

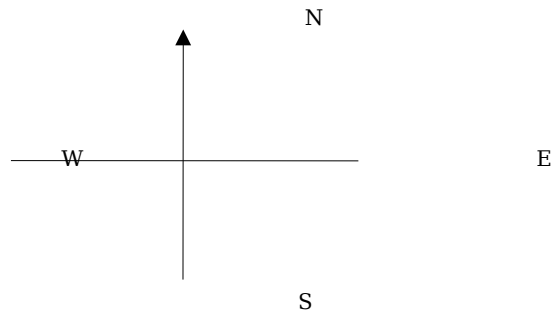
BEARING AND SCALE DRAWING

1). **BEARING:** Bearing refers to the direction of a movement.

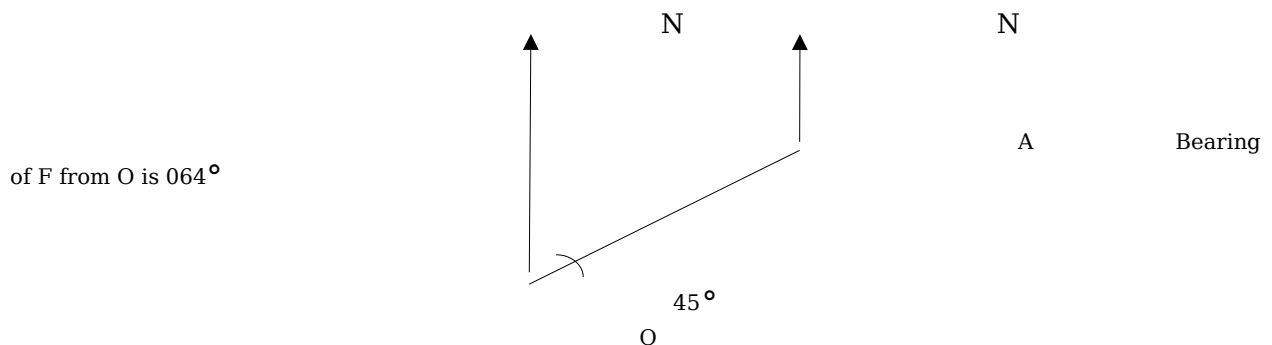
We use three methods to show direction.

i. COMPAS BEARING (Nautical bearing)

- There are four cardinal points on the compass.

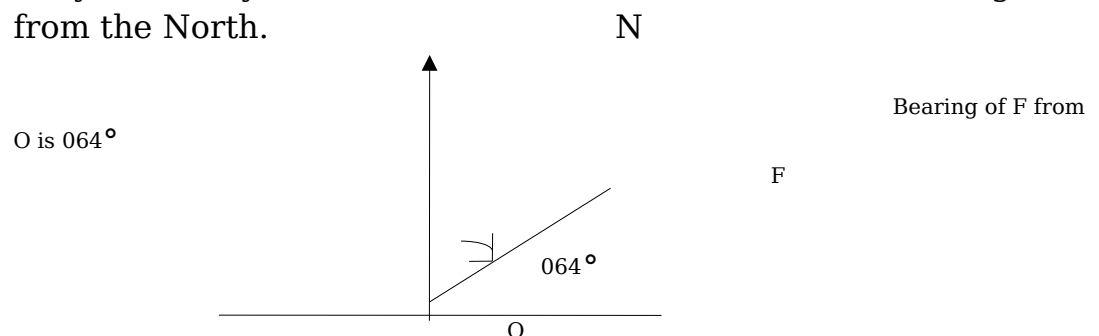


- There are other points half way between the cardinal points e.g. North West (NW), South East (SE) etc.
- Nautical bearings are measured as acute angles from the North or South to the East or West.



ii. THREE FIGURE BEARING

- These are given in three figures
- They are always measured in the clockwise direction starting from the North.



