

Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	
Pearson Edexcel Level 1/Level 2 GCSE (9–1)		<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px;"></div> </div>	
<h2>Thursday 8 November 2018</h2>			
Morning (Time: 1 hour 30 minutes)		Paper Reference 1MA1/2H	
<h3>Mathematics</h3> <h4>Paper 2 (Calculator)</h4> <h4>Higher Tier</h4>			
You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.			Total Marks <div style="border: 1px solid black; width: 50px; height: 40px; margin-top: 5px;"></div>

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.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



Information

- The total mark for this paper is 80
- 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.

Turn over ➤

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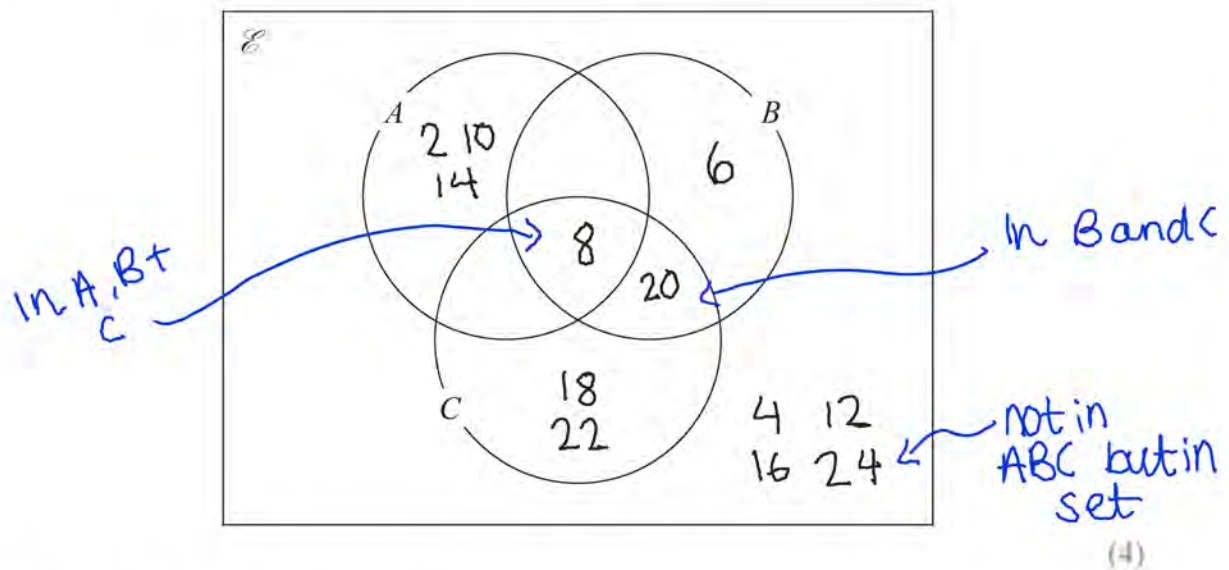
Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 $\mathcal{E} = \{\text{even numbers between 1 and 25}\} = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24\}$
 $A = \{2, 8, 10, 14\}$
 $B = \{6, 8, 20\}$
 $C = \{8, 18, 20, 22\}$

(a) Complete the Venn diagram for this information.



A number is chosen at random from \mathcal{E} .

(b) Find the probability that the number is a member of $A \cap B$.

$$\frac{\text{only 1 in } A \cap B (8)}{\text{Total numbers } 12} = \frac{1}{12}$$

