

WA7MMGTH2

Three-dimensional space

Core + Challenge

Volume of Composite Prisms

I can find the volume of composite prisms by splitting them into rectangular prisms or using cross-section area $\times$ length.

Name: _____ Date: _____ Score: _____ / 58

Key idea

A **prism** has the same cross-section all the way along, so **$V = \text{area of cross-section} \times \text{length}$** .

Method 1 – split: break the solid into rectangular prisms, find each volume and add (or subtract a hole).

Method 2 – cross-section: find the area of the L, T or step-shaped face, then multiply by the length.

Check that the parts **don't overlap** and that every length is in the **same unit**.

A

Fluency *practise the skill*

/ 16 marks

Find each volume or missing measurement. Lengths are in cm unless shown. 1 mark each.

- | | |
|--|--|
| 1. Cross-section 20 cm^2 , length 6 cm _____ | 9. $V = 200 \text{ cm}^3$, cross-section 25 cm^2 :
length _____ |
| 2. Cross-section 35 cm^2 , length 4 cm _____ | 10. $V = 144 \text{ cm}^3$, length 12 cm:
cross-section _____ |
| 3. Cross-section 12.5 cm^2 , length 8
cm _____ | 11. Three 2 cm cubes stacked _____ |
| 4. $3 \times 2 \times 2$ prism + $4 \times 2 \times 2$ prism _____ | 12. Steps: $4 \times 3 \times 1 + 4 \times 2 \times 1 + 4 \times 1 \times 1$ _____ |
| 5. $5 \times 4 \times 2$ prism + $2 \times 2 \times 2$ cube _____ | 13. $8 \times 5 \times 3$ prism with a $2 \times 2 \times 3$ notch _____ |
| 6. 10 cm cube with a $5 \times 5 \times 10$ hole _____ | 14. Cross-section 7.5 cm^2 , length 4 cm _____ |
| 7. L cross-section $6 \times 4 - 3 \times 2$, length
5 _____ | 15. 6 cm cube on top of a 3 cm cube _____ |
| 8. Cross-section 48 m^2 , length 2.5 m _____ | 16. $12 \times 5 \times 2$ prism + $6 \times 5 \times 2$ prism _____ |

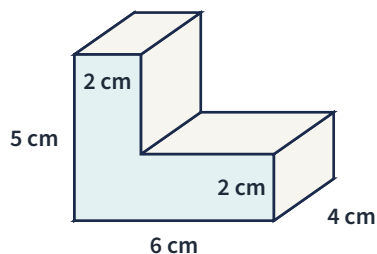
B

Core *apply the skill to problems*

/ 22 marks

- 1 Find the volume of this L-shaped prism.

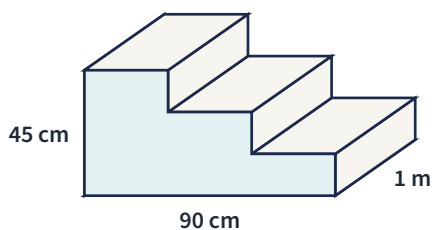
[2 marks]



Answer: _____

- 2 A concrete staircase has 3 steps. Each step is 30 cm deep and 15 cm high, and the stairs are 1 m wide. Find the volume of concrete in cm^3 and m^3 .

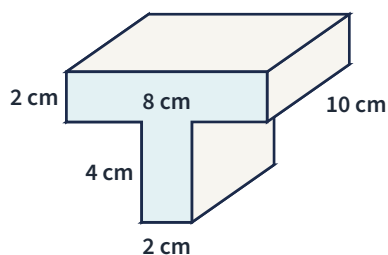
[3 marks]



Answer: _____

- 3 Find the volume of this T-shaped prism.

[2 marks]



Answer: _____

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- 4 A wooden block $10\text{ cm} \times 8\text{ cm} \times 6\text{ cm}$ has a square hole $4\text{ cm} \times 4\text{ cm}$ cut all the way through its 6 cm height. Find the volume of wood left. [2 marks]

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Answer: _____

- 5 A building is made of two rectangular prisms: $20\text{ m} \times 10\text{ m} \times 6\text{ m}$ and $8\text{ m} \times 10\text{ m} \times 3\text{ m}$. Find its total volume. [2 marks]

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Answer: _____

- 6 A pool has a shallow end 10 m long, 5 m wide and 1 m deep, and a deep end 15 m long, 5 m wide and 2 m deep. How many litres does it hold? [3 marks]

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Answer: _____

- 7 A prism has a cross-section area of 45 cm^2 and a volume of 675 cm^3 . How long is it? [2 marks]

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Answer: _____

- 8 A U-shaped prism has a cross-section 10 cm wide and 6 cm high with a $4\text{ cm} \times 4\text{ cm}$ notch cut from the middle of the top. It is 3 cm long. Find its volume. [2 marks]

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Answer: _____

- 9 A concrete step has two layers, each 0.2 m high and 1.2 m wide: the bottom layer is 0.6 m deep and the top layer is 0.3 m deep. Find the volume. [2 marks]

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Answer: _____

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- 10 A prism has an L-shaped cross-section: a $7\text{ cm} \times 5\text{ cm}$ rectangle with a $4\text{ cm} \times 3\text{ cm}$ rectangle removed from one corner. It is 10 cm long. Find its volume. [2 marks]

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Answer:

C

Reasoning *explain, justify and check*

/ 9 marks

- 1 Show that the two methods (splitting, and cross-section $\times$ length) give the same volume for the prism in Core Q1. [3 marks]

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- 2 Explain why $V = \text{cross-section area} \times \text{length}$ only works when the cross-section is the same all the way along. [2 marks]

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- 3 Ana split the L-shape in Core Q1 into a 6×2 rectangle and a 2×5 rectangle and got 22 cm^2 for the cross-section. Explain her mistake. [2 marks]

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- 4 A composite prism is made twice as long. What happens to its volume? Explain. [2 marks]

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D**Challenge** *multi-step and problem-solving*

/ 11 marks

- 1 A block of cheese $12\text{ cm} \times 8\text{ cm} \times 6\text{ cm}$ has a 4 cm cube cut from one corner. Find the volume left, and the fraction of the cheese removed. [3 marks]

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Answer: _____

- 2 A trough has a constant cross-section of 0.4 m^2 and is 2.5 m long. How many litres does it hold? [2 marks]

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Answer: _____

- 3 A staircase has 4 steps, each 25 cm deep and 18 cm high, and it is 90 cm wide. Find its volume in m^3 . [3 marks]

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Answer: _____

- 4 A 2 cm cube is glued on top of a 4 cm cube. Find the total volume. Explain why the big cube has 8 times the volume of the small one, even though its sides are only twice as long. [3 marks]

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Answer: _____

How did I go?Fluency ____ / 16 Core ____ / 22 Reasoning ____ / 9 Challenge ____ / 11 **Total ____ / 58**

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