

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)

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 ►

P55588A

©2018 Pearson Education Ltd.

6/7/17/17/1/1



Pearson

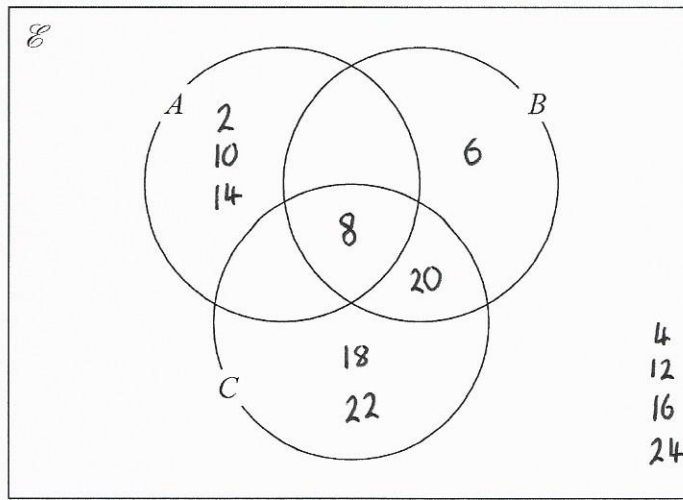
Answer ALL questions.

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 $A \cap B$.
A and B

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

(2)

Only number that satisfies is 8

(Total for Question 1 is 6 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

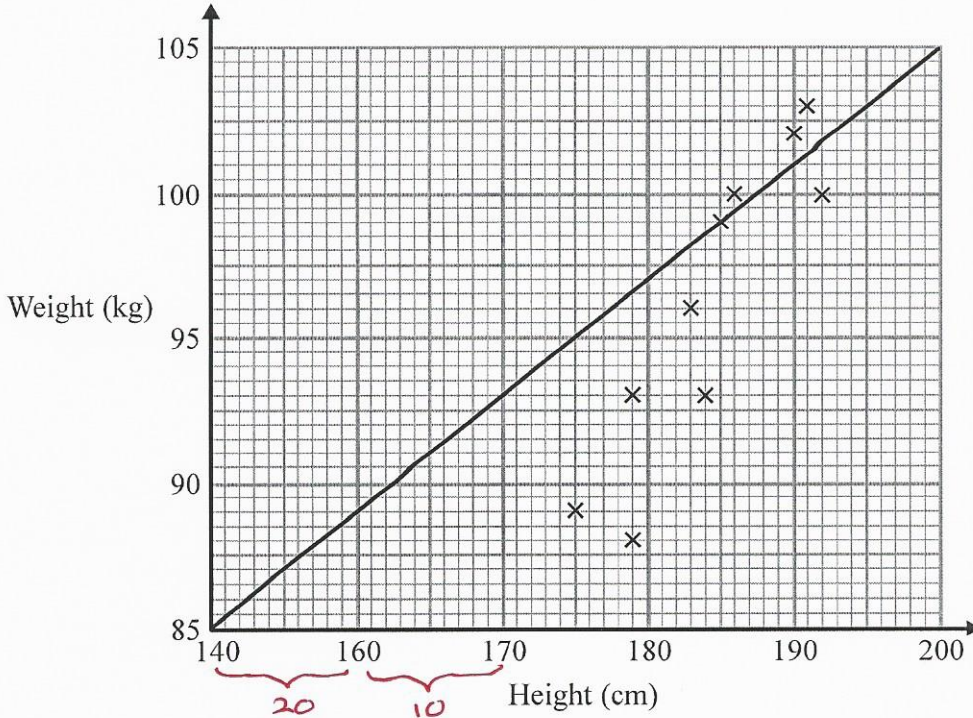


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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.

