

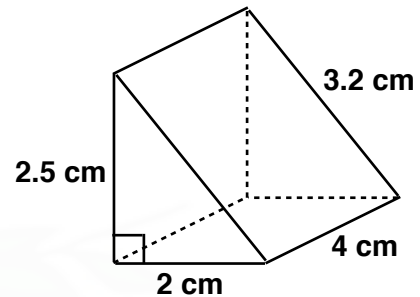
Volume and Surface Area of a Cylinder

Starter

1. **(Review of last lesson)** A semi-circle of radius 4 cm has the same area as a complete circle of radius r cm. Calculate the radius of the complete circle.

Working: A semi-circle of radius 4 cm has area $= \frac{1}{2} \times \pi \times 4^2 = 8\pi$
 So area of complete circle $= 8\pi$
To find its radius: $\pi r^2 = 8\pi$
Cancel the π : $r^2 = 8$
 $r = \sqrt{8} = 2.83 \text{ cm (3 s.f.)}$

2. **(Review of previous material)**
 Calculate the volume of the triangular prism.



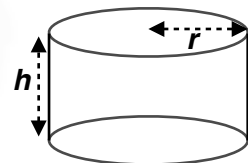
Working: Volume of a prism = Area of cross-section \times Length
 $= \frac{2.5 \times 2}{2} \times 4$
 $= 2.5 \times 4$
 $= 10 \text{ cm}^3$.

3. Write down the usual name for a circular prism.

Working: Cylinder

- E.g. 1** Using the formula for the prism, write down the formula for the volume of a cylinder whose radius is r and whose height is h .

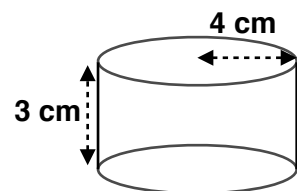
Working: Area of cross-section $= \pi r^2$
 So $V = \pi r^2 h$



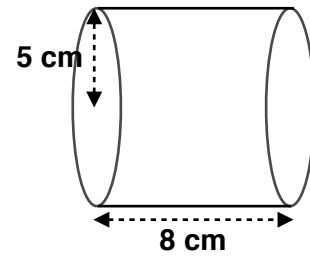
Volume of a cylinder, $V = \pi r^2 h$

- E.g. 2** Calculate the volume of the cylinder.
 Give your answer to 3 s.f..

Working: $r = 4$ and $h = 3$
 $V = \pi r^2 h$
 $V = \pi \times 4^2 \times 3$
 $= 151 \text{ cm}^3 \text{ (3 s.f.)}$



E.g. 3 Calculate the volume of the cylinder.
Give your answer in terms of π .

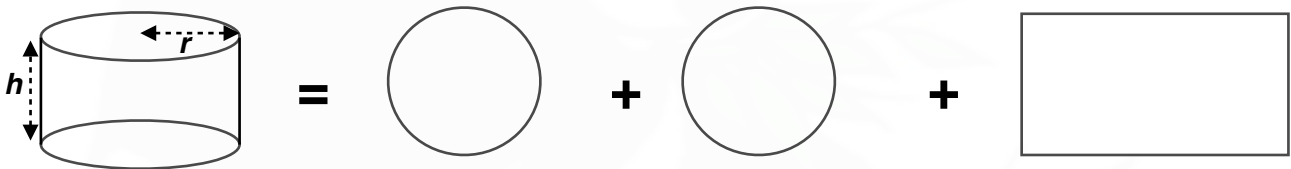


Working: $r = 5$ and $h = 8$
 $V = \pi r^2 h:$ $V = \pi \times 5^2 \times 8$
 $= 200\pi \text{ cm}^3$

E.g. 4 Calculate the volume of a cylinder whose height is 9 cm and whose diameter is 6 cm.
Give your answer in terms of π .

Working: Since the diameter is 6 cm, the radius is 3 cm.
 Volume of a cylinder, $V = \pi \times 3^2 \times 9 = 81\pi \text{ cm}^3$

E.g. 5 Using the diagram below, write down a formula for the surface area of a cylinder.

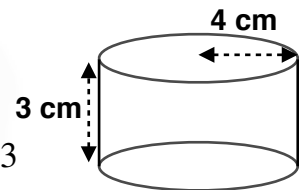


Working: The length of the rectangle is equal to the circumference of the circle.
 Surface area = Area of circle + Area of circle + Area of rectangle
 $= \pi r^2 + \pi r^2 + 2\pi r \times h$
 $= 2\pi r^2 + 2\pi r h$

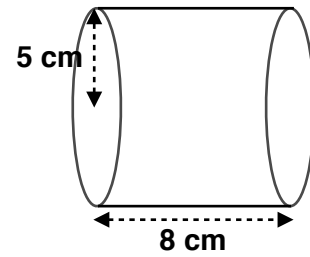
Surface area of cylinder, $SA = 2\pi r^2 + 2\pi r h$

E.g. 6 Calculate the surface area of the cylinder.
Give your answer to 3 s.f..

Working: $r = 4$ and $h = 3$
 $SA = 2\pi r^2 + 2\pi r h:$ $SA = 2\pi \times 4^2 + 2\pi \times 4 \times 3$
 $= 32\pi + 24\pi$
 $= 207 \text{ cm}^2$ (3 s.f.)



E.g. 7 Calculate the surface area of the cylinder.
Give your answer in terms of π .



Working: $r = 5$ and $h = 8$
 $SA = 2\pi r^2 + 2\pi rh:$ $SA = 2\pi \times 5^2 + 2\pi \times 5 \times 8$
 $= 50\pi + 80\pi$
 $= 130\pi \text{ cm}^2$

E.g. 8* The surface area of a cylinder is 70π . Calculate its height given that the radius is 5 cm.

Working: $SA = 2\pi r^2 + 2\pi rh:$ $2\pi \times 5^2 + 2\pi \times 5h = 70\pi$
Simplifying: $50\pi + 10\pi h = 70\pi$
Subtract 50π : $10\pi h = 20\pi$
Divide by 10π : $h = \frac{20\pi}{10\pi} = 2$

Video: [Volume of a cylinder](#)
Video: [Surface area of a cylinder](#)

[Solutions to Starter and E.g.s](#)

Exercise

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