

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)

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Thursday 8 November 2018

Morning (Time: 1 hour 30 minutes)

Paper Reference **1MA1/2H**

Mathematics

Paper 2 (Calculator)
Higher Tier

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

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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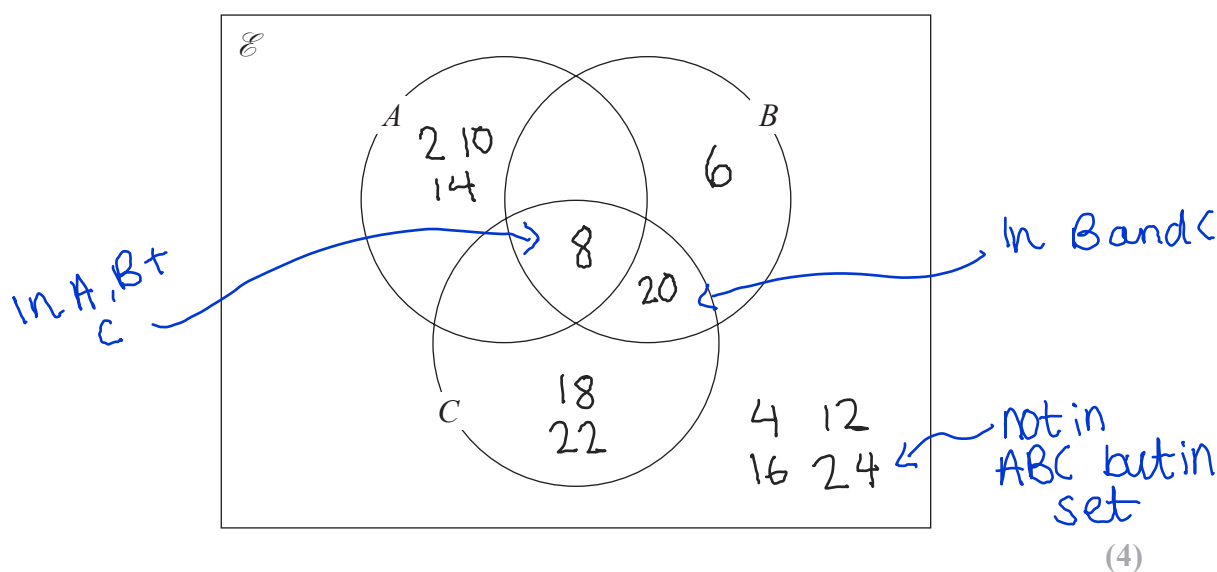
Answer ALL questions.

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 $A \cap B$.

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

$$\frac{\text{A and B}}{8} = \frac{1}{8}$$

(2)

(Total for Question 1 is 6 marks)

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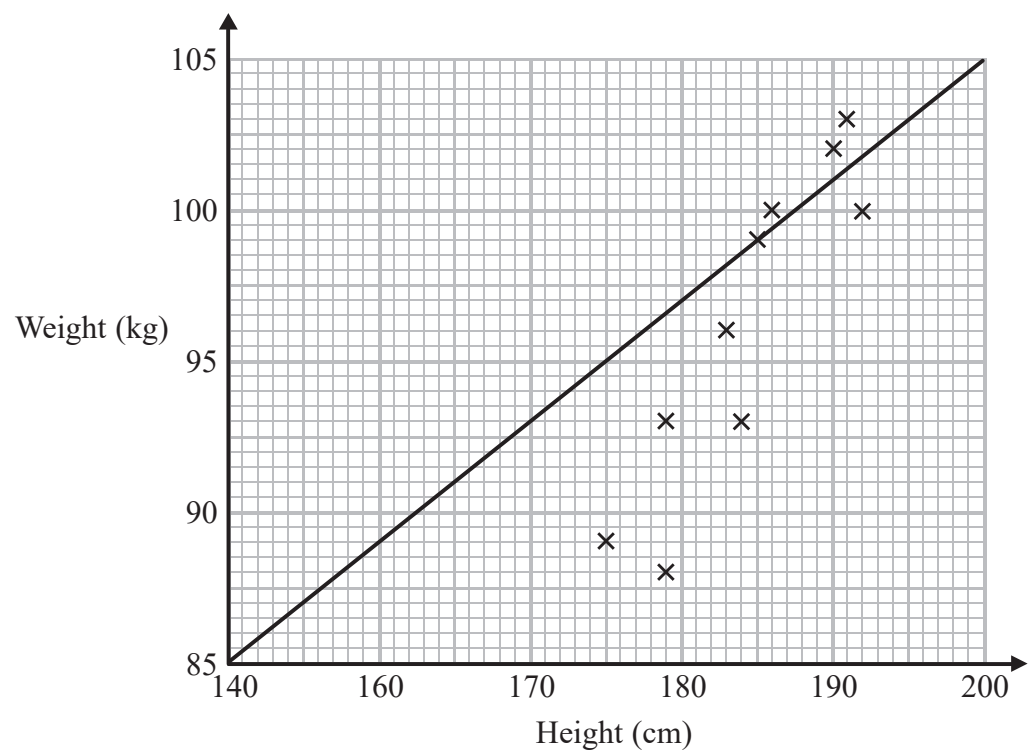
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2 Sean has information about the height, in cm, and the weight, in kg, of each of ten rugby players. He is asked to draw a scatter graph and a line of best fit for this information.

