

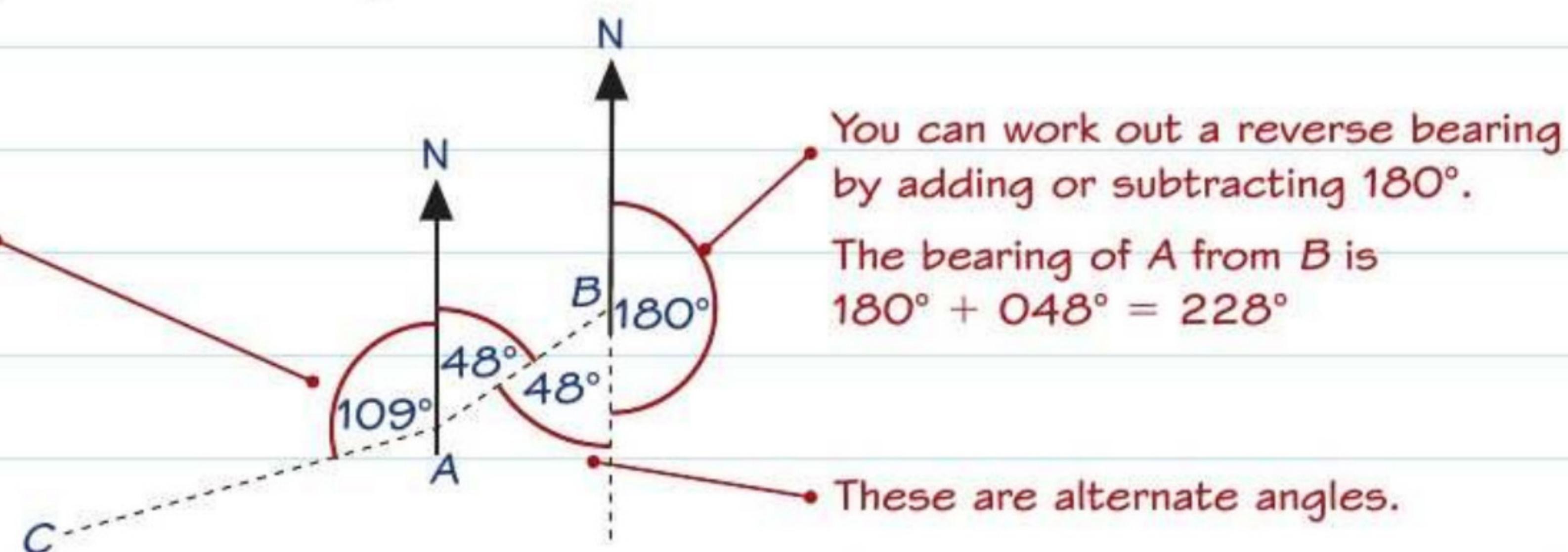
Bearings

Bearings are measured **clockwise** from **north**.

Bearings always have **three figures**, so you need to add zeros if the angle is less than 100°. For instance, in this diagram the bearing of **B** from **A** is 048°.

You can measure a bearing bigger than 180° by measuring this angle and subtracting it from 360°.

