

KG

11366

v. 963

LXXXVI



4478

4481

4478

Stars - Measures

$\frac{1}{145}$ 19591
 $\frac{131}{15159}$ 6062
 90
144831

$\frac{1}{145}$ 19530
 $\frac{131}{1435951}$ 46
 30
4822

$\frac{1}{145}$ 9749
 $\frac{131}{908189}$ 8289
13.0665

$\frac{1}{145}$ 13483
 $\frac{131}{7179}$ 12820
0658

$\frac{2}{23.2}$ 19039
 $\frac{27.4}{17120}$ 2013
 40
23.1921

$\frac{2}{23.2}$ 18790
 $\frac{27.4}{10730}$ 3935
 09
1930

$\frac{2}{23.2}$ 19700
 $\frac{27.4}{1680512}$ 1112
 90
27.2888

$\frac{2}{23.2}$ 19321
 $\frac{27.4}{1219790}$ 8790
 01
12884

$\frac{3}{24.8}$ 17904
 $\frac{6.5}{982915}$ 2215
 00
24.8081

$\frac{3}{24.8}$ 20270
 $\frac{6.5}{1836968}$ 56
 60
8096

$\frac{3}{24.8}$ 18750
 $\frac{6.5}{1382021}$ 21
 40
64923

$\frac{3}{24.8}$ 19940
 $\frac{6.5}{14856500}$ 5950
 12
14939

Density 1.

4478

Star Measures

$$\begin{array}{r}
 \frac{1}{145} \quad 19991 \\
 131 \quad 15159 \\
 \quad \quad 6062 \\
 \quad \quad 90 \\
 \hline
 14.4831
 \end{array}$$

$$\begin{array}{r}
 \frac{2}{232} \quad 19039 \\
 271 \quad 17120 \\
 \quad \quad 2013 \\
 \quad \quad 40 \\
 \hline
 23.1921
 \end{array}$$

$$\begin{array}{r}
 \frac{3}{248} \quad 17904 \\
 61 \quad 982915 \\
 \quad \quad 22 \\
 \quad \quad 00 \\
 \hline
 24.8081
 \end{array}$$

$$\begin{array}{r}
 \frac{1}{145} \quad 19530 \\
 1435951 \\
 \quad \quad 46 \\
 \quad \quad 30 \\
 \hline
 4822
 \end{array}$$

$$\begin{array}{r}
 18790 \\
 10730 \\
 \quad \quad 3935 \\
 \quad \quad 09 \\
 \hline
 1930
 \end{array}$$

$$\begin{array}{r}
 20270 \\
 1836968 \\
 \quad \quad 56 \\
 \quad \quad 60 \\
 \hline
 8096
 \end{array}$$

$$\begin{array}{r}
 \frac{1}{145} \quad 9749 \\
 908189 \\
 \quad \quad 8289 \\
 \hline
 130665
 \end{array}$$

$$\begin{array}{r}
 19700 \\
 1680512 \\
 \quad \quad 11 \\
 \quad \quad 90 \\
 \hline
 272685
 \end{array}$$

$$\begin{array}{r}
 18750 \\
 1382021 \\
 \quad \quad 21 \\
 \quad \quad 40 \\
 \hline
 64923
 \end{array}$$

$$\begin{array}{r}
 \frac{1}{145} \quad 13483 \\
 7179 \\
 12820 \\
 \hline
 0658
 \end{array}$$

$$\begin{array}{r}
 19321 \\
 1219790 \\
 \quad \quad 8790 \\
 \quad \quad 01 \\
 \hline
 12884
 \end{array}$$

$$\begin{array}{r}
 19920 \\
 1485650 \\
 \quad \quad 1950 \\
 \quad \quad 12 \\
 \hline
 14939
 \end{array}$$

Density 1.

4478

d

*

Moon - measures

y 1915 mar 24.

2

$$\begin{array}{r}
 17577 \\
 226 \quad 11810 \\
 15.0 \quad 25-15 \\
 \quad 89 \\
 \hline
 225767
 \end{array}$$

$$\begin{array}{r}
 17242 \\
 1299505 \\
 \quad 00 \\
 \quad 59 \\
 \hline
 5751
 \end{array}$$

$$\begin{array}{r}
 2 \\
 230 \\
 15.6
 \end{array}$$

$$\begin{array}{r}
 17530 \\
 1208680 \\
 \quad 8180 \\
 \quad 12 \\
 \hline
 15.5434
 \end{array}$$

$$\begin{array}{r}
 17060 \\
 12500 \\
 \quad 9918 \\
 \quad 48 \\
 \hline
 5452
 \end{array}$$

$$\begin{array}{r}
 17198 \\
 23.2 \quad 1546870 \\
 16.0 \quad 70 \\
 \quad 20 \\
 \hline
 23.1733
 \end{array}$$

$$\begin{array}{r}
 18238 \\
 9980 \\
 \quad 6972 \\
 \quad 40 \\
 \hline
 1734
 \end{array}$$

$$\begin{array}{r}
 20245 \\
 233 \quad 1798087 \\
 16.5 \quad 79 \\
 \text{max} \quad 42 \\
 \text{in} \quad 232262 \\
 \text{X}
 \end{array}$$

$$\begin{array}{r}
 18180 \\
 1043325 \\
 \quad 30 \\
 \quad 85 \\
 \hline
 2246
 \end{array}$$

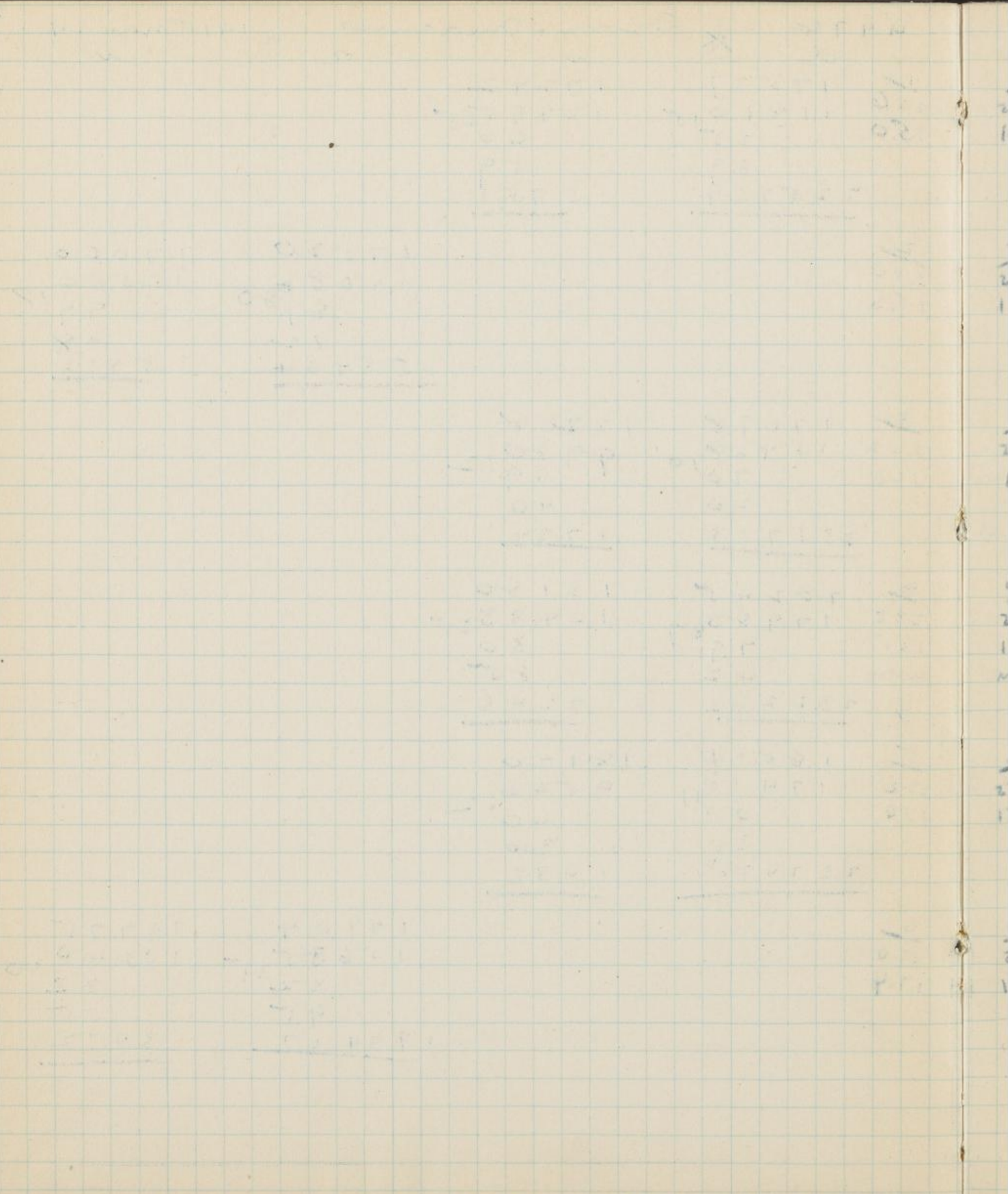
$$\begin{array}{r}
 18834 \\
 232 \quad 1741011 \\
 17.0 \quad 00 \\
 \quad 39 \\
 \hline
 23.1428
 \end{array}$$

$$\begin{array}{r}
 18120 \\
 956062 \\
 \quad 60 \\
 \quad 30 \\
 \hline
 1432
 \end{array}$$

$$\begin{array}{r}
 6 \\
 25.0 \\
 17.4
 \end{array}$$

$$\begin{array}{r}
 19104 \\
 1563535 \\
 \quad 3235 \\
 \quad 95 \\
 \hline
 17.3467
 \end{array}$$

$$\begin{array}{r}
 19775 \\
 1324030 \\
 \quad 32 \\
 \quad 55 \\
 \hline
 3472
 \end{array}$$



