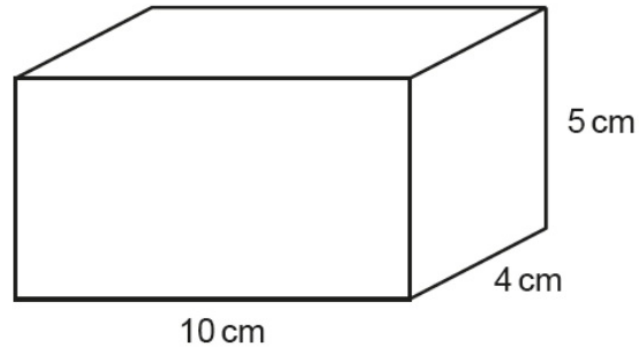


# G32 Volume of Prisms

OCR

- 21 Dani has a silver bar.  
The bar is a cuboid.

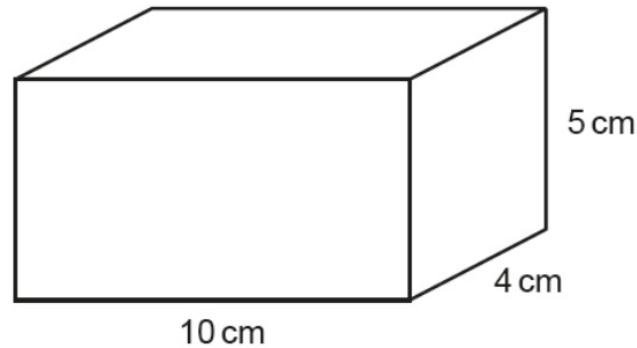


Silver has a density of 10.5 grams per  $\text{cm}^3$ .  
Dani sells the bar and is paid 30p for each gram of silver.

How much is she paid?  
Give your answer in pounds.

£ ..... [5]

- 21 Dani has a silver bar.  
The bar is a cuboid.



Created by

Volume

$$10\text{ cm} \times 4\text{ cm} \times 5\text{ cm} \\ = 200\text{ cm}^3$$

Silver has a density of 10.5 grams per cm<sup>3</sup>.  
Dani sells the bar and is paid 30p for each gram of silver.

How much is she paid?  
Give your answer in pounds.

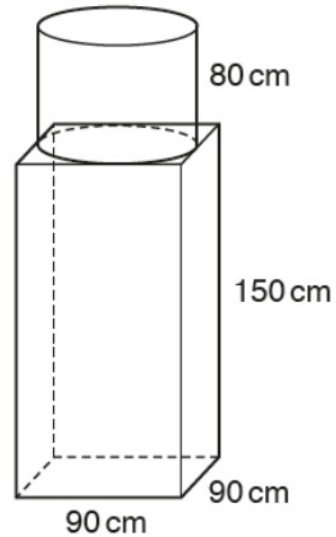
Weight =

$$10.5\text{ g} \times 200\text{ cm}^3$$

$$2100.0 = 2100\text{ g}$$

$$2100\text{ g} \times 30\text{ p} \\ 63000\text{ p}$$

£ £630 ..... [5]



A sculpture is formed from a cylinder resting on top of a cuboid.  
The cylinder has radius 45 cm and height 80 cm.  
The cuboid measures 90 cm by 90 cm by 150 cm.

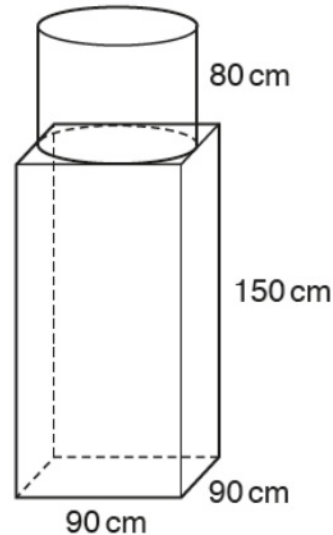
The sculpture is made of granite.  
The granite has a density of  $2.7 \text{ g/cm}^3$ .

Calculate the total mass of the sculpture in tonnes.

.....tonnes [5]

Volume of cuboid

$$90 \times 90 \times 150 \\ = 1215000 \text{ cm}^3$$



Cylinder



Video creator:

$$\pi r^2 \\ \pi \times 45^2 \times 80 \\ = 508938 \text{ cm}^3$$

Total volume =  $1723938 \text{ cm}^3$

$$\times 2.7 \text{ g} \rightarrow 4654632.627 \text{ g}$$

$$1000 \text{ g} = 1 \text{ kg}$$

$$1000 \text{ kg} = 1 \text{ t}$$

$$4654.632 \text{ kg}$$

$$4.654632 \text{ tonnes}$$

$$4.65$$

.....tonnes [5]

A sculpture is formed from a cylinder resting on top of a cuboid.

The cylinder has radius 45 cm and height 80 cm.

The cuboid measures 90 cm by 90 cm by 150 cm.

