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COLORADO SURVEY

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Exploration and Survey of Colorado River.

Commanded by Lieut. J. C. IVES. Topographical Engineers.

No 3

India Building, 82 State Street, Boston.

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1857 Dec. 23d

Station, Camp 1

Latitude = ∠ = + 31. 49 20 + 6"

North polar dist. = △ = 45 13 29.2

Name of star = α Cygni (2 obs)

Obs'd doub. alt. = ~~44 54 26.7~~ 44 37 45.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 22 18 52.5

Ref. (Ther. 49.5 bar. 30.3) = − 2 22.2

True alt. of ∗ = A = 22 16 30.3

p = hour angle

2 m = ∠ + △ + A

∠ = 31 49 20.0 cos. ∠ = 9.929260

△ = 45 13 29.2 sin. △ = 9.851182

A = 22 16 30.3 cos. ∠ sin. △ = 9.780442

2 m = 99 19 19.5

m = 49 39 39.7 cos. m = 9.811110

m − A = 27 23 09.4 sin. (m − A) = 9.662740

Cos. m sin. (m − A) = 9.473850

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.693408$$

Ref − 2' 21.0

Bar − 1.2

Ther 0.0

− 2 22.2

sin. ½ p = 9.846704

½ p = 44° 38 08.0"

p in arc. = 89 16 16.0

p in time = 5 57 05.1 + 0.4

α Cygni AR ∗ = 20 36 33.6

Sidereal time = AR ± p = 2 33 38.7

Time of obs'n by chron'r = 4 11 03.7

Chron'r fast of sid'l time = 1 37 25.0 − 0.4 =

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1857 Dec. 23

Station, Camp 1

Latitude = ∠ = + 31. 49 20 + 6″

North polar dist. = △ = 98 22 02.2

Name of star = β Orionis (Rigel)

Obs'd doub. alt. = 74 20 47.5

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 37 10 23.7

Ref. (Ther. 49.5 bar. 30.3) = -1 17.8

True alt. of * = A = 37 9 5.9

p = hour angle

2 m = ∠ + △ + A

∠ = 31 49 20.0 cos. ∠ = 9.929260

△ = 98 22 2.2 sin. △ = 9.995352

A = 37 9 5.9 cos. ∠ sin. △ = 9.924612

2 m = 167 20 28.1

m = 83 40 14.0 cos. m = 9.042359

m — A = 46 31 8.1 sin. (m — A) = 8.860698

Cos. m sin. (m — A) = 8.903057

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.978445$$

Ref. -1 16.8

Bar. -1.0

Ther. 0.0

-1. 17.8

sin. ½ p = 9.489222

½ p = 17° 58′ 2.8

p in arc. = 35′ 56″ 5.6

p in time = 2 23 44.4 −0.5

AR * = 5 7 44.4

Sidereal time = AR ± p = 2 44 00.0

Time of obs'n by chron'r 330 = 4 21 22.5

Chron'r fast of sid'l time = 1 37 22.5 −0.5 = 1 37 22.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1857 Dec. 26

Station, Camp. 1

Latitude = ∠ = +31 49 20 +3"

North polar dist. = △ = 98 22 02.5

Name of star = β Ursæ Minoris (2d1) ε

Obs'd doub. alt. = 70° 00 25.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 35 00 12.5

Ref. (Ther. 52.5 bar. 30.0) = 1 22.7

True alt. of ∗ = A = 34 58 49.8

p = hour angle

2 m = ∠ + △ + A

∠ = 31 49. 20.0 cos. ∠ = 9.929260

△ = 98 22 2.5 sin. △ = 9.995352

A = 34 58 49.8 cos. ∠ sin. △ = 9.924612

2 m = 165 10 12.3

m = 82 35 6.1 cos. m = 9.110774

m — A = 47 36 16.3 sin. (m — A) = 9.868355

Cos. m sin. (m — A) = 8.979129

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.054517$$

Ref. − 1 23.1

Bar 0.0

Ther. +0.4

− 1. 22.7

sin. ½ p = 9.527258

½ p = 19 40 36.0

p in arc. = 39 21 12.0

p in time = 2 37 24.8 − 0.2

AR ∗ = 5 7 44.4

Sidereal time = AR ± p = 2. 30 19.6

Time of obs'n by chron'r = 3 12 03.2

Chron'r of sid'l time = 0 41 43.6 − 0.2 = 0 41 43.4

Observations discordant result to be rejected

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Dec. 28

Station, Camp 1

Latitude = ∠ = + 31 49 20 +7″

North polar dist. = △ = 82 37 16.3

Name of star = α Orionis (Bet)

Obs'd doub. alt. = 92 48 30.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 46 24 15.0

Ref. (Ther. 52.5 bar. 30.3) = − 0 56.1

True alt. of ✱ = A = 46 23 18.9

p = hour angle

2 m = ∠ + △ + A

∠ =	31	49	20.0	cos. ∠ =	9.929260
△ =	82	37	16.3	sin. △ =	9.996389
A =	46	23	18.9	cos. ∠ sin. △ =	9.925649
2 m =	160	49	55.2		
m =	80	24	57.6	cos. m =	9.221397
m − A =	34	01	38.7	sin. (m − A) =	9.747870

Cos. m sin. (m − A) = 8.969267

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.043618$$

Ref. − 0 55.5 Bar. − 0.8 Ther. + 0.2 = − 0 56.1

sin. ½ p	=	9.521809
½ p	=	19 25 17.0
p in arc.	=	38 50 34.0
p in time	=	2 35 22.3 − 0.3
AR ✱	=	5 47 30.6
Sidereal time = AR ± p	=	3 12 08.3
Time of obs'n by chron'r	=	4 49 27.7
Chron'r of sid'l time	=	1 37 19.4 − 0.3 = 1 37 19.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Dec 28

Station, Camp 1

Latitude = ∠ = + 31 . 49 20 . + 7"

North polar dist. = △ = 61 . 41 . 27.5

Name of star = α Andromedæ (5 d.) W

Obs'd doub. alt. = 94° 40' 42".0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 . 20 . 21.0

Ref. (Ther. 52.5 bar. 30.3) = − 0 54.3

True alt. of ∗ = A = 47 19 26.7

p = hour angle

2 m = ∠ + △ + A

∠ =	31	49	20.0	cos. ∠ =	9.929260
△ =	61	41	27.5	sin. △ =	9.944681
A =	47	19	26.7	cos. ∠ sin. △ =	9.873941
2 m =	140	50	14.2		
m =	70	25	07.1	cos. m =	9.525234
m − A =	23	5	40.4	sin. (m − A) =	9.593561

Cos. m sin. (m − A) = 9.118795

Sin.² ½ p = $\frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}}$ = 9.244854

Ref. − 0 53.7

Bar. − 0.8

Ther. + 0.2

− 0.54.3

sin. ½ p = 9.622427

½ p = 24 47 04.9

p in arc. = 49 34 8.0

p in time = 3 18 16.5 + 0.1

AR ∗ = 0 1 2.9

Sidereal time = AR ± p = 3 19 19.4

Time of obs'n by chron'r = 4 56 44.1

Chron'r of sid'l time = 1 37 24.7 − 0.1 1 37 24.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1857 Dec. 31st

Station, Can. # 2

Latitude = ∠ = + 32 .. 04 18 + 0"

North polar dist. = △ = 84 .. 24 .. 45.7

Name of star = Procyon (6M.)

Obs'd doub. alt. = 95 .. 08 .. 26.7

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 .. 34 .. 13.4

Ref. (Ther. 54.0 bar. 30.2) = - 0 53.2

True alt. of ∗ = A = 47 33 20.2

p = hour angle

2 m = ∠ + △ + A

∠ =	32	4	18.0	cos. ∠ =	9.928081
△ =	84	24	45.7	sin. △ =	9.997932
A =	47	33	20.2	cos. ∠ sin. △ =	9.926013
2 m =	164	2	23.9		
m =	82	1	11.9	cos. m =	9.142477
m — A =	34	27	51.7	sin. (m — A) =	9.752734

Cos. m sin. (m — A) = 8.895211

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.969198$$

Ref. - 0 53.3

Bar. - 0.3

Ther. + 0.4

- 0 .. 53.2

sin. ½ p	=	9.484599
½ p	=	17 46 15.0
p in arc.	=	35 32 30.0
p in time	=	2 22 10.0 +0.0
AR ∗	=	7 39 53.5
Sidereal time = AR ± p	=	5 9 43.5
Time of obs'n by chron'r	=	6 .. 47 .. 33.8
Chron'r of sid'l time	=	1 37 50.3 +0.0 = 1 37 50.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1857 Dec. 31

Station, Camp 2

Latitude = ∠ = 32.. 04 18 + 0"

North polar dist. = △ = 67.. 12.. 28.7

Name of star = α Arietis (3 Obs.)

Obs'd doub. alt. = 88.. 16.. 03.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 44.. 08.. 01.5

Ref. (Ther. 54.0 bar. 30.2) = − 1 0.2

True alt. of ✱ = A = 44 7 1.3

p = hour angle

2 m = ∠ + △ + A

∠ =	32	4	18.0	cos. ∠ =	9.928081
△ =	67	12	28.7	sin. △ =	9.964692
A =	44	7	1.3	cos. ∠ sin. △ =	9.892773
2 m =	143	23	48.0		
m =	71	41	54.0	cos. m =	9.496957
m − A =	27	34	52.7	sin. (m − A) =	9.665588

Cos. m sin. (m − A) = 9.162545

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.269772$$

Ref. −1 00.0

Bar. − 0.7

Thr. + 0.5

− 1.. 00.2

sin. ½ p	=	9.634886
½ p	=	25 33 24.6
p in arc.	=	51 6 49.2
p in time	=	3 24 27.3 +0.0
AR ✱	=	1 59 11.0
Sidereal time = AR ± p	=	5 23 38.3
Time of obs'n by chron'r	=	7.. 01.. 35.5
Chron'r fast of sid'l time	=	1 37 57.2

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 ~~Dec. 27~~ Jan. 1st

Station, Camp 3d

Latitude = ∠ = 32 11 21 +0"

North polar dist. = △ = 45 13 31.6

Name of star = α Cygni (6 obs.)

Obs'd doub. alt. = 69 46 06.7

Index error = + 20.0

Eccentricity =

Doub. alt. cor. = 69 46 26.7

Altitude = 34 53 13.3

Ref. (Ther. 52.5 bar. 30.4) = 1 24.2

True alt. of * = A = 34 51 49.1

p = hour angle

2 m = ∠ + △ + A

∠ =	32	11	21.0	cos. ∠ =	9.927522
△ =	45	13	31.6	sin. △ =	9.851187
A =	34	51	49.1	cos. ∠ sin. △ =	9.778709
2 m =	112	16	41.7		
m =	56	8	20.8	cos. m =	9.745995
m − A =	21	16	31.7	sin. (m − A) =	9.555730

Cos. m sin. (m − A) = 9.305725

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.527018$$

Ref. −1 23.4

Bar. −1.1

Ther. +0.3

−1 24.2

sin. ½ p = 9.763508

½ p = 35 27 29.0

p in arc. = 70 54 58.0

p in time = 4 43 39.9 +0.0

AR * = 20 36 33.5

Sidereal time = AR ± p = 1 20 13.4

Time of obs'n by chron'r = 2 58 10.8

Chron'r of sid'l time = 1 37 57.4 +0.0 = 1 37 57.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Jan. 1st

Station, Camp 3

Latitude = ∠ = 32 11 21 +0"

North polar dist. = △ = 73 46 37.8

Name of star = Aldebaran (2 obs)

Obs'd doub. alt. = 93 16 30.0

Index error = + 20.0

Eccentricity =

Doub. alt. cor. = 93 16 50.0

Altitude = 46 38 25.0

Ref. (Ther. 52.5 bar. 30.4) = − 0 55.6

True alt. of ∗ = A = 46 37 29.4

p = hour angle

2 m = ∠ + △ + A

∠ =	32 11 21.0	cos. ∠ =		9.927522
△ =	73 46 37.8	sin. △ =		9.982354
A =	46 37 29.4	cos. ∠ sin. △ =		9.909876
2 m =	152 35 28.2			
m =	76 17 44.1	cos. m =		9.374589
m − A =	29 40 14.7	sin. (m − A) =		9.699618

Cos. m sin. (m − A) = 9.069207

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.159331$$

Ref. − 0 55.0

Bar. − 0.8

Ther. + 0.2

− 0 55.6

sin. ½ p	=	9.579665
½ p	=	22 19 38.1
p in arc.	=	44 39 16.2
p in time	=	2 58 37.1 +0.0
AR ∗	=	4 27 47.9
Sidereal time = AR ± p	=	1 29 10.8
Time of obs'n by chron'r	=	3 07 05.7
Chron'r of sid'l time	=	1 37 54.9 +0.0 = 1 37 54.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 2d

Station, Camp 4

Latitude = ∠ = 32 17 49 + 0"

North polar dist. = △ = 73.46.37.8

Name of star = Aldebaran (66d)

Obs'd doub. alt. = 96.10.43.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 48 5 21.6

Ref. (Ther. 38.0 bar. 30.5) = −0 54.5

True alt. of ∗ = A = 48 4 27.1

p = hour angle

2 m = ∠ + △ + A

∠ = 32 17 49.0 cos. ∠ = 9.927006

△ = 73 46 37.8 sin. △ = 9.982354

A = 48 4 27.1 cos. ∠ sin. △ = 9.909360

2 m = 154 8 53.9

m = 77 4 26.9 cos. m = 9.349647

m − A = 28 59 59.8 sin. (m − A) = 9.685570

Cos. m sin. (m − A) = 9.035217

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.125857$$

Ref. − 0 52.4 sin. ½ p = 9.562928

Bar. − 0.9 ½ p = 21 26 25.7

Ther. − 1.2 p in arc. = 42 52 51.4

− 0 54.5 p in time = 2 51 31.4 + 0.0

AR ∗ = 4 27 47.9

Sidereal time = AR ± p = 1 36 16.5

Time of obs'n by chron'r = 3 13 48.9

Chron'r of sid'l time = 1 37 32.4 + 0.0 = 1 37 32.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 2d

Station, Camp 4

Latitude = ∠ = 32 17 49 +0"

North polar dist. = △ = 45 13 37.4

Name of star = α Cygni (6 dh)

Obs'd doub. alt. = 61 56 05.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 30 58 2.5

Ref. (Ther. 38.0 bar. 30.5) = 1 40.9

True alt. of ∗ = A = 30 56 21.6

p = hour angle

2 m = ∠ + △ + A

∠ = 32 17 49.0 cos. ∠ = 9.927006

△ = 45 13 31.4 sin. △ = 9.851188

A = 30 56 21.6 cos. ∠ sin. △ = 9.778194

2 m = 108 27 42.0

m = 54 13 51.0 cos. m = 9.766800

m − A = 23 17 29.4 sin. (m − A) = 9.597047

Cos. m sin. (m − A) = 9.363847

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.585653$$

Ref. −1 36.8 Bar. −1.8 Ther. −2.3 = −1 40.9

sin. ½ p = 9.792826

½ p = 38 21 41.2

p in arc. = 76 43 22.4

p in time = 5 6 53.5 +0.0

AR ∗ = 20 36 33.5

Sidereal time = AR ± p = 1 43 27.0

Time of obs'n by chron'r = 3 21 02.9

Chron'r of sid'l time = 1 37 35.9 +0.6 = 1 37 35.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 3

Station, Camp 5

Latitude = ∠ = 32 24 03 +0″

North polar dist. = △ = 73 46 37.8

Name of star = Aldebaran (α 1)

Obs'd doub. alt. = 89 11 32.5

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 44 35 46.2

Ref. (Ther. 32.5 bar. 30.4) = −1 02.1

True alt. of ✱ = A = 44 34 44.1

p = hour angle

2 m = ∠ + △ + A

∠ = 32 24 03.0 cos. ∠ = 9.926507

△ = 73 46 37.8 sin. △ = 9.982354

A = 44 34 44.1 cos. ∠ sin. △ = 9.908861

2 m = 150 45 24.9

m = 75 22 42.4 cos. m = 9.402147

m − A = 30 47 58.3 sin. (m − A) = 9.709300

Cos. m sin. (m − A) = 9.111447

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.202586$$

Ref. −0 59.2 sin. ½ p = 9.601293

Bar. −1.0 ½ p = 23 32 2.6

Thr. −1.9 p in arc. = 47 4 5.2

−1 02.1 p in time = 3 8 16.3 +0.0

AR ✱ = 4 27 47.9

Sidereal time = AR ± p = 1 19 31.6

Time of obs'n by chron'r = 2 56 50.9

Chron'r of sid'l time = 1 37 19.3 +0.0 = 1 37 19.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 30

Station, Camp 5

Latitude = ∠ = 32 24 03 + 0"

North polar dist. = △ = 45 13 32.1

Name of star = α Cygni (6 Obs)

Obs'd doub. alt. = 67 49 20.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 33 54 40.0

Ref. (Ther. 32.5 bar. 30.4) = 1 30.9

True alt. of ∗ = A = 33 53 9.1 Pw

p = hour angle

2 m = ∠ + △ + A

∠ =	32	24	03.0	cos. ∠ =	9.926507
△ =	45	13	32.1	sin. △ =	9.855188
A =	33	53	9.1	cos. ∠ sin. △ =	9.777695
2 m =	111	30	44.2		
m =	55	45	22.1	cos. m =	9.750289
m − A =	21	52	13.0	sin. (m − A) =	9.371134

Cos. m sin. (m − A) = 9.321423

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.543728$$

Ref. − 1 26.8

Bar. − 1.2

Ther. − 2.9

− 1 30.9

sin. ½ p = 9.771864

½ p = 36 15 17.1

p in arc. = 72 30 34.2

p in time = 4 50 2.3 +0.10

AR ∗ = 20 36 33.5

Sidereal time = AR ± p = 1 26 35.8

Time of obs'n by chron'r = 3 03 58.3

Chron'r of sid'l time = 1 37 22.5 + 0.0 = 1 37 22.5

1 37 12.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 11

Station, Camp 12

Latitude = ∠ = 32 45 36. +2"

North polar dist. = △ = 45 13 34.1

Name of star = α Cygni (4ch)

Obs'd doub. alt. = 45 10 35

Index error = 0

Eccentricity =

Doub. alt. cor. = 45 10 35.0

Altitude = 22 35 17.5

Ref. (Ther. 45 bar. 29.8) = −2 19.6

True alt. of ✱ = A = 22 32 57.9

p = hour angle

2 m = ∠ + △ + A.

∠ =	32	45	36.0	cos. ∠ =	−9.924769
△ =	45	13	34.1	sin. △ =	9.851193
A =	22	32	57.9	cos. ∠ sin. △ =	9.775962
2 m =	100	32	08.0		
m =	50	16	4.0	cos. m =	9.805637
m − A =	27	43	6.1	sin. (m − A) =	9.667570

Cos. m sin. (m − A) = 9.473207.

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.697245$$

Ref. −2 19.2

Bar. +1.0

Ther. −1.4

−2.196

sin. ½ p	=	9.848622
½ p	=	44 53 17.0
p in arc.	=	89 46 22.0
p in time	=	5 59. 5.5 +0.1
AR ✱	=	20 36 33.5
Sidereal time = AR ± p	=	2 35 39.0
Time of obs'n by chron'r	=	4 11 20.0
Chron'r of sid'l time	=	1 35 41.0 +0.1 = 1 35 41.1

1 35 41.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 11

Station, Camp 12

Latitude = ∠ = 32 45 36 + 2"

North polar dist. = △ = 98 22 04.7

Name of star = β Orionis (4 Mr)

The star was recorded as α Orionis.

Obs'd doub. alt. = 72 31 07.5

Index error = 0.0

Eccentricity =

Doub. alt. cor. = 72 31 07.5

Altitude = 36 15 33.7

Ref. (Ther. 45 bar. 29.8) = -1 19.7

True alt. of ∗ = A = 36 14 14.0

p = hour angle

2 m = ∠ + △ + A

∠ =	32	45	36.0	cos. ∠ =	9.924769
△ =	98	22	04.7	sin. △ =	9.995352
A =	36	14	14.0	cos. ∠ sin. △ =	9.920121
2 m =	167	21	54.7		
m =	83	40	57.3	cos. m =	9.041535
m — A =	47	26	43.3	sin. (m — A) =	9.867251

Cos. m sin. (m — A) = 8.908786

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.988665$$

Ref. −1 19.6

Ber. + 0.8

Ther. − 0.9

−1 19.7

sin. ½ p = 9.494333

½ p = 18 11 15.0

p in arc. = 36 22 30.2

p in time = 2 25 30.0 − 0.1

AR ∗ = 5 07 44.3

Sidereal time = AR ± p = 2 42 14.3

Time of obs'n by chron'r = 4 17 53.1

Chron'r of sid'l time = 1 35 38.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 12

Station, Camp 13

Latitude = ∠ = 32 50 00 + 1"

North polar dist. = △ = 73 46 38.0

Name of star = Aldebaran (obs)

Obs'd doub. alt. = 97 32 52.5

Index error =

Eccentricity =

Doub. alt. cor. = 97 32 52.5

Altitude = 48 46 26.2

Ref. (Ther. 45.0 bar. 29.9) = − 0 51.3

True alt. of ✱ = A = 48 45 34.9

p = hour angle

2 m = ∠ + △ + A

∠ =	32	50	00.0	cos. ∠ =	9.924409
△ =	73	46	38.0	sin. △ =	9.982354
A =	48	45	34.9	cos. ∠ sin. △ =	9.906763
2 m =	155	22	12.9		
m =	77	41	6.4	cos. m =	9.328959
m − A =	28	55	31.5	sin. (m − A) =	9.684560

Cos. m sin. (m − A) = 9.013509

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.106746$$

Ref. − 0 51.0

Bar + 0.2

Ther. − 0.5

− 0 51.3

sin. ½ p = 9.553373

½ p = 20 57 6.0

p in arc. = 41 54 12.0

p in time = 2 47 36.8 −0.0

AR ✱ = 4 27 47.9

Sidereal time = AR ± p = 1 40 11.1

Time of obs'n by chron'r = 3 15 27.9

Chron'r of sid'l time = 1 35 16.8 −0.0 = 1 35 16.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 12

Station, Camp 13

Latitude = ∠ = 32 50 00 + 1"

North polar dist. = △ = 45 13 34.1

Name of star = α Cygni (4 obs)

Obs'd doub. alt. = 60 52 35.0

Index error =

Eccentricity =

Doub. alt. cor. = 60 52 35.0

Altitude = 30 26 17.5

Ref. (Ther. 45.0 bar. 29.9) = − 1 39.2

True alt. of ∗ = A = 30 24 38.3

p = hour angle

2 m = ∠ + △ + A

∠ = 32 50 00.0 cos. ∠ = 9.924409

△ = 45 13 34.1 sin. △ = 9.851193

A = 30 24 38.3 cos. ∠ sin. △ = 9.775602

2 m = 108 28 12.4

m = 54 14 6.2 cos. m = 9.766756

m − A = 23 49 27.9 sin. (m − A) = 9.606312

Cos. m sin. (m − A) = 9.373068

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.597466$$

Ref. −1 38.6 Bar. +0.4 Ther. −1.0 −1 39.2

sin. ½ p = 9.798733

½ p = 38 59 6.5

p in arc. = 77 58 13.0

p in time = 5 11 52.9 +0.1

AR ∗ = 20 36 33.5

Sidereal time = AR ± p = 1 48 26.4

Time of obs'n by chron'r = 3 23 42.9

Chron'r of sid'l time = 1 35 16.5 +0.1 = 1 35 16.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 14

Station, Camp 15 Shoal Water Reach

Latitude = ∠ = 33 00 10 +3"

North polar dist. = △ = 45 13 34.7

Name of star = α Cygni (2 obs)

Obs'd doub. alt. = 55 19 30.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 27 39 45.0