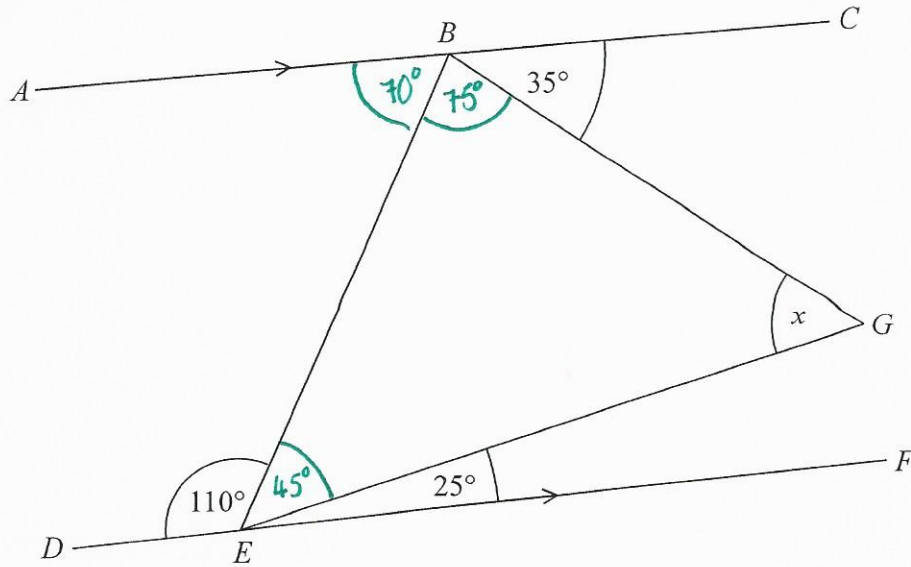
Write down two things that are wrong with his answer.

- 1 Line of best fit does not go through the middle of the pattern
- 2 Labels on Height axis are not linear.

(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.

- $\angle BEG = 180 - (110 + 25) = 45^\circ$ (Angles on a straight line)
- $\angle DEB + \angle ABE = 180^\circ \therefore \angle ABE = 70^\circ$ (Co-interior / supplementary)
- $\angle EBG = 180 - (70 + 35) = 75^\circ$ (Angles on a straight line)
- $\angle BGE = 180 - (75 + 45) = 60^\circ$ (Angles in a triangle)

(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 $2000 \times 1.025^3 = 2153.78125$
 $\therefore \text{Interest} = \pounds 153.78$

Ben: $1600 \times 1.035^3 = 1773.9486$
 $\therefore \text{Interest} = \pounds 173.95$

\therefore 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 (shares) already gets the most so increasing his interest will only make him get even more

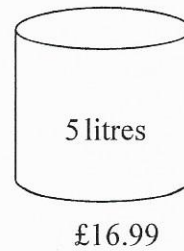
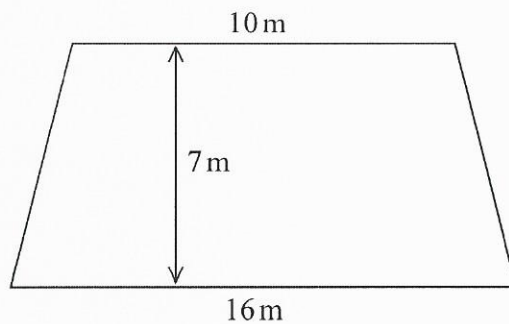
(1)

(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 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.

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

John can only buy full tins, each tin covers 10 m^2 (5×2)

$$\frac{91}{10} = 9.1 \quad \therefore \text{He needs 10 tins}$$

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

\therefore He doesn't have enough money.

(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 .

$$M = \frac{\Delta Y}{\Delta X} = \frac{15-9}{d-5}$$

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

$$\times(d-5) \quad \times(d-5)$$

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

$$6 = 3d - 15$$

$$+15 \quad +15$$

$$21 = 3d$$

$$\div 3 \quad \div 3$$

$$d = 7$$

(Total for Question 6 is 3 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 5 5 5 8 8 A 0 7 2 0

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

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

(1)

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

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

$$7441979.07$$



$$7.44 \times 10^6$$

(2)

(Total for Question 7 is 3 marks)

