

C5.1 Units of measure

Name: _____ Class: _____ Date: _____

Total: 20 marks

KEY WORDS area 面积 • length 长度 • volume 体积

Objective

Use units of measure to solve Core IGCSE Mathematics problems.

You must be able to:

- Convert lengths, areas and volumes using the correct powers
- Convert litres, millilitres and cubic units
- Use consistent units before counting containers

1 Key knowledge and worked examples

■ Key knowledge: Units of measure

Length scales by the unit conversion factor; area scales by its square and volume by its cube. $1\text{ m} = 100\text{ cm}$, so $1\text{ m}^2 = 10000\text{ cm}^2$ and $1\text{ m}^3 = 1000000\text{ cm}^3$. $1\text{ litre} = 1000\text{ ml} = 1000\text{ cm}^3$. Also $1\text{ kg} = 1000\text{ g}$ and $1\text{ km} = 1000\text{ m}$. Keep units attached.

■ Worked example: Units of measure

length: $\times 100$ area: $\times 10000$ volume:
 $\times 1000000$

Convert 0.035 m^2 to cm^2 .

- There are two length dimensions: $A = 0.035(100)^2 = 350\text{ cm}^2$.
- Convert 0.004 m^3 to litres: $V = 0.004 \times 1000 = 4\text{ litres}$.
- Convert 3750 g to kg : $m = 3750/1000 = 3.75\text{ kg}$.

■ Method check

Area conversion squares the length factor and volume conversion cubes it. A factor for length cannot be reused unchanged for area or volume.

2 Practice

2.1 Convert 2.7 km to m and 48 mm to cm. [2]

2.2 Convert 6200 cm² to m². [2]

2.3 Convert 0.008 m³ to cm³. [2]

2.4 Convert 2.35 litres to ml and 4500 g to kg. [2]

3 Exam-style questions

3.1 Apply the units of measure methods below. Show working and include units where appropriate.

(a) A tank holds 0.075 m³. Convert this to litres. [2]

(b) Find the number of full 250 ml bottles it can fill. [2]

(c) A label has area 18 cm^2 . Convert this to mm^2 . [2]

3.2 A tank holds 0.024 m^3 of water. Water is poured into 750 ml bottles.

(a) Convert the capacity to litres and find how many full bottles it fills. [3]

(b) A label has area 0.015 m^2 . Convert this to cm^2 and explain why multiplying by 100 would be incorrect. [3]

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- $l_1 = 2.7(1000) = \mathbf{2700}$ m; $l_2 = 48/10 = \mathbf{4.8}$ cm.

2.2

- $A = 6200/100^2 = \mathbf{0.62}$ m².

2.3

- $V = 0.008(100)^3 = \mathbf{8000}$ cm³.

2.4

- $V = 2.35(1000) = \mathbf{2350}$ ml; $m = 4500/1000 = \mathbf{4.5}$ kg.

3.1

(a)

- $V = 0.075(1000) = \mathbf{75}$ litres.

(b)

- $N = 75000/250 = \mathbf{300}$ bottles.

(c)

- $A = 18(10)^2 = \mathbf{1800}$ mm².

3.2

(a)

- $V_L = 1000V_m = 1000(0.024) = \mathbf{24}$ litres.
- Each bottle is 0.75 litres, so $N = 24/0.75$, giving **32 bottles**.

(b)

- Each metre contains 100 cm, so the area factor is 100^2 .
- $A_{\text{cm}^2} = 0.015(100)^2$, giving **150 cm²**.