

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>				
<h1>Thursday 8 November 2018</h1>									
Morning (Time: 1 hour 30 minutes)					Paper Reference 1MA1/2H				
<div style="display: flex; justify-content: space-between;"> <div> Mathematics Paper 2 (Calculator) Higher Tier </div> <div style="color: blue; font-family: cursive; font-size: 2em;"> <u>Solutions</u> </div> </div>									
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.

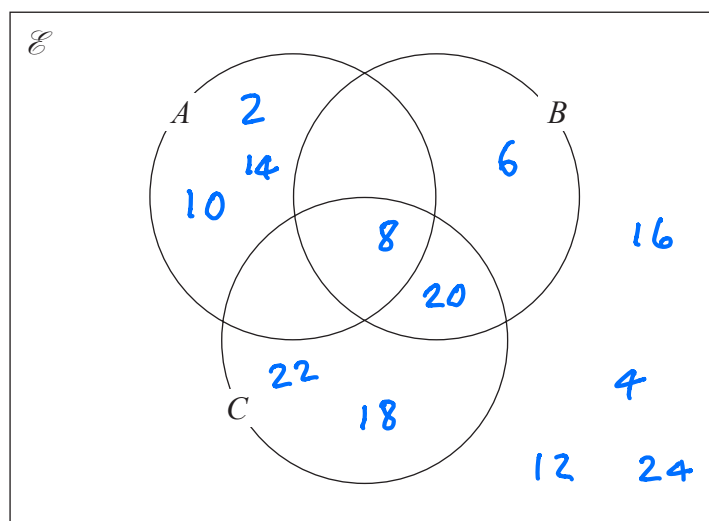
1 $\mathcal{E} = \{\text{even numbers between 1 and 25}\}$

$$A = \{2, 8, 10, 14\}$$

$$B = \{6, 8, 20\}$$

$$C = \{8, 18, 20, 22\}$$

(a) Complete the Venn diagram for this information.



(4)

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

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

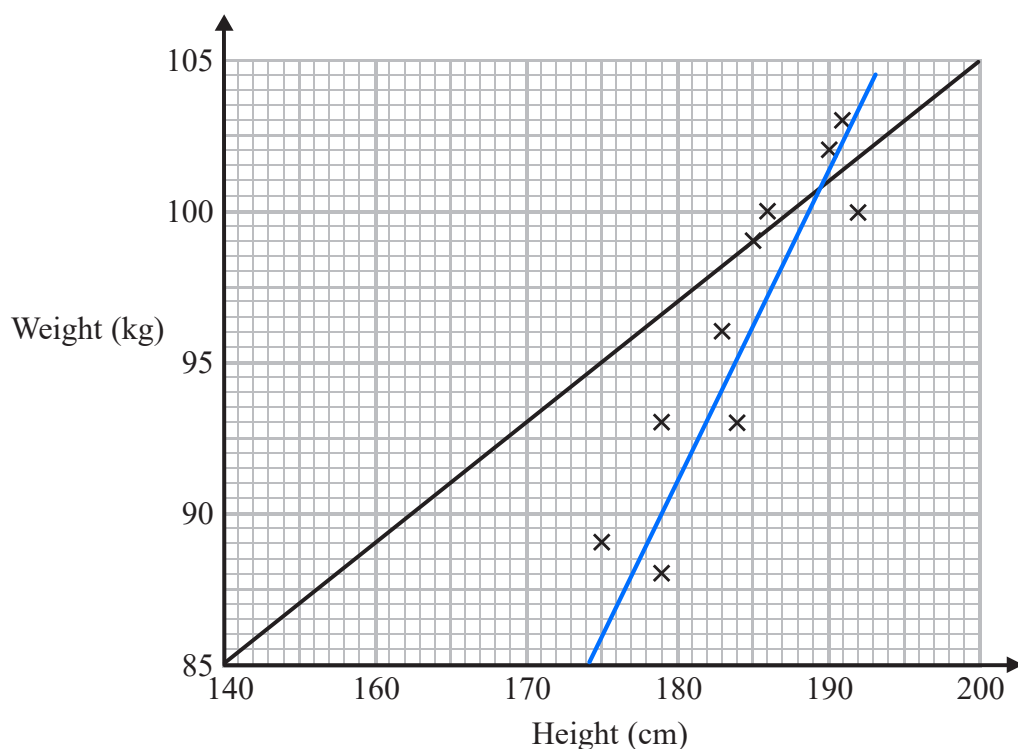
$$\frac{1}{12}$$

(2)

(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.

