

Name: _____

GCSE Maths 2022
AQA Higher Paper 2
Set B
Calculator



Equipment

1. A black ink ball-point pen.
2. A pencil.
3. An eraser.
4. A ruler.
5. A pair of compasses.
6. A protractor.

Guidance

1. Read each question carefully.
2. Check your answers seem right.
3. Always show your workings

Information

1. This paper has been created based on topics in the Advance Information.
2. Also see Corbettmaths for the checklist for the entire GCSE as these topics may still be useful for Paper 2
3. There is one question per topic - this paper is designed to give an opportunity to practice each topic rather than replicate the actual paper.
4. The marks for questions are shown in brackets

GCSE 2022 Resources



1. Work out

$$1\frac{1}{9} \times 3\frac{3}{10}$$

$$\frac{10}{9} \times \frac{33}{10} = \frac{330}{90}$$
$$= \frac{11}{3}$$

$$\frac{3\frac{2}{3}}{\dots\dots\dots}$$

(2)

2. James is thinking of a number.
He writes down the reciprocal of the number.
It is the same as his starting number.

What is the number James is thinking of?

$$\frac{1}{\dots\dots\dots}$$

(1)

3. Write 65.0517 correct to 1 decimal place.

$$\frac{65.1}{\dots\dots\dots}$$

(1)

4. Write $\frac{11}{12}$ as a percentage

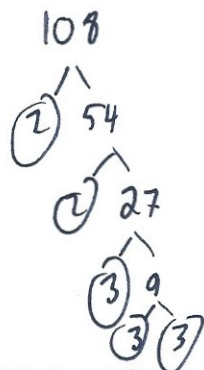
Give your answer to 3 decimal places.

$$11 \div 12 = 0.91666\dots$$

$$\frac{91.667\%}{\dots\dots\dots}$$

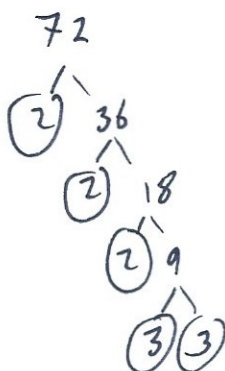
(2)

5. (a) Express 108 as a product of its prime factors.
Give your answer in index form.

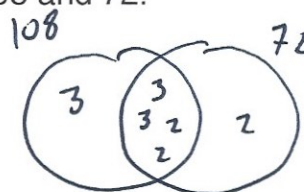


$$\underline{2^2 \times 3^3} \quad (3)$$

- (b) Find the Highest Common Factor (HCF) of 108 and 72.



HCF
 $3 \times 3 \times 2 \times 2$
 $= 36$



$$\underline{36} \quad (2)$$

6. (a) $y^{-3} \times y^n = y^1$

Work out the value of n

$$\underline{4} \quad (1)$$

- (b) Simplify fully $\frac{(a^8)^2}{a^{-4} \times a^{-9}}$

$$16 - (-13) = 29$$

$$\frac{a^{16}}{a^{-13}}$$

$$\underline{a^{29}} \quad (2)$$

7. Work out

$$125^{1/3} \times 2^{-3}$$

$$5 \times \frac{1}{2^3}$$

$$5 \times \frac{1}{8}$$

$$\frac{5}{8}$$

(2)

8. The table gives information about the number of people voting for each party at an election.

Party	Number of Votes
Gold Party	12598
Pink Party	9112
Brown Party	20059
Purple Party	4466

46235

There are 52852 people who can vote
The target was that 88% of people would vote.

Was the target met?

$$\frac{46235}{52852} \times 100 = 87.48\% \dots$$

No

(3)

9. Nancy goes to the Post Office to exchange money.



Exchange Rates

£1 : \$1.31

£1 : €1.14

*Commission Charged

Nancy changes \$759.80 and €342 into pounds sterling.

The Post Office deducts their commission and gives Nancy £827.20

What is the percentage commission?

$$759.80 \div 1.31 = \pounds 580$$

$$342 \div 1.14 = \pounds 300$$

$$\pounds 880$$

$$880 - 827.50 = 52.8$$

$$\frac{52.8}{880} \times 100 = 6$$

.....6.....%
(4)

10. At Donhampton High School the ratio of Year 10 pupils to Year 11 pupils is 7:5
Each pupil studies one language, Spanish or German.

$\frac{3}{5}$ of the Year 11 pupils studied Spanish.

$$(168 \div 2) \times 5 = 420$$

168 Year 11 pupils studied German.

75% of the Year 10 pupils study Spanish.

How many Year 10 pupils study Spanish?

