

## Angles and directions

①

The direction of survey lines may be expressed in two ways: -

1. Relatively to each other  
directions are expressed in terms of angles between two consecutive lines.
2. Relatively to some reference direction  
this case expressed in terms of bearings -

**Meridian**: the fixed direction on the surface of the earth with reference to which bearings of survey lines are expressed.

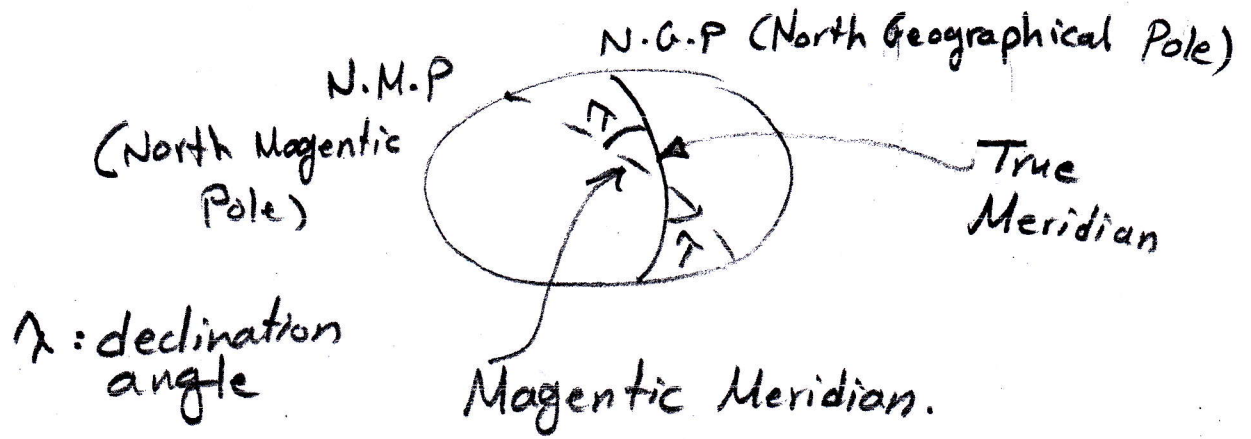
**Bearing**: the horizontal angle between the reference meridian and the survey line measured in a clockwise direction.

The meridians of reference directions employed in surveying may be one of the following:

1. **True meridian**: the line of intersection of the earth surface by a plane containing north pole, south pole and the given place is called true meridian or geographical meridian.

(2)

2. Magnetic Meridian: is the line represents the direction of magnetic needle of compass if it left move freely. (the direction of needle to magnetic north).



3. Grid Meridian: are lines that are parallel to the central meridian.

4. Assumed Meridian: the convenient direction assumed as a meridian for measuring bearings of survey lines.

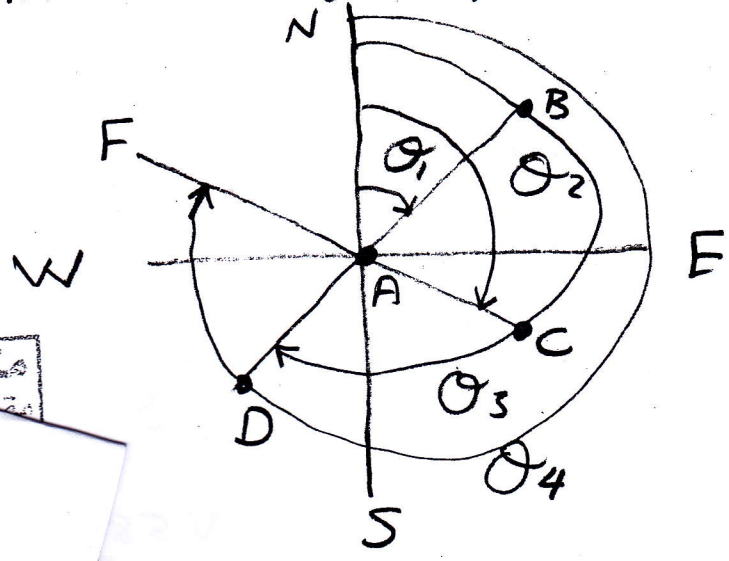
note:

$\lambda$ : is the declination angle written respect to E and W direction and it represents the angle between true Meridian and Magnetic meridian.