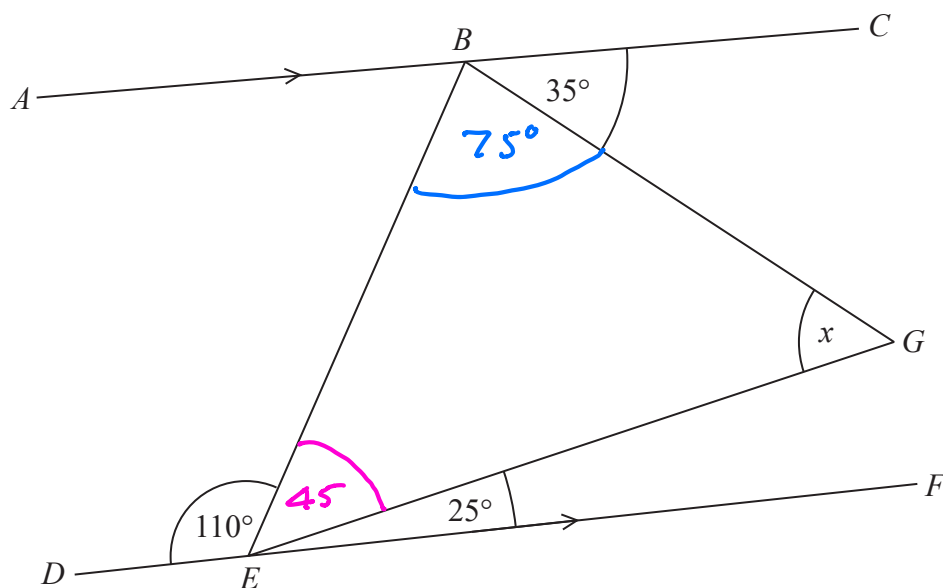
Write down two things that are wrong with his answer.

- 1 Horizontal scale not linear. 150 missing
- 2 Line of best fit unsuitable. Should be in a position similar to blue line drawn.

(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.

$$\angle BEG = 45^\circ \text{ (}\angle\text{s on str line add to } 180^\circ\text{)}$$

$$\angle GBE = 75^\circ \text{ (alternate } \angle\text{s equal)}$$

$$x = 180 - (75 + 45)$$

$$x = 180 - 120$$

$$x = 60^\circ \text{ (}\angle\text{ sum of } \Delta\text{)}$$

(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

$$2000 \times 1.025^3$$

$$= 2153.78$$

£153.78
interest

Ben

$$1600 \times 1.035^3$$

$$= 1773.94$$

£173.94
interest

So Ben gets most 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.

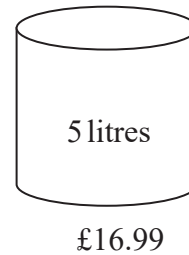
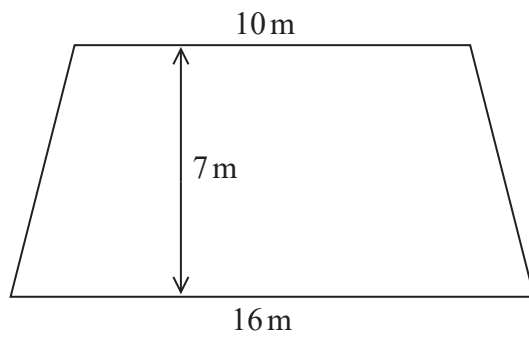
No, Ben already receives the most. Raising his interest from 3.5% to 4% will give him even more interest.

(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.

$$\text{Area} = \frac{1}{2}(10+16) \times 7 = 91\text{ m}^2$$

$$1 \text{ tin covers } 5 \times 2 = 10\text{ m}^2$$

$$\frac{91}{10} = 9.1 \text{ so } 10 \text{ tins required}$$

$$10 \times £16.99 = £169.90$$

So no John does not have
enough money if he has only £160

(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 .