168 is $\frac{2}{5}$ of number of yr 11 students

420 students in Yr 11

$$420 \div 5 = 84$$

$$84 \times 7 = 588$$

$$75\% \text{ of } 588 = 441$$

.....441.....
(4)

11. It would take 48 days for 5 workers to build a house.

(a) How much longer would it take if only 4 workers built the house?

$$48 \times 5 = 240$$

$$240 \div 4 = 60$$

$$60 - 48 = 12$$

12 days
.....
(3)

(b) State one assumption you made in working out your answer to (a)

All workers work at the same rate.
.....
.....

(1)

12. The curved surface area of a cone is given by the formula

$$A = \pi r l$$

where A is the curved surface area
r is the radius of the base of the cone
and l is the slant height

Given $A = 220 \text{ cm}^2$ correct to 3 significant figures,
and $r = 8 \text{ cm}$ correct to 1 significant figure.

Calculate the upper bound for l.

$$l = \frac{A}{\pi r}$$

$$\text{Max } l = \frac{\text{Max } A}{\text{Min } \pi r}$$

$$220.5 / 219.5$$

$$7.5 / 8.5$$

$$\text{Max } l = \frac{220.5}{\pi \times 7.5}$$
$$= 9.35831\dots$$

9.3583
.....cm
(3)

13. (a) Expand and simplify $(x + 7)^2$

$$(x+7)(x+7)$$

$$x^2 + 14x + 49$$

(2)

- (b) Expand and simplify $(x - 5)(x - 2)(x - 1)$

$$(x^2 - 7x + 10)(x - 1)$$

$$x^3 - 7x^2 + 10x - x^2 + 7x - 10$$

$$x^3 - 8x^2 + 17x - 10$$

(4)

14. (a) Factorise $2x^2 - x - 10$

$$(2x-5)(x+2)$$

(2)

- (b) Solve $2x^2 - x - 10 = 0$

$$(2x-5)(x+2) = 0$$

$$x = \frac{5}{2} \text{ or } x = -2$$

$$x = \frac{5}{2} \text{ or } x = -2$$

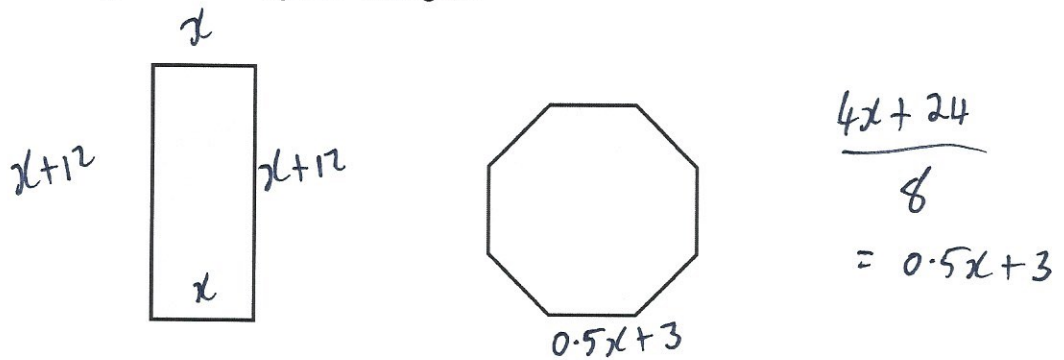
(1)

15. List the first five triangular numbers.

$$1, 3, 6, 10, 15$$

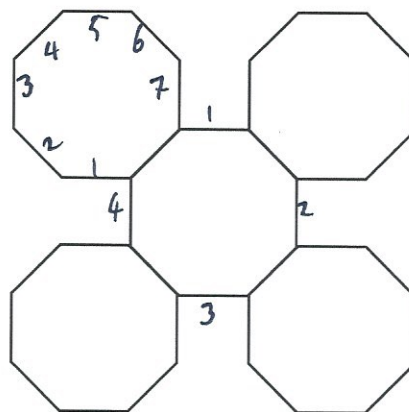
(2)

16. Here is a rectangle and a regular octagon.



The length of the rectangle is 12cm longer than the width of the rectangle.
 The perimeter of the rectangle is equal to the perimeter of the octagon.

5 of the regular octagons are used to make a shape.



The perimeter of this shape is 132cm

Work out the area of the rectangle

$$32(0.5x + 3) = 132$$

$$16x + 96 = 132$$

$$16x = 36$$

$$x = 2.25$$

$$2.25 \times 14.25$$

$$\dots\dots\dots 32.0625 \text{ cm}^2$$

(6)

17. (a) Solve the inequality $3(x - 4) \leq 15$

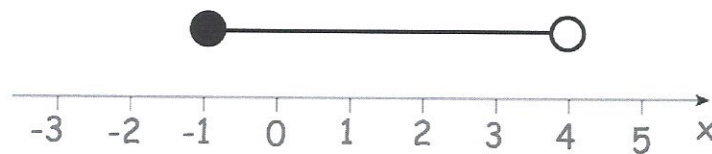
$$x - 4 \leq 5$$

$$x \leq 9$$

$$\underline{x \leq 9}$$

 (2)

(b) Write down the inequality shown by the diagram.



