# R24...Compound Measures - Denisity

OCR

**22** A concrete slab is a cuboid.

It measures 400 mm by 400 mm by 28 mm.
The density of the concrete is 2250 kg/$m^3$.

Calculate the total mass of 60 slabs.

..... kg **[4]**

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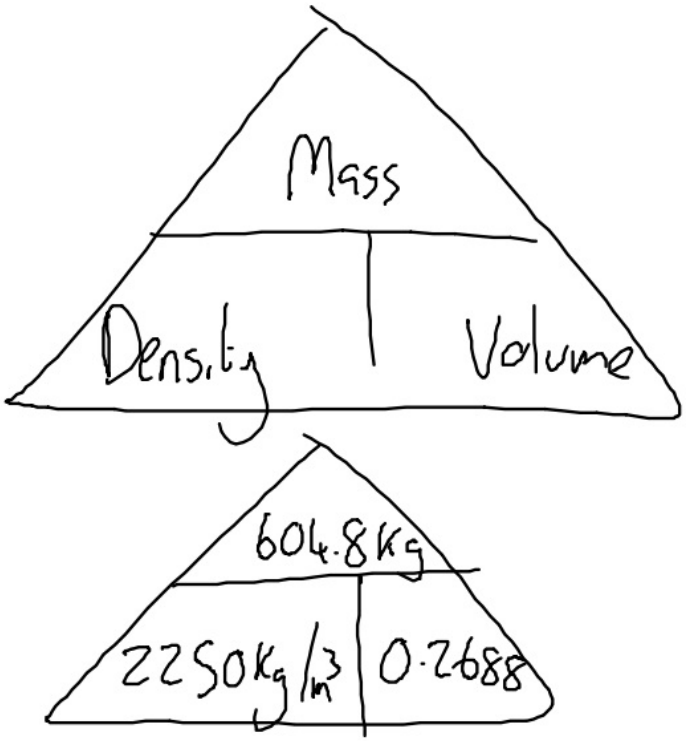


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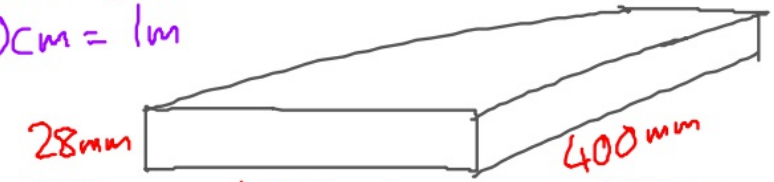
10mm = 1cm
100cm = 1m




2.8cm
0.028m

400mm
40cm
0.4m

40cm
0.4m

Volume of one slab = $0.00448m^3$

Volume of 60 = $0.00448 \times 60$
= $0.2688m^3$

604.8 ✓ ..... kg **[4]**

**14** An alloy is made from 28 $cm^3$ of copper and 41 $cm^3$ of gold.

The density of copper is 9 $g/cm^3$.
The density of gold is 19 $g/cm^3$.

**(a)** Work out the mass of copper used.

**(a)** ..... g **[2]**

**(b)** Work out the density of the alloy.

**(b)** ..... $g/cm^3$ **[4]**

Created by W Neill

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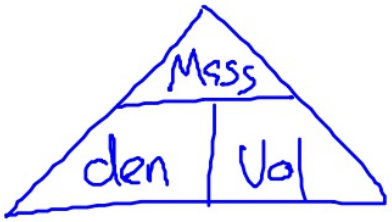
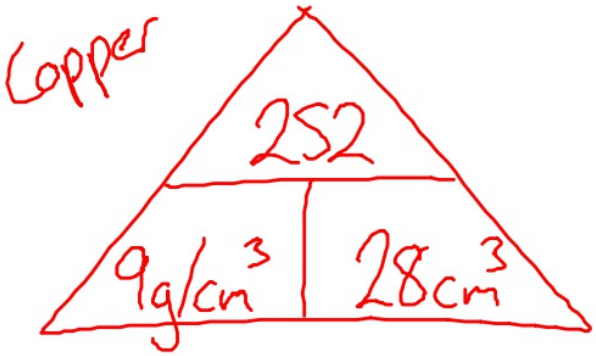
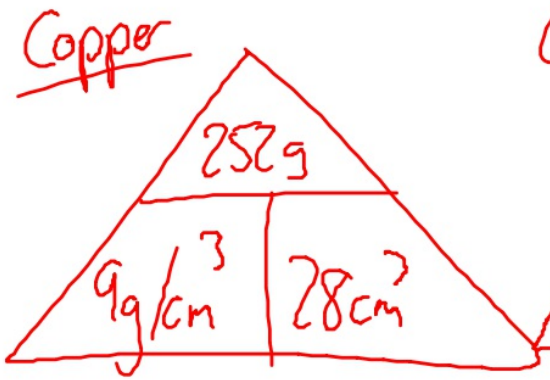
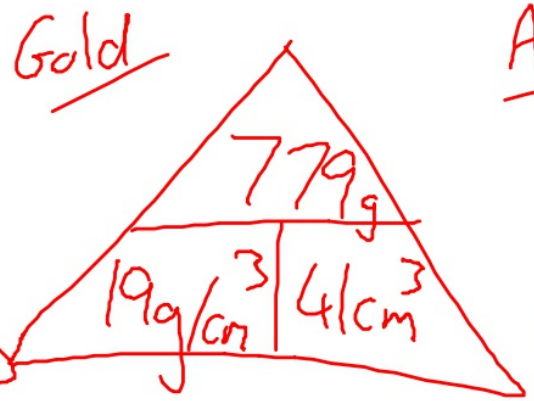