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$3 = \frac{15 - 9}{d - 5}$$

$$3(d - 5) = 6$$

$$3d - 15 = 6$$

$$3d = 6 + 15$$

$$3d = 21$$

$$d = \frac{21}{3}$$

$$\underline{d = 7}$$

$$d = 7$$

(Total for Question 6 is 3 marks)



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

$$\underline{8.623 \times 10^{-5}}$$

(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.

$$= 7441979.07$$

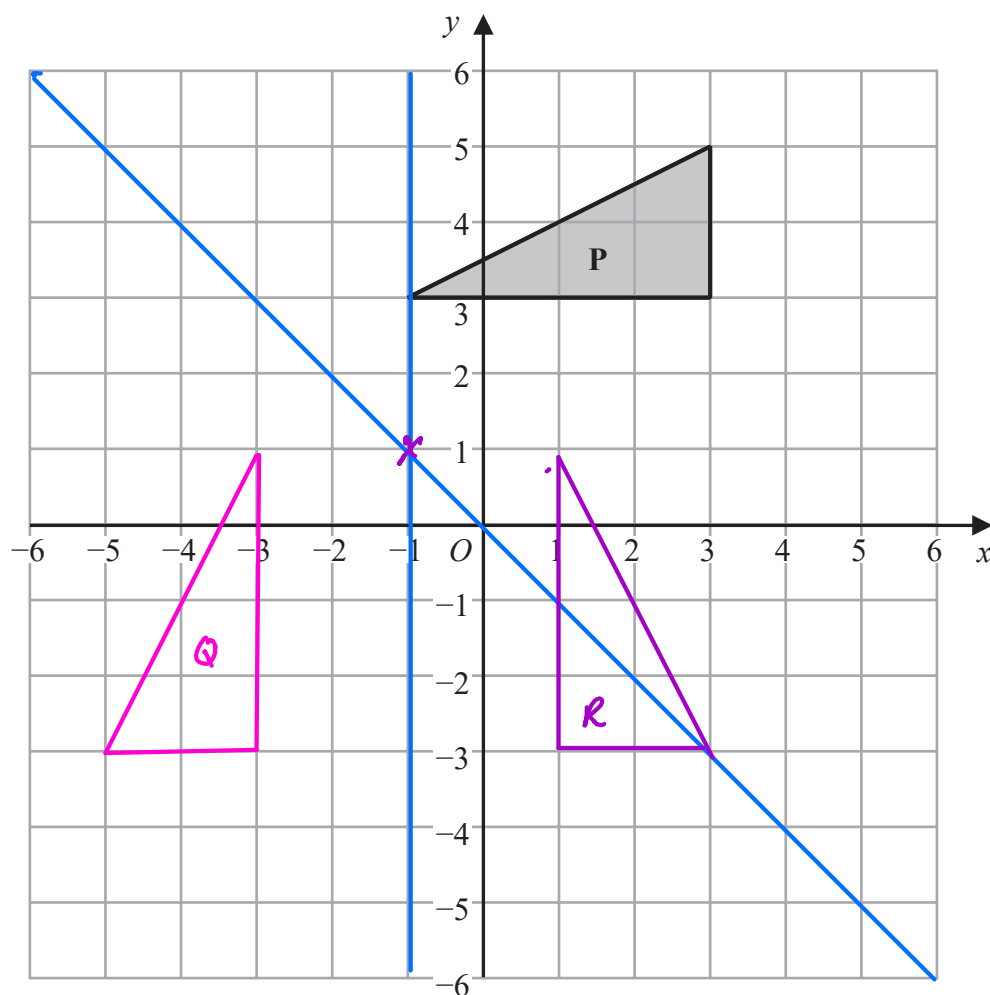
$$\underline{= 7.44 \times 10^6}$$

$$\underline{7.44 \times 10^6}$$

(2)

(Total for Question 7 is 3 marks)





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 by 90° anti-clockwise about $(-1, 1)$