Here is his answer.



Sean has plotted the points accurately.

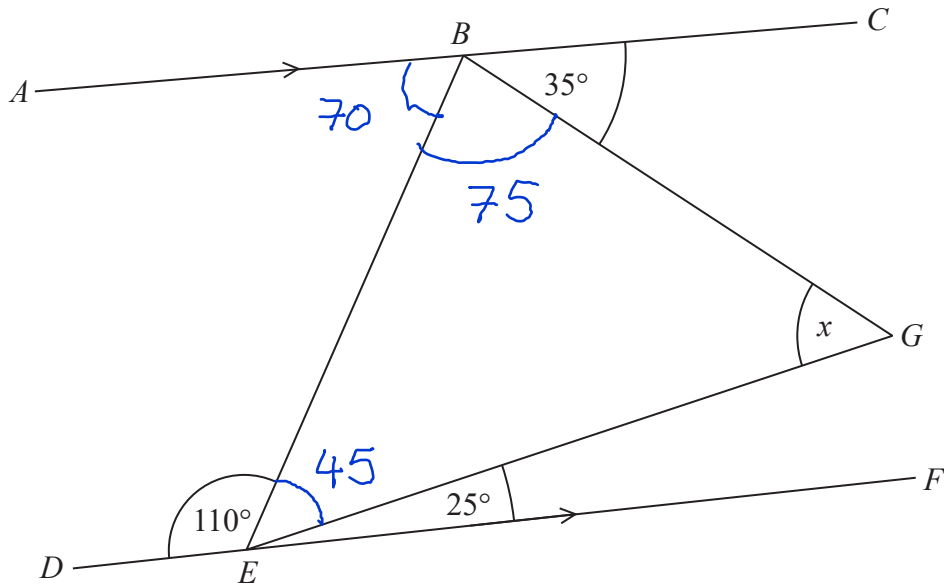
Write down two things that are wrong with his answer.

- 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 (\sphericalangle)
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)



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

<p>Cash savings account Interest 2.5% per annum</p>
--

<p>Shares account Interest 3.5% per annum</p>
--

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

$$2.5\% \div 100 = 0.025$$

$$2.5 \text{ interest} = \times 1.025$$

$$2000 \times 1.025^3 = \text{£}2153.78$$

(Handwritten notes: 3 ← 3 years)

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

Final amount - Initial amount = Gain

Ben 3.5 interest = $\times 1.035$

$$1600 \times 1.035^3 = \text{£}1773.95$$

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

$173.95 > 153.78$, 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.

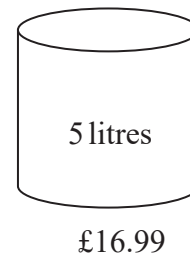
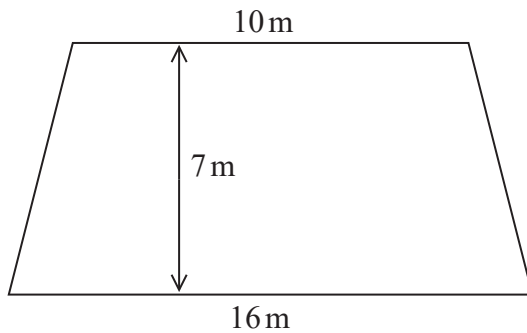
No, Ben already gets the most interest so increasing it means Ben gets even more

(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 2 m^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.

