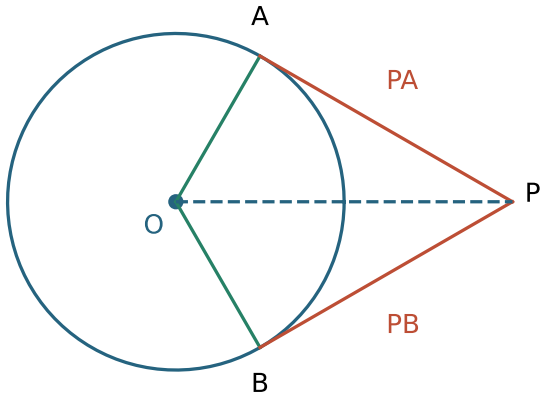
Exercise walk-through

4.2.4
Prism Volume

AQA · GCSE · Mathematics

Figure: Congruence, similarity and circles (4)

Shared OP and equal radii → RHS → PA = PB



- Equal radii, shared OP and right angles give congruent triangles (RHS), so PA = PB
- Match each part of the diagram to the text.

Perimeter, area and volume

- Triangle: $\frac{1}{2} \times b \times h$, where h is the **perpendicular height** .
- Parallelogram: $b \times h$.
- Trapezium: $\frac{1}{2}(a+b)h$, where a and b are the parallel sides.
- Circle: $A = \pi r^2$, and the **circumference** is $C = 2\pi r = \pi d$.

$$\text{arc length} = \frac{\theta}{360} \times 2\pi r \qquad \text{sector area} = \frac{\theta}{360} \times \pi r^2$$

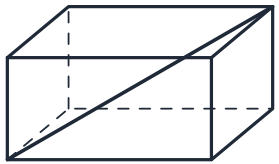
Pythagoras and trigonometry

- **Pythagoras' theorem.** In a right-angled triangle, $a^2 + b^2 = c^2$, where c is the **hypotenuse**, the longest side, opposite the right angle.
- A ladder whose foot is 3 m from a wall and whose top is 4 m up the wall is $\sqrt{9+16} = 5$ m long.
- **Trigonometric ratios.** Label the sides from the angle θ: opposite, **adjacent** (next to the angle) and **hypotenuse**.
- **Worked example 12.** In a right-angled triangle the hypotenuse is 23.7 cm and x is the side **adjacent** to an angle of $52°$.

$$\sin\theta = \frac{\text{opp}}{\text{hyp}} \qquad \cos\theta = \frac{\text{adj}}{\text{hyp}} \qquad \tan\theta = \frac{\text{opp}}{\text{adj}}$$

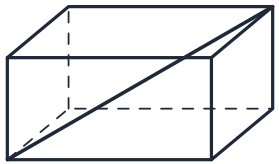
Exercise 2.1

2.1 Work out the volume of a cuboid 8 cm by 5 cm by 3 cm. [1]



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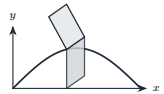


2.1

- $V = lwh = 8 \times 5 \times 3 = \mathbf{120}$ cm^3

Exercise 2.2

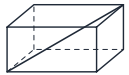
2.2 A prism has cross-sectional area 15 cm^2 and length 12 cm. Work out its volume. [1]



2.3 Work out the volume of a cylinder with radius 5 cm and height 8 cm. Give your answer to 1 decimal place. [2]



2.4 A cuboid has volume 360 cm^3, length 12 cm and width 6 cm. Work out its height. [2]

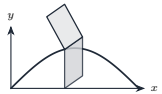


2.5 A tank holds 24 000 cm^3 of water. How many litres is this? [1]



Exercise 2.2

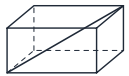
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2.2

- $V = A \times l = 15 \times 12 = \mathbf{180}$ cm^3

2.3

Full solution on next slide

Full solution 2.2

2.2

- $V = A \times l = 15 \times 12 = \mathbf{180}\ \text{cm}^3$

2.3

- $V = \pi r^2 h = \pi \times 5^2 \times 8 = 200\pi = \mathbf{628.3}\ \text{cm}^3$

2.4

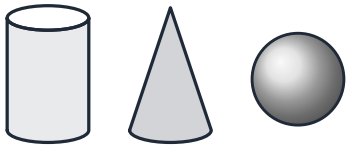
- $360 = 12 \times 6 \times h = 72h$
- $h = \mathbf{5}\ \text{cm}$

2.5

- $24\,000 \div 1000 = \mathbf{24}$ litres

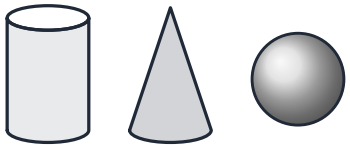
Exercise 3.1

3.1 Zoe works out the volume of a cylinder of radius 4 cm and height 5 cm as $\pi \times 8 \times 5$. Explain her mistake. [1]



Exercise 3.1

3.1 Zoe works out the volume of a cylinder of radius 4 cm and height 5 cm as $\pi \times 8 \times 5$. Explain her mistake. [1]



3.1

- she used $2r = 8$ instead of $r^2 = 16$: $V = \pi \times 4^2 \times 5 = 80\pi$ cm^3

Exercise 3.2

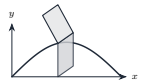
3.2 A cylindrical tin has diameter 10 cm and height 12 cm. Work out the area of the label that covers its curved surface exactly. Give your answer to 3 significant figures. [2]



3.3 A cylinder has volume 500 cm^3 and radius 5 cm. Work out its height, to 1 decimal place. [2]



3.4 A swimming pool is a prism 25 m long. Its cross-section is a trapezium with parallel sides (the depths) 1 m and 2 m and width 10 m. Work out how many litres of water it holds when full. [4]



3.5 Water from a full cuboid tank 40 cm by 30 cm by 20 cm is poured into an empty cylinder of radius 15 cm. Work out the depth of water in the cylinder, to the nearest mm. [3]



Exercise 3.2

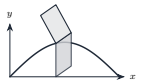
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3.2

- curved area $= 2\pi rh = 2 \times \pi \times 5 \times 12 = 120\pi =$ **377** cm^2

3.3

- $500 = \pi \times 5^2 \times h = 25\pi h$

Full solution on next slide

Full solution 3.2

3.2

- curved area $= 2\pi rh = 2 \times \pi \times 5 \times 12 = 120\pi =$ **377** cm^2

3.3

- $500 = \pi \times 5^2 \times h = 25\pi h$
- $h = \dfrac{500}{25\pi} =$ **6.4** cm

3.4

- cross-section: $A = \frac{1}{2}(a+b)h = \frac{1}{2} \times (1+2) \times 10 = 15$ m^2
- $V = A \times l = 15 \times 25 = 375$ m^3
- 1 m$^3 = 1000$ litres
- $375 \times 1000 =$ **375 000** litres

3.5

- water volume $= 40 \times 30 \times 20 = 24\,000$ cm^3
- $\pi \times 15^2 \times h = 24\,000$, so $h = \dfrac{24\,000}{225\pi}$
- $h = 33.95\ldots \approx$ **34.0** cm