

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number

Candidate Number

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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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Pearson

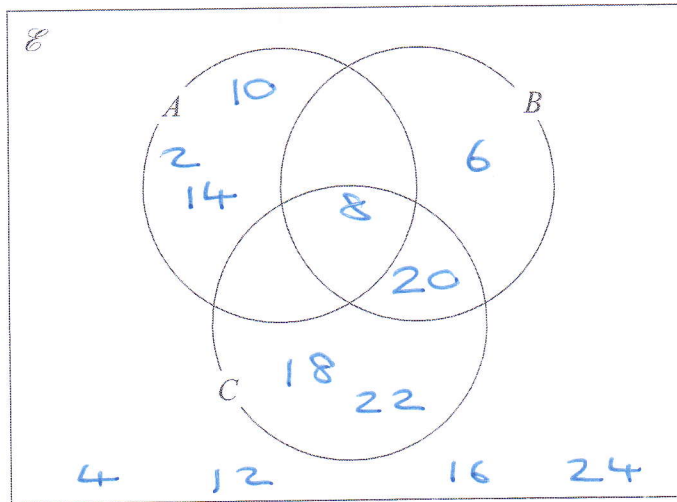
Answer ALL questions.

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)

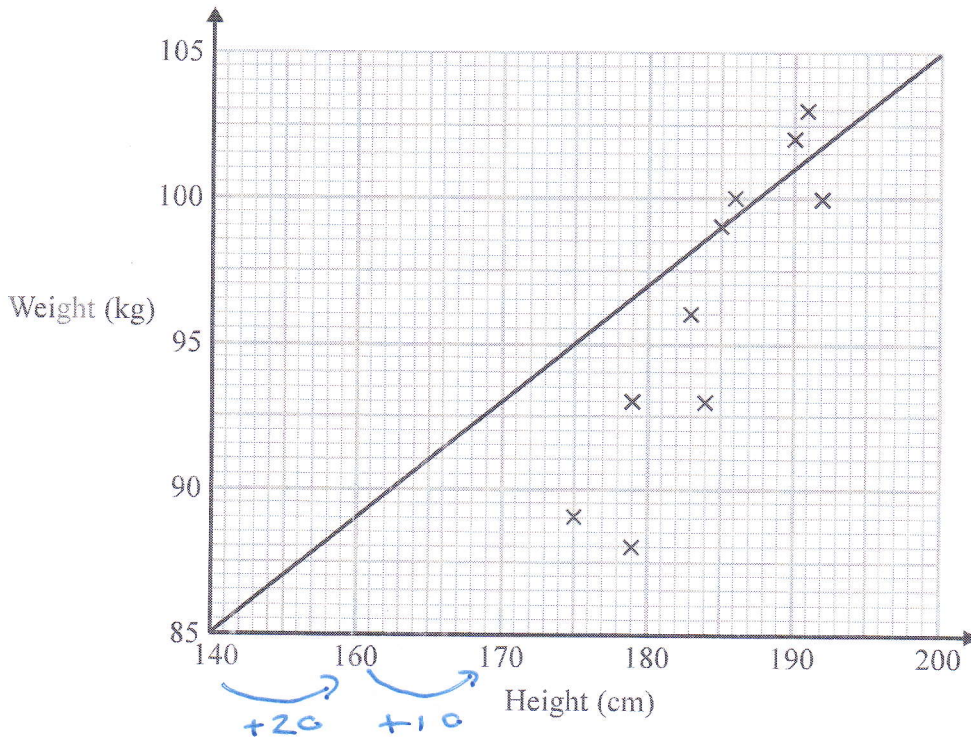


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2 Sean has information about the height, in cm, and the weight, in kg, of each of ten rugby players. He is asked to draw a scatter graph and a line of best fit for this information. Here is his answer.



Sean has plotted the points accurately.

Write down two things that are wrong with his answer.