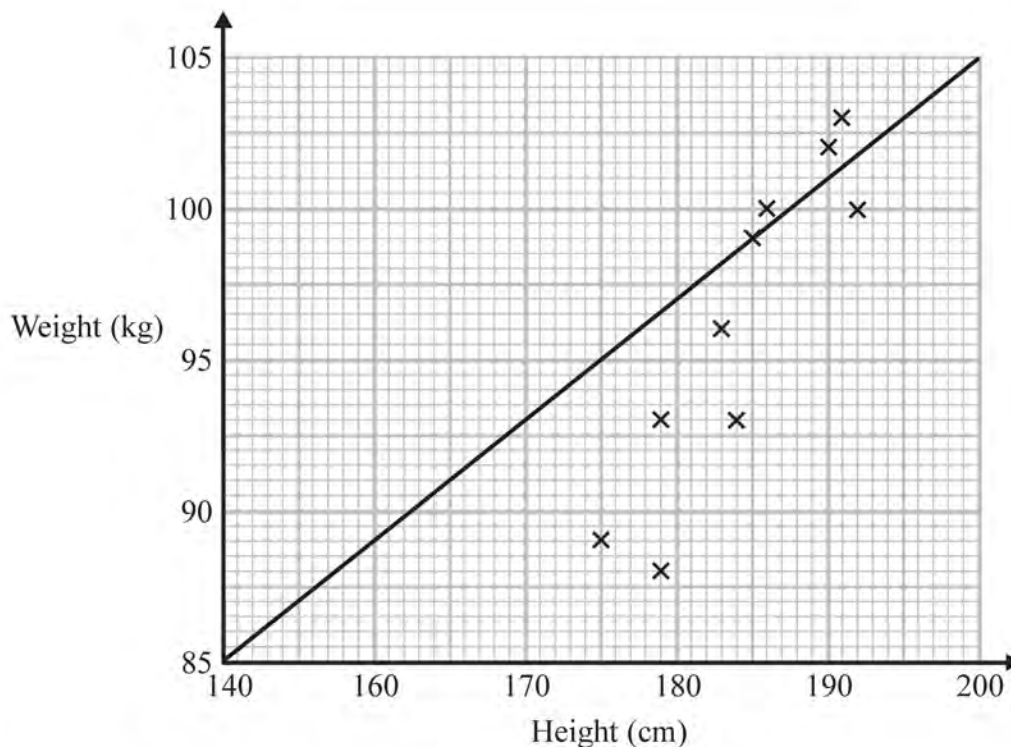
$$\frac{A \text{ and } B}{8}$$

$$\frac{1}{12}$$

(Total for Question 1 is 6 marks)



- 2 Sean has information about the height, in cm, and the weight, in kg, of each of ten rugby players. He is asked to draw a scatter graph and a line of best fit for this information. Here is his answer.



Sean has plotted the points accurately.

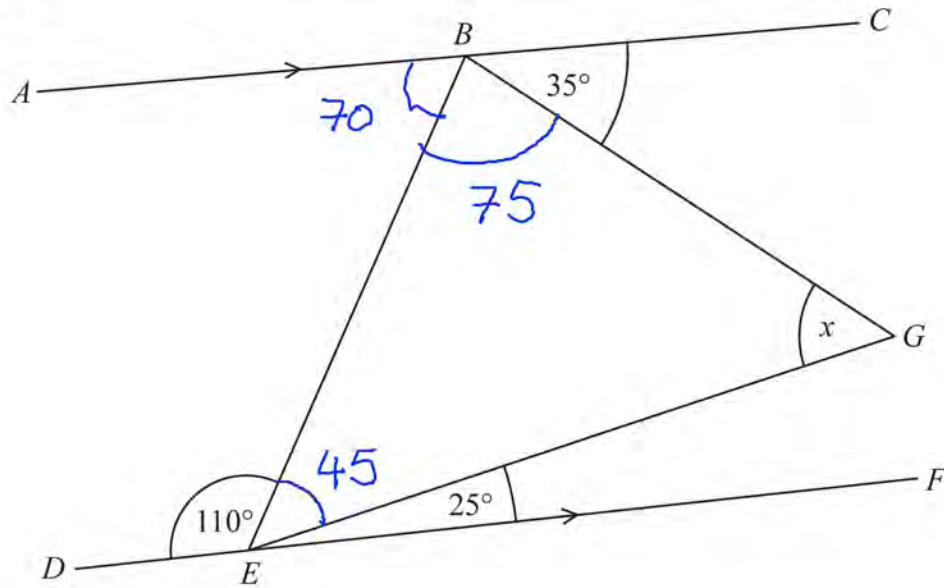
Write down two things that are wrong with his answer.