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

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

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

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

$169.90 > 160$, 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)



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)

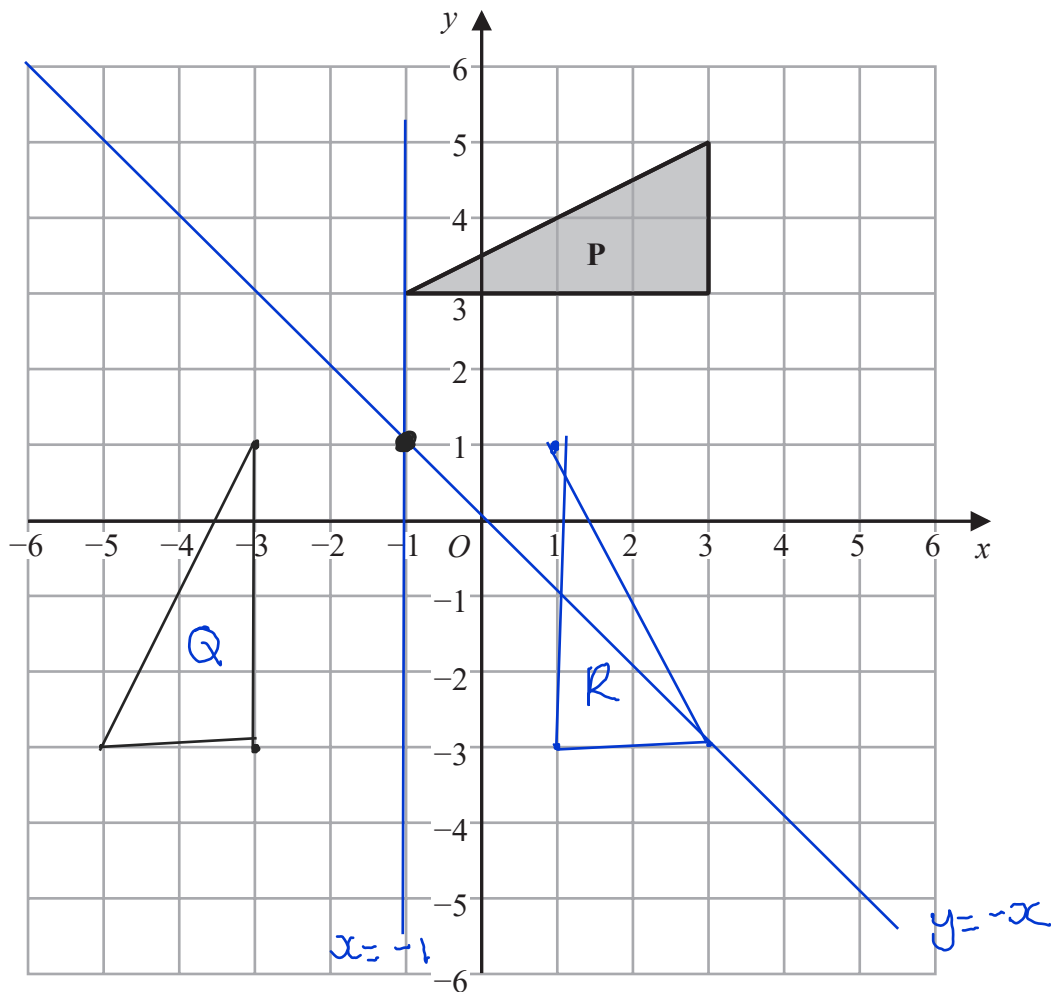
(Total for Question 7 is 3 marks)

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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 $\rightarrow 7 \leq N < 8$

(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.

$$\text{Yellow: } 20 \div 5 = 4 \text{ tins bought} \quad 20 \text{ l}$$

$$4 \times 26 = \text{£}104$$

$$\text{Blue : } 30 \div 10 = 3 \text{ tins bought} \quad 30 \text{ l}$$

$$3 \times 48 = \text{£}144$$

$$\text{Total Cost} = 144 + 104 = \text{£}248$$

$$\text{Sells : } 50 \div 10 = 5 \text{ tins sold} \quad 50 \text{ l}$$

$$5 \times 66.96 = \text{£}334.80$$

$$\text{Profit} = \text{£}334.80 - 248 = \text{£}86.80$$

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

..... 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)