Ref. (Ther. 46.0 bar. 29.9) = 1 51.0

True alt. of ∗ = A = 27 37 54.0

p = hour angle

2 m = ∠ + △ + A

∠ =	33 00 10.0	cos. ∠ =	9.923578
△ =	45 13 34.7	sin. △ =	9.851194
A =	27 37 54.0	cos. ∠ sin. △ =	9.774772
2 m =	105 51 38.7		
m =	52 55 49.3	cos. m =	9.780163
m — A =	25 17 55.3	sin. (m — A) =	9.630771
Cos. m sin. (m — A)		=	9.410934
Sin.² ½ p = cos. m sin. (m — A) / cos. ∠ sin. △		=	9.636162
	sin. ½ p	=	9.818081
	½ p	=	41 7 51.3
	p in arc.	=	82 15 42.6
	p in time	=	5 29 2,8 +0.2
	AR ∗	=	20 36 33.5
Sidereal time = AR ± p		=	2 5 36,3
Time of obs'n by chron'r		=	3 40 45.2
Chron'r	of sid'l time	=	1 35 8.9 −0.2 = 1 35 8.7

Ref. −1 50.7

Bar. +0.6

Ther. −0.9

−1 51.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 14

Station, Camp 95 Shoal Water Reach

Latitude = ∠ = 33 00 10.0 + 3"

North polar dist. = △ = 82 37 17.5

Name of star = α Orionis (3 obs)

Obs'd doub. alt. = 69 06 53.3

Index error =

Eccentricity =

Doub. alt. cor. = 69 06 53.3

Altitude = 34 33 26.6

Ref. (Ther. 46.0 bar. 29.9) = −1 24.8

True alt. of ∗ = A = 34 32 1.8

p = hour angle

2 m = ∠ + △ + A

∠ = 33 00 10.0 cos. ∠ = 9.923578

△ = 82 37 17.5 sin. △ = 9.996389

A = 34 32 1.8 cos. ∠ sin. △ = 9.919967

2 m = 150 9 29.3

m = 75 4 44.6 cos. m = 9.410754

m − A = 40 32 42.8 sin. (m − A) = 9.812946

Cos. m sin. (m − A) = 9.223700

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.303733$$

Ref. −1 24.5 Bar. +0.4 Ther. −0.7 = −1 24.8

sin. ½ p = 9.651866

½ p = 26 39 15.7

p in arc. = 53 18 31.4

p in time = 3 33 14.1 −0.1

AR ∗ = 5 47 30.6

Sidereal time = AR ± p = 2 14 16.5

Time of obs'n by chron'r = 3 49 27.3

Chron'r of sid'l time = 1 35 10.8 −0.1 = 1 35 10.7

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 17

Station, Camp 18 Desert Shoals

Latitude = ∠ = 33 10 27 +0″

North polar dist. = △ = 45 13 35.6

Name of star = α Cygni (7 obs)

Obs'd doub. alt. = 51 03 00.0

Index error = + 20.0

Eccentricity =

Doub. alt. cor. = 51 03 20.0

Altitude = 25 31 40.0

Ref. (Ther. 49.0 bar. 29.9) = 2 01.0

True alt. of ✱ = A = 25 29 39.0

p = hour angle

2 m = ∠ + △ + A

∠ =	33 10 27.0	cos. ∠ =	9.922730
△ =	45 13 35.6	sin. △ =	9.851195
A =	25 29 39.0	cos. ∠ sin. △ =	9.773925
2 m =	103 53 41.6		
m =	51 56 50.8	cos. m =	9.789852
m — A =	26 27 11.8	sin. (m — A) =	9.648817

Cos. m sin. (m — A) = 9.438669

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.664744$$

Ref. 2 01.5

Bar. + 0.8

Ther. − 0.3

2 01.0

sin. ½ p	=	9.832372
½ p	=	42 49 37.0
p in arc.	=	185 39 14.0
p in time	=	5 42 36.9 +0.0
AR ✱	=	20 36 33.5
Sidereal time = AR ± p	=	2 19 10.4
Time of obs'n by chron'r	=	3 55 06.85
Chron'r of sid'l time	=	1 35 56.4 +0.0 = 1 35 56.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 17

Station, Camp 18 Desert Shoals

Latitude = ∠ = 33 10 27.0 + 0"

North polar dist. = △ = 98 22 05.7

Name of star = β Orionis (6 obs)

Obs'd doub. alt. = 69 42 13.3

Index error = + 20.0

Eccentricity =

Doub. alt. cor. = 69 42 33.3

Altitude = 34 51 16.6

Ref. (Ther. 49.0 bar. 29.9) = − 1 23.3

True alt. of ✱ = A = 34 49 53.3

p = hour angle

2 m = ∠ + △ + A

∠ = 33 10 27.0 cos. ∠ = 9.922731

△ = 98 22 5.7 sin. △ = 9.995352

A = 34 49 53.3 cos. ∠ sin. △ = 9.918083

2 m = 166 22 26.0

m = 83 11 13.0 cos. m = 9.074195

m − A = 48 21 19.7 sin. (m − A) = 9.873484

Cos. m sin. (m − A) = 8.947679

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.029596$$

Ref. −1 23.6 Bar +0.5 Thm. −0.2 −1 23.3

sin. ½ p = 9.514798

½ p = 19 5 53.6

p in arc. = 38 11 47.2

p in time = 2 32 47.2 +0.0

AR ✱ = 5 07 44.3

Sidereal time = AR ± p = 2 34 57.1

Time of obs'n by chron'r = 4 10 52.5

Chron'r of sid'l time = 1 35 55.4 +0.0 = 1 35 55.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 18

Station, Camp 19.

Latitude = ∠ = 33 19 45 − 2″

North polar dist. = △ = 45 13 35.8

Name of star = α Cygni (7 obs)

Obs'd doub. alt. = 50 38 55.7

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 25 19 27.8

Ref. (Ther. 52.0 bar. 29.9) = − 2 01.2

True alt. of ∗ = A = 25 17 26.6

p = hour angle

2 m = ∠ + △ + A

∠ =	33	19	45.0	cos. ∠ =	9.921961
△ =	45	13	35.8	sin. △ =	9.851196
A =	25	17	26.6	cos. ∠ sin. △ =	9.773157
2 m =	103	50	47.4		
m =	51	55	23.7	cos. m =	9.790086
m − A =	26	37	57.1	sin. (m − A) =	9.651532

Cos. m sin. (m − A) = 9.441618

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos. m \sin. (m - A)}{\cos. \angle \sin. \triangle} = 9.668461$$

Ref.
− 2.. 2.5
Bar + 0.8
Ther. + 0.5
− 2 01.2

sin. ½ p = 9.834230

½ p = 43 3 18.1

p in arc. = 86 6 36.2

p in time = 5 44 26.4 − 0.1

AR ∗ = 20 36 33.5

Sidereal time = AR ± p = 2 20 59.9

Time of obs'n by chron'r = 3 57 05.9

Chron'r of sid'l time = 1 36 06.0 + 0.1 = 1 36 06.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 18

Station, Camp 19

Latitude = ∠ = 33 19 45.0 − 2"

North polar dist. = △ = 98 22 05.5

Name of star = β Orionis (8 Obs)

Obs'd doub. alt. = 68.. 19.. 16.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 34 9 38.1

Ref. (Ther. 52.0 bar. 29.9) = 1 25.1

True alt. of ∗ = A = 34 8 13.0

p = hour angle

2 m = ∠ + △ + A

∠ = 33 19 45.0 cos. ∠ = 9.921961

△ = 98 22 5.5 sin. △ = 9.995352

A = 34 8 13.0 cos. ∠ sin. △ = 9.917313

2 m = 165 50 3.5

m = 82 55 1.7 cos. m = 9.090480

m − A = 48 46 48.7 sin. (m − A) = 9.876326

Cos. m sin. (m − A) = 8.967306

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.049993$$

Ref. −1 25.6

Bar +0.2

Thr. +0.3

−1 25.1

sin. ½ p = 9.524996

½ p = 19 34 13.0

p in arc. = 39 8 26.0

p in time = 2 36 33.7 +0.1

AR ∗ = 5.. 07.. 44.3

Sidereal time = AR ± p = 2 31 10.6

Time of obs'n by chron'r = 4.. 07.. 13.3

Chron'r of sid'l time = 1 36 02.7 +0.1 = 1 36 02.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 21st

Station, Camp 22 Broad Water Camp

Latitude = ∠ = 33 35 10 + 3"

North polar dist. = △ = 84 24 48.1

Name of star = Procyon (2 obs)

Obs'd doub. alt. = 80 22 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 11 5.0

Ref. (Ther. 66.0 bar. 29.9) = 1 6.7

True alt. of ✱ = A = 40 9 58.3

p = hour angle

2 m = ∠ + △ + A

∠ =	33	35	10.0	cos. ∠ =	9.920674
△ =	84	24	48.1	sin. △ =	9.997933
A =	40	9	58.3	cos. ∠ sin. △ =	9.918607
2 m =	158	9	56.4		
m =	79	4	58.2	cos. m =	9.277357
m — A =	38	54	59.9	sin. (m — A) =	9.798091

Cos. m sin. (m — A) = 9.075448

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.156841$$

Ref. −1 9.0

Bar. +0.2

Thm. +2.1

−1 6.7

sin. ½ p = 9.578420

½ p = 22 15 36.0

p in arc. = 44 31 12.0

p in time = 2 58 4.8 −0.1

AR ✱ = 7 31 53.7

Sidereal time = AR ± p = 4 33 48.9

Time of obs'n by chron'r = 6 09 05.5

Chron'r of sid'l time = 1 35 16.6 − 0.1 = 1 35 16.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 21st

Station, Camp 22 Beyond Water Camp.

Latitude = ∠ = 33 35 10.0 + 3"

North polar dist. = △ = 77 12 8.2

Name of star = Jupiter (2 obs)

Obs'd doub. alt. = 97° 29' 40.0"

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 48 44 50.0

Ref. (Ther. 86.0 bar. 29.9) = 0 49.2

True alt. of ∗ = A = 48 44 0.8

p = hour angle

2 m = ∠ + △ + A

∠ = 33 35 10.0 cos. ∠ = 9.920674

△ = 77 12 8.2 sin. △ = 9.989075

A = 48 44 0.8 cos. ∠ sin. △ = 9.909749

2 m = 159 31 19.0

m = 79 45 39.5 cos. m = 9.249826

m — A = 31 1 38.7 sin. (m — A) = 9.712188

Cos. m sin. (m — A) = 8.962009

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.052260$$

Ref. − 0 51.0

Bar. + 0.2

Ther. + 1.6

− 0 49.2

sin. ½ p = 9.526130

½ p = 19° 37' 25"

p in arc. = 39° 14' 50"

p in time = 2h 38m 59.3 — 0.1

AR ∗ = 2 19 14.0

Sidereal time = AR ± p = 4 56 13.3

Time of obs'n by chron'r = 6h 31m 34.0

Chron'r of sid'l time = 1 35 20.7 + 0.1 = 1 35 20.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 22

Station, Camp 23 Big South Bend

Latitude = ∠ = 33 38 12 +0"

North polar dist. = △ = 61 41 29.8

Name of star = α Andromeda (7 obs)

Obs'd doub. alt. = 84 50 37.4

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 25 25.7

Ref. (Ther. 64.0 bar. 29.8) = -1 1.4

True alt. of ∗ = A = 42 24 24.3

p = hour angle

2 m = ∠ + △ + A

∠ =	33	38	12.0	cos. ∠ =	9.920419
△ =	61	41	29.8	sin. △ =	9.944684
A =	42	24	24.3	cos. ∠ sin. △ =	9.865103
2 m =	137	44	6.1		
m =	68	52	3.0	cos. m =	9.555937
m — A =	26	27	38.7	sin. (m — A) =	9.648930

Cos. m sin. (m — A) = 9.205867

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.340764$$

Ref. -1 3.7 Bar. +0.5 Ther. +1.8 -1 1.4

sin. ½ p = 9.670382

½ p = 27 54 51.0

p in arc. = 55 49 42.0

p in time = 3 43 18.8 +0.0

AR ∗ = 0 01 02.6

Sidereal time = AR ± p = 3 44 21.4

Time of obs'n by chron'r = 5 19 33.7

Chron'r of sid'l time = 1 35 12.3 +0.0 = 1 35 12.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 22

Station, Camp 23

Latitude = ∠ = 33 38 12.0 + 0"

North polar dist. = △ = 98 22 06.3

Name of star = β Orionis (7 obs)

Obs'd doub. alt. = 88.. 29.. 41.4

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 44 14 50.7

Ref. (Ther. 64.0 bar. 29.8) = - 0 57.7

True alt. of ∗ = A = 44 13 53.0

p = hour angle

2 m = ∠ + △ + A

∠ = 33 38 12.0 cos. ∠ = 9.920419

△ = 98 22 6.3 sin. △ = 9.995352

A = 44 13 53.0 cos. ∠ sin. △ = 9.915771

2 m = 176 14 11.3

m = 88 7 5.6 cos. m = 8.516368

m — A = 43 53 12.6 sin. (m — A) = 9.840881

Cos. m sin. (m — A) = 8.357249

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.441478$$

Ref. - 0 59.8 Bar + 0.4 Ther. + 1.7 - 0 57.7

sin. ½ p = 9.220739

½ p = 9 34 10.0

p in arc. = 19 8 20.0

p in time = 1 16 33.3 + 0.0

AR ∗ = 5.. 07.. 44.3

Sidereal time = AR ± p = 3 51 11.0

Time of obs'n by chron'r = 5.. 26.. 18.4

Chron'r of sid'l time = 1 35 7.4 + 0.0 = 1 35 7.4

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T. Groom & Co., Stationers,

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 23

Station, Camp 24 Deep Water Bend

Latitude = ∠ = 33 48 16 − 1″

North polar dist. = △ = 98 22 06.3

Name of star = β Orionis (7 obs)

Obs'd doub. alt. = 76 36 18.5

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 38 18 9.2

Ref. (Ther. 48.0 bar. 29.9) = 1 13.7

True alt. of ∗ = A = 38 16 55.5

p = hour angle

2 m = ∠ + △ + A

∠ =	33	48	16.0	cos. ∠ =	9.919571
△ =	98	22	6.3	sin. △ =	9.995352
A =	38	16	55.5	cos. ∠ sin. △ =	9.914923
2 m =	170	27	17.8		
m =	85	13	38.9	cos. m =	8.920111
m − A =	46	56	43.4	sin. (m − A) =	9.863747

Cos. m sin. (m − A) = 8.783858

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.868929$$

Ref. −1 13.7

Bar +0.3

Ther −0.3

−1 13.7

sin. ½ p = 9.434464

½ p = 15 46 46.0

p in arc. = 31 33 32.0

p in time = 2 6 14.1 + 0.1

AR ∗ = 5 07 44.2

Sidereal time = AR ± p = 3 1 30.1

Time of obs'n by chron'r = 4 36 81.64

Chron'r of sid'l time = 1 35 01.5 + 0.1 = 1 35 14.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 23

Station, Camp 24

Latitude = ∠ = 33 48 16.0 −1″

North polar dist. = △ = 61 41 30.4

Name of star = α Andromeda (7 obs)

Obs'd doub. alt. = 98 05 37.5

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 2 48.7

Ref. (Ther. 48.0 bar. 29.9) = 0 50.6

True alt. of ∗ = A = 49 1 58.1

p = hour angle

2 m = ∠ + △ + A

∠ =	33	48	16.0	cos. ∠ =	9.919571
△ =	61	41	30.4	sin. △ =	9.944684
A =	49	1	58.1	cos. ∠ sin. △ =	9.864255
2 m =	144	37	44.5		
m =	72	15	52.2	cos. m =	9.483763
m − A =	23	13	54.1	sin. (m − A) =	9.595992

Cos. m sin. (m − A) = 9.079755

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.215500$$

Ref. − 0 50.6

Bar. + 0.2

Ther. − 0.2

− 0 50.6

sin. ½ p = 9.607750

½ p = 23 54 30.0

p in arc. = 47 49 00.0

p in time = 3 11 16.0 0.0

AR ∗ = 0 01 02.6

Sidereal time = AR ± p = 3 12 18.6

Time of obs'n by chron'r = 4 47 21.64

Chron'r of sid'l time = 1 35 03.0 0.0 = 1 35 03.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 25-

Station, Camp 26 Riverside Mts.

Latitude = ∠ = 33 37 26 -1"

North polar dist. = △ = 84 24 48.5

Name of star = Procyon (7 obs)

Obs'd doub. alt. = 89 28 24.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 44 44 12.1

Ref. (Ther. 47.0 bar. 30.0) = 0 59.1

True alt. of ∗ = A = 44 43 13.0

p = hour angle

2 m = ∠ + △ + A

∠ = 33 37 26.0 cos. ∠ = 9.918793

△ = 84 24 48.5 sin. △ = 9.999932

A = 44 43 13.0 cos. ∠ sin. △ = 9.916725

2 m = 163 5 27.5

m = 81 32 43.7 cos. m = 9.167389

m — A = 36 49 30.7 sin. (m — A) = 9.777699

Cos. m sin. (m — A) = 8.945088

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.028363$$

Ref. " sin. ½ p = 9.514181

− 0.. 58.7 ½ p = 19 4 12.0

Bar 0.0 p in arc. = 38 8 24.0

Ther. − 2.4 p in time = 2 32 33.6 + 0.0

− 0 59.1 AR ∗ = 7 31 53.8

Sidereal time = AR ± p = 4 59 20.2

Time of obs'n by chron'r = 6 34 24.6

Chron'r of sid'l time = 1 35 4.4 + 0.0 = 1 35 4.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 25

Station, Camp 26.

Latitude = ∠ = 33 57 26.0 − 1″

North polar dist. = △ = 106 31 27.7

Name of star = Sirius (7 obs)

Obs'd doub. alt. = 69. 52. 38.6

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 34 56 19.3

Ref. (Ther. 47.0 bar. 30.0) = 1 23.7

True alt. of ∗ = A = 34 54 55.6

p = hour angle

2 m = ∠ + △ + A

∠ =	33	57	26.0	cos. ∠ =	9.918793
△ =	106	31	27.7	sin. △ =	9.981682
A =	34	54	55.6	cos. ∠ sin. △ =	9.900475
2 m =	175	23	49.3		
m =	87	41	54.6	cos. m =	8.603772
m − A =	52	46	59.0	sin. (m − A) =	9.901104

Cos. m sin. (m − A) = 8.504876

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.604401$$

Ref. 1. 23.2 − 0.5 = 1. 22.7

Bar. 0.0

Ther. − 0.5

− 1 23.7

sin. ½ p	=	9.302200
½ p	=	11 34. 6.6
p in arc.	=	23 8 13.2
p in time	=	1 32 32.9 + 0.2
AR ∗	=	6. 38. 55.2
Sidereal time = AR ± p	=	5 6 22.3
Time of obs'n by chron'r	=	6. 41. 22.4
Chron'r of sid'l time	=	1. 35 0.1 + 0.2 = 1 35 0.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 25

Station, Camp 26

Latitude = ∠ = 33 57 26.0 − 1"

North polar dist. = △ = 77 4 55.5

Name of star = Jupiter (7 obs)

Obs'd doub. alt. = 90 47 54.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 45 23 57.1

Ref. (Ther. 48.5 bar. 30.0) = 0 57.9

True alt. of ∗ = A = 45 22 59.2

p = hour angle

2 m = ∠ + △ + A

∠ = 33 57 26.0 cos. ∠ = 9.918794

△ = 77 04 55.5 sin. △ = 9.988866

A = 45 22 59.2 cos. ∠ sin. △ = 9.907660

2 m = 156 25 20.7

m = 78 12 40.3 cos. m = 9.310282

m − A = 32 49 41.1 sin. (m − A) = 9.734096

Cos. m sin. (m − A) = 9.044388

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.136728$$

Ref. 0.57.9
Bar 0.0
Ther. − 0.4
− 0 57.9

sin. ½ p = 9.568364

½ p = 21 43 27

p in arc. = 43 26 54

p in time = 2 53 47.6 + 0.0

AR ∗ = 2 20 27.0

Sidereal time = AR ± p = 5 14 14.6

Time of obs'n by chron'r = 6 49 22.4

Chron'r of sid'l time = 1 35 07.8 + 00 = 1 35 07.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 25

Station, Camp 26

Latitude = ∠ = 33 57 26.0 −1″

North polar dist. = △ = 67 12 29.8

Name of star = α Arietis (7 obs)

Obs'd doub. alt. = 89 05 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 44 32 35.0

Ref. (Ther. 46.5 bar. 30.0) = 0 59.7

True alt. of ∗ = A = 44 31 35.3

p = hour angle

2 m = ∠ + △ + A

∠ = 33 57 26.0	cos. ∠ =	9.918793
△ = 67 12 29.8	sin. △ =	9.964693
A = 44 31 35.3	cos. ∠ sin. △ =	9.883486
2 m = 145 41 31.1		
m = 72 50 45.5	cos. m =	9.469736
m − A = 28 19 10.2	sin. (m − A) =	9.676134
Cos. m sin. (m − A)	=	9.145870
Sin.² ½ p = cos. m sin. (m − A) / cos. ∠ sin. △	=	9.262384
	sin. ½ p =	9.631192
Ref. −0.59.2 Par 0.0 Ther. −0.5 −0 59.7	½ p =	25 19 30.0
	p in arc. =	50 39 00.0
	p in time =	3 22 36.0 +0.0
	AR ∗ =	1 59 10.7
Sidereal time = AR ± p	=	5 21 46.7
Time of obs'n by chron'r	=	6 56 53.7
Chron'r of sid'l time	=	1 35 7.0 + 0.0 = 1 35 7.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 26

Station, Camp 27

Latitude = ∠ = 33 58 17.0 — 0."

