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 | | | | |

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

6/7/7/7/7/1/

P 5 5 5 8 8 A 0 1 2 0

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

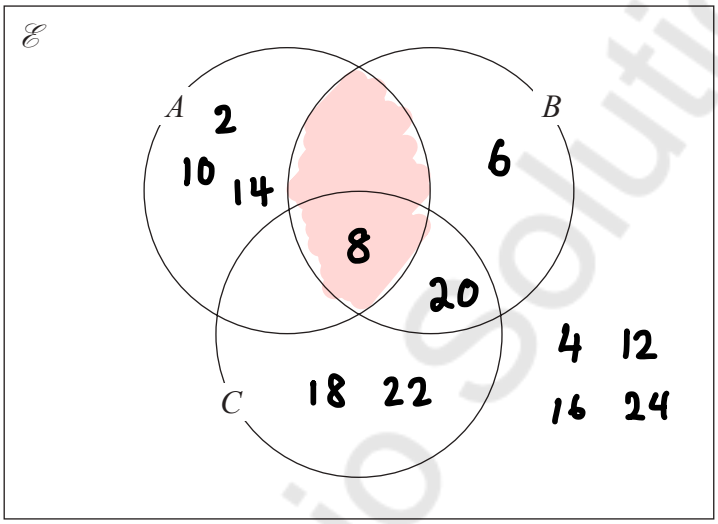
1 $\mathscr{E}$ = {even numbers between 1 and 25} = {2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24}

A = {2, 8, 10, 14}

B = {6, 8, 20}

C = {8, 18, 20, 22}

(a) Complete the Venn diagram for this information.



(4)

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

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

$P(A \cap B) = \frac{1}{12}$ A and B $\frac{1}{12}$

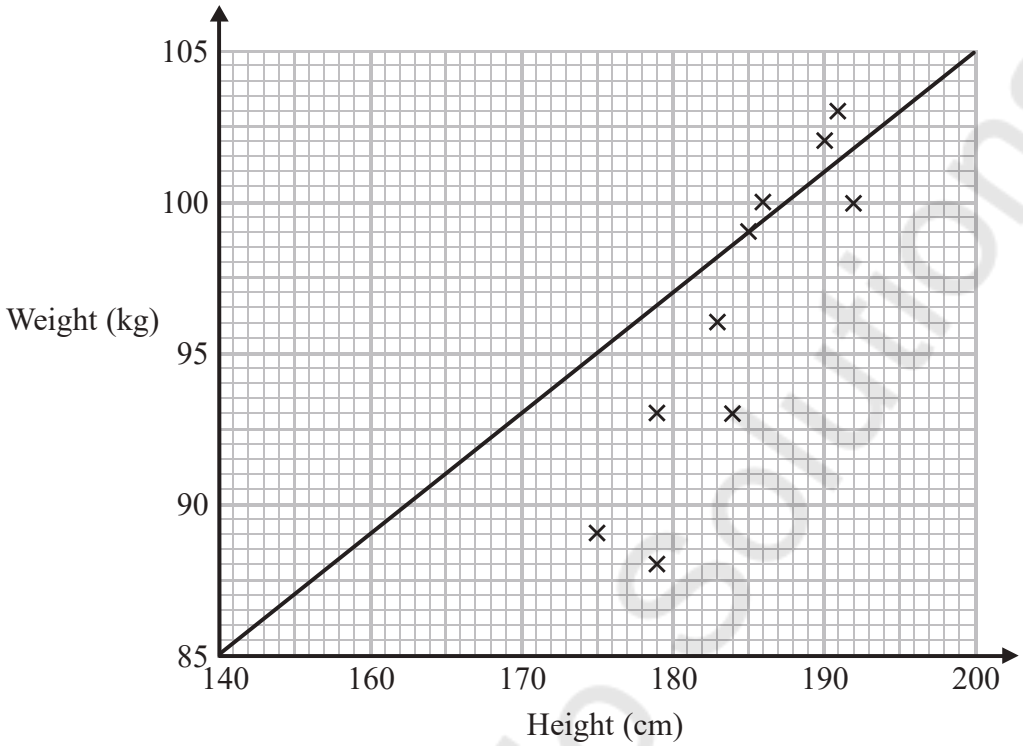
(2)

(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.