### Designation of bearings :-

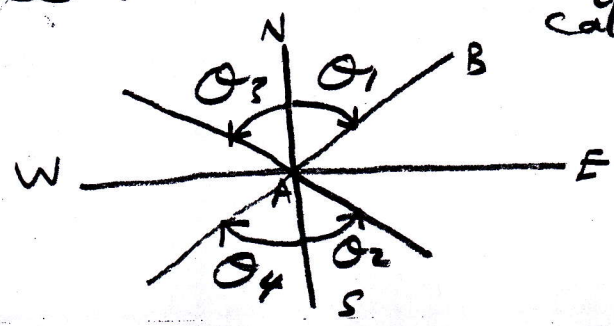
- 1) Whole Circle Direction (W.C.D)  
or whole Circle Bearing (W.C.B)

is the horizontal angle measured from true north or magnetic north to the specified line in clockwise direction. The value of angle ranged from  $0^\circ$  to  $360^\circ$ . This system also called Azimuth.



- 2) Quadrantal bearing system (Q.B)

bearings of survey lines are measured eastward or westward from north or south whichever is nearer. The value of angle ranged from  $0^\circ - 90^\circ$ . This system also called bearing.



Example/

(4)

bearing  $AB = N 60^\circ E$

"  $AC = S 75^\circ E$

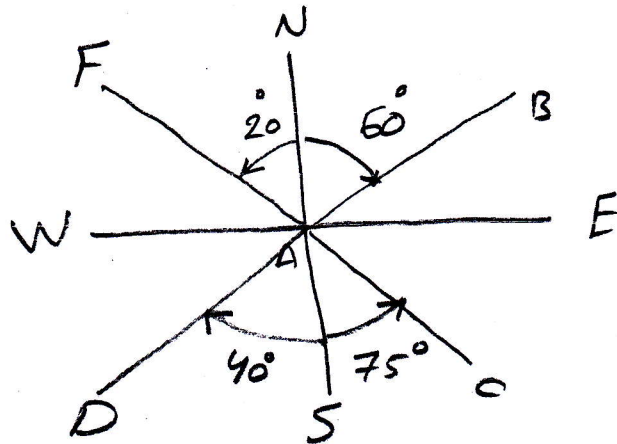
"  $AD = S 40^\circ W$

"  $AF = N 20^\circ W$

① Draw bearings of these lines.

② if bearings of these lines were magnetic, find the true if  $\lambda = 2^\circ W$

Sol.

