Name ANSWERS	Class

MATHS TEACHER HUB

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Volume

(9 – 1) Topic booklet

Foundation

These questions have been collated from previous years GCSE Mathematics papers.

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser.	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must **show all your working out.**
- If the question is a **1F** question you are not allowed to use a calculator.
- If the question is a **2F** or a **3F** question, you may use a calculator to help you answer.

Information

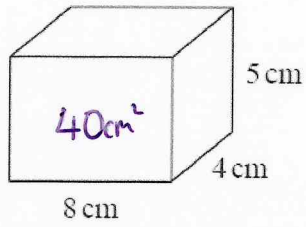
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Answer ALL questions
Write your answers in the space provided.
You must write down all the stages in your working.

11 Here is a cuboid.



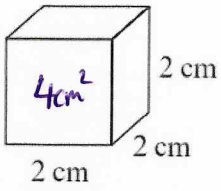
Work out the volume of the cuboid.

$40cm^2 \times 4cm$

160 ..... cm^3

(Total for Question 11 is 2 marks)

12 The diagram shows a cube of side length 2 cm.



Volume = $4cm^2 \times 2cm$
$= 8cm^3$

Vera says,

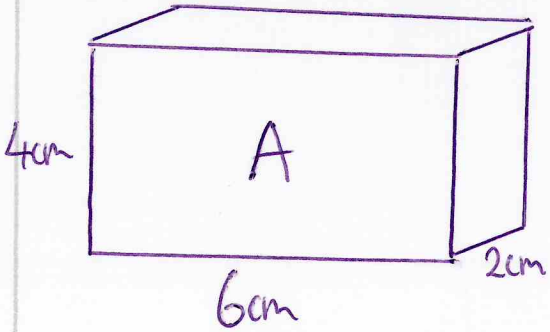
"The volume of any solid made with 6 of these cubes is 48 cm^3"

(a) Is Vera correct?
You must show your working.

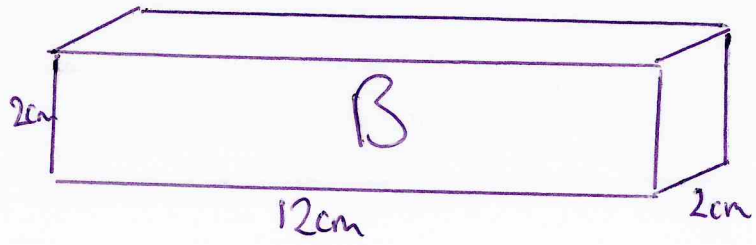
$8cm^3 \times 6 = 48cm^3$
Yes Vera is correct.

(2)

(b) (i) Draw a cuboid that can be made with 6 of these cubes.
Write the dimensions of the cuboid on your diagram.



or



(1)

(ii) Work out the surface area of your cuboid.

Surface area of prism A = $88cm^2$
Surface area of prism B = $104cm^2$

..... cm^2

(2)

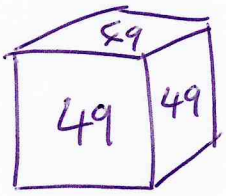
(Total for Question 12 is 5 marks)

13 The total surface area of a cube is 294 cm^2.

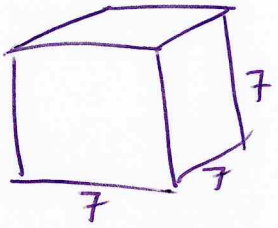
Work out the volume of the cube.

