

Exercise walk-through

4.2.4

Prism Volume

AQA · GCSE · Mathematics

92. Solid properties, plans and elevations · Foundation

Solid properties, plans and elevations · Foundation

A cube or cuboid has 6 faces, 12 edges and 8 vertices. A triangular prism has 5 faces, 9 edges and 6 vertices; a square pyramid has 5 faces, 8 edges and 5 vertices. A cylinder has two circular flat faces and one curved surface, with no vertices. A cone has one flat circular face, one curved surface and one apex; a sphere has only a curved surface. For a cuboid of width 4, depth 3 and height 2 units, the plan is 4 by 3, front elevation 4 by 2 and side elevation 3 by 2. A stack with front-row column heights 1 and 3, and back-row heights 2 and 1, occupies four cells.

131. Prism volume and cylinder measurement · Foundation

Prism volume and cylinder measurement · Foundation

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.

145. Spheres, cones, pyramids and frustums · Foundation

Spheres, cones, pyramids and frustums · Foundation

A cone with radius 3 cm and perpendicular height 4 cm has slant height 5 cm. Volume is $12\pi \text{ cm}^3$, curved area $15\pi \text{ cm}^2$ and total closed area $24\pi \text{ cm}^2$. A sphere of radius 3 has volume $36\pi \text{ cm}^3$ and area $36\pi \text{ cm}^2$, with different units. A square pyramid of base side 6 and height 4 has volume $6^2 \times 4/3 = 48 \text{ cm}^3$; each triangular face has slant height $\sqrt{(4^2 + 3^2)} = 5$, so lateral area is $4 \times (6 \times 5/2) = 60 \text{ cm}^2$ and total area 96 cm^2 . A large cone $r=6, h=8$ loses a similar top cone $r=3, h=4$: frustum volume is $96\pi - 12\pi = 84\pi \text{ cm}^3$.

Exercises 2.1·2.3

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

2.2 (Foundation) Find the coefficient of π 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

Exercises 2.1·2.3

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

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

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

$$\mathbf{2.2} \quad r^2 h = 9 \times 5 = 45.$$

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

3 Exam-style questions

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

Exercise 3.1

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

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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.