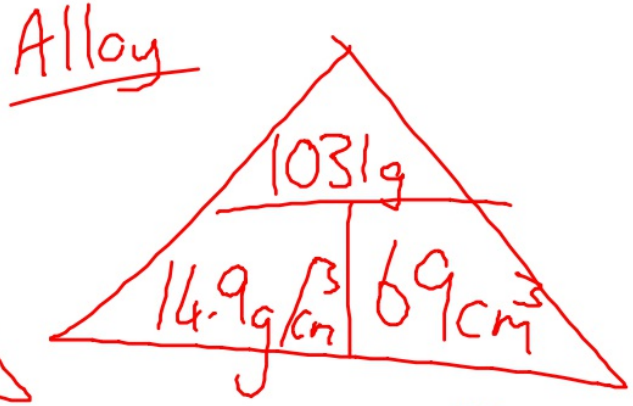




**(a)** 252 ✓ ..... g **[2]**

**(b)** Work out the density of the alloy.




**(b)** 14.9 $g/cm^3$ ..... $g/cm^3$ **[4]**

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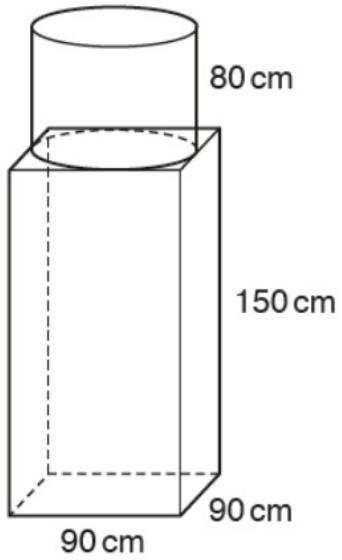
**22**




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.

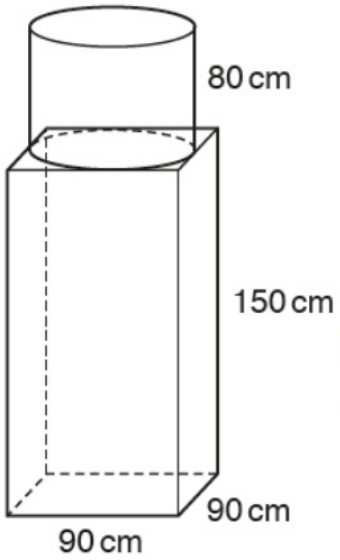
The sculpture is made of granite.
The granite has a density of 2.7 g/cm$^3$.

Calculate the total mass of the sculpture in tonnes.

.....tonnes **[5]**

Video created by W Neill

**22**

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Calculate the total mass of the sculpture in tonnes.

Volume of cuboid

$90 \times 90 \times 150$

$= 1215000 \text{ cm}^3$

Cylinder


$\pi r^2$

$\pi \times 45^2 \times 80$

$= 508938 \text{ cm}^3$

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

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

$1000 \text{ g} = 1 \text{ kg}$ → $4654.632 \text{ kg}$

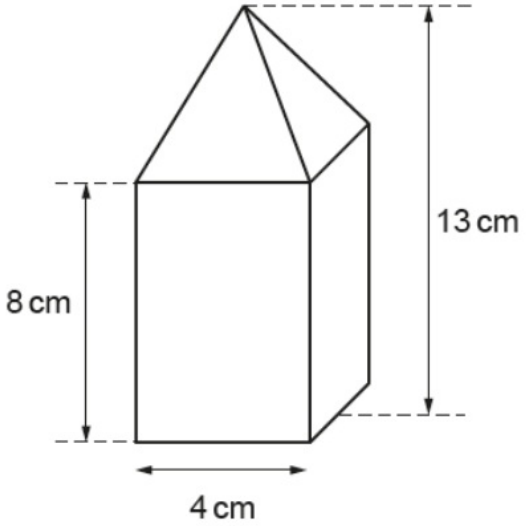
$1000 \text{ kg} = 1 \text{ t}$ → $4.654632$ tonnes

4.65

.....tonnes **[5]**

Video created by W Neill

**8** The object below is made from a square-based pyramid joined to a cuboid.




The base of the cuboid and the base of the pyramid are both squares of side 4 cm.
The height of the cuboid is 8 cm and the total height of the object is 13 cm.
The total mass of the object is 158 g.

