9
22	18		01	27.30	- 47	12.9
+2.8160	-6.0726					

$$\text{Plate Center} \begin{cases} A. 10^h 20^m 07.22 \\ B. 06^h 10^m 39.0 \end{cases}$$

$$\begin{aligned} X-5+500X & + 61.9X & + 1.8X & - 10810 \\ +2600 + 7547 & = 10147 + 625 = 10772 + 27 = 10799 = -11 \\ -0294 + 9592 & = 9298 + 1490 = 10788 + 34 = 10822 + 12 \\ -2084 + 12558 & = 10474 + 305 = 10779 + 45 = 10824 + 14 \\ -7173 + 16954 & = 9781 + 952 = 10733 + 61 = 10794 - 18 \\ 23.9163 + 11958 & + 912 & + 43 = 24.1266 \end{aligned}$$

$$\begin{aligned} y-m + 500y & - 64.3X & + 6.8y & - 10949 \\ +6800 + 5051 & = 11851 - 970 = 10881 + 68 = 10949 \\ -0016 + 12036 & = 12020 - 1233 = 10787 + 162 = 10949 \\ +1.0063 + 2468 & = 12531 - 1615 = 10916 + 33 = 10949 \\ +0.5331 + 7693 & = 13024 - 2180 = 10844 + 104 = 10948 \\ 14.7419 + 7371 & - 1537 & + 100 = 14.2404 \end{aligned}$$

$$\begin{aligned} \text{Table } a &= - .6 & e &= -2.6 & a-e &= +2.0 & b+d &= -0.0 \\ & - 501.8 & & - 506.8 & + 50 & & + 2.4 \\ & & & & + 3.0 & & + 2.4 \\ 0-C &= 501.2 & & - 504.2 & & & \end{aligned}$$

12044

Plate Constants + Center

14

19.1840	24.0726	10	18	39.92 + 0.6	57	51.9
22	18		01	27.30	- 47	12.9
+2.8160	-6.0726					

Plate Center {

10	20	07.22
06	10	39.0

X-5+500X + 61.9y + 13x - 10816

$-2600 + 75.47 = 10147 + 623 = 10772 + 27 = 10799$
 $-0294 + 95.92 = 9298 + 1490 = 10788 + 34 = 10822$
 $-2184 + 125.5x = 10474 + 305 = 10779 + 45 = 10824$
 $-7173 + 169.54 = 9781 + 952 = 10733 + 61 = 10794$
 $239163 + 11958 + 912 + 43 = 241266$

Y-2 + 500y - 64.3x + 6.8y - 10949

$6800 + 5052 = 11851 - 970 = 10881 + 68 = 10949$
 $0016 + 12136 = 12020 - 1233 = 10787 + 162 = 10949$
 $1.0163 + 2468 = 12531 - 1615 = 10916 + 33 = 10949$
 $0.5331 + 7693 = 13024 - 2180 = 10844 + 104 = 10948$
 $14.7419 + 1371 - 1537 + 100 = 142404$

Table a = - .6 c = - 2.6 a-c = + 2.0 b+d = 0.0

$- 501.8$ $- 506.8$ $+ 50$ $+ 2.4$

$0-C = 501.2$ $- 504.2$ $+ 3.0$ $+ 2.4$

Cape no 1424 mag 6.6.

10 20 57.90
 57.92
 57.84

10 20 57.89
 + 52.96

α 10 21 50.85

A 10 20 07.22

+ 1 43.63

+ 103.63

2.01549

999875

0.52148

+ 3.3226

+ 18

S 25.3244

X 25.1160 12558

- 2084 -2084

10474

4 26 26.5

26.3 198

27.0

4 26 26.6

- 05 09.7

δ 4 21 16.9

D 6 10 39.0

- 1 49 22.1

- 6564.3

3.81719m

1.14834m

888168

104296

6.978.0

-14.071.6

+ 9

η 3.9293

η 4.9356 2468

$\eta - \eta + 1.0063$ 10063

12044

Standard Coordinates

15

Cape No 1412 mag 8.1

Cape No 1418 mag 6.3

Cape No 1436 mag 8.3

C	10	15	30.43	10	17	46.51	10	25	48.61
y			30.48			46.57			48.65
E			30.43			46.52			48.56
m	10	15	30.45	10	17	46.53	10	25	48.61
Prec			+53.12			53.39			53.15
α	10	16	23.57	10	18	39.92	10	26	41.76
A	10	20	07.22	10	20	07.22	10	20	07.22
$\alpha - A$	-	3	43.65	-	1	27.30	+	6	34.54
Sim			-223.64			-87.30			+394.49
log	2.34	955	m	1.94	101	m	2.59	604	m
cos δ	9.99	830		9.99	678		9.99	780	
" δ_0	0.85	509	m	0.44	503	m	1.10	108	m
δ_0	-7.16	30		-2.78	63		+12.62	06	
δ_1	-	23		-	3		+	50	
S	14.8	347		19.2	134		34.6	256	
X	15.0	947		119.1	840		33.9	083	
X-S	+	2600		-	0294		-	7173	

C	+05	09	01.0	07	03	00.9	05	51	15.6
L			01.9			01.2			15.8
E			01.4			01.1			15.2
m	+05	09	01.4	07	03	01.1	05	51	15.5
Prec	-05	06.2		-05	09.2		-05	12.7	
δ	+05	03	55.2	06	57	51.9	05	46	02.8
D	+06	10	39.0	6	10	39.0	6	10	39.0
$\delta - D$	-1	6	43.8	+	47	12.9	-	24	36.2
tan			-4004.3	+		2833.1			-1476.2
log	3.60	252	m	3.45	226	m	3.16	915	m
" n_0	0.93	367	m	0.78	341	m	0.50	030	m
log δ_0	8.94	76		9.08	69		9.00	43	
" δ_1	1.71	02		0.89	01		2.20	22	
" n_1	7.71	12		7.03	04		8.25	99	
n_0	-8.58	36		+6.07	31		-3.16	45	
n_1	+0.00	51		+0.00	11		+0.01	82	
n	9.42	15		24.07	42		14.85	37	
y	10.10	15		24.07	26		15.38	68	
y-n	+	6800		-	0016		+	0.53	31