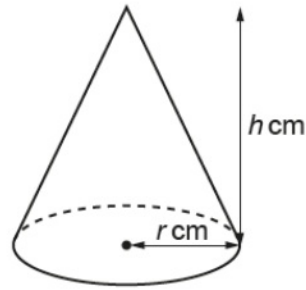
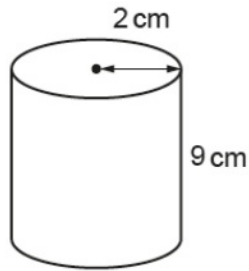
The sculpture is made of granite.

The granite has a density of  $2.7 \text{ g/cm}^3$ .

Calculate the total mass of the sculpture in tonnes.

14 The diagram shows a cylinder and a cone.

G32  
G34



Created by

The cylinder has radius 2 cm and height 9 cm.  
The cone has radius  $r$  cm and height  $h$  cm.

The ratio  $r : h$  is 1 : 4.  
The volume of the cone is **equal to** the volume of the cylinder.

Work out the value of  $r$ .

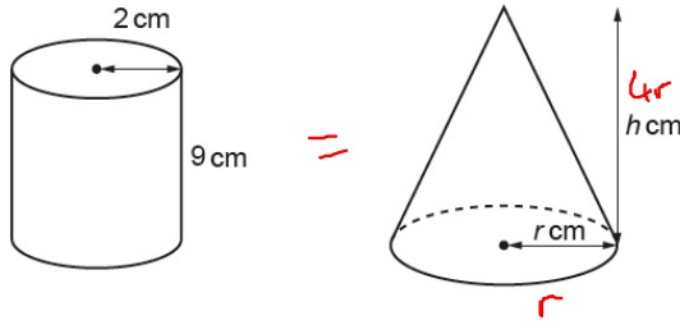
[The volume  $V$  of a cone with radius  $r$  and height  $h$  is  $V = \frac{1}{3}\pi r^2 h$ .]

..... [5]

14 The diagram shows a cylinder and a cone.

G32

G34



The cylinder has radius 2 cm and height 9 cm.  
The cone has radius  $r$  cm and height  $h$  cm.

The ratio  $r : h$  is 1 : 4.

The volume of the cone is **equal** to the volume of the cylinder.

Work out the value of  $r$ .

[The volume  $V$  of a cone with radius  $r$  and height  $h$  is  $V = \frac{1}{3}\pi r^2 h$ .]

Created by

Volume of cylinder

$$R^2 \times \pi \times 9$$

$$= 2^2 \times \pi \times 9$$

$$= 4 \times \pi \times 9$$

$$= 36\pi$$

Volume of cone

$$r^2 \times \pi \times 4r$$

$$= 4r^3 \pi$$

$$\frac{1}{3} \pi r^2 4r = 36\pi$$

$$\frac{1}{3} 4r^3 = 36$$

$$\frac{1}{3} r^3 = 9 \quad (\div 4)$$

$$r^3 = 27 \quad (\times 3)$$

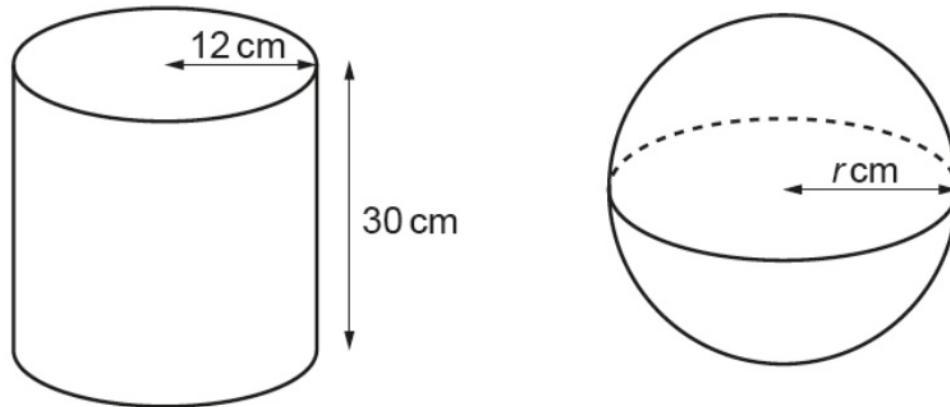
$$\sqrt[3]{27} = 3$$

$$r = 3 \checkmark$$



6 The diagram shows a cylinder and a sphere.

G32  
G34



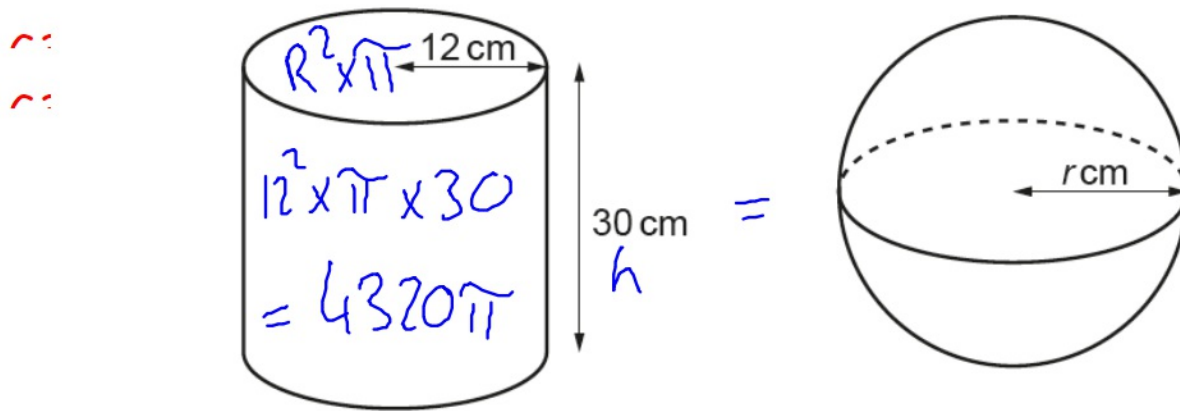
The cylinder has radius 12 cm and height 30 cm.  
The cylinder and the sphere have the same volume.