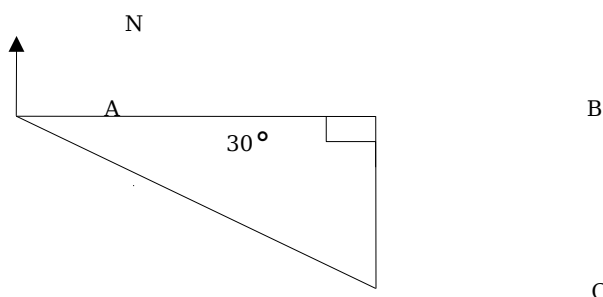
2). **SCALE DRAWING**

When making a scale drawing;

- Make a rough drawing (sketch diagram) to give a general idea of what the final diagram should look like.
- Choose a suitable scale to give a large diagram.

- The larger the diagram the more accurately you can read the lengths and angles.
- Draw parallel lines from North to South (North lines) if you are making a scale diagram to show bearings at the points from where you are reading the bearings.

7.



In the diagram above, B is due East of A and due North of C. Angle BAC is 30° , find the bearing of A from C.

Solution

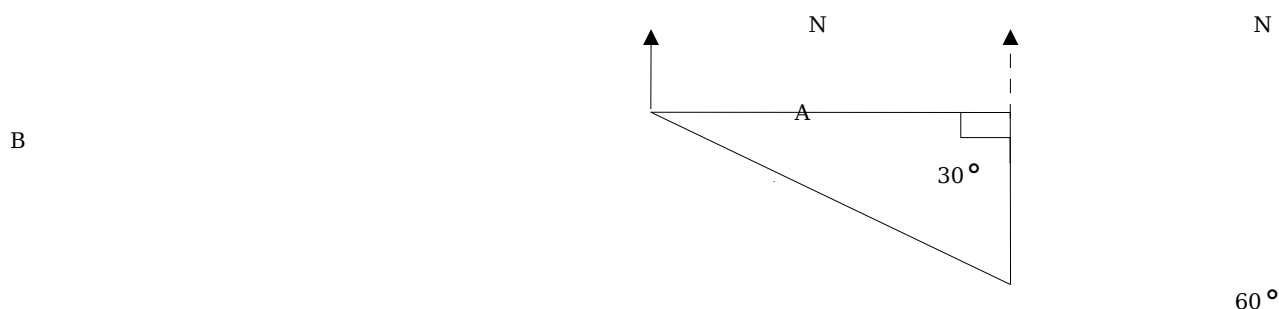
Find $\angle ACB$

$$\angle ABC + \angle BAC + \angle ACB = 180^\circ \quad (\text{angles in a triangle})$$

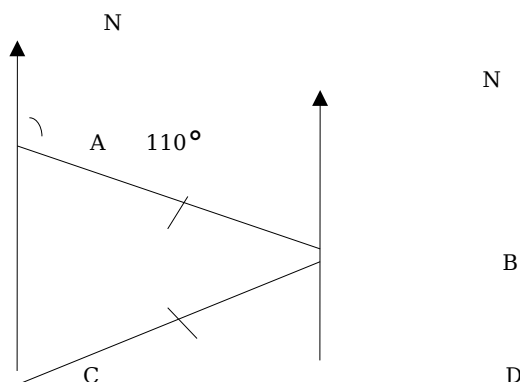
$$90^\circ + 30^\circ + \angle ACB = 180^\circ \quad \text{Therefore, the bearing of A from C} = 360^\circ - 60^\circ$$

$$\angle ACB = 180^\circ - 120^\circ = 300^\circ$$

$$\angle ACB = 60^\circ$$



8).



In the diagram above, C is due south of A, $AB = BC$ and the bearing of B from A is 110° . Find the bearing of C from B.