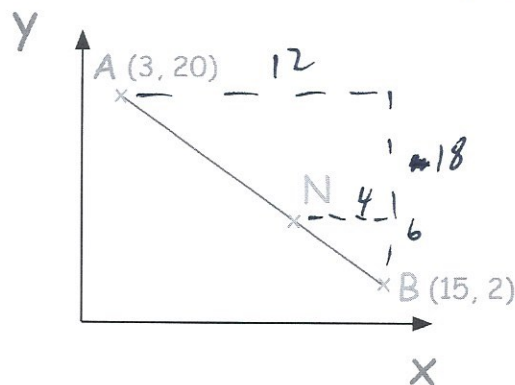
$$\underline{-1 \leq x < 4}$$

 (2)

18. A is the point with coordinates (3, 20)
 B is the point with coordinates (15, 2)

N is a point of the line AB such that $AN : NB = 2 : 1$

$$2 + 1 = 3$$

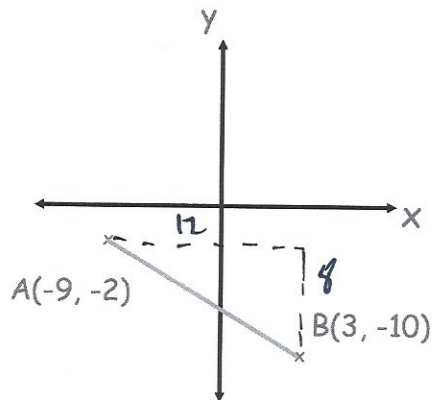


Find the coordinates of the point N.

$$\underline{(11, 8)}$$

 (3)

19. Shown below are the points A(-9, -2) and B(3, -10)



Calculate the length of the line joining A and B.

$$12^2 + 8^2$$

$$144 + 64 = 208$$

$$\sqrt{208}$$

$$14.42$$

.....
(2)

20. A straight line, L, is perpendicular to the line with equation $y = 2x + 3$
L passes through the point (10, 3)

Find an equation for the straight line L.

$$2 \rightarrow -\frac{1}{2}$$

$$y = -\frac{1}{2}x + c$$

$$3 = -5 + c$$

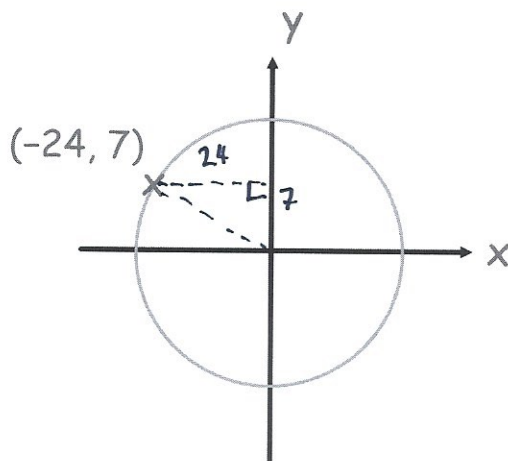
$$c = 8$$

$$y = -\frac{1}{2}x + 8$$

.....
(3)

21. The circle below has centre $(0, 0)$.
The point $(-24, 7)$ is a point on the circle.

Find the equation of the circle.



$$24^2 + 7^2 = 625$$

$$\sqrt{625} = 25$$

$$\underline{x^2 + y^2 = 625}$$

(2)

22. For all values of x

$$f(x) = 3x + 2$$

Find $f^{-1}(-12)$

$$y = 3x + 2$$

$$y - 2 = 3x$$

$$\frac{y - 2}{3} = x$$

$$f^{-1}(x) = \frac{x - 2}{3}$$

$$f^{-1}(-12) = \frac{-12 - 2}{3}$$

$$\underline{-\frac{14}{3}}$$

(2)

23. Solve $4x^2 + 8x + 1 = 0$

Give your answers to 1 decimal place.

$$a = 4$$

$$b = 8$$

$$c = 1$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-8 \pm \sqrt{8^2 - (4 \times 4 \times 1)}}{8}$$

$$x = \frac{-8 \pm \sqrt{16 - 16}}{8}$$

$$x = -0.13 \quad \text{or} \quad x = -1.9$$

~~Answer~~
-0.1

$$x = -0.1 \quad \text{or} \quad x = -1.9$$

.....
(3)

