

Area and Volume Unit Conversions

Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • 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)

Change 6 m^2 into cm^2

1 m^2 is a square 100 cm by 100 cm.

So $1 \text{ m}^2 = 100 \times 100 = 10\,000 \text{ cm}^2$

$6 \times 10\,000 = 60\,000$

Answer: 60 000

Tip: 1 m^2 is $10\,000 \text{ cm}^2$, not 100 or 1000. For areas, multiply by 100 twice.

2 (1 mark)

Change 2.5 litres into cm^3

1 litre = 1000 cm^3

$2.5 \times 1000 = 2500$

Answer: 2500

3 (1 mark)

Change $25\,000 \text{ cm}^3$ into m^3

$1 \text{ m}^3 = 100 \times 100 \times 100 = 1\,000\,000 \text{ cm}^3$

cm^3 to m^3 : divide by $1\,000\,000$.

$$25\,000 \div 1\,000\,000 = 0.025$$

Answer: 0.025

Tip: For volumes, divide by 100 **three** times ($100^3 = 1\,000\,000$). Dividing by 100 or 1000 gives the wrong answer.

4 (3 marks)

A rectangle is 2.4 m long and 150 cm wide.

- (a) Work out the area of the rectangle.
Give your answer in m^2

Change the lengths to metres first.

$$150\text{ cm} = 150 \div 100 = 1.5\text{ m}$$

$$\text{Area} = 2.4 \times 1.5$$

$$= 3.6$$

Answer: 3.6

Marks: 1 mark for 2.4×1.5 (or 240×150). 1 mark for 3.6.

- (b) Theo says,
‘The area of the rectangle is 360 cm^2
because $3.6\text{ m}^2 \times 100 = 360\text{ cm}^2$,
Theo is wrong.
Explain why.

1 m^2 is a square 100 cm by 100 cm.

$$\text{So } 1\text{ m}^2 = 100 \times 100 = 10\,000\text{ cm}^2$$

He should multiply by 10 000, not 100.

$$3.6\text{ m}^2 = 3.6 \times 10\,000 = 36\,000\text{ cm}^2$$

Check with the lengths in cm: $240 \times 150 = 36\,000$ ✓

Answer: $1\text{ m}^2 = 10\,000\text{ cm}^2$, so the area is $36\,000\text{ cm}^2$

Tip: Multiplying by 100 only works for lengths. For areas the conversion is $100 \times 100 = 10\,000$.

5 (2 marks)

A cube has a volume of 0.008 m^3

Work out the length of one edge of the cube.

Give your answer in centimetres.

Volume of a cube = edge $\times$ edge $\times$ edge

$$\text{Edge} = \sqrt[3]{0.008} = 0.2\text{ m}$$

$$\text{Check: } 0.2 \times 0.2 \times 0.2 = 0.008 \quad \checkmark$$

$$0.2\text{ m} = 0.2 \times 100 = 20\text{ cm}$$

$$\text{Or: } 0.008\text{ m}^3 = 0.008 \times 1\,000\,000 = 8000\text{ cm}^3, \text{ and } \sqrt[3]{8000} = 20$$

Answer: 20

Marks: 1 mark for $\sqrt[3]{0.008} = 0.2$ or 8000 cm^3 . 1 mark for 20.

6 (4 marks)

A water trough for animals is in the shape of a cuboid.

The trough is 1.2 m long, 45 cm wide and 40 cm high.

The trough is empty.

Water flows into the trough at a rate of 9 litres per minute.

How many minutes does it take to fill the trough?

Change the lengths to the same unit: $1.2\text{ m} = 120\text{ cm}$

$$\text{Volume} = 120 \times 45 \times 40 = 216\,000\text{ cm}^3$$

$$1000\text{ cm}^3 = 1\text{ litre}$$

$$216\,000 \div 1000 = 216\text{ litres}$$

Time = $216 \div 9 = 24$ minutes

Answer: 24 minutes

Tip: Change 1.2 m into 120 cm before you multiply.