Solution

$\angle BAC = \angle ACB = 70^\circ$ (Base angles on an isosceles triangle)

$\angle ACB = \angle CBD = 70^\circ$

$\therefore$ the bearing of C from B

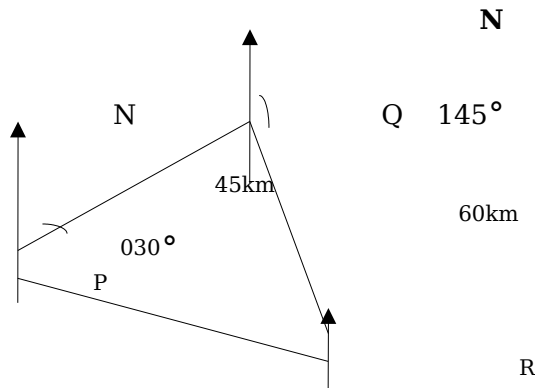
$\angle 180^\circ + 70^\circ$

$\angle 250^\circ$

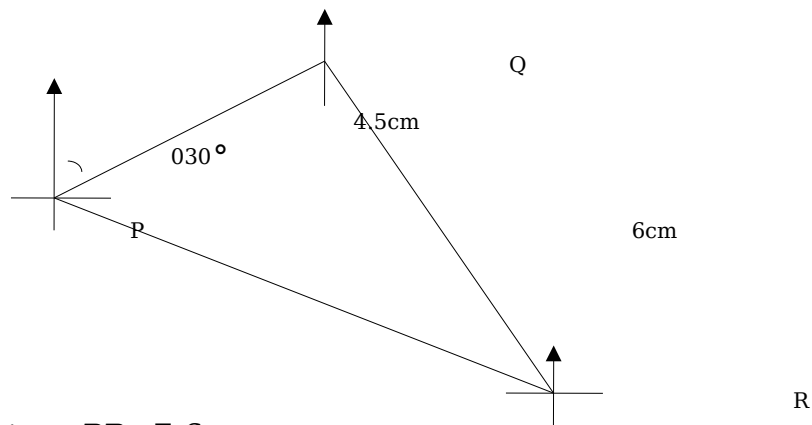
9). Three towns P, Q and R are such that Q is 45 km from P on a bearing of 145° . Make an accurate scale drawing to show the positions of P, Q and R. From the scale drawing, find the distance and bearing of R from P.

Solution

Sketch



Accurate drawing:



From the drawing, $PR = 7.6 \text{ cm}$

$7.6 \times 10 = 76 \text{ km}$

The bearing of R from P is

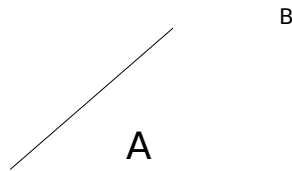
1. B. Show this information in a diagram in a diagram. SW is 225° from N, therefore: A is on a bearing of 225° .

SOLUTION

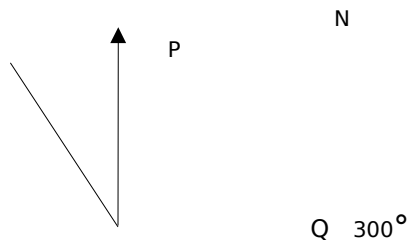
At B, draw a line showing N and measure an angle of 225° clockwise from N. A is south west of point

N





2. Figure 2 shows the bearing of P from Q.
Find the bearing of Q from P.



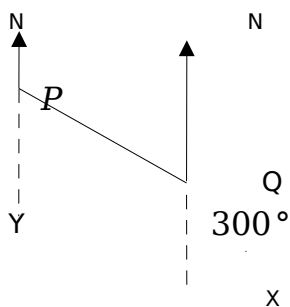
The bearing of Q from P is the angle between North and the direction

from Q to P as parallel to NX shown in figure 3,

It can be found in the following way:

At P, draw line NY.

Solution



$$\angle YPQ = NQP - \text{alternate angles}$$

$$\angle NQP = 360^\circ - 300^\circ = 60^\circ$$

$$\text{Hence } \angle YPQ = 60^\circ$$

$$\text{Therefore, } \angle NPQ = 180^\circ - 60^\circ = 120^\circ$$

The bearing of Q from P is 120° .