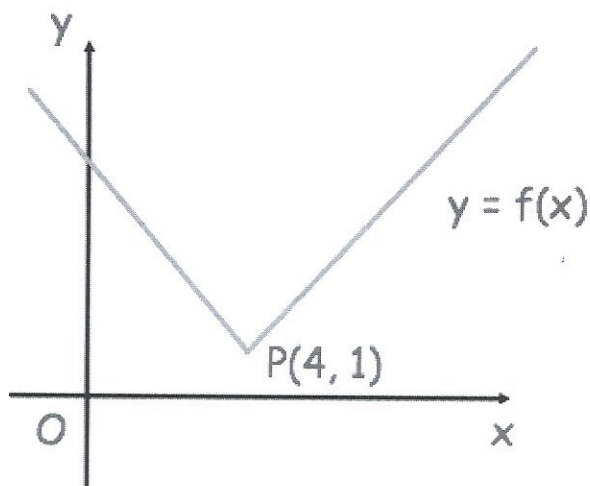
24. Write $x^2 + 8x + 6$ in the form $(x + a)^2 + b$, where a and b are constants.

$$(x + 4)^2 - 16 + 6$$

$$(x + 4)^2 - 10$$

.....
(3)

25. Here is the graph of $y = f(x)$
 The point $P(4, 1)$ is a point on the graph.



What are the coordinates of the new position of P when the graph $y = f(x)$ is transformed to the graph of

(a) $y = -f(x)$

(.....4.....,-1.....)
 (1)

(b) $y = f(x) + 4$

(.....4.....,5.....)
 (1)

(c) $y = f(-x)$

(.....-4.....,1.....)
 (1)

(d) $y = f(x + 5)$

(.....-1.....,1.....)
 (1)

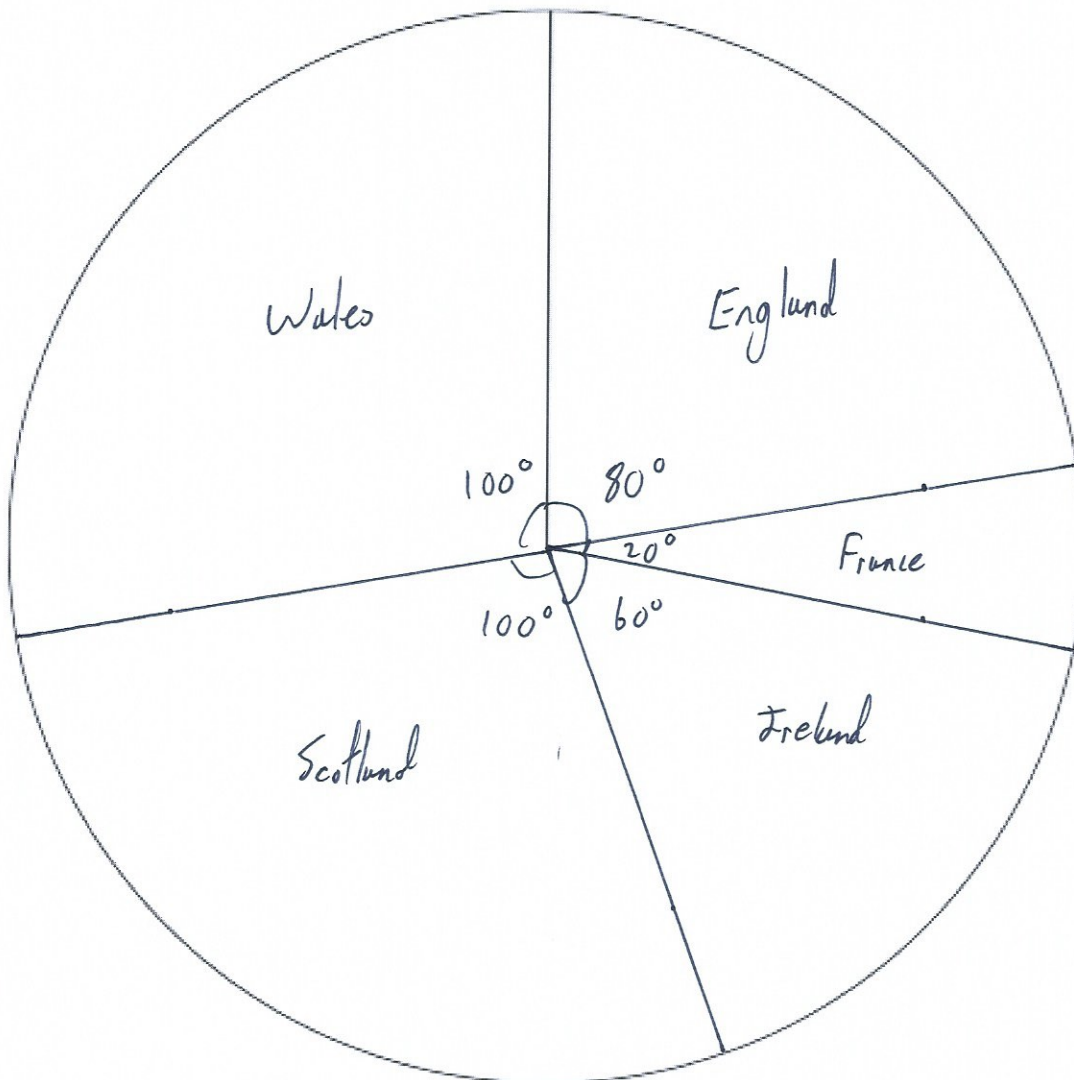
26. The table gives information about the rugby teams a group of people support.

