Meridian Altitude (Noon) Sun Sight

DR Latitude: **Chosen Latitude:** **Log:** **Course:**

Time of meridian passage @ Greenwich (Mer Pass) MONTH DAY HOUR MIN

DR longitude: **Arc to time:** h m s

° + '

rounded = h m **+west –east**

= UT of meridian passage @ ship's DR (local noon): *DAY* *HOUR* *MIN*

Declination at the *HOUR* of meridian passage at ship's position will be:

Increment: + - 'd' for *MIN* =

(+ sign when Declination is increasing)

= Declination at the time of meridian passage at ship's DR

Sextant altitude

Index error (+off arc / –on arc)

= Observed Altitude

Height of eye **Dip** -

= Apparent Altitude

Altitude correction (LL / UL)

89° 60'.0

= True Altitude** -

= Zenith distance

Declination + / - *

OBSERVED LATITUDE

*Latitude greater than declination. Same hemisphere: **Latitude = Zenith distance + Declination**

Latitude less than declination. Same hemisphere: **Latitude = Declination – Zenith Distance**

Latitude opposite hemisphere to declination: **Latitude = Zenith distance - Declination**

**Additional corrections for non-standard conditions (temperature, pressure) could be applied on top.

Sun Sight

DR Latitude: **DR Longitude:**

Chosen Latitude: **Log:** **Course:**

Month: **Day:** **Local Time of the sight:**

Zone or Longitude to time:

UT Day & Time of the sight:

UT of the sight: HOUR MINS SECS

For the hour of the sight HOUR **find GHA:** **and** **Declination:**

Increment: MINS SECS = + + - "d" for MINS =

= Declination @ time of sight

= G.H.A @ time of sight

Chosen Longitude (–West +East)

= Local Hour Angle (LHA) 00'.0

Enter sight reduction table with Chosen Latitude, whole degrees of Declination & Local Hour Angle (LHA) to find 'Hc', 'd'and 'Z'. Use "SAME" if DR Lat and Dec are on the same hemisphere, otherwise use "CONTRARY". Then enter table 5 with 'd' and the minutes of Declination to find correction (corr.) to apply to Hc to calculate Tabulated Altitude. 360/180

"Hc" "Z"

'd' correction "ZN"

Mins of Dec

Tabulated Altitude

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude

Index error (+off arc / –on arc)

= Observed Altitude

Height of eye **Dip** -

= Apparent Altitude

Altitude correction (LL / UL)

= True Altitude*

Tabulated Altitude

Intercept
(difference between True and Tabulated Altitude)

Towards / Away
(Tabulated tinier = Towards)

*Additional corrections for non-standard conditions (temperature, pressure) could be applied on top.

Star Sight Plan by Pub. 249 Vol. 1 "Selected Stars"

DR Latitude: **DR Longitude:** **Morning / Evening Twilight**

Chosen Latitude: **Log:**

Date @ ship's DR

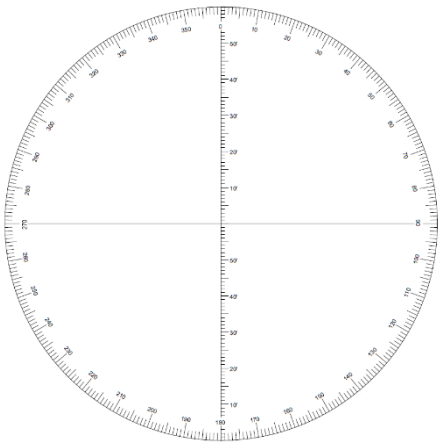
Time of civil twilight on Greenwich Meridian @ ship's latitude: h m s

Longitude to time: ° ' + h m

rounded = h m **+west –east**

Date @ Greenwich

UT of civil twilight @ ship's longitude:



At the HOUR of civil twilight: **find GHA of Aries:**

Increment: MINS **=** **+**

= GHA of Aries @ civil twilight

Chosen Longitude (–West +East)

= Local Hour Angle (LHA) 00'.0

Stars Available:	**Hc**	**Zn**	**Sextant Altitude** ° '	**Time of sight** Hour Minute Seconds
1				
2				
3				
4				
5				
6				
7				

1 degree = four minutes of time

3 stars are marked with a diamond symbol as being best suitable for a three-star fix.
The brightest stars are written in CAPITAL letters.