2044			Standard Coordinates			15			
Cafe No 1412 mag 8.1			Cafe No 1418 mag. 6.3			Cafe No 1436 mag 8.3			
C	10	15	30.43	10	17	46.51	10	25	48.61
y			30.48			46.57			48.65
E			30.43			46.52			48.56
m	10	15	30.45	10	17	46.53	10	25	48.61
Prec			+53.12			53.39			53.15
α	10	16	23.57	10	18	39.92	10	26	41.76
A	10	20	07.22	10	20	07.22	10	28	07.22
$\alpha - A$		-03	43.65		-01	27.30		+06	34.54
Σm			-223.64			-87.30			+394.49
log			2.34955 ^m			1.94101 ^m			2.59604
base			999830			999678			999780
Σ_0			0.85509 ^m			0.44503 ^m			1.10108
Σ_0			-7.1630			-2.7863			+12.6206
Σ_1			-23			-3			+50
S			14.8347			19.2134			34.6256
K			15.0947			19.7840			33.9083
$\Sigma - S$			+2600			-0294			-7173
C	+05	09	01.0	07	03	00.9	05	51	15.6
z			01.9			01.2			15.8
E			01.4			01.1			15.2
m	+05	09	01.9	07	03	01.1	05	51	15.5
Prec	-05	06.2		-05	09.2		-05		12.7
δ	+05	03	55.2	06	57	51.9	05	46	02.8
θ	+06	10	39.0	16	10	39.0	16	10	39.6
$\delta - \theta$	+1	26	43.8	+47	12.9		+1	24	36.2
Σ			-4009.3			+2832.1			-1476.2
γ			3.60252 ^m			3.45226			3.16915 ^m
η_0			0.93367 ^m			0.78341			0.50036
$\eta_{1/2}$			8.94761			9.08691			9.00432
Σ_2			4.7102			0.8901			2.20227
η_1			7.7112			7.0304			8.2599
η_0	-85836			+60731			-31645		
η_1	+00051			+00011			+00182		
η	9.4215			24.0742			14.8537		
γ	10.1015			24.0726			15.3868		
η	+6800			-0016			+0.5331		

12044	X	X-X ₀	ΔX / Mean Center	D-C 16	
1	23.9160	+0.0000	0.0000	3.3731	+132-22
2	24.4805	+0.5645	0.3186	3.3552	-47
3	25.0000	+1.0840	1.1751	3.3613	+14
4	25.5915	+1.6755	2.8073	3.3580	-19
5	25.7495	+1.8335	3.3615	3.3615	+16
6	25.7316	+1.8156	3.2964	3.3630	+31
7	25.2487	+1.3327	1.7761	3.3529	-10
8	25.0000	+1.0840	1.1751	3.3649	+50

Com. R² 3.3621

	Y	Y-Y ₀	ΔY		
1	12.9057	-1.8363	-3	3.3731	180 ✓
2	13.0000	-1.7420	-3	3.0366	162 ✓
3	13.2636	-1.4784	-2	2.1862	143
4	14.0000	-0.7420	-1	0.5507	114 ✓
5	14.7420	0.0000	+0	0.0000	90 ✓
6	15.0000	+0.2580	+0	0.0666	82 ✓
7	16.0000	+1.2580	+1	1.5828	47 ✓
8	16.2216	+1.4796	+2	2.1898	36 ✓

Range 144

Approx Center

$$X = 25 \quad Y = 13.2636$$

$$16.2216$$

$$29.4852$$

$$Y_0 = 14.7420$$

$$Y_{min} = 12.9057$$

$$R = 1.8369$$

$$Com R = 1.8330$$

$$X_{max} = 25.7495$$

$$\text{Mean Center} \left\{ \begin{array}{l} X_0 = 23.9160 \\ Y_0 = 14.7420 \end{array} \right.$$

12044	X	X-Y0	all Moans Center	D-C 16
1	23.9160	+0.0100	0.0000	3.3731 + 138.22
2	24.4805	+0.5645	0.3186	3.3552 - 47
3	25.0000	+1.0840	1.1751	3.3613 + 14
4	25.5995	+1.6755	2.8073	3.2580 - 19
5	25.7495	+1.8335	3.3615	3.3615 + 16
6	25.7316	+1.8156	3.2964	3.3631 + 31
7	25.2487	+1.3327	1.7161	3.3589 - 10
8	25.0000	+1.0840	1.1751	3.3649 + 50

Com R² 3.3621

	Y	Y-Y0	dy		
1	12.9057	-1.8363	-3	3.3731	180
2	13.0000	-1.7420	-3	3.0366	162
3	13.2636	-1.4784	-2	2.1862	143
4	14.0000	-0.2420	-1	0.5507	114
5	14.7420	0.0000	+0	0.0000	90
6	15.0000	+0.2580	+0	0.1666	82
7	16.0000	+1.2580	+1	1.5228	47
8	16.2216	+1.4796	+2	2.1898	36

Approx Center

$$X = 25 \quad Y = 13.2636$$

$$16.2216$$

$$29.4852$$

$$Y_0 = 14.7420$$

$$Y_{min} = 12.9057$$

$$R = 1.8369$$

$$Com R = 1.8330$$

$$X_{map} = 25.7495$$

$$\left. \begin{array}{l} X_0 = 23.9160 \\ Y_0 = 14.7420 \\ Y_1 = 14.7420 \end{array} \right\} \text{Moans Center}$$

Formations of Normals

1	- 0.00	+	000	-	243.0
2	- 0.98	-	26.3	+	82.0
3	- 1.60	+	15.1	-	20.8
4	- 1.23	-	31.8	+	14.0
5	+ 0.00	+	29.3	+	0.0
6	+ 0.47	+	56.1	+	8.0
7	+ 1.68	-	13.3	-	12.6
8	+ 1.62	+	54.0	+	75.0
	+ 3.77	+	154.5	+	179.0
	- 3.81	-	71.4	-	276.4
	- .04	+	83.1	-	97.4
		corr	- 2.1	corr	+ 61.2
					- 36.2

	a	b	c	o-c <u>corr</u>
a = +24	+ 0	+ 15	- 22	+ 83
	+ 13	+ 14	- 10	- 87
b = - 8	+ 26	+ 12	+ 1	- 17
	+ 40	+ 6	+ 9	- 42
c = - 37	+ 44	- 0	+ 7	- 9
	+ 43	- 2	+ 4	+ 4
	+ 32	- 10	- 15	- 52
	+ 13	- 12	- 36	- 10

12044

17

Conditional Equations:

corr -22

0 - C

1 + 0.00 - 1.84 = +13.2	+ 0.0 + 5' + 5' + 10.5
2 + 0.56 - 1.74 = - 4.7	+ 3.3 + 5' + 8' - 9.7
3 + 1.08 - 1.48 = + 1.4	+ 6.6 + 4' + 10' - 1.8
4 + 1.67 - 0.74 = - 1.9	+ 1.0 + 2' + 12' - 1.53
5 + 1.83 + 0.00 = + 1.6	+ 1.0 - 0' + 10' - 1.6
6 + 1.81 + 0.26 = + 3.1	+ 1.0 - 1' + 9' + 2.0
7 + 1.33 + 1.26 = - 1.0	+ 8 - 3' + 5' - 3.7
8 + 1.25 + 1.50 = + 5.0	+ 6 - 4' + 2' + 2.6

