

Centre No.						Surname.	Initial(s)
Candidate No.						Signature.	

Paper Reference(s)

4400/3H

London Examinations IGCSE

Mathematics

Paper 3H

Higher Tier

Friday 4 November 2005 – Morning

Time: 2 hours

Examiner's use only

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Team Leader's use only

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Total	

Materials required for examination

Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Items included with question papers

Nil

Instructions to Candidates

In the boxes above, write your centre number and candidate number, your surname, initial(s) and signature.

The paper reference is shown at the top of this page. Check that you have the correct question paper. Answer ALL the questions in the spaces provided in this question paper. Show all the steps in any calculations.

Information for Candidates

There are 24 pages in this question paper. All blank pages are indicated. The total mark for this paper is 100. The marks for parts of questions are shown in round brackets: e.g. (2). You may use a calculator.

Advice to Candidates

Write your answers neatly and in good English.

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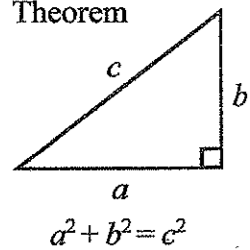


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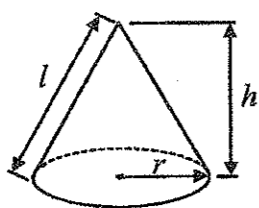
IGCSE MATHEMATICS 4400
FORMULA SHEET – HIGHER TIER

Pythagoras' Theorem



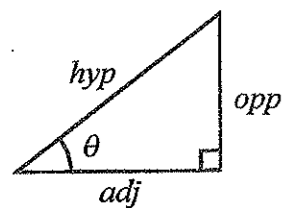
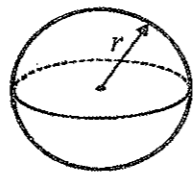
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$



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

Surface area of sphere = $4\pi r^2$



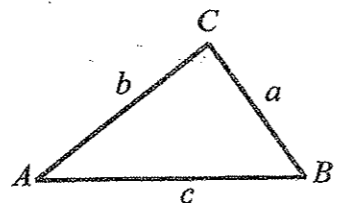
adj = hyp \times cos θ
opp = hyp \times sin θ
opp = adj \times tan θ

or $\sin \theta = \frac{\text{opp}}{\text{hyp}}$

$\cos \theta = \frac{\text{adj}}{\text{hyp}}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$

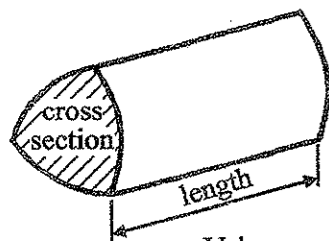
In any triangle ABC



Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

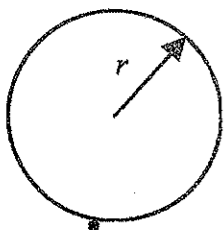
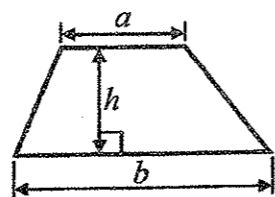
Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$

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



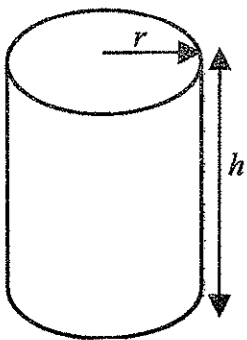
Volume of prism = area of cross section \times length

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



Circumference of circle = $2\pi r$

Area of circle = πr^2



Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi r h$

The Quadratic Equation.
The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Leave blank

Answer ALL TWENTY ONE questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. (a) Use your calculator to work out the value of

$2.6 - \frac{9.8}{2.7 + 1.2}$

Write down all the figures on your calculator display.

$2.6 - \frac{9.8}{3.9}$

$2.6 - 2.512820513$

0.08717487

(2)

- (b) Give your answer to part (a) correct to 2 significant figures.

0.087

(1)

(Total 3 marks)