The cuboid is made from wood with density 0.67 g/cm$^3$.
The pyramid is made from granite.

Calculate the density of the granite.

[The volume of a pyramid is $\frac{1}{3}$ × area of base × perpendicular height.]

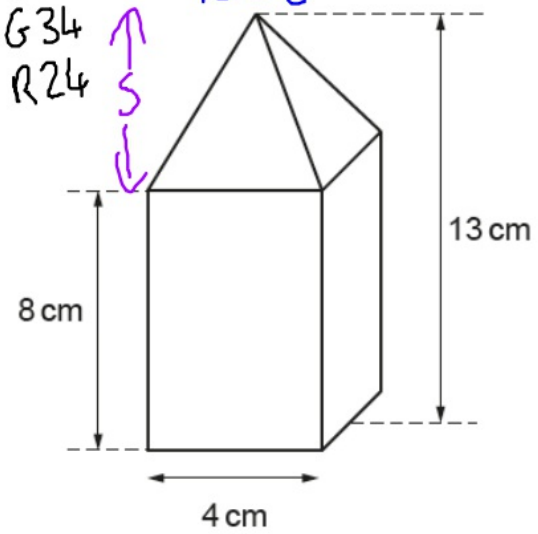
..... g/cm$^3$ **[5]**

Video created by W Neill

**8** The object below is made from a square-based pyramid joined to a cuboid.

G31
G34
R24

158g

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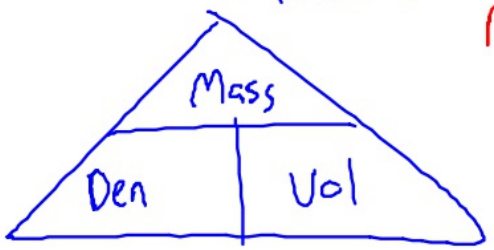
The cuboid is made from wood with density 0.67 g/cm$^3$.
The pyramid is made from granite.

Calculate the density of the granite.

[The volume of a pyramid is $\frac{1}{3}$ × area of base × perpendicular height.]

Wood → 4 x 4 x 8
= 128 cm$^3$




Mass = 0.67 x 128

85.76g

granite = mass = 72.24g

Volume = 1/3 x 4 x 4 x 5
= 26.6 cm$^3$


= D = 72.24 / 26.6

2.709 ..... g/cm$^3$ **[5]**

Video created by Will Neill

**4** A solid metal block has mass 500 g and volume 125 $cm^3$.

Work out the density of the block.
Give the units of your answer.

R24

..... **[3]**

Video created by Will Neill

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Work out the density of the block.
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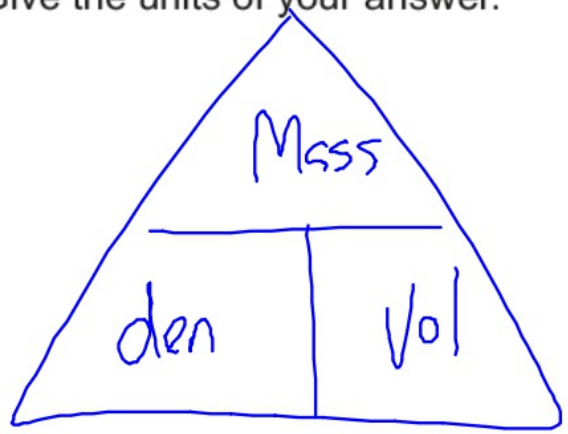
R24




den $\frac{500\,g}{125\,cm^3}$

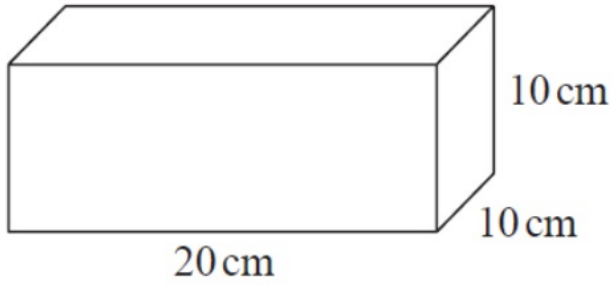
4 $g/cm^3$ ..... [3]

Edexcel

Video created by W Neill

G31
R24

**29** The diagram shows a block of silver in the shape of a cuboid.




The density of silver is 10.5 g/cm$^3$

Work out the mass, in grams, of the block of silver.

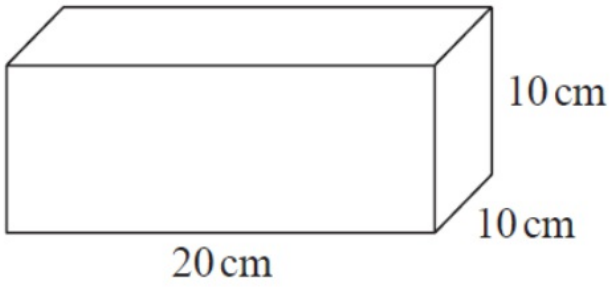
..... grams

**(Total for Question 29 is 3 marks)**

Video created by W Neill

**29** The diagram shows a block of silver in the shape of a cuboid.

G31
R24


The density of silver is 10.5 g/cm³

Work out the mass, in grams, of the block of silver.

