

4H(R)

Pearson Edexcel
International GCSE

EDEXCEL IGCSE

MATHEMATICS A

SOLUTIONS

JUNE 2015

4MA0/4HR

Disclaimer

These solutions have been produced by Maths4Everyone Limited. While We have used reasonable endeavours to verify the accuracy of these solutions, these solutions are provided on an “as is” basis and We make no warranties of any kind, whether express or implied, in relation to these solutions.

We make no warranty that these solutions will meet Your requirements or provide the results which You want, or that they are complete, or that they are error-free. If You find anything confusing within these solutions then it is Your responsibility to seek clarification from Your teacher, tutor or mentor.

We request that You use the ‘contact’ link on Our web site to inform Us of any errors or omissions that You find. We will update these solutions and correct errors that We become aware of. We recommend that You check Our web site for the most up-to-date version of these solutions.

The methods used in these solutions, where relevant, are methods which have been successfully used with students. The method shown for a particular question is not always the only method and We do not claim that the method we have used is necessarily the most efficient or ‘best’ method. We will, from time to time, update a solution to show a different method if We feel that it is a good idea to do so.

Sometimes a method used in these solutions might be unfamiliar to You. If You are able to use a different method to obtain the correct answer then We would usually recommend that You keep using your existing method and not change to the method that We have used here. However, the choice of method is always up to You and We believe that it is often useful if You know more than one method to solve a particular type of problem.

Within these solutions We have indicated where marks **might** be awarded for each question. We have used B marks, M marks and A marks in a similar, but **not identical**, way that the exam board uses these marks within their mark schemes. We have done this for simplicity and convenience. We have sometimes interchanged B marks, M marks and A marks and We have sometimes awarded the marks in different ways to the exam board.

B1 - This is an unconditional accuracy mark (the specific number, word or phrase must be seen. This type of mark cannot be given as a result of ‘follow through’).

M1 - This is a method mark. We have indicated where method marks might be awarded for the method that is shown. If You use a different method, then the same number of method marks would be awarded but We are not able to indicate for what the marks would be awarded for Your particular method. When appropriate, You should seek clarity and download the relevant examiner mark scheme from the exam board’s web site

A1 - These are accuracy marks. Accuracy marks are typically awarded after method marks. If the correct answer is obtained, then You should normally (but not always) expect to be awarded all of the method marks (provided that You have shown Your method) and all of the accuracy marks.

The distance from Kyoto to Hakata is 638 kilometres.

The train journey from Kyoto to Hakata takes 2 hours 45 minutes.

2.75 HOURS

Work out the average speed, in kilometres per hour, of the train from Kyoto to Hakata.

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

$$= \frac{638}{2.75} \quad | \quad \text{(M)} \text{ [DIVIDING]}$$

$$\text{(B)} \text{ ['2.75']}$$

(A)
232 km/h

Amit invests 15000 rupees.

At the end of one year, his investment has increased by $7\frac{1}{2}\%$

$$\rightarrow +0.075 = 1.075$$

(a) Work out the value of Amit's investment at the end of one year.

$$15000 \times 1.075 \quad (M1)$$

$$\underline{16125} \text{ rupees} \quad (A1)$$

(2)

Priya invests a sum of money at an interest rate of 8% per year.
At the end of one year, the interest she receives is 1800 rupees.

$$8\% \equiv 1800$$

(b) Work out the value of Priya's investment at the end of one year.

$$8\% \equiv 1800$$

$$\therefore 1\% \equiv \frac{1800}{8}$$

$$\Rightarrow \boxed{100\%} \equiv \frac{1800}{8} \times 100 = \underline{22500} \quad (B1)$$