Q1

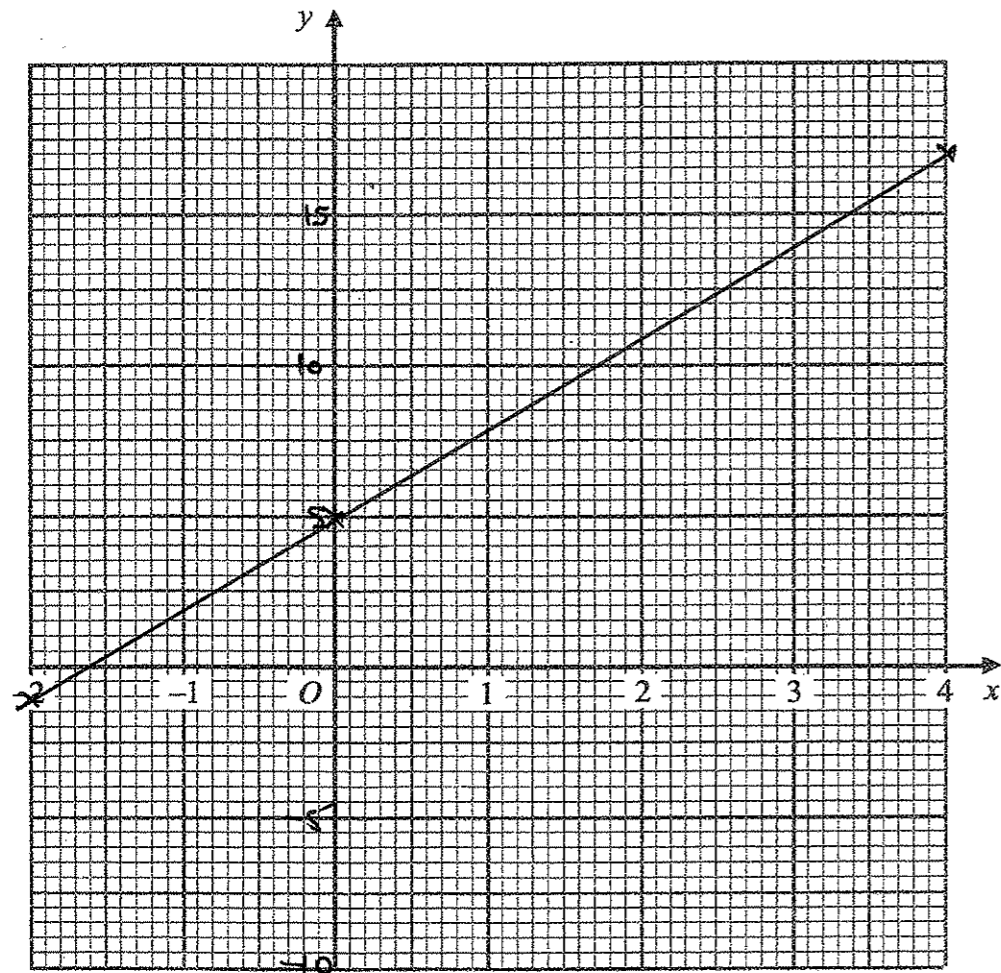


2. On the grid, draw the graph of $y = 3x + 5$ from $x = -2$ to $x = 4$

Leave blank

$x = -2 \quad y = -1$

$x = 4 \quad y = 17$



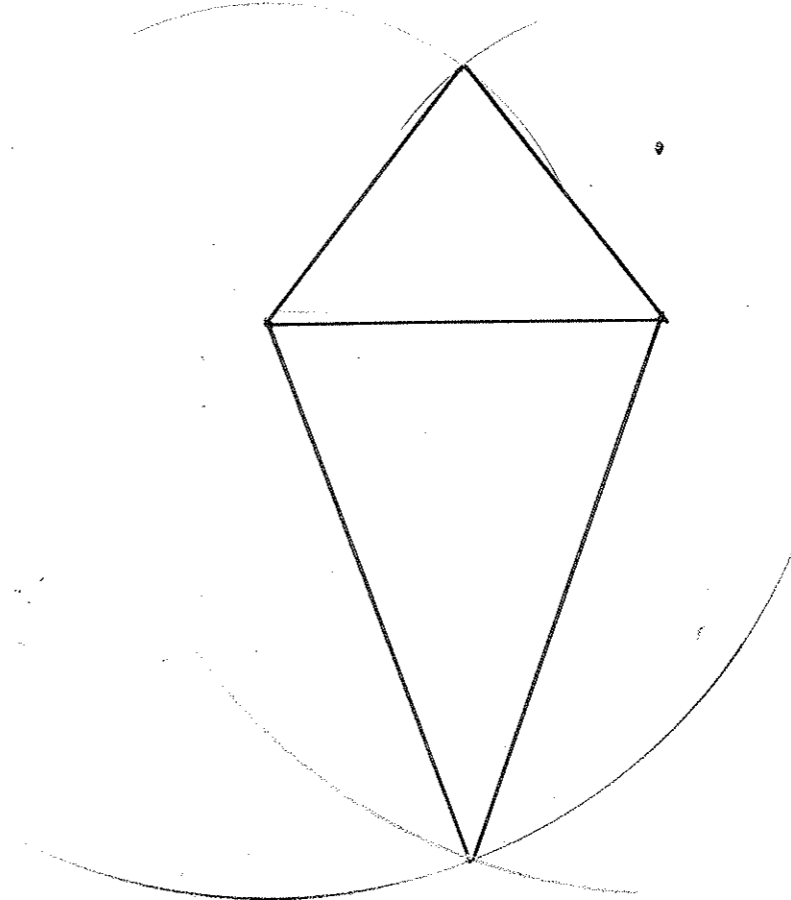
(Total 3 marks)

Q2

3. The lengths of two of the sides of a kite are 7.6 cm and 4.3 cm. The length of the shorter diagonal of the kite is 5.2 cm.

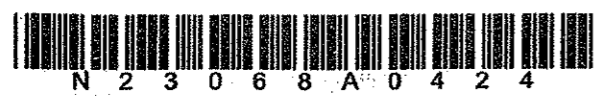
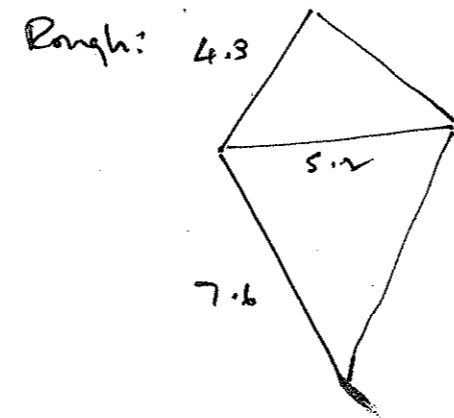
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In the space below, use ruler and compasses to construct an accurate, full-size drawing of the kite. You must show all construction lines.



