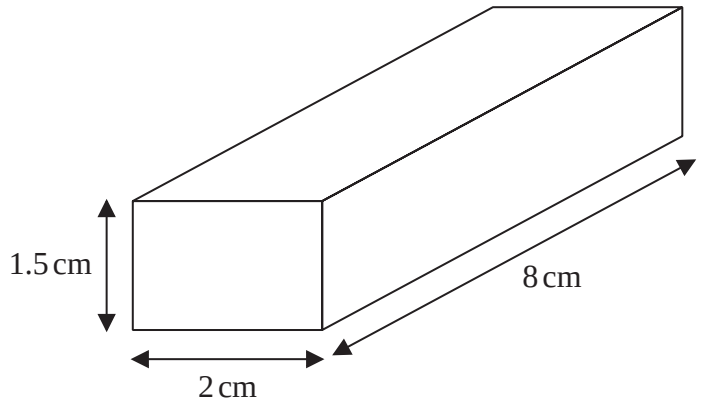
1 Pablo made a solid gold statue.

He melted down some gold blocks and used the gold to make the statue.
Each block of gold was a cuboid, as shown below.

Diagram **NOT** accurately drawn



The mass of the statue is 5.73 kg.
The density of gold is 19.32 g/cm^3

Work out the least number of gold blocks Pablo melted down in order to make the statue.
Show your working clearly.

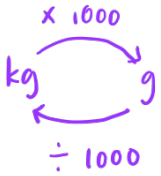
Volume of gold blocks : $2 \times 1.5 \times 8 = 24\ cm^3$ (1)

Mass of gold = density x volume

$= 19.32 \times 24$

$= 463.68\ g$ (2)

Convert to kg = $0.46368\ kg$



Number of gold blocks needed = $\frac{5.73}{0.46368}$

$= 12.35\ldots$ (1)

round up the value

≈ 13

13 (1)

(Total for Question 1 is 5 marks)

2 The diagram shows a box in the shape of a cuboid.

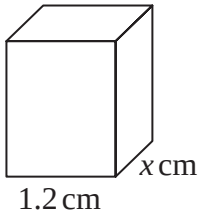


Diagram **NOT** accurately drawn

The box is put on a table.
The face of the box in contact with the table has length 1.2 metres and width x metres.

The force exerted by the box on the table is 27 newtons.
The pressure on the table due to the box is 30 newtons/m^2

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the value of x.

Area of the base of the box :

$1.2x \text{ m}^2$

$30 \text{ N/m}^2 = \frac{27 \text{ N}}{1.2x \text{ m}^2}$ (1)

$1.2x = \frac{27}{30}$

$1.2x = 0.9$

$x = \frac{0.9}{1.2}$ (1)

$= 0.75$ (1)

$x =$ 0.75

(Total for Question 2 is 3 marks)

3 The density of gold is 19.3 g/cm^3
A gold bar has volume 150 cm^3

density = mass / volume

Work out the mass of the gold bar.

$19.3 = \frac{\text{mass}}{150}$

mass = 19.3×150 (1)

= 2895 g (1)

2895 ..... g

(Total for Question 3 is 2 marks)

4 The diagram shows a solid cylinder made from iron.

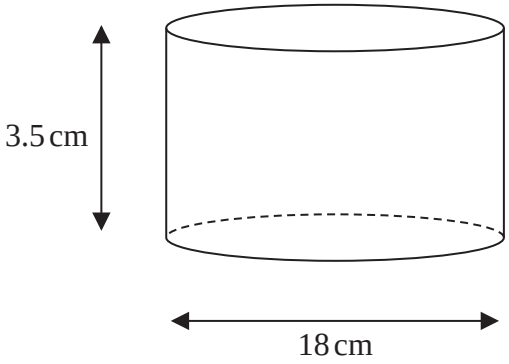
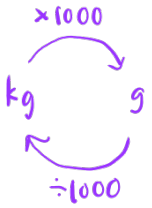


Diagram **NOT** accurately drawn

The cylinder has diameter 18 cm and height 3.5 cm
The mass of the cylinder is 7.04 kg

density = mass / volume

Work out the density of the iron.
Give your answer in g/cm^3 correct to 2 significant figures.