$$6 \overline{)29^{5}4} \quad 049$$

49cm^2 = Each side



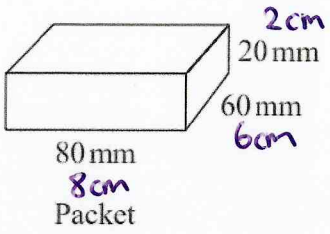
$\sqrt{49} = 7$



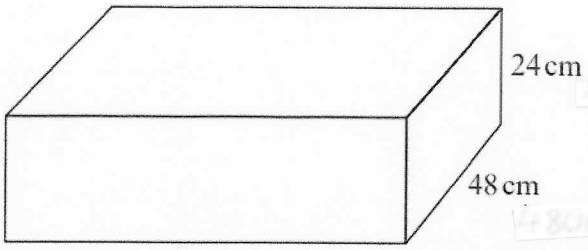
343 ..... cm^3

(Total for Question 13 is 4 marks)

14 Packets of sweets are put into boxes.



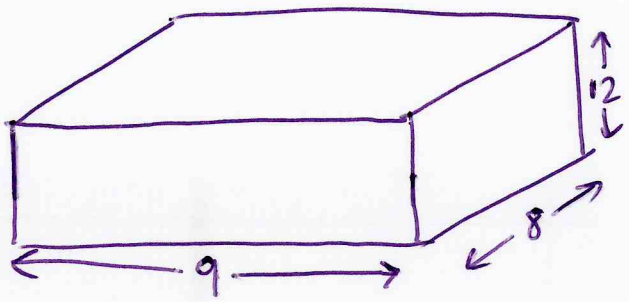
Packet



Box

Each packet is a cuboid, 80 mm by 60 mm by 20 mm.
Each box is a cuboid, 72 cm by 48 cm by 24 cm.

Work out the greatest number of packets that can be put into each box.



$72 \div 8 = 9$

$48 \div 6 = 8$

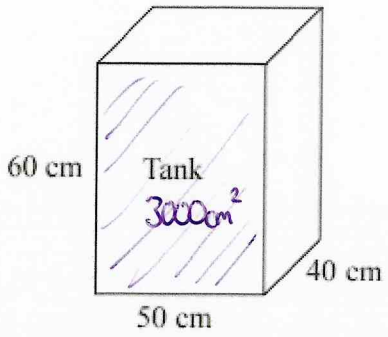
$24 \div 2 = 12$

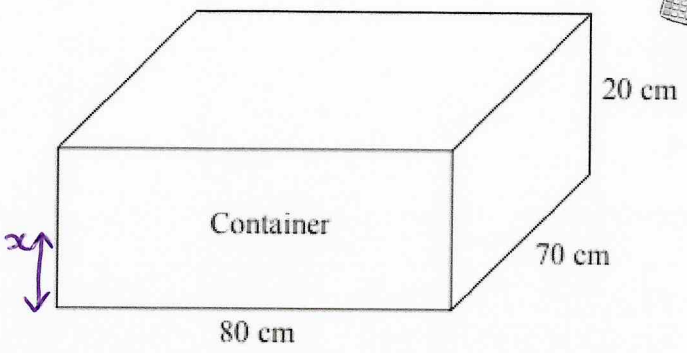
$9 \times 8 \times 12 = 864$

864

(Total for Question 14 is 4 marks)

14 The diagram shows a tank in the shape of a cuboid.
It also shows a container in the shape of a cuboid.





The tank is full of oil.
The container is empty.

35% of the oil from the tank is spilled.
The rest of the oil from the tank is put into the container.

Work out the height of the oil in the container.
Give your answer to an appropriate degree of accuracy.

Tank = $3000cm^2 \times 40cm$

$= 120000cm^3$

-35%

$120000 \times 0.65 = 78000cm$

Container $= 80 \times x \times 70$

$= 5600x$

$\frac{78000}{5600} = x$

$13.9285714 = x$

$14cm = x$

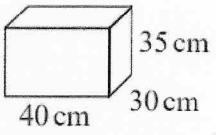
To the nearest integer

14 ..... cm

(Total for Question 14 is 5 marks)

16 Chloe has a van.

She is going to use the van to deliver boxes.
Each box is a cuboid, 40 cm by 30 cm by 35 cm.



