

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)				
<b>Thursday 8 November 2018</b>									
Morning (Time: 1 hour 30 minutes)					Paper Reference <b>1MA1/2H</b>				
<b>Mathematics</b> <b>Paper 2 (Calculator)</b> <b>Higher Tier</b>									
<b>You must have:</b> 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  $\pi$  button, take the value of  $\pi$  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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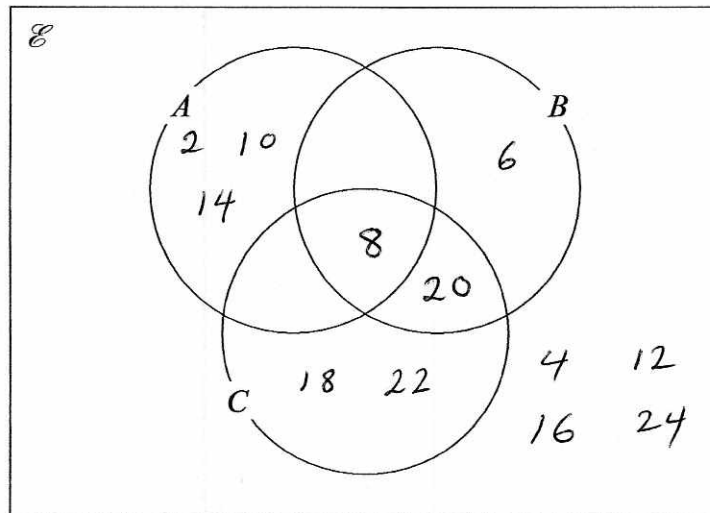
Answer ALL questions.

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)

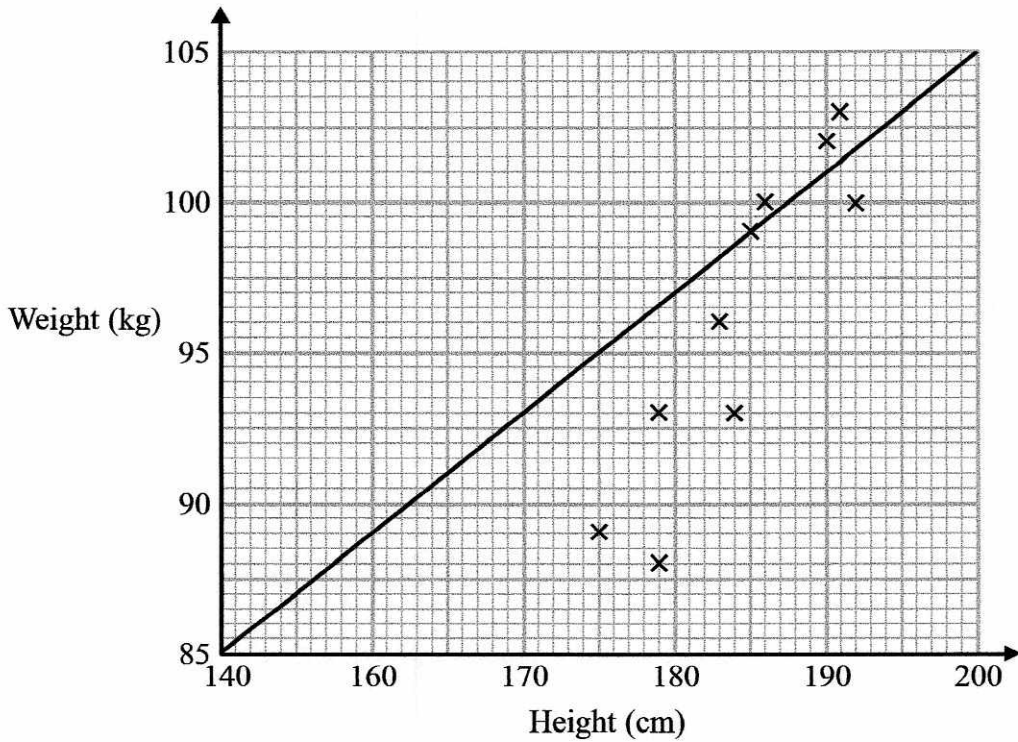


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2 Sean has information about the height, in cm, and the weight, in kg, of each of ten rugby players. He is asked to draw a scatter graph and a line of best fit for this information. Here is his answer.



