Merit+ Trigonometry Practice #1

1. Find $x$

2. A rescue helicopter has to fly to a concert to treat someone in acute distress from too much of something undesirable.

Air control steer the helicopter to avoid the town centre, so get them to fly 4 kilometres at bearing 045, then 6 kilometres at bearing 300.

How far from the helicopter’s starting point is the concert?

3. Bill sails 10 kilometres out from home on a bearing of 040.

He then gets into trouble, and decides to make for the nearest shore.

There is a headland which is 7 kilometres from his home on a bearing of 060.

What bearing must he take from his current position to head directly towards the headland (dotted line)?

4. Find $\angle AOC$

The circle has a radius of 5 cm.

AB is 8 cm.

AB and AC are tangents to the circle.
1. Find $x$

\[ r = \cos 37^\circ \times 8.3 = 6.6287 \]

The bottom angle is 44°

(\(\Delta\) interior angles add to 180°)

\[ l = \cos 44^\circ \times 7.2 = 5.1792 \]

\[ x = l + r \]

\[ x = 11.8 \]

2. Air control steer the helicopter to avoid the town centre, so get them to fly 4 kilometres at bearing 045, then 6 kilometres at bearing 300.

How far from the helicopter’s starting point is the concert?

The two sections must be divided into N/S and E/W components

The triangles are shown: bearing 300 is 60° from N anti-clockwise

Total North = $a + c = \cos 45^\circ \times 4 + \cos 60^\circ \times 6 = 5.8284$

Total East = $d – b = \sin 60^\circ \times 6 – \sin 45^\circ \times 4 = 2.3677$

Distance overall is dotted line = $\sqrt{5.8284^2 – 2.3677^2} = 6.29$ km

3. Bill sails 10 kilometres out from home on a bearing of 040.

A headland is 7 kilometres from his home on a bearing of 060.

What bearing must he take from his current position to head directly towards the headland (dotted line)?

10 kms at bearing 040 can be made into a triangle with a N component and a E component – shown to right.

N part = $\cos 40^\circ \times 10 = 7.6604$, E part = $\sin 40^\circ \times 10 = 6.4279$

Doing the same with the 7 km at 060

N part = $\cos 60^\circ \times 7 = 3.5$, E part = $\sin 60^\circ \times 7 = 6.0622$

So needs to sail $7.6604 – 3.5 = 4.1604$ S and $6.4279 – 6.0622 = 0.3657$ W

\[ \theta = \tan^{-1} \left( \frac{0.3657}{4.1604} \right) = 5.023^\circ \]. Bearing = $180^\circ + \theta = 185.0$

4. Find $\angle AOC$

The circle has a radius of 5 cm. B is 8 cm.

AB and AC are tangents to the circle

$\angle OAB$ is 90° (tangent to radius)

So we can use right angle trig

\[ z = \tan^{-1} \left( \frac{8}{5} \right) = 57.99^\circ \]

$\angle AOC = 2z$ (by symmetry)  $\angle AOC = 115.99$