- 1 Line of best fit not in correct position
- 2 Scale on height axis incorrect (+20 from 140 → 160, then +10)

(Total for Question 2 is 2 marks)

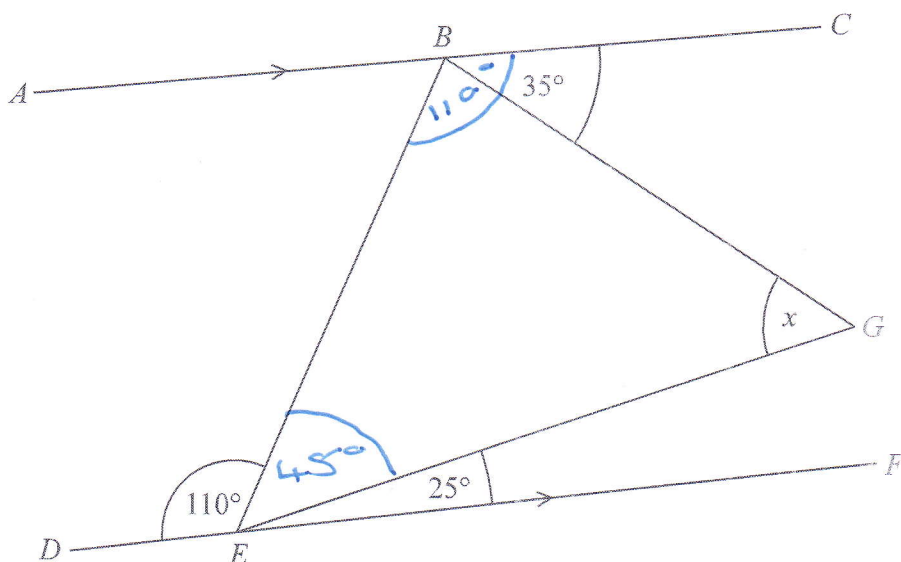


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3 *BEG* is a triangle.



ABC and *DEF* are parallel lines.

Work out the size of angle *x*.

Give a reason for each stage of your working.

$$\angle ERG = 75^\circ \quad (\angle DEF = \angle EBC = 110^\circ \text{ alternate})$$

$$\angle BEG = 45^\circ \quad (\text{angles on straight line})$$

$$x = 60^\circ \quad (\text{angles in triangle add to } 180^\circ)$$

$$x = 60^\circ$$

(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

$$100\% + 2.5\% = 102.5\%$$

Ali invests £2000 in the cash savings account.

Ben invests £1600 in the shares account. 1.025

$$1.035$$

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

Ali:

$$2000 \times 1.025^3$$
$$= \pounds 2153.78$$

$$\text{Interest} = \pounds 153.78$$

Ben

$$1600 \times 1.035^3$$
$$= \pounds 1773.95$$
$$- 1600$$

$$\text{Interest} = \pounds 173.95$$

Ben gets 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 change. Ben already had more interest, and will just get even more.

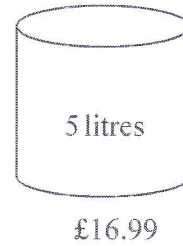
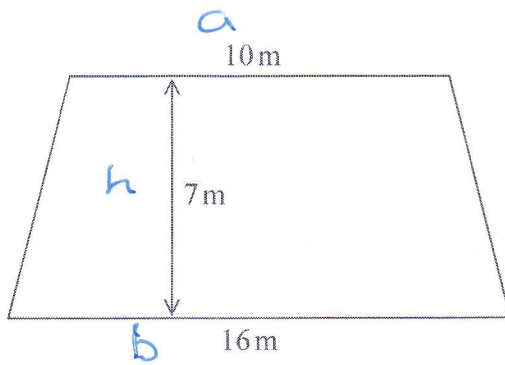
(1)

(Total for Question 4 is 5 marks)



P 5 5 5 8 8 A 0 5 2 0

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



John is going to paint the floor.

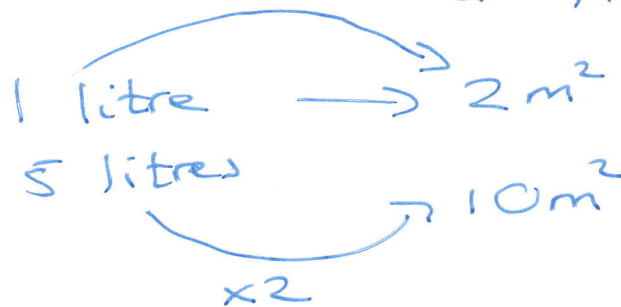
Each 5 litre tin of paint costs £16.99
1 litre of paint covers an area of 2m²

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.

$$A = \frac{1}{2}(a+b)h = \frac{1}{2}(10+16) \times 7$$

$$\qquad \qquad \qquad \times 2 \qquad \qquad \qquad = 91\text{m}^2$$



Need 10 tins

$$10 \times 16.99 = \pounds 169.90$$

John does not have enough money. He is $\pounds 9.90$ short.