ORIGINAL INVESTMENT

$$\text{TOTAL IS NOW } \underline{22500} + 1800 \quad (M1)$$

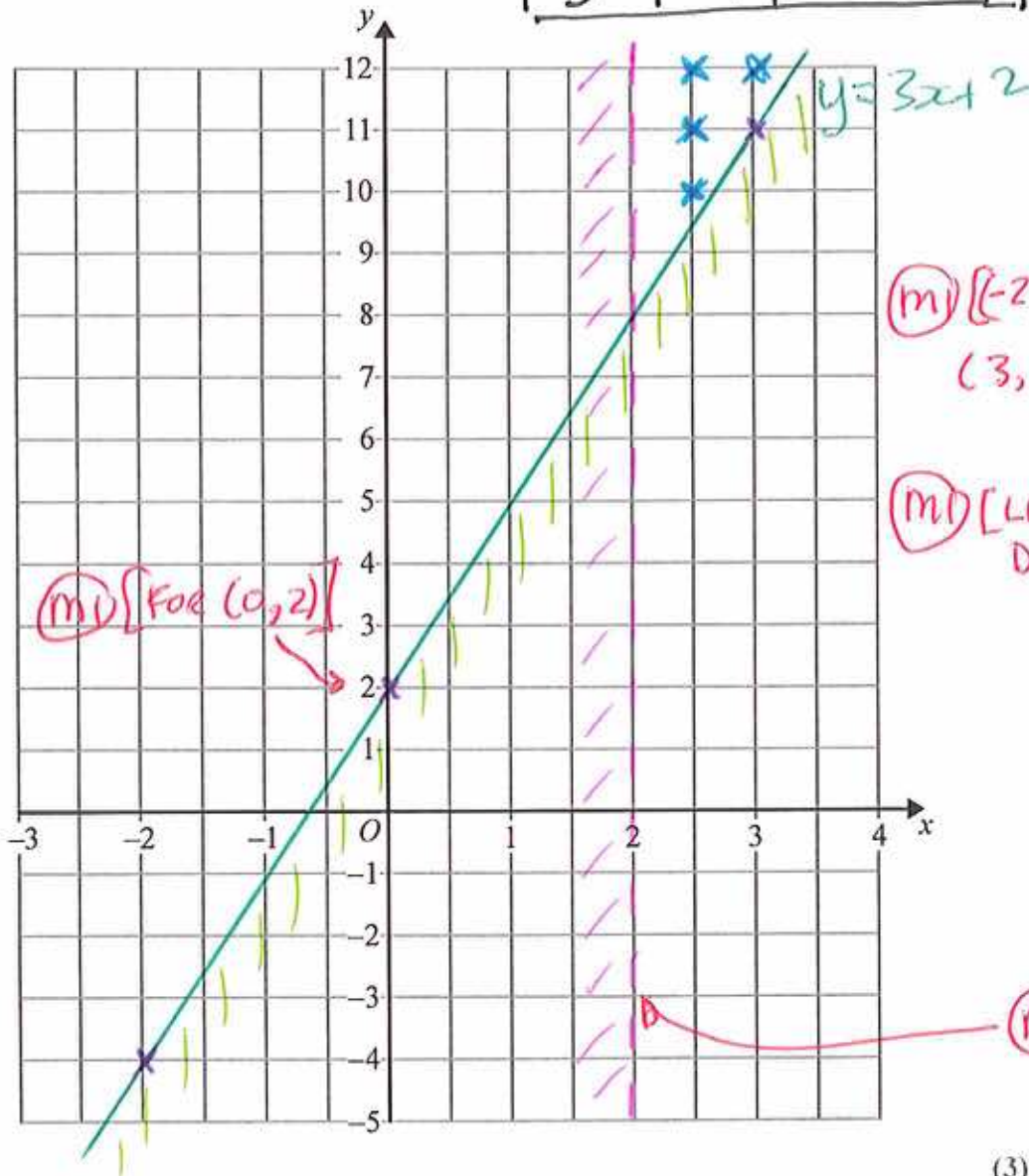
$$\underline{24300} \text{ rupees} \quad (A1)$$

(3)

(a) On the grid, draw the graph of $y = 3x + 2$ for values of x from -2 to 3

$y = mx + c$

x	-2	0	3
y	-4	2	11



(3)

(b) Mark with a cross (x) a point on the grid that satisfies both the inequalities

$x > 2$ and $y > 3x + 2$

Label this point P .

P IS ANY OF THE FOUR POINTS (2)

'x' (m)

Jordan's school awards certificates for outstanding work.

The table shows information about the numbers of certificates awarded in Jordan's class during a term.

Number of certificates	Number of students	CUMULATIVE
0	4	4
1	9	13
2	7	20
3	1	21
4	6	27
5	3	30

(a) Work out the median number of certificates awarded.

TOTAL = 30

$$\begin{aligned} \text{MEDIAN} &= \frac{30+1}{2} \\ &= 15.5\text{TH VALUE (M)} \end{aligned}$$

$$\begin{array}{r} 2 \text{ (A)} \\ \hline (2) \end{array}$$

(b) Work out the interquartile range of the numbers of certificates awarded.

$$Q_1 = \frac{30+1}{4} = 7.75\text{TH VALUE} = \underline{1} \text{ (B)}$$

$$Q_3 = 3 \times \frac{(30+1)}{4} = 23.25\text{TH VALUE} = \underline{4} \text{ (B)}$$

$$\begin{aligned} \text{IQR} &= Q_3 - Q_1 \\ &= 4 - 1 \\ &= \underline{3} \text{ (A)} \end{aligned}$$

The table shows the probabilities of people in Wales being in blood group O or in blood group A or in blood group AB.

Blood group	Probability
O	0.44
A	0.42
B	
AB	0.04

All people in Wales are in exactly one of the blood groups O, A, B or AB.

A person is selected at random from the people in Wales.