9.36

+ 2 - 201 + 131

or 41

$$+ 13.91 - 0.04 = + 81.0$$

$$+ 9.36$$

$$- 0.04 + 12.98 = - 36.2$$

$$- 2.78$$

$$+ () - 0.0 = + 0.2$$

$$- 0.21$$

$$+ 12.98 = - 36.0$$

$$b = - 2.8$$

$$13.91 = + 81.0 - 0.1 = + 80.9$$

$$a = + 5.85$$

$$+ 0.67$$

$$arc = 144$$

$$P_n = .12$$

$$\Delta R = - 0.9$$

$$\frac{EK}{n} = - 8.8$$

$$corr A + 0.5$$

$$+ \frac{8.8}{.12} = - 73$$

$$true \Delta R = - 1.4$$

$$R = 1.83$$

$$- 2RC = - 1.83$$

$$\Delta h = + 0.38 \quad \Delta \delta = + 0.2$$

$$\Delta a = - 1.22 \quad \Delta \alpha = - 0.04$$

12044

Conditional Equations

17

corr -22

C - C

1 + 0.00 - 1.84 = +13.2	+ 0.0 + -5 + 5 = +10.5 +10.5
2 + 0.56 - 1.74 = -47	+ 8.3 + -5 + 9 = -7.7 -6.5
3 + 1.08 - 1.48 = +14	+ 6.6 + -4 + 10 = +12.2
4 + 1.61 - 0.74 = -19	+ 1.0 + -2 + 12 = -5.3 -2.2
5 + 1.83 + 0.01 = +16	+ 11.0 - 0 + 1.0 = +11.6 +1.3
6 + 1.81 + 0.26 = +31	+ 1.8 - 1 + 9 = +0.8 +2.6
7 + 1.33 + 1.26 = -10	+ 8 - 3 + 5 = -3.7 -3.6
8 + 1.05 + 1.50 = +50	+ 6 - 14 + 2 = -2.6 +1.2

$$-20.1 + 13.1$$

or 41

$$-13.91 - 0.04 = +81.0 \quad +9.36$$

$$-0.04 + 12.98 = -36.2 \quad -2.78$$

$$+(-) - 0.0 = +0.2$$

$$-0.21$$

$$+12.98 = -36.0$$

$$b = -2.8$$

$$13.91 + 81.0 - 0.1 = +80.9$$

$$a = +5.85$$

$$+0.67$$

$$\text{arc} = 144$$

$$\frac{P}{n} = 11$$

$$\Delta R = -0.9$$

$$\frac{PK}{n} = -8.82$$

$$\text{corr } \mu = +0.5$$

$$- \frac{8.82}{12} = -7.35$$

$$\text{true } \Delta R = +1.4$$

$$R = 1.83$$

$$2RC = -1.83$$

$$\Delta h = +0.38 \quad \Delta \delta = +0.2$$

$$\Delta a = -1.22 \quad \Delta x = -0.04$$

1917 11 10 15 26.249
23.938
+ 2311

$$\begin{array}{r} + 20 \quad 15 \quad 29.64 \\ \quad \quad \quad 42.71 \\ \hline - 13.07 \end{array}$$

$$\begin{array}{r} 2 \cdot 10 \quad 22 \quad 06545 \\ \underline{4,536} \\ + 2,009 \end{array}$$

$$\begin{array}{r} -16 \quad 24 \quad 48 \quad 04 \\ 43, 67 \\ -4, 37 \end{array}$$

$$\begin{array}{r} (3) \quad 10 \quad 28 \quad 28.684 \\ \underline{26.559} \\ + 2.125 \end{array}$$

$$\begin{array}{r} + \quad 9 \quad 43 \quad 51.77 \\ \quad \quad 44 \quad \quad 2.93 \\ \hline \quad \quad \quad -11.16 \end{array}$$

2	3	1	1
2	1	2	5
	1	8	6

2	2	3	1
2	0	0	9
	2	2	2
2	2	3	7

$$\begin{array}{r} -13.07 \\ -11.16 \\ \hline -1.91 \end{array}$$

$$\begin{array}{r} -12.31 \\ -4.37 \\ \hline 7.94 \end{array}$$

① 2.157

12 Hydruan

20
15
10
5
0
-5
-10
-15

33 31 29 27 25 23 21 19 17 15 13 11 9 102

12044

Moon's Mean Position

18

$$\begin{array}{r} X_0 \quad 23.9160 \\ \quad + \quad 3 \\ \hline 23.9163 \end{array}$$

$$\begin{array}{r} Y_0 \quad 14.7420 \\ \quad - \quad 1 \\ \hline 14.7419 \end{array}$$

From Plate Constants

$$\begin{array}{r} X \quad 24.1266 \\ \quad - \quad 22 \\ \hline \Sigma. +2.1266 \end{array}$$

$$\begin{array}{r} Y \quad 14.2404 \\ \quad - \quad 18 \\ \hline -3.7596 \end{array}$$

$$\begin{array}{l} \log S_0 \quad 0.32769 \\ \log \cos \delta_0 \quad 9.99786 \\ \hline 8.50724 \\ \log \sin(\alpha - A) \quad 1.82259 \end{array}$$

$$\begin{array}{l} \log \tan \delta_1 \quad 8.9966 \\ \log S_1^2 \quad 0.6554 \\ \hline 7.0534 \\ \log u_1 \quad 6.7054 \end{array}$$

$$\sin(\alpha - A) \quad + 66.46$$

$$\begin{array}{l} \eta_1 \quad +0.0005 \\ \eta_0 \quad -3.7601 \end{array}$$

$$\alpha - A \quad 01 \quad 06.46$$

$$A \quad 10 \quad 20 \quad 07.22$$

$$\alpha_0 \quad 18 \quad 21 \quad 13.68$$

$$\text{Red} \quad + 2.14$$

$$\alpha' \quad 10 \quad 21 \quad 15.82$$

$$\begin{array}{l} \log \eta_0 \quad 0.57520 \\ \hline 7.33115 \\ \log \tan(\delta - \delta_0) \quad 3.24405 \\ \hline (-1.7541) \end{array}$$

$$\delta - \delta_0 \quad - 29 \quad 14.1$$

$$\delta \quad + 6^\circ \quad 10 \quad 39.0$$

$$\delta_0 \quad + 5^\circ \quad 41 \quad 24.9$$

$$\text{Red} \quad -10.0$$

$$\delta' \quad 5^\circ \quad 41 \quad 14.9$$

12044

Moon's Mean Position

18

$$\begin{array}{r} X_0 \quad 23.9160 \\ + \quad 3 \\ \hline 23.9163 \end{array}$$

$$\begin{array}{r} Y_0 \quad 14.7420 \\ - \quad 1 \\ \hline 14.7419 \end{array}$$