Volume
= 10 x 10 x 20
= 2000 cm³

x2000 10.5g = 1cm³
= 2000 cm³

10.5 x 2000
21000

21000 grams

**(Total for Question 29 is 3 marks)**

Video created by W Neill

**20** The density of apple juice is 1.05 grams per $cm^3$.

The density of fruit syrup is 1.4 grams per $cm^3$.

The density of carbonated water is 0.99 grams per $cm^3$.

25 $cm^3$ of apple juice are mixed with 15 $cm^3$ of fruit syrup and
280 $cm^3$ of carbonated water to make a drink with a volume of 320 $cm^3$.

Work out the density of the drink.
Give your answer correct to 2 decimal places.

..... $g/cm^3$

**(Total for Question 20 is 4 marks)**

Video created by W Neill

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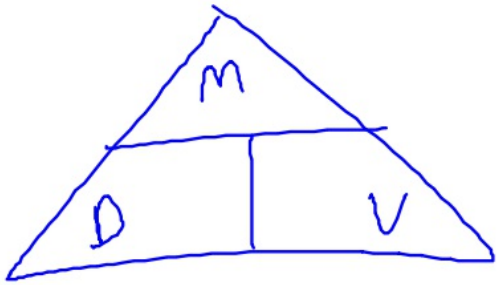


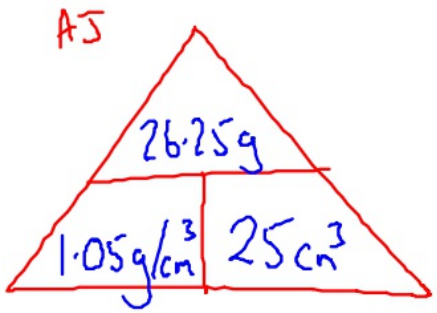



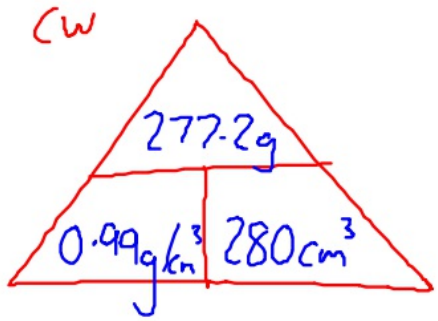


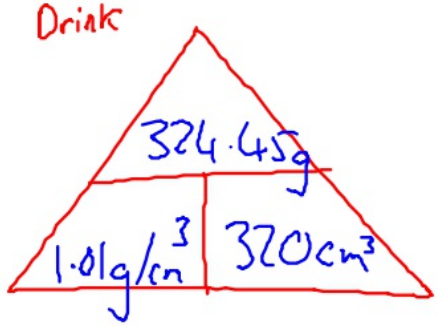


1.01 ..... g/$cm^3$

**(Total for Question 20 is 4 marks)**

**21** A gold bar has a mass of 12.5 kg.

The density of gold is 19.3 g/cm$^3$

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

..... cm$^3$

**(Total for Question 21 is 3 marks)**

Created by W Neill

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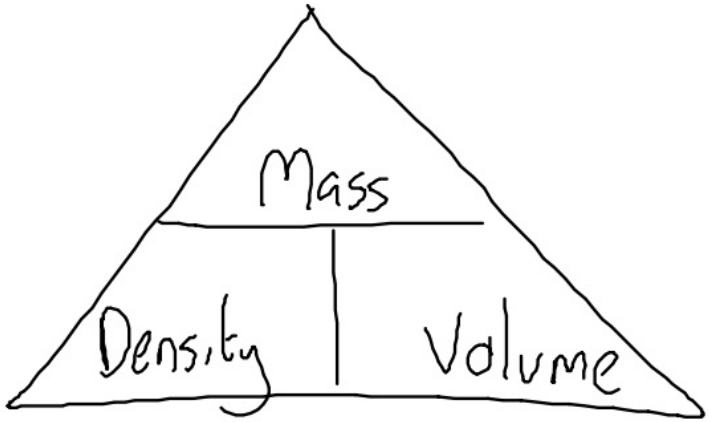
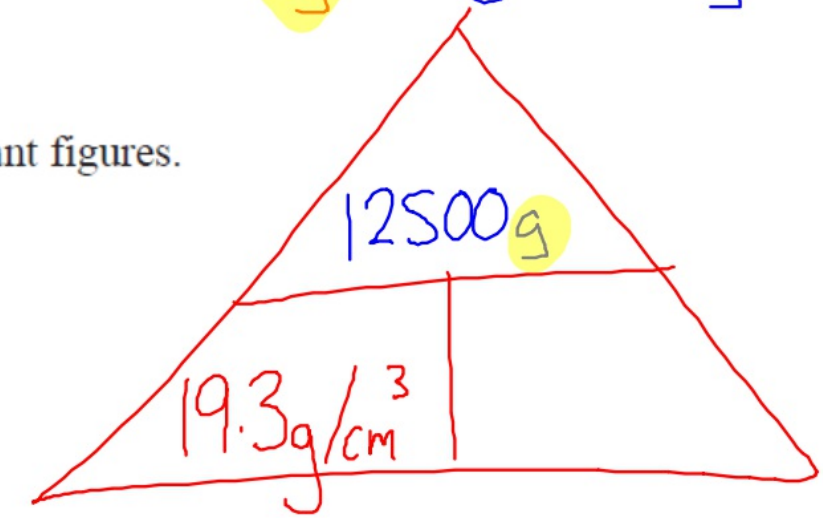