(a) Find the probability that this person is in blood group B.

$$1 - (0.44 + 0.42 + 0.04) \quad \text{(M1)}$$

$$= 1 - 0.9$$

$$\begin{array}{r} 0.1 \quad \text{(A1)} \\ \hline (2) \end{array}$$

(b) Find the probability that this person is in blood group O or A.

$$0.44 + 0.42$$

$$\begin{array}{r} 0.86 \quad \text{(A1)} \\ \hline (1) \end{array}$$

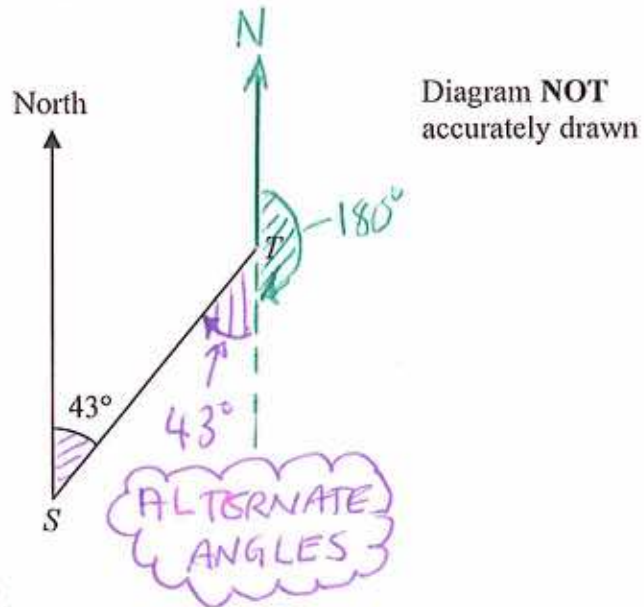
There are 1200 students in Aled's school.
Aled's school is in Wales.

(c) Work out an estimate for the number of pupils in Aled's school who are in blood group AB.

$$1200 \times 0.04 \quad \text{(M1)}$$

$$\begin{array}{r} 48 \quad \text{(A1)} \\ \hline (2) \end{array}$$

The diagram shows two points S and T .
The bearing of T from S is 043°



Work out the bearing of S from T .

$$180 + 43 \quad (M)$$

$$\underline{\underline{223^\circ}} \quad (A)$$

Flaky pastry is made using flour and fat in the ratio 9:7 by weight.

Cassie makes some flaky pastry.

She uses 175 grams of fat.

(a) Work out the weight of flour Cassie uses.

FL : FAT

9 : 7

175g

$$\frac{175}{7} = 25 \text{ (M)}$$

$$25 \times 9 = \underline{\underline{225}} \text{ g (A)}$$

Sweet pastry is made using flour, fat and sugar in the ratio 27:14:9 by weight.

Luke makes some sweet pastry.

The total weight of flour, fat and sugar he uses is 400 grams.

(b) Work out the weight of flour Luke uses.

FL : FAT : S	TOTALS
27 : 14 : 9	50
	400g

(m) $\frac{400}{50} = 8 \rightarrow 8 \times 27 \rightarrow 216$ (A) grams
(2)

Elisha makes some flaky pastry and some sweet pastry.

She uses the same weight of flour for the flaky pastry as she does for the sweet pastry.

(c) Work out the ratio of the weight of fat she uses in the flaky pastry to the weight of fat she uses in the sweet pastry.

FLAKY	SWEET
FL : FAT	FL : FAT : S
9 : 7	27 : 14 : 9
$\times 3$ \rightarrow 27 : 21	
(m)	FAT RATIO IS 21:14
	= <u>3:2</u> (A)

(a) Expand $5(2p - 3)$

$$\underline{10p - 15} \quad \text{(AI)}$$

(1)

(b) Solve the inequality $9 - 2x < 3$

$$\begin{aligned} -2x &< 3 - 9 \\ \Rightarrow -2x &< -6 \quad \text{(MI)} \\ \Rightarrow x &> \frac{-6}{-2} \end{aligned}$$

DIVIDE BY -VE
∴ SIGNS SWITCHES

$$\underline{x > 3} \quad \text{(AI)}$$

(2)

(c) $y = x^3 - kx + 5$ Work out the value of k when $y = 6$ and $x = -2$

$$y = x^3 - kx + 5 \quad (y = 6, x = -2)$$

$$6 = (-2)^3 - k(-2) + 5 \quad \text{(MI) [SUBSTITUTION]}$$

$$\Rightarrow 6 = -8 + 2k + 5 \quad \text{(MI) [SIMPLIFY]} \quad k = \frac{6 + 8 - 5}{2}$$

$$\Rightarrow 2k = 6 + 8 - 5$$

$$k = \underline{4.5} \quad \text{(AI)}$$

(3)

(d) Solve $\frac{1}{f+2} = 3$

$$f + 2 = \frac{1}{3} \quad \text{(MI)}$$

$$f = \frac{1}{3} - 2$$

$$f = \underline{-1\frac{2}{3}} \quad \text{(AI)}$$

(2)

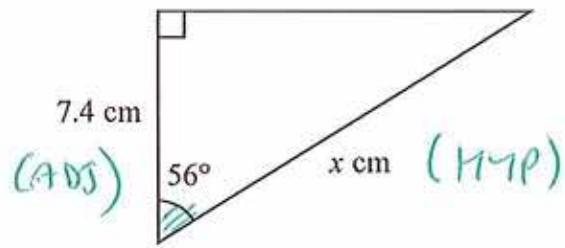


Diagram NOT
accurately drawn

SOH (CAH) TOA

Work out the value of x .

