

Volume and Surface Area of a Cylinder

Starter

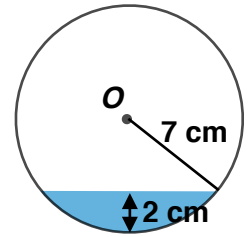
1. (Review of last lesson)

A pipe of radius 7 cm can have a maximum depth of 2 cm.

(a) Find the shaded area (cross-sectional area of water).

(b) What is the volume of water in a length of 30 cm of the pipe?

Hint: Find the distance from O to the surface of the water.



Notes

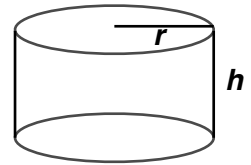
Volume of a cylinder

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 a cylinder whose height is 10 cm and whose diameter is 12 cm. Give your answer in terms of π .

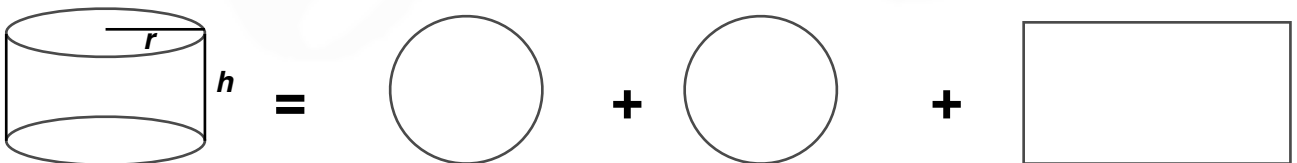
E.g. 3 A gold cube of side 5 cm is melted down to form a cylinder whose height is 3 cm. Find the cylinder's radius.

Surface area of a cylinder

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

2 circles and a rectangle

E.g. 4 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
= $\pi r^2 + \pi r^2 + 2\pi r \times h$
= $2\pi r^2 + 2\pi r h$

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