North polar dist. = △ = 98 22 06.8

Name of star = β Orionis (7 obs)

Obs'd doub. alt. = 85 55 35.7

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 57 47.8

Ref. (Ther. 47.0 bar. 30.0) = 1 2.8

True alt. of ✱ = A = 42 56 45.0

p = hour angle

2 m = ∠ + △ + A

∠ = 33 58 17.0 cos. ∠ = 9.918720

△ = 98 22 6.8 sin. △ = 9.995352

A = 42 56 45.0 cos. ∠ sin. △ = 9.914072

2 m = 175 17 8.8

m = 87 38 34.4 cos. m = 8.614135

m — A = 44 41 49.4 sin. (m — A) = 9.847177

Cos. m sin. (m — A) = 8.461312

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.547240$$

Ref. −1.02.4

Obs 0.0

Ther −0.4

1 02.8

sin. ½ p = 9.273620

½ p = 10 49 21.0

p in arc. = 21 38 42.0

p in time = 1 26 34.8 0.0

AR ✱ = 5 07 44.2

Sidereal time = AR ± p = 3 41 9.4

Time of obs'n by chron'r = 5 16 06.5

Chron'r of sid'l time = 1 34 57.1 C.C. = 1 34.571

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 26

Station, Camp 27

Latitude = ∠ = 33 58 17.0 -0"

North polar dist. = △ = 82 37 18.5

Name of star = α Orionis (7 obs)

Obs'd doub. alt. = 102 30 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 51 15 5.0

Ref. (Ther. 47.0 bar. 30.0) = 0 47.1

True alt. of ∗ = A = 51 14 17.9

p = hour angle

2 m = ∠ + △ + A

∠ = 33 58 17.0 cos. ∠ = 9.918720

△ = 82 37 18.5 sin. △ = 9.996390

A = 51 14 17.9 cos. ∠ sin. △ = 9.915110

2 m = 167 49 53.4

m = 83 54 56.7 cos. m = 9.025268

m − A = 32 40 38.8 sin. (m − A) = 9.732321

Cos. m sin. (m − A) = 8.757589

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.842479$$

Ref. -0.46.8

Ber 0.0

Ther. -0.3

0 47.1

sin. ½ p = 9.421239

½ p = 15 17 40.0

p in arc. = 30 35 20.0

p in time = 2 2 21.3 0.0

AR ∗ = 5 47 30.6

Sidereal time = AR ± p = 3 45 9.3

Time of obs'n by chron'r = 5 20 08.2

Chron'r of sid'l time = 1 34 58.9 0.0 = 1 34 58.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 26

Station, Camp 27

Latitude = ∠ = 33 58 17.0 -0"

North polar dist. = △ = 61 41 30.7

Name of star = α Andromeda (7 obs)

Obs'd doub. alt. = 82 22 37.1

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 41 11 18.5

Ref. (Ther. 47.0 bar. 30.0) = 1 7.0

True alt. of ∗ = A = 41 10 11.5

p = hour angle

2 m = ∠ + △ + A

∠ = 33 58 17.0 cos. ∠ = 9.918720

△ = 61 41 30.7 sin. △ = 9.944685

A = 41 10 11.5 cos. ∠ sin. △ = 9.863405

2 m = 136 49 59.2

m = 68 24 59.6 cos. m = 9.565678

m − A = 27 14 48.1 sin. (m − A) = 9.660698

Cos. m sin. (m − A) = 9.226376

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos.\ m \sin.\ (m - A)}{\cos.\ \angle \sin.\ \triangle} = 9.362971$$

Ref. −1.066

Bar 0.0

Ther. −0.4

−1 7.0

sin. ½ p = 9.681485

½ p = 28 42 11.0

p in arc. = 57 24 22.0

p in time = 3 49 37.5 0.0

AR ∗ = 0 01 02.52

Sidereal time = AR ± p = 3 50 40.0

Time of obs'n by chron'r = 5 26 41.0

Chron'r — sid'l time = 1 35 1.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 26

Station, Camp 27

Latitude = ∠ = 33 58 17.0 − 0″

North polar dist. = △ = 77 2 56.9

Name of star = Jupiter (7 obs)

Obs'd doub. alt. = 119 35 25.7

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 59 47 42.8

Ref. (Ther. 47.0 bar. 30.0) = 0 34.1

True alt. of ∗ = A = 59 47 8.7

p = hour angle

2 m = ∠ + △ + A

∠ = 33 58 17.0 cos. ∠ = 9.918720

△ = 77 2 56.9 sin. △ = 9.988809

A = 59 47 8.7 cos. ∠ sin. △ = 9.907529

2 m = 170 48 22.6

m = 85 24 11.3 cos. m = 8.903841

m − A = 25 37 2.6 sin. (m − A) = 9.635833

Cos. m sin. (m − A) = 8.539674

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos. m \sin. (m - A)}{\cos. \angle \sin. \triangle} = 8.632185$$

Ref. "
−0.33.9
Bar 0.0
Ther. −0.2
0 34.1

sin. ½ p = 9.316092

½ p = 11 57 00

p in arc. = 23 54 00

p in time = 1 35 36 0.0

AR ∗ = 2 20 45.7

Sidereal time = AR ± p = 3 56 21.7

Time of obs'n by chron'r = 5 31 21.86

Chron'r of sid'l time = 1 35 00.1 0.0 = 1 35 00.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 27

Station, Camp 28

Latitude = ∠ = 34 00 00.0 − 2″

North polar dist. = △ = 61 41 30.8

Name of star = α Andromedæ (7 obs)

Obs'd doub. alt. = 92 55 27.1

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 46 27 43.5

Ref. (Ther. 48.0 bar. 30.1) = 0 55.5

True alt. of ∗ = A = 46 26 48.0

p = hour angle

2 m = ∠ + △ + A

∠ =	34	00	00.0	cos. ∠ =	9.918574
△ =	61	41	30.8	sin. △ =	9.944685
A =	46	26	48.0	cos. ∠ sin. △ =	9.863259
2 m =	142	8	18.8		
m =	71	4	9.4	cos. m =	9.511114
m − A =	24	37	21.4	sin. (m − A) =	9.619760

Cos. m sin. (m − A) = 9.130874

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.267615$$

Ref. −0.55.3
Bar 0.0
Thr −0.2
0 55.5

sin. ½ p = 9.633807

½ p = 25 29 20.0

p in arc. = 50 58 40.0

p in time = 3 23 54.7 + 0.0

AR ∗ = 0 01 02.5

Sidereal time = AR ± p = 3 24 57.2

Time of obs'n by chron'r = 4 09 47.8

Chron'r of sid'l time = 1 34 50.6 + 0.0 = 1 34 50.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 27

Station, Camp 28

Latitude = ∠ = 34 00 00.0 − 2″

North polar dist. = △ = 98 22 06.8

Name of star = β Aquilæ (Obs)

Obs'd doub. alt. = 84.. 42.. 34.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 . 21 27.1

Ref. (Ther. 48.0 bar. 30.1) = 1 4.4

True alt. of ✱ = A = 42 20 22.7

p = hour angle

2 m = ∠ + △ + A

∠ =	34	00	00.0	cos. ∠ =	9.9185 74
△ =	98	22	6.8	sin. △ =	9.9953 52
A =	42	20	22.7	cos. ∠ sin. △ =	9.9139 26
2 m =	174	42	29.5		
m =	87	21	14.7	cos. m =	8.6647 62
m − A =	45	00	52.0	sin. (m − A) =	9.8495 94

Cos. m sin. (m − A) = 8.5143 56

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 8.600430$$

Ref −1.03.9
Bar −0.2
Ther. −0,3
1 4.4

sin. ½ p = 9.300215

½ p = 11 30 54.2

p in arc. = 23 1 48.4

p in time = 1 32 7.2 +0,3

AR ✱ = 5.. 07.. 44.27

Sidereal time = AR ± p = 3 35 37.0

Time of obs'n by chron'r = 5..10.24.9

Chron'r of sid'l time = 1 34 47.9 +0,3 = 1 34 48.2

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 29

Station, Camp 80 Grand Hill Bend

Latitude = ∠ = 34 6 58.0 − 0″

North polar dist. = △ = 61 41 31.1

Name of star = α Andromedæ (70 M)

Obs'd doub. alt. = 97 27 48.6

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 48 43 54.3

Ref. (Ther. 63.0 bar. 29.9) = 0 50.2

True alt. of ✱ = A = 48 43 4.1

p = hour angle

2 m = ∠ + △ + A

∠ =	34	6	58.0	cos. ∠ =	9.917978
△ =	61	41	31.1	sin. △ =	9.944685
A =	48	43	4.1	cos. ∠ sin. △ =	9.862663
2 m =	144	31	33.2		
m =	72	15	46.6	cos. m =	9.483800
m − A =	23	32	42.5	sin. (m − A) =	9.601486

Cos. m sin. (m − A) = 9.085286

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.222623$$

Ref. − 0.51.0
Bar + 0.3
Ther + 0.5
− 0 50.2

sin. ½ p	=	9.611311
½ p	=	24 7 4.0
p in arc.	=	48 14 8.0
p in time	=	3 12 56.5 0.0
AR ✱	=	0 01 02.5
Sidereal time = AR ± p	=	3 13 59.0
Time of obs'n by chron'r	=	4 48 33.1
Chron'r of sid'l time	=	1 34 34.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 29

Station, Camp 30

Latitude = ∠ = 34, 6, 58.0 - 0"

North polar dist. = △ = 98 22 07.1

Name of star = β Orionis (7 obs)

Obs'd doub. alt. = 80.. 28.. 44.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 14 22.1

Ref. (Ther. 55.0 bar. 29.9) = 1 7.8

True alt. of ∗ = A = 40 13 14.3 Rw

p = hour angle

2 m = ∠ + △ + A

∠ = 34 6 58.0 cos. ∠ = 9.917978

△ = 98 22 7.1 sin. △ = 9.995352

A = 40 13 14.3 cos. ∠ sin. △ = 9.913330

2 m = 172 42 19.4

m = 86 21 9.7 cos. m = 8.803553

m − A = 46 7 55.4 sin. (m − A) = 9.857898

Cos. m sin. (m − A) = 8.661451

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.748121$$

Ref. " 1.08.8

Bar + 0.3

Thrt + 0.7

− 1.7.8

sin. ½ p = 9.374060

½ p = 13 41 14.7

p in arc. = 27 22 29.4

p in time = 1 49 30.0 0.0

AR ∗ = 5.. 07.. 44.2

Sidereal time = AR ± p = 3 18 14.2

Time of obs'n by chron'r = 4.. 52.. 41.5

Chron'r of sid'l time = 1 34 27.3 0.0 = 1 34 27.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 31st

Station, Camp 32 Woody Island

Latitude = ∠ = 34 10 15.0 − 0″

North polar dist. = △ = 82 37 18.8

Name of star = α Orionis (5 obs)

Obs'd doub. alt. = 94 30 42.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 15 21.0

Ref. (Ther. 53.0 bar. 30.0) = 0 53.6

True alt. of ✳ = A = 47 14 27.4

p = hour angle

2 m = ∠ + △ + A

∠ =	34	10	15.0	cos. ∠ =	9.917698
△ =	82	37	18.8	sin. △ =	9.996390
A =	47	14	27.4	cos. ∠ sin. △ =	9.914088
2 m =	164	2	1.2		
m =	82	1	0.6	cos. m =	9.142646
m − A =	34	46	33.2	sin. (m − A) =	9.756155

Cos. m sin. (m − A) = 8.898801

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.984713$$

Ref. − 0..53.9 0.0 Then + 0.3 − 0 53.6

sin. ½ p = 9.492356

½ p = 18 6 7.4

p in arc. = 36 12 14.8

p in time = 2 24 49.0 0.0

AR ✳ = 5 47 30.6

Sidereal time = AR ± p = 3 22 41.6

Time of obs'n by chron'r = 11 56 43.9

Chron'r of sid'l time = 1 34 2.3 0.0 = 1 34 2.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 January 31st

Station, Camp 82

Latitude = ∠ = 34 10 15.0 − 0″

North polar dist. = △ = 61 41 31.3

Name of star = α Andromedæ (1st Mag)

Obs'd doub. alt. = 87 14 22.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 43 37 11.0

Ref. (Ther. 53.0 bar. 30.0) = 1 0.7

True alt. of ✱ = A = 43 36 10.3

p = hour angle

2 m = ∠ + △ + A

∠ = 34 10 15.0 cos. ∠ = 9.917698

△ = 61 41 31.3 sin. △ = 9.944685

A = 43 36 10.3 cos. ∠ sin. △ = 9.862383

2 m = 139 27 56.6

m = 69 43 58.3 cos. m = 9.539575

m − A = 26 7 48.0 sin. (m − A) = 9.643856

Cos. m sin. (m − A) = 9.183431

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.321048$$

Ref. 1 01.1 0.0 Ther. + 0.4 1 0.7

sin. ½ p = 9.660524

½ p = 27 14 5.7

p in arc. = 54 28 11.4

p in time = 3 37 52.8 0.0

AR ✱ = 0 01 02.5

Sidereal time = AR ± p = 3 38 55.3

Time of obs'n by chron'r = 5 12 57.3

Chron'r of sid'l time = 1 34 2.0 0.0 = 1 34 2.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 1st

Station, Camp 33 Mouth of Bill Williams' Fork

Latitude = ∠ = 34 18 17.0 + 0″

North polar dist. = △ = 84 24 49.1

Name of star = Procyon (5 obs.)

Obs'd doub. alt. = 78 31 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 39 15 35.0

Ref. (Ther. 50.0 bar. 29.6) = 1 10.2

True alt. of * = A = 39 14 24.8

p = hour angle

2 m = ∠ + △ + A

∠ =	34	18	17.0	cos. ∠ =	9.917007
△ =	84	24	49.1	sin. △ =	9.997933
A =	39	14	24.8	cos. ∠ sin. △ =	9.914940
2 m =	157	57	30.9		
m =	78	58	45.4	cos. m =	9.281406
m — A =	39	44	20.6	sin. (m — A) =	9.805699

Cos. m sin. (m — A) = 9.087105

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. ∠ sin. △}} = 9.172165$$

Ref. −1.11.2
Bar. +1.0
Thm. 0.0
1 10.2

sin. ½ p	=	9.586082
½ p	=	22 40 40.6
p in arc.	=	45 21 21.2
p in time	=	3 1 25.4
AR *	=	7 31 53.8
Sidereal time = AR ± p	=	4 30 28.4
Time of obs'n by chron'r	=	6 03 50.3
Chron'r of sid'l time	=	1 33 21.9

0.0 = 1 33 21.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 1st

Station, Camp 33

Latitude = ∠ = 34 18 17.0 + 0"

North polar dist. = △ = 61 41 31.4

Name of star = α Andromedæ (5 Mr)

Obs'd doub. alt. = 61 47 06.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 30 53 33.0

Ref. (Ther. 50.0 bar. 29.6) = 1 35.4

True alt. of ∗ = A = 30 51 57.6

p = hour angle

2 m = ∠ + △ + A

∠ = 34 18 17.0 cos. ∠ = 9.917007

△ = 61 41 31.4 sin. △ = 9.944685

A = 30 51 57.6 cos. ∠ sin. △ = 9.861692

2 m = 126 51 46.0

m = 63 25 53.0 cos. m = 9.650569

m — A = 32 33 55.4 sin. (m — A) = 9.730994

Cos. m sin. (m — A) = 9.381563

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.519871$$

Bar. "

— 1.36.8

Ber + 1.4

Ther 0.0

1 35.4

sin. ½ p = 9.759935

½ p = 35 7 28.0

p in arc. = 70 14 56.0

p in time = 4 40 59.7 0.0

AR ∗ = 0 01 02.5

Sidereal time = AR ± p = 4 42 2.2

Time of obs'n by chron'r = 6 15 26.2

Chron'r of sid'l time = 1 33 24.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 4

Station, Camp 36 S. end of L. Mojave valley

Latitude = ∠ = 34 26 8.0 − 0″

North polar dist. = △ = 67 12 30.6

Name of star = α Arietis (5 Dec)

Obs'd doub. alt. = 99 26 52.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 43 26.0

Ref. (Ther. 60.0 bar. 30.1) = 0 48.6

True alt. of ✱ = A = 49 42 37.4

p = hour angle

2 m = ∠ + △ + A

∠ =	34	26	8.0	cos. ∠ =	9.916329
△ =	67	12	30.6	sin. △ =	9.964694
A =	49	42	37.4	cos. ∠ sin. △ =	9.881023
2 m =	151	21	16.0		
m =	75	40	38.0	cos. m =	9.393372
m − A =	25	58	00.6	sin. (m − A) =	9.641327

Cos. m sin. (m − A) = 9.034699

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.153676$$

Ref. ″

− 0 49.3

Bar − 0.2

Ther + 0.9

− 0 48.6

sin. ½ p = 9.576838

½ p = 22 10 29.0

p in arc. = 44 20 58.0

p in time = 2 57 23.8 0.0

AR ✱ = 1 59 10.6

Sidereal time = AR ± p = 4 56 34.4

Time of obs'n by chron'r = 6 h 30 37.7

Chron'r of sid'l time = 1 34 3.3 0 0 = 1 34 3.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 4th

Station, Camp 36

Latitude = ∠ = 34 26 8.0 − 0″

North polar dist. = △ = 84 „ 24 „ 49.4

Name of star = Procyon (5 obs)

Obs'd doub. alt. = 91 „ 00 „ 22.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 45 30 11.0

Ref. (Ther. 60.0 bar. 30.1) = 0 56.6

True alt. of ∗ = A = 45 29 14.4

p = hour angle

2 m = ∠ + △ + A

∠ = 34 26 8.0 cos. ∠ = 9.916329

△ = 84 24 49.4 sin. △ = 9.997933

A = 45 29 14.4 cos. ∠ sin. △ = 9.914262

2 m = 164 20 11.8

m = 82 10 5.9 cos. m = 9.134380

m − A = 36 40 51.5 sin. (m − A) = 9.776235

Cos. m sin. (m − A) = 8.910615

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.996353$$

Ref. − 0 „ 57.3

Bar. − 0.5

Ther. + 1.2

− 0 56.6

sin. ½ p = 9.498176

½ p = 18 21 17.8

p in arc. = 36 42 35.6

p in time = 2 26 50.4 0.0

AR ∗ = 7 „ 31 „ 53.8

Sidereal time = AR ± p = 5 5 3.4

Time of obs'n by chron'r = 6 „ 39 „ 03.9

Chron'r of sid'l time = 1 34 00.5 0.0 = 1 34 01.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 6

Station, Camp 38

Latitude = ∠ = 34 27 52.0 −2″

North polar dist. = △ = 61 41 32.3

Name of star = α Andromeda (504)

Obs'd doub. alt. = 75 43 18.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 37 51 39.0

Ref. (Ther. 52.0 bar. 29.8) = 1 13.4

True alt. of ∗ = A = 37 50 25.6

p = hour angle

2 m = ∠ + △ + A

∠ = 34 27 52.0 cos. ∠ = 9.916179

△ = 61 41 32.3 sin. △ = 9.944687

A = 37 50 25.3 cos. ∠ sin. △ = 9.860866

2 m = 133 59 49.6

m = 66 59 54.8 cos. m = 9.591904

m − A = 29 9 29.5 sin. (m − A) = 9.687727

Cos. m sin. (m − A) = 9.279631

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.418765$$

Ref. − 1.14.9

Bar + 0.9

Ther + 0.3

− 1 13.4

sin. ½ p = 9.709382

½ p = 30 48 21.4

p in arc. = 61 36 42.8

p in time = 4 6 26.8 0.0

AR ∗ = 0 01 02.43

Sidereal time = AR ± p = 4 7 29.2

Time of obs'n by chron'r = 5 41 47.2

34 18.8 Chron'r of sid'l time = 1 34 18.0

1 34 18.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 6

Station, Camp 38

Latitude = ∠ = 34 27 52.0 − z″

North polar dist. = △ = 84 24 49.6

Name of star = Procyon (Obs)

Obs'd doub. alt. = 72 28 28.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 36 14 14.0

Ref. (Ther. 52.0 bar. 29.8) = 1 18.8

True alt. of ∗ = A = 36 12 55.7

p = hour angle

2 m = ∠ + △ + A

∠ = 34 27 52.0 cos. ∠ = 9.916179

△ = 84 24 49.6 sin. △ = 9.997933

A = 36 12 55.7 cos. ∠ sin. △ = 9.914112

2 m = 155 5 37.3

m = 77 32 48.6 cos. m = 9.333732

m − A = 41 19 52.9 sin. (m − A) = 9.819816

Cos. m sin. (m − A) = 9.153548

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.239436$$

Ref. −1 19.6 Bar. +0.8 Ther. +0.5 −1 18.8

sin. ½ p = 9.619718

½ p = 24 37 12.2

p in arc. = 49 14 24.4

p in time = 3 16 57.6 + 0.1

AR ∗ = 7 31 53.8

Sidereal time = AR ± p = 4 14 56.2

Time of obs'n by chron'r = 5 49 24.2

Chron'r of sid'l time = 1 34 28.0 + 0.1 = 1 34 28.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 12

Station, Camp 43 Mojave Villages

Latitude = ∠ = 34 53 46.0 − 0″

North polar dist. = △ = 61 41 33.2

Name of star = α Andromedæ (Sol.)

Obs'd doub. alt. = 78 45 02.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 36 52 31.0

Ref. (Ther. 55.0 bar. 29.8) = 1 15.7

True alt. of ✱ = A = 36 51 15.3

p = hour angle

2 m = ∠ + △ + A

∠ =	34	53	46.0	cos. ∠ =	9.913915
△ =	61	41	33.2	sin. △ =	9.944688
A =	36	51	15.3	cos. ∠ sin. △ =	9.858603
2 m =	133	26	34.5		
m =	66	43	17.2	cos. m =	9.596819
m − A =	29	52	1.9	sin. (m − A) =	9.697222

Cos. m sin. (m − A) = 9.294041

Sin.² ½ p = $\frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}}$ = 9.435438

By

− 1.17.3 sin. ½ p = 9.717719

Bar + 0.8 ½ p = 31 28 13.5

Ther + 0.8 p in arc. = 62 56 27.0

1 15.7 p in time = 4 11 45.8 0.0

AR ✱ = 0 01 02.4

Sidereal time = AR ± p = 4 12 48.2

Time of obs'n by chron'r = 5 47 45.3

Chron'r of sid'l time = 1 34 57.1 0.0 = 1 34 57.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 12

Station, Camp 43

Latitude = ∠ = 34 53 46.0 −0″

North polar dist. = △ = 84 ,, 24 ,, 50.0

Name of star = Procyon (56 1)

Obs'd doub. alt. = 73 ,, 47 ,, 12.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 36 53 36.0

Ref. (Ther. 55.0 bar. 29.8) = 1 15.7

True alt. of ✱ = A = 36 52 20,3

p = hour angle

2 m = ∠ + △ + A

∠ =	34	53	46.0	cos. ∠ =	9.913915
△ =	84	24	50.0	sin. △ =	9.997933
A =	36	52	20.3	cos. ∠ sin. △ =	9.911848
2 m =	156	10	56.3		
m =	78	5	28.1	cos. m =	9.314616
m − A =	41	13	7.8	sin. (m − A) =	9.818844

Cos. m sin. (m − A) = 9.133460

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.221612$$

Ref. ″
− 1.17.3
Bar + 0.8
Ther. + 0.8
1 15.7

sin. ½ p = 9.610806

½ p = 24 5 16.4

p in arc. = 48 10 32.8

p in time = 3 12 42,2 0.0

AR ✱ = 7 ,, 31 ,, 53.7

Sidereal time = AR ± p = 4 19 11.5

Time of obs'n by chron'r = 5 ,, 54 ,, 08.0

Chron'r of sid'l time = 1 34 56.5 0.0 = 1 34 56.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 15

Station, Camp 45 Mojave Villages.

Latitude = ∠ = 34 58 43.0 +1"

North polar dist. = △ = 84 24 50.2

Name of star = Procyon (S of W)

Obs'd doub. alt. = 94 18 52.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 9 26.0

Ref. (Ther. 57.0 bar. 30.0) = 0 53.3

True alt. of ∗ = A = 47 8 32.7

p = hour angle

2 m = ∠ + △ + A

∠ =	34	58	43.0	cos. ∠ =	9.913478
△ =	84	24	50.2	sin. △ =	9.997933
A =	47	8	32.7	cos. ∠ sin. △ =	9.911411
2 m =	166	32	5.9		
m =	83	16	2.9	cos. m =	9.069055
m — A =	36	7	30.2	sin. (m — A) =	9.770521

Cos. m sin. (m — A) = 8.839576

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos.\ m \sin.\ (m - A)}{\cos.\ \angle \sin.\ \triangle} = 8.928165$$

Ref. − 0.54.0
Bar 0.0
Ther. + 0.7
0 53.3

sin. ½ p = 9.464082

½ p = 16 55 31.5

p in arc. = 33 51 3.0

p in time = 2 15 24.2 − 0.1

AR ∗ = 7 31 53.74

Sidereal time = AR ± p = 5 16 29.5

Time of obs'n by chron'r = 6 51 42.6

Chron'r of sid'l time = 1 35 13.1 − 0.1 = 1 35 13.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 15

Station, Camp 45

Latitude = ∠ = 34 58 43.0 + 1"

North polar dist. = △ = 76 13 24.4

Name of star = Jupiter (5 Ed)

Obs'd doub. alt. = 90 59 18.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 45 29 39.0

Ref. (Ther. 57.0 bar. 30.0) = 0 56.4

True alt. of ✱ = A = 45 28 42.6

p = hour angle

2 m = ∠ + △ + A

∠ = 34 58 43.0 cos. ∠ = 9.913478

△ = 76 13 24.4 sin. △ = 9.987324

A = 45 28 42.6 cos. ∠ sin. △ = 9.900802

2 m = 156 40 50.0

m = 78 20 25.0 cos. m = 9.305666

m — A = 32 51 42.4 sin. (m — A) = 9.734490

Cos. m sin. (m — A) = 9.040156

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.139354$$

Ref. − 0 56.2

Bar 0.0

Ther + 0.8

0 56.4

sin. ½ p = 9.569677

½ p = 21 47 36

p in arc. = 43 35 12

p in time = 2 54 20.8 0.0

AR ✱ = 2 29 39.3

Sidereal time = AR ± p = 5 24 00.1

Time of obs'n by chron'r = 6 59 14.5

Chron'r of sid'l time = 1 35 14.4 0.0 = 1 35 14.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 17

Station, Camp 47 Head of Mojave Valley

Latitude = ∠ = 35 7 15.0 − 1"

North polar dist. = △ = 61 41 34.0

Name of star = α Andromedæ (5 Sh.)