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

Volume of cylinder $= \pi \times \left(\frac{18}{2}\right)^2 \times 3.5$

$= 890.64\ldots$ (1)

density $= \frac{7.04 \times 1000}{890.64\ldots}$ (1) – convert to g

$= 7.9$ g/cm^3 (1)

7.9 g/cm^3

(Total for Question 4 is 3 marks)

5 A cylinder is placed on the ground.

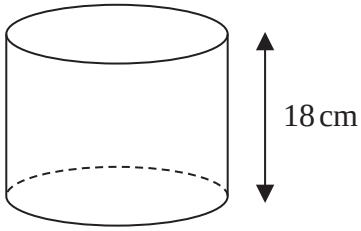


Diagram **NOT** accurately drawn

The height of the cylinder is 18 cm.

The force exerted by the cylinder on the ground is 72 newtons.
The pressure on the ground due to the cylinder is 1.4 newtons / cm^2

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

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

area = force / pressure

= 72 / 1.4 = 51.4 (1) (1)

$51.4 = \pi \times r^2$

$r = \sqrt{\frac{51.4}{\pi}}$

= 4.046 (1)

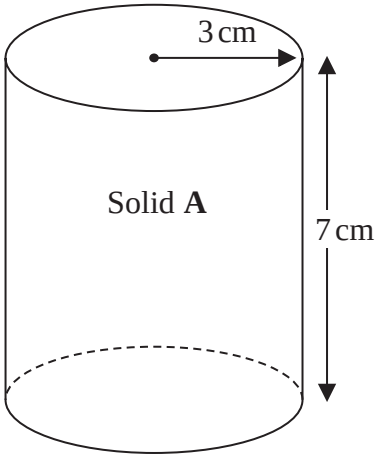
Volume : $\pi \times (4.046)^2 \times 18$

: 926 (1)

926 ..... cm^3

(Total for Question 5 is 4 marks)

6 The diagram shows two solids, **A** and **B**, made from two different metals.



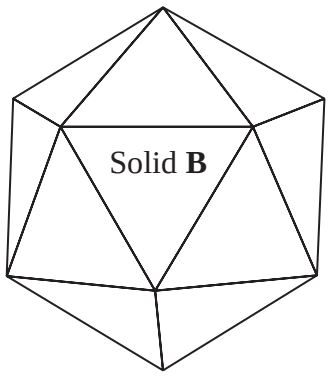


Diagram **NOT** accurately drawn

Solid **A** is in the shape of a cylinder with radius 3 cm and height 7 cm
Solid **A** has a mass of 2000 g

Solid **B** has a mass of 3375 g
Solid **B** has a volume of 450 cm^3

All of the metal from Solid **A** and Solid **B** is melted down to make a uniform Solid **C**

Given that there is no change to mass or volume during this process

work out the density of Solid **C**
Give your answer correct to one decimal place.

volume A : $\pi \times 3^2 \times 7$ = 197.9 .... (1)

density C : $\frac{2000 + 3375}{197.9... + 450}$ (1)

= 8.3 (1)

8.3 ..... g/cm^3

(Total for Question 6 is 3 marks)

7 The diagram shows a block of iron in the shape of a cuboid.

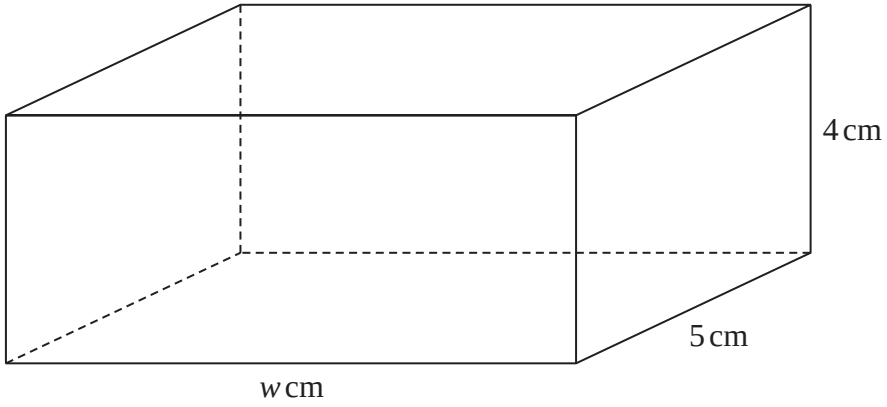


Diagram **NOT** accurately drawn

The block has length w cm, width 5 cm and height 4 cm

The density of iron is 7.8 g/cm^3
The mass of the block is 1950 g

Work out the value of w

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

$$\text{volume} = \frac{1950}{7.8} = 250 \text{ cm}^3 \quad (1)$$

$$250 = 5 \times 4 \times w$$

$$250 = 20w \quad (1)$$

$$w = \frac{250}{20} = 12.5 \quad (1)$$

$w =$ 12.5

(Total for Question 7 is 3 marks)