(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 .

$$m = \frac{\text{change in } y}{\text{change in } x}$$

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

$$3(d - 5) = 15 - 9$$

$$3d - 15 = 6$$
$$+15 \quad +15$$

$$3d = 21$$

$$d = 7$$

$$d = 7$$

(Total for Question 6 is 3 marks)



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

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

(1)

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

$$= 7441979.07$$

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

$$7.441979.07$$

$$7.44 \times 10^6$$

(2)

(Total for Question 7 is 3 marks)

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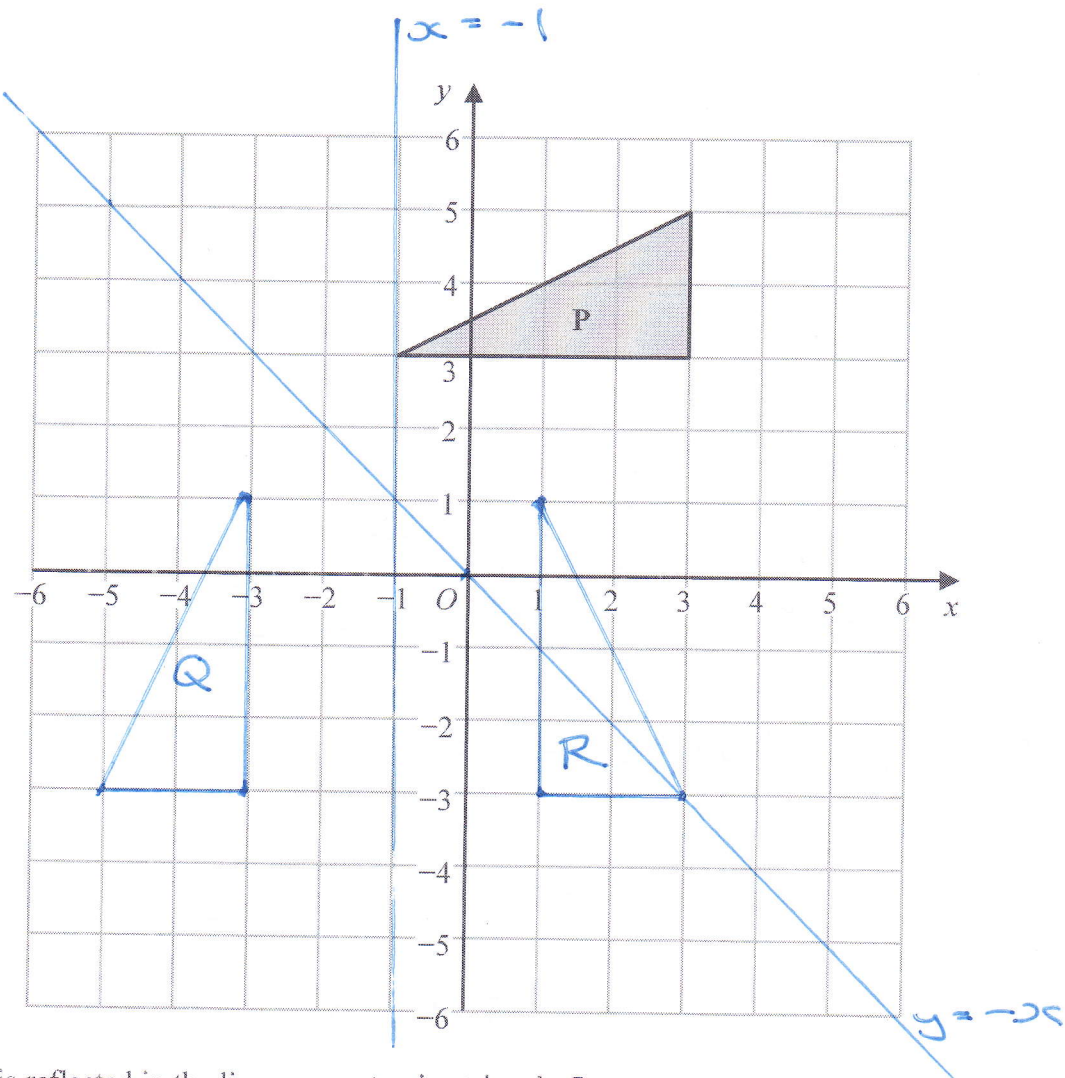


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8



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 centre $(-1, 1)$

(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)



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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.

