MAD 256 – SURVEYING **April 3rd, 2014**

1st MIDTERM EXAM (ANSWERS)

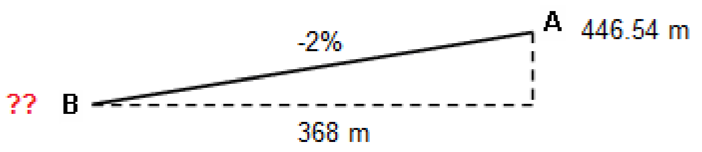
(10 p) 1. A horizontal distance was recorded as 242.84 m with a 20-m tape that was 20.003 m under standard conditions. Calculate the true horizontal distance.

<u>SOLUTION :</u>

Correction per tape length = -error = -(20-20.003) = +0.003 m
Tape correction = (242.84/20)*0.003 = 0.036 m
Corrected horizontal distance = 242.84+0.036 = **242.876 m**

(10 p) 2. Elevation of point A is 446.54 m and slope of line from point A to B is -2%. If the horizontal distance between the points A and B is 368 m, calculate the elevation of the point B.

<u>SOLUTION :</u>



Vertical distance = 368*(-0.02) = -7.36 m (since point B is lower)
Elevation of Point B = 446.54 – 7.36 = **439.18 m**

(10 p) 3. Make the necessary conversions for the followings.

a) 24^o = ? % (slope) **b)** $3\pi/7$ = ? degree **c)** 130^o = ? radian **d)** 260 cm^3 = ? dl (deciliter)

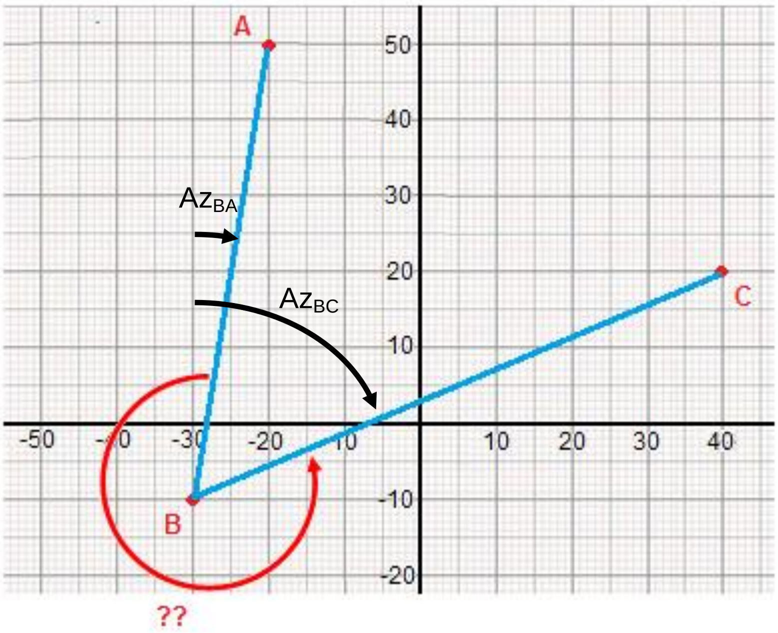
<u>SOLUTION :</u>

a) 24^o = ? % (slope) tan 24^o = 0.445 then slope = 44.5%
b) $3\pi/7$ = ? degree $(3\pi/7)*360/2\pi$ = 77.1 degree
c) 130^o = ? radian $130*2\pi/360=0.72\pi$ or 2.27 radian
d) 260 cm^3 = ? dl (deciliter) 260/1000=0.26 liter = 2.6 deciliter

(20 p) 4. The coordinates of the points ABC (a broken line) are given. Calculate the angle to the left at point B in degree unit. Use the azimuths of lines.

Point	Coordinates (m) Easting	Northing
A	-20	50
B	-30	-10
C	40	20

SOLUTION :



Angle to the right at point B = Az_{BC}-Az_{BA}+360^o

α = atan [(E_A-E_B)/(N_A-N_B)] = atan [(-20-(-30))/(50-(-10))] = atan (10/60) = 9.46^o

If both ΔE and ΔN are positive, then Az_{BA} = 9.46^o

α = atan [(E_C-E_B)/(N_C-N_B)] = atan [(40-(-30))/(20-(-10))] = atan (70/30) = 66.80^o

If both ΔE and ΔN are positive, then Az_{BC} = 66.80^o

Angle to the left at point B =360^o-(66.80^o-9.46^o) = **302.66^o**

(15 p) 5. Coordinates of points A and B are given as follows. Calculate the Azimuth and Bearing angles of the line AB in degree.