Obs'd doub. alt. = 62 27 22.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 31 13 41.0

Ref. (Ther. 51.0 bar. 29.6) = 1 34.3

True alt. of ∗ = A = 31 12 6.7

p = hour angle

2 m = ∠ + △ + A

∠ =	35	7	15.0	cos. ∠ =	9.9127721
△ =	61	41	34.0	sin. △ =	9.944689
A =	31	12	6.7	cos. ∠ sin. △ =	9.857410
2 m =	128	00	55.7		
m =	64	00	27.8	cos. m =	9.641722
m − A =	32	48	21.1	sin. (m − A) =	9.733835

Cos. m sin. (m − A) = 9.375557

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.518147$$

Ref. 1.36.8 − Bar. + 1.3 − Thr. + 0.2 = 1 34.3

sin. ½ p = 9.759073

½ p = 35 2 40.0

p in arc. = 70 5 20.0

p in time = 4 40 21.3

AR ∗ = 0 01 02.4

Sidereal time = AR ± p = 4 41 23.7

Time of obs'n by chron'r = 6 16 19.2

Chron'r of sid'l time = 1 34 55.5 0.0 − 1 34 55.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 17

Station, Camp 47

Latitude = ∠ = 35 7 15.0 −1"

North polar dist. = △ = 84 24 50.3

Name of star = Procyon (Obs)

Obs'd doub. alt. = 83 47 48.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 41 53 54.0

Ref. (Ther. 57.0 bar. 29.6) = 1 3.7

True alt. of ∗ = A = 41 52 50.3

p = hour angle

2 m = ∠ + △ + A

∠ =	35	7	15.0	cos. ∠ =	9.912721
△ =	84	24	50.3	sin. △ =	9.999933
A =	41	52	30.3	cos. ∠ sin. △ =	9.910654
2 m =	161	24	55.6		
m =	80	42	27.8	cos. m =	9.208094
m − A =	38	49	37.5	sin. (m − A) =	9.799248

Cos. m sin. (m − A) = 9.005342

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.094688$$

Ref. −1.04.8
Bar +0.0
Ther. +0.1
1 3.7

sin. ½ p = 9.547344

½ p = 20 38 58.0

p in arc. = 41 17 56.0

p in time = 2 45 11.7 0.0

AR ∗ = 7 31 53.7

Sidereal time = AR ± p = 4 46 42.0

Time of obs'n by chron'r = 6 21 36.0

Chron'r of sid'l time = 1 34 54.0 0.0 = 1 34 54.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 18

Station, Camp 48 Jesup's Rapid

Latitude = ∠ = 35 18 31,0 − 0"

North polar dist. = △ = (504)

Name of star = α Pegasi ? Dec. about 30 N.

Obs'd doub. alt. = 74.. 05.. 28.0

Index error =

Eccentricity = Cannot recognise this Star

Doub. alt. cor. =

Altitude = 37 2 44.0

Ref. (Ther. 48.0 bar. 29.7) = 1 16.5

True alt. of ∗ = A = 37 1 27.5

p = hour angle

2 m = ∠ + △ + A

∠ = 35 18 31.0 cos. ∠ =

△ = sin. △ =

A = cos. ∠ sin. △ =

2 m =

m = cos. m =

m − A = sin. (m − A) =

Cos. m sin. (m − A) =

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} =$$

Ref. − 1.17.2
Bar. + 1.0
Thr. − 0.3
1 16.5

sin. ½ p =

½ p =

p in arc. =

p in time =

AR ∗ =

Sidereal time = AR ± p =

Time of obs'n by chron'r = 6.. 23.. 38.7

Chron'r of sid'l time =

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 18

Station, Camp 48

Latitude = ∠ = 35 18 31.0 − 0″

North polar dist. = △ = 84 24 30.3

Name of star = Procyon (58)

Obs'd doub. alt. = 87 18 08.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 43 39 4.0

Ref. (Ther. 48.0 bar. 29.7) = 1 0.2

True alt. of ∗ = A = 43 38 3.8

p = hour angle

2 m = ∠ + △ + A

∠ =	35	18	31.0	cos. ∠ =	9.911717
△ =	84	24	30.3	sin. △ =	9.999933
A =	43	38	3.8	cos. ∠ sin. △ =	9.909650
2 m =	163	21	25.1		
m =	81	40	42.5	cos. m =	9.160553
m − A =	38	2	38.7	sin. (m − A) =	9.789769

Cos. m sin. (m − A) = 8.950322

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.040672$$

Ref. −1.01.0

Bar. +1.0

Ther. −0.2

−1 00.2

sin. ½ p = 9.520336

½ p = 19 21 11.0

p in arc. = 38 42 22.0

p in time = 2 34 49.5 0.0

AR ∗ = 7 31 53.7

Sidereal time = AR ± p = 4 57 4.2

Time of obs'n by chron'r = 6 31 57.2

Chron'r of sid'l time = 1 34 53.0 0.0 = 1 34 53.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 20th

Station, Camp 49. Five Rapids

Latitude = ∠ = 35 19 30.0 + 3"

North polar dist. = △ = 75 58 31.8

Name of star = Jupiter (5 Obs.)

Obs'd doub. alt. = 104°.59'.04.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 52 29 32.0

Ref. (Ther. 52.0 bar. 29.5) = 0 43.7

True alt. of ✱ = A = 52 28 48.3

p = hour angle

2 m = ∠ + △ + A

∠ = 35°.19'.30.0 cos. ∠ = 9.911629

△ = 75°.58'.31.8 sin. △ = 9.986858

A = 52°.28'.48.3 cos. ∠ sin. △ = 9.898487

2 m = 163°.46'.50.1

m = 81°.53'.25.0 cos. m = 9.149432

m — A = 29°.24'.36.7 sin. (m — A) = 9.691133

Cos. m sin. (m — A) = 8.840565

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.942076$$

Ref. " — 0.44.7

Bar + 0.8

Ther + 0.2

0 43.7

sin. ½ p = 9.971059

½ p = 17°.12'.26

p in arc. = 34°.24'.52

p in time = 2°.17'.39.5 — 0.1

AR ✱ = 2 32 28.3

Sidereal time = AR ± p = 4°.50'.07.8

Time of obs'n by chron'r = 6°.25'.03.1

Chron'r of sid'l time = 1°.34'.45.3 + 0.1 = 1 34 45.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 20

Station, Camp 49.

Latitude = ∠ = 35° 19′ 30.0 + 3″

North polar dist. = △ = 68 12 2.5

Name of star = Saturn (East)

Obs'd doub. alt. = 105° 56′ 34.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 52 58 17.0

Ref. (Ther. 52.0 bar. 29.5) = 0 42.9

True alt. of ∗ = A = 52 57 34.1

p = hour angle

2 m = ∠ + △ + A

∠ = 35° 19′ 30.0 cos. ∠ = 9.911629

△ = 68° 12′ 2.5 sin. △ = 9.967777

A = 52° 57′ 34.1 cos. ∠ sin. △ = 9.879406

2 m = 156° 29′ 06.6

m = 78° 14′ 33.3 cos. m = 9.309140

m − A = 25° 16′ 59.2 sin. (m − A) = 9.630520

Cos. m sin. (m − A) = 8.939660

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.060254$$

Ref. − 0′ 43.9 Corr + 0.8 Ther. + 0.2 − 0 42.9

sin. ½ p = 9.530127

½ p = 19° 48′ 45

p in arc. = 39° 37′ 30

p in time = 2h 38m 30 0.0

AR ∗ = 7h 36m 14.7

Sidereal time = AR ± p = 4h 57m 44.7

Time of obs'n by chron'r = 6h 32m 37.8

Chron'r of sid'l time = 1h 34m 53.1 0.0 = 1 34 53.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 22

Station, Camp 49 One or two hundred yds higher up the bank than on Feb. 20

Latitude = ∠ = 35 19 30.0 + 0" by bar

North polar dist. = △ = 84 24 50.5

Name of star = Procyon (Sth)

Obs'd doub. alt. = 99 58 06.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 59 3.0

Ref. (Ther. 54.0 bar. 29.6) = 0 47.7

True alt. of ✱ = A = 49 58 15.3

p = hour angle

2 m = ∠ + △ + A

∠ = 35 19 30.0 cos. ∠ = 9.911629

△ = 84 24 50.5 sin. △ = 9.997933

A = 49 58 15.3 cos. ∠ sin. △ = 9.909562

2 m = 169 42 35.8

m = 84 51 17.9 cos. m = 8.952681

m — A = 34 53 2.6 sin. (m — A) = 9.757334

Cos. m sin. (m — A) = 8.710015

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.800453$$

Ref. — 0 48.9

Bar + 0.8

Ther. + 0.4

— 0 47.7

sin. ½ p = 9.400226

½ p = 14 33 20.0

p in arc. = 29 6 40.0

p in time = 1 56 26.7 0.0

AR ✱ = 7 31 63.7

Sidereal time = AR ± p = 5 35 27.0

Time of obs'n by chron'r = 7 10 24.1

Chron'r of sid'l time = 1 34 57.1 0.0 = 1 34 57.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 22.

Station, Camp 49

Latitude = ∠ = 35° 19′ 30.0 + 0″

North polar dist. = △ = 75° 52′ 11.0

Name of star = Jupiter (east)

Obs'd doub. alt. = 86° 02′ 22.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 43° 1′ 11.0

Ref. (Ther. 54.0 bar. 29.6) = 1′ 0.9

True alt. of ✱ = A = 43° 0′ 10.1

p = hour angle

2 m = ∠ + △ + A

∠ = 35° 19′ 30.0 cos. ∠ = 9.911629

△ = 75° 52′ 11.0 sin. △ = 9.986657

A = 43° 00′ 10.1 cos. ∠ sin. △ = 9.898286

2 m = 154° 11′ 51.1

m = 77° 05′ 55.5 cos. m = 9.348838

m — A = 34° 05′ 45.4 sin. (m — A) = 9.748636

Cos. m sin. (m — A) = 9.097474

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.199184$$

Ref. — 1′ 02.4

Bar. + 1.0

Ther. + 0.5

1′ 0.9

sin. ½ p = 9.599594

½ p = 23° 26′ 12

p in arc. = 46° 52′ 24

p in time = 3h 07m 29.6 0.0

AR ✱ = 2h 33m 41.3

Sidereal time = AR ± p = 5h 41m 10.9

Time of obs'n by chron'r = 7h 16m 07.9

Chron'r of sid'l time = 1h 34m 57.0 0.0 = 1h 34m 57.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 24

Station, Camp 30 Foot of Long Rapid

Latitude = ∠ = 35 21 53.0 + 0"

North polar dist. = △ = 68 9 44.7

Name of star = Saturn (Sol)

Obs'd doub. alt. = 111..32..40.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 55 46 20.0

Ref. (Ther. 59.0 bar. 29.8) = 0 38.5

True alt. of ✱ = A = 55 45 41.5

p = hour angle

2 m = ∠ + △ + A

∠ = 35..21..53.0 cos. ∠ = 9.911415

△ = 68.. 9.. 44.7 sin. △ = 9.967667

A = 55..45..41.5 cos. ∠ sin. △ = 9.879076

2 m = 159..17..19.2

m = 79..38..39.6 cos. m = 9.254684

m — A = 23..52..58.1 sin. (m — A) = 9.607312

Cos. m sin. (m — A) = 8.861996

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.982920$$

Ref. " "

−0..39.6 sin. ½ p = 9.991460

Bar + 0.5" ½ p = 14..03..48

Ther + 0.6 p in arc. = 36..07..36

− 0 38.5" p in time = 2..24..30.4

AR ✱ = 7..35..24.4

Sidereal time = AR ± p = 5..10..54.0

Time of obs'n by chron'r = 6..45..50

Chron'r of sid'l time = 1..34..56.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 24

Station, Camp 50

Latitude = ∠ = 35 21 53.0 + 0"

North polar dist. = △ = 75 45 55.9

Name of star = Pollux (5 obs)

Obs'd doub. alt. = 95 27 30.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 43 45.0

Ref. (Ther. 59.0 bar. 29.8) = 0 51.3

True alt. of * = A = 47 42 53.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35 21 53.0 cos. ∠ = 9.911415

△ = 75 46 55.9 sin. △ = 9.986457

A = 47 42 53.7 cos. ∠ sin. △ = 9.897872

2 m = 158 50 42.6

m = 79 25 21.3 cos. m = 9.263791

m — A = 31 42 27.6 sin. (m — A) = 9.720634

Cos. m sin. (m — A) = 8.984425

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.086553$$

Ref. −0.53.0 Bar. + 0.7 Ther. + 1.0 −0 51.3

sin. ½ p = 9.543276

½ p = 20 26 54

p in arc. = 40 53 48

p in time = 2 43 35.2 0.0

AR * = 2 34 54.5

Sidereal time = AR ± p = 5 18 29.7

Time of obs'n by chron'r = 6 53 27.9

Chron'r of sid'l time = 1 34 58.2 0.0 = 1 34 58.2

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 24

Station, Camp 30

Latitude = ∠ = 35 21 53.0 + 0"

North polar dist. = △ = 84 24 50.6

Name of star = Procyon (Sha)

Obs'd doub. alt. = 100 54 46.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 50 27 23.0

Ref. (Ther. 59.0 bar. 29.8) = 0 46.4

True alt. of ✱ = A = 50 26 36.6

p = hour angle

2 m = ∠ + △ + A

∠ = 35 21 53.0 cos. ∠ = 9.911416

△ = 84 24 50.6 sin. △ = 9.997933

A = 50 26 36.6 cos. ∠ sin. △ = 9.909349

2 m = 170 13 20.2

m = 85 6 40.1 cos. m = 8.930558

m — A = 34 40 3.5 sin. (m — A) = 9.754971

Cos. m sin. (m — A) = 8.685529

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.776180$$

Ref. — 0 46.1

Bar + 0.8

Ther. + 0.4

— 0 46.4

sin. ½ p = 9.388090

½ p = 14 8 45.9

p in arc. = 28 17 31.8

p in time = 1 53 10.1 0.0

AR ✱ = 7 31 53.7

Sidereal time = AR ± p = 5 38 43.6

Time of obs'n by chron'r = 7 13 39.9

Chron'r of sid'l time = 1 34 56.3 0.0 = 1 34 56.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 24

Station, Camp 50

Latitude = ∠ = 35 21 53.0 + 0"

North polar dist. = △ = 67 12 32.2

Name of star = α Ursæ Minoris (5 day

Obs'd doub. alt. = 78 49 20.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 39 24 40.0

Ref. (Ther. 59.0 bar. 29.8) = 1 8.8

True alt. of ✱ = A = 39 23 31.2

p = hour angle

2 m = ∠ + △ + A

∠ =	35	21	53.0	cos. ∠ =		9.911416
△ =	67	12	32.2	sin. △ =		9.964695
A =	39	23	31.2	cos. ∠ sin. △ =		9.876111
2 m =	141	57	56.4			
m =	70	58	58.2	cos. m =		9.513020
m — A =	31	35	27.0	sin. (m — A) =		9.719207

Cos. m sin. (m — A) = 9.232227

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos.\ m \sin.\ (m - A)}{\cos.\ \angle \sin.\ \triangle} = 9.356116$$

Ref. " 1 10.9 − 0.9

Bar + 0.9

Ther + .1.2

1 8.8

sin. ½ p = 9.678058

½ p = 28 27 24.0

p in arc. = 56 54 48.0

p in time = 3 47 39.2 0.0

AR ✱ = 1 59 10.3

Sidereal time = AR ± p = 5 46 49.5

Time of obs'n by chron'r = 7 21 49.1

Chron'r of sid'l time = 1 34 59.6 0.0 = 1 34 59.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 25

Station, Camp 51 Cotton Wood Valley

Latitude = ∠ = 35 24 4.0 — 0″

North polar dist. = △ = 84 24 50.6

Name of star = Procyon (5 d.)

Obs'd doub. alt. = 100 33 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 50 16 35.0

Ref. (Ther. 67.0 bar. 29.8) = 0 47.1

True alt. of ∗ = A = 50 15 47.9

p = hour angle

2 m = ∠ + △ + A

∠ =	35	24	4.0	cos. ∠ =	9.911220
△ =	84	24	50.6	sin. △ =	9.997933
A =	50	15	47.9	cos. ∠ sin. △ =	9.909153
2 m =	170	4	42.5		
m =	85	2	21.2	cos. m =	8.938884
m — A =	34	46	33.3	sin. (m — A) =	9.756155

Cos. m sin. (m — A) = 8.693039

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.783886$$

Ref. — 0.48.5″

Bar + 0.8

Ther + 0.6

0 47.1

sin. ½ p = 9.391943

½ p = 14 16 29.0

p in arc. = 28 32 58.0

p in time = 1 54 11.9 0.0

AR ∗ = 7 31 53.7

Sidereal time = AR ± p = 5 37 41.8

Time of obs'n by chron'r = 7 12 44.8

Chron'r of sid'l time = 1 35 3.0 0.0 = 1 35 3.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 25

Station, Camp 51

Latitude = ∠ = 35 24 4.0 − 0 "

North polar dist. = △ = 75 42 39.8

Name of star = Antilia (50 d)

Obs'd doub. alt. = 85° 46' 54.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 53 27.0

Ref. (Ther. 57.0 bar. 29.8) = 1 0.8

True alt. of ∗ = A = 42 52 26.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35° 24' 04.0 cos. ∠ = 9.911222

△ = 75° 42' 39.8 sin. △ = 9.986362

A = 42° 52' 26.2 cos. ∠ sin. △ = 9.897574

2 m = 153° 59' 10.0

m = 76° 59' 35.0 cos. m = 9.352816

m − A = 34° 07' 08.8 sin. (m − A) = 9.748894

Cos. m sin. (m − A) = 9.101218

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos. m \sin. (m - A)}{\cos. \angle \sin. \triangle} = 9.203236$$

Refr. − 1' 02".5

Bar + 0.9

Ther. + 0.8

− 1 0.8

sin. ½ p = 9.601618

½ p = 23° 33' 10

p in arc. = 47° 06' 20

p in time = 3 h 08 m 25.3 0.0

AR ∗ = 2 h 35 m 32.6

Sidereal time = AR ± p = 5 h 43 m 57.9

Time of obs'n by chron'r = 7 h 19 m 08.1

Chron'r of sid'l time = 1 h 35 m 10.2 0.0 = 1 35 10.2

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Commanded by Lieut. J. C. IVES. Topographical Engineers.

T. Groom & Co., Stationers,

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 25

Station, Camp 51

Latitude = ∠ = 35 24 4.0 − 0″

North polar dist. = △ = 67 12 32.3

Name of star = α Aurigæ (51)

Obs'd doub. alt. = 77 21 12.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 38 40 36.0

Ref. (Ther. 57.0 bar. 29.8) = 1 10.8

True alt. of ∗ = A = 38 39 25.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35 24 4.0 cos. ∠ = 9.911220

△ = 67 12 32.3 sin. △ = 9.964695

A = 38 39 25.2 cos. ∠ sin. △ = 9.875915

2 m = 141 16 1.5

m = 70 38 0.7 cos. m = 9.520627

m − A = 31 58 35.5 sin. (m − A) = 9.723925

Cos. m sin. (m − A) = 9.244552

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.368637$$

Ref. − 1 12.7

Bar + 0.9

Thr. + 1.0

− 1 10.8

sin. ½ p = 9.684318

½ p = 28 54 30.0

p in arc. = 57 49 00.0

p in time = 3 51 16.0

AR ∗ = 1 59 10.3

Sidereal time = AR ± p = 5 50 26.3

Time of obs'n by chron'r = 7 25 30.0

Chron'r of sid'l time = 1 35 3.7

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 25

Station, Camp 51

Latitude = ∠ = 35 24 4.0 −0″

North polar dist. = △ = 77 20 32.2

Name of star = α Leonis (Sol.)

Obs'd doub. alt. = 64 41 00.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 32 20 30.0

Ref. (Ther. 57.0 bar. 29.8) = 1 29.5

True alt. of ✻ = A = 32 19 00.5

p = hour angle

2 m = ∠ + △ + A

∠ = 35 24 4.0 cos. ∠ = 9.911220

△ = 77 20 32.2 sin. △ = 9.989315

A = 32 19 0.5 cos. ∠ sin. △ = 9.900535

2 m = 145 3 36.7

m = 72 31 48.3 cos. m = 9.477418

m − A = 40 12 47.8 sin. (m − A) = 9.809986

Cos. m sin. (m − A) = 9.287404

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.386869$$

Ref. −1 31.8

Bar. +1.0

Ther. +1.3

1 29.5

sin. ½ p = 9.693434

½ p = 29 34 55.0

p in arc. = 59 9 50.0

p in time = 3 36 39.3 0.0

AR ✻ = 10 00 50.5

Sidereal time = AR ± p = 6 4 11.2

Time of obs'n by chron'r = 7 39 13.4

Chron'r of sid'l time = 1 35 2.2 0.0 = 1 35 2.2

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 27

Station, Camp 53 Round Island Rapid

Latitude = ∠ = 35° 32′ 7.0 + 0″

North polar dist. = △ = 84° 24′ 50.7

Name of star = Procyon (5 Obs.)

Obs'd doub. alt. = 96° 48′ 36.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 48 21 48.0

Ref. (Ther. 51.0 bar. 29.5) = 0 51.1

True alt. of ∗ = A = 48 20 56.9

p = hour angle

2 m = ∠ + △ + A

∠ = 35 32 7.0 cos. ∠ = 9.910495

△ = 84 24 50.7 sin. △ = 9.997933

A = 48 20 56.9 cos. ∠ sin. △ = 9.908428

2 m = 168 17 54.6

m = 84 8 57.3 cos. m = 9.008334

m — A = 35 48 00.4 sin. (m — A) = 9.767125

Cos. m sin. (m — A) = 8.775459

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.867031$$

9.433515

Ref. − 0.52.0

Bar + 0.8

Ther. + 0.1

0 51.1

sin. ½ p =

½ p = 15 44 29.0

p in arc. = 31 28 58.0

p in time = 2 5 55.9 0.0

AR ∗ = 7h 31m 53.6s

Sidereal time = AR ± p = 5 25 57.7

Time of obs'n by chron'r = 7h 01m 09.1

Chron'r of sid'l time = 1 35 11.4 0.0 = 1 35 11.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 Feb. 27

Station, Camp 53

Latitude = ∠ = 35 32 7.0 +0"

North polar dist. = △ = 67 12 32.4

Name of star = α Aquilæ (52d)

Obs'd doub. alt. = 83 09 20.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 41 34 40.0

Ref. (Ther. 61.0 bar. 29.5) = 1 4.7

True alt. of ✱ = A = 41 33 35.3

p = hour angle

2 m = ∠ + △ + A

∠ =	35	32	7.0	cos. ∠ =	9.910495
△ =	67	12	32.4	sin. △ =	9.964695
A =	41	33	35.3	cos. ∠ sin. △ =	9.875190
2 m =	144	18	14.7		
m =	72	9	7.3	cos. m =	9.486420
m — A =	30	35	32.0	sin. (m — A) =	9.706653

Cos. m sin. (m — A) = 9.193073

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.317883$$

Bar. −1.05.8

Bar + 1.0

Ther. + 0.1

−1 4.7

sin. ½ p = 9.659941

½ p = 27 7 40.0

p in arc. = 54 15 20.0

p in time = 3 37 1.3 0.0

AR ✱ = 1 59 10.3

Sidereal time = AR ± p = 5 36 11.6

Time of obs'n by chron'r = 7 11 24.6

Chron'r of sid'l time = 1 35 13.0 0.0 = 1 35 13.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 1st

Station, Camp 63 Fifty yds north of station of Feb. 27

Latitude = ∠ = 35 32 10.0 — 0″

North polar dist. = △ = 84 24 50.8

Name of star = Procyon (Obs.)