The space for boxes in the van has

maximum length 2.4 m → 240 cm
maximum width 1.5 m → 150 cm
maximum height 1.4 m → 140 cm

The space for boxes is empty.
Chloe wants to put as many boxes as possible into the van.

She can put 3 boxes into the van in one minute.
Assume that the space for boxes is in the shape of a cuboid.

(a) Work out how many minutes it should take Chloe to put as many boxes as possible into the van.

$\frac{240}{40} = 6$

$\frac{150}{30} = 5$

$\frac{140}{35} = 4$

$6 \times 5 \times 4 = 120$ boxes

$\frac{120}{3} = 40$ minute

40 minutes

(4)

The space for boxes might **not** be in the shape of a cuboid.

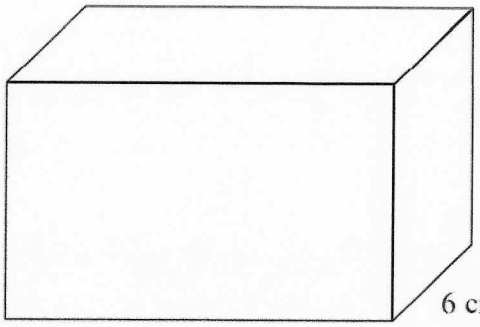
(b) Explain how this could affect the time it would take Chloe to put as many boxes as possible into the van.

less space means less boxes, which would mean less time for Chloe to put the boxes into the van

(1)

(Total for Question 16 is 5 marks)

23 A container is in the shape of a cuboid.



Volume = 570cm² × 6cm
= 3420cm³
= 3.42 litres

The container is $\frac{2}{3}$ full of water.

A cup holds 275 ml of water.

What is the greatest number of cups that can be completely filled with water from the container?

$\frac{2}{3}$ of 3.42 litres = 2.28 litres
= 2280ml

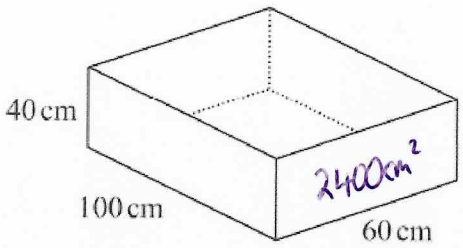
$\frac{2280}{275} = 8.290\dot{}$

= 8 cups

8

(Total for Question 23 is 4 marks)

24 The diagram shows a sand pit.
The sand pit is in the shape of a cuboid.



Sally wants to fill the sand pit with sand.
A bag of sand costs £2.50
There are 8 litres of sand in each bag.

Sally says,

"The sand will cost less than £70"

Show that Sally is wrong.

Volume = $2400cm^2 \times 100cm$

$= 240000cm^3$

$= 240$ litres

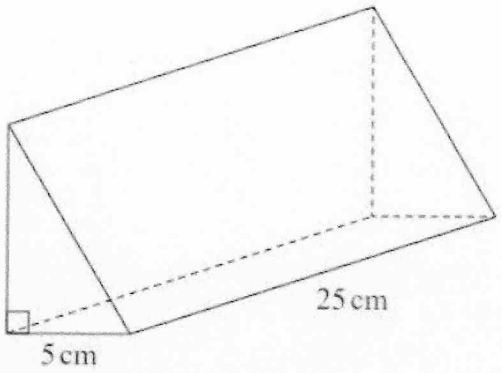
$\frac{240 \text{ litres}}{8 \text{ litres}} = 30$ bags of sand

30 bags $\times$ £2.50 = £75

Sally is wrong, it will be more than £70

(Total for Question 24 is 5 marks)

25 The diagram shows a prism.

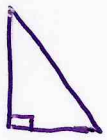


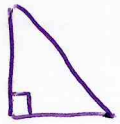
The cross section of the prism is a right-angled triangle.
The base of the triangle has length 5 cm

The prism has length 25 cm
The prism has volume 750 cm^3

Work out the height of the prism.