Star Sight Plan by Pub. 249 Vol. 1 "Selected Stars"

DR Latitude: **DR Longitude:** **Morning / Evening** **Twilight**

Chosen Latitude: **Log:**

Date @ ship's DR
DAY **MONTH**

	Sunset/ Nautical Twilight	Civil Twilight	Sunrise/ Nautical Twilight
Time on Greenwich Meridian @ ship's latitude:			
Longitude to Time: (+West –East):			
UT @ ship's DR:			
Period in minutes:			
Halve period:			
Available period:			

Date @ Greenwich

Longitude to time:

h m s

° ' +

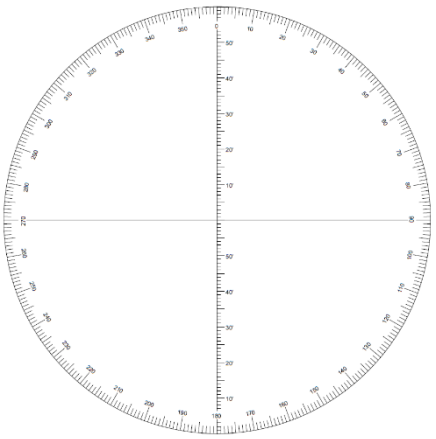
For the HOUR of civil twilight **find GHA of Aries:**

Increment: MINS = +

= GHA of Aries @ Civil Twilight

Chosen Longitude (–West +East)

= Local Hour Angle (LHA) 00'.0



Stars Available:	Hc	Zn	Sextant Altitude ° '	Time of sight Hour Minute Seconds
1				
2				
3				
4				
5				
6				
7				

1 degree = four minutes of time

3 stars are marked with a diamond symbol as being best suitable for a three-star fix.
The brightest stars are written in CAPITAL letters.

Star Sight Reduction by Pub. 249 Vol. 1 "Selected Stars"

DAY: **MONTH:** **DR Latitude:** **DR Longitude:**

Chosen Latitude: **Log:**

Star Observed:	**1**	**2**	**3**	**4**
UT of sight				
GHA of Aries (for hour of sight)				
Increment (for minutes and seconds of sight)	+	+	+	+
= GHA of Aries @ time of sight				
Chosen Longitude: (–West +East)				
= LHA of Aries ♈	00’.0	00’.0	00’.0	00’.0
Sextant Alt				
Index Error (+off arc / –on arc)				
= Observed Altitude				
Height of eye **Dip**	-	-	-	-
= Apparent altitude				
Altitude correction				
= True altitude*				
Tabulated Altitude (Hc) (from sight reduction tables vol 1 using LHA and Chosen Latitude)				
Intercept (difference between True and Tabulated Altitude)				
Towards / Away (Tabulated tinier Towards)				
Tabulated bearing (Zn)				

*Additional corrections for non-standard conditions (temperature, pressure) could be applied on top.

Using Pub. 249 Vol. 1 "Selected Stars" is easier and faster than SHA method. The disadvantage is that only 7 selected stars are given for each Latitude and LHA in the Vol. 1. All 57 navigational stars are available when using SHA method and could be useful if you cannot find the given "Selected Stars".

Star Sight Plan (SHA Method)

DR Latitude: **DR Longitude:** **Star Name:**

Chosen Latitude:

Date @ ship's DR

Time of civil twilight on Greenwich Meridian @ ship's latitude: h m s

Longitude to time: ° ' + =

Date @ Greenwich

rounded = h m **+west –east**

UT of civil twilight @ ship's longitude:

For the DAY of the civil twilight find SHA:

and Declination: **(if "+" then N, if "-" then S)**

For the hour of the civil twilight HOUR **find GHA of Aries:** +

Increment: MINS = +

= GHA @ time of civil twilight
(if > 360º subtract 360º)

Chosen Longitude (–West +East)

= Local Hour Angle (LHA)* 00'.0

You can find SHA and Declination of all 57 navigational stars in the Nautical Almanac but note that many starts have Declination > 29º and cannot be used with Sight Reduction Tables Pub. 249 as it only covers Declination from 0º to 29º. For Declination > 29º you will have to use Sight Reduction Tables Pub. No. 229 that covers Declination from 0º to 90º.

Enter sight reduction table with Chosen Latitude, Declination (rounded to the whole degrees) and Local Hour Angle (LHA). Use "SAME" tables if DR Latitude and Declination are on the same hemisphere, otherwise use "CONTRARY".

360/180

"Hc" **"Z"**

North Lat:
if LHA > 180 then Zn = Z,
if LHA < 180 then ZN = 360 - Z

"ZN"

South Lat:
if LHA > 180 then ZN = 180 – Z,
if LHA < 180 then Zn = 180 + Z

*We are looking for stars which should be visible from the boat, i.e. over a meridian which is not too far away from the boat meridian (70º on either side, depending on the season, boat latitude, and the Declination of the star). This means the LHA has to be less than 70º and greater than 290º. Doing the exercise for every navigational star is time consuming. In practice, doing rough mental calculation to pre-select stars should be enough. A more straightforward option is to use a Starfinder which only requires calculation of LHA of Aries to get azimuth and bearing for all available stars all at once:

LHA of Aries = GHA Aries – Boat Longitude West (+ if Longitude is East)

Once the stars are pre-selected you can continue the calculation using Sight Reduction Tables.

