Units, time and scale

Square the conversion factor for areas and cube it for volumes.

A trip of 54 km takes 45 minutes. Find the average speed in km/h.

$45 \div 60 = 0.75$	Convert minutes to hours.
$54 \div 0.75 = 72$	Average speed is total distance divided by total time.

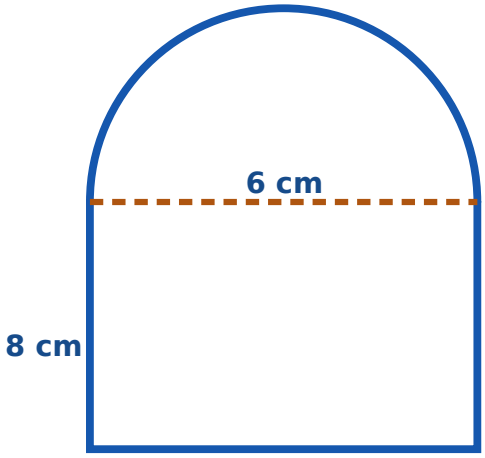
$72\,\text{km/h}$

Remember

1 m² = 10,000 cm²; 1 cm³ = 1 mL. At 1 : 500, a 4 cm line represents 2,000 cm, or 20 m.

Composite areas and perimeters

Split the shape into simpler pieces. Count only the outside edges for perimeter.



The dashed diameter is a dividing line, not an outside edge.

A semicircle of diameter 6 cm sits on the short side of an 8 cm by 6 cm rectangle. Find its area and perimeter.

$A = 8(6) + \frac{\pi(3)^2}{2}$	Add rectangle and semicircle.
$P = 8 + 8 + 6 + 3\pi$	The shared diameter is inside the figure.

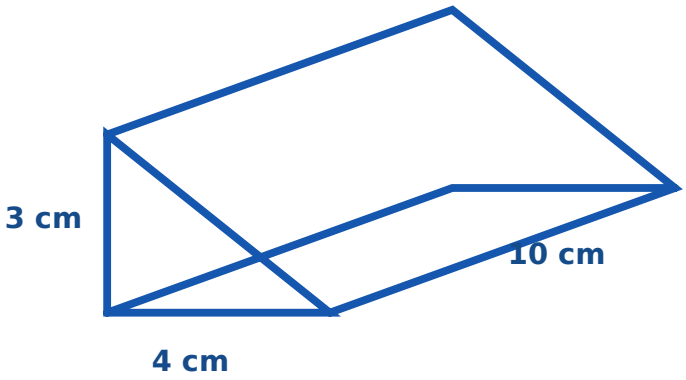
$A = 48 + 4.5\pi, \quad P = 22 + 3\pi$

Remember

The area is in cm² and the perimeter is in cm.

Prisms and nets

The volume of a prism is cross-section area × prism length.



The blue outline shows a triangular end and the length of the prism.

A right triangular prism has a 3–4–5 cm end and is 10 cm long. Find volume and total surface area.

$A=\frac{1}{2}(3)(4)=6$	Find one triangular end.
$V=6(10)=60$	The same cross-section runs along the prism.
$S=2(6)+10(3+4+5)=132$	Two triangle ends and three rectangular faces.

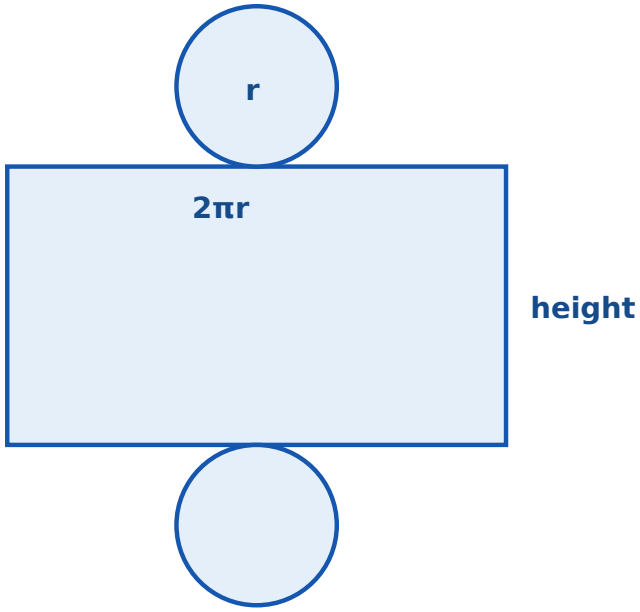
$60\,\text{cm}^3$ and $132\,\text{cm}^2$

Remember

A net has three rectangles, side by side, with the two triangular ends attached to opposite edges.

Cylinders and spheres

A cylinder net has two discs and one rectangle. A sphere has no flat face.



Unrolling the curved surface gives a rectangle whose long edge is one circumference.

Find a closed cylinder’s volume and surface area if r = 3 cm and h = 5 cm.

$V=\pi(3)^2(5)=45\pi$	Base area times height.
$S=2\pi(3)^2+2\pi(3)(5)=48\pi$	Two circular ends plus the curved surface.

$45\pi\,\text{cm}^3$ and $48\pi\,\text{cm}^2$

Remember

Cylinder net rectangle: 2πr by h. For a sphere: volume = 4πr³/3; surface area = 4πr². Remove hidden contact faces for composite solids.

Capacity and spherical solids

Convert cubic centimetres to millilitres before converting to litres.

Find the volume and surface area of a sphere of radius 6 cm.

$V=\frac{4}{3}\pi(6)^3=288\pi$	Use the sphere volume formula.
$S=4\pi(6)^2=144\pi$	Use the sphere surface area formula.

$288\pi\,\text{cm}^3$ and $144\pi\,\text{cm}^2$

Remember

A hemisphere has half the volume; for its total surface area add the circular base to half the sphere’s surface area.

Measurement

Try the questions before opening the separate answer key. Show one step per line.

15.1 · Fluency

Convert 0.75 m² to cm².

15.2 · Variation

A triangular prism has a cross-section area of 12 cm² and length 8 cm. Find its volume.

15.3 · Choose a method

A closed cylinder has radius 4 cm and height 9 cm. Find its surface area in terms of π.

Check your work: are the sign, units and level of accuracy appropriate?