Rugby Team	Frequency
England	20 × 4
France	5 × 4
Ireland	15 × 4
Scotland	25 × 4
Wales	25 × 4
	90

$360 \div 90 = 4$

80°
20°
60°
100°
100°

Draw an accurate pie chart to show this information.



(4)

27. The table shows information about the delivery times of pizzas.

Delivery Time	Frequency	fd
$0 < t \leq 10$	5	3
$10 < t \leq 20$	15	10
$20 < t \leq 30$	25	14
$30 < t \leq 40$	35	19
$40 < t \leq 50$	45	4
	<u>50</u>	<u>1360</u>

(a) Work out an estimate for the mean delivery time.

$$1360 \div 50$$

27.2

(3)

Evelyn says,

“The mean may **not** be the best average to use to represent this information.”

(b) Do you agree with Evelyn?
You must justify your answer

There are no outliers, so I do not agree.

(1)

28. 10 girls and 15 boys sit a test.

The mean mark for the boys is 70.
The mean mark for the girls is 82.

$$10 \times 82 = 820$$

$$15 \times 70 = 1050$$

$$\underline{1870}$$

Work out the mean mark for the whole class.

$$1870 \div 25$$

74.8

(3)

29. A spinner has a green section and a blue sector.
The spinner is spun 500 times.
The table shows the relative frequency of a green after different numbers of spins.

Number of spins	Relative frequency of a green
100	0.12
200	0.17
300	0.21
400	0.23
500	0.22

How many times was a green obtained after 400 spins?

$$400 \times 0.23$$

92

.....
(2)

30. Tilly wanted to do a survey about homework at her school.
She interviewed the 5 students in her class with the highest test results.

State ^{two}~~three~~ reasons why her sample may not be representative of the whole school population.

Reason 1 The sample should include a range of
..... classes / ages

Reason 2 The sample should include a range of
..... ability levels

(2)

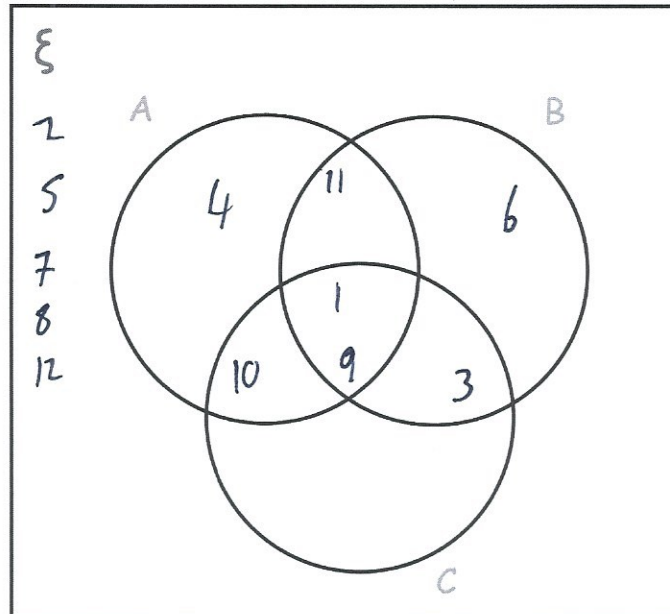
31. $\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

$A = \{1, 4, 9, 10, 11\}$

$B = \{1, 3, 6, 9, 11\}$

$C = \{1, 3, 9, 10\}$

(a) Complete the Venn diagram



(3)

