

Exercise walk-through

E5.1

Units of measure

IGCSE Mathematics

You must be able to

- convert between mm, cm, m and km, and between g, kg and tonnes
- convert areas and volumes, squaring or cubing the length conversion factor
- convert between cm^3 , millilitres and litres

1

The method

Method — Square the factor for an area, cube it for a volume

length	area	volume
1 cm = 10 mm	$1 \text{ cm}^2 = 100 \text{ mm}^2$	$1 \text{ cm}^3 = 1000 \text{ mm}^3$
1 m = 100 cm	$1 \text{ m}^2 = 10\,000 \text{ cm}^2$	$1 \text{ m}^3 = 1\,000\,000 \text{ cm}^3$
1 km = 1000 m	$1 \text{ km}^2 = 1\,000\,000 \text{ m}^2$	

- **Capacity:** $1 \text{ cm}^3 = 1 \text{ ml}$, so 1 litre = 1000 cm^3 and $1 \text{ m}^3 = 1000$ litres.
- **Mass:** 1 kg = 1000 g and 1 tonne = 1000 kg.
- **The commonest error** is converting an area as if it were a length: $24\,000 \text{ cm}^2$ is 2.4 m^2 , not 240 m^2 .
- **Convert before calculating**, not after — mixing metres and centimetres inside one formula is the other common loss.

Method — Square the factor for an area, cube it for a volume

Answer shapes (marked by **method marks** — M1 for a correct method, A1 for the correct answer): the conversion line is a method mark in its own right, so write it out rather than doing it on the calculator.

Method — Square the factor for an area, cube it for a volume

center Answer shapes (marked by method marks — M1 for a correct method, A1 for the correct answer): the...



(to a smaller unit, multiply)

A ladder of metric units, each step a factor of ten

2

Practice

Practice 2.1 ■ 1 mark

Convert 3.5 m into centimetres.

Solution 2.1

Method: Square the factor for an area, cube it for a volume — p.4

Worked steps

■ 3.5×100

$= 350 \text{ cm}$

B1

Practice 2.2 ■ 2 marks

Convert $24\,000\text{ cm}^2$ into square metres.

Solution 2.2

Method: Square the factor for an area, cube it for a volume — p.4

Worked steps

■ $1 \text{ m}^2 = 100 \times 100 = 10\,000 \text{ cm}^2$, so divide by 10 000 M1

$$24\,000 \div 10\,000 = \mathbf{2.4 \text{ m}^2} \quad \text{A1}$$

Practice 2.3 ■ 1 mark

Convert 0.75 litres into cm^3 .

Solution 2.3

Method: Square the factor for an area, cube it for a volume — p.4

Worked steps

■ 1 litre = 1000 cm^3

$$0.75 \times 1000 = \mathbf{750 \text{ cm}^3}$$

B1

3

Exam-style

Exam-style 3.1 ■ 5 marks

A rectangle measures 2.4 m by 80 cm.

Exam-style 3.1 (a) ■ 3 marks

Find its area in square metres.

Solution 3.1 (a)

Method: Square the factor for an area, cube it for a volume — p.4

Worked steps

■ convert first: $80 \text{ cm} = 0.8 \text{ m}$ **M1**

■ area = 2.4×0.8 **M1**

$$= 1.92 \text{ m}^2$$

A1

Exam-style 3.1 (b) ■ 2 marks

Write that area in square centimetres.

Solution 3.1 (b)

Worked steps

- multiply by 10 000, because this is an AREA M1

$$1.92 \times 10\,000 = \mathbf{19\,200\,cm^2}$$

A1

Exam-style 3.2 ■ 3 marks

A tank holds 4.5 m^3 of water. Find this volume in litres.

Solution 3.2

Method: Square the factor for an area, cube it for a volume — p.4

Worked steps

■ $1 \text{ m}^3 = 1\,000\,000 \text{ cm}^3$, so $4.5 \text{ m}^3 = 4\,500\,000 \text{ cm}^3$ M1 M1

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

$$4\,500\,000 \div 1000 = \mathbf{4500} \text{ litres}$$

A1