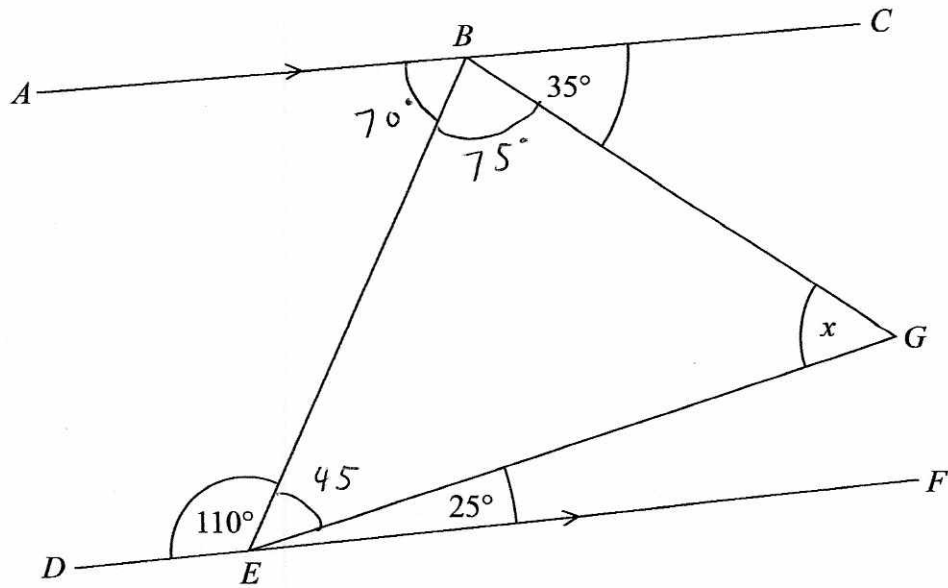
Sean has plotted the points accurately. Write down two things that are wrong with his answer.

- 1 The line of best fit is not in line with the correlation
- 2 150 is missing from the height scale

(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.

$$\begin{aligned} BEG &= 180 - 110 - 25 \\ &= 45^\circ \end{aligned}$$

Angles on a straight line  
add to  $180^\circ$

$$ABE = 70^\circ$$

Co-interior angles add to  $180^\circ$

$$\begin{aligned} EBG &= 180 - 70 - 35 \\ &= 75^\circ \end{aligned}$$

Angles on a straight line  
add to  $180^\circ$

$$\begin{aligned} x &= 180 - 75 - 45 \\ &= 60^\circ \end{aligned}$$

Angles in a triangle  
add to  $180^\circ$

.....  $60^\circ$

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

<p><b>Shares account</b> 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

$$2000 \times 1.025^3$$

$$= £2153.78$$

£153.78 Interest

Ben

$$1600 \times 1.035^3$$

$$= £1773.95$$

£173.95 Interest

Ben.

(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 will get more interest.

Ben already gets more than Ali.

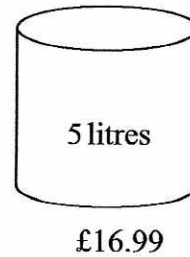
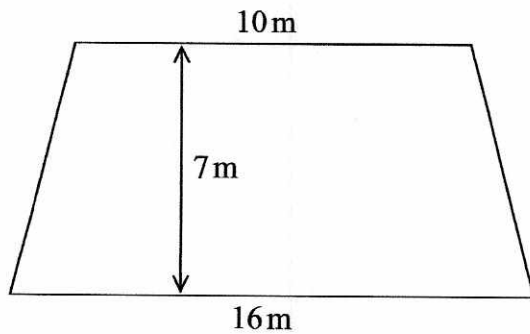
(1)

(Total for Question 4 is 5 marks)



D 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  $2\text{m}^2$

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.

$$\begin{aligned}\text{Area of trapezium} &= \frac{10 + 16}{2} \times 7 \\ &= 13 \times 7 \\ &= 91 \text{ m}^2\end{aligned}$$

$$\frac{91}{2} = 45.5 \text{ litres of paint.}$$

$$\frac{45.5}{5} = 9.1 \quad [10 \text{ tins of paint}]$$

$$10 \times 16.99 = \underline{\underline{£169.90}}$$

No.

(Total for Question 5 is 5 marks)

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- 6  $A$  is the point with coordinates  $(x_1, y_1)$   $(5, 9)$   
 $B$  is the point with coordinates  $(x_2, y_2)$   $(d, 15)$   
 The gradient of the line  $AB$  is 3

Work out the value of  $d$ .