4478

d

X

Moon - measures

1915 Mar 24

2

$$\begin{array}{r}
 \checkmark \\
 226 \\
 150 \\
 17577 \\
 11810 \\
 25-15 \\
 89 \\
 \hline
 225767
 \end{array}$$

$$\begin{array}{r}
 17242 \\
 129950 \\
 00 \\
 59 \\
 \hline
 5751
 \end{array}$$

$$\begin{array}{r}
 2 \\
 270 \\
 156
 \end{array}$$

$$\begin{array}{r}
 17520 \\
 12086 \\
 8180 \\
 12 \\
 \hline
 155434
 \end{array}$$

$$\begin{array}{r}
 17060 \\
 12500 \\
 9918 \\
 48 \\
 \hline
 15452
 \end{array}$$

$$\begin{array}{r}
 3 \\
 232 \\
 160 \\
 17198 \\
 1546870 \\
 70 \\
 20 \\
 \hline
 231733
 \end{array}$$

$$\begin{array}{r}
 18238 \\
 9980 \\
 6972 \\
 40 \\
 \hline
 1734
 \end{array}$$

$$\begin{array}{r}
 4 \\
 233 \\
 165 \\
 20245 \\
 1798087 \\
 79 \\
 42 \\
 \hline
 232262
 \end{array}$$

$$\begin{array}{r}
 18180 \\
 1043325 \\
 30 \\
 85 \\
 \hline
 2246
 \end{array}$$

$$\begin{array}{r}
 5 \\
 232 \\
 170 \\
 18834 \\
 1741011 \\
 00 \\
 39 \\
 \hline
 231428
 \end{array}$$

$$\begin{array}{r}
 18120 \\
 956062 \\
 60 \\
 30 \\
 \hline
 1432
 \end{array}$$

$$\begin{array}{r}
 6 \\
 250 \\
 174
 \end{array}$$

$$\begin{array}{r}
 19104 \\
 1563535 \\
 32 \\
 95 \\
 \hline
 173467
 \end{array}$$

$$\begin{array}{r}
 19775 \\
 1324030 \\
 32 \\
 55 \\
 \hline
 3472
 \end{array}$$

4
7
2
18

22
18

21
18
3

21
18

20
18

4

4478

moon-measures

1915 Mar. 24

d

N

d

N

7	18050	19610
22.4	1368180	14082
18.0	8580	1621
	69	95
	<u>22.4377</u>	<u>4415</u>

8
22.0
18.3

9
21.3
18.4
max
w
9

10
21.0
18.3

11
20.1
18.0
20.1309

17109
1579009
0309
32

16221
7495
9601
25
1272

18394
1593950
45
90
18.2448

18465
1463130
29
58
18.3832

19293
1365048
47
88
18.3643

16250
8711
0901
40
2465

16186
1002221
20
80
3839

17220
1086553
60
10
2645

42

4478 *moon - measures* 1915 Mar 24
 d n d n
 1 18050 19610
 224 1368180 14082
 180 8580 1621
 69 95
22.4377 4415

270
 183

9
 213
 184
 27
 9

18
 210
 183

11 17109
 20.1 1579009
 180 0309
 32
201309

12

16221
 7495
 9601
 25
1272

18394
 15939
 4110
 90
182448

18465
 1463130
 29
 58
78.3832

17293
 13650
 4748
 88
18.3643

16250
 8711
 0901
 40
2465

16186
 1002221
 2021
 80
3839

17220
 1086553
 6053
 10
2645

L
E
C
L
S
I
V

4478 Times etc.

Ephemeris	1913 Dec 13	8 ^h 35 ^m	- 8 ^h 47 ^m
moon		8 41 18.3 ^v	- 8 41 18.7 ^v
clock fast		0 12.6 ^v	
H. Sid T.		8 41 05.9 ^v	$\theta - \alpha = + 2^h 39^m$
H long		4 44 31.05 ^v	
g Sid T.		13 25 36.95 ^v	
Sid T. M. hom		17 26 15.56 ^v	
Interval		19 59 21.39 ^v	
Reduction		3 16.49 ^v	
G. M. T.		19 56 04.90 ^v	

From Nant Allen	R. A.	Decl.
Moon 20 ^h	6 ^h 02 ^m 00.73 ^v	+ 28° 21' 16" 0 ^v
Motion in R	0.678 ^v	
Motion in Decl	- 9.90 ^v	+ 2.7 ^v
Tabular place	6 01 50.83 ^v	+ 28 21 18.7 ^v

Moon's age 16 days. (after full)

- parallax	57' 16.7 ^v
semidiameter	15 38.0 ^v
R	9 38.0 ^v

$$934 = +12.9$$

$$924 = +13.0$$

Augmentation	+ 13.0
Irradiation (1)	+ 0.2

$$c = 5027$$

$$+ 24.0$$

$$478.7$$

R	9 51.2
R	2.0390
1a R	- 976
(1+a) R	1 9414
R ²	3.7691

4478

Times etc.

Explosion 1913 Dec 13 $8^h 35^m$ - $8^h 47^m$
 Moon $8^h 41^m 18.3$ - $8^h 41^m 18.7$
 clock past 0 12.6

H. J. q. T. $8^h 41^m 05.9$ $6^h 41^m 29^m$
 H. J. q. T. $4^h 44^m 31.05$
 9. Sig. T. $13^h 25^m 36.95$
 Sid. T. M. horn $17^h 26^m 15.56$
 Interval $19^h 59^m 21.39$
 Reduction $3^h 16.49$
 B. M. T. $19^h 56^m 04.90$

From Naut. Alman. R. A. decl.
 Moon $20^h 02^m 00.73$ $+28^{\circ} 21' 16''$
 Interval 2525^s 0.678
 Motion -39183 -990 $+27$
 Tabular place $6^h 01^m 50.83$ $+28^{\circ} 21' 18.7$

Moon's age 16 days. (initially)

parallax $57' 16.7$
 semidiam. $15' 38.0$

$954 + 129$
 925

R 9380
 Augmentation $+130$
 Irradiation (1) $+02$

25029
 240
 4787

R 9512
 R 20390
 $10R$ -976
 $(1+0.1)R$ 19414
 R^2 37691

4

3

+

1

1

1

1

1

1

1

1

1

4478

Plato Centur.

5

x	y	R.A.	Decl.
144826	13.0662	5 55 32	+27 34 07
23.1926	27.2886	6 00 49	+29 31 13
24.8088	6.4931	6 01 54	+26 41 31
3 6248	46.85	3 17 56 135	+22 106 51
2083	1562	5 59 25	27 55 37
-22	-18	+	36
1.17	2.38	6 00 01	28 14 07
31	4665		
365	1110"		
	= 18' 30"		
		Center	A = 6" 00" 00"
			D = +28° 14' 00"

$$\begin{array}{rclcl}
 2-3 & +500x & -100y & +2.7x & -7087 \\
 +1114 & +7241 & +9355 & -1307 & +7048 + 39 = +7087 = 0 \\
 -1843 & +11596 & +9753 & -2729 & +7024 + 63 = +7087 = 0 \\
 -4735 & +12404 & +7669 & -649 & +7020 + 67 = +7087 = 0 \\
 21.2820 & +10641 & -1644 & +58 & 21.4788 \checkmark
 \end{array}$$

$$\begin{array}{rclcl}
 4-7 & +500y & +1037x & +31y & -9686 \\
 +1611 & +6533 & +8144 & +1502 & +9646 + 40 = +9686 = 0 \\
 -6448 & +13644 & +7196 & +2405 & +9601 + 85 = +9686 = 0 \\
 +3846 & +3247 & +7093 & +2573 & +9666 + 20 = +9686 = 0 \\
 16.4429 & +8221 & +2207 & +51 & 16.5222 \checkmark
 \end{array}$$

$$\begin{array}{lclcl}
 \text{Tables} & a = -1.3 & e = -1.0 & a-e = -0.3 & b+a = -1.4 \\
 \text{Obs} & a = 2.7 & e = -503.1 & a-e = +0.4 & b+a = -3.7
 \end{array}$$

$$\begin{array}{rclcl}
 0-c & -501.4" & -502.1" & +0.7 & -2.3"
 \end{array}$$

4478	Plate Center								
x	y	R	A	plac.					
144826	130662	5	55	32	127	34	07		
23.1926	27.2886	6	00	49	129	31	13		
24.8088	6.4931	6	01	54	126	41	31		
3 6248	4685	3 17	56	135	7 12	106	51		
2083	1562	5	59	25	27	55	37		
	18		1	36		18	30		
117	238	6	00	01	28	14	07		
31	468								
36	1110								
	18' 30"								
		Center							
		A :			6	00	00		
		B :			+28	14	00		

$$\begin{aligned}
 2 - \bar{M} &+ 500x & -100y & +27x & -7087 \\
 +1114 &+ 7241 &+ 835.5 &- 1307 &+ 7048 + 39 = +7087 = 0 \\
 -1843 &+ 11596 &+ 9753 &- 2729 &+ 7024 + 63 = -7087 = 0 \\
 -4735 &+ 12404 &+ 7669 &- 647 &+ 7020 + 67 = -7087 = 0 \\
 21420 &+ 10641 & -1644 & + 178 & & 214788
 \end{aligned}$$

$$\begin{aligned}
 4 - \bar{y} &+ 100x & +1037x & +3.1y & -9686 \\
 +1611 &+ 6533 &+ 8144 &+ 1502 &+ 9646 + 40 = +9686 = 0 \\
 -6448 &+ 13644 &+ 7196 &+ 2405 &+ 9601 + 85 = +9686 = 0 \\
 +3846 &+ 3247 &+ 7093 &+ 2573 &+ 9666 + 20 = +9686 = 0 \\
 164429 &+ 8221 & + 2207 & + 51 & & 165222
 \end{aligned}$$

