

4.2.4 Prism Volume

Name: _____ Class: _____ Date: _____

KEY WORDS cross-section

<!-- Session 2 native-skill companion -->

Objective

Practise prism volume within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Prism volume and cylinder measurement · Foundation

For a right prism, volume is constant cross-sectional area times perpendicular length. Cuboid volume is lwh . A cylinder is a circular prism: $V = \pi r^2 h$. Total closed-cylinder surface area includes two circular ends and the curved surface $2\pi rh$. Open containers omit the specified faces.

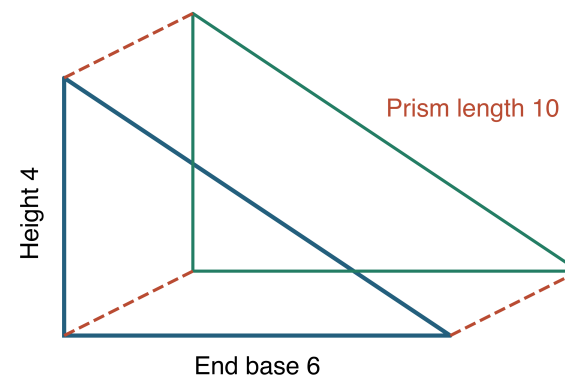
$$V = A_{\text{cross}}L, \quad V_{\text{cylinder}} = \pi r^2 h$$

A triangular prism with end base 6 cm, end height 4 cm and length 10 cm has cross-section 12 cm^2 and volume 120 cm^3 . A cylinder of radius 3 cm and height 5 cm has volume $45\pi \text{ cm}^3$. Its curved surface unwraps to a rectangle of width $2\pi r = 6\pi$ and height 5, so curved area is $30\pi \text{ cm}^2$. Adding two ends gives total area $30\pi + 18\pi = 48\pi \text{ cm}^2$. An open-top tank of those dimensions has surface area $39\pi \text{ cm}^2$ because it keeps only one end. If a prism has volume 180 cm^3 and cross-section 15 cm^2 , its length is 12 cm. Convert 2000 cm^3 to 2 litres, keeping volume conversion separate from surface area.

Use cross-sectional area, not perimeter, in the volume formula. Distinguish cylinder radius from diameter and identify whether end faces are present. A length times an area gives cubic units.

AQA G16/G17 includes cuboids, right prisms and cylinders. Draw the constant end shape, calculate it first and label the extrusion length. Preserve exact multiples of pi when asked.

Constant triangular end area 12 → volume 120



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find triangular-prism volume for end base 6, end height 4 and length 10.

2.2 (Foundation) Find the coefficient of pi in cylinder volume for $r=3, h=5$.

2.3 (Foundation) Find the length of a prism with volume 180 and end area 15.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Prism volume equals cross-section perimeter times length.

Solutions

2.1 $(6 \times 4 / 2) \times 10 = 120 \text{ cm}^3$.

2.2 $r^2 h = 9 \times 5 = 45$.

2.3 $\text{Length} = \text{volume} / \text{area} = 180 / 15$.

3.1 False. A 3 cm by 4 cm rectangular cross-section and 10 cm length give 120 cm^3 . Perimeter times length gives 140 cm^2 , which has the wrong units.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.