Obs'd doub. alt. = *103 43 14.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 51 51 37.0

Ref. (Ther. 52.0 bar. 29.8) = 0 45.1

True alt. of * = A = 51 50 51.9

p = hour angle

2 m = ∠ + △ + A

*The 4th observation seems to have been read off 5′ too small giving for the mean 103° 44′ 14″ differing by 1′ 00″ from the above. The star was in the altitude used viz ½(103° 43′ 14″) at 7h 24m 22.5s by Chron'r which has been adopted as the time of Obs'n by Chron'r

∠ =	35	32	10.0	cos. ∠ =	9.910491
△ =	84	24	50.8	sin. △ =	9.999933
A =	51	50	51.9	cos. ∠ sin. △ =	9.908424
2 m =	171	47	52.7		
m =	85	53	56.3	cos. m =	8.854399
m — A =	34	3	4.4	sin. (m — A) =	9.748136

Cos. m sin. (m — A) = 8.602535

Sin.² ½ p = cos. m sin. (m — A) / cos. ∠ sin. △ = 8.694111

Ref. — 0 45.6

Bar + 0.3

Ther. + 0.2

0 45.1

sin. ½ p = 9.347055

½ p = 12 50 51.5

p in arc. = 25 41 43.0

p in time = 1 42 46.9 0.0

AR * = 7 31 53.63

Sidereal time = AR ± p = 5 49 06.7

Time of obs'n by chron'r = 7 24 22.2

Chron'r of sid'l time = 1 35 15.5 [illegible]

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 1st

Station, Camp 53

Latitude = ∠ = 35 32 10.0 — 0″

North polar dist. = △ = 67 12 32.6

Name of star = α Arietis (54

Obs'd doub. alt. = 73 53 58.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 36 56 59.0

Ref. (Ther. 32.0 bar. 29.8) = 1 16.3

True alt. of ∗ = A = 36 55 42.7

p = hour angle

2 m = ∠ + △ + A

∠ =	35 32 10.0	cos. ∠ =	9.910491
△ =	67 12 32.6	sin. △ =	9.964695
A =	36 55 42.7	cos. ∠ sin. △ =	9.875186
2 m =	139 40 25.3		
m =	69 50 12.6	cos. m =	9.537435
m — A =	32 54 29.9	sin. (m — A) =	9.735037

Cos. m sin. (m — A) = 9.272472

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.397286$$

Ref. 1″ 16.2

Bar + 0.6

Ther. + 0.3

−1 16.3

sin. ½ p	=	9.698643
½ p	=	29 58 30.0
p in arc.	=	59 57 00.0
p in time	=	3 59 48.0 0.0
AR ∗	=	1 59 10.3
Sidereal time = AR ± p	=	5 58 58.3
Time of obs'n by chron'r	=	7 34 12.1
Chron'r of sid'l time	=	1 35 13.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 2

Station, Camp 64

Latitude = ∠ = 35 37 50.0 + 0"

North polar dist. = △ = 67 12 32.7

Name of star = α Arietis (5 Dr.)

Obs'd doub. alt. = 61 44 18.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 30 52 9.0

Ref. (Ther. 43.0 bar. 29.6) = 1 37.3

True alt. of ∗ = A = 30 50 31.7

p = hour angle

2 m = ∠ + △ + A

∠ =	35	37	50.0	cos. ∠ =	9.909978
△ =	67	12	32.7	sin. △ =	9.964695
A =	30	50	31.7	cos. ∠ sin. △ =	9.874673
2 m =	133	40	54.4		
m =	66	50	27.2	cos. m =	9.594709
m — A =	35	59	55.5	sin. (m — A) =	9.769206

Cos. m sin. (m — A) = 9.363915

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos.\ m \sin.\ (m - A)}{\cos.\ \angle \sin.\ \triangle} = 9.489242$$

Ref. −1.37.2
Bar + 1.2
Ther − 1.3
1 37 3

sin. ½ p = 9.744621

½ p = 33 44 23

p in arc. = 67 28 46

p in time = 4 29 55.1 0.0

AR ∗ = 1 59 10.2

Sidereal time = AR ± p = 6 29 5.3

Time of obs'n by chron'r = 8 04 22.4

Chron'r of sid'l time = 1 35 17.1 0.0 = 1 35 17.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 20

Station, Camp 54

Latitude = ∠ = 35 37 50.0 + 0"

North polar dist. = △ = 77 20 32.3

Name of star = α Leonis (5 Ah)

Obs'd doub. alt. = 76 57 14.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 38 25 37.0

Ref. (Ther. 43.0 bar. 29.6) = 1 13.5

True alt. of * = A = 38 24 23.5

p = hour angle

2 m = ∠ + △ + A

∠ =	35 37 50.0	cos. ∠ =		9.909978
△ =	77 20 32.3	sin. △ =		9.989315
A =	38 24 23.5	cos. ∠ sin. △ =		9.899293
2 m =	151 22 45.8			
m =	75 41 22.9	cos. m =		9.393001
m — A =	37 16 59.4	sin. (m — A) =		9.782296
Cos. m sin. (m — A)		=		9.175297
Sin.² ½ p = cos. m sin. (m — A) / cos. ∠ sin. △		=		9.276004
Ref. + 1.13.5	sin. ½ p	=		9.638002
Ber + 1.0	½ p	=		25 45 15.3
Ther. − 1.0	p in arc.	=		51 30 30.6
1.13.5	p in time	=		3 26 2.0
	AR *	=		10 00 50.5
	Sidereal time = AR ± p	=		6 34 48.5
	Time of obs'n by chron'r	=		8 10 05.9
	Chron'r of sid'l time	=		1 35 17.4

0.0 — 1 35 17.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 5

Station, Camp 56

Latitude = ∠ = 35 41 43.0 − 0."

North polar dist. = △ = 67 12 33.0

Name of star = α Arietis (Obl)

Obs'd doub. alt. = 69 29 04.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 34 44 32.0

Ref. (Ther. 65.0 bar. 29.3) = 1 19.2

True alt. of ✱ = A = 34 43 12.8

p = hour angle

2 m = ∠ + △ + A

∠ =	35	41	43.0	cos. ∠ =	9.909626
△ =	67	12	33.0	sin. △ =	9.964695
A =	34	43	12.8	cos. ∠ sin. △ =	9.874321
2 m =	137	37	28.8		
m =	68	48	44.4	cos. m =	9.558017
m − A =	34	5	31.6	sin. (m − A) =	9.748395

Cos. m sin. (m − A) = 9.306612

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.432291$$

Ref. −1.24.0
Bar + 1.8
Ther. + 3.0
1 19.2

sin. ½ p = 9.716145

½ p = 31 20 37.0

p in arc. = 62 41 14.0

p in time = 4 10 44.9 0.0

AR ✱ = 1 69 10.2

Sidereal time = AR ± p = 6 9 55.1

Time of obs'n by chron'r = 7 45 17.4

Chron'r of sid'l time = 1 35 22.3 0.0 = 1 35 22.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 5

Station, Camp 56

Latitude = ∠ = 35 41 43.0 - 0"

North polar dist. = △ = 77.20.32.3

Name of star = a Leonis (5 obs)

Obs'd doub. alt. = 69.13.30.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 34 36 45.1

Ref. (Ther. 65.0 bar. 29.3) = 1 20.1

True alt. of ✱ = A = 34 35 24.9

p = hour angle

2 m = ∠ + △ + A

∠ =	35	41	43.0	cos. ∠ =	9.909626
△ =	77	20	32.3	sin. △ =	9.989315
A =	34	35	24.9	cos. ∠ sin. △ =	9.898941
2 m =	147	37	40.2		
m =	73	48	50.1	cos. m =	9.445227
m — A =	39	13	25.2	sin. (m — A) =	9.800957

Cos. m sin. (m — A) = 9.246184

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.347243$$

Ref. — 1.24.9

Am + 1.8

Ther. + 3.0

1 20.1

sin. ½ p	=	9.673621	
½ p	=	28 8 30.0	
p in arc.	=	56 17 00.0	
p in time	=	3 45 8.0	0.0
AR ✱	=	10.00.50.5	
Sidereal time = AR ± p	=	6 15 42.5	
Time of obs'n by chron'r	=	7.37.04.8	
Chron'r of sid'l time	=	1 35 22.3	0.0 = 1 35 22.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 6

Station, Camp 67 Mouth of Big Cañon

Latitude = ∠ = 35 44 58.0 − 0″

North polar dist. = △ = 67 12 33.1

Name of star = α Aurigæ (Sol.)

Obs'd doub. alt. = 70 59 38.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 35 29 49.0

Ref. (Ther. 70.0 bar. 29.4) = 1 16.5

True alt. of ✳ = A = 35 28 32.5

p = hour angle

2 m = ∠ + △ + A

∠ =	35	44	58.0	cos. ∠ =	9.909331
△ =	67	12	33.1	sin. △ =	9.964696
A =	35	28	32.5	cos. ∠ sin. △ =	9.874027
2 m =	138	26	3.6		
m =	69	13	1.8	cos. m =	9.550016
m − A =	33	44	29.3	sin. (m − A) =	9.744642

Cos. m sin. (m − A) = 9.294658

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.420631$$

Ref. − 1 21.5

Bar + 1.8

Ther. + 3.2

1 16.5

sin. ½ p = 9.710315

½ p = 30 52 46.0

p in arc. = 61 45 32.0

p in time = 4 7 2.1 0.0

AR ✳ = 1 59 10.2

Sidereal time = AR ± p = 6 6 12.3

Time of obs'n by chron'r = 7 41 39.0

Chron'r of sid'l time = 1 35 26.7 0.0 1 35 26.7

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 6

Station, Camp 57

Latitude = ∠ = 35 44 58.0 − 0″

North polar dist. = △ = 77 20 32.2

Name of star = α Leonis (50h)

Obs'd doub. alt. = * 67 35 44.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 33 47 52.0

Ref. (Ther. 70.0 bar. 29.4) = 1 21.4

True alt. of * = A = 33 46 30.6

p = hour angle

2 m = ∠ + △ + A

∠ = 35 44 58.0 cos. ∠ = 9.909331

△ = 77 20 32.2 sin. △ = 9.989315

A = 33 46 30.6 cos. ∠ sin. △ = 9.898646

2 m = 146 52 0.8

m = 73 26 0.4 cos. m = 9.455041

m − A = 39 39 29.8 sin. (m − A) = 9.804962

Cos. m sin. (m − A) = 9.260003

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.361357$$

Ref. − 1.26.7

Bar + 1.8

Ther. + 3.5

1 21.4

sin. ½ p = 9.680678

½ p = 28 38 41.3

p in arc. = 57 17 22.6

p in time = 3 49 9.5 0.0

AR * = 10 00 50.5

Sidereal time = AR ± p = 6 11 41.0

Time of obs'n by chron'r = 7 47 06.2

Chron'r of sid'l time = 1 35 25.2

* The 3rd observation seems to have been read 10′ too large giving for the mean 67° 33′ 44″ differing by 2′ 00″ from the above. The star was in the altitude used viz. ½(67° 35′ 44″) at 7h 47m 6.5 by 330 which has been adopted as the time of obs'n by Chron'r.

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 8th

Station, Camp 57

Latitude = ∠ = 35° 44' 56.0" − 0"

North polar dist. = △ = 75° 5' 34.5"

Name of star = Jupiter (S. L.)

Obs'd doub. alt. = 67° 02' 14.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 33° 31' 7.0

Ref. (Ther. 70.0 bar. 29.5) = 1' 22.8

True alt. of ✱ = A = 33° 29' 44.2

p = hour angle

2 m = ∠ + △ + A

∠ =	35° 44' 56.0	cos. ∠ =	9.909334
△ =	75° 05' 34.5"	sin. △ =	9.985132
A =	33° 29' 44.2	cos. ∠ sin. △ =	9.894466
2 m =	144° 20' 14.7		
m =	72° 10' 07.3	cos. m =	9.485963
m − A =	38° 40' 23.1	sin. (m − A) =	9.795794
Cos. m sin. (m − A)		=	9.281757
Sin.² ½ p = cos. m sin. (m − A) / cos. ∠ sin. △		=	9.387291

Ref. − 1' 27.9"
Bar + 1.6
Ther. + 3.5
1' 22.8

sin. ½ p	=	9.693645
½ p	=	29° 35' 52
p in arc.	=	59° 11' 44
p in time	=	3h 56m 46.9s 0.0
AR ✱	=	2h 42m 58.9s
Sidereal time = AR ± p	=	6h 39m 45.8s
Time of obs'n by chron'r	=	8h 15m 13.6s
Chron'r of sid'l time	=	1h 35m 27.8s 0.0 = 1 35 27.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 8

Station, Camp 57

Latitude = ∠ = 35 44 56.0 − 0″

North polar dist. = △ = 77 20 32.2

Name of star = α Leonis (51)

Obs'd doub. alt. = 80 57 12.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 28 36.0

Ref. (Ther. 70.0 bar. 29.5) = 1 4.2

True alt. of ✱ = A = 40 27 31.8

p = hour angle

2 m = ∠ + △ + A

∠ = 35 44 56.0 cos. ∠ = 9.909334

△ = 77 20 32.2 sin. △ = 9.989315

A = 40 27 31.8 cos. ∠ sin. △ = 9.898649

2 m = 153 33 00.0

m = 76 46 30.0 cos. m = 9.359410

m − A = 36 18 58.2 sin. (m − A) = 9.772498

Cos. m sin. (m − A) = 9.131908

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.233259$$

Ref. "

− 1.08.8

Bar + 1.2

Ther. + 2.8

1 4.2

sin. ½ p = 9.616629

½ p = 24 26 3.0

p in arc. = 48 52 6.0

p in time = 3 15 28.4 0.0

AR ✱ = 10 00 50.54

Sidereal time = AR ± p = 6 45 21.1

Time of obs'n by chron'r = 8 20 49.0

Chron'r of sid'l time = 1 35 27.9 0.0 = 1 35 27.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 10

Station, Camp 59. Bivouac 2. Head of Big Cañon

Latitude = ∠ = 36 3 1.0 + 0"

North polar dist. = △ = 77..20..32.2

Name of star = α Leonis (3 Obs.)

Obs'd doub. alt. = 109..40..10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 54 50 5.0

Ref. (Ther. 65.0 bar. 29.4) = 38.7

True alt. of ∗ = A = 54 49 26.3

p = hour angle

2 m = ∠ + △ + A

∠ =	36	3	1.0	cos. ∠ =	9.907681
△ =	77	20	32.2	sin. △ =	9.989315
A =	54	49	26.3	cos. ∠ sin. △ =	9.896996
2 m =	168	12	59.5		
m =	84	6	29.7	cos. m =	9.011356
m — A =	29	17	3.4	sin. (m — A) =	9.689436

Cos. m sin. (m — A) = 8.700792

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.803796$$

Ref. − 0..40.9

Bar + 1.0

Ther. + 1.2

− 0 38.7

sin. ½ p = 9.401898

½ p = 14 36 47.0

p in arc. = 29 13 34.0

p in time = 1 56 54.3 0.0

AR ∗ = 10..00..50.5

Sidereal time = AR ± p = 8 3 56.2

Mean Solar Chron. Time of obs'n by chron'r 438 = 12..01..08.3

Chron'r of sid'l time = 3 57 7.1 0.0 = 3 57 7.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 10.

Station, Camp 59 Bivouac

Latitude = ∠ = 36 3 1.0 + 0″

North polar dist. = △ = 44 08 47.5

Name of star = α Aurigae (3041)

Obs'd doub. alt. = 109 08 13.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 54 34 6.6

Ref. (Ther. 65.0 bar. 29.4) = 0 39.3

True alt. of ∗ = A = 54 33 27.3

p = hour angle

2 m = ∠ + △ + A

∠ =	36 3 1.0	cos. ∠ =	9.907681
△ =	44 8 47.5	sin. △ =	9.842918
A =	54 33 27.3	cos. ∠ sin. △ =	9.750599
2 m =	134 45 15.8		
m =	67 22 37.9	cos. m =	9.585080
m — A =	12 49 10.6	sin. (m — A) =	9.346123

Cos. m sin. (m — A) = 8.931203

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.180604$$

Ref. − 0 41.5

Bar + 1.0

Ther. + 1.2

0 39.3

sin. ½ p	=	9.590302
½ p	=	22 54 43
p in arc.	=	45 49 26
p in time	=	3 3 17.7 0.0
AR ∗	=	5 06 13.2
Sidereal time = AR ± p	=	8 9 30.9
Time of obs'n by chron'r 438	=	12 06 39.7
Chron'r 4 of sid'l time	=	3 57 8 0.0 = 3 57 08

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 22

Station, Beale's Crossing (Camp 59?)

Latitude = ∠ = 35 2 51.0 − 0″

North polar dist. = △ = 77 20 32.0

Name of star = α Leonis (51 L)

Obs'd doub. alt. = 107 37 34.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 53 48 47.0

Ref. (Ther. 52.0 bar. 28.0) = 0 39.5

True alt. of ∗ = A = 53 48 7.5

p = hour angle

2 m = ∠ + △ + A

∠ = 35 2 51.0 cos. ∠ = 9.913113

△ = 77 20 32.0 sin. △ = 9.989315

A = 53 48 7.5 cos. ∠ sin. △ = 9.902428

2 m = 166 11 30.5

m = 83 5 45.2 cos. m = 9.079934

m − A = 29 17 37.7 sin. (m − A) = 9.689564

Cos. m sin. (m − A) = 8.769498

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 8.867070$$

Ref. − 0 42.5

Bar + 2.8

Ther. + 0.2

− 0 39.5

sin. ½ p = 9.433535

½ p = 15 44 41.3

p in arc. = 31 29 22.6

p in time = 2 5 57.5 0.0

AR ∗ = 10 50 60.5

Sidereal time = AR ± p = 7 54 53.0

Time of obs'n by chron'r = 9 29 51.4

Chron'r of sid'l time = 1 34 58.4 0.0 = 1 34 58.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 22

Station, Beale's Crossing

Latitude = ∠ = 35 2 51.0 — 0"

North polar dist. = △ = 44°08'48.1

Name of star = α Aurigæ (Sh)

Obs'd doub. alt. = 111°00'54

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 55 30 27.0

Ref. (Ther. 52.0 bar. 28.0) = 0 37.0

True alt. of ✱ = A = 55 29 50.0

p = hour angle

2 m = ∠ + △ + A

∠ =	35	2	51.0	cos. ∠ =	9.913113
△ =	44	8	48.1	sin. △ =	9.842920
A =	55	29	50.0	cos. ∠ sin. △ =	9.756033
2 m =	134	41	29.1		
m =	67	20	44.5	cos. m =	9.585653
m — A =	11	50	54.5	sin. (m — A) =	9.312440

Cos. m sin. (m — A) = 8.898093

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.142060$$

Ref. — 0.48.0
Bar + 2.8
Ther. + 0.2
0 37.0

sin. ½ p = 9.571030

½ p = 21 51 53.2

p in arc. = 43 43 46.4

p in time = 2 54 55.1 0.0

AR ✱ = 5°06'13.0

Sidereal time = AR ± p = 8 1 8.1

Time of obs'n by chron'r = 9.30.06.0

Chron'r of sid'l time = 1 34 57.9 0.0 = 1 34 57.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 23

Station, Camp 60 Sitgreave's Pass

Latitude = ∠ = 35 4 34.0 − 0″

North polar dist. = △ = 74 38 15.8

Name of star = δ Leonis (5 obs)

Obs'd doub. alt. = 93 :: 04 .. 38

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 46 32 19.0

Ref. (Ther. 53.0 bar. 28.0) = 0 51.2

True alt. of ✱ = A = 46 31 27.8

p = hour angle

2 m = ∠ + △ + A

∠ =	35	4	34.0	cos. ∠ =		9.912960
△ =	74	38	15.8	sin. △ =		9.984198
A =	46	31	27.8	cos. ∠ sin. △ =		9.897158
2 m =	156	14	17.6			
m =	78	7	8.8	cos. m =		9.313609
m − A =	31	35	41.0	sin. (m − A) =		9.719254

Cos. m sin. (m − A) = 9.032863

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos.\ m \sin.\ (m - A)}{\cos.\ \angle \sin.\ \triangle} = 9.135705$$

Ref.
− 0.55.3
Bar + 3.8
Ther. + 0.3
− 0 51.2

sin. ½ p = 9.567852

½ p = 21 41 50

p in arc. = 43 23 40

p in time = 2 53 34.7 0.0

AR ✱ = 11 41 51.2

Sidereal time = AR ± p = 8 48 16.5

Time of obs'n by chron'r = 10 .. 22 .. 26.5

Chron'r of sid'l time = 1 34 10.0 0.0 = 1 34 10.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 28

Station, Camp 60

Latitude = ∠ = 35 4 34.0 −0"

North polar dist. = △ = 44.08.48.1

Name of star = α Aurigæ (50 1)

Obs'd doub. alt. = 92.17.18.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 46 8 39.0

Ref. (Ther. 53.0 bar. 28.0) = 0 51.8

True alt. of ∗ = A = 46 7 47.2

p = hour angle

2 m = ∠ + △ + A

∠ =	35 4 34.0	cos. ∠ =	9.912960
△ =	44 8 48.1	sin. △ =	9.842420
A =	46 7 47.2	cos. ∠ sin. △ =	9.755880
2 m =	125 21 9.3		
m =	62 40 34.6	cos. m =	9.661829
m − A =	16 32 47.4	sin. (m − A) =	9.454530

Cos. m sin. (m − A) = 9.116359

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.360479$$

Ref. " − 0.56.9

Bar + 3.8

Ther. + 0.3

− 0 51.8

sin. ½ p = 9.680239

½ p = 28 36 47.4

p in arc. = 57 13 34.8

p in time = 3 48 54.3 0.0

AR ∗ = 5.06.12.9

Sidereal time = AR ± p = 8 55 7.2

Time of obs'n by chron'r = 10.29.18.4

Chron'r of sid'l time = 1 34 11.2 0.0 − 1 34 11.2

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 25

Station, Camp - - - -

Latitude = ∠ = 35 9 51.0 - 1"

North polar dist. = △ = 68 42 05.3

Name of star = δ Leonis (50)

Obs'd doub. alt. = 100 52 00.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 50 26 00.0

Ref. (Ther. 44.0 bar. 27.1) = 0 43.8

True alt. of ∗ = A = 50 25 16.2

p = hour angle

2 m = ∠ + △ + A

∠ =	35	2	19.0	cos. ∠ =	9.913159
△ =	68	42	5.3	sin. △ =	9.969276
A =	50	25	16.2	cos. ∠ sin. △ =	9.882435
2 m =	154	9	40.5		
m =	77	4	50.2	cos. m =	9.349433
m — A =	26	39	34.0	sin. (m — A) =	9.651943

Cos. m sin. (m — A) = 9.001376

Sin.² ½ p = $\frac{\text{cos. m sin. (m — A)}}{\text{cos. ∠ sin. △}}$ = 9.118941

Ref. − 0.48.1

Bar. + 4.9

Ther. − 0.6

0 43.8

sin. ½ p = 9.559470

½ p = 21 15 43.7

p in arc. = 42 31 27.4

p in time = 2 50 5.8 0.0

AR ∗ = 11.06.35.5

Sidereal time = AR ± p = 8 16 29.7

Time of obs'n by chron'r = 9.49.20.8

Chron'r of sid'l time = 1 32 51.1 0.0 = 1 32 51.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 26

Station, Camp ----

Latitude = ∠ = 35 9 51 +1"

North polar dist. = △ = 61.30.49.6

Name of star = β Tauri (5 obs)

Obs'd doub. alt. = 98.23.00.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 11 30.0

Ref. (Ther. 44.0 bar. 27.1) = 0 46.0

True alt. of ∗ = A = 49 10 44.0

p = hour angle

2 m = ∠ + △ + A

∠ =	35	2	19.0	cos. ∠ =	9.913159
△ =	61	30	49.6	sin. △ =	9.943956
A =	49	10	44.0	cos. ∠ sin. △ =	9.857115
2 m =	145	43	52.6		
m =	72	51	56.3	cos. m =	9.469253
m — A =	23	41	12.3	sin. (m — A) =	9.603941

Cos. m sin. (m — A) = 9.073194

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos. m \sin. (m - A)}{\cos. \angle \sin. \triangle} = 9.216079$$

Ref. −0.50.3 Bar. +4.9 Thr. −0.6 0 46.0

sin. ½ p = 9.608039

½ p = 23 55 31.0

p in arc. = 47 51 2.0

p in time = 3 11 24.1

AR ∗ = 5.17.19.7

Sidereal time = AR ± p = 8 28 43.8

Time of obs'n by chron'r = 10.01.32.8

Chron'r of sid'l time = 1 32 49.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 29

Station, Camp 64 Basin Valley

Latitude = ∠ = 35 23 55.0 +9"

North polar dist. = △ = 74 38 15.5

Name of star = β Leonis (5 obs)

Obs'd doub. alt. = 81 53 60.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 56 55.0

Ref. (Ther. 62.0 bar. 26.2) = 0 56.9

True alt. of ∗ = A = 40 55 58.1

p = hour angle

2 m = ∠ + △ + A

∠ =	35	23	55.0	cos. ∠ =	9.911234
△ =	74	38	15.5	sin. △ =	9.984198
A =	40	55	58.1	cos. ∠ sin. △ =	9.895432
2 m =	150	58	8.6		
m =	75	29	4.3	cos. m =	9.399053
m — A =	34	33	6.2	sin. (m — A) =	9.753698