Give your answer correct to 3 significant figures.

$$\cos 56 = \frac{\text{ADJ}}{\text{HYP}}$$

$$\Rightarrow \cos 56 = \frac{7.4}{x} \quad (M1)$$

$$x = \frac{7.4}{\cos 56} \quad (M1)$$

$$= 13.233\dots$$

$$= \underline{\underline{13.2 \text{ cm}}} \quad (A1)$$

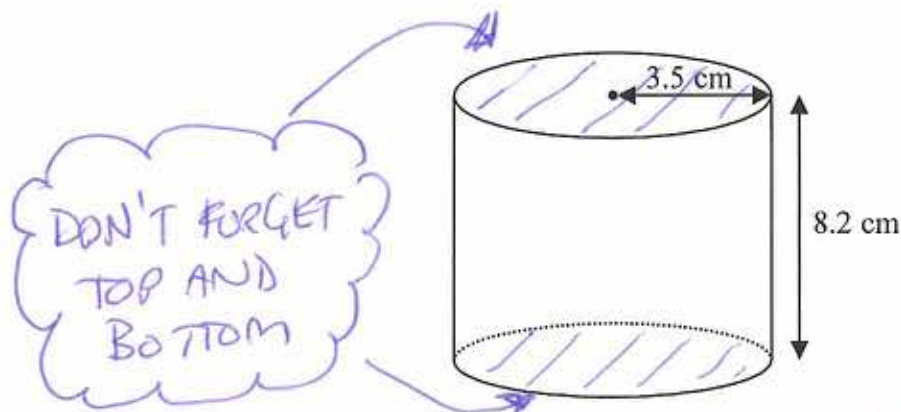


Diagram NOT
accurately drawn

A solid cylinder has radius 3.5 cm and height 8.2 cm.

Work out the total surface area of the cylinder.
Give your answer correct to 3 significant figures.

USE $2\pi rh$

$$\text{CURVED SURFACE AREA} = 2\pi \times 3.5 \times 8.2$$

$$= \underline{180.327\dots} \text{ (BI)}$$

$$\text{TOP + BOTTOM} = 2 \times [\pi \times 3.5^2]$$

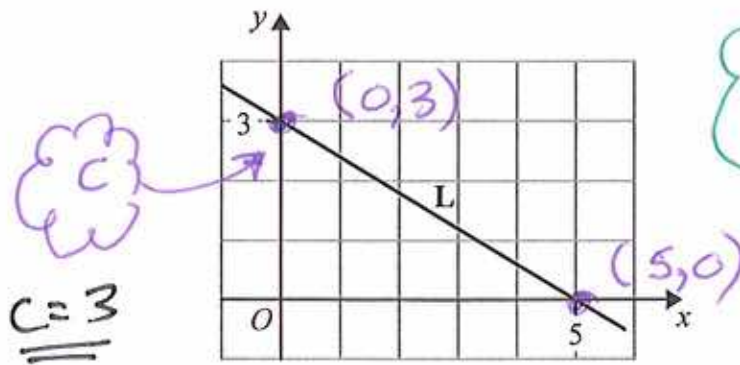
$$= \underline{76.969\dots} \text{ (BI)}$$

$$\text{TOTAL} = 180.32\dots + 76.969$$

$$= 257.29\dots$$

$$\text{(AI)} \\ \underline{257 \text{ cm}^2}$$

The straight line L is shown on the grid.



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

Find an equation of L .

$$y = mx + c$$

$$m = \frac{3 - 0}{0 - 5} \quad (M1)$$

$$= -\frac{3}{5} \quad (A1)$$

$$\therefore y = mx + c$$

$$\text{is } \underline{\underline{y = -\frac{3}{5}x + 3}} \quad (A1)$$

$PQRS$ and $PLMN$ are similar quadrilaterals.

$PN = 12$ cm, $NS = 8$ cm, $PL = 9$ cm and $RS = 13.5$ cm.

LM is parallel to QR and MN is parallel to RS .

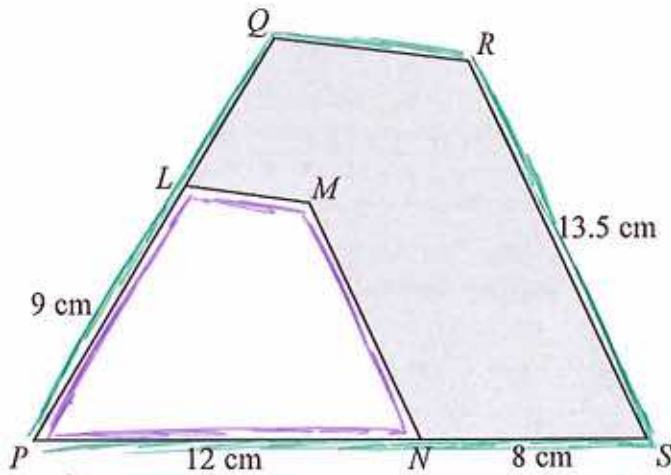


Diagram NOT accurately drawn

SCALE FACTOR = $\frac{20}{12} = \frac{5}{3}$

(a) Work out the length of MN .