The bearing of **C** from **A** is $360^\circ - 109^\circ = 251^\circ$

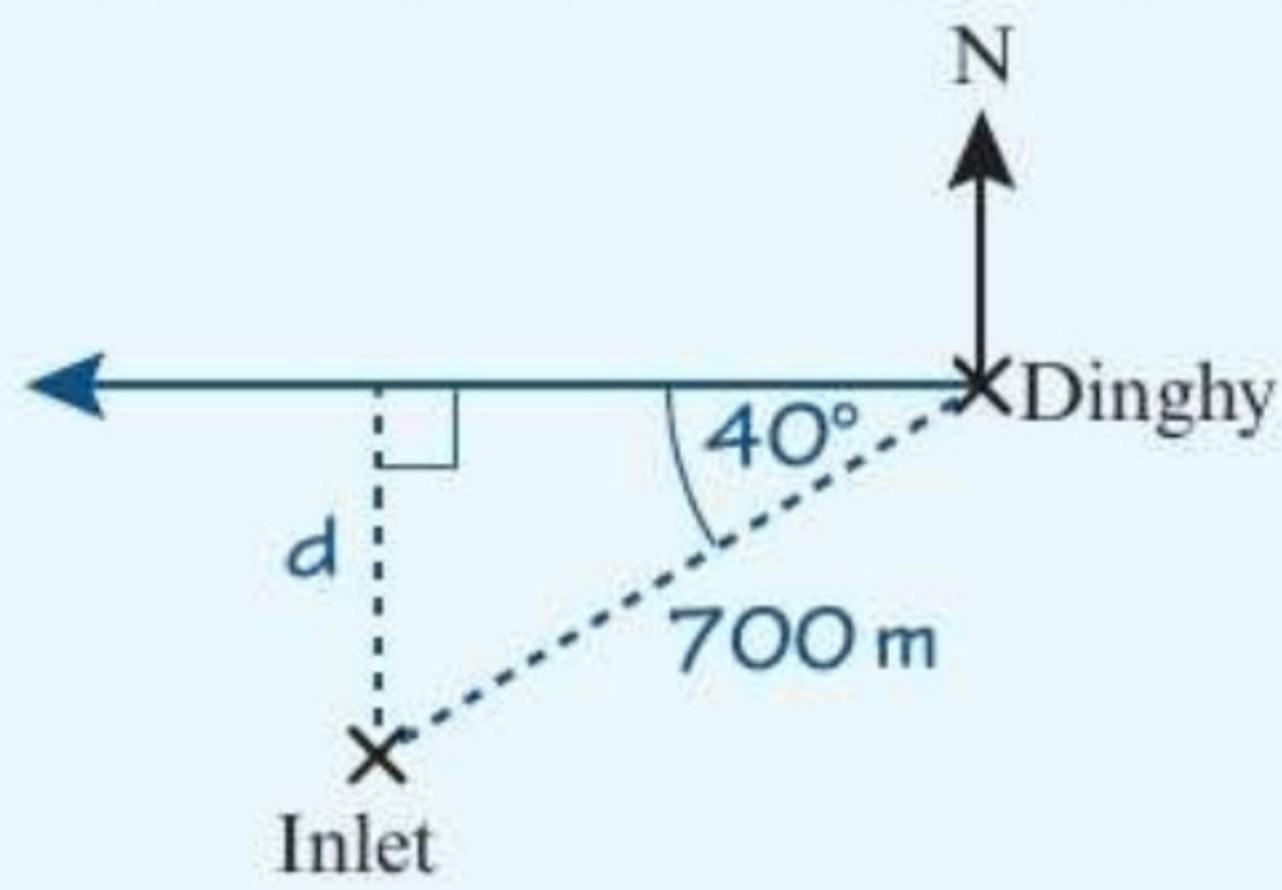


You can work out a reverse bearing by adding or subtracting 180°. The bearing of **A** from **B** is $180^\circ + 048^\circ = 228^\circ$

Worked example

Target grade 5

The diagram shows the location of a sailing dinghy on a reservoir. The reservoir has a water inlet that is 700 m from the dinghy on a bearing of 230°.



Everything in blue is part of the answer.

(a) Write down the bearing of the dinghy from the water inlet. (1 mark)

$$230 - 180 = 50$$

Bearing of dinghy from inlet is 050°.

Boats are not allowed within 400 m of the water inlet. The dinghy sails due west.

(b) Show by calculation that the boat will not pass within 400 m of the water inlet. (4 marks)