Tables	a = -13	b = -1.0	c = -0.3	b + a = -14
Obs	a = -2.7	c = -0.31	a - c = +0.4	b + a = -3.7
O - c	-14	-21	+0.7	-2.3

Curvature

	S_1	γ	$\Delta 3$	-2.53	$+1.27$	-2
1	-7.63	-5.13	-16	+19 = +3	-1 = +2	
2	+1.38	+9.93	+3	-3 = +0	+2 = +2	
3	+3.28	-11.90	+13	-8 = +5	-2 = +3	
M	+0.52	-1.47		-1 - 0	= -3	

	$\Delta 7$	-2.97	$+13$	$+4$
-12	+15 = +3	-8 = -5		
+24	-29 = -5	+1 = -4		
-42	+35 = -7	+3 = -4		
M	+4	0 = +8		

Corr $\alpha = -0.01$
 $\delta = +0.4$

4478

Standard Coordinates

6

Ceph. No. 856 mag 6.1

Ceph. No. 867 mag 6.3

Ceph. No. 870 mag 7.0

191

C	5	54	43.37	5 ^h 59 ^m 59.38	6	01	05.56	
L			.43				.51	
B			37				.52	
Mean	5	54	43.39	5 59 59.42	6	01	05.53	
Pre		+	49.01	+	49.78	+	48.68	
α	5	55	32.40	6 00 49.20	6	01	54.21	
δ	6	00	00	6 00 00	6	00	00	
$\alpha - \delta$	-	4	27.60	+	49.20	+	1 54.21	
$\sin(\alpha - \delta)$	-		267.58	+	49.20	+	1 14.21	
log μ			2.42746	1.69197			2.05771	
cos			9.94766	9.93961			9.95106	
γ_0			0.88236	0.13882			0.51601	
γ_0			-7.6272	+	1.3766		+ 32810	
γ_1			-		3		+	13
γ_2			14.3712	23.3769			25.2823	
γ_3			14.4826	23.1926			24.8068	
$\gamma - \gamma_3$			+	1114			- 1843	- 4735

$\tilde{\alpha}$	+27	34	020	+29° 31'	13.8	+26° 41'	33.0
L			014		127		32.8
B			019		126		32.8
Mean	+27	34	01.8	+29 31	13.0	+26 41	32.9
Pre		+	55		- 0.4		- 1.7
δ	+27	34	073	+29 31	12.6	+26 41	31.2
D	+28	14	00	+28 14	00	+28 14	00
$\delta - D$	-	39	527	+1 17	126	-1 32	288
$\sin(\delta - D)$		-23	928		+46334		-5550.2
log μ		3.37890	m		3.66590		3.74431
γ_0		0.71005	m		0.99705		1.07546
\cos		9.7178			9.7530		9.7014
γ_1		9.7647			0.2776		1.0320
γ_2		85359			70840		7.7868
γ_0		-5.1292			+9.9322		-11.8976
γ_1		+ 343			+ 12		+ 61
γ_2		12.9051			27.9334		6.1085
γ_3		13.0662			27.2886		6.4931
$\gamma - \gamma_3$		+1611			-6448		+3846

4 + 78

Standard Coordinates

6

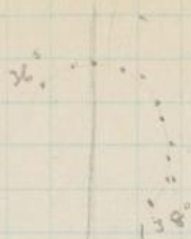
Cape No 856 mag 6.1

Cape No 867 mag 6.3

Cape No 870 mag 7.0

C	5	54	43.37	5	59	59.38	6	01	05.56
L			43			43			51
E			37			43			52
Mean	5	54	43.39	5	59	59.42	6	01	05.53
Pre		+	49.01		+	49.78		+	48.68
q	5	55	32.40	6	00	49.20	6	01	54.21
H	6	00	00	6	00	00	6	00	00
A-A		-	4 27.60		+	49.20		+	1 54.21
A-A		-	2 67.58		+	49.20		+	1 14.21
log			2.42746			1.69197			2.05771
log			9.94766			9.93961			9.95106
log			0.88236			0.13882			0.51601
log			-7.6272			-1.3766			+3.2810
log			-			8			+ 13
log			14.3712			23.3769			25.2823
log			14.4826			23.1926			24.8088
log			+1114			-1843			-4735

C	+27	34	020	+29	31	13.8	+26	41	33.0
L			014			127			328
E			019			126			328
Mean	+27	34	018	+29	31	13.0	+26	41	329
Pre		+	55		-	04		-	17
q	+27	34	07.3	+29	31	12.6	+26	41	31.2
D	+28	14	00	+28	14	00	+28	14	00
S-D	-	39	52.7	+1	17	12.6	-1	32	288
log			-23.928			+46.334			-55.502
log			3.37890			3.66590			3.74431
log			0.71005			0.99705			1.07546
log			9.7178			9.7530			9.7014
log			8.7647			0.2776			1.0320
log			8.5359			7.0840			7.7868
log			-5.1292			+9.9322			-11.8976
log			+			12			+ 61
log			12.9051			27.9334			61.085
log			13.0662			27.2886			64.931
log			+1611			-6448			+3846


$$\frac{138}{42}$$
$$\frac{138}{21} = 6.57$$

4478

Moon's Center

7

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$O - C$
1	22.5759 + 1.2909	- 2	1.6659	3.7478	- 213	
2	23.0000 + 1.7150	- 1	2.9409	3.7486	- 205	
3	23.1734 + 1.8884	- 1	3.5656	3.7618	- 73	
+ 4	23.2254 + 1.9404	0	3.7652	3.7652	- 39	
5	23.1430 + 1.8580	+ 1	3.4526	3.7628	- 63	
6	23.0000 + 1.7150	+ 1	2.9416	3.7588	- 103	
7	22.4396 + 1.1546	+ 2	1.3335	3.7574	- 117	
8	22.0000 + 0.7150	+ 2	0.5115	3.7605	- 84	
9	21.2850 0.0000	+ 3	0.0000	3.7656	- 35	
10	21.0000 - 0.2850	+ 3	0.0810	3.7724	+ 33	
11	20.1290 - 1.1560	+ 2	1.3358	3.7657	- 34	

$$R^2 = 3.7691$$

	y	y - y ₀	Δy	(y - y ₀) ²		
1	25.0000 - 1.4430	+ 1	2.0819	142	138	
2	15.5443 - 0.8987	0	0.8077	118		
3	16.0000 - 0.4430	0	0.1962	103		
4	16.4430 0.0000	0	0.0000	90		
5	17.0000 + 0.5570	0	0.3102	73		
6	17.3470 + 0.9040	0	0.8172	62		
7	18.0000 + 1.5570	- 1	2.4239	36		
8	18.2456 + 1.8026	- 1	3.2490	21	22	
+ 9	18.3836 + 1.9406	- 1	3.7656	0		
10	18.3644 + 1.9214	- 1	3.6914	352		
11	18.0000 + 1.5570	- 1	2.4299	324		
				Range	178	

Approx. Center

$$x = 230 \quad y = 15.5443$$

$$\begin{array}{r} 17.3470 \\ \hline 32.8913 \end{array}$$

$$y_0 = 16.4456$$

$$y_{\text{max}} = 18.3836$$

$$R = 1.9380$$

$$(1.9414)$$

$$x_{\text{max}} = 23.2254$$

$$x_0 = 21.2874$$

$$\text{Center } \begin{cases} x_0 = 21.2850 \\ y_0 = 16.4430 \end{cases}$$

4 + 78

Moon's Center

7

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0) + (y - y_0)$	$O - C$
1	22.5759 + 1.2909	- 2	1.6659	3.7478	- 213	
2	23.0000 + 1.7150	- 1	2.9409	3.7486	- 205	
3	23.1734 + 1.8884	- 1	3.5656	3.7618	- 73	
4	23.2254 + 1.9404	0	3.7652	3.7652	- 39	
5	23.1430 + 1.8580	+ 1	3.4526	3.7628	- 63	
6	23.0000 + 1.7150	+ 1	2.9416	3.7588	- 102	
7	22.4396 + 1.1546	+ 2	1.3335	3.7574	- 117	
8	22.0000 + 0.7150	+ 2	0.5113	3.7605	- 84	
9	21.2850 0.0000	+ 3	0.0000	3.7656	- 35	
10	21.0000 - 0.2850	+ 3	0.0810	3.7724	+ 33	
11	20.1290 - 1.1560	+ 2	1.3358	3.7657	- 34	

 $R^2 = 3.7691$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	15.0000 - 1.4420	+ 1	2.0819	1.42	
2	15.5443 - 0.8987	0	0.8077	1.18	
3	16.0000 - 0.4420	0	0.1962	1.03	
4	16.4430 0.0000	0	0.0000	90	
5	17.0000 + 0.5570	0	0.3102	73	
6	17.3470 + 0.9040	0	0.8172	82	
7	18.0000 + 1.5570	- 1	2.4239	36	
8	18.2456 + 1.8026	- 1	3.2490	21	
9	18.3836 + 1.9406	- 1	3.7656	0	
10	18.3644 + 1.9214	- 1	3.6914	352	
11	18.0000 + 1.5570	- 1	2.4299	324	

Range 176

Approx Center:

$$\begin{aligned}
 x &= 23.0 & y &= 15.5 + 43 \\
 & & & \underline{17.3470} \\
 & & & 32.8913 \\
 y &= 16.4456 \\
 y &= 18.3836 \\
 R &= 1.9380 \\
 x &= 23.2254 \\
 x &= 21.2874
 \end{aligned}$$

$$\begin{aligned}
 \text{Center } \left\{ \begin{aligned} x_0 &= 21.2850 \\ y_0 &= 16.4430 \end{aligned} \right.
 \end{aligned}$$

Formation of Normals.