Marks: 1 mark for changing to the same units. 1 mark for the volume, 216 000 cm³. 1 mark for 216 litres. 1 mark for 24.

7 (4 marks)

Mia is going to paint a wall.

The wall is a rectangle 350 cm wide and 240 cm high.

She will paint 2 coats.

1 litre of paint covers 12 m²

Paint is sold in tins of 750 ml.

How many tins of paint does Mia need?

You must show all your working.

Change the lengths to metres: 3.5 m and 2.4 m.

Area of the wall = $3.5 \times 2.4 = 8.4$ m²

Two coats: $2 \times 8.4 = 16.8$ m²

Paint needed = $16.8 \div 12 = 1.4$ litres

1.4 litres = 1400 ml

$1400 \div 750 = 1.86 \dots$

1 tin is not enough, so she needs 2 tins.

Answer: 2 tins

Tip: You can only buy whole tins, so round 1.86 **up**. Remember the 2 coats.

Marks: 1 mark for 8.4. 1 mark for 16.8 and dividing by 12. 1 mark for dividing by 750 (or 0.75). 1 mark for 2 tins.

8 (4 marks)

Ffion is going to sow wildflower seed on a rectangular meadow 18 m by 12.5 m.
She needs 5 g of seed for each m^2
Wildflower seed is sold in packets of 0.25 kg.

How many packets of wildflower seed does Ffion need to buy?

$$\text{Area of the meadow} = 18 \times 12.5 = 225 \text{ m}^2$$

$$\text{Seed needed} = 225 \times 5 = 1125 \text{ g}$$

$$\text{Change to kg: } 1125 \div 1000 = 1.125 \text{ kg}$$

$$\text{Packets} = 1.125 \div 0.25 = 4.5$$

4 packets are not enough, so she needs 5 packets.

Answer: 5

Tip: Use the same units: change 1125 g into kg (or 0.25 kg into 250 g) before dividing. You can only buy whole packets, so round up.

Marks: 1 mark for 225. 1 mark for 1125. 1 mark for converting and dividing by 0.25. 1 mark for 5.

9 (4 marks)

Omar collects rainwater in a water butt.

The water butt is a cylinder with diameter 70 cm and height 110 cm.

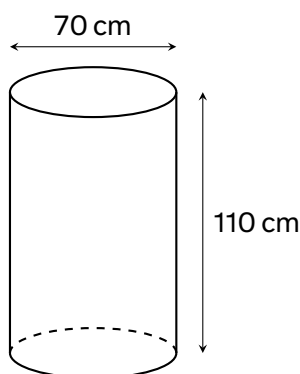


Diagram **NOT** accurately drawn

The water butt is full of rainwater.

Omar uses the water to fill a watering can.

The watering can holds 8 litres.

Omar says,

‘I can fill the watering can completely more than 50 times
from the full water butt.’

$$1 \text{ litre} = 1000 \text{ cm}^3$$

Is Omar correct?

You must show how you get your answer.

$$\text{Radius} = 70 \div 2 = 35 \text{ cm}$$

$$\text{Volume of a cylinder} = \pi r^2 h$$

$$\text{Volume} = \pi \times 35^2 \times 110 = 423\,330 \text{ cm}^3 \text{ (to the nearest cm}^3\text{)}$$

$$\text{In litres: } 423\,330 \div 1000 = 423.3 \text{ litres}$$

$$\text{Number of cans} = 423.3 \div 8 = 52.9 \dots$$

So Omar can fill the can completely 52 times.

52 is more than 50, so Omar is correct.

Answer: Yes: 423.3 litres fills the can 52 times

Tip: Use the radius (35 cm), not the diameter, in $\pi r^2 h$.

Marks: 1 mark for the volume of the cylinder. 1 mark for changing to litres. 1 mark for dividing by 8. 1 mark for “Yes” with correct figures.