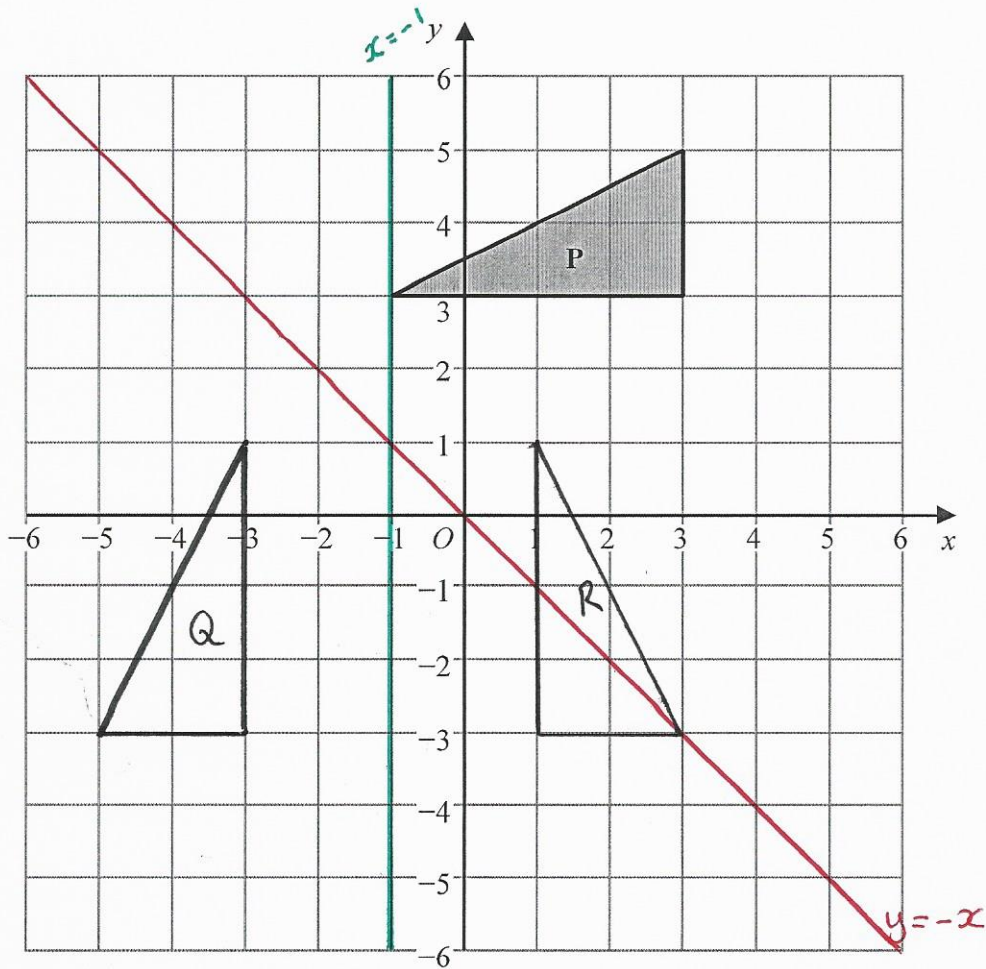
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



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

Truncate means shorten, this is not an error interval question.

Write down the error interval for N .

$$7 \leq N < 8$$

(Total for Question 9 is 2 marks)



P 5 5 5 8 8 A 0 9 2 0

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- 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

$$\text{Profit} = \text{Income} - \text{Expense}$$

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.

$$\begin{aligned} \text{Expense: } & 50 \div 5 = 10 \\ & 10 \times 2 = 20 \text{ litres yellow} \\ & 10 \times 3 = 30 \text{ litres blue} \end{aligned}$$

$$\begin{aligned} Y & \rightarrow 4 \times 26 = 104 \\ B & \rightarrow 3 \times 48 = \underline{144} \\ & \quad \quad \quad \pounds 248 \end{aligned}$$

$$\text{Income: } 66.96 \times 5 = \pounds 334.80$$

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

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

.....%

(Total for Question 10 is 5 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



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.

$$9 \times 15 = 135$$

$$15 \times 8 = 120$$

$$9 \times 15 \times 8 = 1080$$

$$\therefore 135 + 120 + 1080 = 1335$$

(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.