12.5kg  1kg = 1000g




648 cm$^3$

**(Total for Question 21 is 3 marks)**

7 Liquid **A** has a density of 1.42 g/cm$^3$

7 cm$^3$ of liquid **A** is mixed with 125 cm$^3$ of liquid **B** to make liquid **C**.

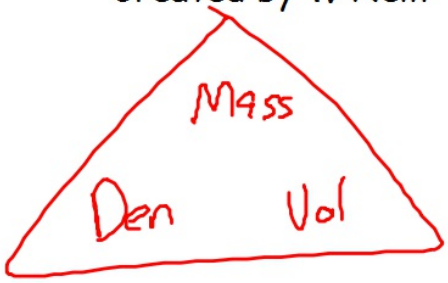
Liquid **C** has a density of 1.05 g/cm$^3$

Find the density of liquid **B**.
Give your answer correct to 2 decimal places.

.....g/cm$^3$

**(Total for Question 7 is 3 marks)**

Created by W Neill

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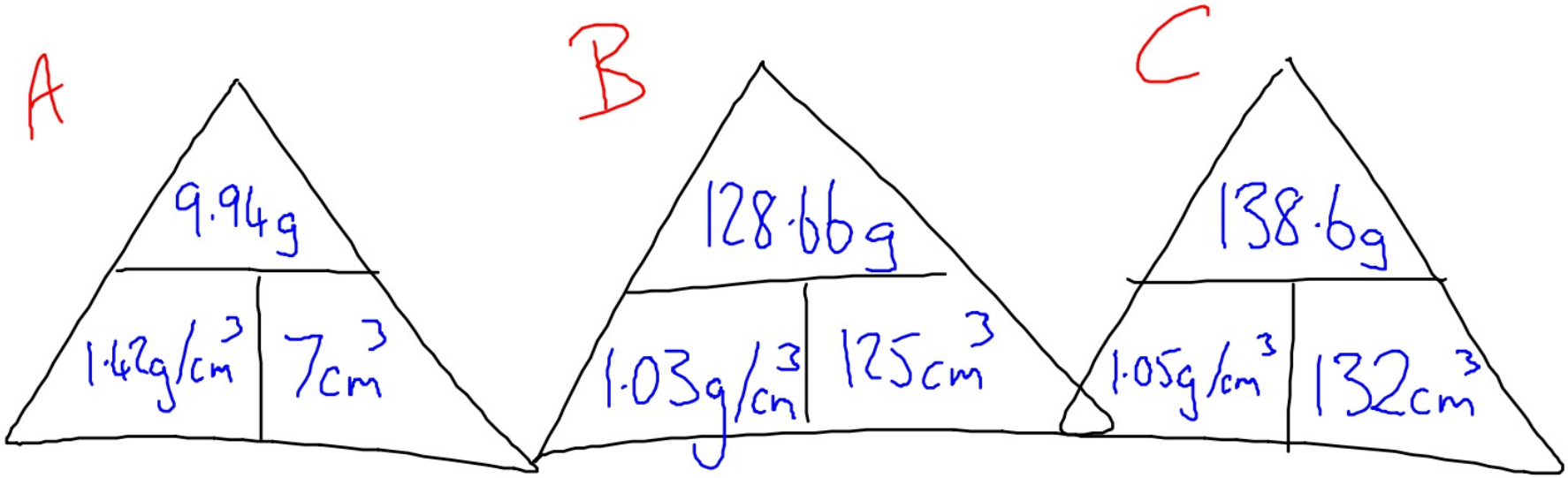
Find the density of liquid **B**.
Give your answer correct to 2 decimal places.



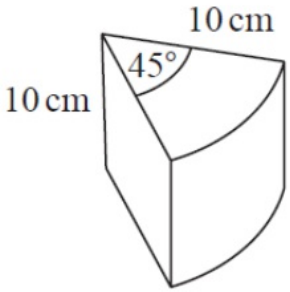

1.03 ✓ g/cm$^3$

**(Total for Question 7 is 3 marks)**

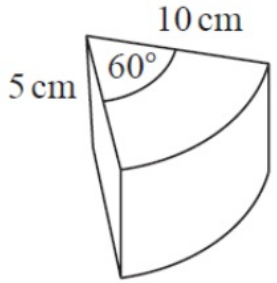
Video created by W Neill

G32
R24
R5

**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°, 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°, 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**.