(Total 4 marks)

Q3



4. The table shows information about the number of bananas the students in class 1B ate in one week.

Number of bananas	Frequency
0	1
1	6
2	5
3	2
4	7
5	4

- (a) Find the mean number of bananas.

$$\frac{0 \times 1 + 1 \times 6 + 2 \times 5 + 3 \times 2 + 4 \times 7 + 5 \times 4}{1 + 6 + 5 + 2 + 7 + 4}$$

$$= \frac{70}{25}$$

2.8
.....
(3)

There are 575 students in the school.

The numbers of bananas eaten by students in class 1B are typical of the numbers eaten by students in the whole school.

- (b) Work out an estimate for the number of students in the whole school who will eat exactly one banana next week.

$$P(1 \text{ banana}) = \frac{6}{25}$$

So estimate $\frac{6}{25} \times 575$

138
.....
(3)

(Total 6 marks)

Leave blank

5.

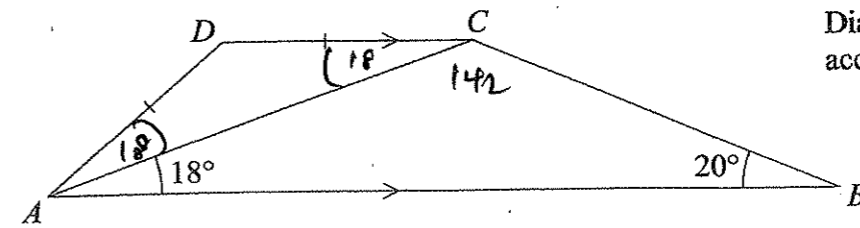


Diagram NOT accurately drawn

$ABCD$ is a trapezium.
 AB is parallel to DC .
 Angle $BAC = 18^\circ$.
 Angle $ABC = 20^\circ$.
 $AD = DC$.

Calculate the size of angle ADC .

Give a reason for each step in your working.

$$\hat{DCA} = 18^\circ \text{ (alt. } \angle\text{'s)} \quad \hat{DAC} = 18^\circ \text{ (iso } \Delta)$$

$$\hat{ACD} = 142^\circ \text{ (} \angle \text{ sum of } \Delta)$$

$$\angle ADC = 360 - 216 \text{ (} \angle\text{'s in quadrilateral)}$$

$$= 144^\circ$$

144
.....
(Total 5 marks)

Q5

Q4



Leave blank

6. $f = \frac{uv}{u+v}$
Work out the value of f when $u = 5.7$ and $v = -7.6$

$$\begin{array}{r} -43.32 \\ \hline -1.9 \\ \hline = 22.8 \end{array}$$

$f = 22.8$
(Total 3 marks) Q6

7. The amount of petrol a car uses is directly proportional to the distance it travels.
A car uses 3 litres of petrol when it travels 50 km.

(a) Work out the amount of petrol the car uses when it travels 125 km.

Several options for method!

$$\begin{array}{l} \times 2.5 \left\{ \begin{array}{l} 3 \rightarrow 50 \\ ? \rightarrow 125 \end{array} \right. \times 2.5 \end{array}$$

7.5 litres
(2)

(b) Work out the distance the car travels when it uses 5.7 litres of petrol.

$$\begin{array}{l} \times 1.9 \left\{ \begin{array}{l} 3 \rightarrow 50 \\ 5.7 \rightarrow ? \end{array} \right. \times 1.9 \end{array}$$

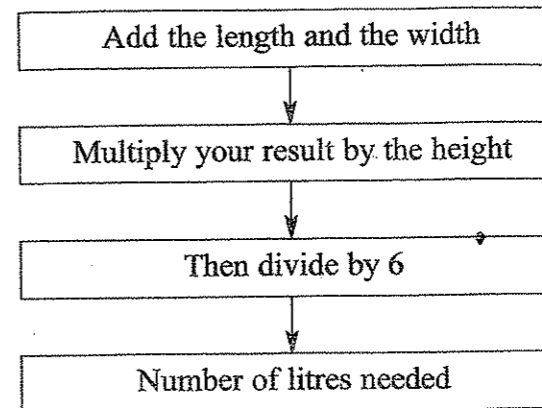
95 km
(2) Q7

(Total 4 marks)



Leave blank

8. This rule can be used to work out the number of litres of paint needed to cover the walls of a room, using the length, width and height, in metres, of the room.



A room has length L metres, width W metres and height H metres.
 N litres of paint are needed to cover the walls of the room.

(a) Find a formula for N in terms of L , W and H .

$$N = \frac{(L+W) \times H}{6}$$

$$\text{or } N = \frac{H(L+W)}{6}$$

(3)

The perimeter of the room is P metres.

(b) Find a formula for N in terms of P and H .