- 1 The line of best fit doesn't fit in the general trend
- 2 The x axis for height is missing 150cm

(Total for Question 2 is 2 marks)



3 BEG is a triangle.



ABC and DEF are parallel lines.

Work out the size of angle x .

Give a reason for each stage of your working.

$$\angle BEG = 180 - 25 - 110 = 45^\circ$$

angles on a straight line
add up to 180°

$$\angle EBA = 45 + 25 = 70^\circ$$

Alternate angles (\angle)
are equal

$$\angle EBG = 180 - 70 - 35 = 75^\circ$$

angles on a straight line
add to 180°

$$\angle x = 180 - 75 - 45 = 60^\circ$$

angles in triangle
add to 180

60

(Total for Question 3 is 4 marks)



- 4 Northern Bank has two types of account.
Both accounts pay compound interest.

Cash savings account

Interest
2.5% per annum

Shares account

Interest
3.5% per annum

Ali invests £2000 in the cash savings account.
Ben invests £1600 in the shares account.

- (a) Work out who will get the most interest by the end of 3 years.
You must show all your working.

Ali

$$2.5\% \text{ interest} = \times 1.025 \quad \leftarrow \begin{array}{l} 2.5\% = \frac{2.5}{100} = 0.025 \\ \leftarrow 3 \text{ years} \end{array}$$

$$2000 \times 1.025^3 = £2153.78$$

$$2153.78 - 2000 = £153.78 \quad \text{— Ali gains}$$

Final amount — Initial amount = Gain

Ben 3.5 interest = $\times 1.035$

$$1600 \times 1.035^3 = £1773.95$$

$$1773.95 - 1600 = £173.95 \quad \text{— Ben gains}$$

173.95 > 153.78, Ben gains more interest

(4)

In the 3rd year the rate of interest for the shares account is changed to 4% per annum.

- (b) Does this affect who will get the most interest by the end of 3 years?
Give a reason for your answer.

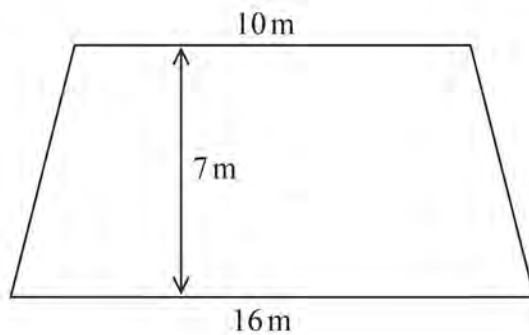
No, Ben already gets the most interest so increasing it means Ben gets even more

(1)

(Total for Question 4 is 5 marks)



- 5 The diagram shows a floor in the shape of a trapezium.



John is going to paint the floor.

Each 5 litre tin of paint costs £16.99

1 litre of paint covers an area of 2m^2

John has £160 to spend on paint.

Has John got enough money to buy all the paint he needs?

You must show how you get your answer.

$$\begin{aligned}\text{Area of trapezium} &: \frac{1}{2}(a+b)h \\ &= \frac{1}{2}(10+16) \times 7 = 91\text{m}^2\end{aligned}$$

$$\text{Number of l of paint} = 91 \div 2 = 45.5\text{ l} \rightarrow 1\text{ l covers } 2\text{m}^2$$

$$\begin{aligned}\text{Number of 5 l tins} &= 45.5 \div 5 = 9.1 \\ &\quad 1\text{ tin} = 16.99 = 10\text{ tins needed} \quad \text{— round up}\end{aligned}$$

$$10\text{ tins cost: } 10 \times 16.99 = £169.90$$

$169.90 > 160$, John doesn't have enough

(Total for Question 5 is 5 marks)



- 6 A is the point with coordinates $(5, 9)$
 B is the point with coordinates $(d, 15)$

The gradient of the line AB is 3

Work out the value of d .

$$m = \frac{15 - 9}{d - 5}$$

$$3 = \frac{6}{d - 5}$$

$$d - 5 = \frac{6}{3}$$

$$(m) \text{ gradient} = \frac{y_1 - y_2}{x_1 - x_2}$$

$$d - 5 = 2$$

$$d = 7$$

$$d = 7$$

(Total for Question 6 is 3 marks)

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- 7 (a) Write the number 0.00008623 in standard form.