..... %

**(Total for Question 19 is 5 marks)**

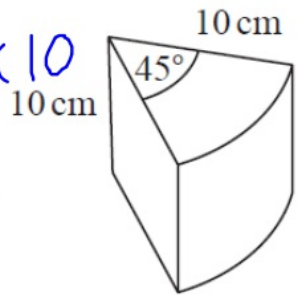
**19** Here are two solid prisms, prism **A** and prism **B**.

G32 R24 R5

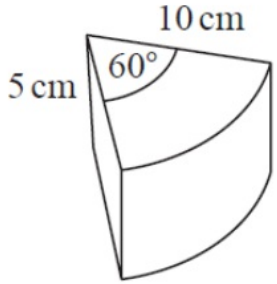
$R^2 \times \pi \div 8 \times 10$

$\frac{100\pi}{8} \times 10$

$= \frac{1000\pi}{8} = 125\pi$




prism **A**




prism **B**

$R^2 \times \pi \div 6 \times 5$

$100\pi \div 6 \times 5$

$\frac{500\pi}{6}$

The cross section of prism **A** is a sector, with angle 45°, 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°, 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**.

diff $= 0.6 - 0.32$
$= 0.28$

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

$= \frac{7}{8}$

$= 87.5\%$


A

$D = \frac{40\pi}{125\pi}$

$= \frac{40}{125} = \frac{8}{25}$ $0.32 g/cm^3$

B

$D = \frac{50}{\pi} \div \frac{500\pi}{6}$

$= \frac{50 \times 6}{500} = \frac{300}{500}$ $0.6 g/cm^3$

87.5 %

**21** Jackson is trying to find the density, in g/cm$^3$, of a block of wood.
The block of wood is in the shape of a cuboid.

He measures

NS8 the length as 13.2 cm, correct to the nearest mm
the width as 16.0 cm, correct to the nearest mm
R24 the height as 21.7 cm, correct to the nearest mm

He measures the mass as 1970 g, correct to the nearest 5 g.

By considering bounds, work out the density of the wood.
Give your answer to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

**(Total for Question 21 is 5 marks)**

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the width as 16.0 cm, correct to the nearest mm
the height as 21.7 cm, correct to the nearest mm

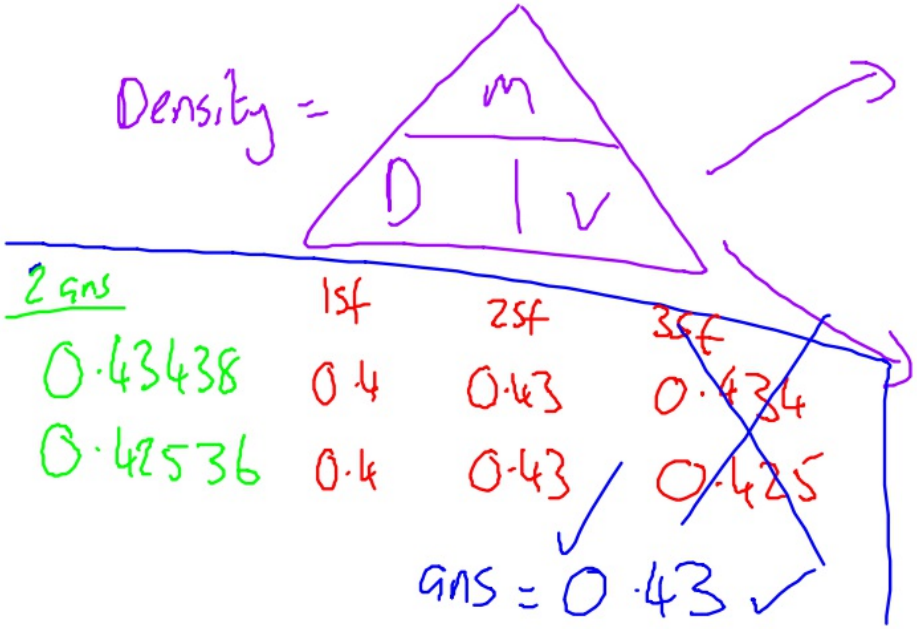
NS8
R24

He measures the mass as 1970 g, correct to the nearest 5 g.

| | U | L |
|---|---|---|
| length | 13.25cm | 13.15cm |
| width | 16.05cm | 15.95cm |
| height | 21.75cm | 21.65cm |
| mass | 1972.5g | 1967.5g |

By considering bounds, work out the density of the wood.
Give your answer to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.