Frame Plate Constants

$$\begin{array}{r} X \quad 24.1266 \\ 22 \\ \hline S \quad +2.1266 \end{array}$$

$$\begin{array}{r} Y \quad 14.2404 \\ 18 \\ \hline -3.1596 \end{array}$$

$$\begin{array}{r} \log S_0 \quad 0.32769 \\ \log \cos \delta_0 \quad 9.99186 \\ 2.51724 \\ \hline \sin(X-A) \quad 9.82259 \end{array}$$

$$\begin{array}{r} \log \tan \delta_0 \quad 2.99662 \\ \log S_0 \quad 0.6354 \\ 7.1534 \\ \hline \log u \quad 6.7054 \end{array}$$

$$\sin(X-A) \quad +66.46$$

$$\begin{array}{r} \eta_1 \quad +0.0005 \\ \eta_2 \quad -3.7601 \end{array}$$

$$X-A \quad 01 \quad 06.46$$

$$\begin{array}{r} \log m_0 \quad 0.57520 \\ 7.33115 \\ \log \tan \delta_0 \quad 3.24405 \\ -1.7541 \end{array}$$

$$A \quad 10 \quad 20 \quad 07.22$$

$$X_1 \quad 11 \quad 21 \quad 13.68$$

$$\text{Red} \quad +2.14$$

$$-X' \quad 10 \quad 21 \quad 15.82$$

$$\delta_0 \quad -29 \quad 14.1$$

$$\delta_1 \quad 6^\circ \quad 10 \quad 39.0$$

$$\delta_0 \quad 5^\circ \quad 41 \quad 24.9$$

$$\text{Red} \quad -10.0$$

$$\delta' \quad 5^\circ \quad 41 \quad 14.9$$

12044

Reduction to Apparent Place

19

$H + \alpha_0$	8	57.5	134	22.5	δ_0	$5^\circ 41.4$
H	22	36.3				
α	10	21.2			$\log \cos \delta_1$	9.9979
G	23	40.2			$\log i$	0.4769 m
$G + \alpha_0$	9	01.4	135 $^\circ$	21'	" (i)	0.4748 m

$\log \cos G + \alpha_0$	9.8521 m	$\log \sin \delta_1$	8.9963
$\log g$	0.9001	" $\cos H + \alpha_1$	9.8447 m
" $\sin G + \alpha_0$	9.8468	$\log h$	1.3064
" $\tan \delta_0$	8.9984	" $H + \alpha_1$	9.8543
	8.8239	$\sec \delta_1$	0.0021
			8.8239

$$\log g' \quad 0.7522 $m$$$

$$g \quad 8.5692$$

$$q \quad +1.134$$

$$(g) \quad +0.037$$

$$(h) \quad +0.970$$

$$\text{Red.} \quad +2.141$$

$$\log h' \quad 0.1474 $m$$$

$$h \quad 9.9867$$

$$q' \quad -5.652$$

$$h' \quad -1.404$$

$$i \quad -2.984$$

$$\text{Red} \quad -10.040$$

12044

Reduction to Apparent Place

19

$H + \alpha_0$	8	57.5	134	22.5	δ_0	5° 41.4
H	22	36.3				
α	10	21.2			$\log \cos \delta_0$	9.9979
G	23	40.2			$\log i$	0.4769 m
$G + \alpha_0$	8	01.4	135°	21	" (1)	0.4748 m

$\log \cos G + \alpha_0$	9.8521 ~
$\log g$	0.9001
$\sin G + \alpha_0$	9.8468 m
$\tan \delta_0$	8.9984
	8.8239

$\log \sin \delta_0$	8.9963
" $\cos H + \alpha_0$	9.8447 m
$\log h$	1.3064
" $H + \alpha_0$	9.8543
$\sec \delta_0$	0.0021
	8.8239

$\log g'$	0.1522
g	8.5692

$\log h'$	0.1474
h	9.9867

f	+1.134
g	+0.037
h	+0.970
Rede	+2.141

g'	-5.652
h'	-1.404
i	-2.284
Red	-11.040

12044

Lunar Parallax.

20

α'	10	21	15.82 ^v
θ	10	35	39.95 ^v
$\theta - \alpha'$		+ 14	24.13 ^v
$=$	+ 3'	36	01.95 ^v
$\frac{1}{2}(\theta - \alpha')$		01	15.96
$\theta - \alpha' = "$	3	34	45.99 ^v

$\log \tan \delta'$	9.95727-
$\log \cos \frac{1}{2} \alpha'$	0.00000
$\log \sec \theta - \alpha'$	0.00085
$\log \tan \gamma$	9.95812 ^v

γ	42	14	30.0 ^v
δ'	05	41	14.9 ^v
$\gamma - \delta'$	36	33	15.1 ^v

	9.82640
$\log \sin \Pi$	8.19756
$\sin \gamma - \delta'$	9.77494 ^v
$\csc \gamma$	0.17246 ^v
$\sin (\delta - \delta')$	7.97136

$$\delta - \delta' \quad + 32 \quad 11.0^v$$

$$\delta + 6 \quad 13 \quad 25.9^v$$

$$\text{eph } \delta + 6 \quad 13 \quad 32.0^v$$

$$O-C \quad - \quad 6.1^v$$

$$\text{corr} \quad + \quad 0.3^v$$

$$\text{2nd Obs. Ref.} \quad 0.0$$

$$\delta = + 6 \quad 13 \quad 26.2$$

$$O-C = -5.8$$

$$\Pi \quad 54 \quad 10.94^v$$

$$9.86913$$

$$\log \sin \Pi \quad 8.19756^v$$

$$\sin (\theta - \alpha') \quad 8.79796^v$$

$$\sec \delta' \quad 0.00257^v$$

$$\sin (\alpha - \alpha') \quad 6.86722$$

$$\alpha - \alpha' \quad 2' 13.193$$

$$= + 105.13''$$

$$\alpha \quad 10 \quad 21 \quad 25.95^v$$

$$\text{eph } \alpha \quad 10 \quad 21 \quad 24.83^v$$

$$O-C \quad + \quad 1.12^v$$

$$\text{corr.} \quad - \quad 0.04^v$$

$$\alpha = 10 \quad 21 \quad 25.91$$

$$O-C = + 1.08$$

12044

Lunar Parallax.

