

Area and Volume Unit Conversions

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)

How many square centimetres are there in 1 square metre?

Circle your answer.

Options: 10, 100, 1000, 10 000

1 m² is a square 1 m by 1 m.

That is a square 100 cm by 100 cm.

Area = 100 × 100 = 10 000 cm²

Answer: 10 000

Tip: 100 is the most common wrong answer. For areas you multiply by 100 **twice**, because a square has two dimensions.

2 (1 mark)

Which of these is equal to 42 000 cm²?

Circle your answer.

Options: 0.42 m², 4.2 m², 42 m², 420 m²

1 m² = 100 × 100 = 10 000 cm²

cm² to m²: divide by 10 000.

$$42\,000 \div 10\,000 = 4.2$$

Answer: 4.2 m^2

Tip: 420 m^2 comes from dividing by 100. For areas, divide by 100 twice.

3 (1 mark)

How many cubic centimetres are there in 1 litre?

Circle your answer.

Options: 10, 100, 1000, 10 000

A litre fills a cube 10 cm by 10 cm by 10 cm.

$$10 \times 10 \times 10 = 1000\text{ cm}^3$$

Answer: 1000

4 (3 marks)

(a) Convert 5 m^2 to cm^2

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

$$5 \times 10\,000 = 50\,000$$

Answer: $50\,000\text{ cm}^2$

(b) Convert 3 cm^2 to mm^2

$$1\text{ cm} = 10\text{ mm}$$

$$\text{So } 1\text{ cm}^2 = 10 \times 10 = 100\text{ mm}^2$$

$$3 \times 100 = 300$$

Answer: 300 mm^2

Tip: 1 cm^2 is 100 mm^2 , not 10 mm^2 . Square the length conversion: $10^2 = 100$.

- (c) Convert $45\,000\text{ cm}^2$ to m^2

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

cm^2 to m^2 : divide by 10 000.

$$45\,000 \div 10\,000 = 4.5$$

Answer: 4.5 m^2

Tip: Dividing by 100 is a very common mistake. For cm^2 to m^2 divide by $100 \times 100 = 10\,000$.

5 (2 marks)

- (a) Convert 2 m^3 to cm^3

1 m^3 is a cube 100 cm by 100 cm by 100 cm.

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

$$2 \times 1\,000\,000 = 2\,000\,000$$

Answer: $2\,000\,000\text{ cm}^3$

Tip: For volumes, multiply by the length conversion **three** times: $100^3 = 1\,000\,000$.

- (b) Convert 7500 cm^3 to litres.

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

$$7500 \div 1000 = 7.5$$

Answer: 7.5 litres

6 (3 marks)

A rectangle is 2.5 m long and 80 cm wide.

- (a) Work out the area of the rectangle in m^2

Change the lengths to the same unit first.

$$80\text{ cm} = 80 \div 100 = 0.8\text{ m}$$

$$\text{Area} = 2.5 \times 0.8$$

$$= 2$$

Answer: 2 m^2

Tip: Change the lengths into metres **before** you multiply. It is much easier than converting an area afterwards.

Marks: 1 mark for changing to the same units, e.g. 0.8 m. 1 mark for 2.

(b) Write your answer to part (a) in cm^2

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

$$2 \times 10\,000 = 20\,000$$

Check with the lengths in cm: $250 \times 80 = 20\,000$ ✓

Answer: $20\,000 \text{ cm}^2$

7 (1 mark)

Ed says,

‘ $1 \text{ m} = 100 \text{ cm}$, so $1 \text{ m}^2 = 100 \text{ cm}^2$ ’

Is Ed correct? Tick a box.

Give a reason for your answer.

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

Its area is $100 \times 100 = 10\,000 \text{ cm}^2$, not 100 cm^2 .

You have to multiply by 100 twice.

Answer: No, $1 \text{ m}^2 = 10\,000 \text{ cm}^2$

8 (3 marks)

A fish tank is a cuboid.

It is 60 cm long, 30 cm wide and 40 cm high.

How many litres of water does the tank hold when it is full?

Volume of a cuboid = length $\times$ width $\times$ height

$$60 \times 30 \times 40 = 72\,000 \text{ cm}^3$$

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

$$72\,000 \div 1000 = 72$$

Answer: 72 litres

Tip: Multiply the three lengths for the volume. Do not add them.

Marks: 1 mark for $60 \times 30 \times 40$. 1 mark for dividing by 1000. 1 mark for 72.

9 (3 marks)

A rectangular room is 450 cm long and 380 cm wide.

Carpet costs £14 per m^2

The whole floor is covered with carpet.

Work out the cost of the carpet.

The price is per m^2 , so change the lengths to metres.

$$450 \text{ cm} = 4.5 \text{ m and } 380 \text{ cm} = 3.8 \text{ m}$$

$$\text{Area} = 4.5 \times 3.8 = 17.1 \text{ m}^2$$

$$\text{Cost} = 17.1 \times 14$$

$$= \text{£}239.40$$

Answer: £239.40

Marks: 1 mark for changing to metres. 1 mark for 17.1×14 . 1 mark for £239.40.

10 (2 marks)

Square tiles have side length 20 cm.

How many tiles are needed to cover 1 m^2 ?

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

Tiles along each side: $100 \div 20 = 5$

Number of tiles = $5 \times 5 = 25$

Or: $10\,000 \text{ cm}^2 \div (20 \times 20) \text{ cm}^2 = 10\,000 \div 400 = 25$

Answer: 25

Marks: 1 mark for $100 \div 20$ or $10\,000 \div 400$. 1 mark for 25.

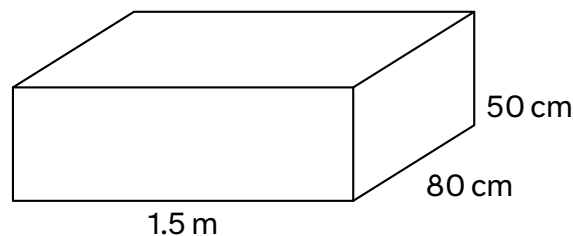
11 (5 marks)

Jess has an empty garden pond in the shape of a cuboid.

She fills it with water from a hose.

The water flows at 15 litres per minute.

She starts filling the pond at 9:40 am.



Not drawn accurately

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

At what time will the pond be full?

Change the lengths to the same unit: $1.5 \text{ m} = 150 \text{ cm}$

Volume of the pond = $150 \times 80 \times 50 = 600\,000 \text{ cm}^3$

In litres: $600\,000 \div 1000 = 600 \text{ litres}$

Time to fill = $600 \div 15 = 40 \text{ minutes}$

$$9:40 \text{ am} + 40 \text{ minutes} = 10:20 \text{ am}$$

Answer: 10:20 am

Tip: Change 1.5 m into 150 cm **before** you multiply. Using $1.5 \times 80 \times 50$ mixes metres and centimetres.

Marks: 1 mark for changing to the same units. 1 mark for $150 \times 80 \times 50$. 1 mark for dividing by 1000. 1 mark for dividing by 15. 1 mark for 10:20 am.
