

Volume of Cuboids and Prisms

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 cuboid measures 5 cm by 3 cm by 2 cm.

Circle the volume of the cuboid.

Options: 10 cm³, 20 cm³, 30 cm³, 62 cm³

Volume of a cuboid = length × width × height

$$5 \times 3 \times 2 = 30$$

Answer: 30 cm³

Tip: Multiply the three lengths. Do not add them. (62 cm² is the surface area, not the volume.)

2 (1 mark)

A cube has a volume of 64 cm³

Work out the length of one edge of the cube.

All the edges of a cube are the same length.

So edge × edge × edge = 64

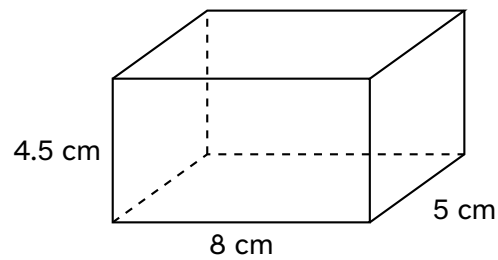
$$4 \times 4 \times 4 = 64$$

So the edge is $\sqrt[3]{64} = 4$ cm.

Answer: 4 cm

3 (2 marks)

Here is a cuboid.



Not drawn accurately

Work out the volume of the cuboid.

Volume = length $\times$ width $\times$ height

$$= 8 \times 5 \times 4.5$$

$$= 180$$

Answer: 180 cm³

Marks: 1 mark for $8 \times 5 \times 4.5$. 1 mark for 180.

4 (2 marks)

A prism has a cross-section with area 24 cm²

The prism is 15 cm long.

Work out the volume of the prism.

Volume of a prism = area of cross-section $\times$ length

$$= 24 \times 15$$

$$= 360$$

Answer: 360 cm³

Marks: 1 mark for 24×15 . 1 mark for 360.

5 (2 marks)

How many cubes of edge 2 cm fit exactly into a box 10 cm by 6 cm by 4 cm?

Work out how many cubes fit along each edge of the box.

Along the 10 cm edge: $10 \div 2 = 5$

Along the 6 cm edge: $6 \div 2 = 3$

Along the 4 cm edge: $4 \div 2 = 2$

Number of cubes = $5 \times 3 \times 2 = 30$

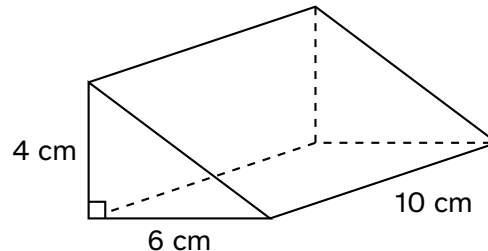
(Or: volume of box $\div$ volume of one cube = $240 \div 8 = 30$.)

Answer: 30

Marks: 1 mark for $5 \times 3 \times 2$ or $240 \div 8$. 1 mark for 30.

6 (3 marks)

The cross-section of this prism is a right-angled triangle.



Not drawn accurately

Work out the volume of the prism.

The cross-section is a triangle.

$$\text{Area of triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 6 \times 4 = 12 \text{ cm}^2$$

Volume = area of cross-section $\times$ length

$$= 12 \times 10 = 120$$

Answer: 120 cm^3

Tip: Do not forget the $\frac{1}{2}$ for the triangle. $6 \times 4 \times 10 = 240$ is the volume of a cuboid, which is twice as big.

Marks: 1 mark for the area of the triangle, 12. 1 mark for multiplying by 10. 1 mark for 120.

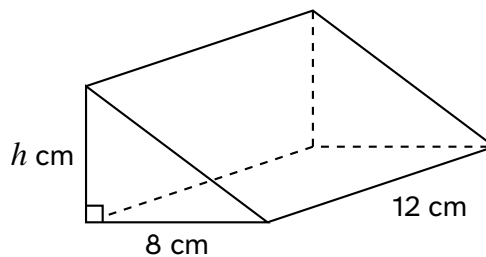
7 (3 marks)

A wooden doorstep is a prism.

Its cross-section is a right-angled triangle with base 8 cm and height h cm.

The length of the doorstep is 12 cm.

The volume of the doorstep is 240 cm^3



Not drawn accurately

Work out the value of h .