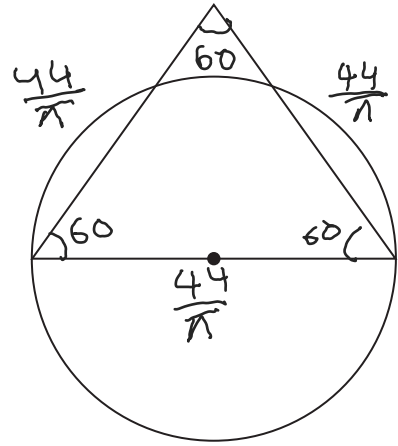


- 13 The diagram shows a circle and an equilateral triangle.

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.



$$\begin{aligned} \text{Circumference} &= \pi \times d \\ 44 &= \pi \times d \\ d &= \frac{44}{\pi} \end{aligned}$$

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

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

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

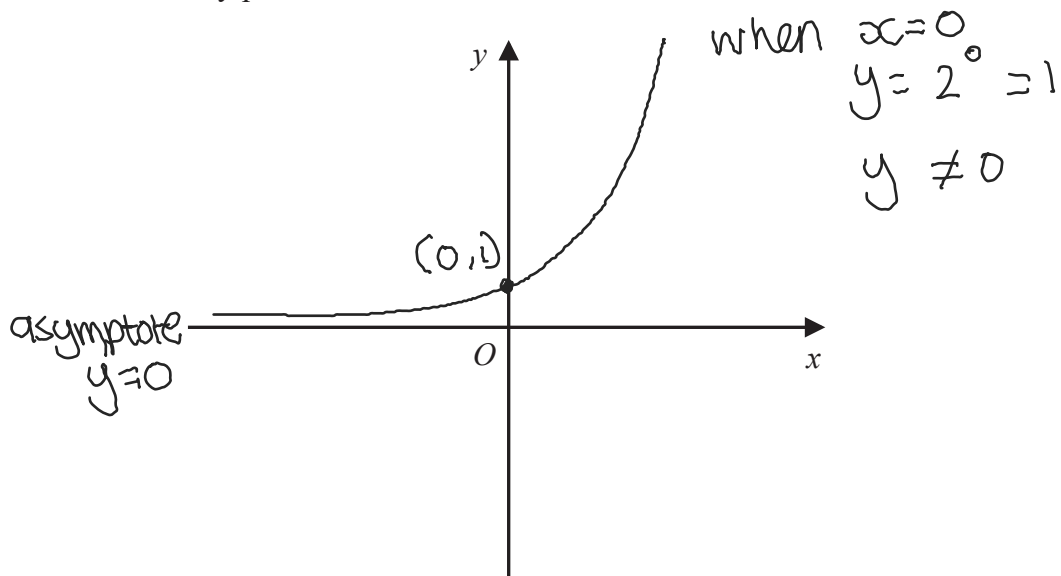
$$= 84.9388... \text{ cm}^2$$

3 \angle S
round down

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

(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.

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

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

OR Joe and Mary
+ blue and red

$$0.65 \times 0.35$$

$$+ 0.35 \times 0.65$$

$$= 0.455$$

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.

$$\begin{aligned} p-5 &: q-5 \\ 5 &: 1 \end{aligned}$$

$$\begin{aligned} p+20 &: q+20 \\ 5 &: 2 \end{aligned}$$

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

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

$$p = 5q - 20$$

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

(Handwritten annotations: $5q-20$ above $p+20$, $=5q$ above $q+20$)

$$10q = 5q + 100$$

$$5q = 100$$

$$q = 20$$

$$\begin{aligned} p &= 5 \times 20 - 20 \\ &= 80 \end{aligned}$$

$$\begin{aligned} p &: q \\ 80 &: 20 \\ 4 &: 1 \end{aligned}$$

4 : 1

(Total for Question 17 is 5 marks)



P 5 5 5 8 8 A 0 1 5 2 0

- 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)

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

$$6 = -\frac{1}{2} \times 4 + c$$

$$6 = -2 + c$$

$$c = 8$$

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

Intersect:

$$-\frac{1}{2}x + 8 = -3x$$

$$\begin{array}{r} +3x \\ -8 \end{array}$$

$$\frac{5}{2}x = -8$$

$$\begin{array}{r} \div 5/2 \\ \hline x = -\frac{16}{5} \end{array}$$

← y values are equal

$$y = -3x$$

$$y = -3 \times \frac{-16}{5} = \frac{48}{5}$$

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

(Total for Question 18 is 4 marks)



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

Show all your working.