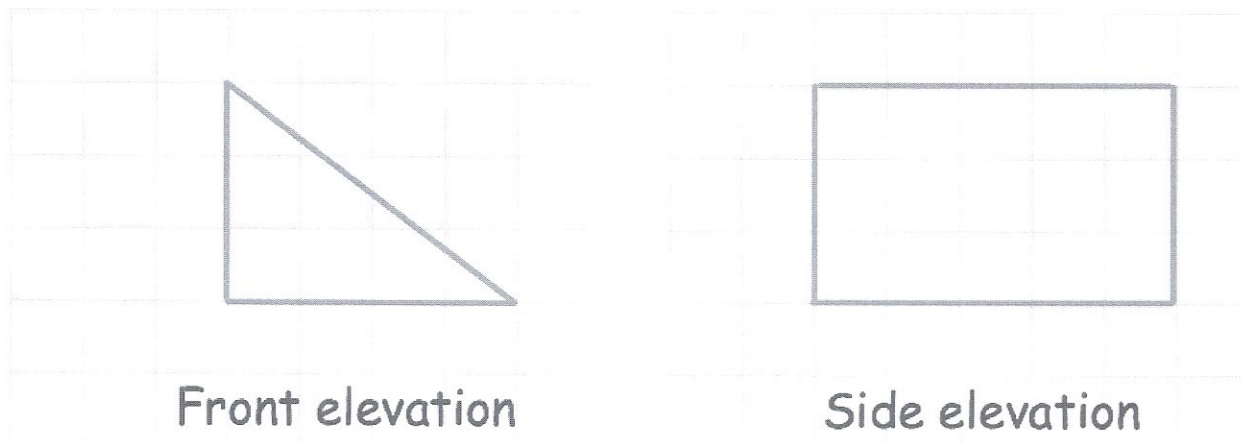
A number is chosen at random

(b) Find the probability that the number is a member of $B \cup C$

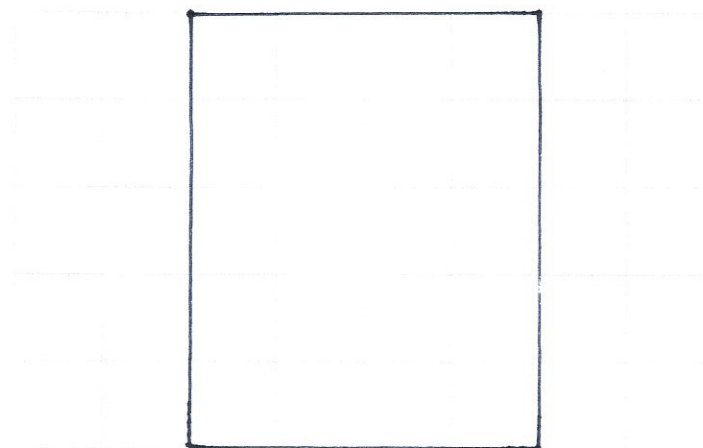
$$\frac{6}{12} = \frac{1}{2}$$

.....
(1)

32. Here are the front and side elevations of a solid shape.

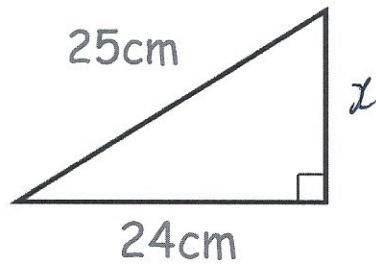


On the grid, draw the plan view.



(2)

33. Shown is a right angle triangle.



Find the perimeter of the triangle.

$$x^2 + 24^2 = 25^2$$

$$x^2 + 576 = 625$$

$$x^2 = 49$$

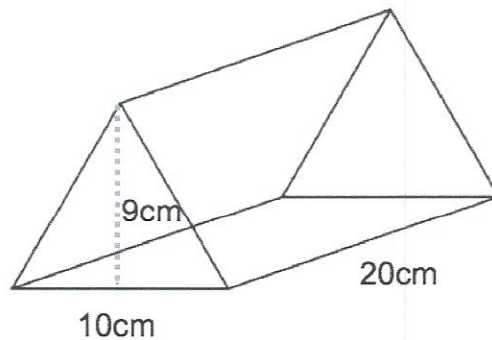
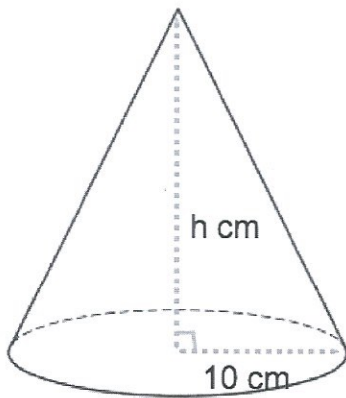
$$x = 7$$

$$7 + 24 + 25$$

56

.....cm
(2)

34. Shown is a cone and a triangular prism.



$$\frac{1}{2} \times 10 \times 9 \times 20 = 900$$

Both solids have the same volume.

