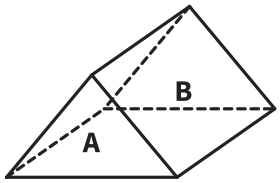
Fix it 1 The cross-section

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

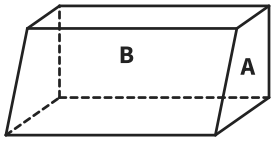
Which face is the cross-section?



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.

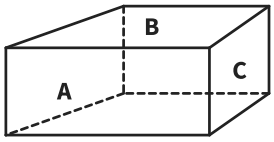
YOUR TURN

1. Which face is the cross-section?



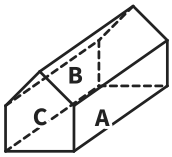
Face _____

2. Which face is the cross-section?



Face _____

3. Which face is the cross-section?



Face _____

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

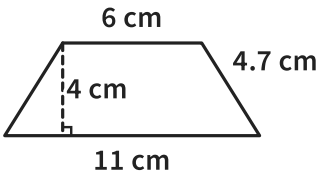
The Maths Habit

Fix it 2 Area of the cross-section

Use the area rule for its shape. Rectangle: base × height. Triangle: ½ × base × height. Trapezium: ½ × (a + b) × h. Circle: π × r^2. The height is at right angles to the base, never the slant side.

EXAMPLE

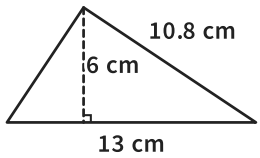
The cross-section is this trapezium. Find its area.



1. Trapezium: ½ × (a + b) × h
2. ½ × (6 + 11) × 4
3. = 34 cm^2

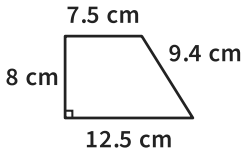
YOUR TURN

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



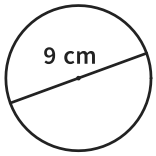
Area = _____

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



Area = _____

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



Area = _____

Check: Your area is less than the rectangle that fits round the shape, and it is in cm^2.

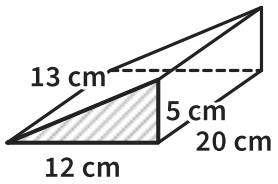
The Maths Habit

Fix it 3 The length

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

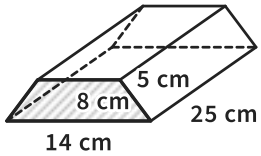
The cross-section is shaded. What is the length of the prism?



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

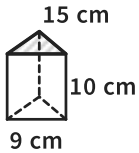
YOUR TURN

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



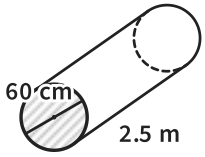
Length = _____

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



Length = _____

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



Length = _____

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

The Maths Habit

Fix it 4 Same units

Before you multiply, put the length in the same unit as the cross-section. Area in cm²: length in cm. Area in m²: length in m. 1 m = 100 cm and 1 cm = 10 mm.

EXAMPLE

The area of the cross-section is 350 cm². The prism is 1.2 m long. What length do you use?

1. The area is in cm², so the length must be in cm.
2. 1 m = 100 cm
3. 1.2 × 100 = 120
4. Use 120 cm.

YOUR TURN

1. The area of the cross-section is 74 cm². The prism is 2.5 m long. What length do you use?

Length = _____

2. The area of the cross-section is 0.36 m². The prism is 90 cm long. What length do you use?

Length = _____

3. The area of the cross-section is 6.5 cm². The prism is 85 mm long. What length do you use?

Length = _____

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

The Maths Habit

Fix it 5 Area × length

V = area of cross-section × length. cm^2 × 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 = area of cross-section × length
2. $V = 34 \times 15$
3. $V = 510$ 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 = _____

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

   V = _____

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

   V = _____

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

Fix it 6 Round, then check

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… cm^2. It is 19 cm long.
Find its volume to 1 decimal place, then check it.

1. 38.484… × 19 = 731.205…
2. $V = 731.2$ cm^3
3. Estimate: 40 × 20 = 800
4. 731.2 is close to 800 ✓

YOUR TURN

1. The calculator shows a volume of 1017.876… cm^3. Write it to 1 decimal place.

   V = _____

2. The calculator shows a volume of 24 328.493… cm^3. Write it to 3 significant figures.

   V = _____

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?

   _____

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