1	- 1.85	- 274.5	+ 307.0
2	- 1.55	- 352.5	+ 184.8
3	- 0.83	- 138.0	+ 32.1
4	+ 0.00	- 75.7	- 0.0
5	+ 1.04	- 117.2	- 35.3
6	+ 1.55	- 176.3	- 92.6
7	+ 1.86	- 134.8	- 182.8
8	+ 1.30	- 60.5	- 151.5
9	+ 0.00	- 0.0	- 68.0
10	- 0.56	- 9.6	+ 63.4
11	- 1.81	+ 39.5	- 53.0
	- 0.91	- 1299.6	+ 41

		⁴⁰
		²⁵
		+ 79
- a	- b	+ ΔC
- 54	+ 52	+ 77 ^v
- 72	+ 32	+ 30 + 39
- 79	+ 14	+ 14 ^v
- 82	- 0	- 3 ^v
- 78	- 20	- 19 ^v
- 72	- 32	- 25 ^v
- 48	- 56	- 23 - 25 ^v
- 30	- 65	- 16 ^v
- 0	- 70	+ 9 ^v
+ 12	- 69	+ 22 ^v
+ 49	- 56	+ 72 ^v

omniv's center Conditional equation					O-C	Corr ⁸
1	+1.29	-1.44	= -2.13	-78 + 4 = -74	-139	-62 ⁶⁹
2	+1.72	-0.90	= -2.05	-104 + 2 = -102	-103	-73 ⁶⁹
3	+1.89	-0.44	= -73	-114 + 1 = -113	+40	+54 ⁶⁹
4	+1.94	+0.00	= -39	-117 - 0 = -117	+78	+75 ⁶⁹
5	+1.86	+0.56	= -63	-112 - 1 = -113	+50	+31 ⁶⁹
6	+1.72	+0.90	= -103	-104 - 2 = -106	+8	-22 ⁶⁹
7	+1.15	+1.56	= -1.17	-70 - 4 = -74	-43	-66 ⁶⁹
8	+0.72	+1.80	= -84	-43 - 5 = -48	-36	-52 ⁶⁹
9	+0.00	+1.94	= -35	0 - 5 = -5	-30	-21 ⁶⁹
10	-0.29	+1.92	= +33	+18 - 5 = +13	+20	+42 ⁶⁹
11	-1.16	+1.56	= -84	+70 - 4 = +66	-100	-28 ⁶⁹

191-451

Average 58

Normal Equation.

$$+21.59 - 0.91 = -1300 \quad +10.84$$

$$-0.91 + 19.77 = \quad +4 \quad +7.46$$

$$+0.91 - 0.04 = -5.5 \quad +0.46$$

$$+19.73 \quad -5.1 \quad +8.926 = 2.6 \quad +0.45$$

$$+21.59 = -1300 - 2 = -1302$$

$$a = -604 \quad +0.52$$

Arc measured: 174° Average (O-C) = -23.7 $\frac{p.c. \pm 28}{n}$

$$-\frac{23.7}{28} = -0.85 \quad \Delta n = -4.0$$

$$-2RC = +3.98$$

$$\Delta \beta = +1.80^{36}$$

$$\Delta \alpha = +2.08^{42}$$

$$\Delta \delta = +0.9$$

$$\Delta \alpha = +0.08$$

$$\text{Corr.} = -1.0$$

$$\Delta R = 0.0$$

4478 various center Conditional Equations

1	+129	-144	= -213	+78	+4	= -74	-139
2	+172	-090	= -205	-104	+2	= -102	-103
3	+189	-044	= -73	-114	+1	= -113	+40
4	+194	+000	= -39	-117	-0	= -117	+78
5	+186	+056	= -63	-112	-1	= -113	+50
6	+172	+090	= -103	-104	-2	= -106	+3
7	+115	-156	= -117	-70	-4	= -74	-43
8	+072	+180	= -84	-43	-5	= -48	-36
9	+000	+194	= -35	-0	-5	= -5	-30
10	-029	+192	+22	+18	-5	= +13	+20
11	-116	+156	= -34	+70	-4	= -66	-100
							191-451
							Average -58

Normal Equations.

$$+21.59 - 0.91 = -1300$$

$$-0.91 + 19.77 = +4$$

$$+0.91 - 0.04 = -55$$

$$+19.73 = -51$$

$$+21.59 - 1300 - 2 = -1302$$

$$b = 2.6$$

$$a = -60.4$$

1.0

Moon's mean position (1913.0)

$$\begin{array}{r}
 X_0 = 21.2850^\circ \\
 \text{mean} \quad - 30^\circ \\
 \hline
 21.2520^\circ
 \end{array}
 \quad
 \begin{array}{r}
 Y_0 = 16.4430^\circ \\
 \text{mean} \quad - 1^\circ \\
 \hline
 16.4429^\circ
 \end{array}$$

From Plato Constants $X = 21.4788^\circ$ $Y = 16.5222^\circ$

$$\begin{array}{r}
 \bar{z} = -0.5212^\circ \\
 \log \bar{z} = 9.71700^\circ \\
 \text{cos} \quad 994576^\circ \\
 \quad \quad 8.50724^\circ
 \end{array}$$

$$(H-A) \quad 1.26400^\circ$$

$$A-A \quad -18.37^\circ$$

$$A \quad 6 \quad 00 \quad 00^\circ$$

$$X_0 \quad 5 \quad 59 \quad 41.63^\circ$$

$$\text{Red} \quad + \quad 5.33$$

$$X' \quad 5 \quad 59 \quad 46.96^\circ$$

$$\eta = -1.4778^\circ$$

$$\begin{array}{r}
 \log \tan \delta = 9.7258^\circ \\
 \quad \quad 9.4338^\circ \\
 \hline
 7.0534^\circ \\
 6.2130^\circ
 \end{array}$$

$$\eta_0 = +2^\circ$$

$$\eta_0 = -1.4780$$

$$\begin{array}{r}
 \log \eta_0 = 0.16967^\circ \\
 \quad \quad 7.33115^\circ
 \end{array}$$

$$(H-D) = 2.83852^\circ$$

$$\delta - D = -11 \quad 29.5$$

$$D = +28 \quad 14 \quad 00^\circ$$

$$\delta_0 = +28 \quad 02 \quad 30.5$$

$$\text{Red} \quad + \quad 8.1$$

$$+28 \quad 02 \quad 38.6$$

4478

Red. 2nd Emission. 4478.

5

28 02 31

H + A 6 299 97 28

H 0 30.2

X 5 197

g 22 30.1

g + A 4 298 67 27

L cos S

967220

L cos (G + A) 95838

cos (G + A)

91138 m

g 13381

h

13104

L 99655

L

99962

L cos S 97264

L cos S

00542

88239

88239

g' 09219

g'

00964 m

g 98539

h

01848

f + 5097

g'

+ 835

f + 0.71

h'

- 125

h + 153

(u)

+ 103

+ 533

+ 8.13

Moons mean position (1913.0)

$$\begin{array}{r} X_0: 21.2850 \quad Y_0: 16.4430 \\ - 30 \quad - 1 \\ \hline 21.2820 \quad 16.4429 \end{array}$$

From Plate Constants $X = 21.4788 \quad Y = 16.5222$

$$z = -0.5212$$

$$\begin{array}{r} \log z = 9.71790 \\ + 99 + 176 \\ \hline 8.50724 \end{array}$$

$$(z-A) \quad 1.26802$$

$$a-h \quad - \quad 1437$$

$$A \quad 6 \quad 00 \quad 00$$

$$x \quad 5 \quad 59 \quad 41.68$$

$$\text{Red} \quad + \quad 533$$

$$x' \quad 5 \quad 59 \quad 46.96$$

$$y = -1.4778$$

$$\begin{array}{r} \log \tan \delta = 9.7258 \\ 94338 \\ \hline 7.0534 \\ 6.2130 \end{array}$$

$$y_0 + 2$$

$$y_0 = -1.4780$$

$$\begin{array}{r} \log y_0 = 0.16967 \\ 733115 \end{array}$$

$$(y-D) \quad 2.83842$$

$$D-h = - \quad 11 \quad 29.5$$

$$D \quad + \quad 28 \quad 14 \quad 00$$

$$S_0 \quad + \quad 28 \quad 02 \quad 30.5$$

$$\text{Red} \quad + \quad 8.1$$

$$+ 28 \quad 02 \quad 38.6$$

4478

Red. and locum app.

5

28 02 31

$$H + \alpha \quad 6 \quad 299 = 97^\circ 28'$$

$$H \quad 0 \quad 30.2$$

$$\alpha \quad 5 \quad 59.7$$

$$\theta \quad 22 \quad 30.1$$

$$H + \alpha \quad 4 \quad 298 = 67^\circ 27'$$

$$l \cos S \quad 9.9458$$

$$i \quad 0.0670$$

$$(i) \quad 0.0128$$

$$l \sin S \quad 9.67220$$

$$- \cos(H + \alpha) \quad 9.1138 m$$

$$h \quad 1.3104$$

$$\sin \quad 9.9963$$

$$\sec b \quad 0.0542$$

$$8.8239$$

$$l \cos(H + \alpha) \quad 9.5838$$

$$- \delta \quad 1.3381$$

$$- \sin \quad 9.9605$$

$$- \tan S \quad 9.7264$$

$$8.8239$$

$$\delta' \quad 0.9219$$

$$\delta \quad 9.8539$$

$$R' \quad 0.0964 m$$

$$h \quad 0.1848$$

$$l = +3.097$$

$$h \quad +0.71$$

$$h \quad +1.53$$

$$+5.33 \checkmark$$

$$\delta' \quad +8.35$$

$$h' \quad -1.25$$

$$(i) \quad +1.03$$

$$+8.13$$

$$\begin{array}{r}
 +478 \\
 \alpha' \quad 5^h \quad 59^m \quad 46.96^s \\
 0 \quad 8 \quad 41 \quad 05.9^s \\
 G-\alpha +2 \quad 41 \quad 18.93^s \\
 + \quad 40 \quad 19 \quad 44^s
 \end{array}$$