20cm

$$\frac{13.5}{5/3} \leftarrow \text{mi}$$

8.1 (AI) cm
(2)

(b) Work out the length of LQ .

$PQ = 9 \times \frac{5}{3}$ (mi) $\rightarrow \therefore LQ = 15 - 9$
 $= 15$

$= 6$ (AI) cm
(2)

The area of $PLMN$ is A cm²
The area of $PQRS$ is kA cm²

(c) Find the value of k .

$A_2 = \left(\frac{5}{3}\right)^2 \times A$

$k = \frac{25}{9}$ (AI)
(1)

The area of the shaded region is 105.6 cm^2

(d) Work out the value of A .

$$A_2 - A = 105.6$$

$$\frac{25}{9}A - A = 105.6 \quad \textcircled{m1} \text{ [EQUATION]}$$

$$\Rightarrow \frac{16}{9}A = 105.6 \quad \textcircled{m2} \text{ [SIMPLIFYING]}$$

$$\Rightarrow A = \frac{105.6}{\frac{16}{9}}$$

$$= \underline{\underline{59.4 \text{ cm}^2}} \quad \textcircled{A1}$$

V is inversely proportional to the square of t

$V = 28$ when $t = 2.5$

$$V = \frac{k}{t^2}$$

(a) Express V in terms of t

$$V = \frac{k}{t^2} \quad (V = 28, t = 2.5)$$

$$\Rightarrow 28 = \frac{k}{2.5^2} \quad \text{(M1) [EITHER]}$$

$$\Rightarrow k = 28 \times 2.5^2 = \underline{\underline{175}} \quad \text{(M1)}$$

$$V = \frac{175}{t^2} \quad \text{(A1)}$$

(3)

(b) Work out the value of V when $t = 6.25$

$$V = \frac{175}{t^2} \quad (t = 6.25)$$

$$\Rightarrow V = \frac{175}{6.25^2} \quad \text{(M1)}$$

$$V = \underline{\underline{4.48}} \quad \text{(A1)}$$

(2)

(a) Complete the table of values for $y = x^3 - 3x^2 + 5$

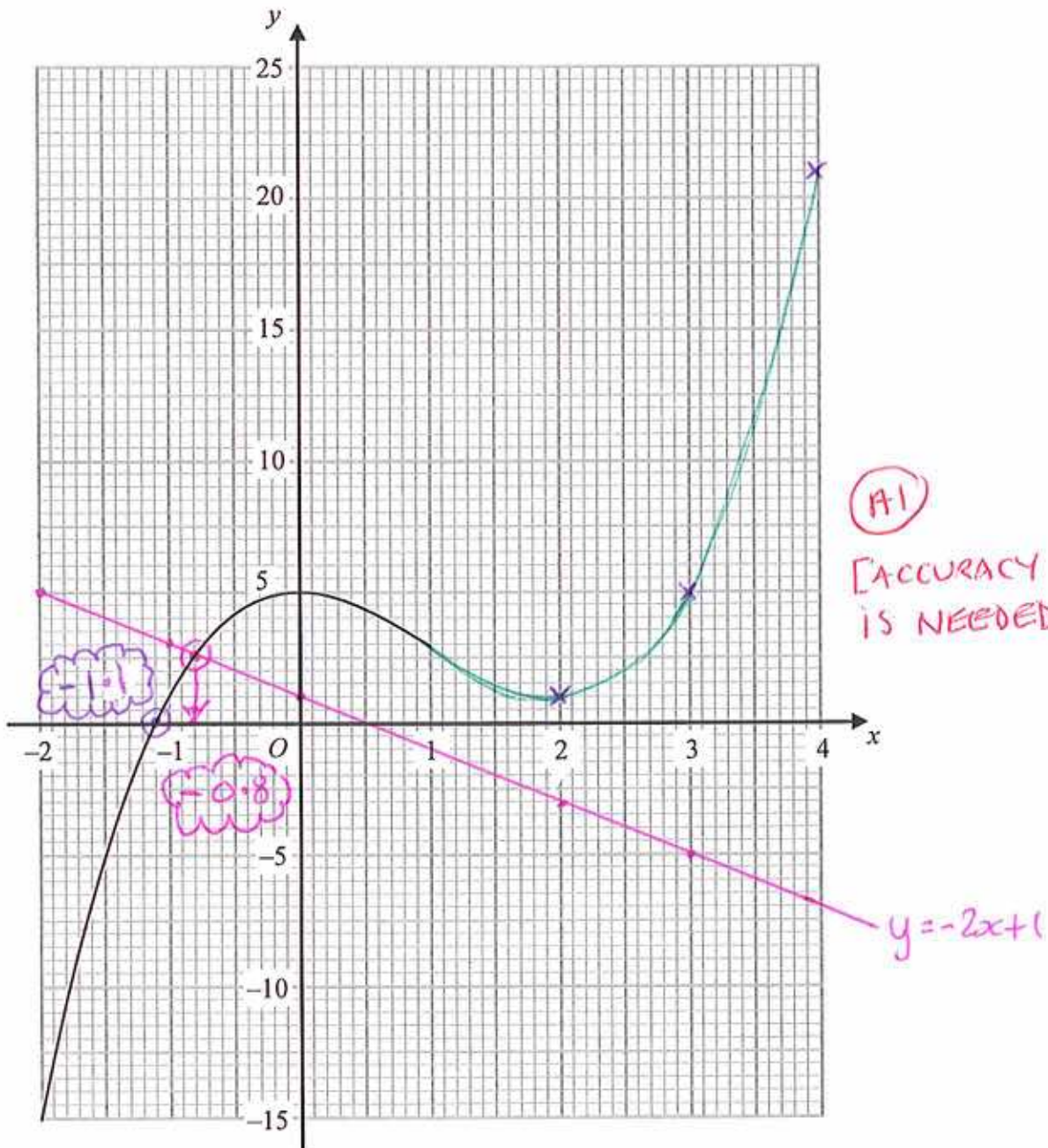
$y = (-2)^3 - 3(-2)^2 + 5$ ETC.