Star Sight Reduction (SHA method)

DR Latitude: **DR Longitude:** **Star Name:**

Chosen Latitude: **Log:**

Month: **Day:** **Local Time of the sight:**

Zone or Longitude to time:

UT Day & Time of the sight:

UT of sight (hour minute and second) HOUR MINS SECS

For the DAY of the sight find **SHA:** **and** **Declination:** (if "+" then N, if "-" then S)

For the hour HOUR find **GHA of Aries:** +

Increment: MINS SECS = +

= GHA @ time of sight
(if > 360º subtract 360º)

Chosen Longitude (–West +East)

= Local Hour Angle (LHA) 00’.0

Enter sight reduction table with Chosen Latitude, whole degrees of Declination and Local Hour Angle (LHA) to find ‘Hc’, ‘d’and ‘Z’.**
Then enter table 5 with 'd' and the minutes of Declination to find correction to apply to Hc to calculate Tabulated Altitude.

360/180

"Hc" **"Z"**

'd' **correction** **"ZN"**

Mins of Dec

Tabulated Altitude

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude

Index error (+off arc / –on arc)

= Observed Altitude

Height of eye **Dip** -

=Apparent Altitude

Altitude correction

= True Altitude*

Tabulated Altitude

Intercept
(difference between True and Tabulated Altitude)

Towards / Away
(Tabulated tinier = Towards)

*Additional corrections for non-standard conditions (temperature, pressure) could be applied on top
**Pub. No. 249 is limited to Dec. 0º to 29º. For Dec. > 29º use Sight Reduction Tables Pub. No. 229 (covers Dec. 0º to 90º)

Moon Sight

DR Latitude: **DR Longitude:**

Chosen Latitude: **Log:** **Course:**

Month: **Day:** **Local Time of the sight:**

Zone or Longitude to time:

UT Day & Time of the sight:

UT of sight (hour minute and second) HOUR MINS SECS

For the hour of the sight HOUR find **GHA:** **and** **Declination:**

Increment: MINS SECS = + + "d" for MINS =

"v" for MINS = = Declination @ time of sight

= GHA @ time of sight

Chosen Longitude (–West +East)

= Local Hour Angle (LHA) 00’.0

Enter sight reduction table with Chosen Latitude, whole Degrees of Declination & Local Hour Angle (LHA) to find ‘Hc’, ‘d’and ‘Z’. Use "SAME" if DR Lat and Dec are on the same hemisphere, otherwise use "CONTRARY".
Then enter table 5 with ‘d’ and the minutes of Declination to find correction to apply to Hc to calculate Tabulated Altitude.

360/180

"Hc" "Z"

'd' correction "Zn"

Mins of Dec

Tabulated Altitude

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude

Index error (+off arc / –on arc)

= Observed Altitude

Height of eye **Dip** -

=Apparent Altitude

Altitude correction +

H.P. LL / UL +

=True altitude*
(if Upper Limb subtract 30')

Tabulated Altitude

Intercept
(difference between True and Tabulated Altitude)

Towards / Away
(Tabulated tinier = Towards)

*Additional corrections for non-standard conditions (temperature, pressure) could be applied on top.

Planet Finder

DR Latitude: **DR Longitude:** **Planet Name:**

Chosen Latitude:

Date @ ship's DR

Time of civil twilight on Greenwich Meridian @ ship's latitude:

Longitude to time: ° h m s

\+ '

Date @ Greenwich

rounded = h m **+west –east**

UT of civil twilight @ ship's longitude:

For the hour of civil twilight HOUR **find GHA:** **and** **Declination:**

Increment: MINS = +

= GHA @ time of civil twilight

Chosen Longitude (–West +East)

= Local Hour Angle (LHA) 00'.0

Enter sight reduction table with Chosen Latitude,Declination (rounded to the whole degrees) and Local Hour Angle (LHA). Use "SAME" if DR Lat and Dec are on the same hemisphere, otherwise use "CONTRARY".

"Hc" **"Z"** 360/180

North Lat:
if LHA > 180 then Zn = Z,
if LHA < 180 then ZN = 360 - Z

"ZN"

South Lat:
if LHA > 180 then ZN = 180 – Z,
if LHA < 180 then Zn = 180 + Z

The planets orbit the sun and when they are close to the sun when viewed from the earth, they are not available for Astro use. To pre-check their availability, refer to the planet diagram in astronomical phenomena or nautical almanac that shows Local Time of Meridian Passage of Planets for each day of the year. Beware of confusing planets that are close together – see the notes in the astronomical phenomena or the nautical almanac.