$$S' = +28^\circ 02' 38'' 6''$$

$$\pi = 57' 16.7''$$

$$\begin{array}{r}
 1.5 \quad 35^s \\
 +40 \quad 04 \quad 09
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 \hline
 0.11619^s \\
 0.07346^s
 \end{array}$$

$$\begin{array}{r}
 \gamma - 49 \quad 49 \quad 22^s \\
 28 \quad 02 \quad 39^s \\
 21 \quad 46 \quad 43^s
 \end{array}$$

$$\begin{array}{r}
 9.82640^s \\
 8.22169^s \\
 9.56946^s \\
 \hline
 0.11688^s \\
 7.73437^s
 \end{array}$$

$$\delta - \delta' = +18 \quad 38.9^s$$

$$\delta = +28 \quad 21 \quad 17.5^s$$

$$\text{Gen Eph } \delta = +28 \quad 21 \quad 18.7^s$$

$$O-C = -1.2^s$$

$$\text{curr.} = +0.4$$

$$\text{Inv.} = +0.9$$

$$\delta = +28 \quad 21 \quad 18.4$$

$$O-C = -0.3$$

$$\alpha \quad 6 \quad 01 \quad 51.67^s$$

$$\alpha \quad 6 \quad 01 \quad 50.83^s$$

$$\begin{array}{r}
 +0.78^s \\
 \text{curr.} = 0.01
 \end{array}$$

$$\begin{array}{r}
 \text{Inv.} = +0.08 \\
 \alpha \quad 6 \quad 01 \quad 51.69
 \end{array}$$

$$O-C = +0.86$$

+478

human parallel

$$\begin{array}{r} \alpha' \quad 5' \quad 59'' \quad 46.96 \\ 0 \quad 8 \quad 41 \quad 05.9 \end{array}$$

$$S = +28^{\circ} 02' 38.6''$$

$$\begin{array}{r} \delta - \alpha + 2 \quad 41 \quad 18.93 \\ + \quad 40 \quad 19 \quad 94 \end{array}$$

$$\pi = 57 \quad 167$$

15 35

+ 40 04 09

9.95727

0.00000

0.11619

0.07346

9.86913

8.22169

9.81102

0.05551

7.95735

+ 31 09.74

+ 2 04.65

$$\begin{array}{r} \gamma \quad 49 \quad 49 \quad 22 \\ 28 \quad 02 \quad 39 \\ 21 \quad 46 \quad 43 \end{array}$$

9.82640

8.22169

9.56956

0.11688

7.73437

$$\delta - \delta' = +18 \quad 38.9$$

$$S = +28 \quad 21 \quad 17.5$$

$$\alpha \quad 6 \quad 01 \quad 51.62$$

$$\text{Amp. } \delta = +28 \quad 21 \quad 18.7$$

$$\alpha \quad 6 \quad 01 \quad 50.83$$

$$O-C \quad -1.2$$

+ 0.78

- 0.4

In.

+ 0.9

$$\begin{array}{r} \text{In.} \quad +0.08 \\ \alpha \quad 6 \quad 01 \quad 51.69 \end{array}$$

$$\delta = +28 \quad 21 \quad 18.4$$

$$O-C \quad +0.86$$

$$O-C \quad -0.3$$

4

17

8

2

19

26

3

33

24

4481		Stars-Measures		1915 Mar 24.	
α	ν	α	ν	α	ν
✓ 12625	13645	18249	18597		
179 2129	13112	10120	16740		
88 12100	1920	1208	3632		
		38	06		
17.9475	.9472	8.8127	.8137		
2 17254	17280	18343	17810		
196 10646	1390000	1676569	939809		
262 4747	00	60	0209		
72	72	99	11		
19.6619	.6623	26.1621	.1592		
3 16690	19740	18196	16294		
33.6 1098995	1544239	11859	1261106		
24.6 95	4839	7067	1006		
00	40	92	92		
23.5703	.5703	24.6329	.6316		

Density 3

4481		Stars - Measures		1915 Mar 24			
a		x		y			
✓	12625	1	3645	1	8249	1	8197
179	2129	1	3112	1	0120	1	6740
88	12100		1920		1208		3632
					38		06
	<u>179475</u>		<u>9472</u>		<u>8.8127</u>		<u>8137</u>
5	17254	1	7280	1	8353	1	7810
196	10646	1	390000	1	6765	1	398
262	4747		00		609		0209
	72		72		99		11
	<u>196619</u>		<u>6623</u>		<u>261621</u>		<u>1592</u>
3	16690	1	9740	1	8196	1	6294
396	10989	1	5442	1	1855	1	2611
496	91		4839		7067		1006
	00		40		92		92
	<u>88.703</u>		<u>5703</u>		<u>24.6329</u>		<u>6316</u>

Meaning 3

✓
23
13.

2
23
14.

3
23
14.

5
24
14
W

8
23
14

1
23
14

4481 moon-measures

1915 mar. 24.

$$\begin{array}{r}
 230 \\
 13.3 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 20249 \\
 18435 \\
 46 \\
 50 \\
 \hline
 131809
 \end{array}
 \quad
 \begin{array}{r}
 18860 \\
 10659 \\
 6971 \\
 75 \\
 \hline
 11794
 \end{array}$$

$$\begin{array}{r}
 2 \\
 239 \\
 14.0 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 1412720 \\
 30 \\
 13828
 \end{array}
 \quad
 \begin{array}{r}
 14149 \\
 1383036 \\
 33 \\
 \hline
 9684
 \end{array}$$

$$\begin{array}{r}
 3 \\
 240 \\
 14.1 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 16361 \\
 1586366 \\
 50 \\
 \hline
 14.0501
 \end{array}
 \quad
 \begin{array}{r}
 15999 \\
 6249 \\
 15415 \\
 \hline
 0552
 \end{array}$$

$$\begin{array}{r}
 4 \\
 243 \\
 15.0 \\
 \text{max} \\
 \text{in} \\
 \text{in} \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 18645 \\
 1614765 \\
 5156 \\
 65 \\
 24.2495
 \end{array}
 \quad
 \begin{array}{r}
 20206 \\
 12704 \\
 9902 \\
 18 \\
 \hline
 2487
 \end{array}$$

$$\begin{array}{r}
 5 \\
 240 \\
 159 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 1513320 \\
 10 \\
 14690 \\
 \hline
 159569
 \end{array}
 \quad
 \begin{array}{r}
 13000 \\
 1256953 \\
 50 \\
 \hline
 9557
 \end{array}$$

$$\begin{array}{r}
 6 \\
 23.9 \\
 16.0 \\
 \hline
 \end{array}
 \quad
 \begin{array}{r}
 12461 \\
 5453 \\
 12170
 \end{array}
 \quad
 \begin{array}{r}
 10320 \\
 1008879 \\
 5979 \\
 \hline
 9765
 \end{array}$$

4481 moon measures

1915 Mar. 24

$$\begin{array}{r} \times \\ 230 \\ 133 \end{array}$$

$$\begin{array}{r} 20249 \\ 18435 \\ 46 \\ 50 \\ \hline 131809 \end{array}$$

$$\begin{array}{r} 18860 \\ 10659 \\ 6971 \\ 75 \\ \hline 11797 \end{array}$$

$$\begin{array}{r} 2 \\ 239 \\ 14.0 \end{array} \quad \begin{array}{r} 14127 \\ 30 \\ 13828 \end{array} \quad \begin{array}{r} 14149 \\ 13830 \\ 33 \end{array}$$
2397029684

$$\begin{array}{r} 3 \\ 240 \\ 141 \end{array}$$

$$\begin{array}{r} 16361 \\ 118636 \\ 50 \end{array}$$

$$\begin{array}{r} 15999 \\ 6249 \\ 15411 \end{array}$$
1405010552

$$\begin{array}{r} 4 \\ 243 \\ 11.0 \\ \text{meas} \\ 70 \end{array} \quad \begin{array}{r} 18645 \\ 161476 \\ 5156 \\ 65 \\ 242495 \end{array} \quad \begin{array}{r} 20206 \\ 12704 \\ 9902 \\ 18 \\ 2487 \end{array}$$

$$\begin{array}{r} 5 \\ 240 \\ 159 \end{array}$$

$$\begin{array}{r} 1513320 \\ 10 \\ 14690 \end{array}$$

$$\begin{array}{r} 13000 \\ 1256953 \\ 50 \end{array}$$
1595699557

$$\begin{array}{r} 6 \\ 23.9 \\ 16.0 \end{array} \quad \begin{array}{r} 12461 \\ 5453 \\ 12170 \end{array} \quad \begin{array}{r} 10320 \\ 10088 \\ 5979 \end{array}$$
2397149765

4481

moon-measures

1915 Mar 24.

13

7
23.0
16.7

d

~

d

y

~

18350

16985

10054

15282

6142

8690

42

99

1682928298

8
22.4
16.9
very
in
gt

1312013

13403

11

13003

12710

09

1695959604

fuzzy on limit of east two points

44.81

d

moon - measures

1911 Men 24.

d

v

$$\begin{array}{r} 7 \\ \hline 23.0 \\ 167 \end{array}$$

18350

16985

10054

15282

61 + 2

8690

42

99

1652928298

$$\begin{array}{r} 8 \\ \hline 22.4 \\ 169 \\ \text{new} \\ 8 \end{array}$$

13120.3

13403

11

13003 09

127.10

09

1695919604

fuzzy on limit of east the point

4481 Times etc.

Exp. To stars	1913 Dec 14.	9 ^h	58 ^m	- 10 ^h	10 ^m
moon		10	03	08.6	- 10 03 08.8
clock fast			0	11.5	
H. sid T.		10	02	57.2	$\theta - \alpha = + 2^h 57^m$
H. long		4	44	31.05	
G. sid T.		14	47	28.25	
Sid. T. in horn		17	30	12.12	
Interval		21	17	16.13	
Reduction			3	29.25	
g.m.T.		21	13	46.88	