Work out the radius  $r$  cm of the sphere.

[The volume  $V$  of a sphere with radius  $r$  is  $V = \frac{4}{3} \pi r^3$ .]

..... cm [5]

6 The diagram shows a cylinder and a sphere.



$$\frac{4}{3} \pi r^3 = 4320\pi$$

$$\frac{4}{3} r^3 = 4320$$

$$r^3 = \frac{4320}{\frac{4}{3}}$$

$$r^3 = 3240$$

$$r = \sqrt[3]{3240}$$

The cylinder has radius 12 cm and height 30 cm.  
The cylinder and the sphere have the same volume.

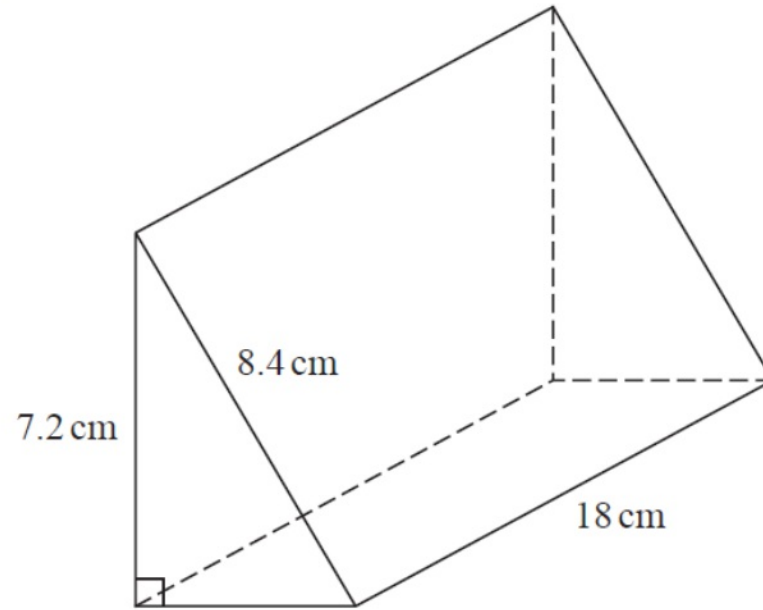
Work out the radius  $r$  cm of the sphere.

[The volume  $V$  of a sphere with radius  $r$  is  $V = \frac{4}{3} \pi r^3$ .]

$$14.8 \text{ cm} \checkmark \text{ cm [5]}$$

Edexcel

26 Here is a triangular prism.



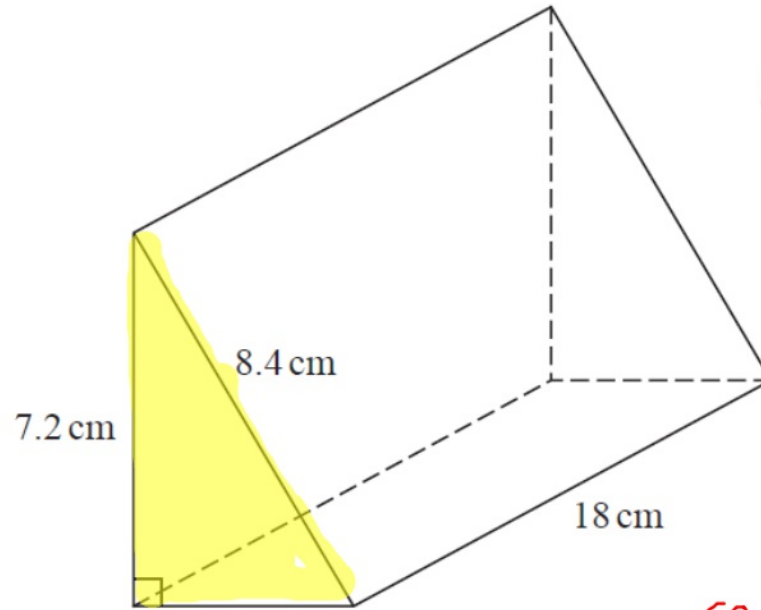
Work out the volume of the prism.  
Give your answer correct to 3 significant figures.

..... cm<sup>3</sup>

**(Total for Question 26 is 5 marks)**

26 Here is a triangular prism.

G43  
G44  
G32



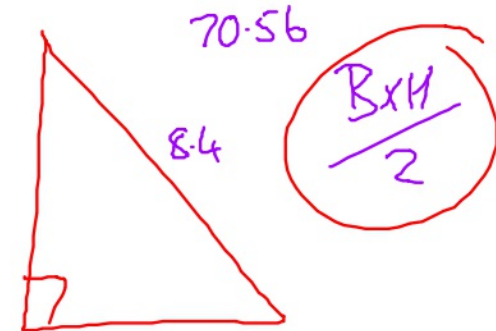
Area of CS x length

Work out the volume of the prism.