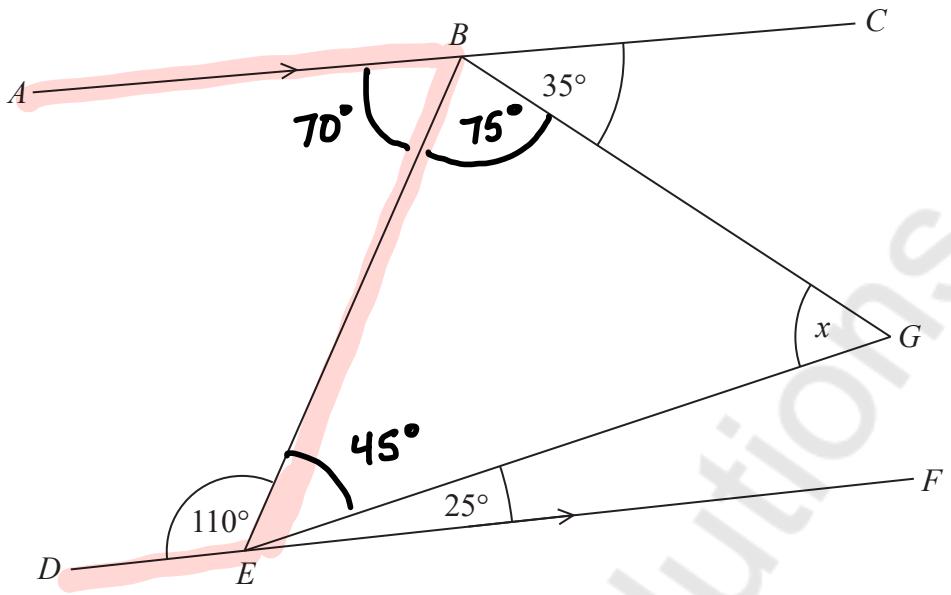
Write down two things that are wrong with his answer.

1 The line of best fit does not follow the trend of the points

2 150 is missing from the height axis

(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 ABE = 180° - 110° = 70° Co-interior angles sum to 180°

Angle BEG = 180° - (110° + 25°) = 45° Angles on a straight line sum to 180°

Angle EBG = 180° - (70° + 35°) = 75° Angles on a straight line sum to 180°

x = 180° - (75° + 45°) = 60° Angles in a triangle sum to 180°

60 °

(Total for Question 3 is 4 marks)

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

Cash savings account	**Shares account**
Interest	Interest
2.5% per annum	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.

Final amount = investment × multiplier^{n} ← no. of years

Ali

Multiplier = 100 + 2.5 = 102.5% → 1.025

Final amount = 2000×1.025^{3}

= £2153.78

Interest = 2153.78 − 2000

= £153.78

Ben

Multiplier = 100 + 3.5 = 103.5% → 1.035

Final amount = 1600×1.035^{3}

= £1773.95

Interest = £1773.95 − £1600 = £173.95 **(4)**

In the 3rd year the rate of interest for the shares account is changed to 4% per annum.

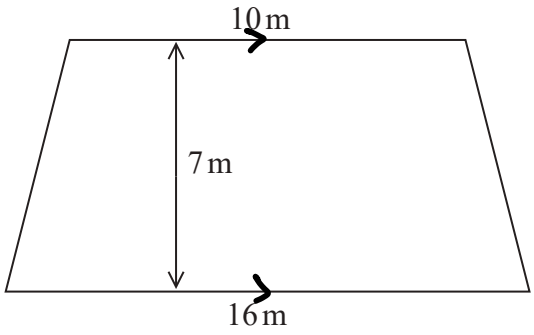
(b) Does this affect who will get the most interest by the end of 3 years?
Give a reason for your answer.

No. Ben already has more interest.

(1)

(Total for Question 4 is 5 marks)

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



£16.99

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.

Floor

Area $= \frac{1}{2}(a+b) \times h$

$= \frac{1}{2}(10+16) \times 7$

$= 91\,m^2$

Tins

$91\,m^2 \div 2\,m^2 = 45.5\,L$

$45.5\,L \div 5\,L = 9.1$ tins

10 tins needed

Cost

$10 \times £16.99 = £169.90$

$£160 < £169.90$

No.

(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*.