$$\frac{6N}{H} = (L+W)$$

$$P = 2(L+W)$$

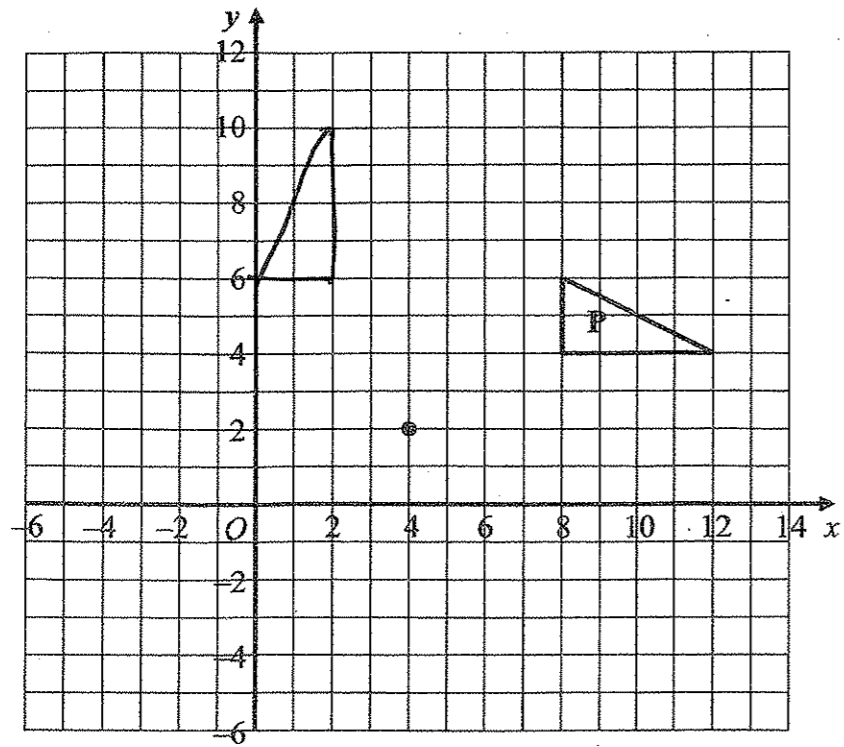
$$\therefore P = \frac{12N}{H}$$

$$N = \frac{PH}{12} \quad (2)$$

(Total 5 marks) Q8



9. (a)

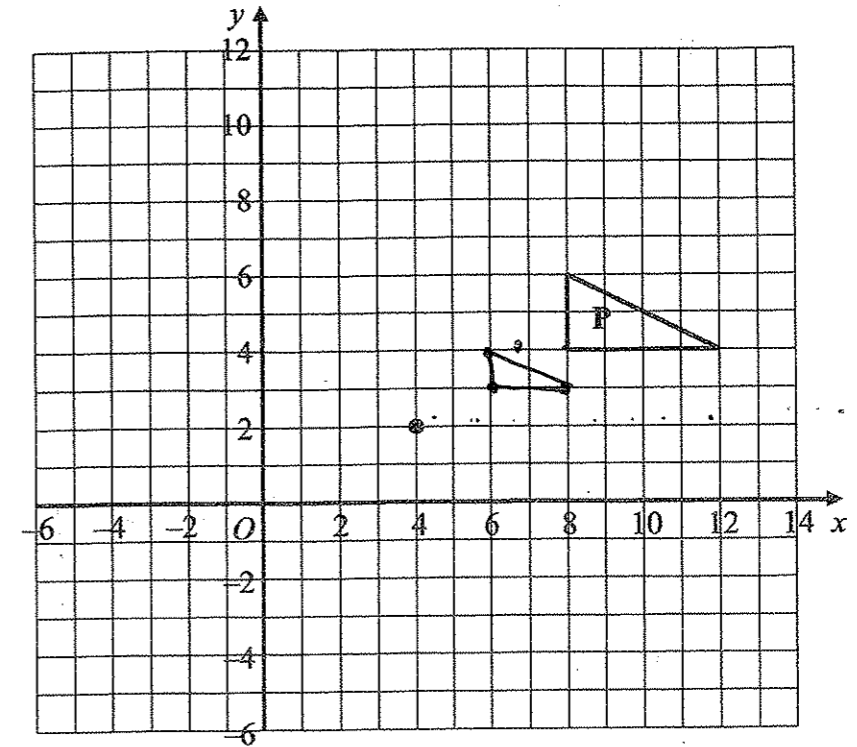


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On the grid, rotate triangle P 90° anti-clockwise about the point (4, 2).

(2)

(b)



Leave blank

On the grid, enlarge triangle P with scale factor $\frac{1}{2}$ and centre (4, 2).

(2)

(Total 4 marks)

Q9



10. Pat drops a ball onto a wooden floor.
The ball bounces to a height which is 26% less than the height from which it is dropped.

- (a) Pat drops the ball from a height of 85 cm.
Calculate the height to which it first bounces.

$$h = 0.74 \times 85$$

$$=$$

..... 62.9 cm
(3)

- (b) Pat drops the ball from a different height.
It first bounces to a height of 48.1 cm.
Calculate the height from which he dropped it.

Reverse percentage!

$$48.1 = 0.74 \times ?$$

$$\frac{48.1}{0.74}$$

..... 65 cm
(3)

Q10

(Total 6 marks)