5 dp moves 5 times

between 1 and 10

↓
 8.623×10^{-5}
 (1)

- (b) Work out $\frac{3.2 \times 10^3 + 5.1 \times 10^{-2}}{4.3 \times 10^{-4}}$

Give your answer in standard form, correct to 3 significant figures.

$= \frac{3200 + 0.051}{0.00043} = 7.44 \times 10^6$
3 sf *1 < 5 round down*
type in calc

7.44×10^6
 (2)

(Total for Question 7 is 3 marks)

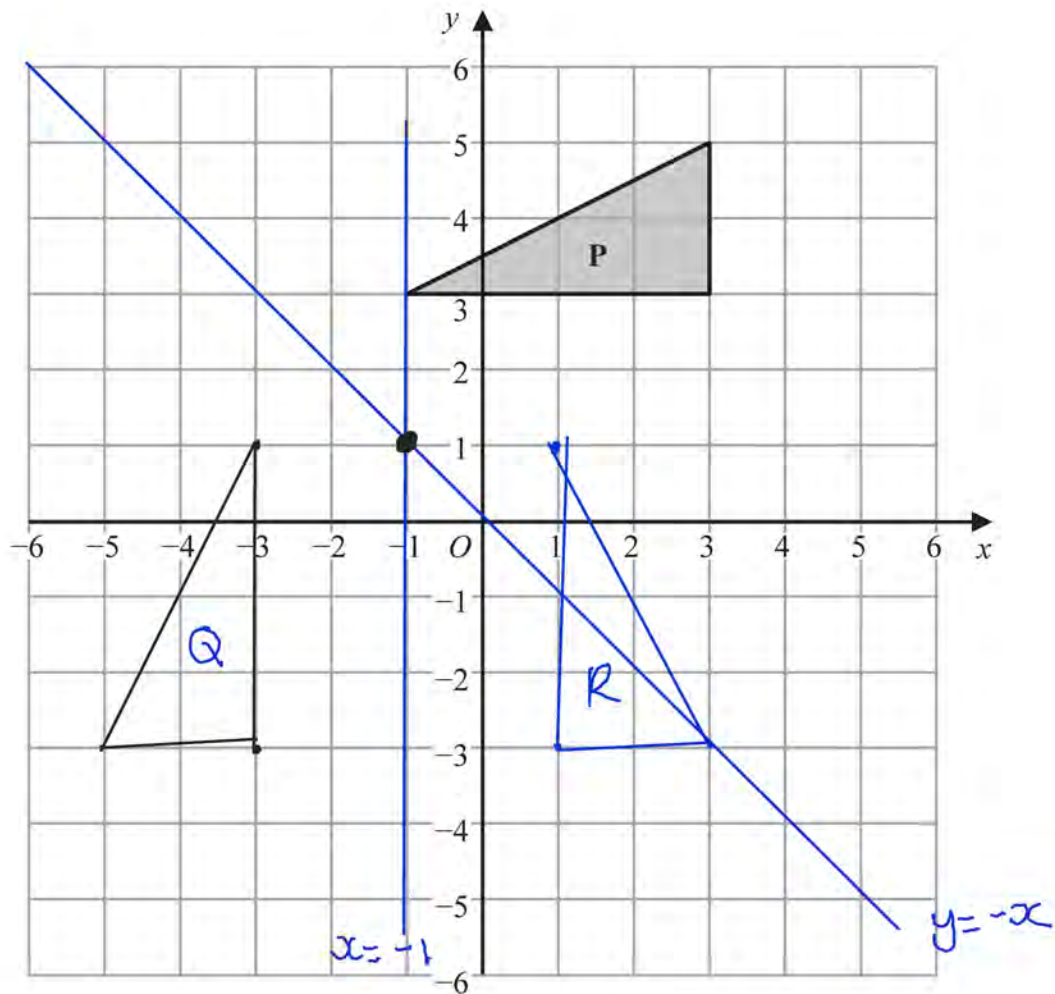
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8



Triangle **P** is reflected in the line $y = -x$ to give triangle **Q**.
Triangle **Q** is reflected in the line $x = -1$ to give triangle **R**.