$$\begin{array}{l}
 Y : B \quad 50 \text{ litres} \\
 \times 10 \left(\begin{array}{l} 2 : 3 \\ \hline 20 : 30 \end{array} \right) \times 10 \quad \begin{array}{l} 2 + 3 = 5 \\ 50 \div 5 = 10 \end{array}
 \end{array}$$

$$\begin{array}{l}
 \text{Yellow} \quad 20 \div 5 = 4 \text{ tins} \\
 \quad \quad \quad 4 \times 26 = \pounds 104
 \end{array}$$

$$\begin{array}{l}
 \text{Blue} \quad 30 \div 10 = 3 \text{ tins} \\
 \quad \quad \quad 3 \times 48 = \pounds 144
 \end{array}$$

$$\text{Total cost} = \underline{\underline{\pounds 248}}$$

$$\begin{array}{l}
 \therefore 50 \text{ litres costs } \pounds 248 \\
 \div 5 \downarrow 10 \text{ litres costs } \pounds 49.60
 \end{array}$$

$$\begin{array}{l}
 \% \text{ Profit} = \frac{66.96 - 49.60}{49.60} \times 100 = 35 \\
 \text{per} \\
 \text{10 litre} \\
 \text{tin}
 \end{array}$$

35 %

(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 9×15
- or a main dish and a dessert dish 15×8
- or a starter dish, a main dish and a dessert dish $9 \times 15 \times 8$

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

$$(9 \times 15) + (15 \times 8) + (9 \times 15 \times 8) \\ = 1335$$

1335

(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.

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

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

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

(3)

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

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

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

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

$$= \frac{4x^2 - 5x - 4x^2 + 4x + 8}{x(x+1)(x-2)} = \frac{-x + 8}{x(x+1)(x-2)}$$

(3)

(Total for Question 12 is 6 marks)

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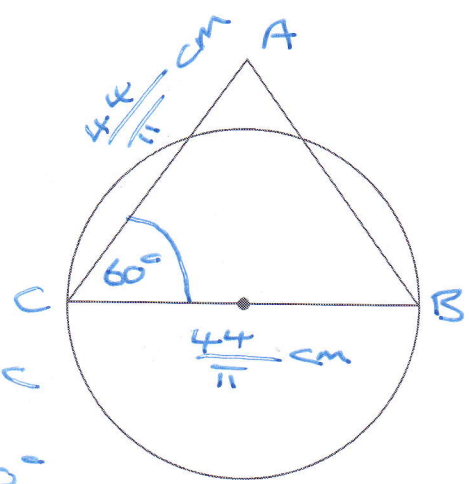
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13 The diagram shows a circle and an equilateral triangle.

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.



$$C = \pi \times d$$

$$d = \frac{44}{\pi} \quad \text{Area } \Delta = \frac{1}{2} ab \sin c$$

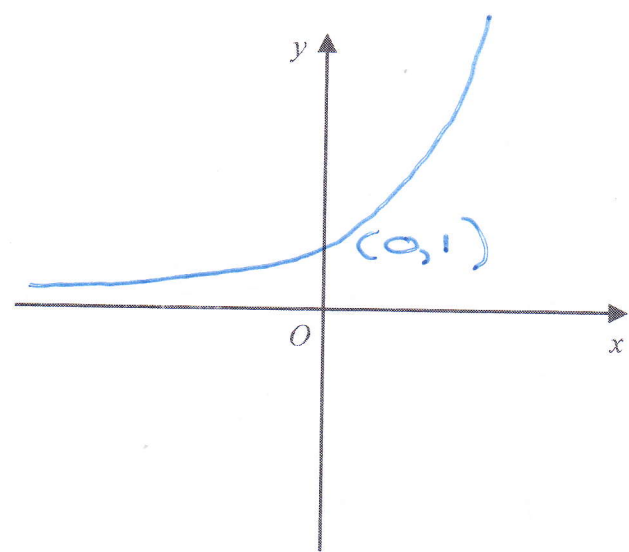
$$= \frac{1}{2} \times \frac{44}{\pi} \times \frac{44}{\pi} \times \sin 60^\circ$$

$$= 84.9388$$

84.9 cm²

(Total for Question 13 is 3 marks) (3sf)

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.