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

(5, 9) (d, 15)
x_1 y_1 x_2 y_2

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

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

$3(d-5) = 6$

$3d - 15 = 6$

$+15$ $+15$

$3d = 21$

$\div 3$ $\div 3$

$d = 7$

7

(Total for Question 6 is 3 marks)

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

8.623×10^{-5}

8.623×10^{-5}

(1)

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

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

744 | 1979.07

7440000

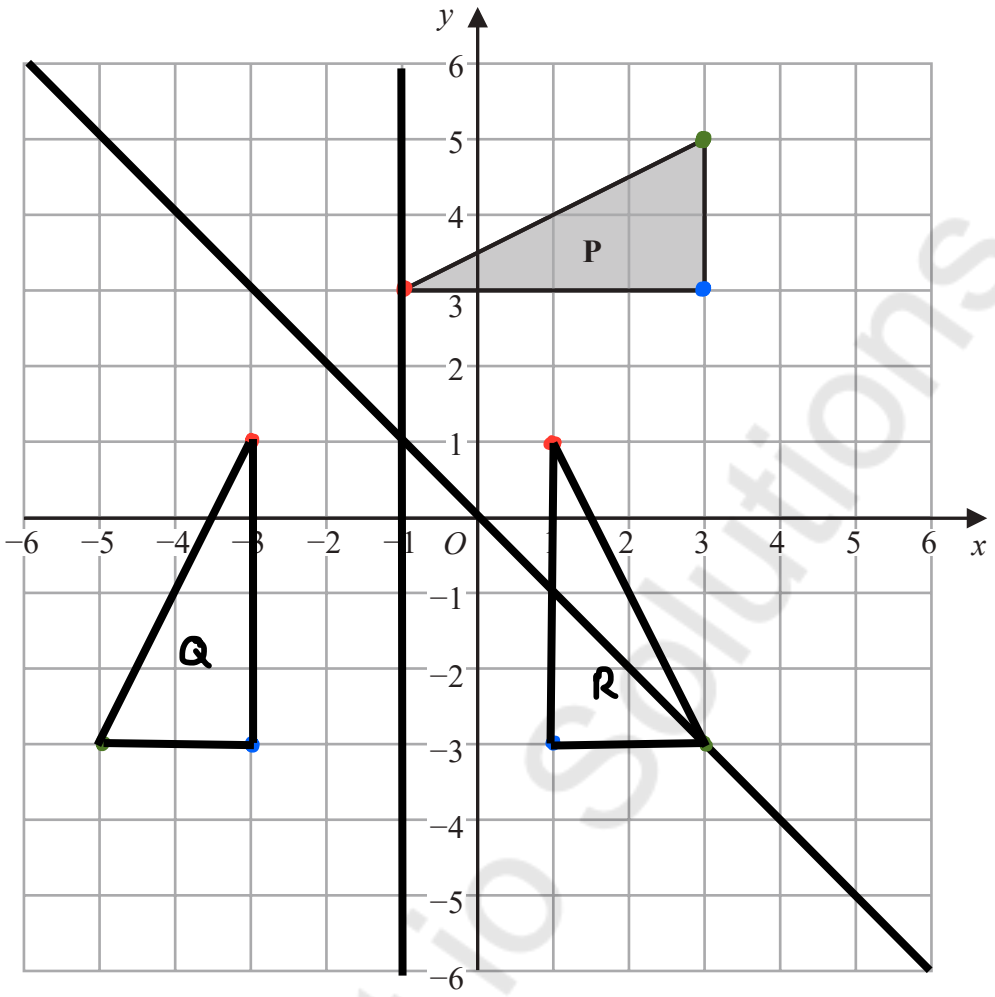
7.44×10^{6}

7.44×10^{6}

(2)

(Total for Question 7 is 3 marks)

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° anti-clockwise, 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 or more $N \geqslant 7$

less than 8 $N < 8$

$7 \leqslant N < 8$

(Total for Question 9 is 2 marks)

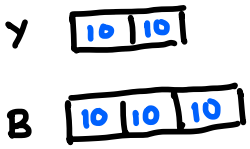
10 Robert makes 50 litres of green paint by mixing litres of yellow paint and litres of blue paint in the ratio 2 : 3

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.



5 parts 50L ÷ 5 = 10L

Yellow = 20L

20L ÷ 5L = 4 tins

4 x £26 = £104

Blue = 30L

30L ÷ 10L = 3 tins

3 x £48 = £144

Total = £104 + £144
= £248

Green

50L ÷ 10L = 5 tins sold

5 x £66.96 = £334.80

Profit = £334.80 - £248 = £86.80

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

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
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.

Starter and main : $9 \times 15 = 135$

Main and desserts : $15 \times 8 = 120$

Starter, main, dessert : $9 \times 15 \times 8 = 1080$

$135 + 120 + 1080 = 1335$

(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.