11. Solve $\frac{5x+4}{3} = 2$

$$5x+4 = 6$$

$$5x = 2$$

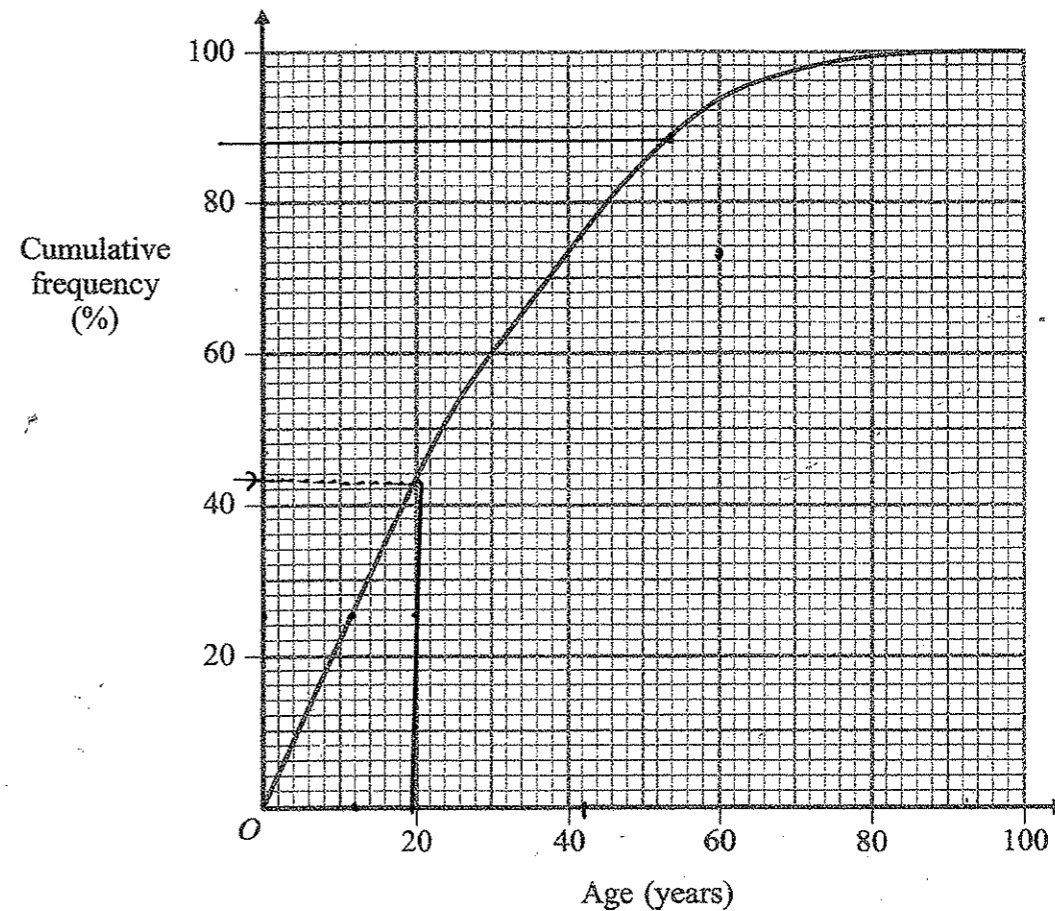
$$x = \frac{2}{5} \quad \text{or } 0.4$$

x =

Q11

(Total 3 marks)

12. The cumulative frequency graph gives information about the ages of people in India.
The cumulative frequency is given as a percentage of all the people in India.



- (a) Use the cumulative frequency graph to find an estimate for the percentage of people in India who are

- (i) aged less than 20,

..... ≈ 43 %

- (ii) aged 54 or over. $100 - 88$

..... ≈ 12 %
(2)

- (b) Find an estimate for the interquartile range of the ages of people in India.

$$25\% \quad LQ \rightarrow 12$$

$$75\% \quad UQ \rightarrow 42$$

..... ≈ 30 years
(2)

Q12

(Total 4 marks)