(Total for Question 8 is 3 marks)

- 9 Martin truncates the number N to 1 digit.
The result is 7

Write down the error interval for N .

$$7 \leq N < 8$$

(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

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.

$$4 \text{ tins Yellow cost } 4 \times £26 = £104$$

$$3 \text{ tins Blue cost } 3 \times £48 = £144$$
$$£248$$

5 tins Green sell for

$$£66.96 \times 5 = £334.80$$

$$\text{Percentage Profit } \frac{334.80 - 248}{248} \times 100 = 35\%$$

35% profit on all sales

so 35% on each tin of green paint

.....%

(Total for Question 10 is 5 marks)



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 (1)
- or a main dish and a dessert dish (2)
- or a starter dish, a main dish and a dessert dish (3)

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

$$\begin{aligned} & \overset{(1)}{9} \times \overset{(2)}{15} + \overset{(2)}{15} \times \overset{(3)}{8} + \overset{(1)}{9} \times \overset{(2)}{15} \times \overset{(3)}{8} \\ = & 135 + 120 + 1080 \\ = & 1335 \end{aligned}$$

(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.

$$= \frac{(2x+3)(2x-3)}{3(2x+3)} \times \frac{2x}{x(x-3)}$$

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

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

(3)

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

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

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

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

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

(3)

(Total for Question 12 is 6 marks)

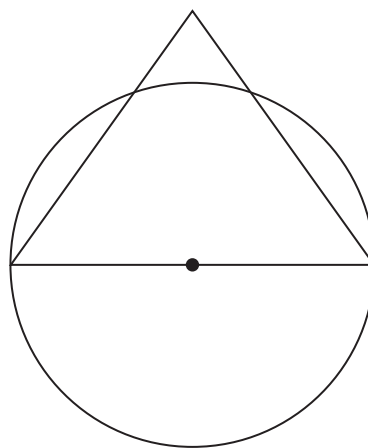


- 13 The diagram shows a circle and an equilateral triangle.

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.



$$\text{Circ} = \pi d$$

$$44 = \pi d$$

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

$$\text{Area of } \triangle = \frac{1}{2} ab \sin c$$

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

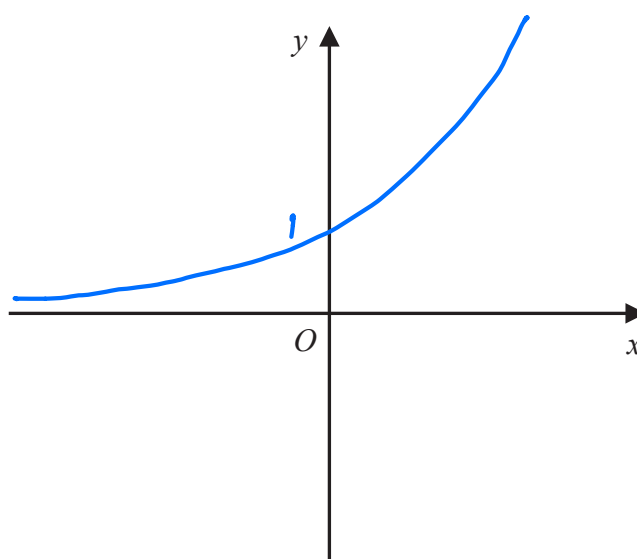
$$= 84.9388$$

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

84.9 cm²

(Total for Question 13 is 3 marks)

- 14 On the grid, sketch the curve with equation $y = 2^x$
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.