28

α	10	21	15.82
δ	10	35	39.93
$\theta - \alpha$		+ 14	24.13
$\theta - \delta$	3	36	01.95
$\frac{1}{2}(\alpha - \delta)$		11	15.96
$\sqrt{\alpha - \delta}$	3	34	45.99

$\log \tan \delta$	9.95727
$\frac{1}{2} \log \frac{1}{\sin \alpha}$	0.00000
$\sec \theta - \alpha$	0.00085
$\log \tan \gamma$	9.95812

 γ 42 14 30.0 δ 05 41 14.9 $\gamma - \delta$ 36 33 15.1

	9.82640
$\log \sin \Pi$	8.19754
$\sin \gamma - \delta$	9.77494
$\sec \gamma$	0.17246
$\sin (\theta - \delta)$	7.97134

 $\delta - \delta'$ 32 10.0 $\delta + 6$ 13 25.9eph $\delta + 6$ 13 32.0 $\theta - \delta$ - 6.1

curr + 0.3

find Aled Ref 0.0

 $\delta + 6$ 13 26.2 $\theta - \delta$ - 5.8 Π 54 10.94

	9.86913
$\log \sin \Pi$	8.19754
$\sin (\theta - \alpha)$	8.79796
$\sec \delta$	1.00257
$\sin (\alpha - \delta)$	6.86722

 $\alpha - \delta$ 5 31.93

= +10.13

 α 10 21 25.95eph α 10 31 24.83 $\theta - \alpha$ + 1.12

curr - 0.09

 $\alpha + 6$ 10 21 25.91 $\theta - \alpha$ + 1.08

1.
1.
15.
9.

2.
19.
23.

3.
25.
3.

4.
34.
14.

1.
23.
12.
4.

2.
24.
12.

12043

Star Measures

21

1 16953 18940
 15.2 14515 11384
 9.1 15 84
 53 40
15.2438 15.3444

17270 18380
 16597 99 905251
 01 50
 70 80
9.0671 9.0671

2 17752 17268
 19.4 14300 10710
 23.0 00 10
 52 68
19.3452 19.3442

16650 16952
 1628789 1732250
 91 1820
 58 52
23.0361 23.0368

3 18795 16573
 25.3 16180 9190
 3.9 8482 90
 95 6573
25.2613 25.2617

18140 17260
 9208 06 1618187
 04 93
 40 60
3.8934 3.8927

4 17748 19770
 34.1 17112 1040506
 14.3 12 07
 48 70
34.0636 34.0636

18480 17160
 15127 10501
 27 01
 80 60
14.3353 14.3341

Moon Measures

1 1
 23.6
 12.2
 8

18038 18878
 15863 1105051
 63 52
 38 78
12.2175 12.2173

2
 24.0
 12.3

18357 18667
 15752 11278
 52 78
 57 67
12.2605 12.2611

15

L

15

9.

2

19

23

3

25

3.

4

14.

4.

L

23

12

7

2

24

12

12093

Star Measures

21

1 16953 18940
 15.2 14515 11384
 9.1 15 24
 53 40
15.2438 15.3444

2 17752 17268
 199 14300 10710
 230 00 10
 52 68
19.3452 19.3442

3 18795 16573
 25.3 16180 9190
 3.9 2482 90
 95 6573
25.2613 25.2611

4 17748 19770
 14.1 17112 10405.6
 4.3 12 07
 48 70
34.0636 34.0636

17250 18380
 16597.99 9052.51
 01 58
 70 80
9.0671 9.0672

16650 16952
 1628789 17322.20
 91 18
 58 52
23.0361 23.0368

18140 17260
 9208.06 1618187
 04 93
 40 60
38934 3.8921

18480 17160
 15127 10501
 27 01
 80 60
14.3353 14.3341

Mean Measures

1
 23.6
 12.2
 7

18038 18878
 15863 11050.51
 63 52
 38 78
12.2175 12.2173

2
 24.0
 12.3

18357 18667
 15752 11278
 52 78
 57 67
12.2605 12.2611

12

3

25

12

4

25

3

5

25

14

6

20

15

7

25

15

8

24

15

12043

Mann

22

3
25.0
12.9
19.7 63
0 13 4
12
63
86355

18763 18352
10103 1701415
1308 16
63 52
128655 128663

4
25.1
3.0
17873 18126
16838 9161
38 61
73 26
251035 251035

5
25.4
14.0
17883 17888
13480 12285
80 85
83 88
254397 254397

6
20.2
15.0
17880 17195
16151 891015
51 20
80 95
25.1729 25.1720

7
25.0
15.2
17880 17195
16151 891015
51 20
80 95
25.1729 25.1720

18355 16260
1596362 865659
61 62
55 8260
152407 152399

8
24.6
15.0
16060 16767
10230 1260405
30 06
60 6767
24.5830 24.5838

17630 17940
11627 13950
27 50
30 40
156003 156010

15

3

25

12

4

25

13

5

25

14

6

25

15

7

25

15

8

25

15

12043

Море

22

3
250
129

18763	18352
10113	1701415
1308	16
63	52
128655	128663

4	1	7	8	7	3	1	8	1	2	6
25	1	6	8	3	8	9	1	6	1	
30			3	8				6	1	
			7	3				2	6	
25	1	0	3	5	25	1	1	3	5	

5	17	8	8	3	17	8	8	8
254	13	4	8	0	12	2	8	5
14.6		8	0				8	5
		8	3				8	8
	254	3	4	7	254	3	9	7

6	17880	17195
25.2	16151	8910.5
15.0	51	20
	80	95
25.1	729	720

2

25	0
15	2

18355	16260
1596312	865659
61	62
55	60
152407	152399

8	10060	16767
24.6	10230	1260405-
15.0	30	06
	68	6767
	<u>245830</u>	<u>245838</u>

17630	17440
11627	13950
27	50
30	40
156003	156010

12044

Times Etc.

Date Jan. 11, 1917

Elg. & Stars	10	43	✓	10	55	✓
" " Moon	10	48	38.0 ✓	10	48	38.3 ✓
Clock fast		12	58.2 ✓			

H. Sid. Time	10	35	39.95 ✓	$\theta = +14^m$ ✓
" Longitude	04	44	31.05	
G. Sid. Time	15	20	1100 ✓	
" " " M.N.	19	21	41.22 ✓	
Interval	19	58	29.78 ✓	
Red.		03	16.34 ✓	
G. M. T.	19	55	13.44 ✓	19 ^h 9204 ✓

From Naut. Alman.

R.A.

Dec.

Upper 19 ^h	10	19	45.14	6	25	04.2
Motion 1 ^m			1.8053 ✓			-12.534 ✓
" 55.224 ✓		01	39.69 ✓		-11	32.2 ✓
Tabular Place.	10	21	24.83 ✓	6	13	32.0 ✓

Moon's age. 18^d

934" = 12.5

$$\begin{array}{r}
 a = -501.8 \\
 + 24. \\
 \hline
 -477.8
 \end{array}$$

Parallax.	54	10.94 ✓
Semi-diam	14	47.4 ✓
R		887.4 ✓
Ang. (2 nd 4)		11.3 ✓
R		-0.4
R		898.3 ✓
R		1.9256 ✓
(1+a) R		-920 ✓
R		1.8336 ✓
R ²		3.3621 ✓

12044.