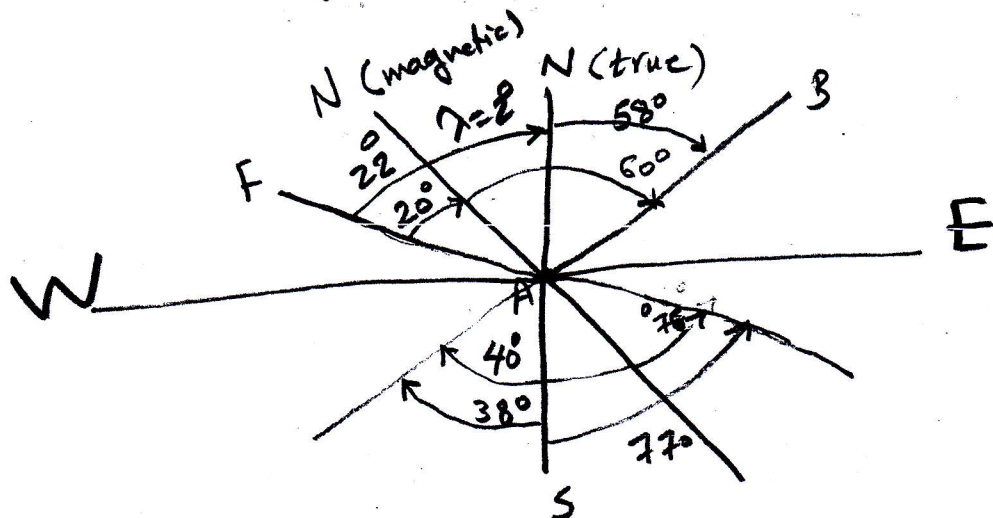


True bearing  $AB = N 58^\circ E$

$AC = S 77^\circ E$

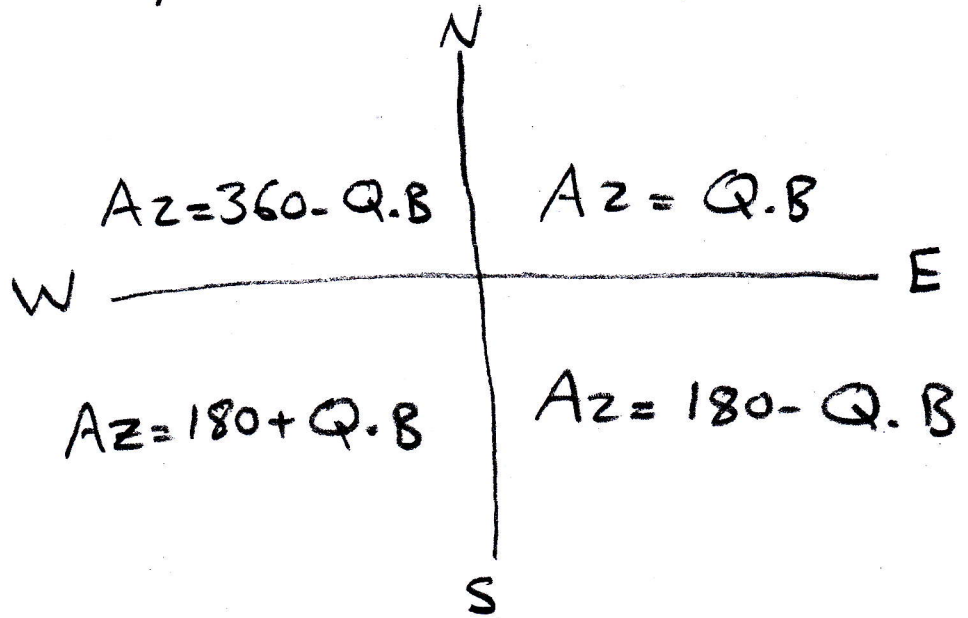
$AD = S 38^\circ W$

$AF = N 22^\circ W$



(5)

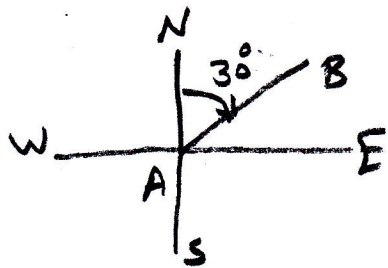
The relationship between (Q.B) and Azimuth