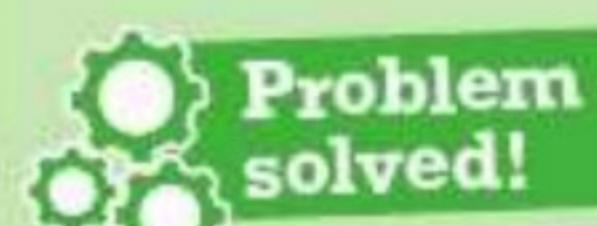
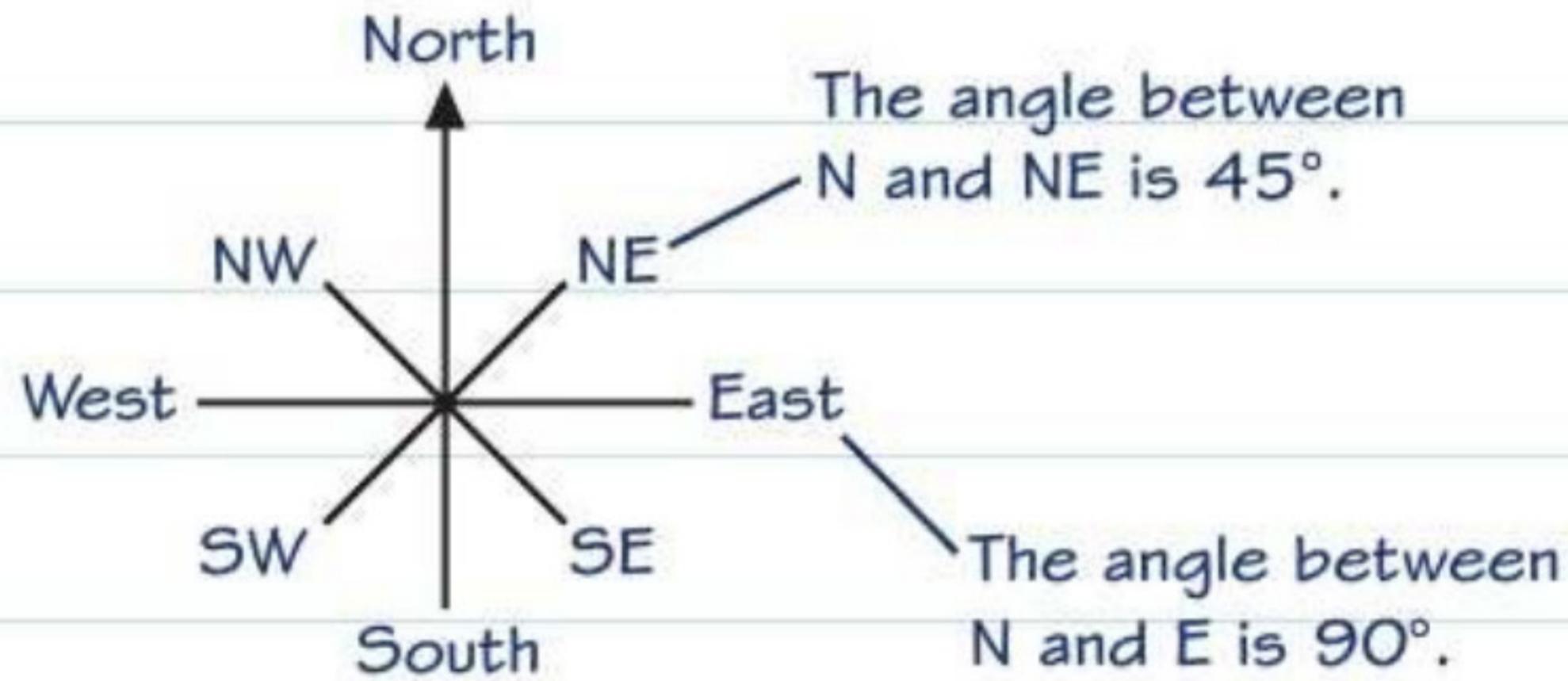
$$\sin x^\circ = \frac{\text{opp}}{\text{hyp}}$$

$$\sin 40^\circ = \frac{d}{700} \text{ so } d = 700 \times \sin 40^\circ = 449.951\ldots \text{ m}$$

$d > 400 \text{ m}$ so the boat does not come within 400 m of the inlet.