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

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

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

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

$$3d - 15 = 6$$

$$3d = 21$$

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

$$d = \underline{\underline{7}}$$

(Total for Question 6 is 3 marks)



D 5 5 5 8 8 A 0 7 2 0

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.

$$7441979.07$$
$$7440000$$

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

(2)

(Total for Question 7 is 3 marks)

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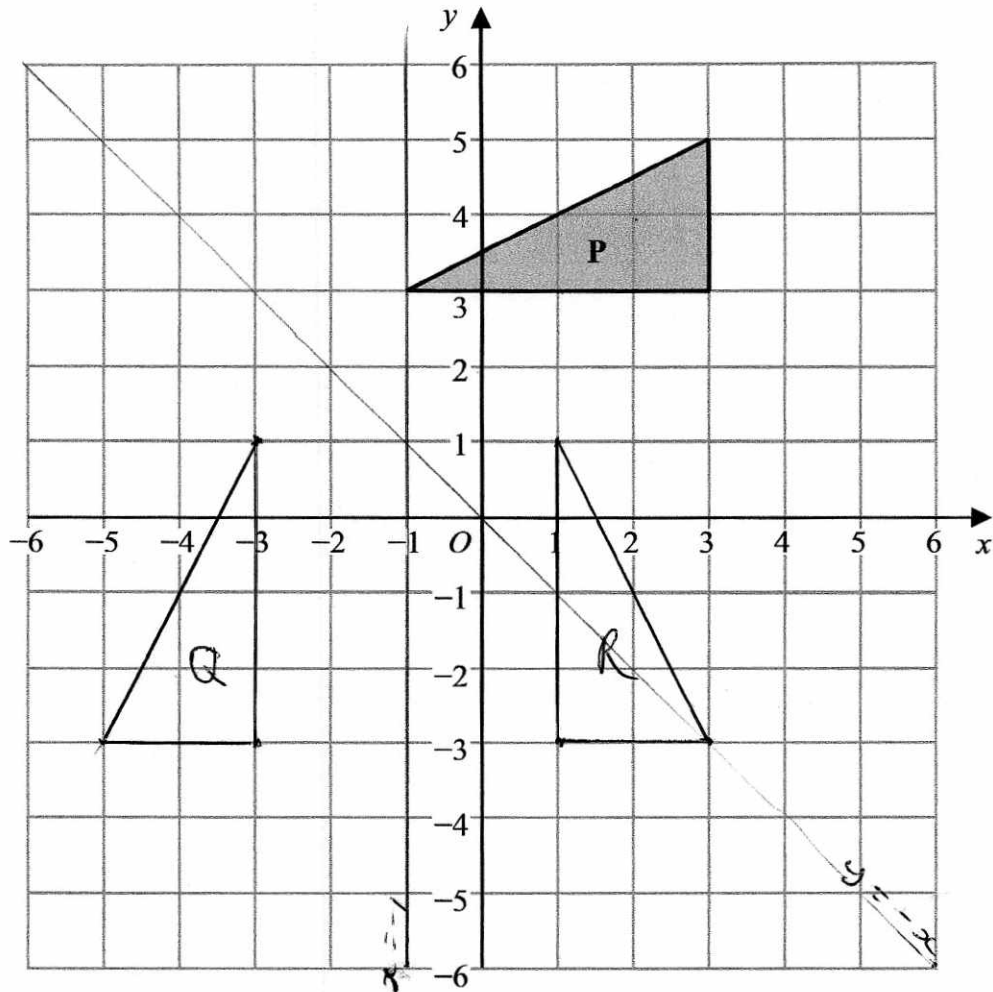
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8



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  $90^\circ$  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)



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

20l yellow 30l 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.

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

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

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

$$\text{Green paint } \begin{matrix} 5 \\ \cancel{10} \end{matrix} \times \text{£}66.96 = \underline{\text{£}334.80}$$

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

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

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.

$$\text{Starter Main} \quad 9 \times 15 = 135$$

$$\text{Main Dessert} \quad 15 \times 8 = 120$$

$$\text{Starter Main Dessert} \quad 9 \times 15 \times 8 = 1080$$

$$135 + 120 + 1080 = \underline{\underline{1335}}$$

(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.

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

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

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

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

(3)

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

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

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

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

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

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

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

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

(3)

(Total for Question 12 is 6 marks)



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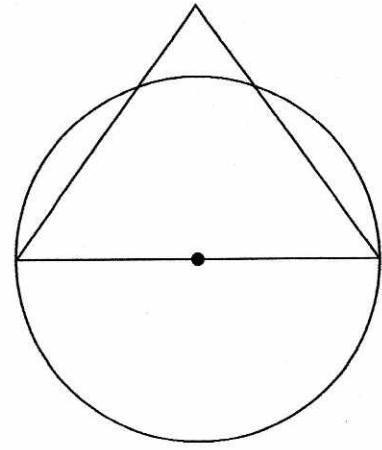
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13 The diagram shows a circle and an equilateral triangle.