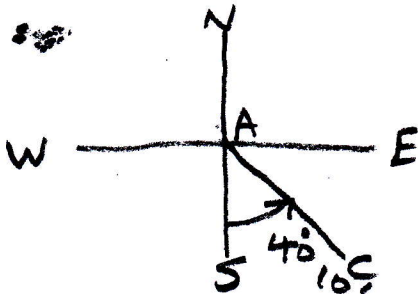
Example/ Convert from Q.B to W.C.B

$AB = N 30^\circ E$  ,  $AC = S 40^\circ 10' E$

$AD = S 25^\circ 35' W$  ,  $AF = N 15^\circ 20' W$

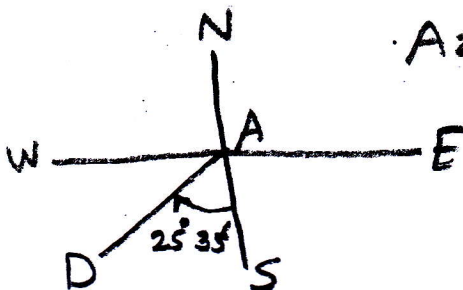


Azimuth  $AB = 30^\circ$



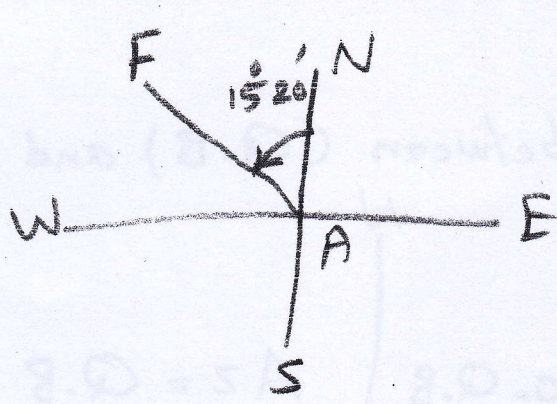
Azimuth  $AC = 139^\circ 50'$

$180^\circ - 40^\circ 10'$



Azimuth  $AD = 205^\circ 35'$

$180^\circ + 25^\circ 35'$



⑥

$$360^\circ - 15^\circ 20'$$

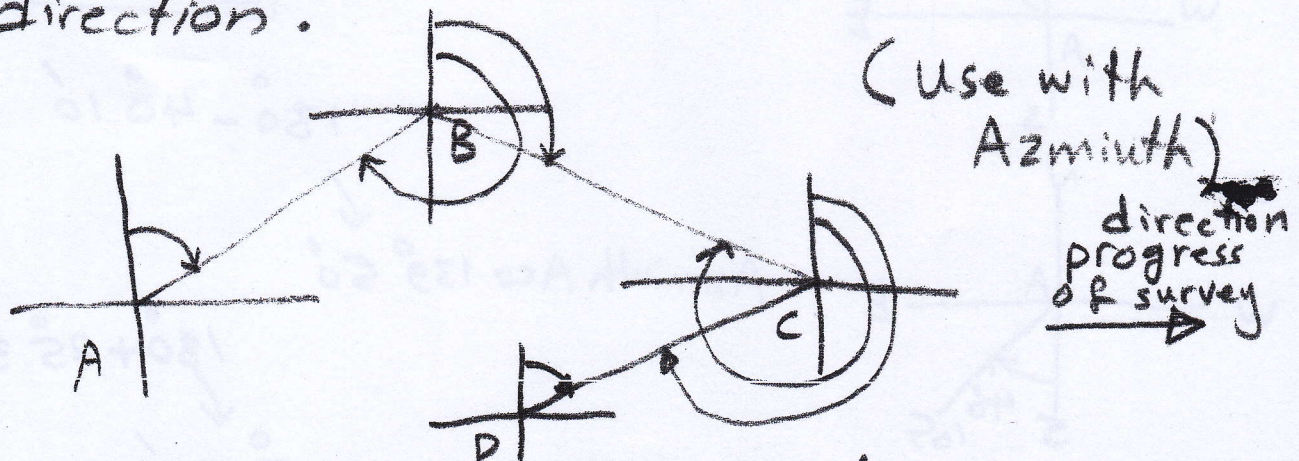
$$\downarrow$$

$$\text{Azimuth AF} = 344^\circ 40'$$

note / if you write  $177^\circ 40' 33''$  in the calculator use the button (0, 0) between the number and this number appears as  $177^\circ 40' 33''$ .

Forward and backward direction

if the bearing of specified line measured with progress of survey is named forward direction, while the bearing in the opposite direction of the progress of survey is called backward direction.