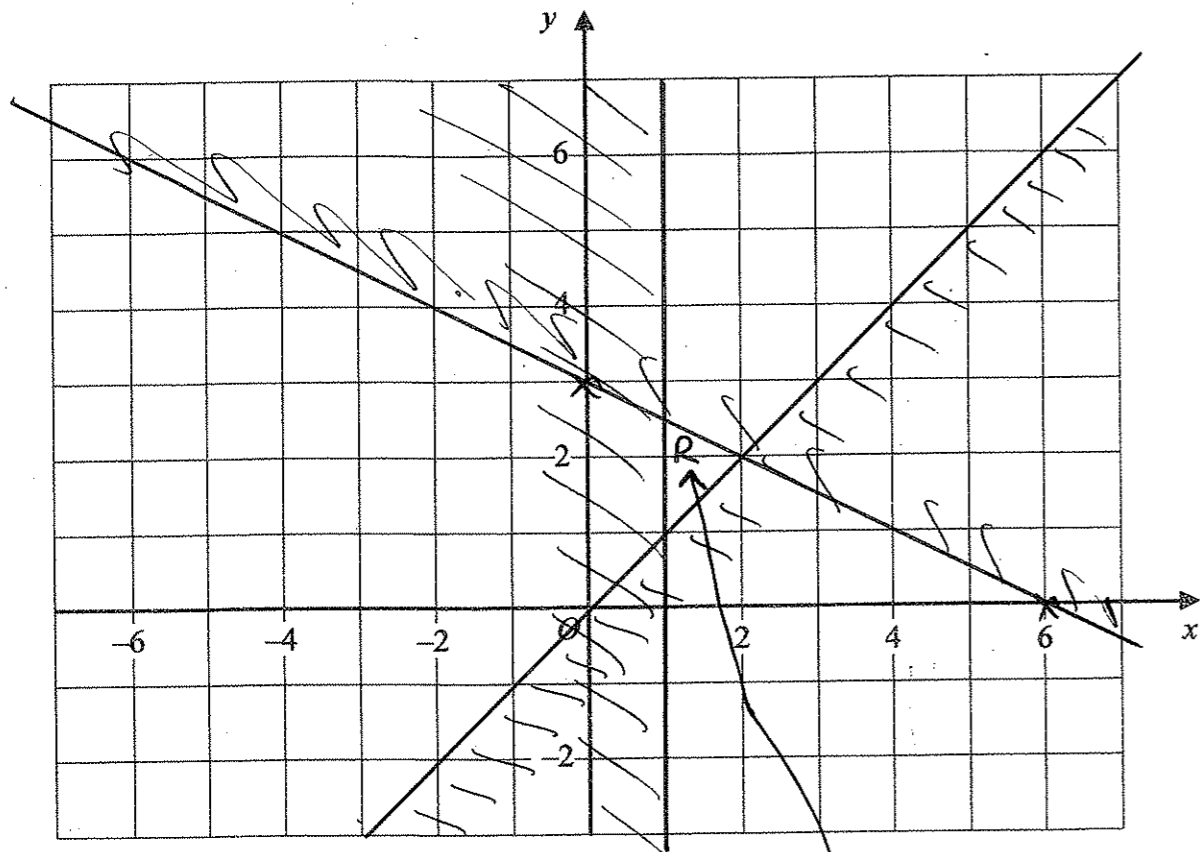


13. Show, by shading on the grid, the region which satisfies all three of these inequalities.

$x \geq 1$ $y \geq x$ $x + 2y \leq 6$

Label your region R.

Leave blank



(Total 4 marks)

Q13

$x + 2y = 6$

(0, 3)

(6, 0)

14.

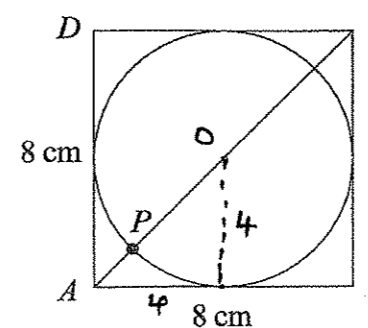


Diagram NOT accurately drawn

The diagram shows a circle of radius 4 cm inside a square ABCD of side 8 cm. P is a point of intersection of the circle and the diagonal AC of the square.

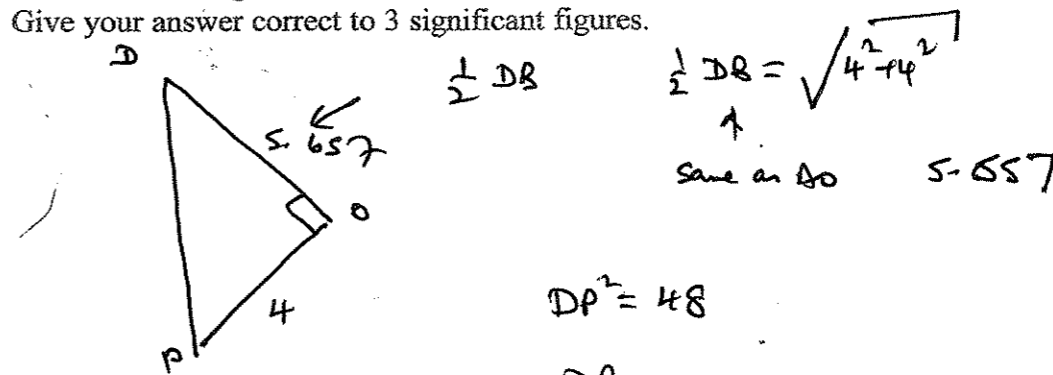
(a) Show that AP = 1.66 cm, correct to 3 significant figures.

By Pythagoras $AO = \sqrt{4^2 + 4^2} = 5.657$

$OP = 4$ $\therefore AP = 5.657 - 4$
 $= 1.657$
 $= \underline{1.66} \text{ (3sf)}$

(4)

(b) Calculate the length of DP. Give your answer correct to 3 significant figures.



$DP^2 = 48$

$DP =$

$\underline{6.93} \text{ cm}$

(3)

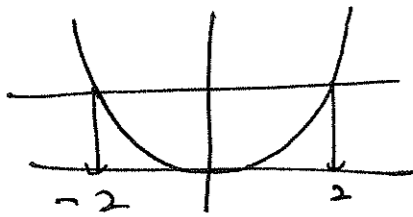
(Total 7 marks)

Q14

It's also possible to solve (b) by a cosine rule.



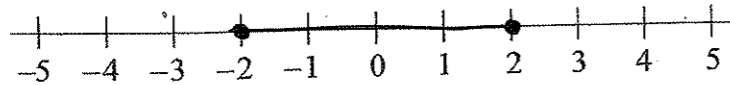
15. (a) Solve the inequality $x^2 \leq 4$



$$-2 \leq x \leq 2$$

(2)

(b) On the number line, represent the solution set of $x^2 \leq 4$



(2)

Q15

(Total 4 marks)

Leave blank

16.

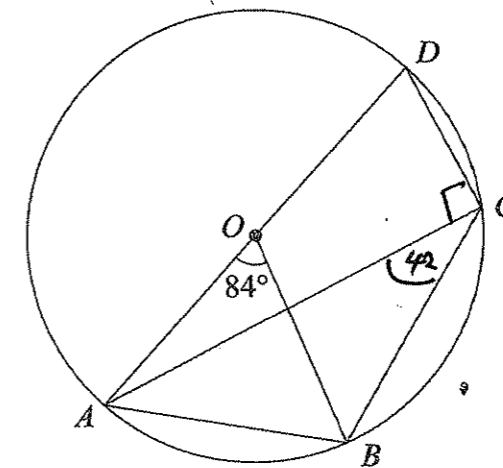


Diagram NOT accurately drawn

A, B, C and D are points on a circle with centre O .
 AOD is a diameter of the circle.
 Angle $AOB = 84^\circ$.

(a) (i) Calculate the size of angle ACB .

42

(ii) Give a reason for your answer.

\angle at centre = $2 \times \angle$ at circumference

(2)

(b) Calculate the size of angle BCD .

