The Panda Math Tutor

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3D Surface Area and Volume

Solutions & Answer Key

Full worked solutions, marking scheme & answer key

IGCSE Mathematics

The Panda Math Tutor

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Companion to the *Student Worksheet*

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Note

About this booklet. These are the complete solutions to every question in the *3D Surface Area and Volume — Student Worksheet*. Question numbers match exactly: units and conversions U1–U5, cuboids and cubes B1–B6, prisms P1–P5, cylinders C1–C6, pyramids Y1–Y5, cones N1–N5, spheres and hemispheres S1–S6, composite solids K1–K6, applications A1–A5, the Mixed Review MR1–MR10, and the examination questions 1–8 of Part III.
Each solution names the formula being applied and works one step at a time. Values of π are kept exact until the final line. Part V collects the common mistakes to watch for, and Part VI is a quick answer key for fast marking.

4 Part IV — Complete Solutions

Note

Each solution names the formula being applied and shows the steps in order, exactly as the notes recommend. Depth is scaled to difficulty — brief for basic questions, fuller for the harder ones.

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4.1 Solutions — Units and Conversions

Solution U1

Volume conversions are *cubed*.
(a) $1\,\text{cm}^3 = 10^3 = 1000\,\text{mm}^3$, so

$$4 \times 1000 = \boxed{4000\,\text{mm}^3}.$$

(b) $1\,\text{m}^3 = 100^3 = 1\,000\,000\,\text{cm}^3$, so

$$7 \times 1\,000\,000 = \boxed{7\,000\,000\,\text{cm}^3}.$$

Solution U2

(a) $1000\,\text{cm}^3 = 1$ litre, so $2500 \div 1000 = \boxed{2.5\,\text{litres}}$.
(b) $1\,\text{m}^3 = 1000$ litres, so $0.35 \times 1000 = \boxed{350\,\text{litres}}$.

Solution U3

(a) $0.75 \times 1\,000\,000 = \boxed{750\,000\,\text{cm}^3}$.
(b) $0.75 \times 1000 = \boxed{750\,\text{litres}}$.
(c) Since $1\,\text{cm}^3 = 1\,\text{ml}$, the answer is $\boxed{750\,000\,\text{ml}}$.

Solution U4

The error: the student used the *length* conversion factor once, but volume has three dimensions, so the factor must be used three times.
A cube of side 1 m is the same as a cube of side 100 cm, and

$$100 \times 100 \times 100 = 100^3 = 1\,000\,000.$$

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

Solution U5

Step 1 — convert everything to cm:

$$250\,\text{mm} = 25\,\text{cm}, \qquad 0.3\,\text{m} = 30\,\text{cm}.$$

Step 2 — volume:

$$V = 40 \times 25 \times 30 = \boxed{30\,000\,\text{cm}^3}.$$

Step 3 — capacity: $30\,000 \div 1000 = \boxed{30\,\text{litres}}$.

Common Mistake

Never substitute mixed units into a formula. Convert first, then multiply.

4.2 Solutions — Cuboids and Cubes

Solution B1

(a) $V = \ell wh$:

$$V = 24 \times 15 \times 9 = \boxed{3240\,\text{cm}^3}.$$

(b) $SA = 2(\ell w + \ell h + wh)$:

$$SA = 2(24 \times 15 + 24 \times 9 + 15 \times 9) = 2(360 + 216 + 135) = 2 \times 711 = \boxed{1422\,\text{cm}^2}.$$

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