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.



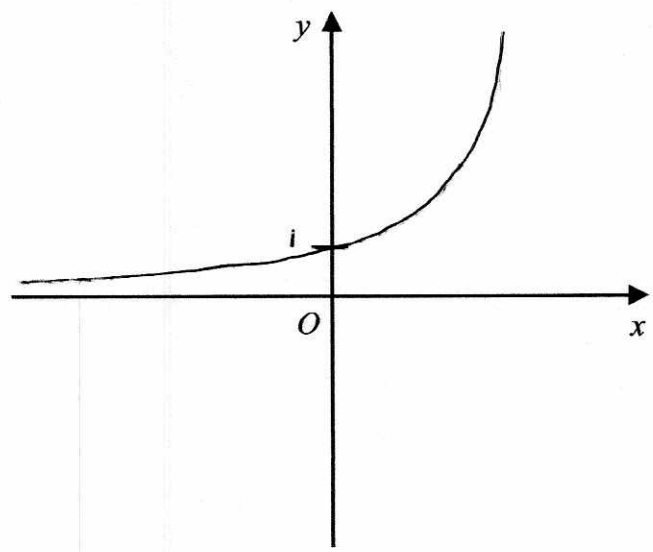
$$\pi \times d = 44$$
$$d = \frac{44}{\pi}$$

$$\begin{aligned} \text{Area of triangle} &= \frac{1}{2} ab \sin C \\ &= \frac{1}{2} \frac{44}{\pi} \frac{44}{\pi} \sin 60 \\ &= 84.9 \text{ cm}^2 \text{ (3sf)} \end{aligned}$$

.....84.9.....cm<sup>2</sup>

(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)



D 5 5 5 8 8 A 0 1 2 2 0

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

Find the radius of the circle.

$$\sqrt{42.25}$$

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 Blue 0.35

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?

$$RB \quad 0.65 \times 0.35 = \frac{91}{400}$$

$$BR \quad 0.35 \times 0.65 = \frac{91}{400}$$

$$\frac{91}{400} + \frac{91}{400}$$

$$\frac{91}{200}$$

(2)

There are 78 red counters in the bag.

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

$$\begin{array}{r} 78 = 65\% \\ \div 13 \qquad \qquad \qquad \div 13 \end{array}$$

$$\begin{array}{r} 6 = 5\% \\ - \times 7 \qquad \qquad \qquad \times 7 \end{array}$$

$$42 = 35\%$$

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.

$$p - 5 : q - 5$$

$$5 : 1$$

$$p - 5 = 5(q - 5) \quad (1)$$

$$p + 20 : q + 20$$

$$5 : 2$$

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

$$(1) \quad p - 5 = 5q - 25$$

$$(2) \quad 2p + 40 = 5q + 100$$

$$p - 5q = -20$$

$$2p - 5q = 60$$

$$2p - 5q = 60$$

$$2p - 10q = -40$$

$$5q = 100$$

$$q = 20$$

$$p - 5(20) = -20$$

$$p - 100 = -20$$

$$p = 80$$

$$p : q$$

$$80 : 20$$

$$4 : 1$$

$$4 : 1$$

(Total for Question 17 is 5 marks)



D 5 5 5 8 8 A 0 1 5 2 0

- 18 The straight line  $L_1$  passes through the points with coordinates  $(x_1, y_1)$  and  $(x_2, y_2)$  and  $(4, 6)$  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  $P$ .

$$L_1 : m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{2 - 6}{12 - 4}$$

$$= \frac{-4}{8}$$

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

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

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

$$6 = -2 + c$$

$$c = 8$$

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

$$L_2 : \underline{y = -3x}$$

Intersect when

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

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

$$x = -\frac{16}{5}$$

$$y = -3\left(-\frac{16}{5}\right)$$

$$= \frac{48}{5}$$

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

(Total for Question 18 is 4 marks)

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

Show all your working.