From naut. alman.			R.A.		local
moon 21 ^h	7 ^h	05 ^m	11.10	+ 27	09 10.5
Motion in 1 ^m 2.5130				5.086	
13.7813		+	34.63	- 1	10.1
Tabular place	7	05	45.73	+ 27	08 00.4

Moon's age 17 days.

parallel 57' 48.38"

semidiameter 15 46.6

924 = 12.25
946.6 = 12.6

R 946.6
Augmentation + 12.6
Irradiation (3) - 0.3

R 958.9

R 20555

AR - 989

(1+a)R 19566

R² 3.8282

a = -505.3

+ 24

481.3

4481 Times etc.
 Exp. Factor 1913 12 314 9" 58" - 10" 10"
 Mon. 10 03 08.6 - 10 03 08.8
 Clock face 0 11.5

H. Sid T. 10 02 57.2 6-2-12 57"
 H. long 4 44 31.05
 G. Sid T. 14 47 28.25
 Sid T. to Mon. 17 30 12.12
 Interval 21 17 16.13
 Reduction 3 29.25
 G. H. T. 21 13 46.88

From hand. Alen R A black
 Mon. 21" 7" 05" 11.10 + 27 09 10.5
 Mon. 21" 2.5130 10.06
 13.7813 + 34.63 - 1 10.1
 Tabular place 7 05 45.73 + 27 08 00.4

Mon. age 17 days.

parallel 57' 48.38"

semidiam 15 46.6

R 946.6

Augmentation 112.6

radiation(?) - 0.3

R 958.9

R 20555

ak - 989

(1+a)R 19566

R² 3.8282

R - 15053

24

4813

63

4481 Plato Centur

$$\begin{array}{r}
 \times \\
 179474 \\
 196621 \\
 335703 \\
 \hline
 3 \overline{) 7118} \\
 2373 \\
 \hline
 -22 \\
 \hline
 173 \\
 31 \\
 \hline
 54^s
 \end{array}$$

$$\begin{array}{r}
 4 \\
 8.8132 \\
 26.1606 \\
 246322 \\
 \hline
 59.61 \\
 19.87 \\
 \hline
 -18 \\
 \hline
 289 \\
 466.5 \\
 \hline
 873'' \\
 = 14' 33''
 \end{array}$$

$$\begin{array}{r}
 70043 \\
 0158 \\
 1031 \\
 \hline
 711132 \\
 70424 \\
 \hline
 -54 \\
 \hline
 70330
 \end{array}$$

$$\begin{array}{r}
 255741 \\
 281852 \\
 280258 \\
 \hline
 8177151 \\
 272630 \\
 \hline
 -1433 \\
 \hline
 271157
 \end{array}$$

$$\text{Center } \left\{ \begin{array}{l} A = 7^h 03^m 30^s \\ D = +27^\circ 12' 00'' \end{array} \right.$$

$$\begin{array}{r}
 x - 5 \quad +500x \quad +241.24 \quad +5.3x \quad -19032 \\
 +7837 +8974 = +16811 +2126^2 +18937 +95 = +19032 \quad = 0 \\
 +2785 +9831 = +12616 +6310^2 +18926 +105 = +19039 \quad = -1 \\
 -3872 +16785 = +12913 +5941^2 +18854 +178 = +19032 \quad = 0 \\
 222910 +11146 \quad +3619 \quad +118 \quad = 21.8761
 \end{array}$$

$$\begin{array}{r}
 y - 7 \quad +500y \quad -240.9x \quad +7.4y \quad -4311 \\
 +4163 +4407 = +8570 -4324 = +4246 +65 = +4311 \quad = 0 \\
 -4226 +13080 = +8854 -4737 = +4117 +194 = +4311 \quad = 0 \\
 -100 +12316 = +12216 -8087 = +4129 +182 = +4311 \quad = 0 \\
 15.0044 +7502 \quad -5370 \quad +111 \quad 14.7926
 \end{array}$$

$$\begin{array}{l}
 \text{Tables } a = -1.8 \quad c = -1.4 \quad a - c = -0.4 \quad b + a = -1.7 \\
 \text{obs } a = -505.3 \quad c = -507.4 \quad a - c = +2.1 \quad b + a = -0.3
 \end{array}$$

$$O - c = \quad -303.5'' \quad -506.0'' \quad +2.5'' \quad +1.4''$$

4481 Plate Center

$$\begin{array}{r}
 \times \\
 17.9474 \\
 19.6621 \\
 33.5703 \\
 \hline
 71.18 \\
 23.73 \\
 \hline
 173 \\
 31 \\
 \hline
 54
 \end{array}$$

$$\begin{array}{r}
 4 \\
 8.8132 \\
 26.1606 \\
 24.6322 \\
 \hline
 59.61 \\
 19.87 \\
 18 \\
 \hline
 2.87 \\
 4665 \\
 873 \\
 \hline
 14' 33''
 \end{array}$$

$$\begin{array}{r}
 7 \ 00 \ 43 \\
 01 \ 58 \\
 10 \ 31 \\
 \hline
 7 \ 11 \ 132 \\
 7 \ 04 \ 24 \\
 \hline
 - \ 54 \\
 7 \ 03 \ 30
 \end{array}$$

$$\begin{array}{r}
 25 \ 57 \ 91 \\
 28 \ 18 \ 52 \\
 28 \ 02 \ 58 \\
 \hline
 181 \ 77 \ 151 \\
 27 \ 26 \ 30 \\
 \hline
 - \ 14 \ 33 \\
 27 \ 11 \ 57
 \end{array}$$

$$\text{Center } \left\{ \begin{array}{l} A = 7^{\circ} 03' 20'' \\ D = +27^{\circ} 12' 00'' \end{array} \right.$$

$$\begin{array}{r}
 -5 \quad +5004 \quad +24124 \quad -531 \quad -19032 \\
 +7837 +8974 +16811 +2126 +18932 +95 +19032 = 0 \\
 +2785 +9831 +12616 +6310 +18926 -105 +19029 = -1 \\
 -3872 +16785 +12913 +5941 +18854 +175 +19032 = 0 \\
 222910 +11146 +3619 +118 = 214761
 \end{array}$$

$$\begin{array}{r}
 4-7 \quad +5004 \quad -240.92 \quad +7.47 \quad -4311 \\
 +4163 +4907 +8570 -4324 +4246 +65 +4311 = 0 \\
 -4226 +13080 +8857 -4737 +4117 +194 +4311 = 0 \\
 -100 +12316 +12216 -8087 +4129 +182 +4311 = 0 \\
 150047 +7502 -5370 +111 = 147976
 \end{array}$$

$$\begin{array}{r}
 \text{Tables } a = -1.8 \quad a = -1.4 \quad a = -0.4 \quad a + a = -1.7 \\
 \text{also } a = -505.3 \quad a = -507.4 \quad a + a = +2.1 \quad b + a = -0.3 \\
 0.2 = -3.5 \quad -6.0 \quad +2.5 \quad +1.4
 \end{array}$$

Curvature

	S	γ	ΔS	$-3.8S$	$-.1\gamma$	-5
1	-4.83	-9.62	-14	+18 =	+4	+1 = +5
2	-2.61	+8.58	-5	+10 =	+5	-1 = +4
3	+16.95	+6.56	+51	-45 =	+6	-1 = +5
M	-0.12	-3.20		+5	+0 =	<u>0</u>
		$\Delta\gamma$		-2.37	-1.33	= 0
		-27		+22 =	-7	-6 = -1
		+17		-20 =	-3	+3 = +0
		+30		-15 =	+15	-15 = +0
				+7	0 =	<u>+7</u>

$$\text{corr. } \alpha = +0.00$$

$$\text{corr. } S = +0.3$$

4481 Standard Coordinates.

Capeho 1014 m 8.5 Capeho 1015 m 6.2 Capeho 1031 m 5.9

C	6	59	54.64	7	01	08.63	7	09	42.51
L			54.68			62			53
Σ			.66 ^v			62			50
mean	6	59	54.66	7	01	08.62	7	09	42.51
Prec		+	48.11		+	48.97		+	48.75
X	7	00	42.77	7	01	57.59	7	10	31.26
A	7	03	30	7	03	30	7	03	30
$\alpha-A$		-2	47.23		-1	32.41		+	7 01.26
$\sin(\alpha-A)$			-1.67.23			-92.41			+421.19
log			2.22332 ^m			1.96572 ^m			2.62448
cos			9.95383			9.94467			9.94573
Σ			0.68439 ^m			0.41763 ^m			1.07745
Σ			-4.8346			-2.6159			+11.9522
Σ			-14			5			+53
Σ			17.1637			19.3836			33.9575
Σ			17.9474			19.6621			33.5703
Σ			+7837			+2785			-3872
C	+25	58	22.4	+28	19	50.7	+28	04	16.8
L			23.2			50.1			16.6
Σ			22.5 ^v			51.6 ^v			17.0
mean	+25	58	22.7	+28	19	50.8 ^v	+28	04	16.8
Prec		-1	07.8		-1	09.2		-1	08.6
S	+25	57	14.9	+28	18	41.6 ^v	+28	02	58.2
D	+27	12	00	+27	12	00	+27	12	00
S-D	-1	14	45.1	+1	06	41.6	+	50	58.2
$\tan(\alpha-D)$			-44.85.8			+40.02.1			+30.58.4
log			3.65184 ^m			3.60239 ^v			3.48550
Σ			0.98299 ^m			0.93344 ^v			0.81665
\tan			9.6874			9.7314			9.7266
Σ			1.3687			0.8352			2.1549
Σ			8.1095			7.6200			8.9349
Σ			-9.6160			+8.5790			+6.5561
Σ			+129			+42			+801
Σ			8.3969			26.5832			24.6422
Σ			8.8132			26.1606			24.6322
Σ			+4163			-4226			-100