Volume = Area of cross section × depth

$750cm^3$ =  × 25

$30cm^2$ = 

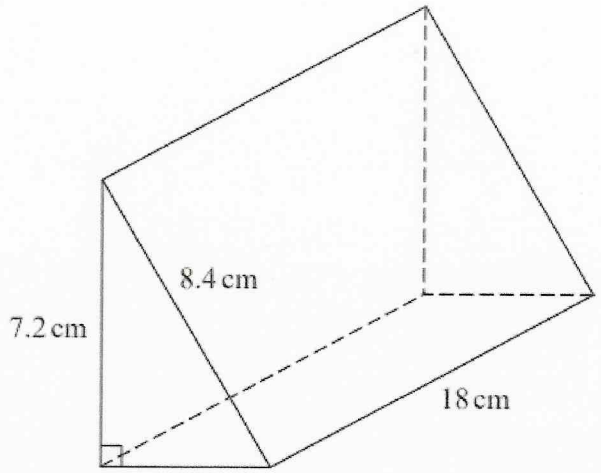
$\frac{b \times h}{2} = 30cm^2$

$\frac{5 \times h}{2} = 30cm^2$

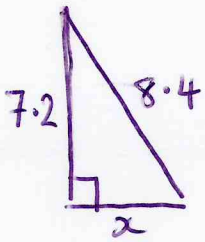
h = 12 cm

November 2021 – Paper 1F **(Total for Question 25 is 3 marks)**

26 Here is a triangular prism.



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



$8.4^2 - 7.2^2 = x^2$

$18.72 = x^2$

$\sqrt{18.72} = x$

$4.326661 = x$

Volume = Area of cross section × depth

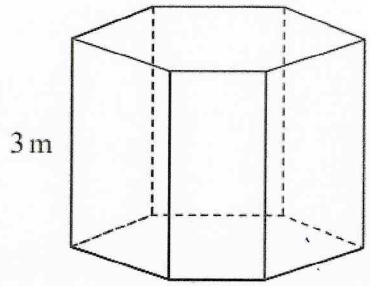
$= \left(\frac{4.326661 \times 7.2}{2}\right) \times 18$

$= 280.3676672$

280 ..... cm³

(Total for Question 26 is 5 marks)

27 The diagram shows a prism placed on a horizontal floor.



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

The prism has height 3 m
The volume of the prism is 18 m^3

The pressure on the floor due to the prism is 75 newtons/m^2

Work out the force exerted by the prism on the floor.

Volume = Area of Hexagon x depth

$18m^3$ = ⬡ x 3m

$6m^2$ = ⬡

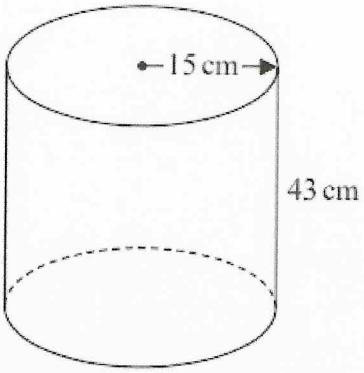
$F = 75N/m^2 \times 6m^2$

$F = 450$ Newtons

450 ..... newtons

(Total for Question 27 is 3 marks)

28 The diagram shows an empty tank in the shape of a cylinder.



The cylinder has radius 15 cm and height 43 cm.

Water flows into the tank at a rate of 0.47 litres per minute.

Calculate the number of minutes it will take to completely fill the tank.
Give your answer correct to the nearest minute.