Cos. m sin. (m — A) = 9.152751

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.257319$$

Ref. 1.07.0
Bar. + 8.5
Ther. + 1.6
0 56.9

sin. ½ p = 9.628659

½ p = 25 10 3.0

p in arc. = 50 20 6.0

p in time = 3 21 20.4 −0.1

AR ∗ = 11 41 51.2

Sidereal time = AR ± p = 8 20 30.8

Time of obs'n by chron'r = 9 51 26.4

Chron'r of sid'l time = 1 30 55.6 −0.1 = 1 30 55.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 29

Station, Camp 64

Latitude = ∠ = 35° 23′ 55.0 + 9″

North polar dist. = △ = 82 ,, 37 ,, 20.0

Name of star = α Orionis (58d)

Obs'd doub. alt. = 87 ,, 25 ,, 64.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 43 42 57.0

Ref. (Ther. 62.0 bar. 26.2) = 0 51.6

True alt. of ∗ = A = 43 42 5.4

p = hour angle

2 m = ∠ + △ + A

∠ =	35 ,, 28 ,, 55.0	cos. ∠ =	9.911234
△ =	82 ,, 37 ,, 20.0	sin. △ =	9.996390
A =	43 ,, 42 ,, 05.4	cos. ∠ sin. △ =	9.907624
2 m =	161 ,, 43 ,, 20.4		
m =	80 ,, 51 ,, 40.2	cos. m =	9.200928
m — A =	37 ,, 09 ,, 34.8	sin. (m — A) =	9.781066
Cos. m sin. (m — A)		=	8.981993
Sin.² ½ p = cos. m sin. (m — A) / cos. ∠ sin. △		=	9.074369
	sin. ½ p	=	9.537184
	½ p	=	20 ,, 09 ,, 04
	p in arc.	=	40 ,, 18 ,, 08
	p in time	=	2 ,, 41 ,, 12.5 −0.3
	AR ∗	=	5 ,, 47 ,, 29.8
Sidereal time = AR ± p		=	8 ,, 28 ,, 42.3
Time of obs'n by chron'r		=	10 ,, 00 ,, 13.8
Chron'r of sid'l time		=	1 ,, 31 ,, 31.5 + 0.3 = 1 ,, 31 ,, 31.8

Ref , ,,
− 1.01.6
Bar + 8.0
Ther. + 4.4
− 0 51.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 30

Station, Camp 65 Peacock's Spring

Latitude = ∠ = 35 25 13 — 0"

North polar dist. = △ = 74 38 15.4

Name of star = β Leonis (5 Dh)

Obs'd doub. alt. = 81 00 06.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 30 03.0

Ref. (Ther. 60.0 bar. 26.0) = 0 57.3

True alt. of ✱ = A = 40 29 5.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35 25 13 cos. ∠ = 9.910117

△ = 74 38 15.4 sin. △ = 9.984198

A = 40 29 5.7 cos. ∠ sin. △ = 9.895315

2 m = 150 32 34.1

m = 75 16 17.0 cos. m = 9.405246

m — A = 34 47 11.3 sin. (m — A) = 9.756270

Cos. m sin. (m — A) = 9.161516

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.266201$$

Ref. " 1.08.2

Bar + 9.1

Ther. + 1.8

— 0.57.8

sin. ½ p = 9.633100

½ p = 25 26 40

p in arc. = 50 53 20

p in time = 3 23 33.3 0.0

AR ✱ = 11 41 51.2

Sidereal time = AR ± p = 8 18 17.9

Time of obs'n by chron'r = 9 49 13.7

Chron'r of sid'l time = 1 30 55.8 0.0 = 1 30 55.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 March 30

Station, Camp 65

Latitude = ∠ = 35 25 13 ·0 "

North polar dist. = △ = 73 „ 46 „ 40.0

Name of star = Aldebaran (5 Hr)

Obs'd doub. alt. = 68 „ 36 „ 14.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 34 18 7.0

Ref. (Ther. 60.0 bar. 26.0) = 1 12.3

True alt. of ✱ = A = 34 16 54.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35 „ 25 „ 13 cos. ∠ = 9.911117

△ = 73 „ 46 „ 40.0 sin. △ = 9.982355

A = 34 „ 16 „ 54.7 cos. ∠ sin. △ = 9.893472

2 m = 143 „ 28 „ 47.7

m = 71 „ 44 „ 23.8 cos. m = 9.496001

m — A = 37 „ 27 „ 29.1 sin. (m — A) = 9.784032

Cos. m sin. (m — A) = 9.280033

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.386561$$

Ref. — 1 „ 25.2

Bar + 11.2

Ther. + 1.7

— 1 12.3

sin. ½ p = 9.693280

½ p = 29 „ 34 „ 14

p in arc. = 59 „ 08 „ 28

p in time = 3 „ 56 „ 33.9 0.0

AR ✱ = 4 „ 27 „ 46.8

Sidereal time = AR ± p = 8 „ 24 „ 20.7

Time of obs'n by chron'r = 9 „ 55 „ 75.6

Chron'r of sid'l time = 1 „ 30 „ 54.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 2

Station, Camp 67 Diamond River

Latitude = ∠ = 35 45 41 −0″

North polar dist. = △ = 44 08 48.8

Name of star = α Aurigæ (58 d)

Obs'd doub. alt. = 73 40 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 36 50 5.0

Ref. (Ther. 68.0 bar. 28.4) = 1 10.9

True alt. of ∗ = A = 36 48 54.1

p = hour angle

2 m = ∠ + △ + A

∠ = 35 45 41 cos. ∠ = 9.909265

△ = 44 08 48.8 sin. △ = 9.842921

A = 36 48 54.1 cos. ∠ sin. △ = 9.752186

2 m = 116 43 23.9

m = 58 21 41.9 cos. m = 9.719792

m − A = 21 32 47.8 sin. (m − A) = 9.564972

Cos. m sin. (m − A) = 9.284764

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos. m \sin. (m - A)}{\cos. \angle \sin. \triangle} = 9.532574$$

Ref. −1.17.7

Bar. +4.1

Ther. +2.7

1 10.9

sin. ½ p = 9.766289

½ p = 35 43 14

p in arc. = 71 26 28

p in time = 4 45 45.9 0.0

AR ∗ = 5 06 12.7

Sidereal time = AR ± p = 9 51 58.6

Time of obs'n by chron'r = 11 21 49.2

Chron'r of sid'l time = 1 29 50.6 0.0 = 1 29 50.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 8

Station, Camp 67

Latitude = ∠ = 35 45 41 - 0"

North polar dist. = △ = 70 04 56.0

Name of star = Arcturus (5 Bd.)

Obs'd doub. alt. = 67 20 36.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 33 40 18.0

Ref. (Ther. 68.0 bar. 28.4) = 1 19.4

True alt. of ✱ = A = 33 38 58.6

p = hour angle

2 m = ∠ + △ + A

∠ = 35 45 41 cos. ∠ = 9.909266

△ = 70 04 56 sin. △ = 9.973272

A = 33 38 58.6 cos. ∠ sin. △ = 9.882478

2 m = 139 28 35.6

m = 69 44 47.8 cos. m = 9.539292

m — A = 36 05 49.2 sin. (m — A) = 9.770228

Cos. m sin. (m — A) = 9.309520

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.427042$$

Ref. 1 19.4

Bar + 4.8

Ther. + 3.1

1 19.4

sin. ½ p = 9.713521

½ p = 31 08 02

p in arc. = 62 16 04

p in time = 4 09 04.3 0.0

AR ✱ = 14 09 13.4

Sidereal time = AR ± p = 10 00 09.1

Time of obs'n by chron'r = 11 30 00.9

Chron'r of sid'l time = 1 29 51.8 00 = 1 29 51.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date,

Station,

Latitude = ∠ =

North polar dist. = △ =

Name of star =

Obs'd doub. alt. =

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude =

Ref. (Ther. bar.) =

True alt. of ✱ = A =

p = hour angle

2 m = ∠ + △ + A

∠ = cos. ∠ =

△ = sin. △ =

A = cos. ∠ sin. △ =

2 m =

m = cos. m =

m — A = sin. (m — A) =

Cos. m sin. (m — A) =

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} =$$

sin. ½ p =

½ p =

p in arc. =

p in time =

AR ✱ =

Sidereal time = AR ± p =

Time of obs'n by chron'r =

Chron'r of sid'l time =

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date,

Station,

Latitude $= \angle =$

North polar dist. $= \triangle =$

Name of star $=$

Obs'd doub. alt. $=$

Index error $=$

Eccentricity $=$

Doub. alt. cor. $=$

Altitude $=$

Ref. (Ther. bar. $) =$

True alt. of $* = A =$

p = hour angle

$2\,m = \angle + \triangle + A$

$\angle =$ cos. $\angle =$

$\triangle =$ sin. $\triangle =$

$A =$ cos. $\angle$ sin. $\triangle =$

$2\,m =$

$m =$ cos. $m =$

$m - A =$ sin. $(m - A) =$

Cos. m sin. $(m - A) =$

$$\text{Sin.}^2 \tfrac{1}{2}\,p = \frac{\text{cos. m sin. } (m - A)}{\text{cos. } \angle \text{ sin. } \triangle} =$$

sin. $\frac{1}{2}$ p $=$

$\frac{1}{2}$ p $=$

p in arc. $=$

p in time $=$

AR $* =$

Sidereal time $=$ AR $\pm$ p $=$

Time of obs'n by chron'r $=$

Chron'r of sid'l time $=$

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 4

Station, Camp 68

Latitude = ∠ = 35 38 52 − 1″

North polar dist. = △ = 44°08′49.1

Name of star = α Aurigae (5 obs.)

Obs'd doub. alt. = 68° 27′ 24.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 34 13 42.0

Ref. (Ther. 59.0 bar. 25.9) = 1 11.9

True alt. of * = A = 34 12 30.1

p = hour angle

2 m = ∠ + △ + A

∠ =	35° 38′ 52″	cos. ∠ =	9.909885
△ =	44° 08′ 49.1	sin. △ =	9.842922
A =	34° 12′ 30.1	cos. ∠ sin. △ =	9.752807

2 m = 114° 00′ 11.2

m = 57° 00′ 05.6 cos. m = 9.736094

m − A = 22° 47′ 35.5 sin. (m − A) = 9.588164

Cos. m sin. (m − A) = 9.324258

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.571451$$

Ref.
− 1.25.6
Bar + 11.5
Ther + 2.2
1 11.9

sin. ½ p = 9.785726

½ p = 37° 37′ 47

p in arc. = 75° 15′ 34

p in time = 5h 01m 02.3 − 0.1

AR * = 5h 06m 12.7

Sidereal time = AR ± p = 10h 07m 15.0

Time of obs'n by chron'r = 11h 37m 09.0

Chron'r of sid'l time = 1h 29m 54.0 + 0.1 = 1h 29m 54.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 4

Station, Camp 68

Latitude = ∠ = 35 38 52 - 1"

North polar dist. = △ = 70,,04,,55.7

Name of star = Arcturus (+ δ)

Obs'd doub. alt. = 73,, 02,,18

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 36 31 9.0

Ref. (Ther. 59.2 bar. 25.9) = 1 4.9

True alt. of ∗ = A = 36 29 4.1

p = hour angle

2 m = ∠ + △ + A

∠ = 35,, 38,, 52 cos. ∠ = 9.909885

△ = 70,, 04,, 55.7 sin. △ = 9.973212

A = 36,, 29,, 04.1 cos. ∠ sin. △ = 9.883097

2 m = 142,, 12,, 51.8

m = 71,, 06,, 25.9 cos. m = 9.510275

m — A = 34,, 37,, 21.8 sin. (m — A) = 9.754479

Cos. m sin. (m — A) = 9.264754

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.381657$$

Ref. — 1.18.6

Bar. + 10.7

Ther. + 3.0

1 4.9

sin. ½ p = 9.690828

½ p = 29,, 23,, 15"

p in arc. = 58,, 46,,30

p in time = 3,, 55,, 06 0.0

AR ∗ = 14,, 09,,13.5

Sidereal time = AR ± p = 10,, 14,, 07.5

Time of obs'n by chron'r = 11,, 44,, 08.00

Chron'r of sid'l time = 1,, 30,, 00.5 0.0 — 1 30 00.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 5

Station, Camp 69

Latitude = ∠ = 35 37 09 - 3"

North polar dist. = △ = 74 „ 38 „ 15.0

Name of star = β Leonis (5 obs.)

Obs'd doub. alt. = 89 „ 53 „ 04.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 44 56 32.0

Ref. (Ther. 55.0 bar. 24.4) = 0 46.7

True alt. of ✱ = A = 44 55 45.3

p = hour angle

2 m = ∠ + △ + A

∠ = 35 „ 37 „ 09 cos. ∠ = 9.910040

△ = 74 „ 38 „ 15.0 sin. △ = 9.984198

A = 44 „ 55 „ 45.3 cos. ∠ sin. △ = 9.894238

2 m = 154 „ 11 „ 09.3

m = 77 „ 35 „ 34.6 cos. m = 9.332148

m — A = 32 „ 39 „ 49.3 sin. (m — A) = 9.732158

Cos. m sin. (m — A) = 9.064301

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.170063$$

Ref. — 0 „ 58.2

Bar. + 10.9

Ther. + 0.6

46.7

sin. ½ p = 9.585031

½ p = 22 „ 37 „ 12

p in arc. = 45 „ 14 „ 24

p in time = 3 „ 00 „ 57.6 0.0

AR ✱ = 11 „ 41 „ 51.2

Sidereal time = AR ± p = 8 „ 40 „ 53.6

Time of obs'n by chron'r = 10 „ 10 „ 01.7

Chron'r of sid'l time = 1 „ 29 „ 08.1 0.0 = 1 29 08.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 5

Station, Camp 69

Latitude = ∠ = 35 37 09 − 3″

North polar dist. = △ = 73 46 40.0

Name of star = Aldebaran (50 Δ)

Obs'd doub. alt. = 58 59 22,0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 29 29 41,0

Ref. (Ther. 55.0 bar. 24.4) = 1 22.5

True alt. of ✱ = A = 29 28 18.5

p = hour angle

2 m = ∠ + △ + A

∠ = 35 37 09 cos. ∠ = 9.910040

△ = 73 46 40.0 sin. △ = 9.982355

A = 29 28 18.5 cos. ∠ sin. △ = 9.892395

2 m = 138 52 07.5

m = 69 26 03.7 cos. m = 9.545652

m − A = 39 57 45.2 sin. (m − A) = 9.807728

Cos. m sin. (m − A) = 9.353380

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.460985$$

Ref. − 1.42.7

Bar. + 19.0

Ther. + 1.2

1 22,5

sin. ½ p = 9.730492

½ p = 32 31 24

p in arc. = 65 02 48

p in time = 4 20 11.2 0.0

AR ✱ = 4 27 46.8

Sidereal time = AR ± p = 8 47 58.0

Time of obs'n by chron'r = 10 17 05.

Chron'r of sid'l time = 1 29 07.0 0.0 = 1 29 07.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 9

Station, Camp 71 Pine Forest

Latitude = ∠ = 35 52 16 - 0"

North polar dist. = △ = 74 38 14.7

Name of star = β Leonis (31)

Obs'd doub. alt. = 66 16 40.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 43 8 20.0

Ref. (Ther. 42.0 bar. 23.4) = 0 49.3

True alt. of ∗ = A = 43 7 30.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35 52 16 cos. ∠ = 9.908668

△ = 74 38 14.7 sin. △ = 9.984198

A = 43 07 30.7 cos. ∠ sin. △ = 9.892866

2 m = 153 38 01.4

m = 76 49 00.7 cos. m = 9.358058

m — A = 33 41 30.0 sin. (m — A) = 9.744077

Cos. m sin. (m — A) = 9.102135

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.209269$$

Ref. — 1.02.1 Bar. + 18.8 Ther. — 1.0 49.3

sin. ½ p = 9.604634

½ p = 23 43 37

p in arc. = 47 27 14

p in time = 3 09 48.9 0.0

AR ∗ = 11 41 51.2

Sidereal time = AR ± p = 8 32 02.3

Time of obs'n by chron'r = 10 00 22.8

Chron'r of sid'l time = 1 28 20.5 0.0 — 1 28 20.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 9

Station, Camp 71

Latitude = ∠ = 35 52 16 - 0"

North polar dist. = △ = 44 08 49.4

Name of star = α Aurigæ (30 1)

Obs'd doub. alt. = 99 24 13.3

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 42 6.6

Ref. (Ther. 42.1 bar. 23.4) = 0 39.4

True alt. of ✱ = A = 49 41 27.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35 52 16 cos. ∠ = 9.908666

△ = 44 08 49.4 sin. △ = 9.842922

A = 49 41 27.2 cos. ∠ sin. △ = 9.751588

2 m = 129 42 32.6

m = 64 51 16.3 cos. m = 9.628307

m — A = 15 09 49.1 sin. (m — A) = 9.417598

Cos. m sin. (m — A) = 9.045905

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.294317$$

Ref. — 0 49.4

Ther. + 0.8

0 39.4

sin. ½ p = 9.647158

½ p = 26 20 41

p in arc. = 52 41 22

p in time = 3 30 45.4 0.0

AR ✱ = 5 06 12.6

Sidereal time = AR ± p = 8 36 58.0

Time of obs'n by chron'r = 10 05 20.8

Chron'r of sid'l time = 1 28 22.8 0.0 = 1 28 22.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 10th 11th

Station, Camp 72

Latitude = ∠ = 36 00 30 + 23"

North polar dist. = △ = 74..38..14.5

Name of star = β Leonis (56 1)

Obs'd doub. alt. = 103..58..04.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 51 59 2.0

Ref. (Ther. 50.0 bar. 24.4) = 0 37.0

True alt. of ∗ = A = 51 58 25.0

40^s has been subtracted from time of 1st obs. The five then agree.

p = hour angle

2 m = ∠ + △ + A

∠ =	36..00..30	cos. ∠ =	9.907912
△ =	74..38..14.5	sin. △ =	9.984198
A =	51..58..25.0	cos. ∠ sin. △ =	9.892110
2 m =	162..37..09.5		
m =	81..18..34.7	cos. m =	9.179245
m — A =	29..20..09.7	sin. (m — A) =	9.690132
Cos. m sin. (m — A)		=	8.869377
Sin.^{2} ½ p = cos. m sin. (m — A) / cos. ∠ sin. △		=	8.977267

Ref. −0..45.5

Bar. +8.5

Ther 0.0

−0 37.0

sin. ½ p	=	9.988633
½ p	=	17..56..32
p in arc.	=	35..53..04
p in time	=	2..23..32.3 −0.7
AR ∗	=	11 41 51.2
Sidereal time = AR ± p	=	9..18..18.9
Time of obs'n by chron'r	=	10..45 30.6
Chron'r of sid'l time	=	1 27 11.7 −0.7 = 1 27 11.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 11

Station, Camp 72

Latitude = ∠ = 36 00 30 + 23″

North polar dist. = △ = 44 08 49.6

Name of star = α Lyrae (Vega)

Obs'd doub. alt. = 82 52 14.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 41 26 7.0

Ref. (Ther. 50.0 bar. 24.4) = 0 53.8

True alt. of ✱ = A = 41 25 13.2

p = hour angle

2 m = ∠ + △ + A

∠ = 36 00 30 cos. ∠ = 9.907912

△ = 44 8 49.6 sin. △ = 9.842919

A = 41 25 13.2 cos. ∠ sin. △ = 9.750831

2 m = 121 34 32.8

m = 60 47 16.4 cos. m = 9.688460

m — A = 19 22 03.2 sin. (m — A) = 9.520649

Cos. m sin. (m — A) = 9.209109

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. ∠ sin. △}} = 9.458278$$

Ref. −1.06.1

Bar + 12.8

Thn. 0.0

53.8

sin. ½ p = 9.729189

½ p = 32 24 36

p in arc. = 64 49 12

p in time = 4 19 16.7 +1.3

AR ✱ = 5 04 12.6

Sidereal time = AR ± p = 9 25 29.3

Time of obs'n by chron'r = 10 52 40.6

Chron'r of sid'l time = 1 27 11.3 − 1.3 = 1 27 10.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 14

Station, Camp 73

Latitude = ∠ = 35 55 32 + 26″

North polar dist. = △ = 74.38.14.2

Name of star = β Leonis (56)

Obs'd doub. alt. = 99.58.16.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 59 8.0

Ref. (Ther. 53.0 bar. 24.3) = 0 39.3

True alt. of ∗ = A = 49 58 28.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35.55.32 cos. ∠ = 9.908367

△ = 74.38.14.2 sin. △ = 9.984198

A = 49.58.28.7 cos. ∠ sin. △ = 9.892565

2 m = 160.32.14.9

m = 80.16.07.4 cos. m = 9.227963

m — A = 30.17.38.7 sin. (m — A) = 9.702809

Cos. m sin. (m — A) = 8.930772

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.038207$$

Ref. — 0.48.9

Bar. + 9.3

Ther + 0.3

0 39.3

sin. ½ p = 9.519103

½ p = 19.17.45

p in arc. = 38.35.30

p in time = 2.34.22 −0.7

AR ∗ = 11.41.51.1

Sidereal time = AR ± p = 9.07.29.1

Time of obs'n by chron'r = 10.34.30.8

Chron'r of sid'l time = 1.27.01.7 − 0.7 = 1.27.01.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858. April 14

Station, Camp 73

Latitude = ∠ = 35 55 32 + 26"

North polar dist. = △ = 44 08 50.0

Name of star = α Aurigæ (5 Sh)

Obs'd doub. alt. = 85 54 08

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 57 4.0

Ref. (Ther. 53.0 bar. 24.3) = 0 50.6

True alt. of ✱ = A = 42 56 13.4

p = hour angle

2 m = ∠ + △ + A

∠ = 35 55 32 cos. ∠ = 9.908367

△ = 44 8 50 sin. △ = 9.842924

A = 42 56 13.4 cos. ∠ sin. △ = 9.751291

2 m = 123 00 35.4

m = 61 30 17.7 cos. m = 9.678593

m — A = 18 34 04.3 sin. (m — A) = 9.503018

Cos. m sin. (m — A) = 9.181611

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.430320$$

Ref. − 1 02.4

Bar + 11.4

Ther. + 0.4

50.6

sin. ½ p = 9.715160

½ p = 31 15 52

p in arc. = 62 31 44

p in time = 4 10 06.9 + 1.4

AR ✱ = 5 06 12.5

Sidereal time = AR ± p = 9 16 19.4

Time of obs'n by chron'r = 10 43 31.4

Chron'r of sid'l time = 1 27 12.0 − 1.4 = 1 27 10.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 19

Station, Camp 75

Latitude = ∠ = 35 43 21 + 0"

North polar dist. = △ = 44 08 50.5

Name of star = α Aurigae (54)

Obs'd doub. alt. = 60 56 22.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 30 28 11.0

Ref. (Ther. 55.0 bar. 24.5) = 1 19.5

True alt. of ✱ = A = 30 26 51.5

p = hour angle

2 m = ∠ + △ + A

∠ = 35 43 21 cos. ∠ = 9.909507

△ = 44 08 50.5 sin. △ = 9.842924

A = 30 26 51.5 cos. ∠ sin. △ = 9.752431

2 m = 110 19 03.0

m = 55 09 31.5 cos. m = 9.756869

m — A = 24 42 40.0 sin. (m — A) = 9.627221

Cos. m sin. (m — A) = 9.378090

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.625659$$

Ref. −1.38.6

Bar +18.1

Thm. +1.0

1 19.5

sin. ½ p = 9.812829

½ p = 40 31 56

p in arc. = 81 03 52

p in time = 5 24 15.7 0.0

AR ✱ = 5 06 12.4

Sidereal time = AR ± p = 10 30 28.1

Time of obs'n by chron'r = 11 58 59.8

Chron'r of sid'l time = 1 28 31.7 0.0 = 1 28 31.7

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Commanded by Lieut. J. C. IVES. Topographical Engineers.

India Building, 82 State Street, Boston.