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

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

$$81 < m^2 < 121$$

⊕

$$9 < m < 11$$

⊖

$$-9 > m > -11$$



Change direction
as you 'divide' by negative

↖
square
numbers
have + and
- values

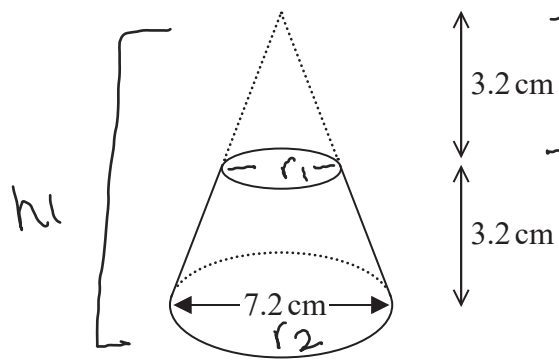
$$9 < m < 11$$

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

(Total for Question 19 is 5 marks)



20 Here is a frustum of a cone.

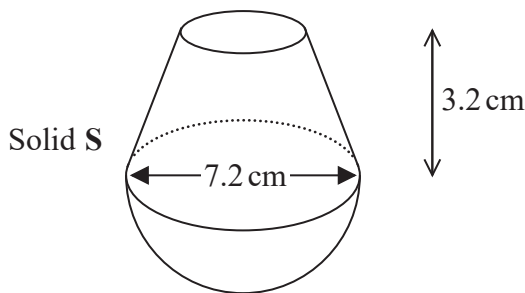


Volume of sphere = $\frac{4}{3}\pi r^3$

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.

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

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

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

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

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

Volume of Frustum:

$$\frac{1}{3} \times \pi \times 3.6^2 \times 6.4 - \frac{1}{3} \times \pi \times 1.8^2 \times 3.2$$

$$= 24.192 \pi \text{ cm}^3$$

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$$\begin{aligned} \text{Volume of hemisphere} &: \frac{1}{2} \times \frac{4}{3} \times \pi \times 3.6^2 \\ &= 8.64 \pi \text{ cm}^3 \end{aligned}$$

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

$$\begin{aligned} \text{Mass of frustum} &= 2.4 \times 24.192 \pi \\ &\approx 182.4 \text{ g} \end{aligned}$$

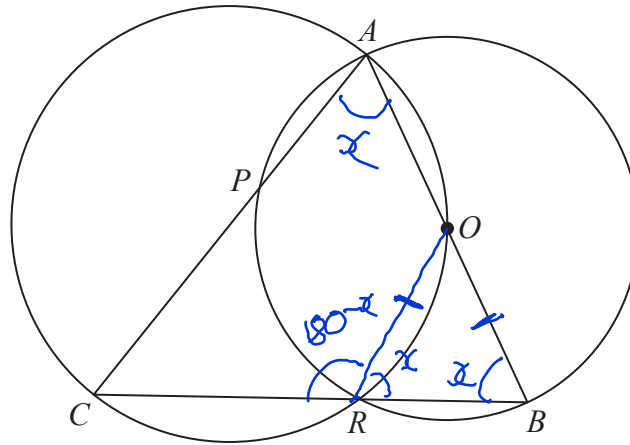
$$\begin{aligned} \text{Mass of hemisphere} &= 4.8 \times 8.64 \pi \\ &= 468.96 \end{aligned}$$

$$\begin{aligned} \text{Density} &= \frac{182.4 + 468.96}{76.0 + 97.7} \\ &= 3.75 \text{ g/cm}^3 \end{aligned}$$

..... 3.75 g/cm³

(Total for Question 20 is 5 marks)





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 angle $CAB =$ angle ABC .

$ACRO$ is a cyclic quad

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

$$\angle ORB = 180 - (180 - x) = x \quad \text{angles on a straight line add to } 180$$

$$\angle ABC = x \quad \begin{array}{l} OR = OB \text{ (radius)} \\ \text{Base angles are equal of isosceles tri} \end{array}$$

Therefore $\angle CAB = \angle ABC$

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