$4x^2 - 9 = (2x + 3)(2x - 3)$ (D.O.T.S)

$6x + 9 = 3(2x + 3)$

$x^2 - 3x = x(x - 3)$

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

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

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

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

(3)

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

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

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

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

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

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

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

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

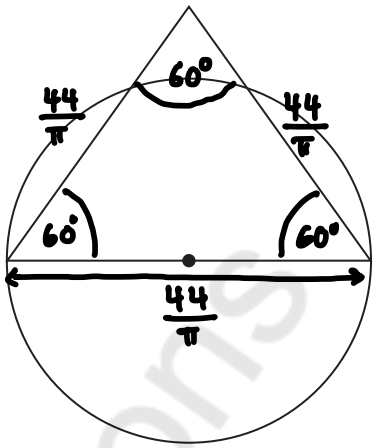
$\frac{-x + 8}{x(x+1)(x-2)}$

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

(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.

$C = \pi d$

$44 = \pi d$

$\div \pi \qquad \div \pi$

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

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

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

$= 84.93882397$

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

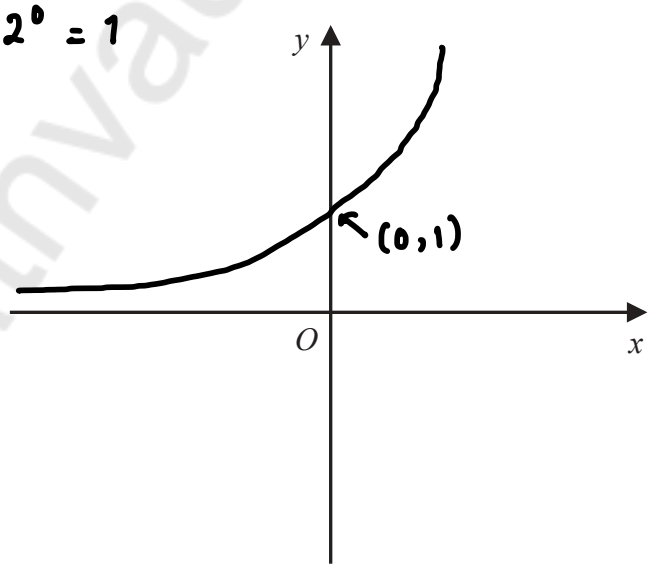
84.9 cm²

(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.

When $x = 0$ $y = 2^0 = 1$

(0, 1)



(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.

$= r^2$

$r^2 = 42.25$

$r = \sqrt{42.25}$

$r = 6.5$

6.5

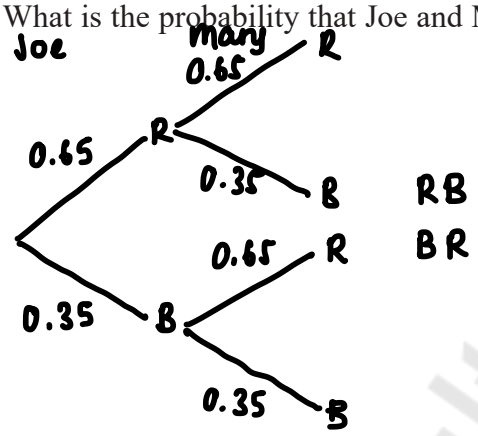
(Total for Question 15 is 1 mark)

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?



$RB = 0.65 \times 0.35 = 0.2275$

$BR = 0.35 \times 0.65 = 0.2275$

$0.2275 + 0.2275 = 0.455$

0.455

(2)

There are 78 red counters in the bag.

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

$78 \div 0.65 = 120$ total counters

$120 - 78 = 42$ blue

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.

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

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

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

$p - 5 = 5q - 25$

$-5q + 5 \quad -5q + 5$

$p - 5q = -20$

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

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

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

$2p + 40 = 5q + 100$

$-5q - 40 \quad -5q - 40$

$2p - 5q = 60$

$p - 5q = -20$

$2p - 5q = 60$

$-p \quad = -80$

$\times -1 \qquad \times -1$

$p = 80$

$p - 5q = -20$

$80 - 5q = -20$

$-80 \qquad -80$

$-5q = -100$

$\div -5 \qquad \div -5$

$q = 20$

$p : q$

$80 : 20$

$\div 20 \qquad \div 20$

$4 : 1$

$4 : 1$

(Total for Question 17 is 5 marks)

18 The straight line $\mathbf{L}_1$ passes through the points with coordinates (4, 6) and (12, 2)
The straight line $\mathbf{L}_2$ passes through the origin and has gradient -3

The lines $\mathbf{L}_1$ and $\mathbf{L}_2$ intersect at point P.

Find the coordinates of P.