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 19

Station, Camp 75

Latitude = ∠ = 35 43 21 + 0"

North polar dist. = △ = 70 04 53.1

Name of star = Aselus (50)

Obs'd doub. alt. = 82 12 60.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 41 6 25.0

Ref. (Ther. 55.0 bar. 24.5) = 0 54.0

True alt. of ✱ = A = 41 5 31.0

p = hour angle

2 m = ∠ + △ + A

∠ = 35 43 21 cos. ∠ = 9.909478

△ = 70 04 53.1 sin. △ = 9.973210

A = 41 05 31.0 cos. ∠ sin. △ = 9.882688

2 m = 146 53 45.1

m = 73 26 52.5 cos. m = 9.454676

m — A = 32 21 21.5 sin. (m — A) = 9.728496

Cos. m sin. (m — A) = 9.183172

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.300484$$

Ref. " 1.06.8

Bar + 12.1

Ther. + 0.7

54.0

sin. ½ p = 9.650242

½ p = 26 32 50

p in arc. = 53 05 40

p in time = 3 32 22.7 0.0

AR ✱ = 14 09 13.6

Sidereal time = AR ± p = 10 36 50.9

Time of obs'n by chron'r = 12 05 22.5

Chron'r of sid'l time = 1 28 31.6 0.0 = 1 28 31.6

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T. Groom & Co., Stationers,

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 21st

Station, Camp 77

Latitude = ∠ = 35 25 49 + 7"

North polar dist. = △ = 44.08.50.7

Name of star = α Aurigæ (5051)

Obs'd doub. alt. = 61..59.. 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 30 59 35.0

Ref. (Ther. 61.0 bar. 24.4) = 1 16.8

True alt. of ∗ = A = 30 58 18.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35..25..49 cos. ∠ = 9.911059

△ = 44..8..51.7 sin. △ = 9.842928

A = 30..58..18.2 cos. ∠ sin. △ = 9.753987

2 m = 110..32..58.9

m = 55..16..29.4 cos. m = 9.755663

m — A = 24..18..11.2 sin. (m — A) = 9.614437

Cos. m sin. (m — A) = 9.370100

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.616113$$

Ref. ..

− 1.36.7

Bar + 17.8

Ther + 2.1

1 16.8

sin. ½ p = 9.808056

½ p = 39..59..56

p in arc. = 79..59..52

p in time = 5..19..59. 5 +0.4

AR ∗ = 5..06..12.4

Sidereal time = AR ± p = 10..26..11.9

Time of obs'n by chron'r = 11..54..08.0

Chron'r of sid'l time = 1..27..57.1 −0.4 −1.27.567

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 21st

Station, Camp 77

Latitude = ∠ = 35 25 49 +7"

North polar dist. = △ = 70 04 53.6

Name of star = Arcturus (5 obs)

Obs'd doub. alt. = 80 12 14.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 6 7.0

Ref. (Ther. 61.0 bar. 24.4) = 0 548

True alt. of ∗ = A = 40 5 12.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35 25 49 cos. ∠ = 9.911063

△ = 70 4 53.6 sin. △ = 9.973211

A = 40 05 12.2 cos. ∠ sin. △ = 9.884274

2 m = 145 35 54.8

m = 72 47 57.4 cos. m = 9.470884

m — A = 32 42 45.2 sin. (m — A) = 9.732734

Cos. m sin. (m — A) = 9.203618

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.319344$$

Bar. — 1.09.2

Bar + 13.0

Ther. + 1.4

54.8

sin. ½ p = 9.659672

½ p = 27 10 38

p in arc. = 54 21 16

p in time = 3 37 25.1 Q.O

AR ∗ = 14 09 13.6

Sidereal time = AR ± p = 10 31 48.5

Time of obs'n by chron'r = 11 59 47.5

Chron'r of sid'l time = 1 28 59.0 Q.O = 1 27 59.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 23

Station, Camp 98

Latitude = ∠ = 35 19 46 + .0"

North polar dist. = △ = 70 04 53.3

Name of star = Arcturi (52)

Obs'd doub. alt. = 84 18 32.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 9 16.0

Ref. (Ther. 71.0 bar. 25.0) = 0 51.1

True alt. of ✱ = A = 42 8 24.9

p = hour angle

2 m = ∠ + △ + A

∠ = 35 19 46 cos. ∠ = 9.911606

△ = 70 04 53.3 sin. △ = 9.973210

A = 42 08 24.9 cos. ∠ sin. △ = 9.884816

2 m = 147 33 04.2

m = 73 46 32.1 cos. m = 9.446228

m — A = 31 38 07.2 sin. (m — A) = 9.719754

Cos. m sin. (m — A) = 9.165982

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.281166$$

Ref. — 1.04.3

Bar + 10.5

Ther + 2.7

51.1

sin. ½ p = 9.640583

½ p = 25 55 10

p in arc. = 51 50 20

p in time = 3 27 21.3 0.0

AR ✱ = 14 09 13.7

Sidereal time = AR ± p = 10 41 52.4

Time of obs'n by chron'r = 12 09 22.4

Chron'r of sid'l time = 1 27 30.0 0.0 = 1 27 30.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 23

Station, Camp 78

Latitude = ∠ = 35 19 46.+0"

North polar dist. = △ = 68 8 0.1

Name of star = Sabiæ (50 h)

Obs'd doub. alt. = 92.. 18.. 42.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 46 9 21.0

Ref. (Ther. 71.0 bar. 25.0) = 0 44.3

True alt. of ∗ = A = 46 8 36.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35.. 19.. 46 cos. ∠ = 9.911606

△ = 68.. 8.. 1.5" sin. △ = 9.967574

A = 46.. 08.. 36.5" cos. ∠ sin. △ = 9.879180

2 m = 149.. 36 .. 24.0

m = 74.. 48.. 12.0 cos. m = 9.418535

m — A = 28.. 39 .. 35.5" sin. (m — A) = 9.680867

Cos. m sin. (m — A) = 9.099402

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.220222$$

Ref.; −0.56.0 Bar + 9.4 Ther. + 2.3 44.3

sin. ½ p = 9.610111

½ p = 24.. 02.. 49

p in arc. = 48.. 05.. 38

p in time = 3 .. 12 .. 22.6 0.0

AR ∗ = 7 36 36.6

Sidereal time = AR ± p = 10 48.. 58.2

Time of obs'n by chron'r = 12 16.. 27.6

Chron'r of sid'l time = 1.. 27 .. 29.4 0.0 = 1 27 29.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 24

Station, Camp 99 Cedar Creek

Latitude = ∠ = 35 18 47 + 1"

North polar dist. = △ = 79 04 53.2

Name of star = Arcturus (5 Bl.)

Obs'd doub. alt. = 85 38 44.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 49 22.0

Ref. (Ther. 69.0 bar. 24.5) = 0 49.4

True alt. of ∗ = A = 42 48 32.6

p = hour angle

2 m = ∠ + △ + A

∠ = 35 18 47 cos. ∠ = 9.911695

△ = 80 4 53.2 sin. △ = 9.993212

A = 42 48 32.6 cos. ∠ sin. △ = 9.884907

2 m = 148 12 12.8

m = 74 06 06.4 cos. m = 9.437642

m — A = 31 17 33.8 sin. (m — A) = 9.715512

Cos. m sin. (m — A) = 9.153154

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.268247$$

Ref. −1.02.8

Bar + 11.1

Ther. + 2.3

49.4

sin. ½ p = 9.634123

½ p = 25 30 32

p in arc. = 51 01 04

p in time = 3 24 04.3 0.0

AR ∗ = 14 09 13.7

Sidereal time = AR ± p = 10 45 09.4

Time of obs'n by chron'r = 12 12 03.1

Chron'r . of sid'l time = 1 26 53.7 0.0 − 1 26 53.7

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 24

Station, Camp 79

Latitude = ∠ = 35 18 47 + 1"

North polar dist. = △ = 68 8 30.2

Name of star = Saturn (504)

Obs'd doub. alt. = 90..38..06

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 45 19 3.0

Ref. (Ther. 69.0 bar. 24.5) = 0 45.2

True alt. of ✱ = A = 45 18 17.8

p = hour angle

2 m = ∠ + △ + A

∠ = 35..18..47 cos. ∠ = 9.911694

△ = 68..08..30.2 sin. △ = 9.967598

A = 45..18..17.8 cos. ∠ sin. △ = 9.879292

2 m = 148..45..35.0

m = 74..22..47.5 cos. m = 9.430173

m — A = 29..04..29.7 sin. (m — A) = 9.686595

Cos. m sin. (m — A) = 9.116768

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.237476$$

Ref. −0..57.6

Bar +10.3

Ther. +2.1

45.2

sin. ½ p = 9.618738

½ p = 24..33..39

p in arc. = 49..07..18

p in time = 3..16..29.2 0.0

AR ✱ = 7..36..51.2

Sidereal time = AR ± p = 10..53..20.4

Time of obs'n by chron'r = 12..20..12.5

Chron'r of sid'l time = 1..26..52.1 0.0 = 1..26..52.1

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858. April 25

Station, Camp 80 Base of Bill Williams Mt.

Latitude = ∠ = 35 15 35 + 0"

North polar dist. = △ = 44..08..51.8

Name of star = α Aurigæ (5 Obs.)

Obs'd doub. alt. = 62..51..40.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 31 25 50.0

Ref. (Ther. 58.0 bar. 23.7) = 1 13.3

True alt. of ∗ = A = 31 24 36.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35..15..35 cos. ∠ = 9.911980

△ = 44.. 8.. 51.8 sin. △ = 9.842928

A = 31..24..36.7 cos. ∠ sin. △ = 9.754908

2 m = 110..49..03.6

m = 55..24..31.7 cos. m = 9.754131

m — A = 23..59..55.0 sin. (m — A) = 9.609289

Cos. m sin. (m — A) = 9.363420

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.608512$$

Ref. −1.35.3

Bar + 20.2

Ther. + 1.8

1 13.3

sin. ½ p = 9.804256

½ p = 39..34..53

p in arc. = 79..09..46

p in time = 5..16..39.1 0.0

AR ∗ = 5..06..12.4

Sidereal time = AR ± p = 10..22..51.5

Time of obs'n by chron'r = 11..48..54.4

Chron'r of sid'l time = 1..26..02.9 0.0 = 1..26..02.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 26

Station, Camp 80

Latitude = ∠ = 35 15 35 + 0"

North polar dist. = △ = 70 04 53.0

Name of star = Arcturus (5 Obs)

Obs'd doub. alt. = 78 42 14.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 39 21 7.0

Ref. (Ther. 58.0 bar. 23.7) = 0 54.8

True alt. of ∗ = A = 39 20 12.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35 15 35 cos. ∠ = 9.911980

△ = 70 04 53 sin. △ = 9.973210

A = 39 20 12.2 cos. ∠ sin. △ = 9.885190

2 m = 14 40 40.2

m = 72 20 20.1 cos. m = 9.481990

m — A = 33 00 07.9 sin. (m — A) = 9.736135

Cos. m sin. (m — A) = 9.218131

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.332941$$

Ref. −1 11.0

Bar + 15.1

Ther. + 1.1

548

sin. ½ p = 9.666470

½ p = 27 38 32

p in arc. = 55 17 04

p in time = 3 41 08.3 0.0

AR ∗ = 14 09 13.7

Sidereal time = AR ± p = 10 28 05.4

Time of obs'n by chron'r = 11 54 11.1

Chron'r of sid'l time = 1 26 05.7 0.0 = 1 26 05.7

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T. Groom & Co., Stationers, India

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 26

Station, Camp 81

Latitude = ∠ = 35 17 31 - 0"

North polar dist. = △ = 44 08 51.4

Name of star = α Aurigae (Sol.)

Obs'd doub. alt. = 70 12 40.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 35 6 20.0

Ref. (Ther. 67.0 bar. 28.1) = 1 1.4

True alt. of ✱ = A = 35 5 18.6

p = hour angle

2 m = ∠ + △ + A

∠ = 35 17 31 cos. ∠ = 9.911807

△ = 44 08 51.4 sin. △ = 9.842926

A = 35 5 18.6 cos. ∠ sin. △ = 9.754733

2 m = 114 31 41.0

m = 57 15 50.5 cos. m = 9.733013

m — A = 22 10 31.9 sin. (m — A) = 9.576854

Cos. m sin. (m — A) = 9.309867

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.555134$$

Ref. " "

— 1.22.9

Bar + 18.6

Ther. + 2.9

1 1.4

sin. ½ p = 9.777567

½ p = 36 48 44

p in arc. = 73 37 28

p in time = 4 54 29.8 0.0

AR ✱ = 5 06 12.4

Sidereal time = AR ± p = 10 00 42.2

Time of obs'n by chron'r = 11 25 32.5

Chron'r of sid'l time = 1 24 50.3 0.0 = 1 24 50.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 April 26

Station, Camp 81

Latitude = ∠ = 35 17 31 — 0″

North polar dist. = △ = 79 04 52.9

Name of star = Ascurnus (50)

Obs'd doub. alt. = ~~69~~ 42 40.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 34 51 20.0

Ref. (Ther. 67.0 bar. 23.1) = 1 2.1

True alt. of ✱ = A = 34 50 17.9

p = hour angle

2 m = ∠ + △ + A

∠ = 35 17 31 cos. ∠ = 9.911807

△ = 70 4 52.9 sin. △ = 9.973210

A = 34 50 17.9 cos. ∠ sin. △ = 9885017

2 m = 140 12 41.8

m = 70 06 20.9 cos. m = 9.531842

m — A = 35 16 03.0 sin. (m — A) = 9.761473

Cos. m sin. (m — A) = 9.293315

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.408298$$

Ref. — 1 23.6

Bar + 18.6

Ther. + 2.9

1 2.1

sin. ½ p = 9.704149

½ p = 30 23 52

p in arc. = 60 47 44

p in time = 4 03 10.9 0.0

AR ✱ = 14 09 13.7

Sidereal time = AR ± p = 10 06 02.8

Time of obs'n by chron'r = 11 30 55.3

Chron'r of sid'l time = 1 24 52.5 1 24 52.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 2

Station, Camp "85"

Latitude = ∠ = 35 17 44 + 7"

North polar dist. = △ = 70 04 51.9

Name of star = Aschuma (5 dh)

Obs'd doub. alt. = * 89 56 36.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 44 58 18.0

Ref. (Ther. 45.0 bar. 23.0) = 0 45.2

True alt. of * = A = 44 57 32.8

p = hour angle

2 m = ∠ + △ + A

∠ = 35 17 44 cos. ∠ = 9.911787

△ = 70 4 51.9 sin. △ = 9.973209

A = 44 57 32.8 cos. ∠ sin. △ = 9.884996

2 m = 150 20 08.7

m = 75 10 04.3 cos. m = 9.408222

m − A = 30 12 31.5 sin. (m − A) = 9.701698

Cos. m sin. (m − A) = 9.109920

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.224924$$

Ref. − 0.58.2

Bar + 13.6

Ther. − 0.6

45.2

sin. ½ p = 9.612462

½ p = 24 11 09

p in arc. = 48 22 18

p in time = 3 13 29.2 0.0

AR * = 14 09 13.7

Sidereal time = AR ± p = 10 55 44.5

Time of obs'n by chron'r = 12 16 35.2

Chron'r of sid'l time = 1 20 50.7 0.0 − 1 20 50.7

The 3rd Obs. differs from all the rest & has been rejected - The star was in the altitude ½(89° 56' 36") at 12h 16m 35s.2

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India Building, 82 State Street, Boston.

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 2

Station, Camp 85

Latitude = ∠ = 35 17 44 + 7."5

North polar dist. = △ = 68 12 38.1

Name of star = Saturn (East)

Obs'd doub. alt. = 87..08..52.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 43 34 26.0

Ref. (Ther. 45.0 bar. 23.0) = 0 47.9

True alt. of ✱ = A = 43 33 38.1

p = hour angle

2 m = ∠ + △ + A

for

∠ = 35..17..44 cos. ∠ = 9.911787

△ = 68..12..38.1 sin. △ = 9.967824

A = 43..33..38.1 cos. ∠ sin. △ = 9.879611

2 m = 147..04..20.2

m = 73..32..10.1 cos. m = 9.452417

m — A = 29..58..32.0 sin. (m — A) = 9.698649

Cos. m sin. (m — A) = 9.151066

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.271455$$

Ref. "

— 1..01.4

Bar + 14.1

Ther — 0.6

47.9

sin. ½ p = 9.635727

½ p = 25..36..36

p in arc. = 51..13..12

p in time = 3..24..52.8

AR ✱ = 7 39 00.3

Sidereal time = AR ± p = 11 03..53.1

Time of obs'n by chron'r = 12..14..42.0

Chron'r of sid'l time = 1..20..48.9 G.C. — 1..20..48.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 8

Station, Camp 86 Mogui's Desert

Latitude = ∠ = 35 27 07 + 0"

North polar dist. = △ = 70 04 51.8

Name of star = Arcturus (5 Dh)

Obs'd doub. alt. = 73 44 02

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 36 52 1.0

Ref. (Ther. 47.0 bar. 23.5) = 1 1.3

True alt. of ✱ = A = 36 50 59.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35 27 07 cos. ∠ = 9.910946

△ = 70 4 51.8 sin. △ = 9.973209

A = 36 50 59.7 cos. ∠ sin. △ = 9.884155

2 m = 142 22 58.5

m = 71 11 29.2 cos. m = 9.508404

m — A = 34 20 29.5 sin. (m — A) = 9.751374

Cos. m sin. (m — A) = 9.259778

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.375623$$

Ref. 1 4

− 1 17.7

Bar + 16.9

Ther. − 0.5

1 1.3

sin. ½ p = 9.687811

½ p = 29 09 52

p in arc. = 58 19 44

p in time = 3 53 18.9 0.0

AR ✱ = 14 09 13.7

Sidereal time = AR ± p = 10 15 55.0

Time of obs'n by chron'r = 11 35 57.8

Chron'r of sid'l time = 1 20 02.8 0.0 = 1 20 02.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 3

Station, Camp 86

Latitude = ∠ = 35 27 07 +0"

North polar dist. = △ = 44°08'52.3

Name of star = α Aurigæ (5 Hd)

Obs'd doub. alt. = 62°30'12.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 31 15 6.0

Ref. (Ther. 47.0 bar. 23.5) = 1 15.6

True alt. of ∗ = A = 31 13 50.4

p = hour angle

2 m = ∠ + △ + A

∠ = 35°27'07 cos. ∠ = 9.910948

△ = 44°08'52.3 sin. △ = 9.842528

A = 31°13'50.4 cos. ∠ sin. △ = 9.753876

2 m = 110°49'49.7

m = 55°24'54.8 cos. m = 9.754061

m − A = 24°11'04.4 sin. (m − A) = 9.612443

Cos. m sin. (m − A) = 9.366504

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos. m \sin. (m - A)}{\cos. \angle \sin. \triangle} = 9.612628$$

Ref. "
1'35.8
Bar + 20.8
Ther. − 0.6
1 15.6

sin. ½ p = 9.806314

½ p = 39°48'24

p in arc. = 79°36'48

p in time = 5h 18m 27.2 0.0

AR ∗ = 5h 06m 12.3

Sidereal time = AR ± p = 10 24m 39.5

Time of obs'n by chron'r = 11h 44m 41.9

Chron'r of sid'l time = 1 20 02.4 0.0 = 1 20 02.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 5-15

Station, Camp 88

Latitude = ∠ = 35° 04 09 +0"

North polar dist. = △ = 70°,04,51.6

Name of star = Aschmo (5 Ori.)

Obs'd doub. alt. = 77°. 11°. 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 38 35 35.0

Ref. (Ther. 48.0 bar. 24.2) = 0 59. 2

True alt. of ∗ = A = 38 34 35.8

p = hour angle

2 m = ∠ + △ + A

∠ = 35°. 04°.09 cos. ∠ = 9. 912997

△ = 70°. 04°.51.6 sin. △ = 9. 973 210

A = 38°. 34°.35.8 cos. ∠ sin. △ = 9.886207

2 m = 143°.43°.36.4

m = 71°. 51°.48.2 cos. m = 9.493158

m — A = 33°.17°.12.4 sin. (m — A) = 9.739436

Cos. m sin. (m — A) = 9.232594

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.346387$$

Ref. "

−1.12.8

Bar + 13.9

Thn. − 0.3

59.2

sin. ½ p = 9.673193

½ p = 28°.06°.41

p in arc. = 56°.13°.22

p in time = 3°.44°.53.5 0.0

AR ∗ = 14°.09°.13.7

Sidereal time = AR ± p = 10°.24°.20.2

Time of obs'n by chron'r = 11°.44°.25.2

Chron'r of sid'l time = 1°.20°.05.0 0.0 = 1.20.05.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 5

Station, Camp 88

Latitude = ∠ = 35 04 09 + 0"

North polar dist. = △ = 68 14 53.8

Name of star = Saturn (East)

Obs'd doub. alt. = 101.. 18.. 32.5

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 50 39 16.2

Ref. (Ther. 48.0 bar. 24.2) = 0 37.9

True alt. of ∗ = A = 50 38 38.3

p = hour angle

2 m = ∠ + △ + A

∠ = 35.. 04.. 09 cos. ∠ = 9.912997

△ = 68.. 14.. 53.8 sin. △ = 9.967922

A = 50.. 38.. 38.3 cos. ∠ sin. △ = 9.880919

2 m = 153.. 57.. 41.1

m = 76.. 58.. 50.5 cos. m = 9.352726

m — A = 26.. 20.. 12.2 sin. (m — A) = 9.647036

Cos. m sin. (m — A) = 8.999761

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.118842$$

Ref. "

— 0.. 48.0

Bar. + 10.3

Ther. — 0.2

37.9

sin. ½ p = 9.559428

½ p = 21.. 15.. 31

p in arc. = 42.. 31.. 02

p in time = 2.. 50.. 04.1 0.0

AR ∗ = 7.. 39 54.3

Sidereal time = AR ± p = 10 29.. 58.4

Time of obs'n by chron'r = 11.. 49.. 58.7

Chron'r of sid'l time = 1 20.. 00.8 0.0 = 1 20 00.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 9

Station, Camp 91

Latitude = ∠ = 35 28 48 + 0"

North polar dist. = △ = 70 04 50.8

Name of star = Arcturus (5 d 1)

Obs'd doub. alt. = 81 11 36.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 35 48.0

Ref. (Ther. 58.0 bar. 24.5) = 0 54.4

True alt. of ∗ = A = 40 34 53.6

p = hour angle

2 m = ∠ + △ + A

∠ = 35 28 48 cos. ∠ = 9.910795

△ = 70 04 50.8 sin. △ = 9.973209

A = 40 34 53.6 cos. ∠ sin. △ = 9.884004

2 m = 146 07 32.4

m = 73 03 46.2 cos. m = 9.464389

m — A = 32 28 52.6 sin. (m — A) = 9.729992

Cos. m sin. (m — A) = 9.194381

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.310377$$

Ref. " "

− 1 08.0 sin. ½ p = 9.655188

Bar + 12.6 ½ p = 26 52 32

Ther. + 1.0 p in arc. = 53 45 04

54.4 p in time = 3 35 00.3 0.0

AR ∗ = 14 09 13.7

Sidereal time = AR ± p = 10 34 13.4

Time of obs'n by chron'r = 11 53 08.7

Chron'r of sid'l time = 1 18 55.3 0.0 = 1 18 55.3

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 9

Station, Camp 91

Latitude = ∠ = 35 28 48 + 0'

North polar dist. = △ = 68 17 „ 43.9

Name of star = Saturn (5561)

Obs'd doub. alt. = 97„ 04„ 50.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 48 32 25.0

Ref. (Ther. 38.0 bar. 24.5) = 0 41.3

True alt. of ✱ = A = 48 31 43.7

p = hour angle

2 m = ∠ + △ + A

∠ = 35„ 28„ 48 cos. ∠ = 9.910796

△ = 68„ 17„ 43.9 sin. △ = 9.968065

A = 48„ 31„ 43.7 cos. ∠ sin. △ = 9.878861

2 m = 152„ 18„ 15.6

m = 76„ 09„ 07.8 cos. m = 9.379021

m — A = 27„ 37„ 24.1 sin. (m — A) = 9.666197

Cos. m sin. (m — A) = 9.045218

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\cos. m \sin. (m - A)}{\cos. \angle \sin. \triangle} = 9.166357$$

Refr. „

— 0„51.4

Bar. + 9.3

Ther. + 0.8

41.3

sin. ½ p = 9.583178

½ p = 22„ 31„ 06

p in arc. = 45„ 02„ 12

p in time = 3„ 00„ 08.8 0.0

AR ✱ = 7 41„ 11.9

Sidereal time = AR ± p = 10„ 41„ 20.7

Time of obs'n by chron'r = 12„ 00„ 12.1

Chron'r of sid'l time = 1„ 18„ 51.4 0.0 = 1 18 51.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 10

Station, Camp 92

Latitude = ∠ = 35 41 34 + 0"

North polar dist. = △ = 70 04 50.5

Name of star = Arcturus (56)

Obs'd doub. alt. = 83 34 42.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 41 47 21.0

Ref. (Ther. 62.0 bar. 24.6) = 0 31.6

True alt. of ✱ = A = 41 46 29.4

p = hour angle

2 m = ∠ + △ + A

∠ = 35 41 34 cos. ∠ = 9.909639

△ = 70 4 50.5 sin. △ = 9.973208

A = 41 46 29.4 cos. ∠ sin. △ = 9.882847

2 m = 147 32 53.9

m = 73 46 26.9 cos. m = 9.446264

m — A = 31 59 57.5 sin. (m — A) = 9.724200

Cos. m sin. (m — A) = 9.170464

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.287617$$

Ref. " "

− 1.05.7

Bar + 11.9

Ther. + 1.6

51.6

sin. ½ p = 9.643808

½ p = 26 07 37

p in arc. = 52 15 14

p in time = 3 29 00.9 0.0

AR ✱ = 14 09 13.7

Sidereal time = AR ± p = 10 40 12.8

Time of obs'n by chron'r = 11 59 04.8

Chron'r of sid'l time = 1 18 52.0 0.0 = 1 18 52.0

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ASTRONOMICAL COMPUTATIONS — TIME.