$$r = \sqrt{42.25}$$

6.5

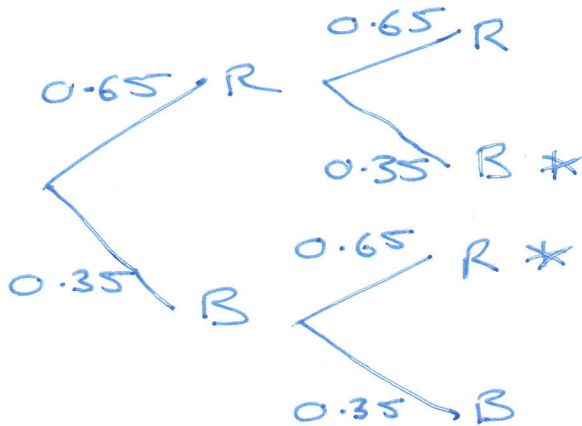
(Total for Question 15 is 1 mark)

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?



$$0.65 \times 0.35 + 0.35 \times 0.65$$

0.455

(2)

There are 78 red counters in the bag.

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

$\div 65 \downarrow$ 65% is 78 counters
 $\times 100 \downarrow$ 10/10
120 $\downarrow \div 65$
 $\times 100$

$$\text{Blue} = 120 - 78 = 42$$

42 blue

(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.

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

$$\frac{20+p}{20+q} = \frac{5}{2} \Rightarrow 2(20+p) = 5(20+q) \text{ (2)}$$

(1) gives $p = 5q - 25 + 5$
 $p = 5q - 20$

substitute in (2)

$$2(20 + 5q - 20) = 100 + 5q$$

$$10q = 100 + 5q$$

$$10q - 5q = 100$$

$$5q = 100$$

$$q = 20$$

$$\therefore p = 5 \times 20 - 20$$

$$p = 100 - 20 = 80$$

$$p:q$$

$$80:20$$

$$4:1$$

$$4:1$$

(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 .

$$L_1 \quad m = \frac{6-2}{4-12} = \frac{4}{-8} = -\frac{1}{2}$$

$$y - y_1 = m(x - x_1)$$

$$y - 6 = -\frac{1}{2}(x - 4)$$

$$y - 6 = -\frac{1}{2}x + 2$$

$$y = -\frac{1}{2}x + 2 + 6$$

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

L_2 if goes through (0, 0) and $m = -3$

$$y = -3x \quad (2)$$

$$\text{Set } (1) = (2)$$

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

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

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

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

(Total for Question 18 is 4 marks)

$$x = \frac{-8 \times 2}{5} = \frac{-16}{5}$$

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

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

Show all your working.

x through by 4

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

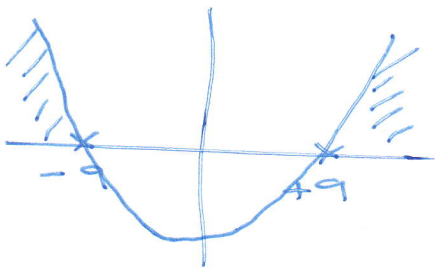
$$(-7) \quad (-7) \quad (-7)$$

$$81 < m^2 < 121$$

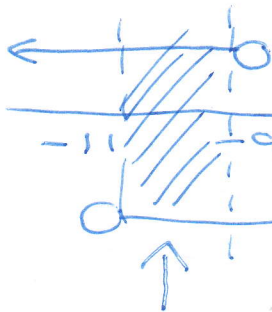
$$m^2 > 81$$

$$m^2 - 81 > 0$$

$$(m+9)(m-9) > 0$$



$$m < -9 \quad m > 9$$

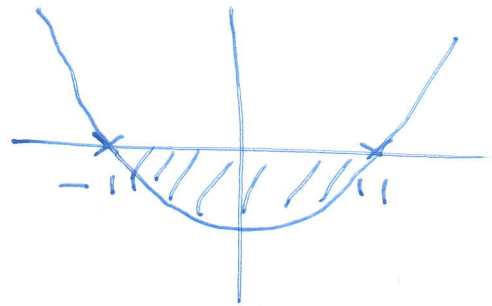


$$-11 < m < -9$$

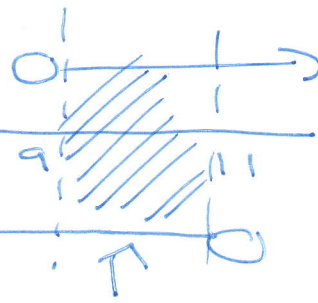
$$m^2 < 121$$

$$m^2 - 121 < 0$$

$$(m+11)(m-11) < 0$$



$$-11 < m < 11$$



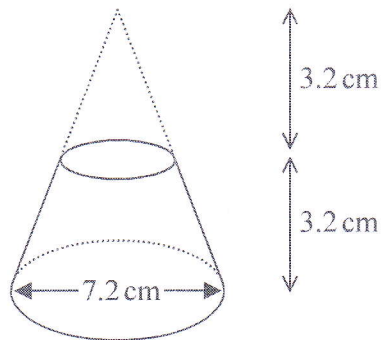
$$9 < m < 11$$

$$-11 < m < -9, \quad 9 < m < 11$$

(Total for Question 19 is 5 marks)



