BASIC AZIMUTH TEMPLATE FOR SUN

ZT DATE
ZD
GMT DATE

CT
CE
CCT
GMT DATE

GMT
GHA (Correct GMT and Date for Nautical Almanac)
m&s
GHA

LHA

Latitude

Decl d (+-) correction
Corr
Decl

LHA:

LAT:

DECL:

Page 505, Bowditch II, 1981 Ed. Set up formula 4a. Read the rules closely.

$$\text{TAN Z} = \frac{\text{SIN LHA}}{(\text{COS LAT} \times \text{TAN DECL}) - (\text{SIN LAT} \times \text{COS LHA})}$$

Convert Z to Zn, then solve for gyro error or deviation.

C	D	M	V	T	GE	GYRO

BASIC AZIMUTH TEMPLATE FOR PLANET

ZT DATE
ZD
GMT DATE

CT
CE
CCT
GMT DATE

GMT (Correct GMT and Date for Nautical Almanac)
GHA
m&s
V v (+-) correction
GHA
λ
LHA

Latitude

Decl d (+-) correction
Corr
Decl

LHA:

LAT:

DECL:

Page 505, Bowditch II, 1981 Ed. Set up formula 4a. Read the rules closely.

$$\text{TAN Z} = \frac{\text{SIN LHA}}{(\text{COS LAT x TAN DECL}) - (\text{SIN LAT x COS LHA})}$$

Convert Z to Zn, then solve for gyro error or deviation.

C D M V T GE GYRO

BASIC AZIMUTH TEMPLATE FOR STAR

ZT DATE
ZD
GMT DATE

CT
CE
CCT
GMT DATE

GMT (Correct GMT and Date for Nautical Almanac)
GHA
m&s
SHA *
GHA

LHA

Latitude

Decl (No correction, found on daily page next SHA*)

LHA:

LAT:

DECL:

Page 505, Bowditch II, 1981 Ed. Set up formula 4a. Read the rules closely.

$$\text{TAN Z} = \frac{\text{SIN LHA}}{(\text{COS LAT x TAN DECL}) - (\text{SIN LAT x COS LHA})}$$

Convert Z to Zn, then solve for gyro error or deviation.

C	D	M	V	T	GE	GYRO

Bowditch II, 1981 Ed. Page 505

As applied to the undivided astronomical triangle of figure 707b, the above equation is stated as:

$$\sin LHA \cot Z = \cos L \tan d - \sin L \cos LHA$$

from which

$$\cot Z = \frac{\cos L \tan d - \sin L \cos LHA}{\sin LHA}$$

$$\tan Z = \frac{\sin LHA}{\cos L \tan d - \sin L \cos LHA}. \quad (4a)$$

Substituting $\frac{\sin d}{\cos d}$ for $\tan d$,

$$\tan Z = \frac{\cos d \sin LHA}{\cos L \sin d - \sin L \cos d \cos LHA}. \quad (4b)$$

Meridian angle, t, can be substituted for LHA in equations 4a and 4b:

$$\tan Z = \frac{\sin t}{\cos L \tan d - \sin L \cos t} \quad (5a)$$

$$\tan Z = \frac{\cos d \sin t}{\cos L \sin d - \sin L \cos d \cos t}. \quad (5b)$$

The sign conventions used in the calculations of the azimuth angle formulas are as follows: (1) If latitude and declination are of contrary name, declination is treated as a negative quantity; (2) If in equations 4a and 4b the local hour angle is greater than 180°, it is treated as a negative quantity.

If the acute angle as calculated is negative, it is necessary to add 180° to obtain the desired azimuth angle.

Azimuth angle is measured from 0° at the north or south reference direction clockwise or counter-clockwise through 180°. It is labeled with the reference direction as the prefix and the direction of measurement from the reference direction as a suffix. Thus, azimuth angle S144°W is 144° west of south, or true azimuth 324°. Azimuth angle is labeled N or S to agree with the latitude and E or W to agree with the meridian angle (labeled E when LHA is greater than 180°).

Azimuth angle can also be converted to true azimuth, Zn, through use of the following rules:

N. Lat.	LHA greater than 180°	Zn=Z
	LHA less than 180°	Zn=360°−Z
S. Lat.	LHA greater than 180°	Zn=180°−Z
	LHA less than 180°	Zn=180°+Z.

BASIC AZIMUTH TEMPLATE FOR PLANET

ZT DATE
ZD
GMT DATE

CT
CE
CCT
GMT DATE

Use correct GMT and Date for Nautical Almanac

Decl d (+-) correction
Corr
Decl (convert increment to decimal)

Lat (convert increment to decimal)

Bowditch II, 1981 Ed., Page 12: Read rules regarding proper labeling
Can be solved by Table or Formula. The latter formula is written in Bowditch II however some students prefer using formula with cosine in lieu of secant.

$$\text{Sin Amplitude} = \frac{\text{Sin Declination}}{\text{Cos Latitude}}$$

Or

Sin Amplitude = Secant Latitude X Sin Declination

Amplitude: E/W _____ N/S (Prefix East if body rising, West if setting)
(Suffix North or South to match Declination)
Base: 090° or 270° (If body rising then 090°; if setting then 270°)

To find True Azimuth "Zn" apply the Amplitude to Base as follows:

If body rising, Amplitude E _____ N then subtract Amplitude from 090°
If body rising, Amplitude E _____ S then add Amplitude to 090°
If body setting, Amplitude W _____ S then subtract Amplitude from 270°
If body setting, Amplitude W _____ N then add Amplitude to 270°

Final step:

C D M V T GE GYRO

BASIC AZIMUTH TEMPLATE FOR STAR

ZT DATE
ZD
GMT DATE

CT
CE
CCT
GMT DATE

Use correct GMT and Date for Nautical Almanac

Decl (convert increment to decimal)

Lat (convert increment to decimal)

Bowditch II, 1981 Ed., Page 12: Read rules regarding proper labeling
Can be solved by Table or Formula. The latter formula is written in Bowditch II however some students prefer using formula with cosine in lieu of secant.

$$\text{Sin Amplitude} = \frac{\text{Sin Declination}}{\text{Cos Latitude}}$$

Or

Sin Amplitude = Secant Latitude X Sin Declination

Amplitude: E/W _____ N/S (Prefix East if body rising, West if setting)
(Suffix North or South to match Declination)
Base: 090° or 270° (If body rising then 090°; if setting then 270°)

To find True Azimuth "Zn" apply the Amplitude to Base as follows:

If body rising, Amplitude E _____ N then subtract Amplitude from 090°
If body rising, Amplitude E _____ S then add Amplitude to 090°
If body setting, Amplitude W _____ S then subtract Amplitude from 270°
If body setting, Amplitude W _____ N then add Amplitude to 270°

Final step:

C D M V T GE GYRO