L_1

$m = \frac{y_2 - y_1}{x_2 - x_1}$ (4, 6) (12, 2) $x_1\ y_1$ $x_2\ y_2$

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

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

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

$y = mx + c$ (4, 6) $x\ y$

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

$6 = -2 + c$

$+2 \quad +2$

$8 = c$

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

L_2

$m = -3$ (0, 0)

$y = -3x$

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

$+\frac{1}{2}x \quad +\frac{1}{2}x$

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

$\div -2\frac{1}{2} \quad \div -2\frac{1}{2}$

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

$y = -3x$

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

$= \frac{48}{5}$

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

(Total for Question 18 is 4 marks)

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

Show all your working.

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

$\times 4 \qquad \times 4 \qquad \times 4$

$88 < m^2 + 7 < 128$

$-7 \qquad -7 \qquad -7$

$81 < m^2 < 121$

$\sqrt{} \qquad \sqrt{} \qquad \sqrt{}$

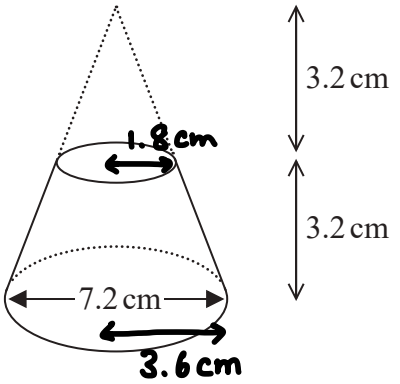
$\pm 9 \qquad m \qquad \pm 11$

$-11 < m < -9 \qquad 9 < m < 11$

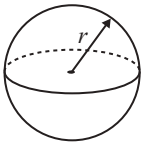
$-11 < m < -9 \quad 9 < m < 11$

(Total for Question 19 is 5 marks)

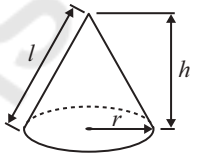
20 Here is a frustum of a cone.



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



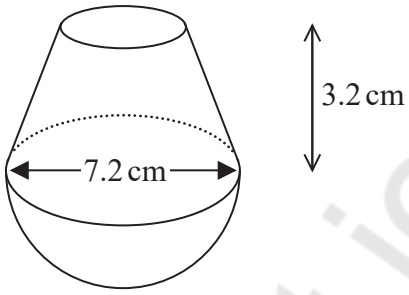
Volume of cone = $\frac{1}{3}\pi r^2 h$



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.

Solid **S**



m
D V

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

$D = 2.4\ g/cm^3$

$V = \frac{1}{3}\pi(3.6)^2(6.4) - \frac{1}{3}\pi(1.8)^2(3.2)$

$= 76.10140948\ cm^3$

$m = 2.4 \times 76.001\ldots = 182.4033827\ g$

Hemisphere

$D = 4.8\ g/cm^3$

$V = \frac{2}{3}\pi(3.6)^3 = 97.7160979\ cm^3$

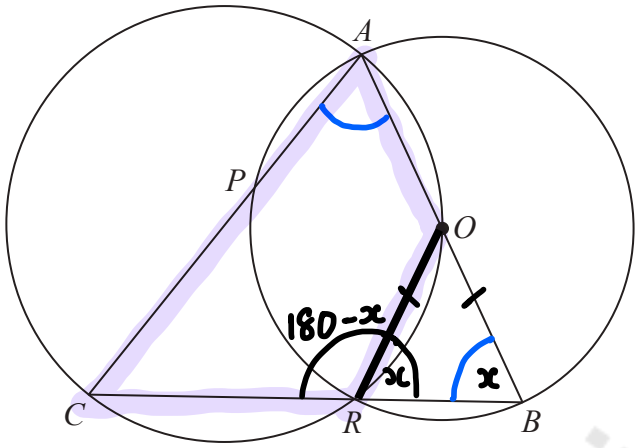
$m = 4.8 \times 97.71\ldots = 469.0372699\ g$

	Frustum	Hemisphere	S
m	182.40...g	469.03... g	651.44065 26 g
D	2.4 g/cm^3	4.8 g/cm^3	651.44... ÷ 173.717... = 3.75
V	76.001... cm^3	97.71.... cm^3	173.717 5074

3.75 g/cm^3

(Total for Question 20 is 5 marks)

21



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 $\hat{ABC} = x$

$\hat{ORB} = x$ Base angles in an isosceles are equal

$\hat{CRO} = 180 - x$ Angles on a straight line sum to 180°

$\hat{CAB} = x$ Opposite angles in a cyclic quadrilateral (ACRO) sum to 180°

∴ Angle CAB = Angle ABC

(Total for Question 21 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS