



Volume of a cylinder

Year 8 About 70 minutes Calculator allowed 46 marks

Date _____

A Do Now

Quick questions to start.

- A1** Needed today [1 mark]

Work out the area of a circle of radius 5 cm, to 1 d.p.

Answer

A2 Needed today [1 mark]

A prism has a cross-section of area 12 cm^2 and length 7 cm. Find its volume.

Answer

- A3** Last lesson [1 mark]

Do sides 6, 9 and 11 make a right-angled triangle?

Answer

A4 Year 7 [1 mark]

Write 3.5 litres in cm^3 .

Answer

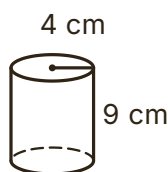
B Example, then your turn

Year 8

Your teacher works through each example with you. Then try the one beside it. A cylinder is a prism with a circle as its cross-section, so $V = \pi r^2 h$.

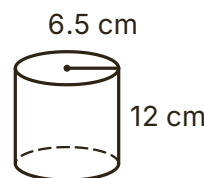
EXAMPLE 1

Work out the volume of this cylinder, to 3 s.f.



Hint Area of the end = πr^2 . Multiply by the height.

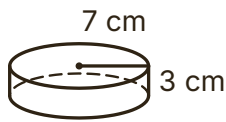
- B1** Work out the volume of this cylinder, to 3 s.f. [2 marks]



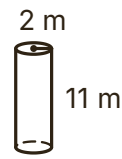
Answer ... cm^3

EXAMPLE 2

Work out the volume of this cylinder. Give your answer in terms of π .



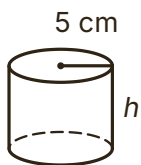
Hint Keep π as a letter: work out r^2h and write π after it.

B2 Work out the volume of this cylinder. Give your answer in terms of π . [2 marks]

Answer ... m^3

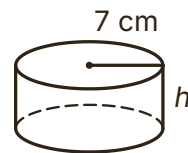
EXAMPLE 3

A cylinder has a volume of 500 cm^3 and a radius of 5 cm. Work out its height h , to 3 s.f.



Not drawn accurately

Hint $500 = \pi \times 5^2 \times h$. Divide 500 by the area of the end.

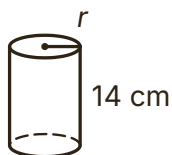
B3 A cylinder has a volume of 1200 cm^3 and a radius of 7 cm. Work out its height h , to 1 d.p. [3 marks]

Not drawn accurately

Answer $h = \dots \text{ cm}$

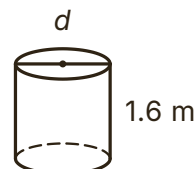
EXAMPLE 4

A cylinder has a volume of 900 cm^3 and a height of 14 cm. Work out its radius r , to 1 d.p.



Not drawn accurately

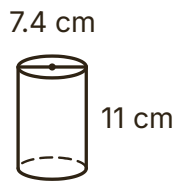
Hint $900 = \pi r^2 \times 14$. Find r^2 first, then take the square root.

B4 A water tank is a cylinder with a volume of 2.5 m^3 and a height of 1.6 m. Work out its diameter d , to 3 s.f. [3 marks]

Not drawn accurately

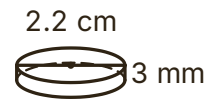
Answer $d = \dots \text{ m}$

- C1** A tin of soup has a diameter of 7.4 cm and a height of 11 cm. [2 marks]
Work out its volume, to the nearest cm^3 .



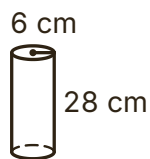
Answer ... cm^3

- C2** A coin has a diameter of 2.2 cm and is 3 mm thick. Work out its volume in cm^3 , to 2 d.p. [2 marks]



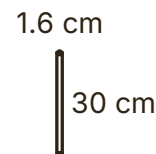
Answer ... cm^3

- C3** A vase is a cylinder with an inside radius of 6 cm and an inside height of 28 cm. It is two-thirds full of water. How many litres of water are in it? Give your answer to 2 d.p. [3 marks]



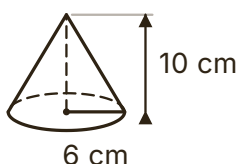
Answer ... litres

- C4** A copper rod is a cylinder with a diameter of 1.6 cm and a length of 30 cm. 1 cm^3 of copper has a mass of 8.9 g. Work out the mass of the rod, to the nearest gram. [3 marks]



Answer ... g

- C5** The volume of a cone is $\frac{1}{3}\pi r^2 h$. [2 marks]
Work out the volume of this cone, to 3 s.f.