Volume = area of cross-section $\times$ length

So area of cross-section = $240 \div 12 = 20 \text{ cm}^2$

Area of the triangle = $\frac{1}{2} \times 8 \times h = 4h$

So $4h = 20$

$$h = 20 \div 4 = 5$$

Answer: $h = 5$

Tip: Remember the $\frac{1}{2}$ for the area of a triangle: $8 \times h \times 12 = 240$ gives $h = 2.5$, which is wrong.
Check your answer: $\frac{1}{2} \times 8 \times 5 \times 12 = 240$.

Marks: 1 mark for $240 \div 12$ (or $\frac{1}{2} \times 8 \times h \times 12$). 1 mark for $4h = 20$ (or $48h = 240$). 1 mark for 5.

8 (4 marks)

A garden pond is in the shape of a cuboid.

The pond is 2 m long and 1.5 m wide.

The water in the pond is 40 cm deep.

A pump removes water from the pond at 25 litres per minute.

1 litre = 1000 cm³

How long will it take to empty the pond?

Change the lengths to cm: 2 m = 200 cm and 1.5 m = 150 cm

Volume of water = $200 \times 150 \times 40$

= 1 200 000 cm³

Change to litres (divide by 1000): $1\,200\,000 \div 1000 = 1200$ litres

The pump removes 25 litres per minute:

$1200 \div 25 = 48$ minutes

Answer: 48 minutes

Tip: Use the depth of the water (40 cm), not the depth of the pond. Make all the lengths the same unit before you multiply.

Marks: 1 mark for $200 \times 150 \times 40$ (or $2 \times 1.5 \times 0.4 = 1.2 \text{ m}^3$). 1 mark for 1200 litres. 1 mark for dividing by 25. 1 mark for 48.

9 (2 marks)

A cube has the same volume as a cuboid measuring 3 cm by 9 cm by 8 cm.
Work out the length of one edge of the cube.

$$\text{Volume of the cuboid} = 3 \times 9 \times 8 = 216 \text{ cm}^3$$

So the cube has volume 216 cm^3

$$\text{Edge of the cube} = \sqrt[3]{216}$$

$$6 \times 6 \times 6 = 216, \text{ so the edge is } 6 \text{ cm.}$$

Answer: 6 cm

Tip: The edge of the cube is the **cube** root of 216, not $216 \div 3 = 72$ or $\sqrt{216}$.

Marks: 1 mark for 216. 1 mark for 6.

10 (6 marks)

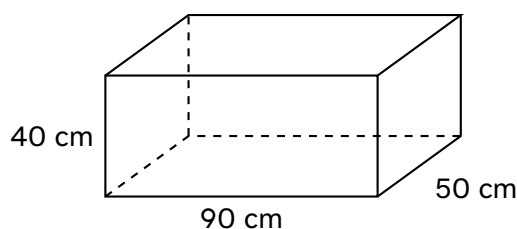
Jo collects rainwater in a tank.

The tank is a cuboid and it is full of water.

Each evening Jo uses 5 full watering cans of water on her garden.

Each watering can holds 8 litres.

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



Not drawn accurately

- (a) For how many evenings can Jo water her garden before the tank runs out?
You must show your working.

$$\text{Volume of the tank} = 90 \times 50 \times 40$$

$$= 180\,000 \text{ cm}^3$$

$$\text{Change to litres: } 180\,000 \div 1000 = 180 \text{ litres}$$

$$\text{Water used each evening} = 5 \times 8 = 40 \text{ litres}$$

$$180 \div 40 = 4.5$$

She can only use full evenings, so 4 evenings.

Answer: 4 evenings

Tip: $180 \div 40 = 4.5$, but half an evening is not enough for 5 full cans. The answer is 4, not 4.5 or 5.

Marks: 1 mark for $90 \times 50 \times 40$. 1 mark for dividing by 1000. 1 mark for $5 \times 8 = 40$. 1 mark for $180 \div 40$. 1 mark for 4.

- (b) How many more litres of water would need to be in the tank at the start for Jo to water her garden for one more evening?

After 4 evenings she has used $4 \times 40 = 160$ litres.

There are $180 - 160 = 20$ litres left.

She needs 40 litres for another evening.

So she needs $40 - 20 = 20$ more litres.

Answer: 20 litres