

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.

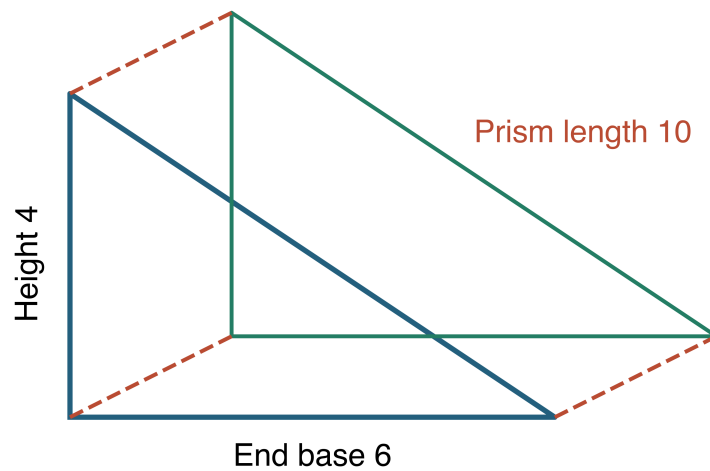
$$V = A_{\text{cross}}L, \quad V_{\text{cylinder}} = \pi r^2 h$$

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 π when asked.

Constant triangular end area 12 $\rightarrow$ 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.