E_A = 160 N_A = 210 E_B = 80 N_B = 40

SOLUTION :

α = atan [(E_B-E_A)/(N_B-N_A)] = atan [(80-160)/(40-210)] = atan (-80/-170) = 25.20^o

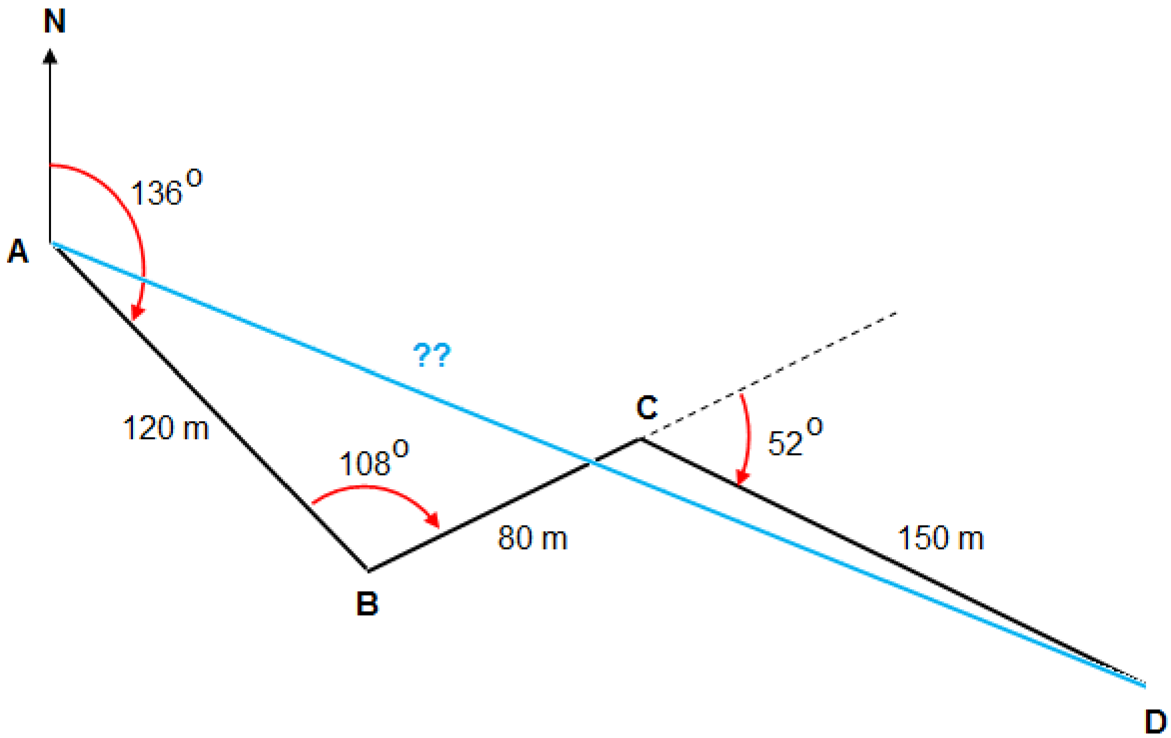
If both ΔE and ΔN are negative, then Az_{BA} = 180+α = 205.20^o

Bearing of AB = Az_{BA}-180 = S25.20^{o}W

(25 p) 6. If the following records are given for a path on the horizontal plane, calculate the horizontal distance between the points A and D.

Azimuth of AB is 136^o	Length of line AB = 120 m
Angle to the right at point B is 108^o	Length of line BC = 80 m
Deflection angle at point C 52^oR	Length of line CD = 150 m

SOLUTION :



$Azimuth_{BC} = Az_{AB}+108-180 = 136+108-180 = 64^o$

$Azimuth_{CD} = Az_{BC}+52 = 64+52 = 116^o$

ΔE of line AB = 120.sin 136 = 83.36 m

ΔN of line AB = 120.cos 136 = -86.32 m

ΔE of line BC = 80.sin 64 = 71.90 m

ΔN of line BC = 80.cos 64 = 35.07 m

ΔE of line CD = 150.sin 116 = 134.82 m

ΔN of line CD = 150.cos 116 = -65.76 m

Departure of Line AD = $\Delta E_{AB}+\Delta E_{BC}+\Delta E_{CD}$ = 83.36+71.90+134.82 = 290.08 m

Ltitude of Line AD = $\Delta N_{AB}+\Delta N_{BC}+\Delta N_{CD}$ = -86.32+35.07-65.76 = -117.01 m

Distance AD = $(\Delta E^2+\Delta N^2)^{1/2} = (290.08^2+117.01^2)^{1/2}$ = **312.79 m**

(10 p) 7. Convert the following bearings to azimuths.

a) S $3^o38'$ W **b)** N $64^o24'$ W **c)** S $82^o19'$ E **d)** N $45^o27'$ E

SOLUTION :

a) Azimuth = $180+3^o38' = 183^o38'$ = 183.63^o

b) Azimuth = $360-64^o24' = 295^o36'$ = 295.60^o

c) Azimuth = $180-82^o19' = 97^o41'$ = 97.68^o

d) Azimuth = $45^o27'$ = 45.45^o