Biggest sns = heaviest / smallest vol = 1972.5 / 4540.925125

= 0.43438285 g/cm$^3$

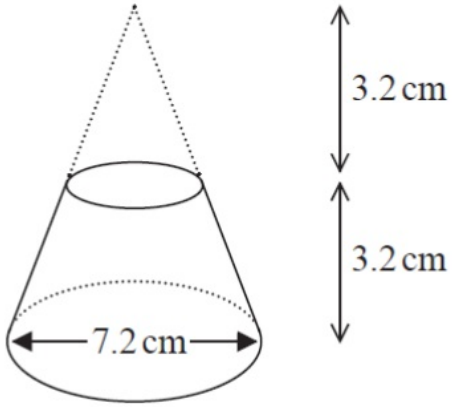
Smallest sns = lightest / largest volume = 1967.5 / 4625.4093

= 0.42536

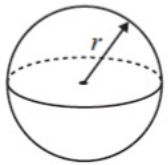
**(Total for Question 21 is 5 marks)**

**20** Here is a frustum of a cone.

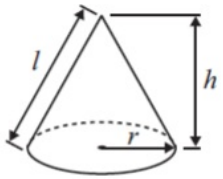
G35
R24




Volume of sphere $= \frac{4}{3}\pi r^3$



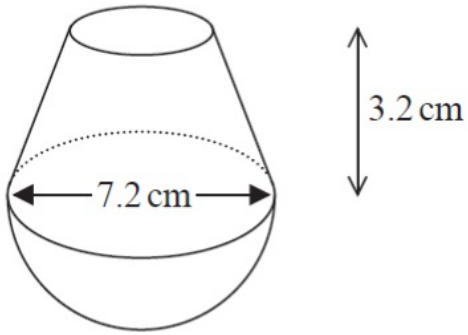

Volume of cone $= \frac{1}{3}\pi r^2 h$




The diagram shows that the frustum is made by removing a cone with height 3.2 cm from a solid cone with height 6.4 cm and base diameter 7.2 cm.

The frustum is joined to a solid hemisphere of diameter 7.2 cm to form the solid **S** shown below.

Solid **S**




The density of the frustum is 2.4 g/cm$^3$
The density of the hemisphere is 4.8 g/cm$^3$

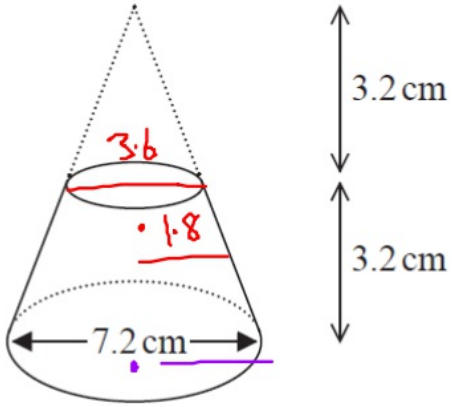
Calculate the average density of solid **S**.

..... g/cm$^3$

**(Total for Question 20 is 5 marks)**

**20** Here is a frustum of a cone.

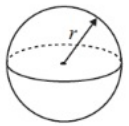
G35
R24



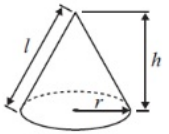




Volume of sphere $= \frac{4}{3}\pi r^3$




Volume of cone $= \frac{1}{3}\pi r^2 h$




Volume of frustrum

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

$= \frac{1}{3}\pi (3.6^2)(6.4)$

$= 86.8587\ cm^3$

The diagram shows that the frustum is made by removing a cone with height 3.2 cm from a solid cone with height 6.4 cm and base diameter 7.2 cm.

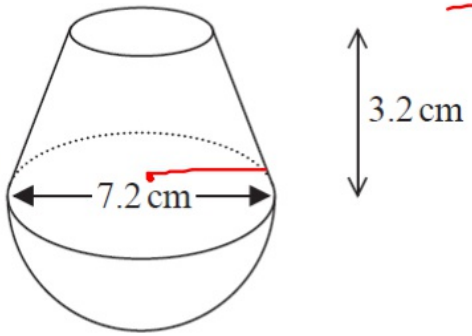
Sub → $\triangle = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi 1.8^2 3.2$

$= 76.0014\ cm^3$

The frustum is joined to a solid hemisphere of diameter 7.2 cm to form the solid **S** shown below.

