

Scale Drawings and Maps

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (1 mark)

A map has a scale of 1 : 20 000

Circle the real distance that 1 cm on the map represents.

Options: 20 m, 200 m, 2 km, 20 km

1 : 20 000 means 1 cm on the map represents 20 000 cm in real life.

Change to metres ($\div 100$): $20\,000 \div 100 = 200$ m

Answer: 200 m

Tip: The 20 000 is in **centimetres**. A common mistake is to divide by 1000 (giving 20 m) instead of by 100.

2 (2 marks)

On a map with a scale of 1 : 40 000 a footpath is 9.5 cm long.

How long is the real footpath?

Give your answer in kilometres.

The scale 1 : 40 000 means real lengths are 40 000 times the map lengths.

$9.5 \times 40\,000 = 380\,000$ cm

Change to metres ($\div 100$): $380\,000 \div 100 = 3800$ m

Change to kilometres ($\div 1000$): $3800 \div 1000 = 3.8$ km

Answer: 3.8 km

Tip: 380 000 is in **centimetres**. To get km you must divide by 100 000 altogether. Answers like 38 km or 380 km mean a conversion step is missing.

Marks: 1 mark for $9.5 \times 40\,000$ (or 380 000). 1 mark for 3.8.

3 (1 mark)

A scale drawing uses a scale of 1 cm to 5 m.

A wall is 32 m long.

How long is the wall on the scale drawing?

Each 1 cm on the drawing stands for 5 m.

So divide the real length by 5:

$$32 \div 5 = 6.4 \text{ cm}$$

Answer: 6.4 cm

4 (2 marks)

The line AB is part of a scale drawing.

The scale is 1 cm represents 20 m.



Work out the real distance from A to B .

Measure AB with a ruler: $AB = 7$ cm

Each cm represents 20 m.

$$7 \times 20 = 140 \text{ m}$$

Any answer from 138 to 142 is fine.

Answer: 140 m

Marks: 1 mark for measuring 7 cm. 1 mark for 140 (anything from 138 to 142).

5 (2 marks)

A real bus is 10.8 m long.

A toy model of the bus is made using a scale of 1 : 36

Work out the length of the toy bus in centimetres.

Change the real length to cm: $10.8 \text{ m} = 1080 \text{ cm}$

The scale 1 : 36 means the real bus is 36 times as long as the toy.

So divide by 36: $1080 \div 36 = 30 \text{ cm}$

Answer: 30 cm

Tip: The toy is smaller than the real bus, so divide by 36. $10.8 \div 36 = 0.3$ is in metres, so change it to cm (or change 10.8 m to cm first).

Marks: 1 mark for $1080 \div 36$ (or $10.8 \div 36 = 0.3$). 1 mark for 30.

6 (3 marks)

Two towns are 36 km apart.

On a map, the towns are 9 cm apart.

Write the scale of the map in the form 1 : n

Both distances must be in the same units, so change 36 km to cm.

$36 \text{ km} = 36\,000 \text{ m} = 3\,600\,000 \text{ cm}$

So 9 cm on the map represents 3 600 000 cm.

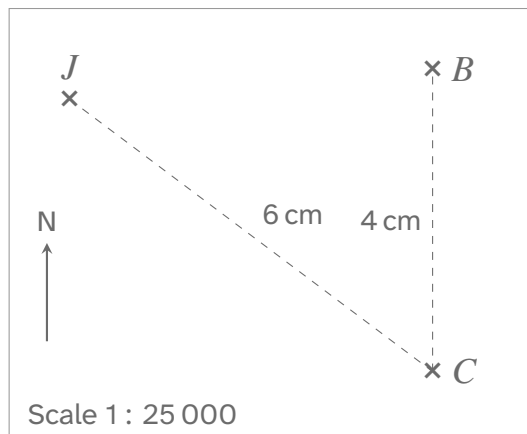
1 cm represents $3\,600\,000 \div 9 = 400\,000$ cm

Answer: 1 : 400 000

Marks: 1 mark for changing 36 km to cm. 1 mark for dividing by 9. 1 mark for 1 : 400 000.

7 (4 marks)

Here is a map of a lake. It shows a jetty, *J*, and a café, *C*.



- (a) Work out the real distance from the jetty to the café.
Give your answer in kilometres.

Measure *JC* with a ruler: *JC* = 6 cm

Scale 1 : 25 000, so the real distance is $6 \times 25\,000 = 150\,000$ cm

$150\,000$ cm = 1500 m = 1.5 km

Any answer from 1.475 to 1.525 is fine.

Answer: 1.5 km

Tip: Measure from the centre of one cross to the centre of the other, and write your measurement down. Then remember $100\,000$ cm = 1 km.

Marks: 1 mark for measuring 6 cm (5.9 to 6.1) and multiplying by 25 000. 1 mark for 1.5.