Give your answer correct to 3 significant figures.

51.84

7.2



4.3266 cm

18.72 ↑

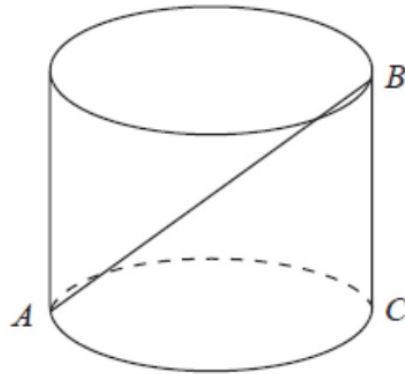
$$CS = \frac{B \times H}{2} = 15.57... \times 18$$

280 ✓ cm<sup>3</sup>

(Total for Question 26 is 5 marks)

12 The diagram shows a metal rod,  $AB$ , resting inside a cylindrical tin.

Created by



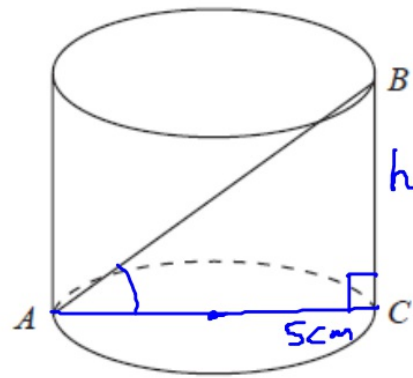
The tin is on a horizontal table.  
 $AC$  is a diameter of the base of the tin.  
 $B$  is on the top edge of the tin.  
 $BC$  is vertical.

The radius of the base of the tin is 5 cm.  
The volume of the tin is  $1178 \text{ cm}^3$

Find the angle between the rod and the base of the tin.  
Give your answer correct to the nearest degree.

.....  
(Total for Question 12 is 4 marks)

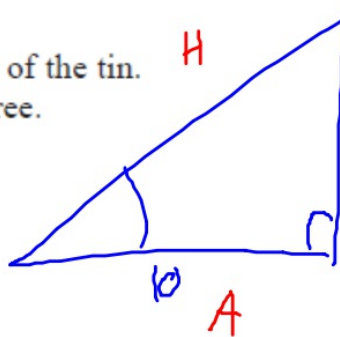
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The radius of the base of the tin is 5 cm.  
 The volume of the tin is  $1178 \text{ cm}^3$

Find the angle between the rod and the base of the tin.  
 Give your answer correct to the nearest degree.



Volume of cylinder

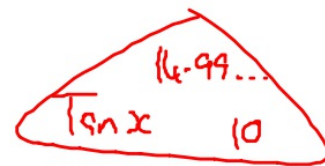
$$\pi r^2 h = 1178$$

$$\pi 5^2 h = 1178$$

$$h = \frac{1178}{\pi 5^2}$$

$$h = 14.99876184 \text{ cm}$$

SHCA TA ✓

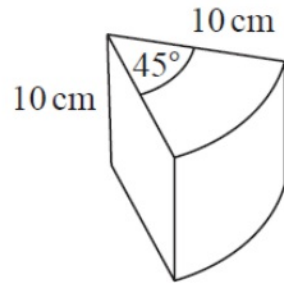


$$\begin{aligned} \tan x &= 1.499.. \\ x &= \tan^{-1} 1.499.. \end{aligned}$$

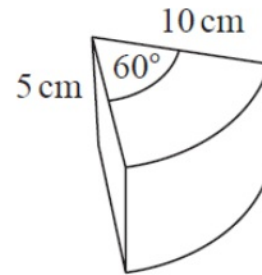
$56^\circ$  ✓

(Total for Question 12 is 4 marks)

19 Here are two solid prisms, prism **A** and prism **B**.



prism **A**



prism **B**

The cross section of prism **A** is a sector, with angle  $45^\circ$ , of a circle of radius 10 cm.  
The prism has a depth of 10 cm and a mass of  $40\pi$  grams.

The cross section of prism **B** is a sector, with angle  $60^\circ$ , of a circle of radius 10 cm.  
The prism has a depth of 5 cm and a mass of  $50\pi$  grams.

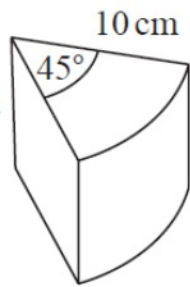
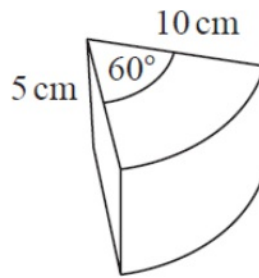
Express the difference in the densities of the two prisms as a percentage of the density of prism **A**.