4481 Standard Coordinates

Capeho 1014 m985				Capeho 1011 m962				Capeho 1031 m959			
C	6	59	54.64	7	01	08.63		7	09	42.51	
L			54.68								53
B			.66			.62					50
mean	6	59	54.66	7	01	08.62		7	09	42.51	
Proc		+	48.11		+	48.97			+	48.75	
A	7	00	42.77	7	01	57.59		7	10	31.26	
A	7	03	30	7	03	30		7	03	30	
A-A		-2	47.23		-1	32.41			+	7.01.26	
2(A-A)		-	167.23		-	92.41			+	43.11.9	
log		2.22	332.4		1.96	572.4			2.62	44.8	
cos		9.95	382		9.94	466			9.94	573	
S		0.68	43.64		0.41	762.4			1.07	74.5	
S		-4.83	46		-2.61	59			+	11.95	22
S		-	17		-	5			+		53
X		17.16	40		1.93	83.6			3.39	57.5	
X-2		17.94	74		1.96	62.1			3.35	70.3	
S		+	78.34		+	27.55			-	38.72	
C	+25	58	22.4	+28	19	50.7		-28	04	16.8	
L			23.2			50.1					16.6
B			22.5			51.6					17.0
mean	+25	58	22.7	+28	19	50.8		-28	04	16.8	
Proc		-	41.8		-1	09.2			-	1.78.6	
S	+25	57	40.9	+28	18	51.6		+28	02	58.2	
D	+27	12	00	+27	12	00		+27	12	00	
S-D	-1	14	19.1	8	1	06.51.6		+		50.58.2	
2(S-D)		-44	59.8		+	40.12.1			+	30.58.4	
log		3.64	931.4		3.60	337			3.48	55.0	
log		0.98	046.4		0.93	452.4			0.81	66.5	
tan		9.68	74		9.73	17			9.72	66	
S		1.36	87		0.83	52			2.15	49	
tan		8.10	95		7.62	00			8.93	49	
tan		-9.56	00		+	8.60	04		+	6.55	61
tan		+	12.9		+	42			+	8.01	
tan		8.45	29		2.66	04.6			24.6	42.2	
tan		8.81	32		2.61	60.6			24.6	32.2	
tan		+	36.03		-	44.40			-	1.00	

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Orion's Center

	x	$x - x_0$	Δx	$(x - x_0)^2$	$(x - x_0)^2 + (y - y_0)^2$	$0 - c$
1	$\sqrt{3.0000} + 0.7060$	-3	0.4980	3.8239	-4.3	
2	$23.9693 + 1.6753$	-2	2.8019	3.8139	-1.43	
3	$\sqrt{4.0000} + 1.7060$	-2	2.9097	3.8149	-1.33	
4	$24.2491 + 1.9551$	-0	3.8224	3.8224	-5.8	
5	$24.0000 + 1.7060$	+2	2.9111	3.8180	-1.02	
6	$23.9740 + 1.6800$	+2	2.8231	3.8151	-1.31	
7	$\sqrt{3.0000} + 0.7060$	+3	0.4988	3.8309	+2.7	
8	$22.2940 \quad 0.0000$	+3	0.0000	3.8255	-2.7	

$$R^2 = 3.8282$$

	y	$y - y_0$	Δy	$(y - y_0)^2$	
1	13.1802 - 1.8238	+1	3.3259	1.59	
2	14.0000 - 1.0040	+0	1.0080	1.21	
3	14.0526 - 0.9514	+0	0.9052	1.19	
4	15.0000 - 0.0040	+0	0.0000	90	
5	15.9563 + 0.9523	-0	0.9069	61	
6	16.0000 + 0.9960	-0	0.9920	54	59.
7	18.2955 + 1.8255	-1	3.3321	21	23
8	16.9600 + 1.9560	-1	3.8255	0	

Range = 15.9

Approx. Center $x_0 = 23.0$ $y = 13.1802$ $24.09 = 14.0526$

$$\begin{array}{r} 16.8295 \\ 30.0097 \\ \hline y_0 = 15.0048 \\ y\text{-max} = 16.9600 \\ R = 1.9552 \\ x\text{-max} = 24.2491 \\ x_0 = 22.2939 \end{array}$$

$$\begin{array}{r} 15.9563 \\ 30.0089 \\ \hline 15.0045 \end{array}$$

$$\text{Center } \begin{cases} x_0 = 22.2940 \\ y_0 = 15.0040 \end{cases}$$

4481

Orion's Center

	x	x - X_0	Δx	$(x - X_0)^2$	$(x - X_0)(y - Y_0)$	$y - Y_0$
1	230000	+0.7060	-3	0.4980	3.8239	-4.3
2	239093	+1.6753	-2	2.8059	3.8139	-1.43
3	240000	+1.7060	-2	2.9097	3.8149	-1.33
4	242491	+1.9551	-0	3.8224	3.8224	-5.8
5	240000	+1.7060	+2	2.9111	3.8180	-1.02
6	239740	+1.6800	+2	2.8231	3.8151	-1.31
7	230000	+0.7060	+3	0.4988	3.8309	+2.7
8	222940	0.0000	+3	0.0000	3.8255	-2.7

$$R^2 = 3.8282$$

	y	y - Y_0	Δy	$(y - Y_0)^2$	
1	13.1802	-1.8238	+1	3.3259	1.59
2	14.0000	-1.0040	+0	1.0080	1.21
3	14.0526	-0.9514	+0	0.9052	1.19
4	15.0000	-0.0040	+0	0.0000	.90
5	15.9563	+0.9523	-0	0.9069	.61
6	16.0000	+0.9960	-0	0.9920	.54
7	16.2295	+1.2255	-1	3.3321	.21
8	16.9600	+1.9560	-1	3.8255	0

Range = 15.9

Approx Center $X_0 = 230$ $Y_0 = 13.1802$

$$\begin{array}{r} 16.8295 \\ \hline 30.0097 \end{array}$$

$$Y_0 = 15.0048$$

$$Y_{\text{max}} = 16.9600$$

$$R = 1.7552$$

$$X_{\text{max}} = 24.2494$$

$$X_0 = 22.2939$$

$$Y_0 = 14.0526$$

$$15.9563$$

$$30.0089$$

$$11.0045$$

$$\text{Center } \left\{ \begin{array}{l} X = 22.2940 \\ Y = 15.0040 \end{array} \right.$$

Formation of Normals

1	- 1.29	- 20.5	+ 78.3
2	- 1.68	- 240.0	+ 143.0
3	- 1.62	- 227.5	+ 126.4
4	+ 0.00	- 113.6	- 0.0
5	+ 1.62	- 174.5	- 96.9
6	+ 1.68	- 220.0	- 131.0
7	+ 1.29	+ 19.2	+ 49.4
8	+ 0.00	- 0.0	- 52.9
	0.00	- 986.9	+ 116.3

-a	-b	+16	+AC
- 7	+ 4	+ 13	✓
- 17	+ 2	+ 1	✓
- 17	+ 2	+ 1	✓
- 20	- 0	- 4	✓
- 17	- 2	- 3	✓
- 17	- 2	- 3	✓
- 7	- 4	+ 5	✓
- 0	- 4	+ 12	✓

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Moon's Center Conditional Equations

	O	C	O - C	Corr.
1	$+0.71 - 1.82 = -43$	$-43 - 15 = -58$	$+15$	$+27^v$
2	$+1.68 - 1.00 = -143$	$-102 - 8 = -110$	-33	-32^v
3	$+1.71 - 0.95 = -133$	$-104 - 8 = -112$	-21	-20^v
4	$+1.96 + 0.00 = -58$	$-109 + 0 = -109$	$+51$	$+47^v$
5	$+1.71 + 0.95 = -102$	$-104 + 8 = -96$	-6	-9^v
6	$+1.68 + 1.00 = -131$	$-102 + 8 = -94$	-37	-40^v
7	$+0.71 + 1.83 = +27$	$-43 + 15 = -28$	$+52$	$+57^v$
8	$+0.00 + 1.96 = -27$	$-0 + 16 = +16$	-43	-31^v
			$+118 = 140$	
			Average = 32^v	

Normal Equations.

$$\begin{aligned}
 +16.27 + 0.00 &= -987 + 10.16 & a &= -60.7 + 0.14 \\
 +0.00 + 14.30 &= +116 + 1.97 & b &= +8.1 + 0.62
 \end{aligned}$$

$$\text{Arc measured} = 159^\circ \quad \text{Average}(O-C) = -2.8$$

$$\begin{aligned}
 \frac{pc}{n} &= 19 & \frac{-2.8}{19} &= -0.14 & \Delta n &= -0.2 \\
 -2RC &= +0.78 & +16 & & \text{Corr.} &= -0.2 \\
 &+2 & & & \Delta n &= 0.0 \\
 \Delta b &= +0.11 & \Delta \delta &= +0.1 & & \\
 &+10 & & & & \\
 \Delta a &= +0.48 & \Delta \alpha &= +0.02 & &
 \end{aligned}$$

4-4-61

Moore's Center
Concluded Equations

	0	C	0-C
1	$+0.71 - 1.82 = -43$	$-43 - 15 = -58$	$+15$
2	$+1.68 - 1.00 = -143$	$-102 - 8 = -110$	-33
3	$+1.71 - 0.95 = -133$	$-104 - 8 = -112$	-21
4	$+1.96 - 0.00 = -58$	$-109 - 0 = -109$	$+51$
5	$+1.71 + 0.95 = -102$	$-104 - 8 = -96$	-6
6	$+1.68 + 1.00 = -131$	$-102 - 8 = -94$	-37
7	$+0.71 + 1.83 = +27$	$-43 + 15 = -28$	$+52$
8	$+0.00 + 1.96 = -27$	$-0 + 16 = +16$	-43
			<hr/>
			$+118 - 140$
			Average = 22