Compass points

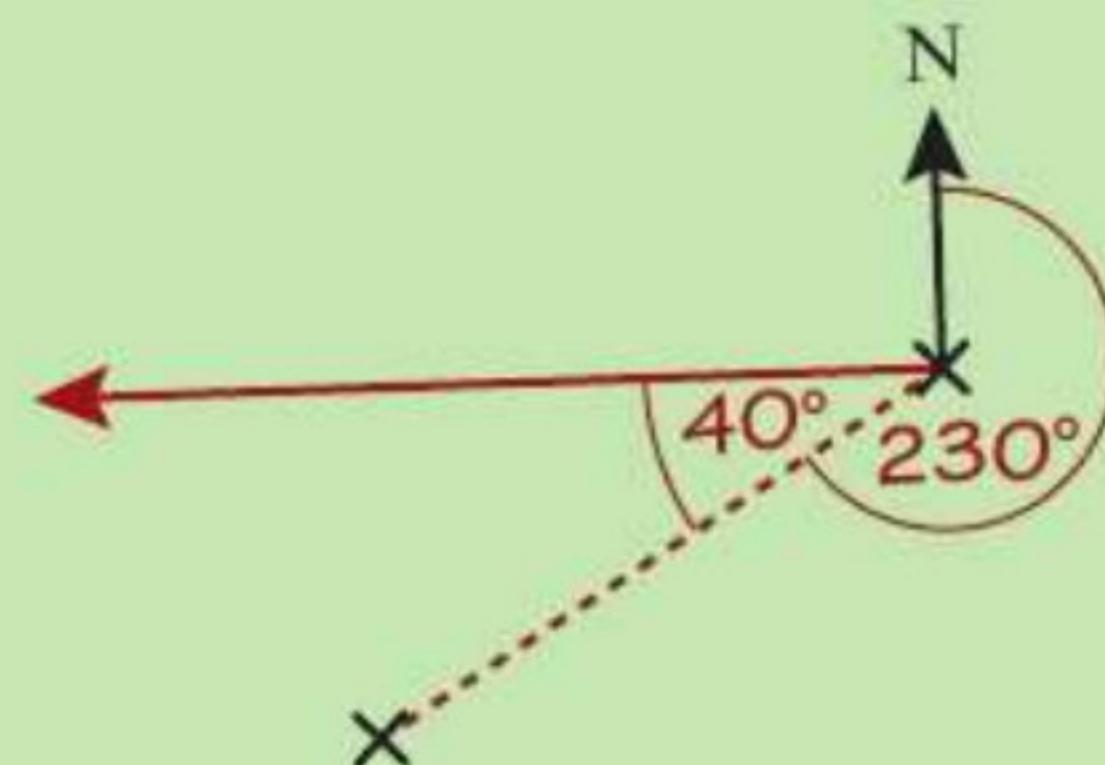
You need to know the **compass points**:



You might have to combine a bearings question with **trigonometry** calculations.

You should always use a clear, well-labelled sketch to make sure you don't make any mistakes.

The shortest distance from a point to a line is a **perpendicular** line. Sketch this on the diagram and write down any lengths or angles you know. You can find the 40° angle by working out $270^\circ - 230^\circ$.