3. Points A, B, C and D lie on level ground.

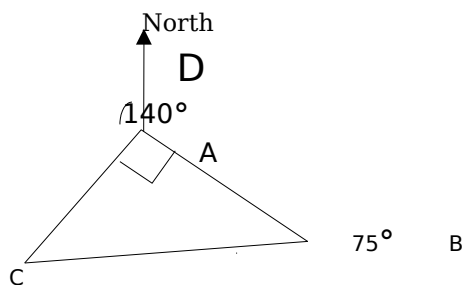
The point D is due North of A.

$\angle DAC = 140^\circ$, $\angle CAB = 90^\circ$ and $\angle ABC = 75^\circ$. Find the bearing of:

a) A from C

b) B from A

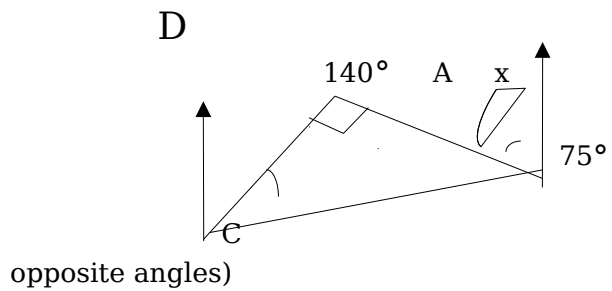
c) C from B



Solution



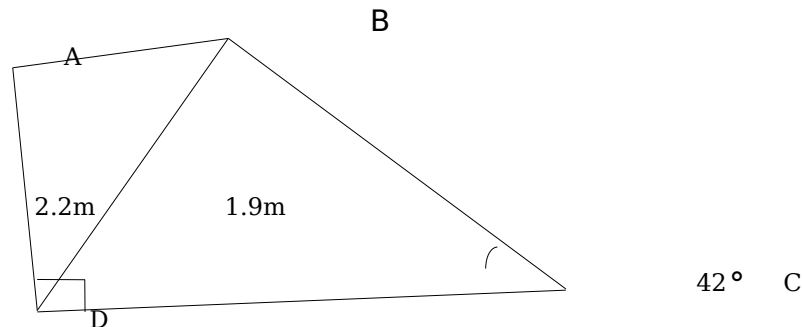
$$\text{a) } Y = 180^\circ - 140^\circ \text{ (interior opposite } \angle\text{s)}$$



$= 40^\circ$
 $\therefore$ Bearing of A from C is 040°
 b) $X = 360^\circ - (140^\circ + 90^\circ) = 130^\circ$
 B $\therefore$ Bearing B from A is 130°
 c) Bearing of C from B
 $\angle x + \angle z = 180^\circ$ (Interior
 $130^\circ + \angle z = 180^\circ$
 $\angle z = 50^\circ$
 $\therefore$ Bearing of C from B
 $= 360^\circ - (75^\circ + 50^\circ)$

C

4.



The diagram shows a frame work ABCD, $AD = 2.2\text{ m}$

$BD = 1.9\text{ m}$ and $\angle BCD = 45^\circ$. $\angle ADC = 90^\circ$

Calculate i) $\angle ADB$ ii) BC

b) A vertical flagpole, 18m high, stands on horizontal ground, Calculate the angle of elevation of the top of the flagpole from a point, on the ground, 25m from its base.

Solutions

a) i) $\angle ADB$,

$$\cos \angle ADB = \frac{BD}{AD} = \frac{1.9}{2.2}$$

$$\angle ADB = \cos^{-1} \frac{1.9}{2.2}$$

$$= 30.27^\circ$$

$$= 30.3^\circ (1 \text{ d.p.})$$

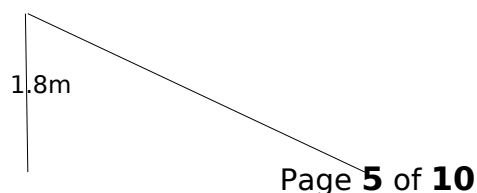
ii) $\angle BDC$,

$$\sin 42^\circ = \frac{BD}{BC} = \frac{1.9}{BC}$$

$$BC = 2.839$$

$$= 2.84\text{ m} (3 \text{ s.f.})$$

b)