Normal Equations

$$+16.27 + 0.00 = -987$$

$$+0.00 + 14.20 = +116$$

$$a = -60.7$$

$$b = +8.1$$

4481 Moon's Mean Position (1913.0)

$$\begin{array}{r} X_0 = 222940 \\ \text{in} = -30 \\ \hline 222910 \end{array} \quad \begin{array}{r} Y_0 = 150040 \\ \text{in} = +4 \\ \hline 150044 \end{array}$$

From plate constants $X = 21.8761$ $Y = 14.7976$

$$z = -0.1239$$

$$\log z = 9.09307 \text{ in}$$

$$\log \cos z = 9.95071$$

$$8.50724$$

$$\log(A) = 0.63512 \text{ in}$$

$$\alpha - A = 4.32$$

$$A = 7 \ 03 \ 30$$

$$\alpha_0 = 7 \ 03 \ 25.68$$

$$\text{Red. rel. aff.} = +5.24$$

$$\alpha' = 7 \ 03 \ 30.92$$

$$\eta = -3.2024$$

$$\log \tan \delta = 9.7040$$

$$8.1861$$

$$7.0534$$

$$\eta_1 = 4.9435$$

$$\log \eta_0 = 0.50548 \text{ in}$$

$$7.33115$$

$$\log(S-D) = 3.17433 \text{ in}$$

$$S-D = -24 \ 53.5$$

$$D = 27 \ 12 \ 00$$

$$S_0 = +26 \ 47 \ 06.1$$

$$\text{Red.} = +0.2$$

$$S' = +26 \ 47 \ 06.3$$

$$\begin{array}{r} 6586200 \\ 5700 \\ \hline + 500 \end{array}$$

$$\begin{array}{r} + 20 \quad 41 \quad 5-6 \quad 9 \\ \underline{5-5 \quad 5-} \\ + \quad 1 \quad 4 \end{array}$$

$$\begin{array}{r} 70546.38 \\ 40.46 \\ \hline + 592 \end{array}$$

$$\begin{array}{r} + 39 \quad 27 \quad 46.6 \\ 48.4 \\ \hline - 18 \end{array}$$

$$\begin{array}{r} 7 \ 58 \ 2745 \\ 2262 \\ \hline + 483 \end{array}$$

$$\begin{array}{r} + 16 \quad 18 \quad 27.5 \\ \underline{} \\ 26.8 \\ + 0.7 \end{array}$$

$$\begin{array}{r} 7 \quad 20 \quad 24.76 \\ 19.52 \\ \hline + 524 \end{array}$$

$$\begin{array}{r} +27 \quad 58 \quad 16.2 \\ 18.7 \\ \hline -2.5 \end{array}$$

Red. ad. Locum aht.

$$\begin{array}{rcl}
 H + \alpha & 7 & 29.7 = 112^\circ 26' \\
 H & 0 & 26.3 \\
 \alpha & 7 & 03.4 \\
 \delta & 22 & 30.5 \\
 \delta + \alpha & 5 & 33.9 = 83^\circ 28'
 \end{array}$$

$$\begin{array}{rcl}
 \log \cos(G + \alpha) & 9.0561 \\
 \log \sin & 1.3406 \\
 \log \tan S & 9.9972 \\
 & 9.7031 \\
 & 88239
 \end{array}$$

$$\begin{array}{rcl}
 \delta' & 0.3967 \\
 \delta & 9.8648
 \end{array}$$

$$\begin{array}{rcl}
 & +3.10 \\
 & +0.73 \\
 & +1.41 \\
 \hline
 & +5.24
 \end{array}$$

$$S = +26^\circ 47'$$

$$\begin{array}{rcl}
 \log \cos S & 9.9507 \\
 & 0.0050 \\
 \hline
 \log & 9.9557
 \end{array}$$

$$\begin{array}{rcl}
 \log \sin S & 9.6538 \\
 \log \cos(H + \alpha) & 9.5816 \\
 \log h & 1.3106 \\
 \log \sin & 9.9658 \\
 \log \sec S & 0.0493 \\
 & 88239
 \end{array}$$

$$\begin{array}{rcl}
 h' & 0.5460 \\
 h & 0.1496
 \end{array}$$

$$\begin{array}{rcl}
 \delta' & +2.49 \\
 h' & -3.21 \\
 i & +0.90 \\
 \hline
 & +0.18
 \end{array}$$

Red. and Emission shifts.

$$\begin{array}{rcl}
 H + \lambda & 7 & 29.7 : 112^\circ 26' \\
 H & 0 & 26.3 \\
 \lambda & 7 & 03.4 \\
 B & 22 & 30.5 \\
 B + \lambda & 5 & 339 : 83^\circ 28'
 \end{array}$$

$$\begin{array}{rcl}
 \lambda \cos(G + \lambda) & 90561 \\
 -f & 13406 \\
 -\sin & 99972 \\
 \sin & 97031 \\
 \sin & 88239
 \end{array}$$

$$\begin{array}{rcl}
 g' & 03967 \\
 g & 98648
 \end{array}$$

$$\begin{array}{rcl}
 f & +3.10 \\
 g & +0.73 \\
 h & +1.41 \\
 \hline
 & +5.24
 \end{array}$$

$$S = +26^\circ 47'$$

$$\begin{array}{rcl}
 \lambda \cos S & 99507 \\
 \lambda & 00050 \\
 \hline
 (a) & 99557
 \end{array}$$

$$\begin{array}{rcl}
 \lambda \cos S & 96538 \\
 -\cos(H + \lambda) & 95516 \\
 -h & 13106 \\
 \sin & 99658 \\
 \sin S & 00493 \\
 \sin & 88239
 \end{array}$$

$$\begin{array}{rcl}
 h' & 05460 \\
 h & 01496
 \end{array}$$

$$\begin{array}{rcl}
 g' & +2.49 \\
 g & -3.21 \\
 \hline
 i & +0.90 \\
 & +0.18
 \end{array}$$

0 6 0

4481

Lunar parallax.

$$\begin{array}{r}
 \alpha = 7^h 03^m 30.92 \\
 \odot = 10 \quad 02 \quad 57.2 \\
 \alpha - \odot = +2 \quad 59 \quad 26.3 \\
 + \quad 44 \quad 51 \quad 34''
 \end{array}$$

$$+ \quad 16 \quad 57$$

$$+ \quad 44 \quad 34 \quad 37$$

$$9.95727$$

$$0.00000$$

$$0.14733$$

$$0.10460$$

$$\delta = 51^\circ 50' 00$$

$$26 \quad 47 \quad 06$$

$$25 \quad 02 \quad 54$$

$$9.82640$$

$$8.22568$$

$$9.62673$$

$$0.10446$$

$$778327$$

$$s - s' = +20 \quad 52.3$$

$$s = +27 \quad 07 \quad 58.6$$

$$\text{Am Eph } s = +27 \quad 08 \quad 00.4$$

$$o - c \quad - \quad 1.8$$

$$\text{Cirr.} \quad +0.3$$

$$\text{Lun.} \quad +0.1$$

$$s \quad +27 \quad 07 \quad 58.7$$

$$o - c \quad - \quad 1.7$$

$$s = +26^\circ 47' 06.3$$

$$\Pi = 57' 48.38$$

$$9.86913$$

$$8.22568$$

$$9.84842$$

$$0.05064$$

$$799385$$

$$\alpha - \alpha' = +33' 53.67$$

$$+ 2 \quad 15.58$$

$$\alpha \quad 7 \quad 05 \quad 46.50$$

$$\alpha \quad 7 \quad 05 \quad 45.73$$

$$+ 0.77$$

$$\text{Cirr.} \quad + 0.00$$

$$\text{Lun.} \quad + 0.03$$

$$\alpha = 7 \quad 05 \quad 46.52$$

$$o - c = +0.79$$

4481

Lunar parallax.

$$\begin{array}{r}
 \alpha = 7^{\circ} 03' 30.92 \\
 \delta = 10^{\circ} 02' 57.2 \\
 \alpha - \delta = +2^{\circ} 59' 26.3 \\
 + \quad 44^{\circ} 51' 34'' \\
 + \quad \quad 16' 57'' \\
 + \quad 44' 34' 37''
 \end{array}$$

$$\begin{array}{r}
 9.95727 \\
 0.00000 \\
 \hline
 0.14733 \\
 0.10460
 \end{array}$$

$$\begin{array}{r}
 51^{\circ} 50' 00'' \\
 26' 47' 06'' \\
 25' 02' 54''
 \end{array}$$

$$\begin{array}{r}
 9.82640 \\
 8.22568 \\
 9.62673 \\
 \hline
 0.10446 \\
 7.78327
 \end{array}$$

$$S - S' = +20' 52.3$$

$$S = 727' 07' 58.6$$

$$\text{Ann. Eph. } S = +27' 08' 00.4$$

$$O - C = -1.8$$

$$\begin{array}{r}
 \text{Lun.} \quad +0.1 \\
 S - S' \quad +27' 07' 58.7 \\
 O - C \quad -1.7
 \end{array}$$

$$S = +26^{\circ} 47' 06.3$$

$$\Pi = 57' 48.38$$

$$\begin{array}{r}
 9.86913 \\
 8.22568 \\
 9.84872 \\
 \hline
 0.05064 \\
 7.99385
 \end{array}$$

$$\alpha - \delta = +33' 53.67$$

$$+2' 11.58$$

$$\alpha = 7^{\circ} 05' 46.50$$

$$\alpha = 7^{\circ} 05' 45.73$$

$$+0.77$$

$$\begin{array}{r}
 \text{Ann.} \\
 \text{Lun.} \quad +0.02 \\
 \alpha = 7^{\circ} 05' 46.52 \\
 O - C = +0.79
 \end{array}$$