20 Here is a frustum of a cone.

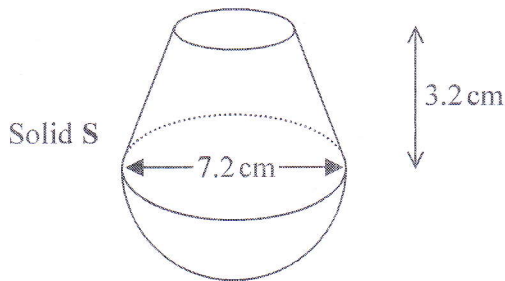


Volume of sphere = $\frac{4}{3}\pi r^3$

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.

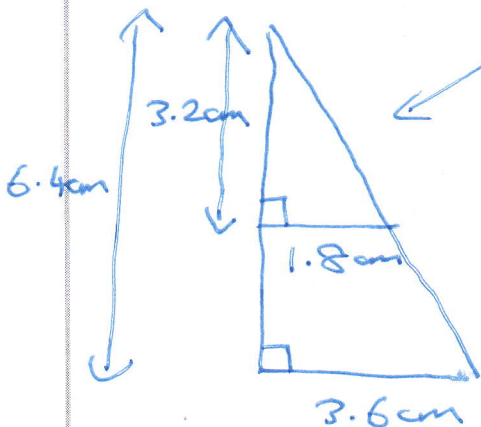
The frustum is joined to a solid hemisphere of diameter 7.2 cm to form the solid S shown below.



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.

Volume large cone
 $= \frac{1}{3}\pi r^2 h$
 $= \frac{1}{3} \times \pi \times 3.6^2 \times 6.4$
 $= 86.85875369 \text{ cm}^3$ (1)



By using similar triangles
 radius of smaller cone = 1.8 cm

Volume of small cone
 $= \frac{1}{3} \times \pi \times 1.8^2 \times 3.2$
 $= 10.85734421 \text{ cm}^3$ (2)

Volume of frustum = (1) - (2)
 $= 76.00140948 \text{ cm}^3$

Mass of frustum = 76.00140948×2.4
 $= 182.4033828 \text{ g}$



$$\text{Volume of hemisphere} = \frac{1}{2} \times \frac{4}{3} \times \pi \times 3.6^3 \times 36$$
$$= 97.7160979 \text{ cm}^3$$

$$\text{Mass of hemisphere} = 97.7160979 \times 4.8$$
$$= 469.0372699 \text{ g}$$

$$\text{overall density} = \frac{\text{total mass}}{\text{total volume}}$$

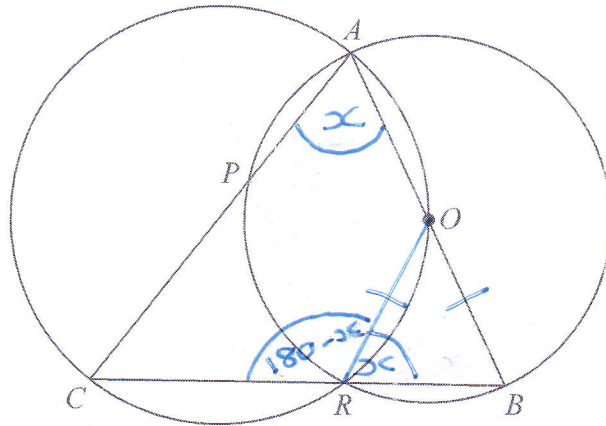
$$= \frac{182.4033828 + 469.0372699}{76.001400948 + 97.7160979}$$
$$= 3.750000184$$

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

(Total for Question 20 is 5 marks)

(3 of)





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 $\angle CAB = x$

$\angle CRB = 180 - x$ (opposite angles of a cyclic quadrilateral add to 180°)

$\angle ORB = x$ (angles on a straight line add to 180°)

$OR = OB$ (radii of circle)

$\therefore \triangle ORB$ is isosceles

$\therefore \angle ABC = x$ (equal angles in isosceles triangle)

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