Describe fully the single transformation that maps triangle **R** to triangle **P**.

Rotation 90° anticlockwise about $(-1, 1)$

(Total for Question 8 is 3 marks)

- 9 Martin truncates the number N to 1 digit.

The result is 7 \rightarrow ignores digit to right

Write down the error interval for N .

Not rounding

All digits in
this interval
would truncate to
7

$7 \leq N < 8$

(Total for Question 9 is 2 marks)



- 10 Robert makes 50 litres of green paint by mixing litres of yellow paint and litres of blue paint in the ratio 2:3

$$2+3 = 5 \quad 50 \div 5 = 10$$

$$20 \text{ yellow} : 30 \text{ blue}$$

Yellow paint is sold in 5 litre tins.
Each tin of yellow paint costs £26

Blue paint is sold in 10 litre tins.
Each tin of blue paint costs £48

Robert sells all the green paint he makes in 10 litre tins.
He sells each tin of green paint for £66.96

Work out Robert's percentage profit on each tin of green paint he sells.

Yellow: $20 \div 5 = 4 \text{ tins bought}$ 20t
 $4 \times 26 = £104$

Blue : $30 \div 10 = 3 \text{ tins bought}$ 30t
 $3 \times 48 = £144$

Total Cost = $144 + 104 = £248$

Sells : $50 \div 10 = 5 \text{ tins sold}$ 50t
 $5 \times 66.96 = £334.80$

Profit = $£334.80 - 248 = £86.80$

percentage = $\frac{86.80 \text{ (profit)}}{248 \text{ (costs)}} \times 100 = 35\%$

35%

(Total for Question 10 is 5 marks)

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11 In a restaurant there are

- 9 starter dishes
- 15 main dishes
- 8 dessert dishes

Janet is going to choose one of the following combinations for her meal.

- a starter dish and a main dish
- or a main dish and a dessert dish
- or a starter dish, a main dish and a dessert dish

Show that there are 1335 different ways to choose the meal.

$$\begin{aligned}\text{Starter and main} &= 9 \times 15 = 135 \text{ ways} & + \\ \text{Main and dessert} &= 15 \times 8 = 120 \text{ ways} & + \\ \text{S and m and D} &= 9 \times 15 \times 8 = 1080 \text{ ways} \\ \hline \text{Total} &= 1335 \text{ ways}\end{aligned}$$

(Total for Question 11 is 3 marks)



- 12 (a) Write $\frac{4x^2 - 9}{6x + 9} \times \frac{2x}{x^2 - 3x}$ in the form $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.

$$\frac{4x^2 - 9}{6x + 9} = \frac{(2x+3)(2x-3)}{3(2x+3)} = \frac{2x-3}{3}$$

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

$$\frac{2x-3}{3} \times \frac{2}{x-3} = \frac{4x-6}{3x-9}$$

(3)

- (b) Express $\frac{3}{x+1} + \frac{1}{x-2} - \frac{4}{x}$ as a single fraction in its simplest form.

$$\frac{3(x-2)(x) + (x+1)(x) - 4(x-2)(x+1)}{(x+1)(x-2)(x)}$$

$$= \frac{3x^2 - 6x + x^2 + x - 4x^2 + 4x + 8}{x(x+1)(x-2)}$$

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

(3)

(Total for Question 12 is 6 marks)

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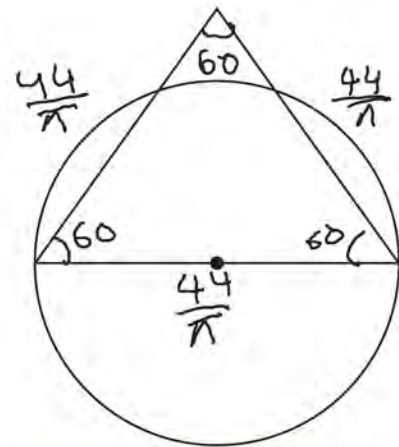


- 13 The diagram shows a circle and an equilateral triangle.