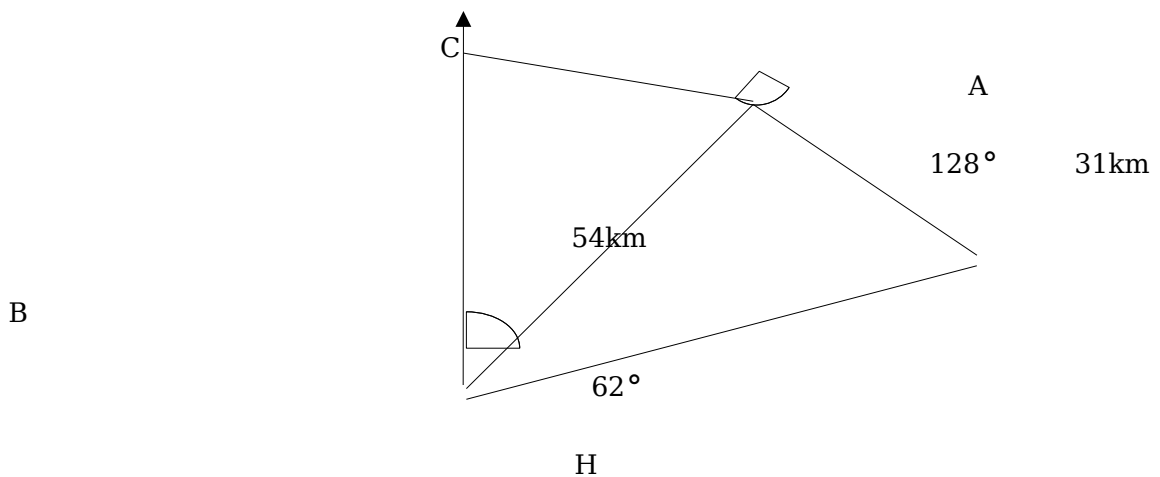
$$\tan Q = \frac{18}{25}$$

$$Q = 35.8^\circ (1 d.p)$$

$\therefore$ $\angle$ of elevation is 35.8° .

5. The diagram shows the position of a harbour, H, and three islands A, B and C.

C is due North of H.



The bearing of A from H is 062° and $\hat{H}AB = 128^\circ$ $HA = 54\text{km}$ and $AB = 31\text{ km}$.

- Calculate the distance HB
- Find the bearing of B from A
- The bearing of A from C is 133° . Calculate the distance AC.