..... %



19 Here are two solid prisms, prism A and prism B.

$\therefore R^2 \times \pi = 8 \times 10$   
 $\therefore \frac{100\pi}{8} \times 10$   
 $= \frac{1000\pi}{8} = 125\pi$  prism A

prism B

$R^2 \times \pi = 6 \times 5$   
 $100\pi = 6 \times 5$   
 $\frac{500\pi}{6}$

$\text{diff} = 0.6 - 0.32$   
 $= 0.28$

$\frac{0.28}{0.32} = \frac{28}{32} = \frac{7}{8}$   
 $= \frac{7}{8}$

$= 87.5\%$

The cross section of prism A is a sector, with angle  $45^\circ$ , of a circle of radius 10 cm. The prism has a depth of 10 cm and a mass of  $40\pi$  grams.

The cross section of prism B is a sector, with angle  $60^\circ$ , of a circle of radius 10 cm. The prism has a depth of 5 cm and a mass of  $50\pi$  grams.

Express the difference in the densities of the two prisms as a percentage of the density of prism A.



$\frac{A}{D} = \frac{40\pi}{125\pi}$   
 $= \frac{40}{125} = \frac{8}{25} \quad 0.32 \text{ g/cm}^3$

$\frac{B}{D} = \frac{50}{\pi} = \frac{500\pi}{6}$   
 $= 50 \times \frac{6}{500} = \frac{300}{500}$

$0.6 \text{ g/cm}^3$

$87.5\%$

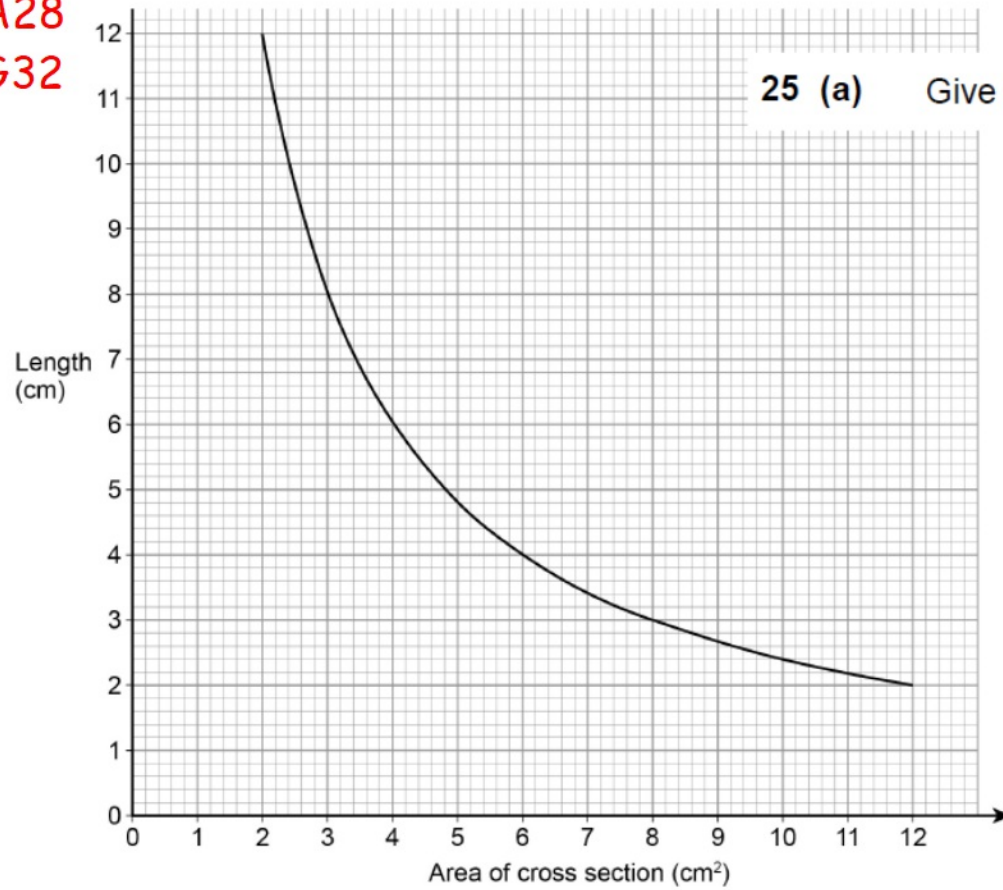
AQA

25

The graph shows information about prisms with the same volume.