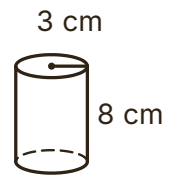


Answer ... cm^3

- D1** Sam says, "If you double the radius of a cylinder and keep its height the same, its volume doubles."

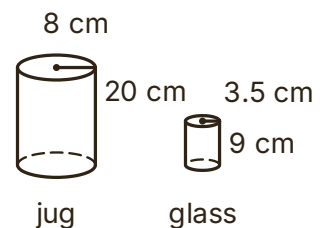
[3 marks]

Use this cylinder to show that Sam is wrong.



- D2** A jug is a cylinder of radius 8 cm and height 20 cm. It is full of juice. The juice is poured into glasses. Each glass is a cylinder of radius 3.5 cm and height 9 cm. How many glasses can be filled completely?

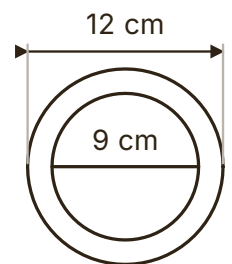
[4 marks]



Answer ... glasses

- D3** A metal pipe is 2.5 m long. The end of the pipe is shown. It has an outside diameter of 12 cm and an inside diameter of 9 cm.

- (a) Work out the volume of metal in the pipe, in cm^3 , to 3 s.f. [3 marks]



Answer ... cm^3

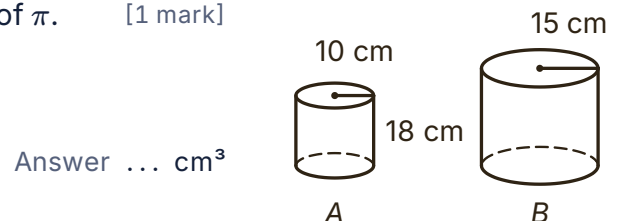
- (b) 1 cm^3 of the metal has a mass of 7.8 g. Work out the mass of the pipe in kg, to 1 d.p. [2 marks]

Answer ... kg

Total for D3: 5 marks

- D4** Cylinder A has a radius of 10 cm. It holds water to a depth of 18 cm. All the water is poured into the empty cylinder B, which has a radius of 15 cm.

- (a) Work out the volume of the water, in terms of π . [1 mark]



Answer ... cm^3

(b) Work out the depth of the water in cylinder B .

[3 marks]

Answer ... cm

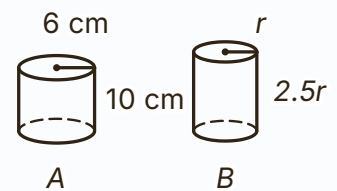
Total for D4: 4 marks

E Extension

Stretch

No route is given. The hints are at the end of the sheet. Use one at a time.

- E1** Cylinder A has a radius of 6 cm and a height of 10 cm. Cylinder B has the same volume as A , and its height is 2.5 times its radius. Work out the radius of B , to 3 s.f. [4 marks]



Answer $r = \dots$ cm Not drawn accurately

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** The volume of A is $\pi \times 6^2 \times 10 = 360\pi \text{ cm}^3$.
Hint 2 For B , $V = \pi \times r^2 \times 2.5r = 2.5\pi r^3$.
Hint 3 $2.5\pi r^3 = 360\pi$, so $r^3 = 144$ and $r = \sqrt[3]{144} = 5.24 \text{ cm}$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can find the volume of a cylinder with $V = \pi r^2 h$. ☐ ☐ ☐
- I can give a volume in terms of π . ☐ ☐ ☐
- I can find the height or the radius from the volume. ☐ ☐ ☐
- I can use volumes to answer questions about capacity and mass. ☐ ☐ ☐