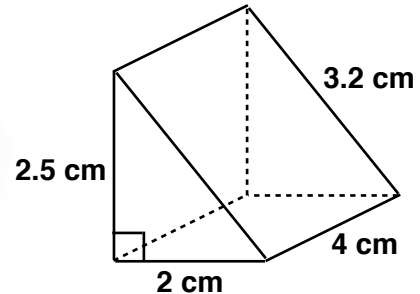


Volume and Surface Area of a Cylinder

Starter

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



- Write down the usual name for a circular prism.

Notes

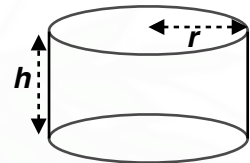
Volume of a cylinder

A cylinder is a prism with a circular cross-section. The volume of a prism is given by:

$$\text{Volume of prism} = \text{Area of cross-section} \times \text{Length}$$

- 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 .

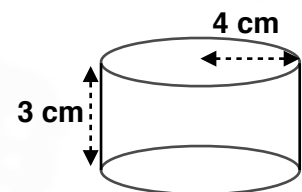
Working: Area of cross-section = πr^2
So $V = \pi r^2 h$



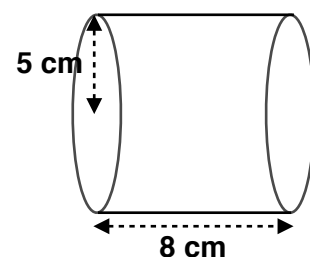
$$\text{Volume of a cylinder, } V = \pi r^2 h$$

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

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



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



- 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 .

Surface area of a cylinder

Give pupils a piece of card or paper and ask them to form two different cylinders.

What shapes is the surface area of a cylinder made up of?

2 circles and a rectangle

E.g. 5 Using the diagram below, find 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

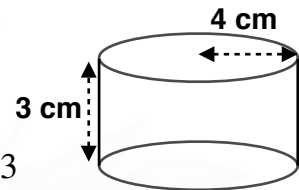
$$= \pi r^2 + \pi r^2 + 2\pi r \times h$$

$$= 2\pi r^2 + 2\pi rh$$

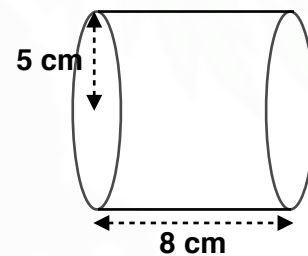
Surface area of cylinder, $SA = 2\pi r^2 + 2\pi rh$

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

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



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



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

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

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

Exercise

p89 Ex 16.6 Qu 1-6, 7-10

Summary

Volume of prism = Area of cross-section \times Length

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

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