Calculate the height of the cone.

$$\frac{1}{3} \times \pi \times 10^2 \times h = 900$$

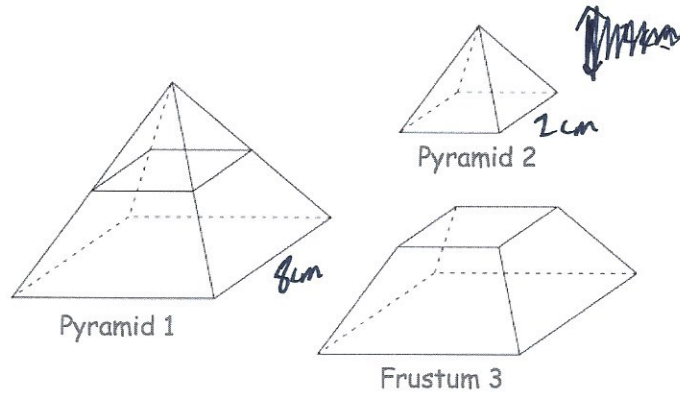
$$\pi \times 100 \times h = 2700$$

$$\pi \times h = 27$$

8.59

.....cm
(3)

35. A solid square based pyramid 1 is divided into two parts: a square based pyramid 2 and a frustum 3, as shown.



Pyramid 1 has a base of side length 8cm.
 Pyramid 2 has a base of side length 2cm.
 The perpendicular height of pyramid 1 is 10cm.

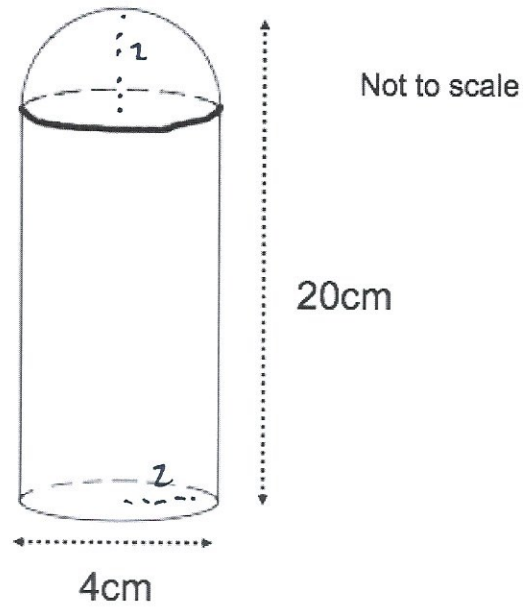
Work out the volume of the frustum.

$$\frac{1}{3} \times 8 \times 8 \times 10 = 213.\dot{3}$$

$$\frac{1}{3} \times 2 \times 2 \times 2.5 = 3.\dot{3}$$

$$\begin{array}{r} 210 \text{ cm}^3 \\ \hline (4) \end{array}$$

36. A container is created from a cylinder and a hemisphere.



The height of the container is 20cm.
The diameter of the cylinder is 4cm.

Calculate the volume of the container.

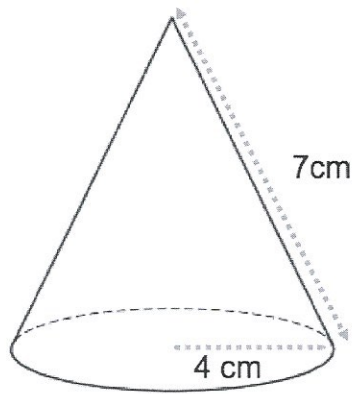
$$\pi \times 2^2 \times 18 = 72\pi \text{ (cylinder)}$$

$$\left(\frac{4}{3} \times \pi \times 2^3 \right) \div 2 = \frac{16}{3}\pi \text{ (hemisphere)}$$

$$\dots\dots\dots 242.95 \text{ cm}^3$$

(3)

37. A cone has base radius 4cm and slant height 7cm.



Work out the surface area of the cone.

.....cm²
(3)

38. Shown is a sphere with diameter 10cm.

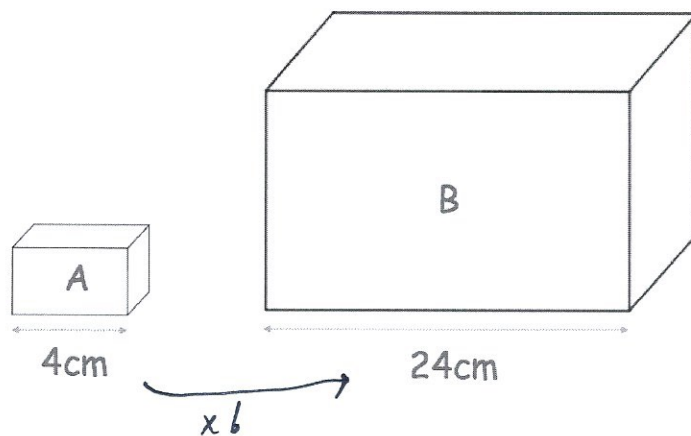


Calculate the surface area of the sphere.
Give your answer to 1 decimal place.

$$4\pi \times 5^2$$
$$= 100\pi$$

314.2
~~100\pi~~.....cm²
(3)

39. Shown below are two mathematically similar cuboids.



The volume of cuboid B is 1728cm^3

Find the volume of cuboid A.