Video assets

A28  
G32



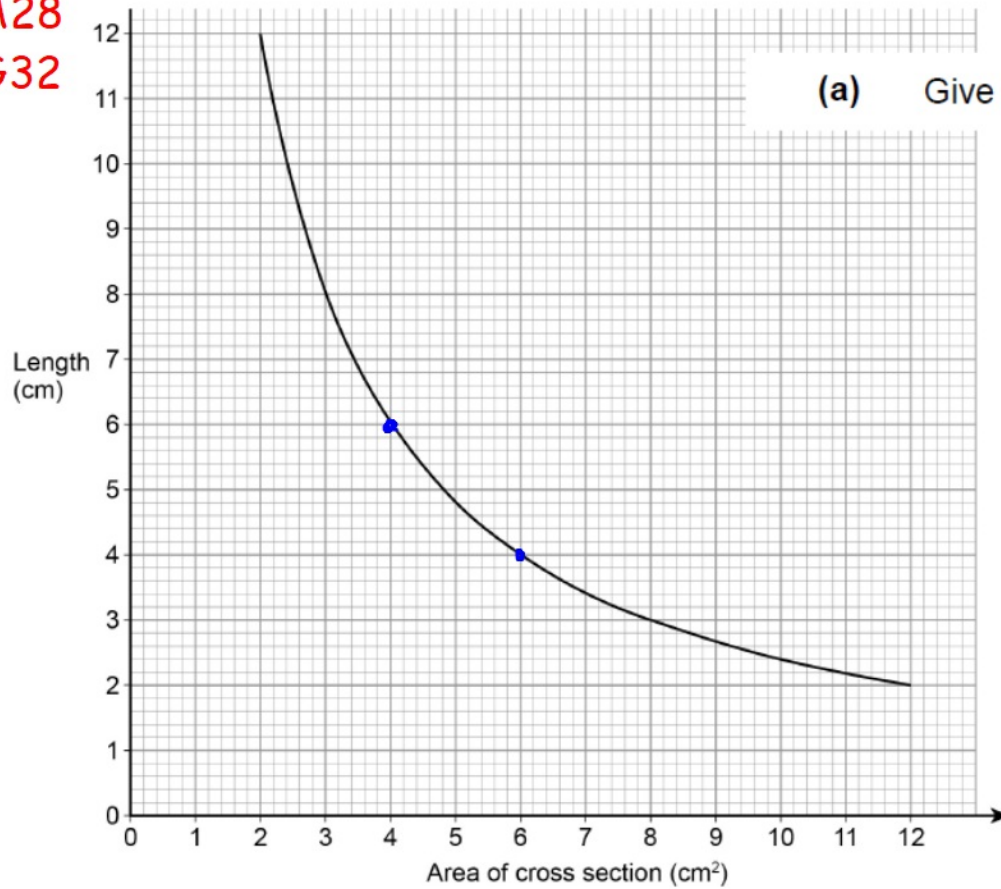
25 (a) Give **one** example to show the volume is  $24 \text{ cm}^3$

[1 mark]

The graph shows information about prisms with the same volume.

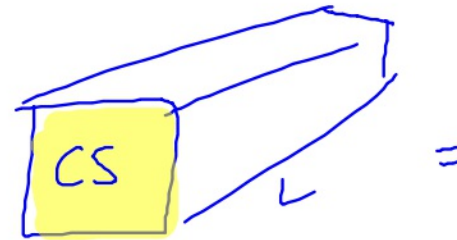
Video created by W Neill

A28  
G32



(a) Give one example to show the volume is  $24 \text{ cm}^3$

[1 mark]



$$CS \times L = \text{Volume}$$

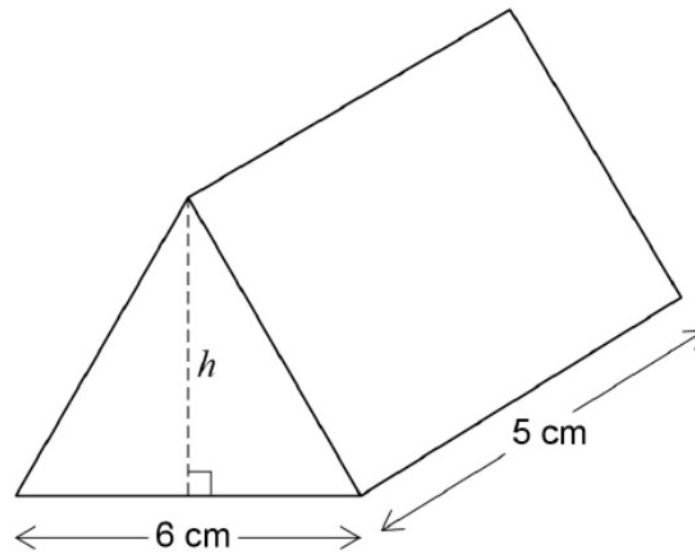
$$4 \times 6 = 24 \text{ cm}^3$$

$$6 \times 4 = 24 \text{ cm}^3$$

- 25 (b) The diagram shows a prism with volume  $24 \text{ cm}^3$   
The height of the triangular cross section is  $h$ .

632

Video created by W Neill



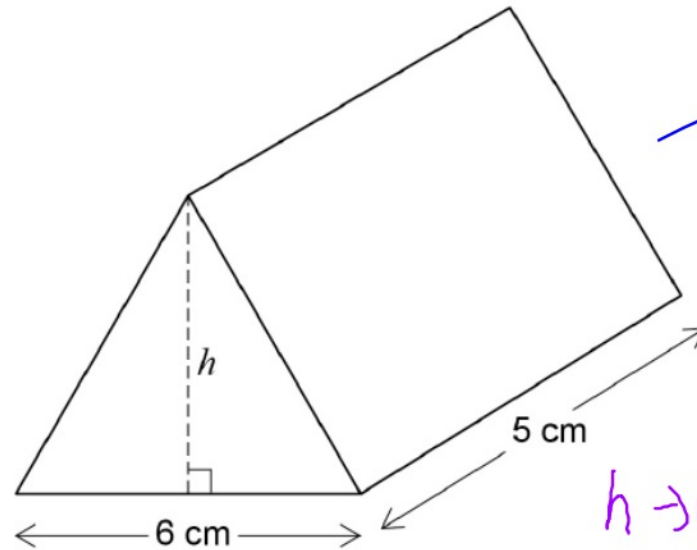
Work out the height,  $h$ .