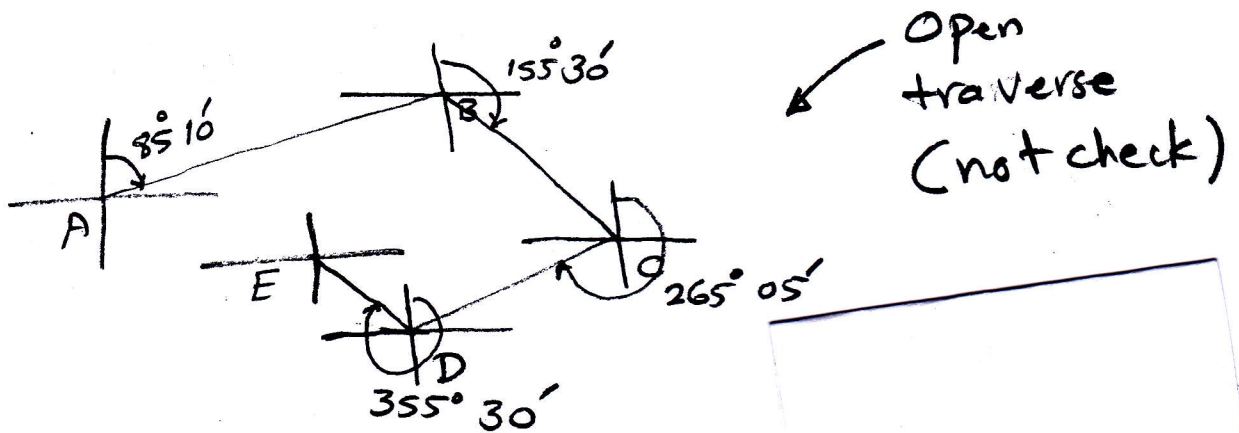


$$\text{back ward direction} = \text{forward direction} \mp 180^\circ$$

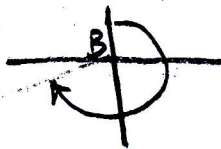
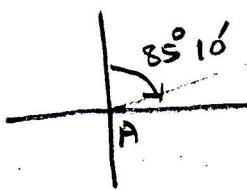
(7)

Example / Find the backward direction for traverse side, if the sides of traverse were forward as follows:

$AB = 85^{\circ} 10'$  ,  $BC = 155^{\circ} 30'$  ,  $CD = 265^{\circ} 05'$   
and  $DE = 355^{\circ} 30'$ .

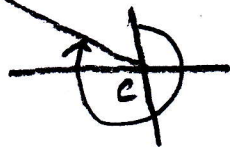


side AB



$$\begin{aligned} \text{Forward } AB &= 85^{\circ} 10' \\ \text{backward } AB &= 180^{\circ} + 85^{\circ} 10' \\ &= 265^{\circ} 10' \end{aligned}$$

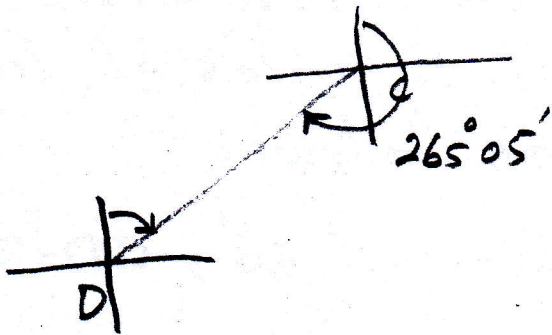
side BC



$$\begin{aligned} \text{Forward } BC &= 155^{\circ} 30' \\ \text{backward } BC &= 180^{\circ} + 155^{\circ} 30' \\ &= 335^{\circ} 30' \end{aligned}$$

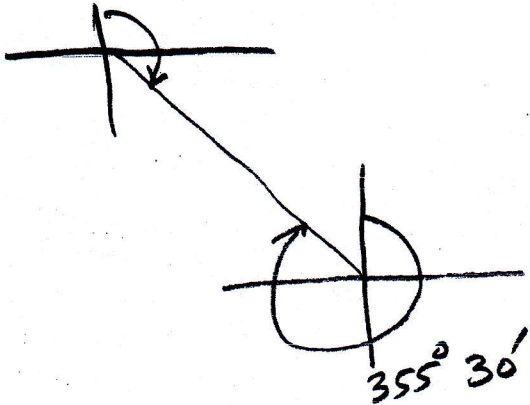
side CD

(8)



$$\begin{aligned} \text{forward CD} &= 265^{\circ} 05' \\ \text{backward CD} &= 265^{\circ} 05' - 180^{\circ} \\ &= 85^{\circ} 05' \end{aligned}$$

side DE



$$\begin{aligned} \text{forward DE} &= 355^{\circ} 30' \\ \text{backward DE} &= 355^{\circ} 30' - 180^{\circ} \\ &= 175^{\circ} 30' \end{aligned}$$