Times Etc.

Date Jan. 11 1917

Eq. & Stars	10	43		10	55	
" " Moon	10	48	38.0	10	48	38.3
Clock fast		12	58.2			

H. Sid Time	10	35	39.95		$\theta = +14^\circ$
" Longitude	04	44	31.05		
to Sid Time	13	21	11.00		
" " M.N	19	21	41.22		
Interval	19	58	29.78		
Red.		03	16.34		
G. M. T.	19	55	13.44		19 ^h 52.04

From Naut. Alman.

R A

Dec.

Moon 19 ^h	10	19	45.14	6	25	04.2
Motion 1"			1.8053			-12.534
" 55.224		01	39.69		-11	32.2
Tabular Place.	10	21	24.83	6	13	32.0

Moon age. 18^d

934" 12.5

 $a = -506.8$ $+24$ -477.8

Parallax.	54	1094
Semi-diam	14	47
R		887
Aug.		11
2 nd		-0
R		898
R		1925
(1+a) R		-926
R		18336
R ²		3.862

12043

Plate Constants.

24

X	15.2441	19.3447	25.2615	34.0636
S	14.8347	19.2134	25.3244	34.6256

y	9.0671	23.0364	3.8930	14.3347
n	9.4215	24.0742	3.9293	14.8537

$$\begin{aligned}
 X-S + 500X & \quad +53.58 \quad +1.21X - 12228 \\
 +4094 + 7622 & = 11716 + 484 = 12200 + 18 = 12218 \\
 +1313 + 9672 & = 10985 + 1230 = 12215 + 23 = 12238 \\
 -0629 + 12631 & = 12002 + 206 = 12208 + 31 = 12239 \\
 -5620 + 17132 & = 11412 + 765 = 12177 + 41 = 12218 \\
 23.6031 + 11802 & \quad + 751 \quad + 28 = 23.6384
 \end{aligned}$$

$$\begin{aligned}
 y-n + 500y & \quad -54.3X \quad +6.38y - 227 \\
 -3544 + 4533 & = 989 - 828 = 161 + 58 = 219 \\
 -10378 + 11518 & = 1140 - 1050 = 90 + 147 = 237 \\
 -0363 + 1946 & = 1583 - 1372 = 211 + 25 = 236 \\
 -5190 + 7167 & = 1977 - 1850 = 127 + 91 = 218 \\
 14.0526 + 7026 & \quad - 1282 \quad + 89 = 14.6132
 \end{aligned}$$

Tables	a = -0.6	d = -2.6	a-e = +2.0	f+d = 0
Obs.	-501.2	-506.4	+5.2	+0.8
d-e	-500.6	-503.8	+3.2	+0.8

12043

Plate Constants.

24

X	15.2441	19.3447	25.2615	34.0636
S	14.8347	19.2134	25.3244	34.6256

Y	9.0671	23.0364	3.8930	14.3347
Y	9.4215	24.1742	3.9293	14.8537

X-S + 500X	+53.58	+1.21X - 1222
+4094 + 7622 = 11716 + 484 = 12210 + 18 = 12218		
+1313 + 9672 = 10985 + 1231 = 12215 + 23 = 12238		
-0629 + 12631 = 12002 + 216 = 12208 + 31 = 12239		
-5620 + 17132 = 11412 + 765 = 12177 + 41 = 12218		
23.6031 + 11802	+ 751	+28 = 23.6384

Y-n + 500Y	-543X	+6.38Y - 221
-3544 + 4533 = 989 - 828 = 161 + 58 = 219		
-10378 + 11518 = 1140 - 1050 = 90 + 147 = 237		
-0363 + 1946 = 1583 - 1372 = 211 + 25 = 236		
-5190 + 7167 = 1977 - 1850 = 127 + 91 = 218		
14.0526 + 7026	- 1282	+ 89 = 14.613

Tables	a = -0.6	c = -2.6	a-c = +2.0	b+d = 0
Obs.	- 501.2	-506.4	+ 5.2	= +0.8
b-c	- 500.6	-503.8	+ 3.2	= +0.8

12043

Marius Center

25-

	$x - x_0$	$x - x_0$	Δx	$(x - x_0)^2$	$(y - y_0)^2$	$0 - e$
1	23.6050	+0.0000	0	0.0000	3.3705	+ 7.3
2	24.0000	+0.3951		0.1560	3.3687	+ 5.5
3	25.0000	+1.3950		1.9460	3.3557	- 7.5
4	25.1035	+1.4985		2.2455	3.3545	- 8.7
5	25.4397	+1.8347		3.3661	3.3661	+ 2.9
6	25.1725	+1.5675		2.4570	3.3540	- 9.2
7	25.0000	+1.3950		1.9460	3.3561	- 7.1
8	24.5834	+0.9784		0.9573	3.3530	- 10.0

3.3632

	$y - y_0$	$y - y_0$		
1	12.2174	-1.8356	-3	3.3705
2	12.2608	-1.7922	-2	3.2127
3	12.8659	-1.7871	-2	1.4097
4	13.0000	-1.0530	-1	1.1090
5	14.0530	-0.0000	-0	0.0000
6	15.0000	+0.9470	+1	0.8970
7	15.2403	+1.1873	+2	1.4101
8	15.6006	+1.5476	+2	2.3957

180

168

130

125

90

59

50

32

arc = 148

Aperture Center

$x = 25$ $y = 12.8659$
 15.2403
 28.1062

$y_0 = 14.0531$
 $y_{min} = 12.2174$
 $R = 1.8357$
 Corn A. 1.8339
 $x_{max} = 25.4397$

Marius Center $\left\{ \begin{array}{l} x_0 = 23.6050 \\ y_0 = 14.0530 \end{array} \right.$

12743

Mass Center

25

	$x - x_0$	$x - x_0$	Δx	$x - x_0$	$y - y_0$	$0 - c$
1	23.6050	+0.0000	0	0.0000	3.3705	+ 7.3
2	24.0000	+0.3951		0.1560	3.3687	+ 5.5
3	25.0000	+1.3950		1.9460	3.3657	- 1.75
4	25.1035	+1.4985		2.2455	3.3545	- 8.7
5	25.4397	+1.8347		3.3681	3.3661	+ 2.9
6	25.1725	+1.5675		2.4570	3.3540	- 9.2
7	25.0000	+1.3950		1.9460	3.3561	= 7.1
8	24.5834	+0.9784		0.9573	3.3530	- 11.0

3.3632

	$x - x_0$	$y - y_0$	Δx	Δy
1	12.2174	-1.8356	+3	3.3705
2	12.2608	-1.7822	-2	3.2127
3	12.8659	-1.7871	-2	1.4098
4	13.0000	-1.0530	-1	1.1090
5	14.0530	-0.0000	-0	0.0000
6	15.0000	+0.9470	+1	0.8970
7	15.2403	+0.1873	+2	1.4101
8	15.6006	+1.5476	+2	2.3957

arc 148

Apex Center

$x = 25$ $y =$ 12.8659
 15.2403
 281.062

y_{min} 14.0531
 12.2174

$R =$ 1.8357

Com A 1.8339

$x_{max} =$ 25.4397

Mass Center $\left\{ \begin{array}{l} x_0 = 23.6050 \\ y_0 = 14.0530 \end{array} \right.$

Formation of Normals.

