

Altitude-Intercept Worksheet

LoP = _____

<p>Section 0 - "Estimated Position"</p> <p>EstLat N/S ____ ° ____ ' ____ "</p> <p>EstLon E/W ____ ° ____ ' ____ "</p>	<p>Section 2 - "Observed Altitude"</p> <p>Hs ____ ° ____ ' ____ " cel.obj. _____</p> <p>IE ± ____ ' ____ " app.dir. _____</p> <p>Dip - ____ ' ____ " _____</p> <p>Ha ____ ° ____ ' ____ " _____</p> <p>Refr - ____ ' ____ " _____</p> <p> ____ ° ____ ' ____ " _____</p> <p>Prllx + ____ ° ____ ' ____ " HP ____ ° ____ ' ____ "</p> <p>SD ± ____ ' ____ " upper limb: - </p> <p> lower limb: + _____</p> <p>Ho ____ ° ____ ' ____ " _____</p>
<p>Section 1 - "Time of Observation"</p> <p>Date ____ ____ ____</p> <p>Chronometer ____ h ____ m ____ s</p> <p>Error ± ____ m ____ s</p> <p>Local Time ____ h ____ m ____ s</p> <p>Time Zone ± ____ h</p> <p>UTo ____ h ____ m ____ s</p>	

Section 3 - "Nautical Almanac"

GHA (NA) ____ ° ____ ' ____ "	ddGHA ± ____ ' ____ "	p(ddGHA) _____
dHA + ____ ° ____ ' ____ "	<-- fMin ____ m ____ s	p(fMin) _____
Intpl ± ____ ' ____ "	<-- (sign of ddGHA) <--	s () _____

GHA ____ ° ____ ' ____ " at UTo

Dec (NA) N/S ____ ° ____ ' ____ "	dDec ± ____ ' ____ "	p(dDec) _____
Intpl ± ____ ' ____ "	<-- fMin ____ m ____ s	p(fMin) _____
	<-- (sign of dDec) <--	s () _____

Dec N/S ____ ° ____ ' ____ " at UTo

Remark: if the result for Declination at the time of observation (UTo) is negative, the N/S declaration must be swapped.

Section 4 - "Sight Reduction"

Sight-Reduction with Tables is done on a separate Worksheet. The trigonometric equations are:

$$H_c = \text{asin}(\sin(\text{LatAP}) * \sin(\text{Dec}) + \cos(\text{LatAP}) * \cos(\text{Dec}) * \cos(\text{GHA} + \text{LonAP}))$$

$$Z_c = \text{atan}(\cos(\text{Dec}) * \sin(\text{GHA} + \text{LonAP}) / (\cos(\text{LatAP}) * \sin(\text{Dec}) - \sin(\text{LatAP}) * \cos(\text{Dec}) * \cos(\text{GHA} + \text{LonAP})))$$

Section 5 - "Line of Position"

LatAP N/S ____ ° ____ ' ____ "	
LonAP E/W ____ ° ____ ' ____ "	
Hc ____ ° ____ ' ____ "	Zc ____ ° ____ "
Ho - ____ ° ____ ' ____ "	
Hd ± ____ ' ____ "	<p>Hd > 0 draw LoP Hd miles away from GP</p> <p>Hd < 0 draw LoP Hd miles towards GP</p>

Section 4 - "Sight Reduction"

GHA	_____ ° _____ ' _____	Lat/Dec: SAME - CONTRARY	
LonAP	± _____ ° _____ ' _____	LatAP ± _____ °	
LHA	_____ °	Dec ± _____ ° _____ ' _____	p (mDec) _____
H	_____ ° _____ ' _____	dH ± _____ ' _____	p (dH) _____
Interp	± _____ ° _____ ' _____	<-- (sign of dH) <--	s () _____
Hc	_____ ° _____ ' _____		
Z	_____ ° _____	N-Lat LHA < 180°: Zc=360°-Z LHA > 180°: Zc=000°+Z	
	_____ ° _____	S-Lat LHA < 180°: Zc=180°+Z LHA > 180°: Zc=180°-Z	
Zc	_____ ° _____		

Remarks and Instructions

Choose an appropriate Assumed Position (AP) close to the Estimated Position, but such that both "LatAP" and "LHA" are integral numbers. This Assumed Position will be the reference location for drawing the Azimuth Line, Altitude Difference and the Line-of-Position.

The "LHA" is the angular distance measured westward from the local celestial Meridian to the position of the celestial object. It is obtained by adding the "GHA" and the "LonAP" using it's correct sign (positive for Easter Longitudes; negative for Western Longitudes).

The following parts are used to enter the Sight-Redution tables:

- the integral value of the Latitude of the Assumed Position ("LatAP")
- the integral value of the Local-Hour Angle ("LHA") and
- the integral part of the Declination ("Dec")

The table evaluation gives the following results:

- the Altitude in the Assumed Position ("H") for the integral Declination value
- the variation of "Hc" for one degree increment of Declination ("dH") and
- the Azimuth angle ("Z")

Use the minutes part of the Declination and the "dH" value to obtain the interpolated altitude correction ("Interp") from the interpolation tables. Adding this correction to "H" eventually yields the Calculated Altitude "Hc".