$$\begin{aligned} \text{radius} &= \sqrt{42.25} \\ &= 6.5 \end{aligned}$$

6.5

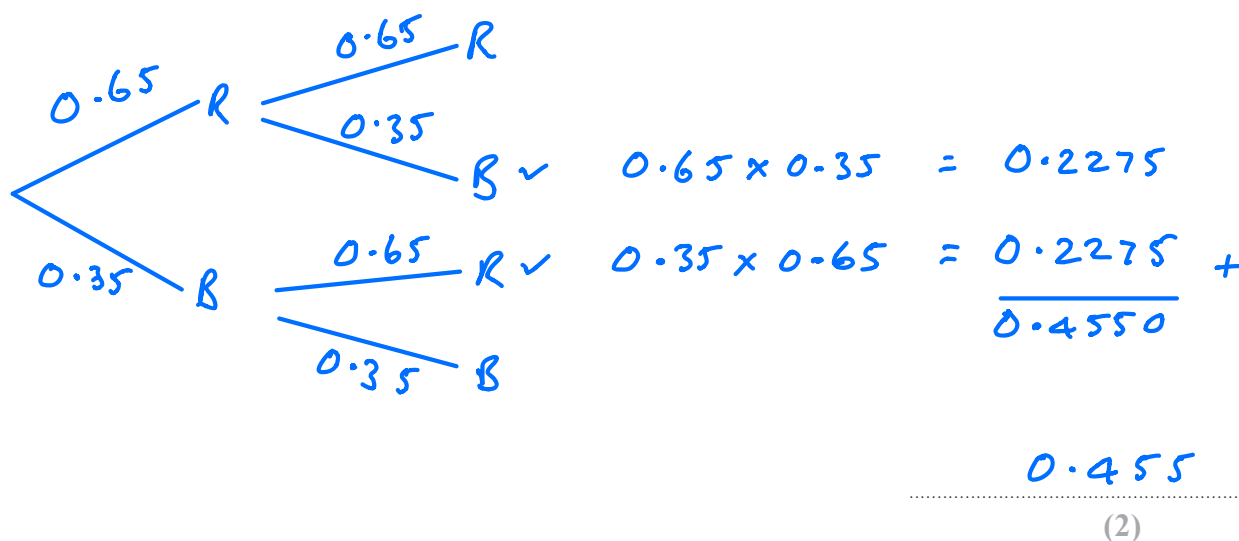
(Total for Question 15 is 1 mark)

- 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?



There are 78 red counters in the bag.

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

$$\begin{aligned} 78 &\rightarrow 65\% \\ 78 \times \frac{35}{65} &= 42 \end{aligned}$$

42

(2)

(Total for Question 16 is 4 marks)



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.

$$\frac{p-5}{q-5} = \frac{5}{1} \Rightarrow p-5 = 5(q-5)$$

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

$$\underline{p-5q = -20} \quad (1)$$

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

$$\Rightarrow 2(p+20) = 5(q+20)$$

$$2p+40 = 5q+100$$

$$\underline{2p-5q = 60} \quad (2)$$

$$(2) - (1)$$

$$\underline{p = 80}$$

sub for p in (1)

$$80-5q = -20$$

$$80+20 = 5q$$

$$100 = 5q$$

$$\underline{q = 20}$$

$$\underline{p = 80, q = 20}$$

$$p:q = 80:20$$

$$= 4:1$$

$$\underline{4:1}$$

(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 .

$$L_1 \text{ gradient} = \frac{2-6}{12-4} = \frac{-4}{8} = -\frac{1}{2}$$

$$L_1 \quad y = -\frac{1}{2}x + c$$

through (4, 6)

$$\begin{aligned} 6 &= -\frac{1}{2}(4) + c \\ 6 &= -2 + c \\ 8 &= c \end{aligned}$$

$$L_1 \quad y = -\frac{1}{2}x + 8$$

$$L_2 \quad y = -3x$$

Sub for y

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

$$-6x = -x + 16$$

$$-5x = 16$$

$$x = -3.2$$

$$y = -3(-3.2) = 9.6$$

$$(-3.2, 9.6)$$

(Total for Question 18 is 4 marks)



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

Show all your working.