One side of the equilateral triangle is a diameter of the circle.
The circle has a circumference of 44 cm.

Work out the area of the triangle.

Give your answer correct to 3 significant figures.



$$\text{Circumference} = \pi \times d$$

$$44 = \pi \times d$$

$$d = \frac{44}{\pi}$$

Equilateral tri so all \angle are 60° and sides are same length

$$\text{Area} = \frac{1}{2} \times a \times b \times \sin C$$

$$= \frac{1}{2} \times \frac{44}{\pi} \times \frac{44}{\pi} \times \sin 60$$

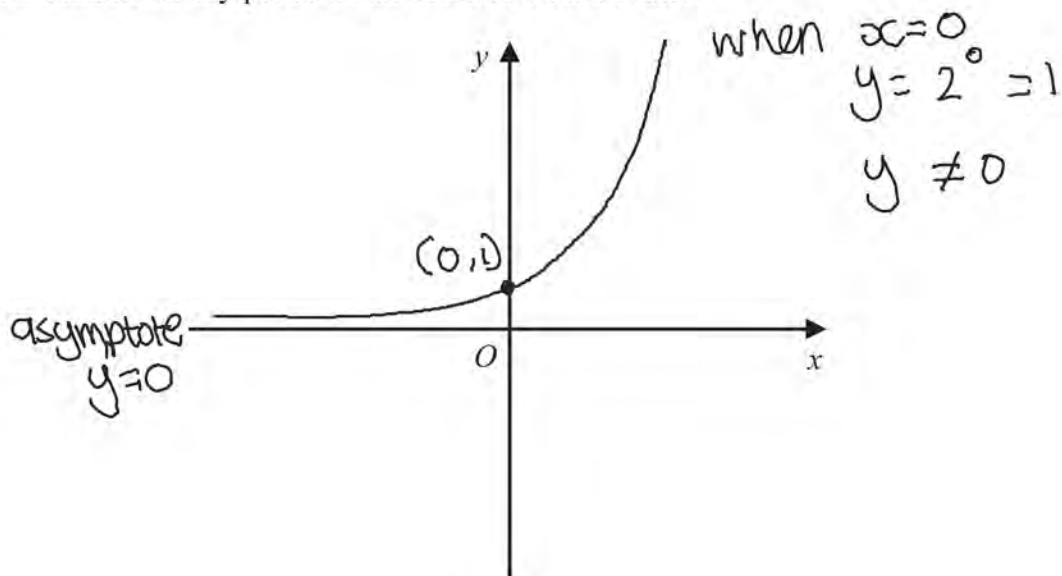
$$= 84.9388... \text{ cm}^2$$

3 \angle S
round down

$$84.9 \text{ cm}^2$$

(Total for Question 13 is 3 marks)

- 14 On the grid, sketch the curve with equation $y = 2^x$ ← exponential
Give the coordinates of any points of intersection with the axes.



(Total for Question 14 is 2 marks)



- 15 The equation of a circle is $x^2 + y^2 = 42.25$

Find the radius of the circle.

$$\begin{aligned}x^2 + y^2 &= r^2 \\r^2 &= 42.25 \\ \sqrt{} & \\r &= 6.5\end{aligned}$$

6.5 cm

(Total for Question 15 is 1 mark)

- 16 There are only red counters and blue counters in a bag.

Joe takes at random a counter from the bag.
The probability that the counter is red is 0.65
Joe puts the counter back into the bag.

Mary takes at random a counter from the bag.
She puts the counter back into the bag.