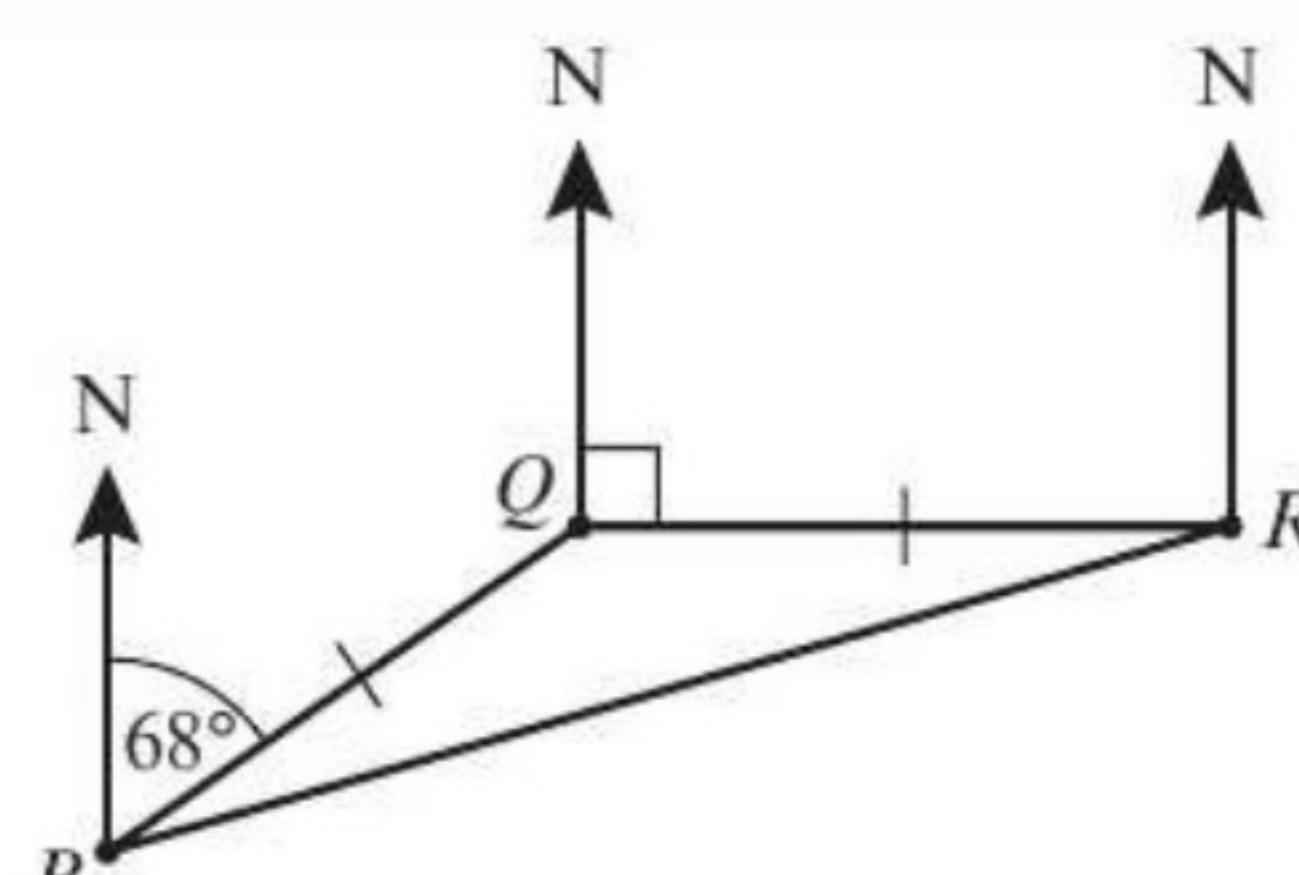


Now try this

The diagram shows three orienteering markers, **P**, **Q** and **R**.

R is due east of **Q**. The bearing of **Q** from **P** is 068°. $PQ = QR$.

(a) Work out the bearing of **P** from **Q**. (2 marks)
(b) Work out the bearing of **R** from **P**. (3 marks)



Target grade 4

Worked solution video



Scale drawings and maps

This is a **scale drawing** of the Queen Mary II cruise ship.

Scale = 1 : 500



You can use the scale to work out the length of the actual ship.