Solution

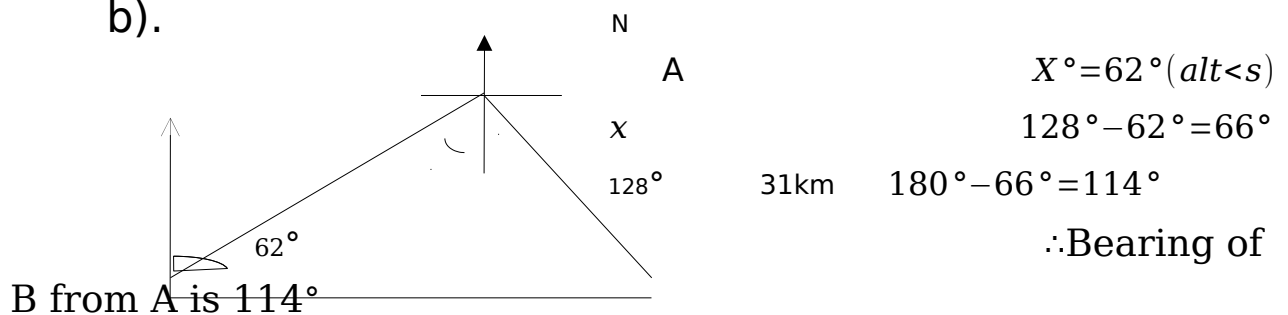
- Using Cosine Rule

$$HB = 54 + 31 - 2(54)(31)\cos 128$$

$$\hat{=} 77.059$$

$$\hat{=} 77.1\text{m} (3 s.f)$$

-



$$X^\circ = 62^\circ (\text{alt} < s)$$

$$128^\circ - 62^\circ = 66^\circ$$

$$180^\circ - 66^\circ = 114^\circ$$

$\therefore$ Bearing of

B

c). $\angle HCA = 180^\circ - 133^\circ$

Using Sine Rule;

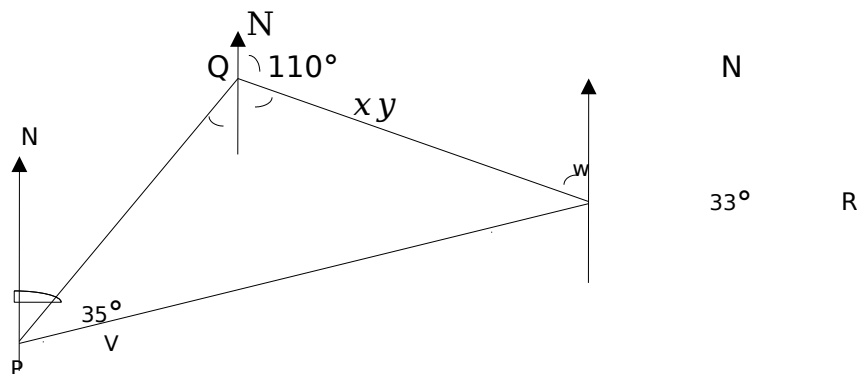
$$\frac{\sin 47^\circ}{54} = \frac{\sin 62^\circ}{AC}$$

$$AC = \frac{54 \sin 62^\circ}{\sin 47^\circ}$$

$$\approx 65.19$$

$$\approx 65.2 \text{ m (3 s.f.)}$$

1. The diagram below shows three points P, Q and R on the map. Given that the bearing of Q from P is 035° , the bearing R from Q is 110° and $\angle QRP = 33^\circ$



Find:

- the bearing of P from Q
- the bearing of Q from R
- the bearing of P from R
- the bearing of R from P

Solution:

a) P from Q

$$X = 35^\circ \text{ (alternate angles)}$$

$$Y = 180^\circ - 110^\circ$$

$$Y = 70^\circ$$

$$\begin{aligned} \text{The bearing of P from Q} &= X + Y + 110^\circ \\ &= 35^\circ + 70^\circ + 110^\circ \\ &= 215^\circ \end{aligned}$$

b) Q from R

$$110^\circ + W + 180^\circ \text{ (interior angles)}$$

$$W = 180^\circ - 110^\circ$$

$$W = 70^\circ$$

$$\begin{aligned}\text{The bearing of Q from R} &= 360^\circ - 70^\circ \\ &= 290^\circ\end{aligned}$$

c) P from R

$$\begin{aligned}360^\circ - (70^\circ + 33^\circ) &\text{ since } W = 70 \\ &= 257^\circ\end{aligned}$$

$\therefore$ The bearing of P from R is 257°

d) R from P

$$V = 180^\circ - (x + y + 33) \text{ (interior angles)}$$

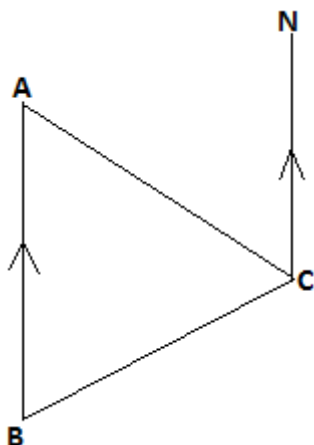
$$V = 180^\circ - (35^\circ + 70^\circ + 33^\circ)$$

$$V = 180^\circ - 138^\circ = 42^\circ$$

$\therefore$ The bearing of R from P is $42^\circ + 35^\circ = 077^\circ$

PRACTICE QUESTIONS:

(1) The diagram below shows an equilateral triangle **ABC**. **A** is due North of **B** and **CN** is parallel to **BA**.