Volume $= (\pi \times 15^2) \times 43$

$= 30394.90892 \text{cm}^3$

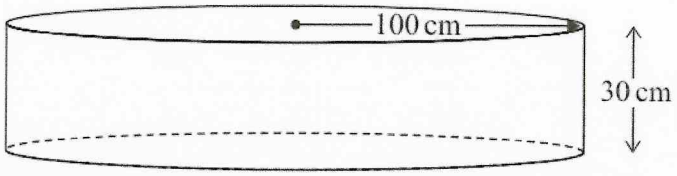
$= 30.3949$ litres

$\frac{30.3949}{0.47} = 64.67$ minutes

65 minutes

(Total for Question 28 is 4 marks)

28 A paddling pool is in the shape of a cylinder.



The pool has radius 100 cm.
The pool has depth 30 cm.

The pool is empty.
It is then filled with water at a rate of 250 cm^3 per second.

Work out the number of minutes it takes to fill the pool completely.
Give your answer correct to the nearest minute.
You must show all your working.

Volume $= (\pi \times 100^2) \times 30$

$= 942477.7961 cm^3$

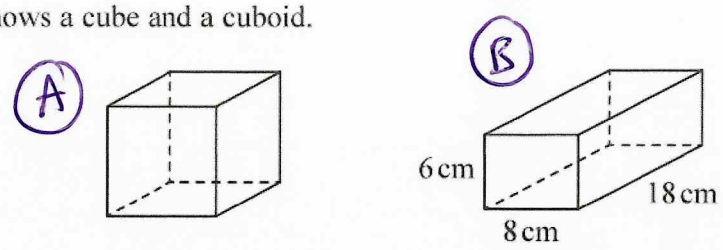
$\frac{942477.7961}{250} = 3769.911184$ seconds $\div 60$

$= 62.83185$ minutes

63 minutes

(Total for Question 28 is 4 marks)

29 The diagram shows a cube and a cuboid.



The total surface area of the cube is equal to the total surface area of the cuboid.

Janet says,

"The volume of the cube is equal to the volume of the cuboid."

Is Janet correct?
You must show how you get your answer.

Surface area of B = $6 \times 8 = 48$

$8 \times 18 = 144$

$6 \times 18 = 106$

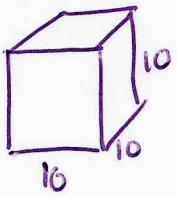
300

300×2

$= 600 cm^2$

Surface area of A

$\frac{600}{6} = 100 cm^2$



Volume of A

$= 1000 cm^3$

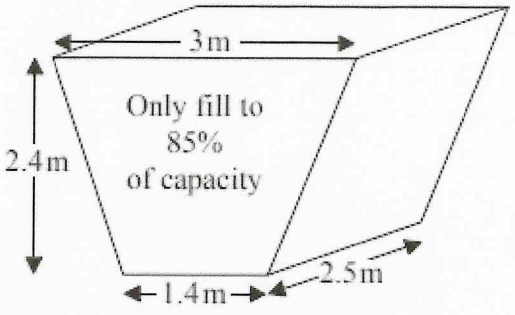
Volume of B = $48 cm^2 \times 18 cm$

$= 864 cm^3$

Janet is wrong.

(Total for Question 29 is 5 marks)

29 The diagram shows an oil tank in the shape of a prism.
The cross section of the prism is a trapezium.



The tank is empty.

Oil flows into the tank.
After one minute there are 300 litres of oil in the tank.

Assume that oil continues to flow into the tank at this rate.

(a) Work out how many **more** minutes it takes for the tank to be 85% full of oil.
($1\,m^3 = 1000$ litres)

Volume = Area of cross section × depth

$= \left[\frac{1}{2}(3+1.4)\times 2.4\right] \times 2.5$

$= 13.2\,m^3$

$13.2 \times 0.85 = 11.22\,m^3$

$= 11220$ litres

$11220 \div 300$

$= 37.4$ minutes

$- 1$ minute

36.4 minutes

(5)

The assumption about the rate of flow of the oil could be wrong.

(b) Explain how this could affect your answer to part (a).

If the average rate was slower, it would take more time.

(1)

(Total for Question 29 is 6 marks)