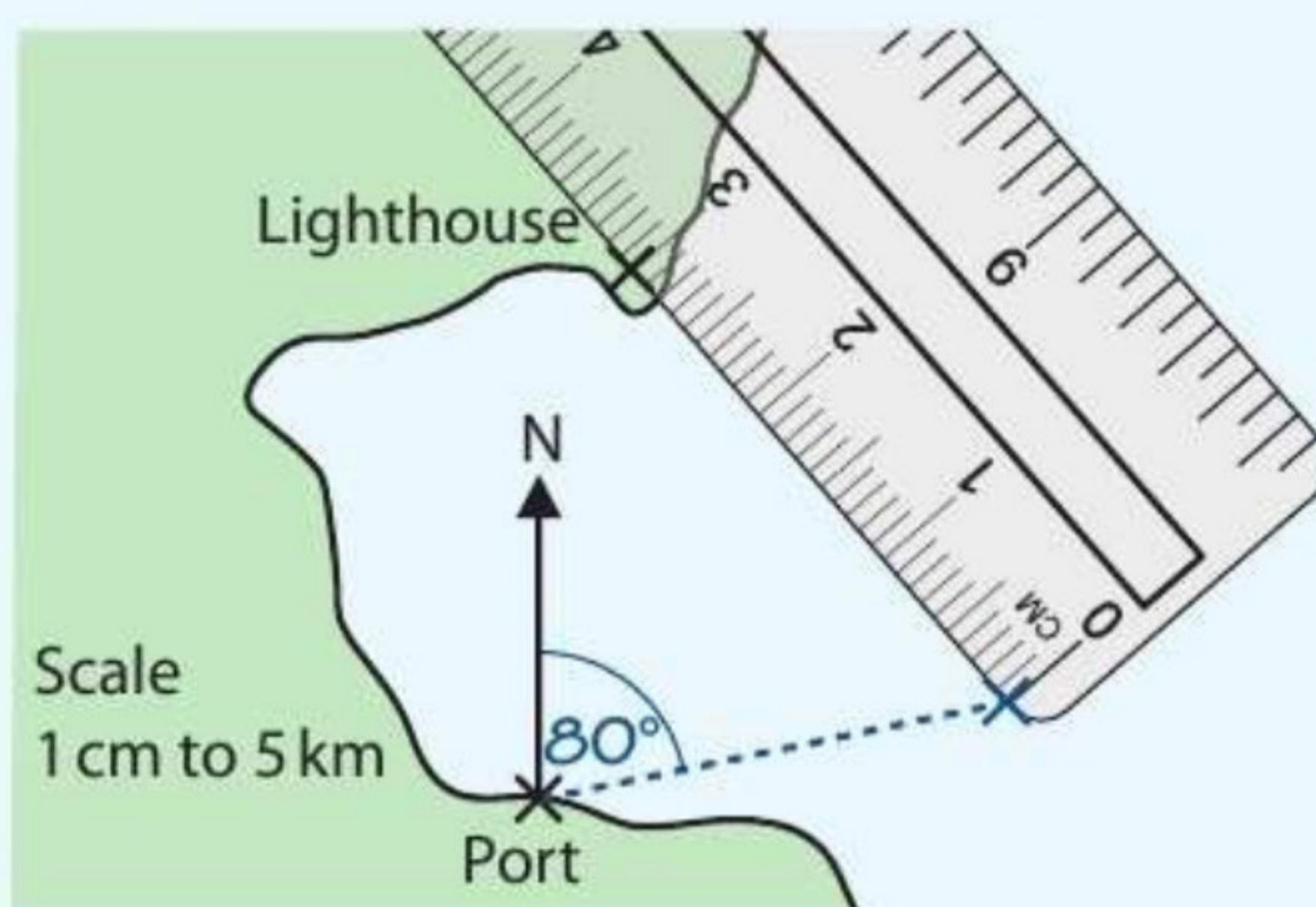
$$69 \times 500 = 34500$$

The ship is 34 500 cm or 345 m long.

Worked example

Target grade 4

The diagram shows a scale drawing of a port and a lighthouse.



A boat sails 12 km from the port in a straight line on a bearing of 080°.

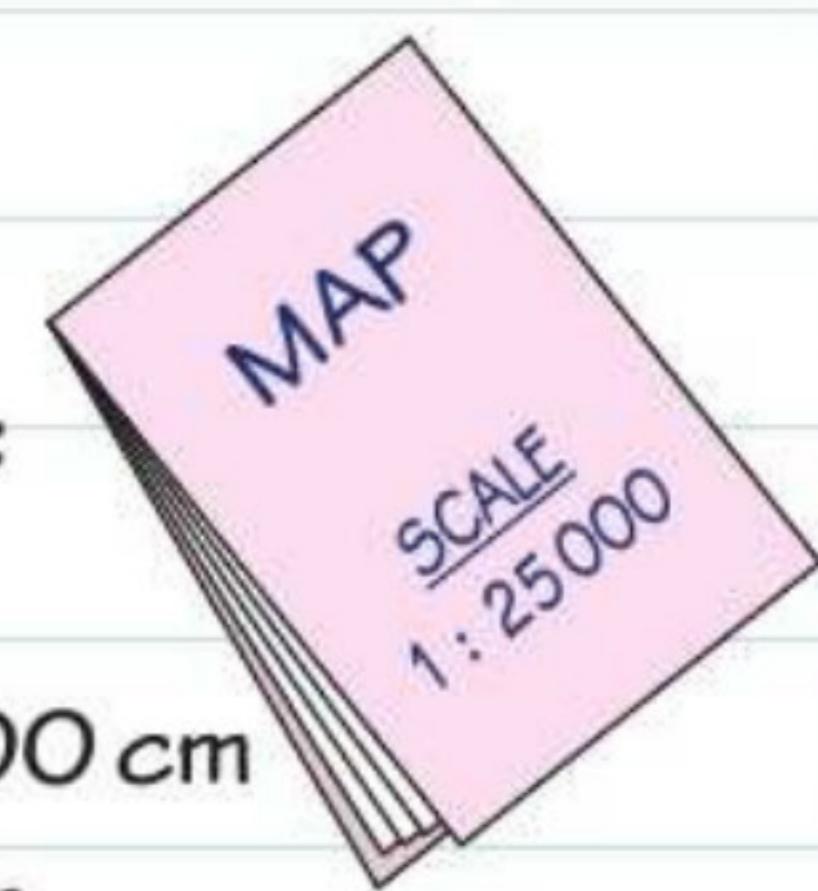
How far away is the boat from the lighthouse?
Give your answer in km. (3 mark)