$90 + 42$

132

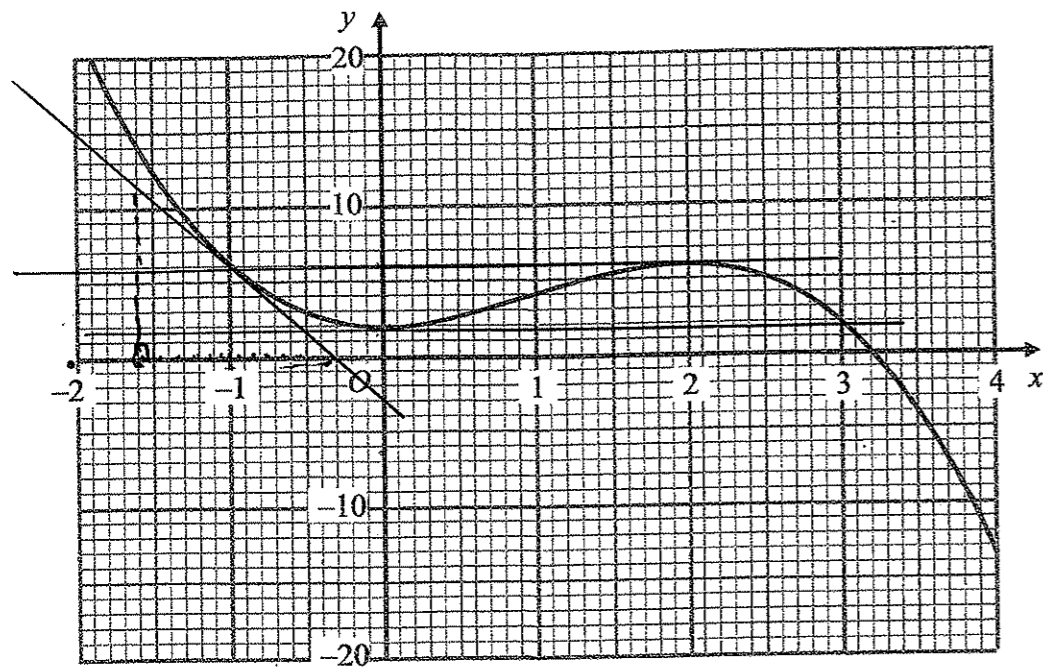
(2)

(Total 4 marks)

Q16



17. The diagram shows part of the graph of $y = f(x)$.



(a) Find $f(3)$. ≈ 2

$\frac{2}{\dots}$
(1)

(b) Solve $f(x) = 6$

$\frac{-1, 2}{\dots}$
(2)

(c) Find $f(1)$.

$f(1) = 4$

$f(1) = -14$

$\frac{-14}{\dots}$
(2)

Leave blank

(d) Find an estimate for the gradient of the curve at the point where $x = -1$

$\approx -\frac{11}{1.3}$

(draw the tangent at $x = -1$)

Remember $\frac{\text{up}}{\text{Across}} = \text{grad.}$

use scale. UNITS.

$\approx -\frac{8.5}{\dots}$
(3)

The equation $f(x) = k$, where k is a number, has 3 solutions between $x = -2$ and $x = 4$

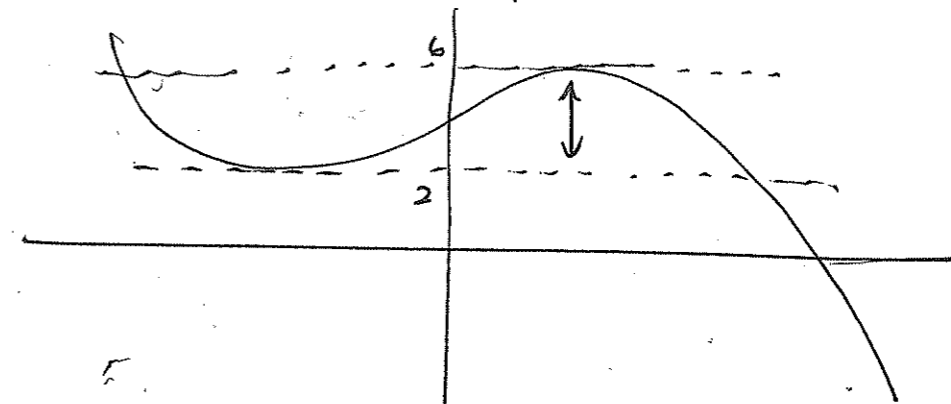
(e) Complete the inequalities which k must satisfy.

$\frac{2}{\dots} < k < \frac{6}{\dots}$
(2)

(Total 10 marks)

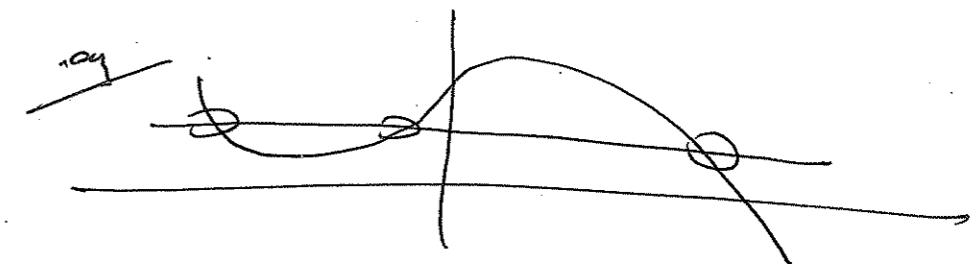
Q17

we are looking for

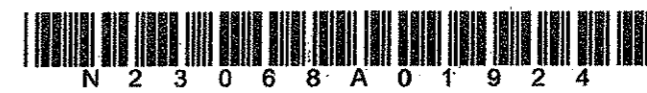


between 2 and 6

the line will cut the graph in 3 places



Leave blank



18.