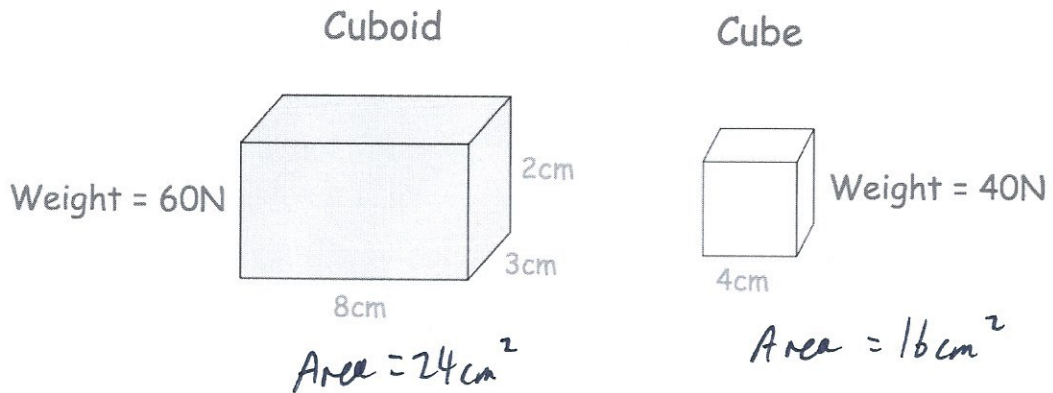
$$1728 \div 6^3$$

.....⁸..... cm^3
(2)

40. The cuboid and cube below are placed on the floor.

The cuboid has a weight of 60N

The cube has a weight of 40N



Jason says that “the cuboid exerts a greater pressure on the ground.”

Is Jason correct?

You must show your working.

$$p = \frac{F}{A}$$

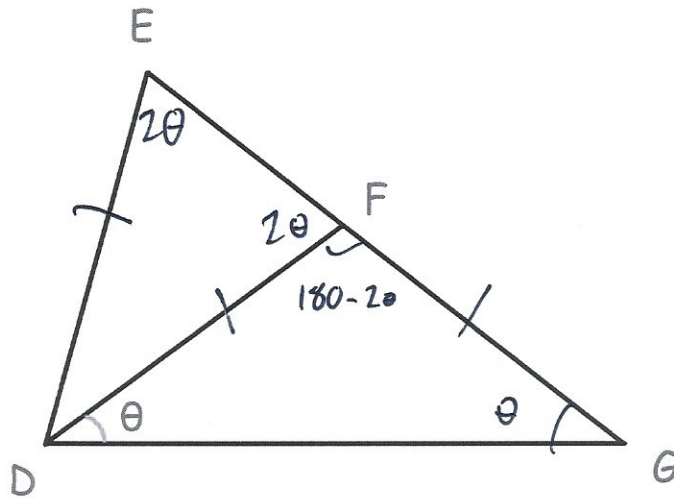
Cuboid $p = \frac{60}{0.0024} = 25000 \text{ N/m}^2$

Cube $p = \frac{40}{0.0016} = 25000 \text{ N/m}^2$

No, same pressure
.....
(4)

41.

Shown below is triangle DEG



$$DE = DF = FG$$

$$\angle FDG = \theta$$

Prove that $\angle EDF = 180 - 4\theta$

$$\angle FGD = \angle FDG = \theta \quad (\text{triangle } DFG \text{ is isosceles})$$

$$\angle DFG = 180 - 2\theta \quad (\text{angles in a triangle add to } 180)$$

$$\angle EFD = 2\theta \quad (\text{angles in a straight line add to } 180^\circ)$$

$$\angle EFD = \angle FED = 2\theta \quad (\text{triangle } DEF \text{ is isosceles})$$

$$\therefore \angle EDF = 180 - 4\theta \quad (\text{angles in a triangle add to } 180)$$

(3)

42. Convert 9m/s into km/h

$$9 \times 60 = 540$$

$$540 \text{ m/min}$$

$$32400 \text{ m/h}$$

$$32.4 \text{ km/h}$$

$$\frac{32.4 \text{ km/h}}{(2)}$$