15 km

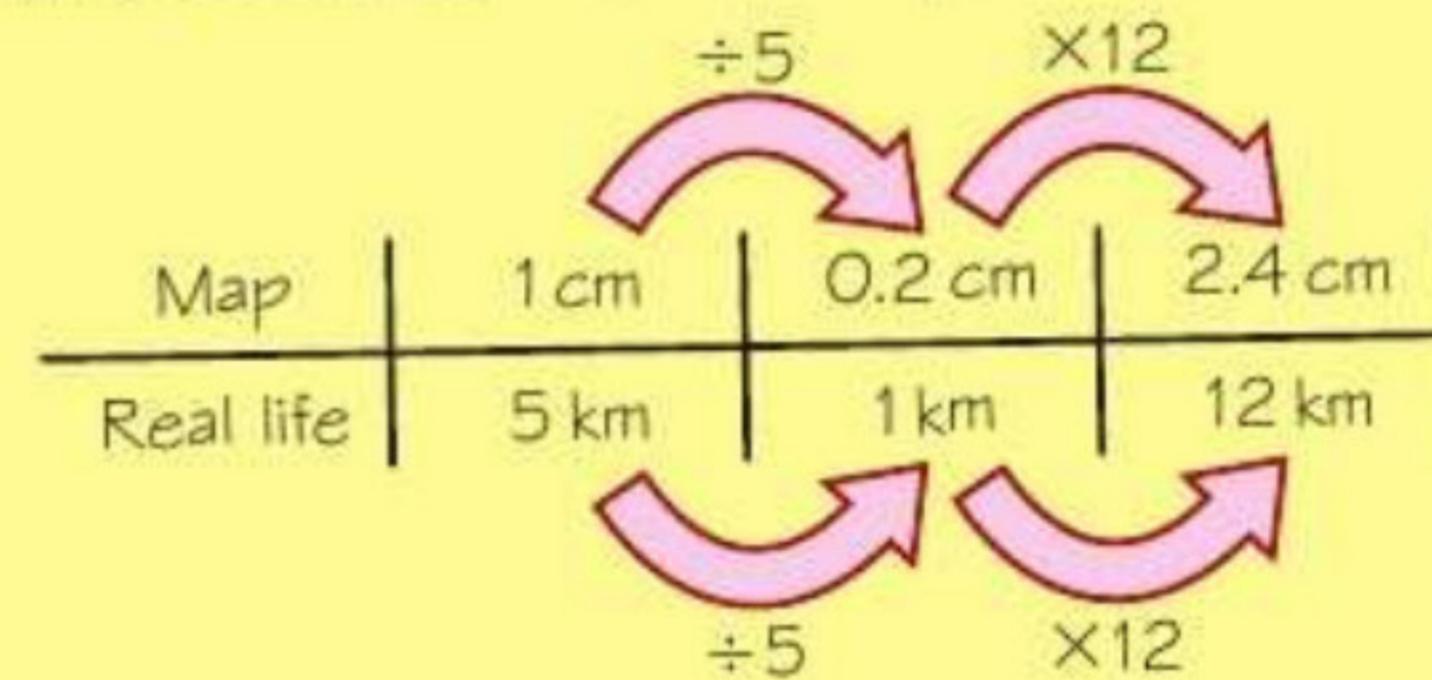
Map scales

Map scales can be written in different ways:

- 1 to 25 000
- 1 cm represents 25 000 cm
- 1 cm represents 250 m
- 4 cm represent 1 km.



First, you need to mark the position of the boat accurately on the scale drawing. Then work out how far the boat is from the port.