- (a) What is the probability that Joe and Mary take counters of different colours?

$$\begin{aligned}P(\text{red}) &= 0.65 \\ P(\text{blue}) &= 1 - 0.65 = 0.35\end{aligned}$$

Joe and Mary
red and blue

$$0.65 \times 0.35$$

OR Joe and Mary
+ blue and red
+ 0.35×0.65

$$= 0.455$$

0.455
(2)

There are 78 red counters in the bag.

- (b) How many blue counters are there in the bag?

$$0.65 = 78 \text{ counters}$$

$$0.05 = 6 \text{ counters}$$

$$0.35 = 42 \text{ counters}$$

$P(\text{Blue})$

42

(2)

(Total for Question 16 is 4 marks)

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17 p and q are two numbers such that $p > q$

When you subtract 5 from p and subtract 5 from q the answers are in the ratio 5:1

When you add 20 to p and add 20 to q the answers are in the ratio 5:2

Find the ratio $p:q$

Give your answer in its simplest form.

$$\begin{array}{l} p-5 : q-5 \\ 5 : 1 \end{array}$$

$$\begin{array}{l} p+20 : q+20 \\ 5 : 2 \end{array}$$

$$\frac{p-5}{q-5} = \frac{5}{1}$$

$$p-5 = 5q-25$$

$$p = 5q-20$$

$$\frac{p+20}{q+20} = \frac{5}{2}$$

$$10q = 5q+100$$

$$5q = 100$$

$$q = 20$$

$$\begin{array}{l} p = 5 \times 20 - 20 \\ = 80 \end{array}$$

$$\begin{array}{l} p : q \\ 80 : 20 \\ 4 : 1 \end{array}$$

$$4 : 1$$

(Total for Question 17 is 5 marks)



- 18 The straight line L_1 passes through the points with coordinates (4, 6) and (12, 2)
The straight line L_2 passes through the origin and has gradient -3

The lines L_1 and L_2 intersect at point P .

Find the coordinates of P .

$$L_2: \quad c=0 \quad m=-3 \quad y=-3x+0 \\ y=-3x$$

$$L_1: \quad m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{2-6}{12-4} = -\frac{1}{2}$$

$$(4, 6) \quad y = -\frac{1}{2}x + c \\ 6 = -\frac{1}{2} \times 4 + c \\ 6 = -2 + c \\ c = 8$$

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

Intersect: $-\frac{1}{2}x + 8 = -3x \quad \leftarrow y \text{ values are equal}$

$$\begin{array}{r} -\frac{1}{2}x + 8 = -3x \\ +3x \quad -8 \quad +3x \quad -8 \\ \hline \frac{5}{2}x = -8 \\ \div \frac{5}{2} \quad \div \frac{5}{2} \\ \hline x = -\frac{16}{5} \end{array}$$

$$\begin{array}{l} y = -3x \\ y = -3 \times -\frac{16}{5} = \frac{48}{5} \end{array}$$

$$\left(-\frac{16}{5}, \frac{48}{5} \right)$$

(Total for Question 18 is 4 marks)

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19 Solve $22 < \frac{m^2 + 7}{4} < 32$

Show all your working.

$$22 < \frac{m^2 + 7}{4} < 32$$

$\times 4$ $\times 4$

$$88 < m^2 + 7 < 128$$

-7 -7

$$81 < m^2 < 121$$

$\sqrt{}$ $\sqrt{}$

$$\oplus \quad 9 < m < 11$$

$$\ominus \quad -9 > m > -11$$



Change direction
as you 'divide' by negative

↖
square
numbers
have + and
- values

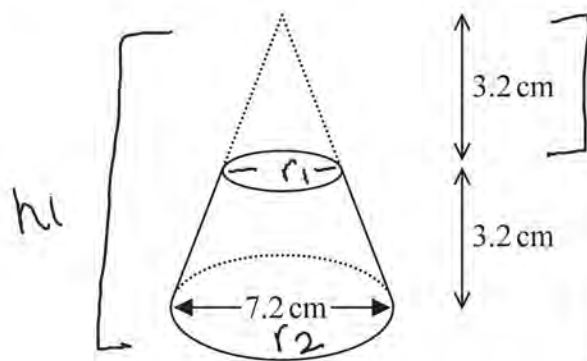
$$9 < m < 11$$

$$\text{OR } -9 > m > -11$$

(Total for Question 19 is 5 marks)