Solid **S**



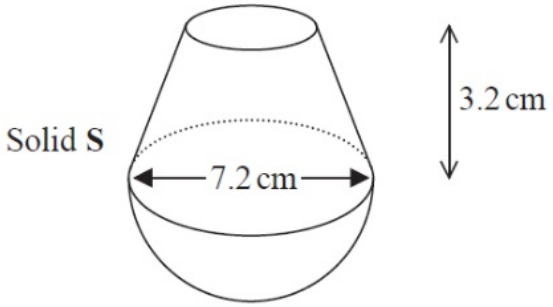

Volume of hemi-s

$\frac{\frac{4}{3}\pi r^3}{2}$

$= 97.716\ cm^3$

.....g/cm³

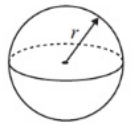
**(Total for Question 20 is 5 marks)**



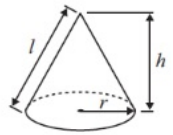

Frust = 76.0014 cm$^3$

Hemis = 97.716 cm$^3$

Volume of sphere = $\frac{4}{3}\pi r^3$



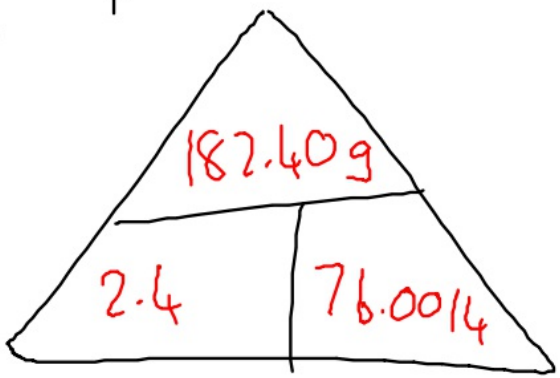

Volume of cone = $\frac{1}{3}\pi r^2 h$



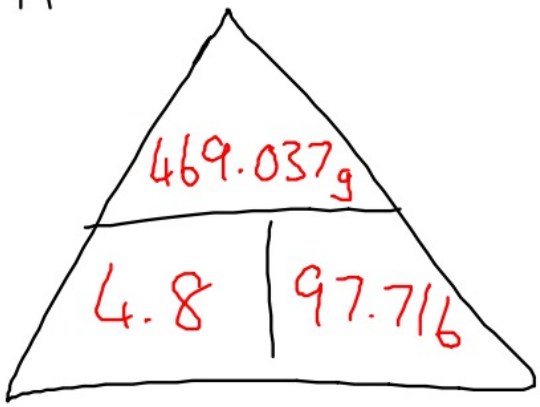

The density of the frustum is 2.4 g/cm$^3$
The density of the hemisphere is 4.8 g/cm$^3$

Calculate the average density of solid **S**.

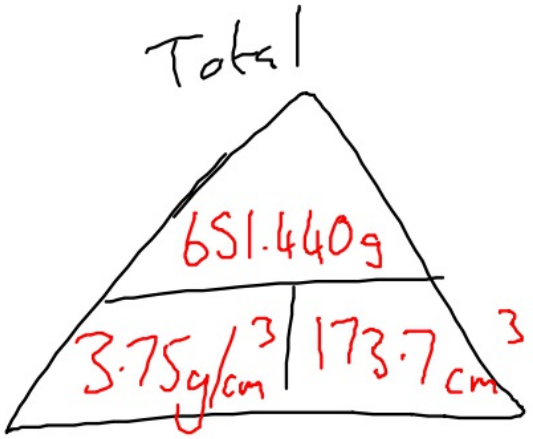
m
d V F




H




Total




3.75 g/cm$^3$ ✓

**(Total for Question 20 is 5 marks)**

AQA

Video created by W Neill

**22 (a)** Density = $\frac{\text{mass}}{\text{volume}}$

R24

The mass of solid A is 6 times the mass of solid B.

The volume of solid A is 3 times the volume of solid B.

Complete the sentence.

**[1 mark]**

The density of solid A is _____ times the density of solid B.

Video created by W Neill

**(a)** Density = $\frac{\text{mass}}{\text{volume}}$

R24

The mass of solid A is 6 times the mass of solid B.

The volume of solid A is 3 times the volume of solid B.

Complete the sentence.

**[1 mark]**

The density of solid A is 2 times the density of solid B.

Density

A: $\frac{120}{60} = 2$

B: $\frac{20}{20} = 1$

x2

Video created by W Neill

**4** Which **one** of these is a unit of density?

Circle your answer.

R24

**[1 mark]**

$kg/m^2$ $m^2/kg$ $kg/m^3$ $m^3/kg$

Video created by W Neill

**4** Which **one** of these is a unit of density?

Circle your answer.

R24

**[1 mark]**

$kg/m^2$ $m^2/kg$ $kg/m^3$ $m^3/kg$

Video created by W Neill

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

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

R24 Work out the mass of the concrete.

**[2 marks]**

Answer _____ kg

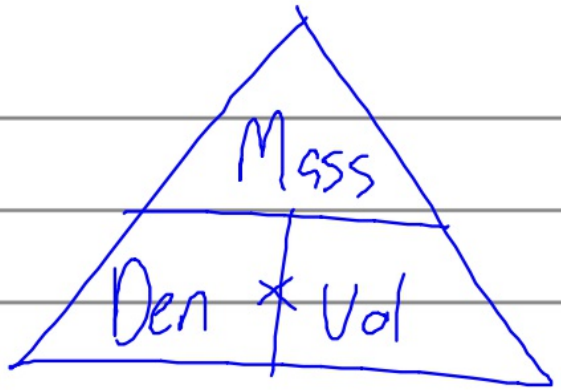
Video created by W Neill

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

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

R24 Work out the mass of the concrete.

**[2 marks]**




2400 x 3.8

Answer 9120 kg