Finally, use the correct calculation scheme to obtain the true Azimuth "Zc" from the tabulated value "Z". Select the scheme according to the Latitude of the Assumed Position (North or South) and the value of "LHA".

Section 4 - "Sight Reduction"

$$\text{AP: LatAP} = \pm \text{ ______ }^\circ \text{ ______ } \text{ (N/S)} \qquad \text{GP: Dec} = \pm \text{ ______ }^\circ \text{ ______ } \text{ (N/S)} \quad (0)$$

$$\text{LonAP} = \pm \text{ ______ }^\circ \text{ ______ } \text{ (E/W)} \qquad \text{GHA} = \text{ ______ }^\circ \text{ ______ }$$

$$1. \quad \text{LHA} = \text{GHA} + \text{LonAP} = \text{ ______ }^\circ \text{ ______ } \pm \text{ ______ }^\circ \text{ ______ } = \text{ ______ }^\circ \text{ ______ }$$

$$t = \text{ ______ } - \text{LHA} = \pm \text{ ______ }^\circ \text{ ______ } \quad \text{if (LHA < 180}^\circ \text{)} \quad (1)$$

$$t = 360^\circ - \text{LHA} = \pm \text{ ______ }^\circ \text{ ______ } \quad \text{if (LHA > 180}^\circ \text{)}$$

$$A(t) = \text{ ______ }$$

$$2. \quad A(\text{Dec}) = \text{ ______ } \qquad B(\text{Dec}) = \text{ ______ }$$

$$3. \quad A(R) = A(t) + B(\text{Dec}) = \text{ ______ } + \text{ ______ } = \text{ ______ }$$

$$R = \text{ ______ }^\circ \text{ ______ } \qquad B(R) = \text{ ______ }$$

$$4. \quad A(\text{LatQ}) = A(\text{Dec}) - B(R) = \text{ ______ } - \text{ ______ } = \text{ ______ }$$

$$\text{LatQ} = \pm \text{ ______ }^\circ \text{ ______ } \text{ (N/S)} \quad (4)$$

$$5. \quad \text{dLat} = \text{LatAP} - \text{LatQ} = \pm \text{ ______ }^\circ \text{ ______ } - \pm \text{ ______ }^\circ \text{ ______ } = \pm \text{ ______ }^\circ \text{ ______ } \quad (5)$$

$$B(\text{dLat}) = \text{ ______ }$$

$$6. \quad A(\text{Hc}) = B(R) + B(\text{dLat}) = \text{ ______ } + \text{ ______ } = \text{ ______ }$$

$$\text{Hc} = \text{ ______ }^\circ \text{ ______ } \qquad B(\text{Hc}) = \text{ ______ }$$

$$7. \quad A(Z) = A(R) - B(\text{Hc}) = \text{ ______ } - \text{ ______ } = \text{ ______ }$$

$$Z = \text{ ______ }^\circ \text{ ______ } \quad (7)$$

$$8. \quad \text{Zc} = \text{ ______ }^\circ \text{ ______ } \quad (8)$$

Remarks and Instructions

(0) Use the appropriate signs for Latitude, Longitude and Declination:
positive for N and E, negative for S and W.

(1) The meridian angle "t" is calculated from "LHA" according to the following rule:
if $\text{LHA} < 180^\circ$ $t = \text{ ______ } - \text{LHA}$ (GP is WEST of AP)
if $\text{LHA} > 180^\circ$ $t = 360^\circ - \text{LHA}$ (GP is EAST of AP)

(4) The sign of the Latitude of "Q" (N/S) depends on the values of "t" and "Dec":
if $|t| < 90^\circ$ LatQ has the same sign as Dec
if $|t| > 90^\circ$ LatQ has the contrary sign of Dec
Where $|t|$ is the absolute value of "t"

(5) The value of "dLat" must be calculated taking the correct signs for "LatAP" and "LatQ" into account. The resulting sign of "dLat" should be recorded correctly (see remark 7).

(7) Select one out of four cases, depending on the value of " $|t|$ " and the sign of "dLat" to determine how to select the value of "Z" from the Tables:

$ t $	$ t < 90^\circ$	$ t > 90^\circ$
dLat	-	+
Z	$< 90^\circ$	$> 90^\circ$

if $Z < 90^\circ$ select Z from the top line - left column of the Table

if $Z > 90^\circ$ select Z from the bottom line - right column of the Table

(8) The true Azimuth "Zc" is obtained from "Z" depending on the sign of "t":
if $t > 0$ $Zc = Z$ (GP is East of AP)
if $t < 0$ $Zc = 360^\circ - Z$ (GP is West of AP)