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

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

$$81 < m^2 < 121$$

$$\sqrt{81} < m < \sqrt{121}$$

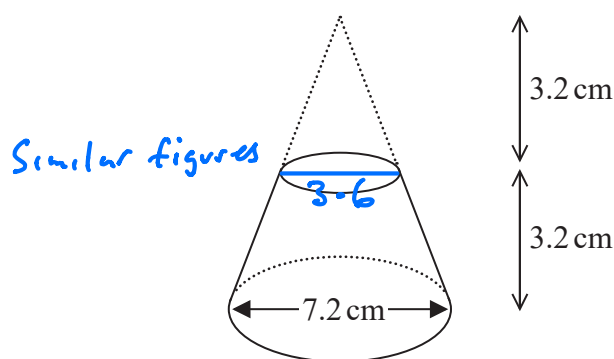
$$9 < m < 11$$

$$\text{or } -11 < m < -9$$

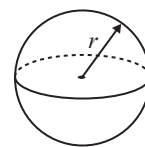
(Total for Question 19 is 5 marks)



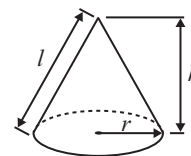
20 Here is a frustum of a cone.



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

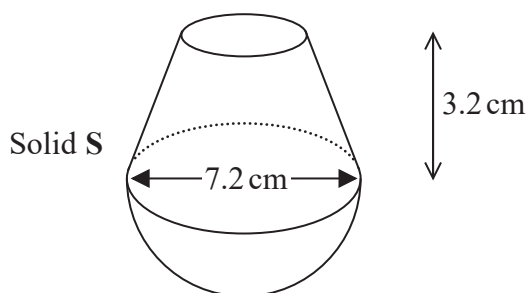


$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$



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.



Vol of frustum

$$\begin{aligned} &= \frac{1}{3} \pi \times 3.6^2 \times 6.4 \\ &\quad - \frac{1}{3} \pi \times 1.8^2 \times 3.2 \\ &= 76.00 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Mass} &= 76.00 \times 2.4 \\ &= 182.4 \text{ g} \end{aligned}$$

The density of the frustum is 2.4 g/cm³
The density of the hemisphere is 4.8 g/cm³

Calculate the average density of solid S.

Vol of hemisphere

$$\begin{aligned} \frac{2}{3} \pi r^3 &= \frac{2}{3} \times \pi \times 3.6^3 \\ &= 97.72 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Mass} &= 97.72 \times 4.8 \\ &= 469.1 \text{ g} \end{aligned}$$

Total Mass

$$182.4 + 469.1 = 651.5 \text{ g}$$

Total Vol

$$76.00 + 97.72 = 173.72 \text{ cm}^3$$

$$\begin{aligned} \text{Density} &= \frac{\text{Mass}}{\text{Vol}} = \frac{651.5}{173.72} \\ &= 3.75 \text{ g/cm}^3 \end{aligned}$$

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

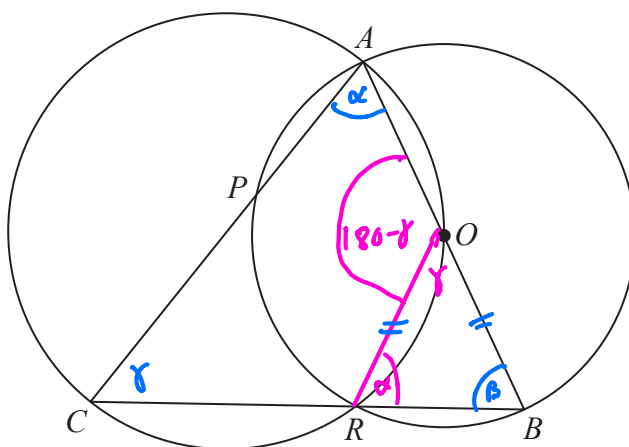
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.....g/cm³

(Total for Question 20 is 5 marks)



P 5 5 5 8 8 A 0 1 9 2 0



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 .

Let $\angle CAB = \alpha$

$\angle ABC = \beta$

$\angle ACB = \gamma$

Join OR

$\Rightarrow \angle AOR = 180 - \gamma$

(Opp \angle s of cyclic quad
add to 180°)

$\Rightarrow \angle ROB = \gamma$ (\angle s on str line
add to 180°)

$\Rightarrow \angle ORB = \alpha$

Since $\alpha + \beta + \gamma = 180^\circ$ ($\triangle ABC$)

But $OR = OB$ (radii)

$\therefore \angle ORB = \angle OBR$

$\alpha = \beta$

base \angle s of isos \triangle

$\therefore \underline{\angle CAB = \angle ABC}$

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