x	-2	-1	0	1	2	3	4
y	-15	1	5	3	1	5	21

(AI)

(1)

(b) On the grid, complete the graph of $y = x^3 - 3x^2 + 5$ for $-2 \leq x \leq 4$



(AI)

[ACCURACY IS NEEDED]

(1)

- (c) Use the graph to find an estimate for the solution of the equation $x^3 - 3x^2 + 5 = 0$ (1)

$$x = \frac{-1.1}{(1)} \quad \text{(AI)}$$

- (d) By drawing a suitable straight line on the grid, find an estimate for the solution of the equation $x^3 - 3x^2 + 2x + 4 = 0$

$$x^3 - 3x^2 + 5 = -2x + 1 \quad \text{(m)}$$

DRAW $y = -2x + 1$

(m) [LINE SEEN ON GRAPH]

$$x = \frac{-0.8}{(3)} \quad \text{(AI)}$$

When a fair dice is thrown the probability of scoring 6 is $\frac{1}{6}$

Arun throws four fair dice.

Work out the probability that he scores 6 with at least one of the four dice.

$$P(\text{NO SIXES}) = P(\bar{6}, \bar{6}, \bar{6}, \bar{6})$$

$$= \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \quad (M1)$$

$$= \frac{625}{1296}$$

$$\therefore P(\text{AT LEAST ONE SIX}) = 1 - \frac{625}{1296} \quad (M1)$$

$$= \frac{671}{1296} \quad (A1)$$

J, K, L and M are points on the circumference of a circle.
 GJH is the tangent to the circle at J .
 MK and JL intersect at the point P .
 GML is a straight line.

Angle $HJK = 62^\circ$, angle $JKM = 21^\circ$ and angle $JGL = 78^\circ$

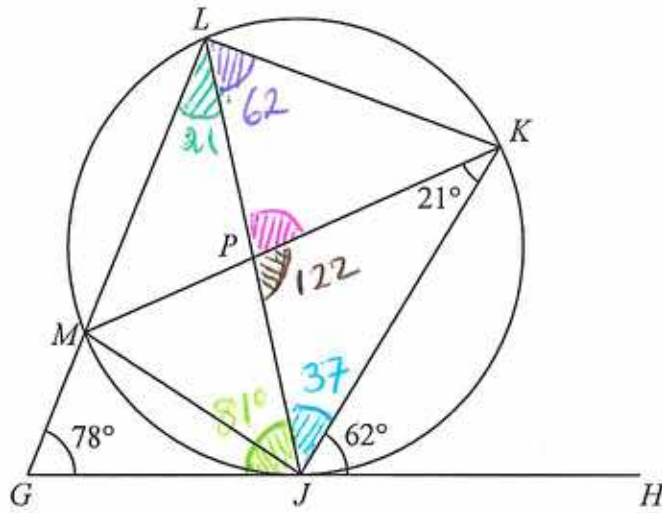


Diagram **NOT** accurately drawn

(a) Write down the size of angle MLJ .

ANGLES IN SAME SEGMENT ARE EQUAL

21 (A1)

 (1)

(b) Write down the size of angle JLK .