1 - 0.00	+ 00.0	- 133.5
2 - 0.70	+ 21.4	- 98.5
3 - 1.66	- 104.0	+ 89.2
4 - 1.57	- 130.5	+ 91.5
5 - 0.00	+ 52.9	- 00.0
6 + 1.49	- 144.2	- 87.5
7 + 1.65	- 98.8	- 84.5
8 + 1.52	- 100.0	- 158.0
+ 4.66	+ 743	+ 180.7
+ 3.93	- 577.5	- 562.0
+ 0.73	- 503.2	- 381.3

$$a = +25$$

$$b = -6$$

$$c = -37$$

a	b	c	d - z
+ 0	+ 11	- 26	+ 33
+ 10	+ 11	- 16	+ 41
+ 35	+ 7	+ 5	- 25
+ 37	+ 6	+ 6	- 32
+ 46	0	+ 9	+ 108
+ 39	- 6	- 4	- 29
+ 35	- 7	- 9	- 19
+ 24	- 9	- 22	- 31

12043

Conditional Equations

26

1	+ 0.08	- 1.83	= +73	- 0.00	+ 14	+ 14	+ 59	-
2	+ 0.39	- 1.79	= +55	- 1.55	+ 13	- 2	+ 57	-
3	+ 1.39	- 1.19	= -75	- 53	+ 8	- 45	- 30	-
4	+ 1.50	- 1.05	= -87	- 57	+ 8	- 49	- 38	-
5	+ 1.83	- 0.00	= +29	- 70	+ 0	- 70	+ 99	-
6	+ 1.57	+ 0.95	= -92	- 60	- 7	- 67	- 25	-
7	+ 1.39	+ 1.19	= -71	- 53	- 8	- 61	- 10	-
8	+ 0.98	+ 1.55	= -102	- 38	- 11	- 49	- 53	-

+215 - 156

or 41

$$13.07 + 0.73 = -503.2 + 9.05$$

$$+ 0.73 + 13.80 = -381.3 - 2.17$$

$$- 0.41 = +281.$$

$$- 0.16$$

$$+ 13.39 = -100.3$$

$$b = -7.5^{\circ}$$

$$13.07 = -503.2 + 5.5 = -497.7$$

$$a = -38.1^{\circ}$$

$$+ 0.69$$

$$arc = 148$$

$$\frac{P}{n} = .15$$

$$\Delta R = +0.6$$

$$\frac{\Sigma K}{n} = +7.4$$

$$corr(A) = +0.5$$

$$\frac{+7.4}{.15} = +49.2$$

$$\text{True } \Delta R = +0.1$$

$$R = 1.83$$

$$-2RC = -1.83$$

$$\Delta t = +0.29$$

$$\Delta S = +0.1$$

$$\Delta a = -1.26$$

$$\Delta a = -0.04$$

12043

Conditional Equations

26

							0 - C	
1	+ 0.00	- 1.83	= +73	- 0.00	+ 14	+ 14	+ 59	+ 3
2	+ 0.39	- 1.19	= +55	- 1.55	+ 13	- 2	+ 57	+ 21
3	+ 1.39	- 1.19	= -75	- 53	+ 8	- 45	- 30	- 25
4	+ 1.50	- 1.05	= -87	- 57	+ 8	- 49	- 38	- 32
5	+ 1.83	- 0.10	= +29	- 70	+ 0	- 70	+ 9.9	+ 10.1
6	+ 1.57	+ 0.95	= -92	- 60	- 7	- 67	- 25	- 27
7	+ 1.39	+ 1.19	= -71	- 53	- 8	- 61	- 10	- 19
8	+ 0.98	+ 1.55	= +102	- 38	- 11	- 49	- 53	- 31

$$13.17 + 0.73 = -503.2 + 9.05$$

$$+ 0.73 + 13.80 = -381.3 - 2.17$$

$$- 0.41 = +281$$

$$- 0.16$$

$$+ 13.39 = -100.3$$

$$A = -7.5$$

$$13.07 = -513.2 + 55 = -497.7$$

$$a = -38.1$$

$$+ 0.69$$

$$arc = 148$$

$$\frac{P}{n} = 15$$

$$\Delta R = +0.6$$

$$\frac{E}{n} = +7.4$$

$$corr(a) = +0.5$$

$$= \frac{7.4}{15} = +49.2$$

$$Zinc \Delta R = +0.1$$

$$R = 1.83$$

$$-2RC = -1.83$$

$$\Delta t = +0.29 \quad \Delta S = +0.1$$

$$\Delta a = -1.26 \quad \Delta a = -0.04$$

12043

Moon's Mean Position

27

$$\begin{array}{r} X_0 \quad 23.6050^{\circ} \\ \quad \quad -19 \\ \hline 23.6031^{\circ} \end{array}$$

$$\begin{array}{r} Y_0 \quad 14.0530^{\circ} \\ \quad \quad -4 \\ \hline 14.0526^{\circ} \end{array}$$

From Plate Constants.

