



- 1 A cuboid measures 6 cm by 4 cm by 3 cm.

Work out the volume of the cuboid.

State the units of your answer.

(2 marks)

Volume of a cuboid = length $\times$ width $\times$ height

$$\text{Volume} = 6 \times 4 \times 3 = 72 \text{ cm}^3$$

$$\boxed{72 \text{ cm}^3}$$

- 2 A cylinder has a radius of 5 cm and a height of 12 cm.

Work out the volume of the cylinder.

Give your answer correct to 3 significant figures.

(3 marks)

The circular cross-section has area πr^2 . Multiplying by the perpendicular height gives the volume, just as base area $\times$ height does for a cuboid

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

$$\text{Volume} = \pi \times 5^2 \times 12 = 300\pi$$

$$\text{Volume} = 942.477... = 942 \text{ cm}^3 \text{ (3 significant figures)}$$

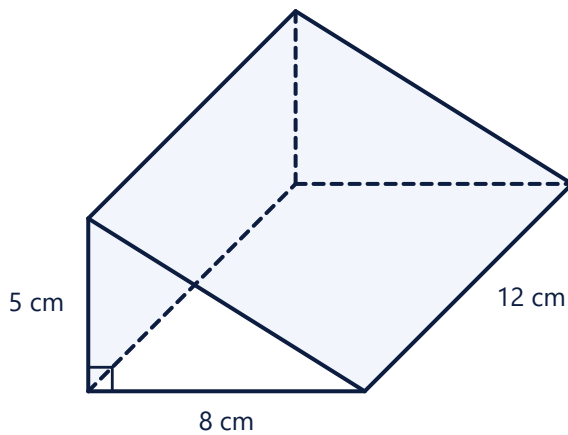
$$\boxed{942 \text{ cm}^3}$$

3

The cross-section of a prism is a right-angled triangle with base 8 cm and height 5 cm.

The length of the prism is 12 cm.

Work out the volume of the prism.



(3 marks)

$$\text{Area of the triangular cross-section} = \frac{1}{2} \times 8 \times 5 = 20 \text{ cm}^2$$

Volume of a prism = area of cross-section $\times$ length

$$\text{Volume} = 20 \times 12 = 240 \text{ cm}^3$$

A prism has the same cross-section all along its length. Imagine stacking identical thin slices: cross-sectional area $\times$ length gives the volume

$$\boxed{240 \text{ cm}^3}$$

4

A cylindrical tin has a diameter of 8 cm and a height of 10 cm.

Work out the volume of the tin.

Give your answer correct to 3 significant figures.

(3 marks)

$$\text{The radius} = 8 \div 2 = 4 \text{ cm}$$

$$\text{Volume} = \pi r^2 h = \pi \times 4^2 \times 10 = 160\pi$$

$$\text{Volume} = 502.654\dots = 503 \text{ cm}^3 \text{ (3 significant figures)}$$

$$\boxed{503 \text{ cm}^3}$$

5 A water tank is a cuboid measuring 50 cm by 40 cm by 30 cm.

a. Work out the volume of the tank in cm^3 .

b. Work out the capacity of the tank in litres. (1 litre = 1000 cm^3)

(3 marks)

a.)

$$50 \times 40 \times 30 = 60\,000$$

$$60\,000 \text{ cm}^3$$

b.)

$$60\,000 \div 1000$$

$$60 \text{ Litres}$$

6 A cuboid has a volume of 180 cm^3 .

The base of the cuboid measures 6 cm by 5 cm.

Work out the height of the cuboid.

(3 marks)

$$\text{Area of the base} = 6 \times 5 = 30 \text{ cm}^2$$

$$\text{Volume} = \text{base area} \times \text{height, so } 30 \times \text{height} = 180$$

$$\text{Height} = 180 \div 30 = 6 \text{ cm}$$

$$6 \text{ cm}$$

7 A cylindrical water butt has a radius of 25 cm and a height of 80 cm.

Work out the number of litres of water the water butt holds when it is full.

Give your answer to the nearest litre.

1 litre = 1000 cm^3

(4 marks)

$$\text{Volume} = \pi r^2 h = \pi \times 25^2 \times 80 = 50000\pi \text{ cm}^3$$

$$\text{Volume} = 157079.6... \text{ cm}^3$$

$$157079.6 \div 1000 = 157.08 \text{ Litres}$$

The water butt holds 157 Litres (nearest Litre)

$$157 \text{ Litres}$$

- 8 The cross-section of a prism is a trapezium.