[3 marks]

Answer \_\_\_\_\_ cm

- (b) The diagram shows a prism with volume  $24 \text{ cm}^3$   
 The height of the triangular cross section is  $h$ .

G32



CS

$$\frac{B \times H}{2} \times 5 = 24$$

$$\frac{bh}{2} \times 5 = 24$$

$$h \rightarrow (\times 6) \Rightarrow (\div 2) \Rightarrow (\times 5) \Rightarrow 24$$

$$\leftarrow (\div 6) \leftarrow (\times 2) \leftarrow (\div 5) \leftarrow 24$$

[3 marks]

Work out the height,  $h$ .

Answer 1.6 ✓ cm

2 Circle the volume, in  $\text{cm}^3$ , of a cylinder with radius 5 cm and height 8 cm

**[1 mark]**

G32

$40\pi$

$80\pi$

$200\pi$

$1600\pi$

2 Circle the volume, in  $\text{cm}^3$ , of a cylinder with radius 5 cm and height 8 cm

[1 mark]

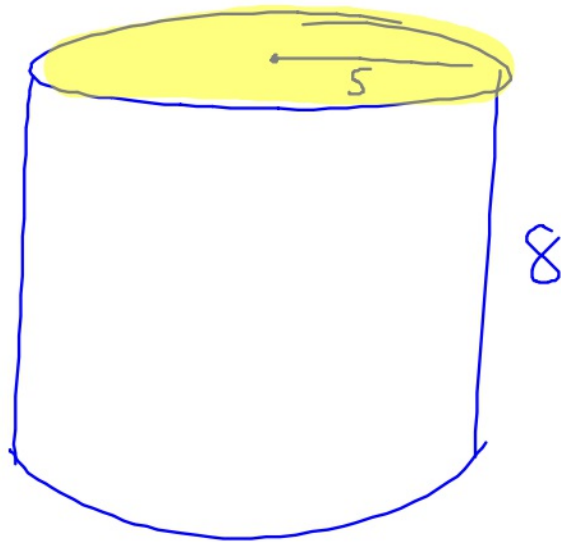
G32

$40\pi$

$80\pi$

$200\pi$

$1600\pi$



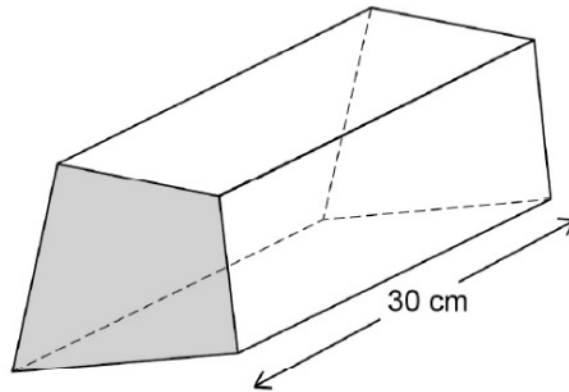
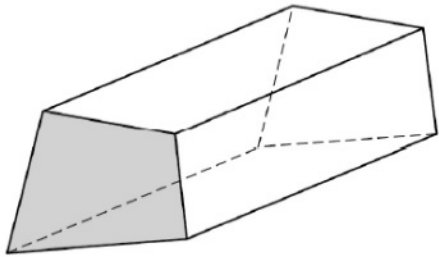
$$\begin{aligned} R^2 \times \pi \times h \\ 5^2 \times \pi \times 8 \\ 25 \times \pi \times 8 \\ 200\pi \end{aligned}$$



Prisms A and B are similar.  
The cross sections are shaded.

**G56**      **Prism A**  
**G32**      volume =  $480 \text{ cm}^3$

**Prism B**  
length = 30 cm



area of the cross section of A : area of the cross section of B = 4 : 9

Work out the area of the cross section of B.    **[5 marks]**

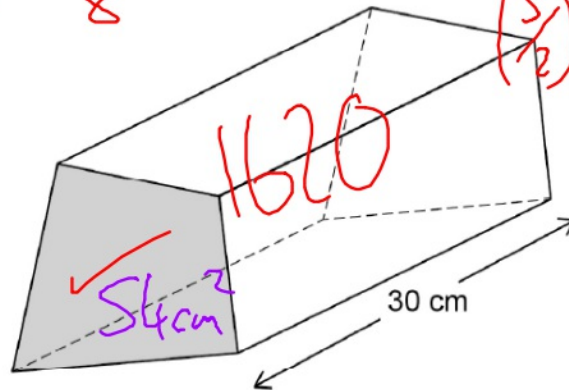
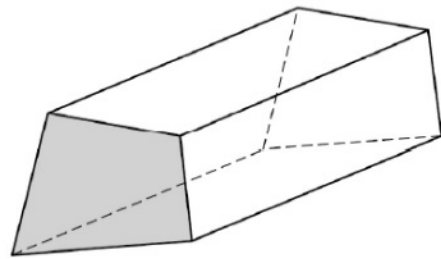
Prisms A and B are similar.  
The cross sections are shaded.