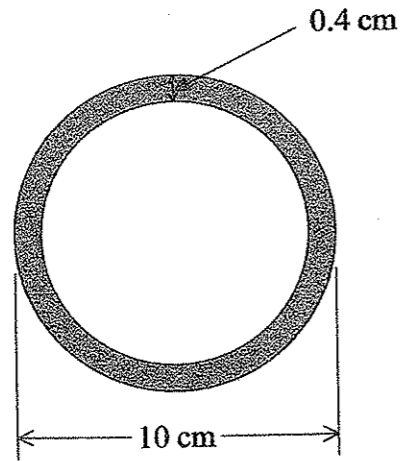


Diagram NOT accurately drawn

The outer diameter of a hollow spherical ball is 10 cm.
The ball is made from rubber which is 0.4 cm thick.

on formula sheet

Calculate the volume of rubber needed to make the ball.
Give your answer correct to 3 significant figures.

Vol. outer sphere = $\frac{4}{3} \pi \times 5^3 = \cancel{130.4} 523.6$

invol. = $\frac{4}{3} \pi \times (5 - 0.4)^3 = 407.77$

Sub. 115.8

116 cm³

(Total 4 marks)

Q18

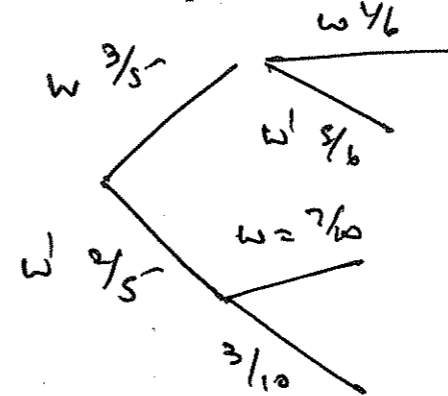
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19. The probability that Gill will walk to school on Monday is $\frac{3}{5}$.

If Gill walks to school on Monday, the probability that she will walk to school on Tuesday is $\frac{1}{6}$.

If she does **not** walk to school on Monday, the probability that she will walk to school on Tuesday is $\frac{7}{10}$.

(a) Calculate the probability that she walks to school on Monday but not on Tuesday.



$\frac{3}{5} \times \frac{5}{6} = \frac{1}{2}$

$\frac{1}{2}$

(2)

(b) Calculate the probability that she walks to school on at least one of the two days.

either $\frac{3}{5} \times \frac{5}{6} + \frac{2}{5} \times \frac{7}{10} + \frac{3}{5} \times \frac{1}{6}$ walking on both days.

$\frac{1}{2} + \frac{7}{25} = \frac{39}{50} = 0.78$

$0.78 + 0.1 = 0.88$

or $1 - \left(\frac{2}{5} \times \frac{3}{6} \right) = 1 - \frac{3}{25} = \frac{22}{25} = 0.88$

$\frac{22}{25} = 0.88$

(3)

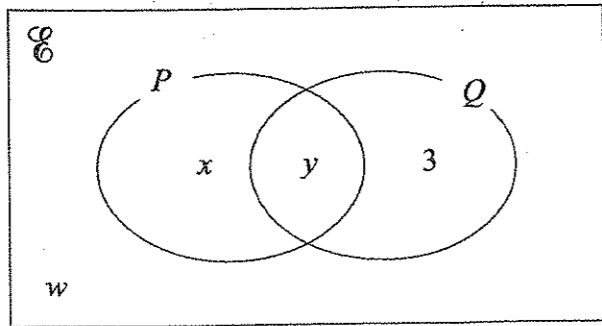
(Total 5 marks)

Q19

Leave blank



20.



In the Venn diagram, 3, w, x and y represent the numbers of elements.
 $n(U) = 24$ $n(P') = 8$ $n((P \cap Q)') = 15$

(a) Find the value of (i) w (ii) x (iii) y

- (i) $w = \underline{\quad 5 \quad}$
 (ii) $x = \underline{\quad 7 \quad}$
 (iii) $y = \underline{\quad 9 \quad}$ (3)

(b) (i) Find $n(P' \cap Q)$.

$\underline{\quad 3 \quad}$

(ii) Find $n(P' \cup Q)$.

$24 - 9$

$\underline{\quad 15 \quad}$

(iii) Find $n(P \cap Q \cap P')$.

has many in the set
 sur is empty ϕ so it has 0 elements in it.

$\underline{\quad 0 \quad}$
 (3)

(Total 6 marks)

Q20

21. Solve the simultaneous equations $y = 3x^2$
 $y = 2x + 5$

Solved

$$2x + 5 = 3x^2$$

$$3x^2 - 2x - 5 = 0$$

$$(3x - 5)(x + 1) = 0$$

$$x = \frac{5}{3} \qquad x = -1$$

$$y = \frac{25}{3} \qquad y = 3$$

or $8\frac{1}{3}$

$x = -1 \quad y = 3$
 $x = \frac{5}{3} \quad y = \frac{25}{3}$ or $8\frac{1}{3}$ Q21

(Total 6 marks)

TOTAL FOR PAPER: 100 MARKS

END