Find (a) $\angle BCN$,
(b) the bearing of **C** from **A**.

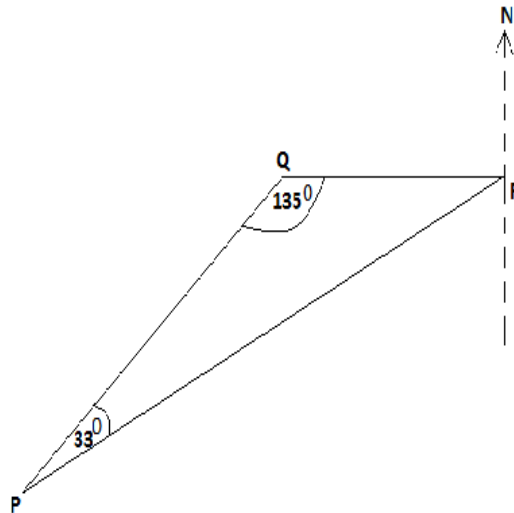
Answer: (a)

.....

(b)

.....

(2) The diagram below shows triangle PQR in which R is due east of Q, angle PQR = 135° and angle QPR = 33° .



Calculate (a) angle PRQ,
 (b) the bearing of P from R.

Answer: (a)

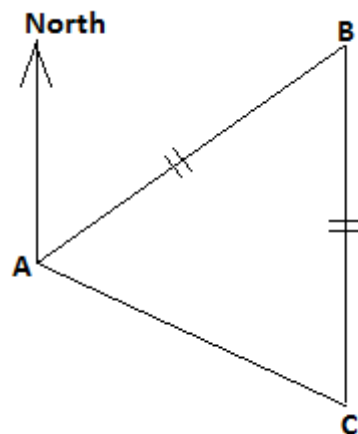
.....

(b)

.....

(3) The bearing of a point **B** from **A** is 129° . What is the bearing of A from B?

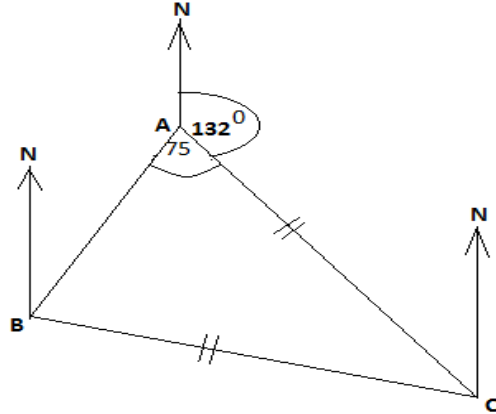
(4) The bearing of B from A is 072° .



(a) Find the bearing of A from B.

(b) C is due South of B and $BA = BC$. Find the bearing of A from C.

(5) A, B and C are three towns. C is equidistant from A and B. The bearing of C from A is 132° and angle $BAC = 75^\circ$.



Find

- (a)** (i) the acute angle ACB,
(ii) the reflex angle ACB,
- (b)** the bearing of A from C,
- (c)** the bearing of A from B.

ANSWERS

- (1)** (a) angle $BCN = 120^\circ$, (b) bearing of C from A = 120°
- (2)** (a) 12° , (b) bearing of P from R = 256°
- (3)** bearing of A from B = 309°
- (4)** (a) bearing of A from B = 252° (b) bearing of A from C = 306°
- (5)** (a) (i) angle $ACB = 30^\circ$
(ii) the reflex angle $ACB = 330^\circ$
(c) bearing of A from C = 312°
(d) bearing of A from B = 27°