Hwa Chong Institution 华侨中学
Mathematics (SMTP)

Name: Wm Rm Hao (27) Class: 3I1 Date: 30th Aug

MA304.4.1 – Bearings

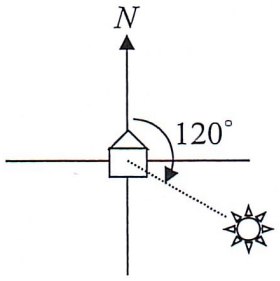
At the end of this unit, you should be able to

- **understand and find bearings of a point from another**
- **solve problems involving bearings**

Long in the past, sailors and explorers had begun using compasses to navigate through seas and lands. While the compass contains a needle which points to the magnetic north pole, locations are often determined by the angle which the line of sight is with respect to the north. It is typically written in 3-digit form, ranging from 000° to 360°. This angle is known as the **bearing**.

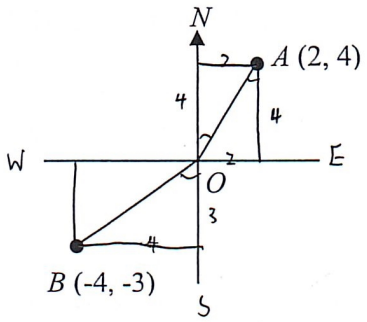
An object which is due east is said to have a bearing of 090°. Similarly, an object which is due south is said to have a bearing of 180° and one which is due west has a bearing of 270°.

E1. The object ☼ is at a bearing of 120° from ⌂.



As you can see, bearings are measured in a clockwise direction from the North line, and hence the method of measurement is different from how angles are measured in trigonometry, which you had learnt earlier.

E2. Find the bearings of the following.



(a) A from O

Let the bearing be x.

$\tan(x) = \frac{2}{4}$

$x = \tan^{-1}\left(\frac{2}{4}\right)^\circ$

$= 026.6^\circ$ (1 d.p.)

The bearing is 026.6°.

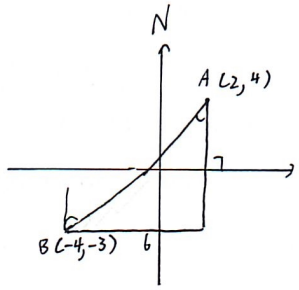
(b) B from O

Let the bearing be x.

$x = 180^\circ + \tan^{-1}\left(\frac{4}{3}\right)^\circ$

$= 233.1^\circ$ (1 d.p.)

The bearing is 233.1°.



(c) B from A

Let the bearing be x.

$x = \tan^{-1}\left(\frac{6}{7}\right)^\circ + 180^\circ$

$= 220.6^\circ$ (1 d.p.)

The bearing is 220.6°.

(d) O from A

Let the bearing be x.

$x = \tan^{-1}\left(\frac{2}{4}\right)^\circ + 180^\circ$

$= 206.6^\circ$ (1 d.p.)

The bearing is 206.6°.

(e) A from B

Let the bearing be x.

$x = \tan^{-1}\left(\frac{6}{7}\right)^\circ$

$= 040.6^\circ$ (1 d.p.)

The bearing is 040.6°.

What do you notice about the answers of (a) and (d)? What about (c) and (e)?

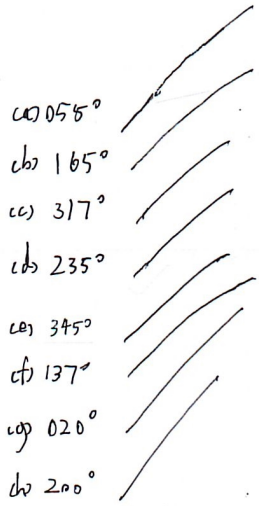
Given two points A and B,

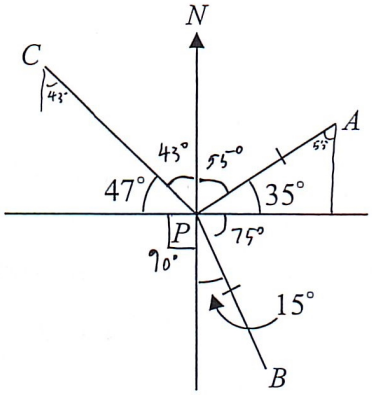
bearing of B from A = bearing of A from B + 180° (mod 360°)

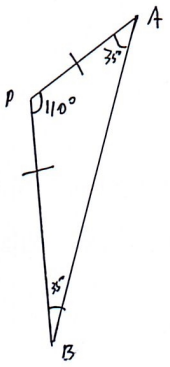
P1. The figure shows the positions of P, A, B and C. Determine the bearing of

(a) A from P (b) B from P (c) C from P (d) P from A

(e) P from B (f) P from C (g) A from B (h) B from A







P2. Three points R, S and T are on level ground such that S is due east of R. The bearing of R from T is 060° and the bearing of S from T is 074°. If the distance between S and T is 14 cm, calculate the distance of S from R. Find also the area of the triangle formed by the three points.

Let the y-intercept of a horizontal line passing through RTS be Y.

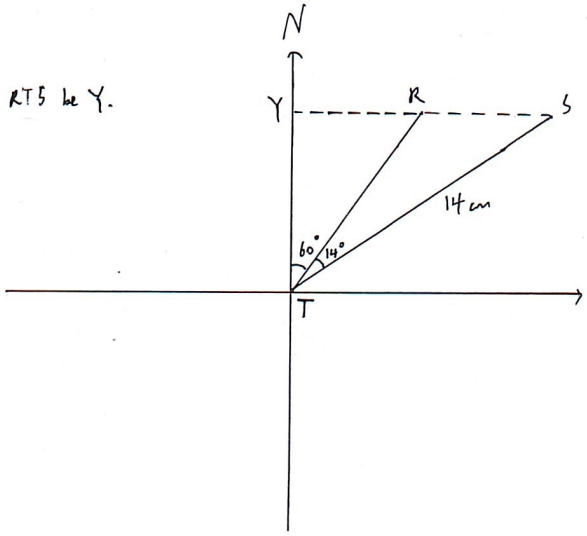
$YT = 14\cos(74^\circ)$ cm

$RS = (14\sin(74^\circ) - 14\cos(74^\circ)\tan(60^\circ))$ cm

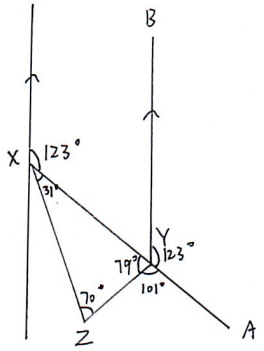
$= 6.77$ cm (3 s.f.)

Area of $\Delta RST = \frac{1}{2}(RS)(14\cos(74^\circ))$ cm^2

$= 13.1$ cm^2 (3 s.f.)



P3. X, Y and Z are three points on level ground. Given that the bearing of Y from X is 123°, $\angle ZXY = 31^\circ$ and $\angle XYZ = 79^\circ$, calculate the possible bearings of Z from Y.



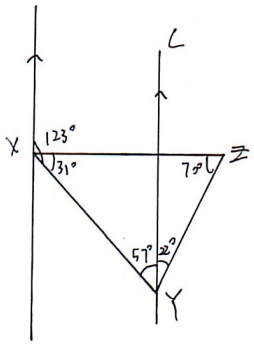
$\angle AYZ = 180^\circ - 71^\circ$

$= 101^\circ$

Bearing = reflex $\angle BYZ$

$= 123^\circ + 101^\circ$

$= 224^\circ$



Bearing = $\angle CYZ$

$= 79^\circ - 57^\circ$

$= 022^\circ$