The parallel sides of the trapezium are 6 cm and 10 cm, and the perpendicular distance between them is 4 cm.

The length of the prism is 15 cm.

Work out the volume of the prism.

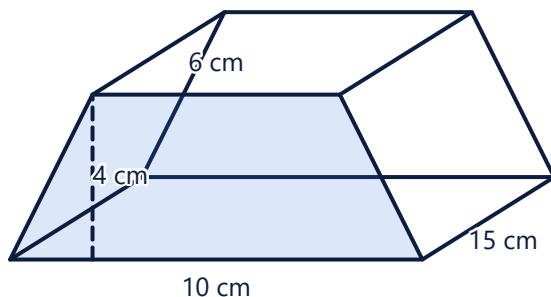


Diagram NOT accurately drawn

(3 marks)

$$\text{Area of the trapezium} = \frac{1}{2} \times (6 + 10) \times 4 = \frac{1}{2} \times 16 \times 4 = 32 \text{ cm}^2$$

Volume of a prism = area of cross-section $\times$ length

$$\text{Volume} = 32 \times 15 = 480 \text{ cm}^3$$

$$\boxed{480 \text{ cm}^3}$$

- 9 A fish tank is a cuboid 60 cm long, 25 cm wide and 30 cm high. It is filled with water to a depth of 20 cm.

The water is poured into cups. Each cup holds 250 cm^3 . How many cups can be filled completely?

(4 marks)

$$\text{water: } 60 \times 25 \times 20 = 30\,000 \text{ cm}^3$$

$$30\,000 \div 250 = 120$$

$$\boxed{120 \text{ cups}}$$

- 10 The cross-section of a prism is a rectangle 10 cm by 6 cm with a smaller rectangle 4 cm by 3 cm cut out of one corner. The prism is 15 cm long.

Work out the volume of the prism.

(3 marks)

$$\text{area} = 10 \times 6 - 4 \times 3$$

$$= 60 - 12 = 48 \text{ cm}^2$$

$$\text{volume} = 48 \times 15$$

$$\boxed{720 \text{ cm}^3}$$

- 11 A swimming pool is a cuboid 25 m long, 10 m wide and 1.6 m deep. It is filled at a rate of 20 m^3 per hour.

How many hours does it take to fill the pool completely?

(3 marks)

$$\text{volume} = 25 \times 10 \times 1.6 = 400 \text{ m}^3$$

$$400 \div 20 = 20$$

20 hours

- 12 A water tank is a cuboid measuring 1.5 m by 0.8 m by 0.6 m.

The tank is empty. Dev fills the tank completely with water.

Water costs £1.25 for every 100 litres.

Work out the cost of the water needed to fill the tank.

$$1 \text{ m}^3 = 1000 \text{ litres}$$

(5 marks)

$$\text{Volume of the tank} = 1.5 \times 0.8 \times 0.6 = 0.72 \text{ m}^3$$

$$0.72 \text{ m}^3 = 0.72 \times 1000 = 720 \text{ litres}$$

$$720 \div 100 = 7.2 \text{ lots of } 100 \text{ litres}$$

$$\text{Cost} = 7.2 \times £1.25 = £9.00$$

£9.00

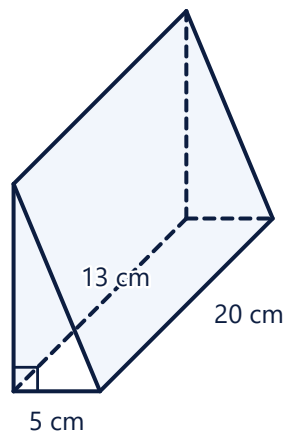
13

The cross-section of a prism is a right-angled triangle.

The hypotenuse of the triangle is 13 cm and one of the shorter sides is 5 cm.

The length of the prism is 20 cm.

Work out the volume of the prism.



(5 marks)

Use Pythagoras' theorem to find the other short side

$$\text{side}^2 = 13^2 - 5^2 = 169 - 25 = 144, \text{ so the side is } 12 \text{ cm}$$

$$\text{Area of the cross-section} = \frac{1}{2} \times 5 \times 12 = 30 \text{ cm}^2$$

$$\text{Volume} = 30 \times 20 = 600 \text{ cm}^3$$

$$\boxed{600 \text{ cm}^3}$$

14

A cuboid has a length of 8 cm and a width of 5 cm. Its volume is 280 cm^3 .

a. Work out the height of the cuboid.

b. Work out the total surface area of the cuboid.