Now place the centre of your protractor on the port with the zero line pointing north. Put a dot at 80°. Line up your ruler between the port and the dot. Draw a cross 2.4 cm from the port.

Examiners' report

3 cm on the drawing represents 15 km in real life. Make sure you have a millimetre ruler **and** a protractor with you in the exam.

Real students have struggled with questions like this in recent exams – **be prepared!**



Now try this

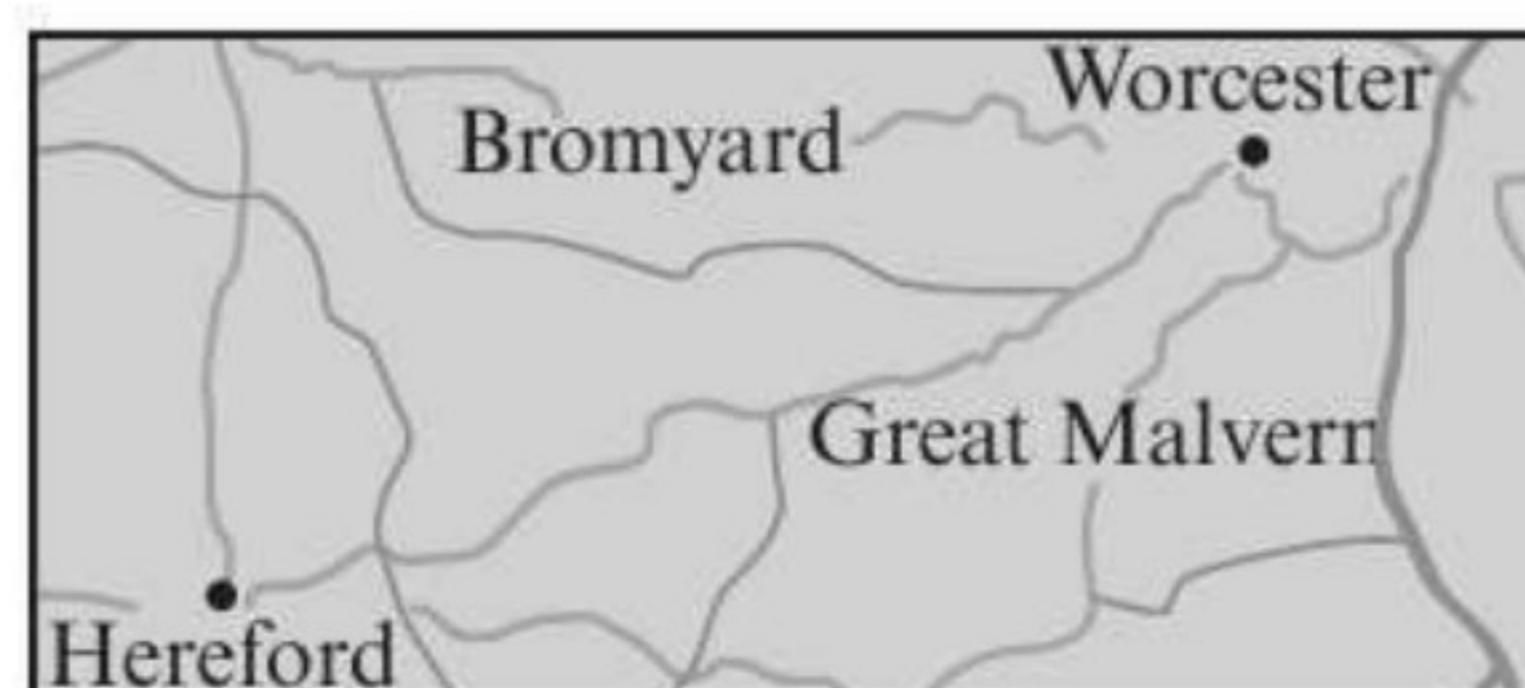
Target grade 4

1 A map has a scale of 1:40 000. A park is shown on the map as a rectangle measuring 5.8 cm by 4.4 cm.

Calculate the area of the park in real life. Give your answer in km² to 3 significant figures. (3 marks)

2 The map shows Hereford and Worcester. The scale of the map is 1:1 000 000. Work out the distance between Hereford and Worcester in kilometres.

(3 marks)



You will need to measure the distance.