Date, 1858 May 10

Station, Camp 92

Latitude = ∠ = 35 41 34 + 0"

North polar dist. = △ = 68 18 29.6

Name of star = Saturn (East)

Obs'd doub. alt. = 94° 38' 12"

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 19 6.0

Ref. (Ther. 62.0 bar. 24.6) = 0 42.8

True alt. of ✱ = A = 47 18 23.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35° 41' 34" cos. ∠ = 9.909640

△ = 68° 18' 29.6 sin. △ = 9.968103

A = 47° 18' 23.2 cos. ∠ sin. △ = 9.877743

2 m = 151° 18' 26.8

m = 75° 39' 13.4 cos. m = 9.394073

m — A = 28° 20' 50.2 sin. (m — A) = 9.676523

Cos. m sin. (m — A) = 9.070596

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.192853$$

Ref. − 0.53.7

Bar + 9.7

Ther. + 1.2

42.8

sin. ½ p = 9.596426

½ p = 23° 15' 23"

p in arc. = 46° 30' 46"

p in time = 3h 06m 03s 0.0

AR ✱ = 7 41 32.3

Sidereal time = AR ± p = 10h 47m 35.3

Time of obs'n by chron'r = 12h 06m 24.0

Chron'r of sid'l time = 1h 18m 48.7 010 = 1 18 48.7

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 11

Station, Camp 93

Latitude = ∠ = 35 47 24 + 3″

North polar dist. = △ = 79 04 50.4

Name of star = Eschwins (264)

Obs'd doub. alt. = 86 25 10.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 43 12 35.0

Ref. (Ther. 64° bar. 24.4) = 0 48.8

True alt. of ∗ = A = 43 11 46.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35 47 24 cos. ∠ = 9.909110

△ = 70 4 50.4 sin. △ = 9.973208

A = 43 11 46.2 cos. ∠ sin. △ = 9.882318

2 m = 149 04 00.6

m = 74 37 00.3 cos. m = 9.423697

m − A = 31 25 14.1 sin. (m − A) = 9.717101

Cos. m sin. (m − A) = 9.140798

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.258480$$

Ref. −1.02.0
Bar. +11.2
Ther. +2.0
48.8

sin. ½ p = 9.629240

½ p = 25 12 12

p in arc. = 50 24 24

p in time = 3 21 37.6

AR ∗ = 14 09 13.7

Sidereal time = AR ± p = 10 47 36.1

Time of obs'n by chron'r = 12 06 19.5

Chron'r of sid'l time = 1 18 43.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 11

Station, Camp 93

Latitude = ∠ = 35 47 24, + 3"

North polar dist. = △ = 68 19 14.9

Name of star = Saturn (2 Obs)

Obs'd doub. alt. = 95° 14' 45".0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 37 22.5

Ref. (Ther. 64.0 bar. 24.4) = 0 42.0

True alt. of ✱ = A = 47 36 40.5

These observations do not accord with each other and the object does not appear to have been Saturn.

p = hour angle

2 m = ∠ + △ + A

∠ = 35° 47' 24" cos. ∠ = 9.909107

△ = 68° 19' 14.9 sin. △ = 9.968140

A = 47° 36' 40.5" cos. ∠ sin. △ = 9.877247

2 m = 151° 43' 19".4

m = 75° 51' 39".7 cos. m = 9.387884

m — A = 28° 14' 59".2 sin. (m — A) = 9.675150

Cos. m sin. (m — A) = 9.063034

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.185787$$

Ref. −0' 53".2

Bar + 9.8

Ther. + 1.4

42.0

sin. ½ p = 9.592893

½ p = 23° 03' 25"

p in arc. = 46° 06' 50"

p in time = 3h 04m 27s.3

AR ✱ = 7 41 52.9

Sidereal time = AR ± p = 10 46' 20".1

Time of obs'n by chron'r = 12h 10m 32s.0

Chron'r of sid'l time = 1 24 11.9

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 15

Station, Camp 97 N. Oraybe Gardens

Latitude = ∠ = 35 55 39 +0"

North polar dist. = △ = 70 04 49.6

Name of star = Arcturus (5 Obs)

Obs'd doub. alt. = 93 44 04

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 46 52 2.0

Ref. (Ther. 60.0 bar. 24.0) = 0 42.4

True alt. of ∗ = A = 46 51 19.6

p = hour angle

2 m = ∠ + △ + A

∠ =	35 55 39	cos. ∠ =	9.908357
△ =	70 4 49.6	sin. △ =	9.973208
A =	46 51 19.6	cos. ∠ sin. △ =	9.881565
2 m =	152 51 47.2		
m =	76 25 53.6	cos. m =	9.370342
m − A =	29 34 34.0	sin. (m − A) =	9.693356

Cos. m sin. (m − A) = 9.063698

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.182138$$

Ref. −0 54.4
Bar. +10.9
Ther. +1.1
42.4

sin. ½ p	=	9.591066
½ p	=	22 57 16
p in arc.	=	45 54 32
p in time	=	3 03 38.1 a.o
AR ∗	=	14 09 13.7
Sidereal time = AR ± p	=	11 05 35.6
Time of obs'n by chron'r	=	12 25 18.0
Chron'r of sid'l time	=	1 19 42.4 a.c = 1 19 42.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 15

Station, Camp 97

Latitude = ∠ = 35 55 39 + 0"

North polar dist. = △ = 68 22 28.6

Name of star = Saturn (East)

Obs'd doub. alt. = 85.. 11.. 28.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 42 35 42.0

Ref. (Ther. 60.0 bar. 24.0) = 0 50.0

True alt. of ✱ = A = 42 34 54.0

p = hour angle

2 m = ∠ + △ + A

∠ = 35.. 55.. 39 cos. ∠ = 9.908356

△ = 68.. 22.. 28.6 sin. △ = 9.968300

A = 42.. 34.. 54.0 cos. ∠ sin. △ = 9.876656

2 m = 146.. 53.. 01.6

m = 73.. 26.. 30.8 cos. m = 9.454825

m — A = 30.. 51.. 36.8 sin. (m — A) = 9.710069

Cos. m sin. (m — A) = 9.164894

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.288238$$

Ref. − 1.. 03.4

Bar + 12.1

Ther. + 13

50.9

sin. ½ p = 9.644119

½ p = 26.. 08.. 49

p in arc. = 52.. 17.. 38

p in time = 3.. 29.. 10.5 0.0

AR ✱ = 7 .. 43 18.6

Sidereal time = AR ± p = 11.. 12.. 29.1

Time of obs'n by chron'r = 12.. 32.. 08.3

Chron'r of sid'l time = 1.. 19.. 39.2 0.0 = 1 19 39.2

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 17

Station, Camp 98 Near Te weh

Latitude = ∠ = 35 50 27 + 0"

North polar dist. = △ = 70 04 49.4

Name of star = Arcturus (50 Gr)

Obs'd doub. alt. = 95 32 06.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 46 3.0

Ref. (Ther. 56.0 bar. 24.0) = 0 41.8

True alt. of ✱ = A = 47 45 11.2

p = hour angle

2 m = ∠ + △ + A

∠ = 35 50 27 cos. ∠ = 9.908832

△ = 70 4 49.4 sin. △ = 9.973207

A = 47 46 11.2 cos. ∠ sin. △ = 9.882039

2 m = 153 40 27.6

m = 76 50 13.8 cos. m = 9.357401

m — A = 29 05 02.6 sin. (m — A) = 9.686717

Cos. m sin. (m — A) = 9.044118

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.162079$$

Ref. " 0 53.0

Bar + 10.6

Ther. + 0.6

41.8

sin. ½ p = 9.581039

½ p = 22 24 07

p in arc. = 44 48 14

p in time = 2 59 12.9

AR ✱ = 14 09 13.7

Sidereal time = AR ± p = 11 10 00.8

Time of obs'n by chron'r = 12 28 44.8

Chron'r of sid'l time = 1 18 44.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 17.

Station, Camp 98

Latitude = ∠ = 35 50 27 + 0"

North polar dist. = △ = 68 24 11.1

Name of star = Saturn (5 obs)

Obs'd doub. alt. = 82 52 30.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 41 26 15.0

Ref. (Ther. 56.0 bar. 24.0) = 0 52.1

True alt. of ∗ = A = 41 25 22.9

p = hour angle

2 m = ∠ + △ + A

∠ = 35 50 27 cos. ∠ = 9.908832

△ = 68 24 11.1 sin. △ = 9.968388

A = 41 25 22.9 cos. ∠ sin. △ = 9.877220

2 m = 145 40 01.0

m = 72 50 00.5 cos. m = 9.470046

m − A = 31 24 37.6 sin. (m − A) = 9.716943

Cos. m sin. (m − A) = 9.186989

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 9.309769$$

Ref. − 1 06.1

Bar + 13.2

Ther. + 0.8

52.1

sin. ½ p = 9.654884

½ p = 26 51 19

p in arc. = 53 42 38

p in time = 3 34 50.5 0.0

AR ∗ = 7 44 03.4

Sidereal time = AR ± p = 11 18 53.9

Time of obs'n by chron'r = 12 37 35 9

Chron'r of sid'l time = 1 18 42.0 06 = 1 18 42.0

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T. Groom & Co., Stationers,

ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858. May 18

Station, Camp 99

Latitude = ∠ = 35 47 14 + 2"

North polar dist. = △ = 70 04 49.3

Name of star = Arcturus (5 obs)

Obs'd doub. alt. = 98 05 18.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 2 39.0

Ref. (Ther. 56.0 bar. 24.0) = 0 39.7

True alt. of ∗ = A = 49 1 59.3

p = hour angle

2 m = ∠ + △ + A

∠ = 35 47 14 cos. ∠ = 9.909125

△ = 70 4 49.3 sin. △ = 9.973207

A = 49 01 59.3 cos. ∠ sin. △ = 9.882332

2 m = 154 54 02.6

m = 77 27 01.3 cos. m = 9.337034

m — A = 28 25 02.0 sin. (m — A) = 9.677506

Cos. m sin. (m — A) = 9.014540

Sin.² ½ p = $\frac{\text{cos. m sin. (m — A)}}{\text{cos. ∠ sin. △}}$ = 9.132208

Ref. "

— 0 50.5

Bar. + 10.2

Ther. + 0.6

0 39.7

sin. ½ p = 9.566104

½ p = 21 36 21

p in arc. = 43 12 42

p in time = 2 52 50.8

AR ∗ = 14 09 13.7

Sidereal time = AR ± p = 11 16 22.9

Time of obs'n by chron'r = 12 34 16.4

Chron'r of sid'l time = 1 17 53.5

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 18

Station, Camp 99

Latitude = ∠ = 35 47 14 + 2".

North polar dist. = △ = 68 25 3.0

Name of star = Saturn (East)

Obs'd doub. alt. = 81 05 12.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 40 32 36.0

Ref. (Ther. 56.0 bar. 24.0) = 0 53.6

True alt. of ✱ = A = 40 31 42.4

p = hour angle

2 m = ∠ + △ + A

∠ = 35 47 14 cos. ∠ = 9.909125

△ = 68 25 3.0 sin. △ = 9.968432

A = 40 31 42.4 cos. ∠ sin. △ = 9.877557

2 m = 144 43 59.4

m = 72 21 59.7 cos. m = 9.481334

m — A = 31 50 17.3 sin. (m — A) = 9.722239

Cos. m sin. (m — A) = 9.203573

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.326016$$

Ref. 1 08.2

Bar. + 18.8

Thr. + 0.8

58.6

sin. ½ p = 9.663008

½ p = 27 24 15

p in arc. = 54 48 30

p in time = 3 39 14 0.0

AR ✱. = 7 44 26.0

Sidereal time = AR ± p = 11 23 40.0

Time of obs'n by chron'r = 12 41 31.2

Chron'r. of sid'l time = 1 17 51.2 0.0 = 1 17 51.2

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 19

Station, Camp 100

Latitude = ∠ = 35 44 45 +10"

North polar dist. = △ = 70 04 49.1

Name of star = Acturus (54)

Obs'd doub. alt. = 99 52 12

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 49 56 6.0

Ref. (Ther. 59.0 bar. 23.9) = 0 38.2

True alt. of ✱ = A = 49 55 27.8

p = hour angle

2 m = ∠ + △ + A

∠ =	35 44 45	cos. ∠ =	9.909351
△ =	70 4 49.1	sin. △ =	9.973207
A =	49 55 27.8	cos. ∠ sin. △ =	9.882558
2 m =	155 45 01.9		
m =	77 52 30.9	cos. m =	9.322303
m — A =	27 57 03.1	sin. (m — A) =	9.670908

Cos. m sin. (m — A) = 8.993211

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.110653$$

Ref. 0.48.9

Bar + 9.9

Ther + 0.8

38.2

sin. ½ p = 9.555326

½ p = 21 03 02

p in arc. = 42 06 04

p in time = 2 48 24.3 — 0.1

AR ✱ = 19 09 13.7

Sidereal time = AR ± p = 11 20 49.4

Time of obs'n by chron'r = 12 37 12.3

Chron'r of sid'l time = [illegible]

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ASTRONOMICAL COMPUTATIONS. — TIME.

Date, 1858 May 19

Station, Camp 100

Latitude = ∠ = 35 44 45 + 10"

North polar dist. = △ = 68 25 56.0

Name of star = Saturn (East)

Obs'd doub. alt. = 79 48 36.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 39 51 48.0

Ref. (Ther. 59.0 bar. 23.9) = 0 54.7

True alt. of ✱ = A = 39 50 53.3

p = hour angle

2 m = ∠ + △ + A

∠ = 35 44 45 cos. ∠ = 9.909351

△ = 68 25 56.0 sin. △ = 9.968475

A = 39 50 53.3 cos. ∠ sin. △ = 9.877826

2 m = 144 01 34.3

m = 72 00 47.1 cos. m = 9.489678

m — A = 32 09 53.8 sin. (m — A) = 9.726204

Cos. m sin. (m — A) = 9.215882

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.338056$$

Ref. 1.0 9.8

Bar. + 14.0

Ther. + 1.1

54.7

sin. ½ p = 9.669028

½ p = 27 49 11

p in arc. = 55 38 22

p in time = 3 42 33.5 0.0

AR ✱ = 7 44 49.1

Sidereal time = AR ± p = 11 27 22.6

Time of obs'n by chron'r = 12 43 40.2

Chron'r of sid'l time = 1 16 17.6 0.0 = 1 16 17.6

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 20

Station, Camp 101

Latitude = ∠ = 35 42 07 + 15"

North polar dist. = △ = 70 04 49.0

Name of star = Arcturus (5 Dh)

Obs'd doub. alt. = 103 51 24.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 51 55 42.0

Ref. (Ther. 53.0 bar. 23.9) = 0 36.0

True alt. of ∗ = A = 51 55 6.0

p = hour angle

2 m = ∠ + △ + A

∠ = 35 42 07 cos. ∠ = 9.909592

△ = 70 4 49 sin. △ = 9.973207

A = 51 55 6.0 cos. ∠ sin. △ = 9.882799

2 m = 157 42 02.0

m = 78 51 01.0 cos. m = 9.286398

m — A = 26 55 55.0 sin. (m — A) = 9.656032

Cos. m sin. (m — A) = 8.942430

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m — A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.059631$$

Ref. — 0.45.6

Bar. + 9.3

Ther. + 0.3

36.0

sin. ½ p = 9.529815

½ p = 19 47 52

p in arc. = 39 35 44

p in time = 2 38 22.9 — 0.1

AR ∗ = 14 09 13.7

Sidereal time = AR ± p = 11 30 50.8

Time of obs'n by chron'r = 12 46 03.7

Chron'r of sid'l time = 1 15 12.9 — 0.1 = 1 15 13.8

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 20

Station, Camp 101

Latitude = ∠ = 35 42 07 + 15"

North polar dist. = △ = 68 26 51.6

Name of star = Saturn (3 obs)

Obs'd doub. alt. = 75° 52. 22.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 37 56 11.0

Ref. (Ther. 53.0 bar. 23.9) = 0 59.0

True alt. of ∗ = A = 37 55 12.0

p = hour angle

2 m = ∠ + △ + A

∠ = 35°.42.07 cos. ∠ = 9.909592

△ = 68°.26.51.6 sin. △ = 9.968521

A = 37°.55.12.0 cos. ∠ sin. △ = 9.878113

2 m = 142°.04.10.6

m = 71°.02.05.3 cos. m = 9.511877

m − A = 33°.06.53.3 sin. (m − A) = 9.737444

Cos. m sin. (m − A) = 9.249321

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. } \angle \text{ sin. } \triangle} = 9.371208$$

Ref. " "
− 1.14.6
Bar. + 15.2
Ther. + 0.4
59.0

sin. ½ p = 9.685604

½ p = 29°.00.09

p in arc. = 5° 8.00.18

p in time = 3.52.01.2 0.0

AR ∗ = 7.45 12.6

Sidereal time = AR ± p = 11.37.13.8

Time of obs'n by chron'r = 12.52.22.8

Chron'r of sid'l time = 1.15.9.0 0.0 − 1.15 9.0

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858. May 23

Station, Camp 103

Latitude = ∠ = 35 41 50 47"

North polar dist. = △ = 72 48 31.9

Name of star = ε Coronae Borealis (Sh.)

Obs'd doub. alt. = 94 46 28.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 47 23 14.0

Ref. (Ther. 45.0 bar. 24.0) = 0 43.4

True alt. of * = A = 47 22 30.6

p = hour angle

2 m = ∠ + △ + A

∠ =	35 41 50	cos. ∠ =	9.909616
△ =	72 48 31.9	sin. △ =	9.980151
A =	47 22 30.6	cos. ∠ sin. △ =	9.889767
2 m =	155 52 52.5		
m =	77 56 26.2	cos. m =	9.319993
m — A =	30 33 55.6	sin. (m — A) =	9.706308
Cos. m sin. (m — A)		=	9.026301
Sin.² ½ p = cos. m sin. (m — A) / cos. ∠ sin. △		=	9.136534
	sin. ½ p	=	9.568267
	½ p	=	21 43 08
	p in arc.	=	43 26 16
	p in time	=	2 53 45.1
	AR *	=	15 28 43.4
Sidereal time = AR ± p		=	12 34 58.3
Time of obs'n by chron'r		=	13 24 10.8
Chron'r	of sid'l time	=	0 49 12.5

Ref. − 0.53.7
Bar + 10.8
Ther − 0.5
43.4

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date, 1858 May 23

Station, Camp 103

Latitude = ∠ = 35 41 50 + 7"

North polar dist. = △ = 77 20 28.8

Name of star = α Leonis (50b1)

Obs'd doub. alt. = 102 57 26.0

Index error =

Eccentricity =

Doub. alt. cor. =

Altitude = 51 28 43.0

Ref. (Ther. 45.0 bar. 24.0) = 0 37.4

True alt. of ∗ = A = 51 28 5.6

p = hour angle

2 m = ∠ + △ + A

∠ = 35 41 50 cos. ∠ = 9.909616

△ = 77 20 28.8 sin. △ = 9.989313

A = 61 28 05.6 cos. ∠ sin. △ = 9.898929

2 m = 164 30 24.4

m = 82 15 12.2 cos. m = 9.129648

m − A = 30 47 06.6 sin. (m − A) = 9.709116

Cos. m sin. (m − A) = 8.838764

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. (m − A)}}{\text{cos. ∠ sin. △}} = 8.939855$$

Ref. − 0 46.3

Bar + 9.3

Ther. − 0.4

37.4

sin. ½ p = 9.469928

½ p = 17 09 43

p in arc. = 34 19 26

p in time = 2 17 17.7 + 0.3

AR ∗ = 10 00 49.8

Sidereal time = AR ± p = 12 18 07.5

Time of obs'n by chron'r = 13 31 30.1

Chron'r of sid'l time = 1 13 22.6 + 0.3 = 1 13 22.9

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Date,

Station,

Latitude $= \angle =$

North polar dist. $= \triangle =$

Name of star $=$

Obs'd doub. alt. $=$

Index error $=$

Eccentricity $=$

Doub. alt. cor. $=$

Altitude $=$

Ref. (Ther. bar. $) =$

True alt. of $* = A =$

p = hour angle

$2\,m = \angle + \triangle + A$

$\angle =$ cos. $\angle =$

$\triangle =$ sin. $\triangle =$

$A =$ cos. $\angle$ sin. $\triangle =$

$2\,m =$

$m =$ cos. $m =$

$m - A =$ sin. $(m - A) =$

Cos. m sin. $(m - A) =$

$$\text{Sin.}^2 \tfrac{1}{2} p = \frac{\text{cos. m sin. } (m - A)}{\text{cos. } \angle \text{ sin. } \triangle} =$$

sin. $\frac{1}{2}$ p $=$

$\frac{1}{2}$ p $=$

p in arc. $=$

p in time $=$

AR $* =$

Sidereal time $=$ AR $\pm$ p $=$

Time of obs'n by chron'r $=$

Chron'r of sid'l time $=$

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ASTRONOMICAL COMPUTATIONS.—TIME.

Date,

Station,

Latitude $= \angle =$

North polar dist. $= \triangle =$

Name of star $=$ _____

Obs'd doub. alt. $=$

Index error $=$

Eccentricity $=$ _____

Doub. alt. cor. $=$

Altitude $=$

Ref. (Ther. bar. $) =$ _____

True alt. of $* = A =$

p = hour angle

$2\,m = \angle + \triangle + A$

$\angle =$ $\qquad$ cos. $\angle =$

$\triangle =$ $\qquad$ sin. $\triangle =$ _____

$A =$ $\qquad$ cos. $\angle$ sin. $\triangle =$

_____

$2\,m =$

$m =$ $\qquad$ cos. $m =$

$m - A =$ $\qquad$ sin. $(m - A) =$

Cos. m sin. $(m - A)$ $\qquad$ $=$

$$\text{Sin.}^2 \tfrac{1}{2}\,p = \frac{\text{cos. m sin. } (m - A)}{\text{cos. } \angle \text{ sin. } \triangle} \qquad =$$

sin. $\frac{1}{2}$ p $\qquad$ $=$

$\frac{1}{2}$ p $\qquad$ $=$

p in arc. $\qquad$ $=$

p in time $\qquad$ $=$

AR $* \qquad$ $=$

Sidereal time $=$ AR $\pm$ p $\qquad$ $=$

Time of obs'n by chron'r $\qquad$ $=$

Chron'r of sid'l time $\qquad$ $=$

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