$$\begin{array}{r} 23.6384^{\circ} \\ \quad \quad 22. \\ \hline S+1.6384 \end{array}$$

$$\begin{array}{r} 14.6132^{\circ} \\ \quad \quad 18. \\ \hline -3.3868 \end{array}$$

$$\begin{array}{ll} \log S & 0.21442^{\circ} \\ \log \cos S & 9.99782 \\ & 8.51724 \\ \log \sin \alpha - A & 1.70936^{\circ} \end{array}$$

$$\begin{array}{ll} \log \tan S & 9.00005^{\circ} \\ \log S, 2 & 0.4288^{\circ} \\ & 7.0534 \\ \log h_1 & 6.4827 \end{array}$$

$$\begin{array}{ll} m_1 & +0.0003 \\ m_0 & -3.3871^{\circ} \end{array}$$

$$\alpha - A \quad + \quad 51.21$$

$$A \quad 10 \quad 20 \quad 07.22^{\circ}$$

$$\alpha_0 \quad 10 \quad 20 \quad 58.43^{\circ}$$

$$\text{Red} \quad + \quad 2.14^{\circ}$$

$$\alpha' \quad 10 \quad 21 \quad 00.57^{\circ}$$

$$\begin{array}{ll} \log h_0 & 0.52983^{\circ} \\ \log \tan \delta - D & 7.33115^{\circ} \\ & 8.19868^{\circ} \end{array}$$

$$\begin{array}{ll} & -15.80.0^{\circ} \\ & -26 \quad 20.0^{\circ} \end{array}$$

$$\delta \quad 6 \quad 10 \quad 39.0^{\circ}$$

$$\delta_0 \quad 5^{\circ} 44 \quad 19.0^{\circ}$$

$$\text{Red} \quad -10.0$$

$$\delta' \quad 5^{\circ} 44 \quad 09.0^{\circ}$$

12043

Mean Mean Position

27

$$\begin{array}{r} X_0 \quad 23.6050 \\ \quad -19 \\ \hline 23.6031 \end{array}$$

$$\begin{array}{r} Y_0 \quad 14.0530 \\ \quad -4 \\ \hline 14.0526 \end{array}$$

From Plate Constants.

$$\begin{array}{r} 23.6384 \\ 22. \\ \hline S \quad 1.6384 \end{array}$$

$$\begin{array}{r} " \quad 14.6132 \\ 18. \\ \hline -33868 \end{array}$$

$$\begin{array}{ll} \log S & 0.21442 \\ \log \cos S & 9.99782 \\ & 8.50724 \\ \log \sin X-A & 1.70936 \end{array}$$

$$\begin{array}{ll} \log \tan S & 9.00005 \\ \log S^2 & 0.4283 \\ & 7.0534 \\ \log h & 6.4827 \end{array}$$

$$\begin{array}{ll} \mu & +0.0003 \\ \mu_0 & -33871 \end{array}$$

$$\alpha - A \quad 51.21$$

$$A \quad 10 \quad 20 \quad 07.22$$

$$\alpha_0 \quad 10 \quad 20 \quad 58.43$$

$$\text{Red} \quad +2.14$$

$$\alpha' \quad 10 \quad 21 \quad 00.57$$

$$\begin{array}{ll} \log h_0 & 0.52783 \\ & 7.33115 \\ \log \tan d-Z & 3.19868 \end{array}$$

$$\begin{array}{ll} & -15.800 \\ & -26.200 \\ \delta & 6 \quad 10 \quad 39.0 \end{array}$$

$$\delta_0 \quad 5^\circ 44 \quad 19.0$$

$$\text{Red} \quad -10.0$$

$$\delta' \quad 5^\circ 44 \quad 09.0$$

12043

Lunar Parallax

28

$$\begin{array}{rcl}
 \alpha' & 10 & 21 & 00.57'' \\
 \theta & 10 & 22 & 10.20'' \\
 \theta - \alpha' & + & 01'' & 9.63'' \\
 = & + & 17'' & 24.45'' \\
 & & & - 6.12''
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos \frac{1}{2}(\theta - \alpha') & 9.95727 & \\
 \sec(\theta - \alpha') & 0.00000 & \\
 \log \tan \gamma & 9.95728 &
 \end{array}$$

$$\gamma \quad 42 \quad 11 \quad 12.0''$$

$$\delta \quad 5^\circ \quad 5' \quad 44'' \quad 09.0''$$

$$\gamma - \delta \quad 36 \quad 27 \quad 03.0''$$

$$\begin{array}{rcl}
 \log \sin \pi & 9.82640 & \\
 \sin \gamma - \delta & 8.19755'' & \\
 \csc \gamma & 9.77388'' & \\
 \sin(\delta - \alpha') & 0.17292'' & \\
 & 7.97075'' &
 \end{array}$$

$$\delta - \alpha' \quad + 32 \quad 08.3''$$

$$\delta \quad 6 \quad 16 \quad 17.3''$$

$$\text{eph } \delta \quad 6 \quad 16 \quad 20.9''$$

$$O - C \quad - 3.6''$$

$$\text{corr.} \quad + 0.3''$$

$$\text{3rd Amd. Ref} \quad 0.0$$

$$\delta - \quad + 6 \quad 16 \quad 17.6''$$

$$O - C = \quad - 3.3$$

$$\pi \quad - 54' \quad 10.83''$$

$$\begin{array}{rcl}
 & 9.86913 & \\
 \log \sin \pi & 8.19755'' & \\
 \sin \theta - \alpha' & 7.70446'' & \\
 \sec \delta & 100260'' & \\
 \sin \alpha - \alpha' & 5.77374'' &
 \end{array}$$

$$\alpha - \alpha' \quad + 12.25''$$

$$\quad \quad \quad + 0.82''$$

$$\alpha \quad 10 \quad 21 \quad 01.39''$$

$$\text{eph } \alpha \quad 10 \quad 21 \quad 00.54''$$

$$O - C \quad + 0.85''$$

$$\text{corr} \quad - 0.04''$$

$$\alpha - \quad 10 \quad 21 \quad 01.35''$$

$$O - C = \quad + 0.81$$

12043

Lunar Parallel

28

x' 10 21 00.57
 θ 10 22 10.20
 $\theta - x'$ + 01 9.63
 $=$ + 17 24.45
 $=$ 6.12

$\log \cos \frac{1}{2} x''$ 9.95727
 $\log \sec \frac{1}{2} x''$ 0.00000
 $\log \tan \frac{1}{2} x''$ 0.00001
 $\log \tan \frac{1}{2} y$ 9.95728

y 42 11 12.0

$y - \delta'$ 5° 44 09.0

$y - \delta'$ 36 21 03.0

$\log \sin \pi$ 9.82640
 $\sin y - \delta'$ 8.19755
 $\cos \delta'$ 9.77388
 $\cos \delta'$ 0.17292
 $\sin \delta'$ 7.97075

$\delta - \delta'$ 32 08.3

δ 6 16 17.3

$\delta - \delta'$ 6 16 20.9

$\delta - \delta'$ -3.6

$\cos$ +0.3

$\sin \delta - \delta'$ 0.0

$\delta - \delta'$ +6 16 17.6

$\delta - \delta'$ -3.3

π -54 10.83

9.86913

$\log \sin \pi$ 8.19755

$\sin \delta - x'$ 7.70446

$\sin \delta$ 10.0261

$\sin x - \delta'$ 5.77374

$x - x'$ +12.25

$=$ +0.82

x 10 21 01.39

$\delta - x$ 10 21 00.54

$\delta - x$ +0.85

$\cos$ -0.07

x 10 21 01.35

$\delta - x$ +0.81