ANGLES IN ALTERATE SEGMENTS

62 (A1)

 (1)

(c) Work out the size of angle KPL .

$$GJL = 180 - (78 + 21) = 81^\circ$$

$$KJP = 180 - (81 + 62) = 37^\circ$$

$$JPK = 180 - (37 + 21) = 122^\circ$$

$$KPL = 180 - 122 = 58^\circ$$

(M2)

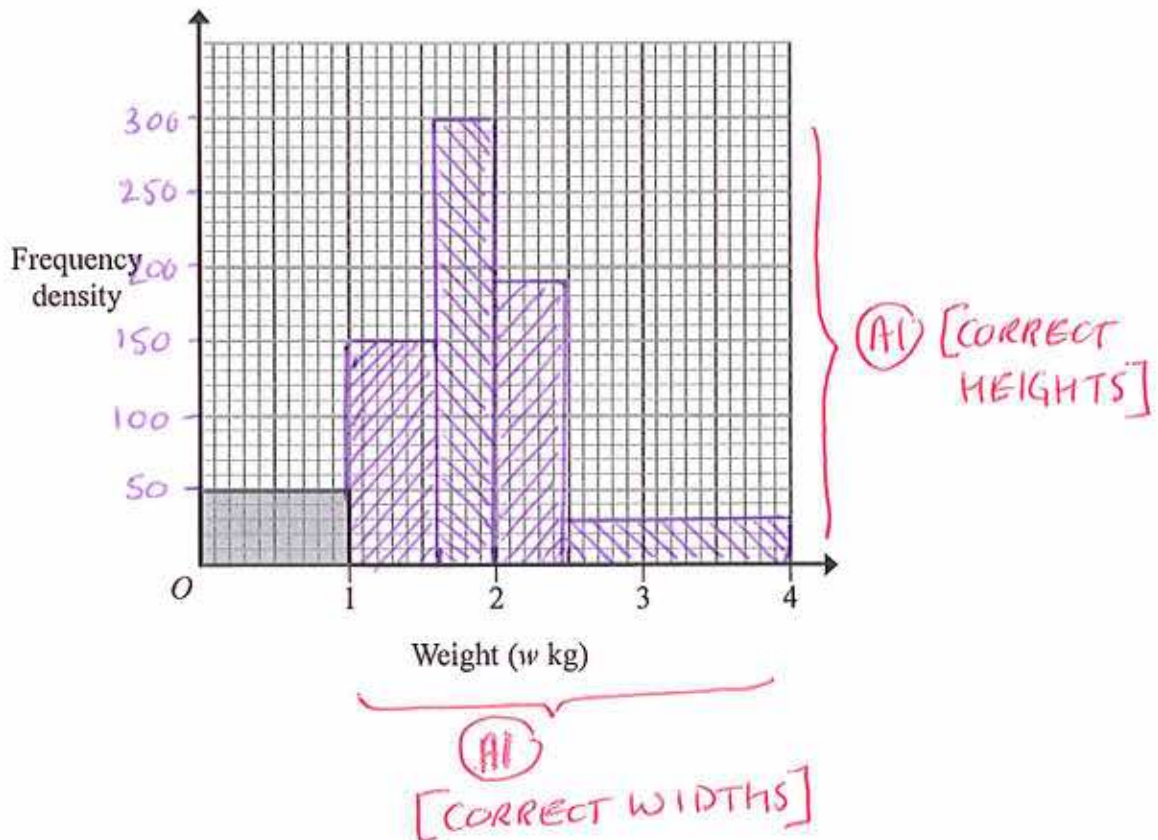
 58 (A1)
 (3)
 [ANY CORRECT AND USEFUL CALCULATIONS GET M1 EACH]

400 people are asked to guess the weight of a large cake.
The table shows information about the weights they guess.

Weight (w kg)	Number of guesses	WIDTH	HEIGHT
$0 < w \leq 1$	50	1	50
$1 < w \leq 1.6$	90	0.6	150
$1.6 < w \leq 2$	120	0.4	300
$2 < w \leq 2.5$	95	0.5	190
$2.5 < w \leq 4$	45	1.5	30

Use the information in the table to complete the histogram.

↑
(m)



$$\frac{1}{5^3} = 5^p \quad 1 = 5^q \quad \sqrt{5^3} = 5^r$$

(a) Write down the value of

(i) p

$$p = \underline{-3} \quad (\text{AI})$$

(ii) q

$$q = \underline{0} \quad (\text{AI})$$

(iii) r

$$r = \underline{\frac{3}{2}} \quad (\text{AI}) \quad (1.5)$$

(b) Show that $\frac{14}{\sqrt{245}} = \frac{2\sqrt{5}}{5}$

You must write down each stage of your working.

$$\begin{aligned} \frac{14}{\sqrt{245}} \times \frac{\sqrt{245}}{\sqrt{245}} &= \frac{14\sqrt{245}}{245} \\ &= \frac{14 \times 7\sqrt{5}}{245} \quad (\text{MI}) \\ &= \frac{98\sqrt{5}}{245} = \frac{2\sqrt{5}}{5} \end{aligned}$$

(2)

$(e - 2\sqrt{3})^2 = f - 20\sqrt{3}$ where e and f are integers.