Use this form to find an approximate Azimuth (true bearing) and rough altitude for the planet that you want to observe. Do not worry about "v" or "d" corrections. Use only the whole degrees of declination rounded to the nearest degree. At the time of civil twilight sight along the bearing (convert it from true to compass) and the body that does not twinkle at the altitude shown is the planet that you are looking for.

Planet Sight

DR Latitude: **DR Longitude:** **Planet Name:**

Chosen Latitude: **Log:**

Month: **Day:** **Local Time of the sight:**

Zone or Longitude to time:

UT Day & Time of the sight:

UT of sight (hour minute and second) HOUR MINS SECS

For the hour of the sight HOUR find **GHA:** **and** **Declination:**

Increment: MINS SECS = + "d" MINS =

"v" for MINS =

= Declination @ time of sight

= GHA @ time of sight

Chosen Longitude (–West +East)

= Local Hour Angle (LHA) 00° .0

Enter sight reduction table with Chosen Latitude, whole degrees of Declination and Local Hour Angle (LHA) to find 'Hc', 'd'and 'Z'.
Then enter table 5 with 'd' and the minutes of Declination to find correction to apply to Hc to calculate Tabulated Altitude.

360/180

"Hc" "Z"

'd' correction "ZN"

Mins of Dec

Tabulated Altitude

North Lat: if LHA > 180 then Zn = Z, if LHA < 180 then ZN = 360 - Z
South Lat: if LHA > 180 then ZN = 180 – Z, if LHA < 180 then Zn = 180 + Z

Sextant altitude

Index error (+off arc / –on arc)

= Observed Altitude

Height of eye **Dip** -

=Apparent Altitude

Altitude correction

Additional corrections

= True Altitude*

Tabulated Altitude

Intercept
(difference between True and Tabulated Altitude)

Towards / Away
(Tabulated tinier = Towards)

*Additional corrections for non-standard conditions (temperature, pressure) could be applied on top.

Polaris Sight

DR Latitude: **DR Longitude:**

Chosen Latitude: **Log:**

Month: **Day:** **Local Time of the sight:**

Zone or Longitude to time:

UT Day & Time of the sight:

	HOUR	MINS	SECS
UT of the sight			
GHA of Aries (Hour of sight)			
Increment (Minutes and Seconds)		+	
= GHA of Aries @ time of sight			
Chosen Longitude (-West +East)			
= LHA of Aries ♈		00’.0	

Sextant Altitude

Index Error (+off arc/- on arc)

= Observed Altitude

Height of eye **Dip** -

= Apparent altitude

Altitude correction

= True altitude*

+ a0

+ a1

+ a2

Or **Q corrections**

- 01° 00'. 0

= Observed Latitude

*Additional corrections for non-standard conditions (temperature, pressure) could be applied on top.

Compass Check on the Sun

DR Latitude: ..... **DR Longitude:** .....

Chosen Latitude: ..... **Heading (C):** .....

Month: ..... **Day:** ..... **Local Time of the sight:** .....

Zone or Longitude to time: .....

UT Day & Time of the sight: ....

HOUR MINS SECS

UT of the sight: ....

For the hour of the sight HOUR ..... **find GHA:** ..... **and** **Declination:** .....

Increment: MINS ..... SECS ..... = + ... + - "d" ..... **for** MINS ..... = ...

= Declination @ time of sight .....

= GHA @ time of sight .....

Chosen Longitude (–West +East) .....

= Local Hour Angle (LHA) 00°.0

Enter sight reduction table with Chosen Latitude, Declination and Local Hour Angle (LHA).

360/180 .....

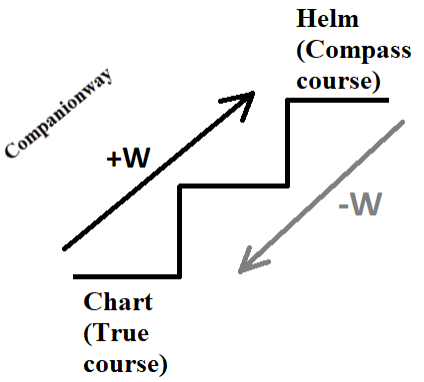
North Lat:
if LHA > 180 then Zn = Z,
if LHA < 180 then ZN = 360 - Z

South Lat:
if LHA > 180 then ZN = 180 – Z,
if LHA < 180 then Zn = 180 + Z

"Z" .....

"ZN" .....

Sun's True Bearing	Variation	Magnetic Bearing	Deviation (to be derived)	Compass reading



If you are going from True course (Chart) to Compass course (Helm) then Westerly degrees are added, and Easterly subtracted. When going backward the opposite logic applies.

The derived deviation is only applicable to this vessel while on a specific heading.