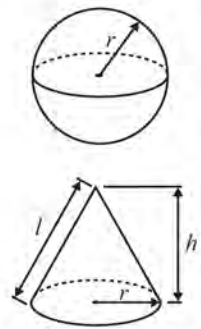


20 Here is a frustum of a cone.



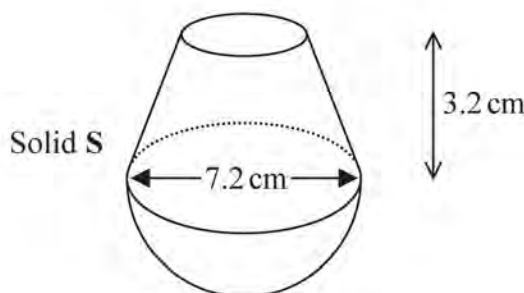
n2
Volume of sphere = $\frac{4}{3}\pi r^3$

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.



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.

$$\text{Volume of Frustum} = \frac{1}{3}\pi r_1^2 h_1 - \frac{1}{3}\pi r_2^2 h_2$$

$$\text{sf: } \frac{3.2+3.2}{3.2} = 2$$

$$r_1 = 7.2 \div 2 = 3.6$$

$$r_2 = 3.6 \div 2 = 1.8$$

$$d_2 = d_1 \div 2 = 7.2 \div 2 = 3.6 \text{ cm}$$

Volume of Frustum:

$$\begin{aligned} & \frac{1}{3} \times \pi \times 3.6^2 \times 6.4 - \frac{1}{3} \times \pi \times 1.8^2 \times 3.2 \\ &= 24.192 \pi \text{ cm}^3 \end{aligned}$$

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$$\text{Volume of hemisphere} : \frac{1}{2} \times \frac{4}{3} \times \pi \times 3.6^2$$

$$= 8.64 \pi \text{ cm}^3$$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Mass of frustum} = 2.4 \times 24.192 \pi$$

$$\approx 182.4 \text{ g}$$

$$\text{Mass of hemisphere} = 4.8 \times 8.64 \pi$$

$$= 468.96$$

$$\text{Density} = \frac{182.4 + 468.96}{76.0 + 97.7}$$

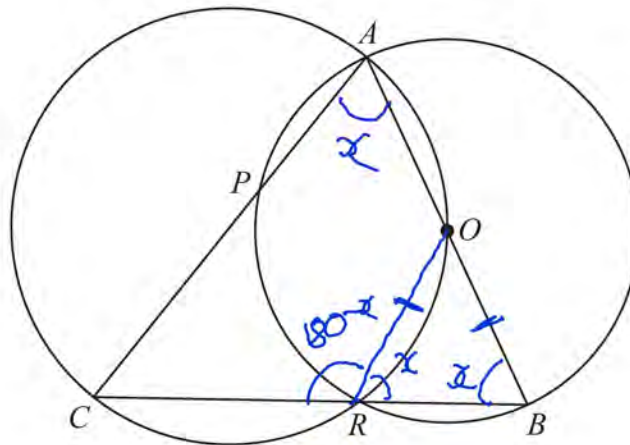
$$= 3.75 \text{ g/cm}^3$$

$$3.75 \text{ g/cm}^3$$

(Total for Question 20 is 5 marks)



21



A, B, R and P are four points on a circle with centre O .
 A, O, R and C are four points on a different circle.
 The two circles intersect at the points A and R .

CPA , CRB and AOB are straight lines.

Prove that $\text{angle } CAB = \text{angle } ABC$.

ACRO is acyclic quad

$\angle CRO = 180 - x$ opp angles in cyclic quad add to 180

$$\angle ORB = 180 - (180 - x) = x$$

angles on a straight line add to 180

$\angle ABC = x$ $OR = OB$ (radius)
Base angles are equal of isosceles tri

Therefore $\angle CAB = \angle ABC$

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