(c) Find the value of e and the value of f

$$(e - 2\sqrt{3})(e - 2\sqrt{3}) = e^2 - 4e\sqrt{3} + 4 \times 3 \quad (\text{MI})$$

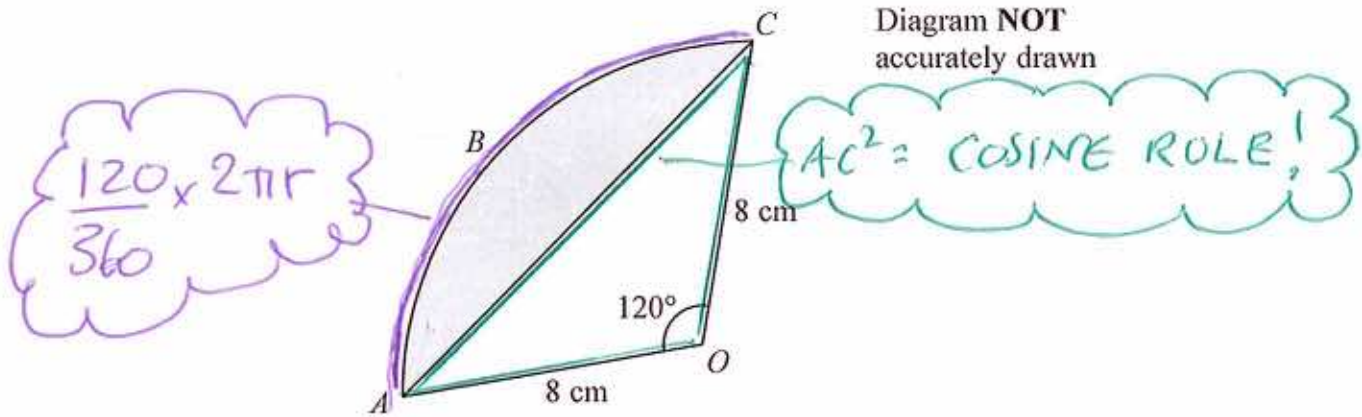
$$= e^2 + 12 - 4e\sqrt{3}$$

$$\therefore 4e = 20 \Rightarrow e = \underline{5} \quad (\text{AI})$$

$$f = e^2 + 12$$

$$= 5^2 + 12$$

$$= \underline{37} \quad (\text{AI})$$



ABC is an arc of a circle with centre O and radius 8 cm.

AC is a chord of the circle.

Angle $AOC = 120^\circ$

Calculate the perimeter of the shaded segment.

Give your answer correct to 3 significant figures.

1ST [ARC]

$$\frac{120}{360} \times 2\pi \times 8 = \underline{\underline{16.755\dots}} \text{ (m)}$$

2ND [LINE AC]

$$AC^2 = 8^2 + 8^2 - 2 \times 8 \times 8 \times \cos 120^\circ$$

$$= 192 \text{ (m)}$$

$$\Rightarrow AC = \sqrt{192}$$

$$= \underline{\underline{13.856\dots}} \text{ (m)}$$

$$\text{TOTAL PERIMETER} = 16.755 + 13.856\dots$$

$$= 30.611\dots$$

$$\underline{\underline{30.6}} \text{ (A1) cm}$$

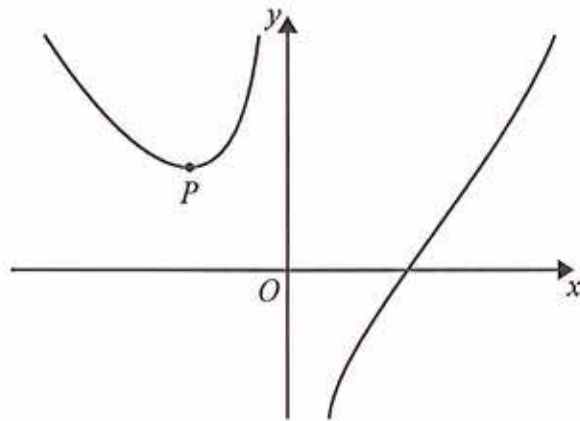
$$y = x^2 - \frac{16}{x}$$

(a) Find $\frac{dy}{dx}$

$$y = x^2 - 16x^{-1} \quad (M1)$$

$$\frac{dy}{dx} = 2x + 16x^{-2} \quad (A1) \quad (A1)$$

(3)



THIS CAN BE WRITTEN AS $\frac{16}{x^2}$

The graph shows part of the curve with equation $y = x^2 - \frac{16}{x}$

The point P is the turning point of the curve.

(b) Work out the coordinates of P .

$$\frac{dy}{dx} = 0$$

$$2x + \frac{16}{x^2} = 0 \quad (M1)$$

$$\Rightarrow 2x^3 + 16 = 0$$

$$\Rightarrow x^3 + 8 = 0$$

$$\Rightarrow x^3 = -8$$

$$\Rightarrow \underline{\underline{x = -2}} \quad (A1)$$

$$y = (-2)^2 - \frac{16}{(-2)} \quad (M1)$$

$$= 4 + 8$$

$$= \underline{\underline{12}} \quad (A1)$$

COORDINATES ARE $(-2, 12)$