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

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

(3)

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

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

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

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

(3)

(Total for Question 12 is 6 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

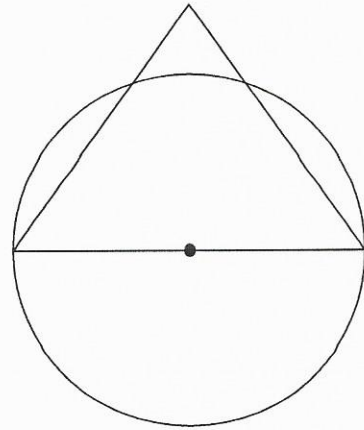
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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.



$$C = \pi d$$

$$\therefore d = \frac{C}{\pi}$$

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

$$= 14.00563$$

Because it is an equilateral triangle, angles are all 60°

$$A = \frac{1}{2} ab \sin C$$

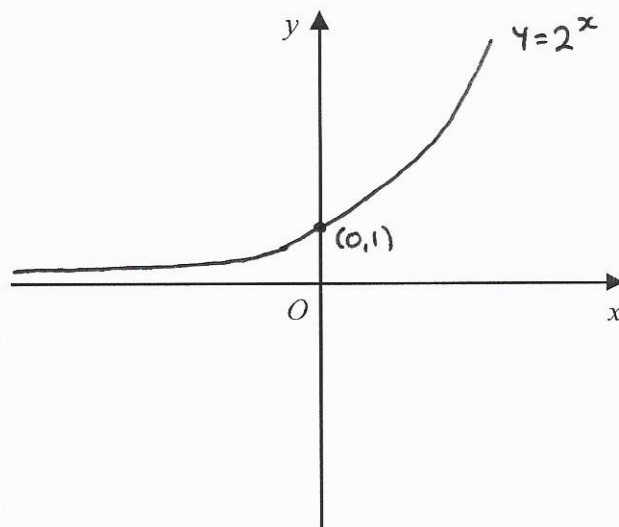
$$= \frac{1}{2} \times \frac{44}{\pi} \times \frac{44}{\pi} \times \sin 60$$

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

.....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)



$$\text{Eqn of a circle} \rightarrow x^2 + y^2 = r^2$$

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

Find the radius of the circle.

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

(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. \leftarrow Independent events

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?

$$\begin{aligned} P(\text{diff}) &= P(R, B) + P(B, R) \\ &= (0.65 \times 0.35) + (0.35 \times 0.65) \\ &= 0.2275 + 0.2275 \\ &= 0.455 \end{aligned}$$

(2)

There are 78 red counters in the bag.

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

$$\begin{aligned} 78 \div 0.65 &= 120 \quad (\text{Total counters}) \\ 120 - 78 &= 42 \end{aligned}$$

(2)

(Total for Question 16 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



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.

$$p - 5 : q - 5 = 5 : 1$$

$$\begin{array}{c} \downarrow \\ \frac{p-5}{q-5} = \frac{5}{1} \end{array}$$

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

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

$$p-5q = -20$$

$$p+20 : q+20 = 5 : 2$$

$$\begin{array}{c} \downarrow \\ \frac{p+20}{q+20} = \frac{5}{2} \end{array}$$

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

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

$$2p-5q = 60$$

Treat as sim. eqns.

$$p - 5q = -20 \quad \textcircled{1}$$

$$2p - 5q = 60 \quad \textcircled{2}$$

Subtract ① from ②

$$p = 80$$

Substitute into ①

$$80 - 5q = -20$$

$$80 = 5q - 20$$

$$100 = 5q$$

$$20 = q$$

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

(Total for Question 17 is 5 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- 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 .

$$L_1: m = \frac{\Delta y}{\Delta x} = \frac{2-6}{12-4} = \frac{-4}{8} = -\frac{1}{2}$$

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

$$\text{@ (4, 6)}$$

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

$$c = 8$$

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

$$L_2: y = -3x$$

Intersection, values of x and y are the same.

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

$$-3x$$

$$+3x$$

$$2.5x + 8 = 0$$

$$-8$$

$$-8$$

$$2.5x = -8$$

$$\div 2.5$$

$$\div 2.5$$

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

$$\therefore y = -3x = -3\left(-\frac{16}{5}\right) = \frac{48}{5}$$

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

(Total for Question 18 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



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

Show all your working.