(4 marks)

a)

$$8 \times 5 \times h = 280$$

$$40h = 280$$

$$\boxed{h = 7 \text{ cm}}$$

b)

$$2(8 \times 5 + 8 \times 7 + 5 \times 7)$$

$$= 2(40 + 56 + 35)$$

$$\boxed{262 \text{ cm}^2}$$

- 15 A cylindrical tank has a radius of 30 cm and a height of 80 cm. It is filled with water from a tap at 12 litres per minute.

How long does it take to fill the tank? Give your answer in minutes, to 1 decimal place. (1 litre = 1000 cm³)

(3 marks)

$$V = \pi \times 30^2 \times 80 = 72\,000\pi$$

$$= 226\,194.7 \text{ cm}^3$$

$$= 226.19 \text{ litres}$$

$$226.19 \div 12 = 18.8496\dots$$

$$\boxed{18.8 \text{ minutes}}$$

- 16 A solid metal cube has sides of 6 cm. It is melted down and made into a cuboid with a square base of side 4 cm.

Work out the height of the cuboid.

(3 marks)

$$\text{cube: } 6 \times 6 \times 6 = 216 \text{ cm}^3$$

$$4 \times 4 \times h = 216$$

$$16h = 216$$

$$\boxed{h = 13.5 \text{ cm}}$$

- 17 A cylindrical tub has a radius of 12 cm and a height of 20 cm. It is filled with a mixture of squash and water. The squash and water are in the ratio 1 : 9 by volume.

How many millilitres of squash are needed? Give your answer to 3 significant figures. (1 cm³ = 1 ml)

(3 marks)

$$V = \pi \times 12^2 \times 20 = 2880\pi = 9047.8 \text{ cm}^3$$

$$\text{ratio } 1 : 9 = 10 \text{ parts}$$

$$9047.8 \div 10 = 904.78$$

$$\boxed{905 \text{ ml}}$$

- 18 The cross-section of a prism is an L-shape.

The L-shape is made by starting with a rectangle 12 cm wide and 9 cm tall, then removing a 7 cm by 5 cm rectangle from the top right corner.

The length of the prism is 24 cm.

Show that the volume of the prism is 1752 cm^3 .

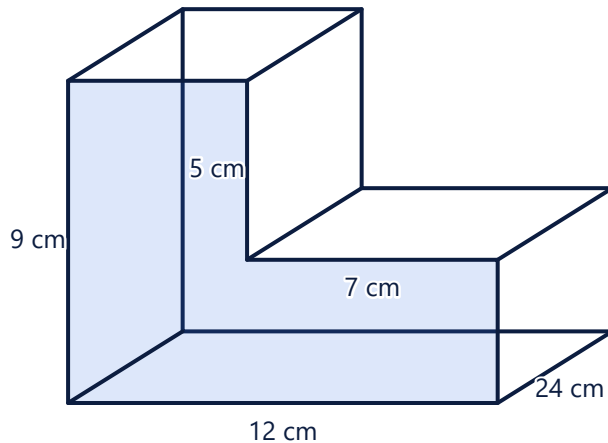


Diagram NOT accurately drawn

(5 marks)

$$\text{Area of the full rectangle} = 12 \times 9 = 108 \text{ cm}^2$$

$$\text{Area removed} = 7 \times 5 = 35 \text{ cm}^2$$

$$\text{Area of the L-shaped cross-section} = 108 - 35 = 73 \text{ cm}^2$$

$$\text{Volume} = \text{area of cross-section} \times \text{length} = 73 \times 24 = 1752 \text{ cm}^3$$

- 19 A prism has a cross-section that is a right-angled triangle. The base of the triangle is 9 cm and the angle between the base and the hypotenuse is 35° . The prism is 12 cm long.

Work out the volume of the prism. Give your answer to 3 significant figures.

(4 marks)

$$\text{height} = 9 \times \tan 35^\circ$$

$$= 6.302 \text{ cm}$$

$$\text{area} = \frac{1}{2} \times 9 \times 6.302 = 28.36 \text{ cm}^2$$

$$\text{volume} = 28.36 \times 12 = 340.3$$

$$\boxed{340 \text{ cm}^3 (3 \text{ sf})}$$