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

$$81 < m^2 < 121$$

$$\underline{\pm 9} < m < \underline{\pm 11}$$

$$-11 < m < -9 \quad \text{and} \quad 9 < m < 11$$

$$-11 < m < -9$$

$$\Rightarrow \dots \dots \dots \text{and } 9 < m < 11 \dots \dots \dots$$

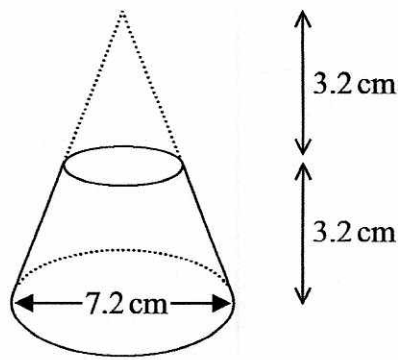
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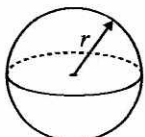
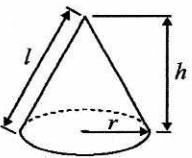
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20 Here is a frustum of a cone.



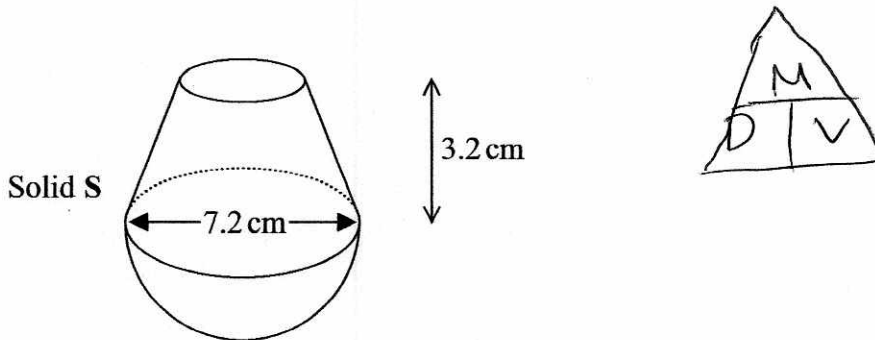
Volume of sphere =  $\frac{4}{3} \pi r^3$

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  $2.4 \text{ g/cm}^3$   
 The density of the hemisphere is  $4.8 \text{ g/cm}^3$

Calculate the average density of solid S.

$$\begin{aligned} \text{volume of big cone} &= \frac{1}{3} \pi (3.6)^2 (6.4) \\ &= 86.8587 \dots \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{volume of little cone} &= \frac{1}{3} \pi (1.8)^2 (3.2) \\ &= 10.8573 \dots \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{volume of frustum} &= \text{big cone} - \text{small cone} \\ &= 76.001 \dots \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{volume of hemisphere} &= \frac{\frac{4}{3} \pi (3.6)^3}{2} \\ &= 97.716 \dots \text{ cm}^3 \end{aligned}$$



m Av. density =  $\frac{\text{Total mass}}{\text{Total volume}}$ .

$$\begin{aligned} \text{mass of frustum} &= 76.001 \times 2.4 \\ &= 182.4 \text{ g} \end{aligned}$$

$$\begin{aligned} \text{mass of hemisphere} &= 97.716 \times 4.8 \\ &= 469.0 \text{ g} \end{aligned}$$

$$\text{Total mass} = 651.44 \text{ g}$$

$$\text{Total volume} = 173.72 \text{ cm}^3$$

$$\frac{651.44}{173.72} = 3.75$$

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

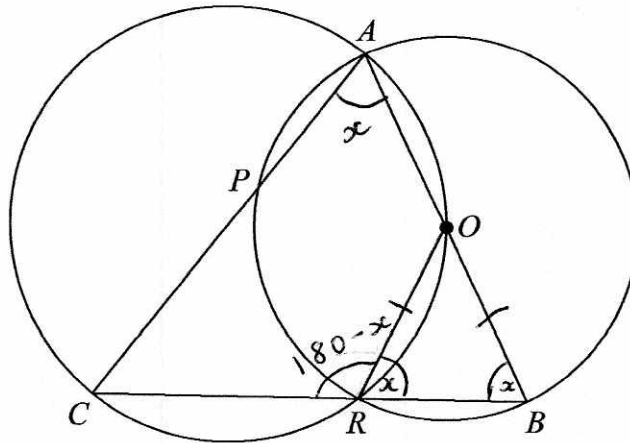
(Total for Question 20 is 5 marks)

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$A, B, R$  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  $ABC$ .

$$\begin{array}{l} \text{ABC} \\ \text{Let } \angle ORB = x \end{array}$$

$$\angle ORB = x \quad (\text{Angles at base of isosceles triangle are equal})$$

$$\angle CRO = 180 - x \quad (\text{Angles on a straight line add to } 180^\circ)$$

$$\angle CAB = x \quad (\text{Opposite angles in cyclic quadrilateral add to } 180^\circ)$$

↑  
quad.  $ACRO$

$$\therefore \angle CAB = \angle ABC$$

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