- (b) A boathouse, *B*, is 1 km due North of the café.
Mark *B* on the map.

1 km = $100\,000$ cm

Distance on the map: $100\,000 \div 25\,000 = 4\text{ cm}$

North is straight up the page (the same way as the North arrow).

So mark *B* 4 cm directly above *C*.

Answer: *B* marked 4 cm directly above *C*

Marks: 1 mark for *B* 4 cm from *C*. 1 mark for *B* due North of *C*.

8 (2 marks)

A garden is a rectangle 12 m long and 8 m wide.

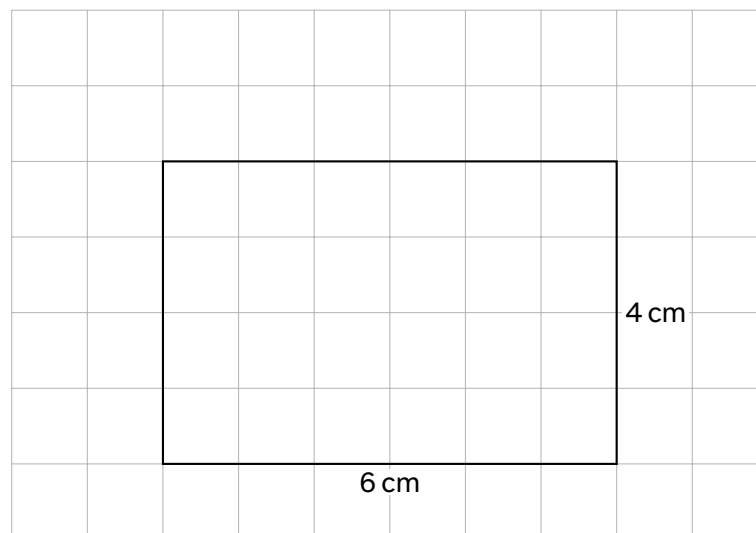
On the centimetre grid, draw an accurate scale drawing of the garden.
Use a scale of 1 cm to 2 m.

Each 1 cm on the drawing stands for 2 m, so divide each real length by 2.

Length: $12 \div 2 = 6\text{ cm}$

Width: $8 \div 2 = 4\text{ cm}$

Draw a rectangle 6 cm by 4 cm:



Answer: Rectangle 6 cm by 4 cm

Marks: 1 mark for one correct side. 1 mark for a fully correct rectangle.

9 (3 marks)

A scale drawing of a park shows two paths.

On the drawing, the path from the gate to the pond is 4.5 cm long and the path from the pond to the café is 3.5 cm long.

The two real paths have a total length of 240 metres.

Work out the real length of the path from the gate to the pond.

On the drawing, the two paths have a total length of $4.5 + 3.5 = 8$ cm.

So 8 cm represents 240 m.

1 cm represents $240 \div 8 = 30$ m

Gate to pond: $4.5 \times 30 = 135$ m

Answer: 135 metres

Tip: The 240 m goes with the **total** length on the drawing (8 cm), not with 4.5 cm on its own.

Marks: 1 mark for $4.5 + 3.5 (= 8)$. 1 mark for $240 \div 8 (= 30)$. 1 mark for 135.

10 (3 marks)

A map has a scale of 1 : 2000

On the map, a field is a rectangle 4 cm by 3 cm.

Work out the real area of the field.

Give your answer in m^2

Scale 1 : 2000, so each real length is 2000 times the map length.

Length: $4 \times 2000 = 8000$ cm = 80 m

Width: $3 \times 2000 = 6000$ cm = 60 m

Area = $80 \times 60 = 4800$ m^2

Answer: 4800 m^2

Tip: Change each length to real metres first, then find the area. Do not work out the map area (12 cm^2) and multiply it by 2000.

Marks: 1 mark for 80 or 60. 1 mark for 80×60 . 1 mark for 4800.

11 (4 marks)

A plan of a sports hall is drawn to a scale of 1 : 200
On the plan, the floor of the hall is a rectangle 16 cm by 9 cm.

The floor is going to be varnished.
One tin of varnish covers 60 m^2
How many tins of varnish are needed?
You must show your working.

Scale 1 : 200, so multiply each length on the plan by 200.

Real length: $16 \times 200 = 3200 \text{ cm} = 32 \text{ m}$

Real width: $9 \times 200 = 1800 \text{ cm} = 18 \text{ m}$

Floor area = $32 \times 18 = 576 \text{ m}^2$

Tins: $576 \div 60 = 9.6$

9 tins would not be enough, so round up.

Answer: 10 tins

Tip: Change the plan lengths to real lengths **before** finding the area. The plan area (144 cm^2) times 200 is wrong. Always round the number of tins **up**.

Marks: 1 mark for 32 or 18. 1 mark for $32 \times 18 (= 576)$. 1 mark for $576 \div 60$. 1 mark for 10.