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

x4 x4 x4

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

-7 -7 -7

$$81 < m^2 < 121$$

$$\therefore m^2 > 81$$

$$m^2 < 121$$

$$m > 9$$

$$m < 11$$

$$m < -9$$

$$m > -11$$

\therefore Combine into two inequalities

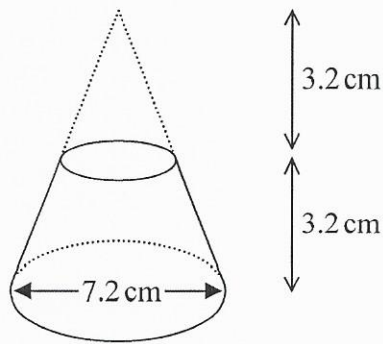
$$9 < m < 11$$

$$-11 < m < -9$$

(Total for Question 19 is 5 marks)



20 Here is a frustum of a cone.

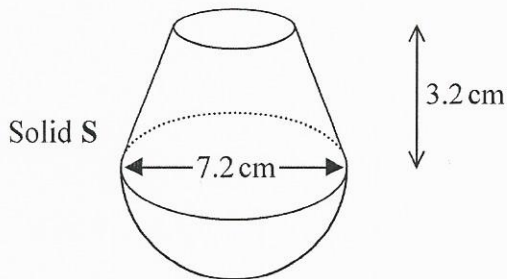


Volume of sphere = $\frac{4}{3}\pi r^3$

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.



$D = \frac{\mu}{V}$
 Need to find volume and mass of each object

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.

Frustum : $V_F = V_{\text{LARGE}} - V_{\text{SMALL}}$
 $= (\frac{1}{3} \times \pi \times 3.6^2 \times 6.4) - (\frac{1}{3} \times \pi \times 1.8^2 \times 3.2)$
 $= 86.859 - 10.857$
 $= 76.002$

$\mu = D \times V$
 $= 2.4 \times 76.002$
 $= 182.405$

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



$$\begin{aligned} \text{Hemisphere : } V_{HS} &= \frac{1}{2} \times \frac{4}{3} \times \pi \times 3.6^3 \\ &= 97.716 \end{aligned}$$

$$\begin{aligned} \mu &= D \times V \\ &= 4.8 \times 97.716 \\ &= 469.037 \end{aligned}$$

$$\begin{aligned} \therefore \text{Total Volume} &= 173.718 \\ \text{Total Mass} &= 651.442 \end{aligned}$$

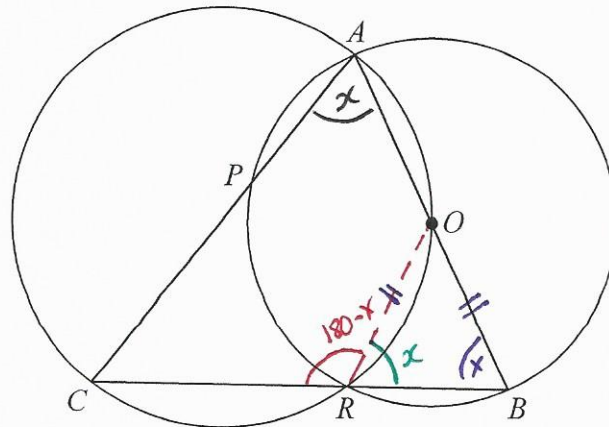
$$\begin{aligned} \text{Average Density} &= \frac{651.442}{173.718} \\ &= 3.7499... \\ &= 3.75 \text{ g/cm}^3 \end{aligned}$$

.....g/cm³

(Total for Question 20 is 5 marks)



21



DO NOT WRITE IN THIS AREA

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 .

Call $\angle CAB = x$

$\therefore \angle CRO = 180 - x$ (Cyclic Quadrilaterals)

$$\begin{aligned} \angle ORB &= 180 - (180 - x) \\ &= x \end{aligned}$$

(Angles on a straight line)

$OR = OB$ (Both radii)

$\therefore \triangle ORB$ is isosceles

$\therefore \angle OBR = \angle ORB = x$

$\angle ABC = x$

$\angle CAB = x$

$\therefore \angle ABC = \angle CAB$

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

