Surface area, volume and measurement - Practice test 2

16 questions | 41 marks | 55 minutes

Connect nets, unknown dimensions, scaling, error bounds and practical decisions.

Equivalent correct methods earn the corresponding marks.

1. A right triangular prism has two triangular ends. How many rectangular side faces does it have? [1 mark]

Each of the three sides of the triangular cross-section produces one rectangle.

Answer: Three rectangular side faces.

2. Convert 25 mm to centimetres and 0.12 m² to square centimetres. [2 marks]

$25 \div 10 = 2.5$ cm; $0.12 \times 10000 = 1200$ cm².

Answer: 2.5 cm; 1200 cm²

3. A cube has volume 216 cm³. Find its side length and total surface area. [3 marks]

$6^3 = 216$, so each side is 6 cm.

Area $= 6(6^2) = 216$ cm².

Answer: 6 cm; 216 cm²

4. A closed cylinder has diameter 6 cm and height 4 cm. Find its total surface area. [3 marks]

Radius $= 3$ cm. Area $= 2\pi(3^2) + 2\pi(3)(4) = 18\pi + 24\pi = 42\pi$ cm².

Answer: 42π cm²

5. A rectangular prism has volume 600 cm³, length 10 cm and height 5 cm. Find its width. [2 marks]

$w = \frac{600}{10 \times 5} = 12$ cm.

Answer: 12 cm

6. A cylindrical pipe has external radius 4 cm and length 15 cm. Only its outer curved wall is painted. Ignore the end rings. Find the painted area. [2 marks]

$A = 2\pi rh = 2\pi(4)(15) = 120\pi$ cm².

Answer: 120π cm²

7. A tank has internal dimensions 0.25 m by 0.4 m by 0.8 m. Find its capacity in litres. [2 marks]

$V = 0.25 \times 0.4 \times 0.8 = 0.08$ m³ $= 80$ L.

Answer: 80 L

8. A 2.5 m reference length is measured as 2.45 m. Find its absolute and percentage error. [3 marks]

Absolute error $= 0.05$ m; percentage $= \frac{0.05}{2.5} \times 100\% = 2\%$.

Answer: 0.05 m and 2%

9. A distance is recorded as 350 m to the nearest 10 m. [3 marks]

(a) State the maximum rounding error. [1 mark]

Half of 10 m is 5 m.

Answer: 5 m

(b) Give the interval of distances that round to 350 m. [2 marks]

Subtract and add 5 m. The upper endpoint rounds to 360 m.

Answer: $345 \le d < 355$ m.

10. A right triangular prism has two end faces of area 12 cm² each. Its cross-section perimeter is 16 cm and its length is 7 cm. Find its surface area. [2 marks]

$A = 2(12) + 16(7) = 24 + 112 = 136$ cm².

Answer: 136 cm²

11. An open cylinder has one circular base, radius 3 cm and height 10 cm. Find its surface area. [3 marks]

One base $= 9\pi$; wall $= 2\pi(3)(10) = 60\pi$. Total 69π cm².

Answer: 69π cm²

12. Two cylinders have the same height. The second has twice the radius of the first. How many times as large is its volume? Explain. [3 marks]

Volume is $\pi r^2 h$. Replacing r with $2r$ gives $\pi(2r)^2 h = 4\pi r^2 h$.

Answer: Four times as large.

13. A container can hold 43.2 L. How many full 3.6 L bottles are needed to fill it exactly? [2 marks]

$43.2 \div 3.6 = 12$.

Answer: 12 bottles

14. A surface of area 43 m² needs two coats of paint. Coverage is 10 m² per litre per coat. Paint is sold only in 4 L tins. Find the least number of tins required. [3 marks]

Total coverage $= 86$ m², requiring $\frac{86}{10} = 8.6$ L.

Two tins hold 8 L and are insufficient; buy three tins.

Answer: 3 tins

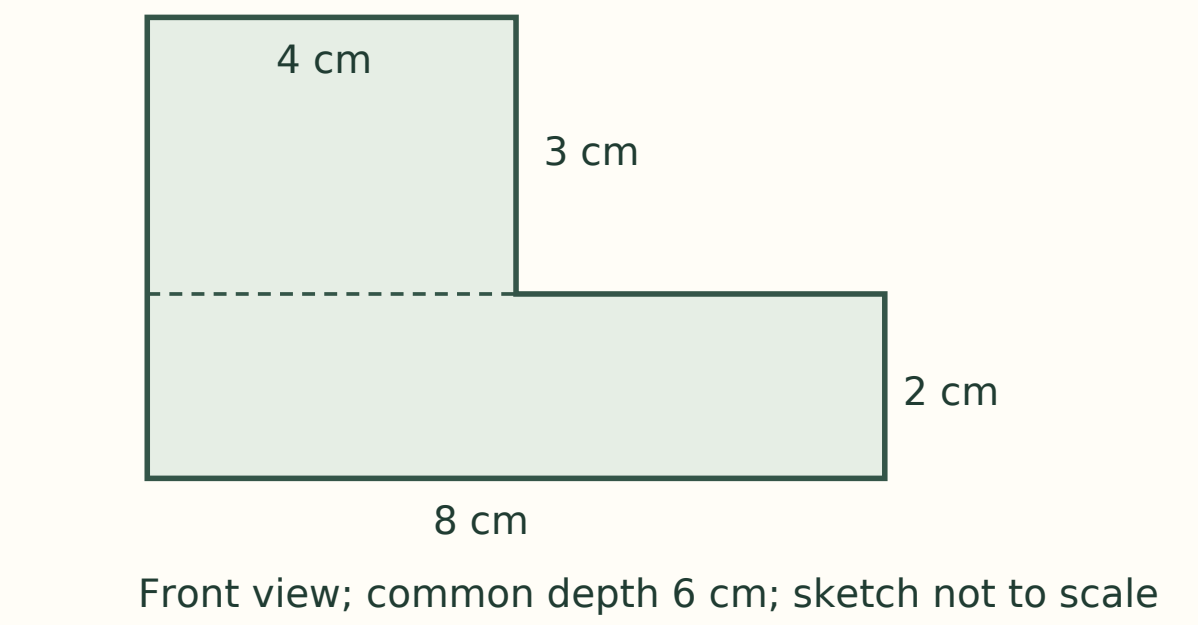
15. A rectangle is measured as 2.4 m by 3.1 m. Calculate its area to one decimal place. Explain why rounding the side lengths to whole metres first is unsuitable. [3 marks]

$2.4 \times 3.1 = 7.44$ m², which rounds to 7.4 m².

Early rounding gives $2 \times 3 = 6$ m², which is much less accurate.

Answer: 7.4 m²; early rounding changes the dimensions unnecessarily.

16. A stepped solid consists of a lower rectangular prism 8 cm by 6 cm by 2 cm and an upper prism 4 cm by 6 cm by 3 cm. The prisms meet without overlapping. [4 marks]



Front view; common depth 6 cm; sketch not to scale

(a) Find the volume of the solid. [2 marks]

Lower $= 8(6)(2) = 96$; upper $= 4(6)(3) = 72$. Total 168 cm³.

Answer: 168 cm³

(b) A student uses $8 \times 6 \times 5$. Explain why this is too large and state the excess volume. [2 marks]

Enclosing volume $= 240$ cm³. Excess $= 240 - 168 = 72$ cm³.

Answer: It includes empty space; excess 72 cm³.