**G56** Prism A  
**G32** volume =  $480 \text{ cm}^3$

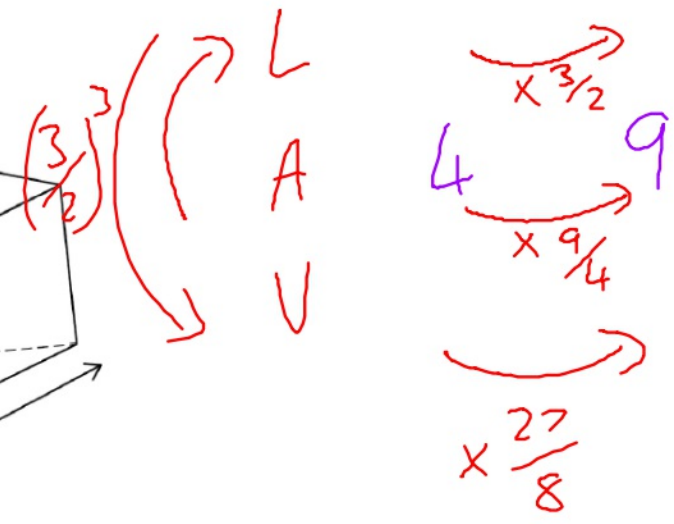
$$\sqrt{\frac{9}{4}} = \frac{3}{2}$$

$$\left(\frac{3}{2}\right)^3 = \frac{27}{8}$$

**Prism B**  
length = 30 cm



A B



area of the cross section of A : area of the cross section of B = 4 : 9

Work out the area of the cross section of B. [5 marks]

$$3 \overline{) 162} \begin{array}{r} 54 \\ \underline{162} \\ 0 \end{array}$$

$$\begin{array}{r} 60 \\ \times 27 \\ \hline 420 \\ 1200 \\ \hline 1620 \end{array}$$

Volume of B

$$CS = \frac{1620}{30} = 54 \text{ cm}^2$$

$$480 \times \frac{27}{8} = 1620$$

**16** Some concrete has volume  $3.8 \text{ m}^3$

**16 (a)** The density of the concrete is  $2400 \text{ kg/m}^3$

**R24** Work out the mass of the concrete.

**[2 marks]**

---

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Answer \_\_\_\_\_ kg

16 Some concrete has volume 3.8 m<sup>3</sup>

16 (a) The density of the concrete is 2400 kg/m<sup>3</sup>

R24 Work out the mass of the concrete.

[2 marks]

The solution is written on a set of four horizontal lines. A blue triangle is drawn with its top vertex at the top line and its base on the bottom line. The top line of the triangle is labeled 'Mass'. The bottom line of the triangle is labeled 'Den \* Vol'. To the right of the triangle, the calculation  $2400 \times 3.8$  is written on the second line from the top, and the result  $9120$  is written on the third line from the top. Below the bottom line, the word 'Answer' is written, followed by a blank space, then the number  $9120$ , then the unit 'kg', and finally a checkmark.

2400 × 3.8

Mass

Den \* Vol

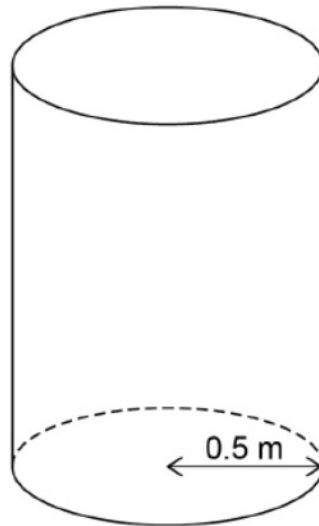
9120

Answer \_\_\_\_\_ kg ✓

Video created by W Neill

- 16 (b)** The  $3.8 \text{ m}^3$  of concrete is made into the shape of a cylinder.  
The base has radius  $0.5$  metres.

**G32**



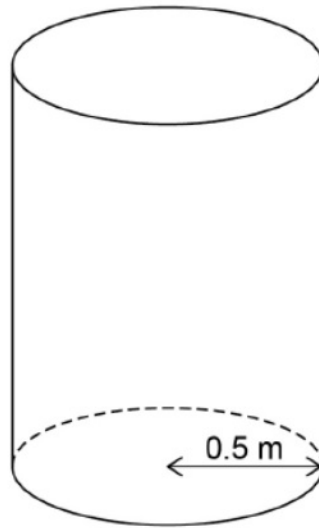
Work out the height of the cylinder.

**[2 marks]**

Answer \_\_\_\_\_ m

- 16 (b) The  $3.8 \text{ m}^3$  of concrete is made into the shape of a cylinder.  
The base has radius 0.5 metres.

∴



Work out the height of the cylinder.

$$R^2 \times \pi \times h = 3.8$$

$$0.5^2 \times \pi \times h = 3.8$$

$$0.785 \dots h = 3.8$$

$$h = \frac{3.8}{0.785}$$

[2 marks]

$$\frac{3.8}{0.785}$$

$$h = 4.838 \text{ m}$$

Answer

4.838 ✓ m