

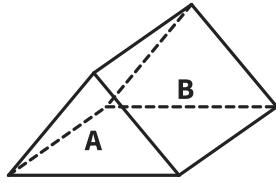
Fix it 1 The cross-section

Volume of a prism · ANSWERS

The cross-section is the face that is the same all the way through: slice the prism anywhere along its length and you get that shape. It can be at the front, at the end or on top.

EXAMPLE

Which face is the cross-section?

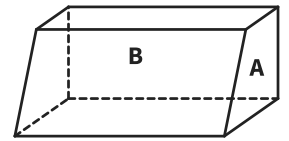


1. Slice the prism anywhere along its length.
2. Every slice is a triangle, the same as face A.
3. The cross-section is A.

YOUR TURN

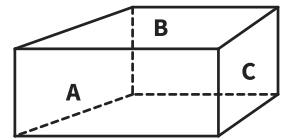
- 1 Which face is the cross-section?

Face A



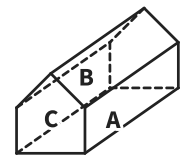
- 2 Which face is the cross-section?

Face B



- 3 Which face is the cross-section?

Face C



Check: The face opposite your cross-section is exactly the same shape, and every other face is a rectangle.

The Maths Habit

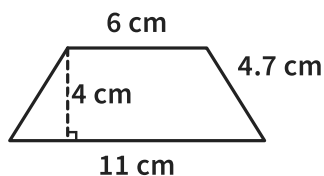
Fix it 2 Area of the cross-section

Volume of a prism · ANSWERS

Use the area rule for its shape. Rectangle: base $\times$ height. Triangle: $\frac{1}{2} \times$ base $\times$ height. Trapezium: $\frac{1}{2} \times (a + b) \times h$. Circle: $\pi \times r^2$. The height is at right angles to the base, never the slant side.

EXAMPLE

The cross-section is this trapezium. Find its area.

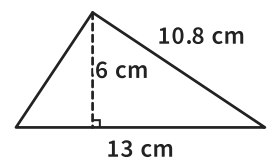


1. Trapezium: $\frac{1}{2} \times (a + b) \times h$
2. $\frac{1}{2} \times (6 + 11) \times 4$
3. $= 34 \text{ cm}^2$

YOUR TURN

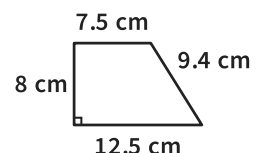
- 1 The cross-section is this triangle. Find its area.

Area = 39 cm²



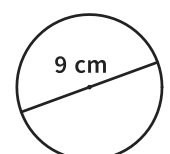
- 2 The cross-section is this trapezium. Find its area.

Area = 80 cm²



- 3 The cross-section of a cylinder is this circle. Find its area to 1 decimal place.

Area = 63.6 cm²



Check: Your area is less than the rectangle that fits round the shape, and it is in cm².

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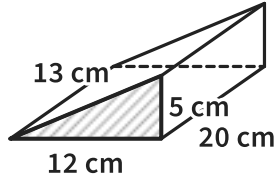
Fix it 3 The length

Volume of a prism · ANSWERS

The length of the prism goes from the cross-section straight to the same face at the other end, at right angles to the cross-section. On a prism standing up, it is the height.

EXAMPLE

The cross-section is shaded. What is the length of the prism?

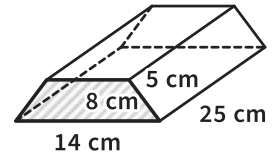


1. 12, 5 and 13 are all on the triangle.
2. The 20 cm edge joins it to the triangle at the back.
3. Length = 20 cm

YOUR TURN

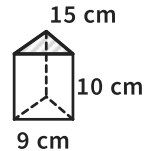
- 1 The cross-section is shaded. What is the length of the prism?

Length = 25 cm



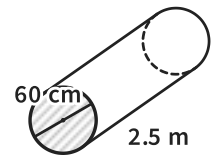
- 2 The cross-section is shaded. What is the length of the prism?

Length = 10 cm



- 3 A pipe is a cylinder. What is its length?

Length = 2.5 m



Check: The length is not on the cross-section, and every edge alongside it is the same length.

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Fix it 4 Same units

Volume of a prism · ANSWERS

Before you multiply, put the length in the same unit as the cross-section. Area in cm^2 : length in cm. Area in m^2 : length in m. $1 \text{ m} = 100 \text{ cm}$ and $1 \text{ cm} = 10 \text{ mm}$.

EXAMPLE

The area of the cross-section is 350 cm^2 . The prism is 1.2 m long. What length do you use?

1. The area is in cm^2 , so the length must be in cm.
2. $1 \text{ m} = 100 \text{ cm}$
3. $1.2 \times 100 = 120$
4. Use 120 cm.

YOUR TURN

- 1 The area of the cross-section is 74 cm^2 . The prism is 2.5 m long. What length do you use?

Length = 250 cm

- 2 The area of the cross-section is 0.36 m^2 . The prism is 90 cm long. What length do you use?

Length = 0.9 m

- 3 The area of the cross-section is 6.5 cm^2 . The prism is 85 mm long. What length do you use?

Length = 8.5 cm

Check: A length in cm is 100 times the number in m: the smaller unit gives the bigger number.

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Fix it 5 Area $\times$ length

Volume of a prism · ANSWERS

$V = \text{area of cross-section} \times \text{length}$. $\text{cm}^2 \times \text{cm}$ gives cm^3 : a volume is always in cubic units.

EXAMPLE

The area of the cross-section is 34 cm^2 .
The prism is 15 cm long.
Work out its volume.

1. $V = \text{area of cross-section} \times \text{length}$
2. $V = 34 \times 15$
3. $V = 510 \text{ cm}^3$

YOUR TURN

- 1 The area of the cross-section is 42 cm^2 . The prism is 16 cm long.
Work out its volume.

$$V = \underline{672 \text{ cm}^3}$$

- 2 The area of the cross-section is 27.5 cm^2 . The prism is 14 cm long.
Work out its volume.

$$V = \underline{385 \text{ cm}^3}$$

- 3 The area of the cross-section is 0.45 m^2 . The prism is 3.2 m long.
Work out its volume.

$$V = \underline{1.44 \text{ m}^3}$$

Check: Divide your volume by the length. You get the area back.

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Fix it 6 Round, then check

Volume of a prism · ANSWERS

Keep the full number in your calculator and round only at the end, to what the question asks. Then estimate: round each number to 1 significant figure and multiply.

EXAMPLE

A cylinder's cross-section has area $38.484... \text{ cm}^2$. It is 19 cm long.
Find its volume to 1 decimal place, then check it.

1. $38.484... \times 19 = 731.205...$
2. $V = 731.2 \text{ cm}^3$
3. Estimate: $40 \times 20 = 800$
4. 731.2 is close to 800 ✓

YOUR TURN

- 1 The calculator shows a volume of $1017.876... \text{ cm}^3$. Write it to 1 decimal place.

$$V = \underline{1017.9 \text{ cm}^3}$$

- 2 The calculator shows a volume of $24\,328.493... \text{ cm}^3$. Write it to 3 significant figures.

$$V = \underline{24\,300 \text{ cm}^3}$$

- 3 Kai says a prism with cross-section 48.7 cm^2 and length 9.6 cm has a volume of 4675.2 cm^3 . Estimate to check. Is Kai right?

$$\underline{\text{No: about } 50 \times 10 = 500}$$

Check: Your answer and your estimate are about the same size. If not, look for the slip.

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