

4H

Pearson Edexcel
International GCSE

EDEXCEL

IGCSE

MATHEMATICS A

SOLUTIONS

JANUARY 2012

4MA0/4H

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.

Work out the value of $\frac{6.7 - 2.5}{2.8 \times 0.4}$

Give your answer as a decimal.

3.75

(A2)

An aeroplane flew from Qatar to Bahrain.

The distance flown was 135 km.

The average speed was 180 km/h.

Work out the time taken.

Give your answer in minutes.

$$v = \frac{d}{t} \quad (v = 180, d = 135)$$

$$180 = \frac{135}{t} \Rightarrow t = \frac{135}{180} = 0.75 \text{ hours} \quad \text{(A1)}$$
$$= 0.75 \times 60$$
$$= \underline{45} \text{ minutes} \quad \text{(A1)}$$

(m1)

Solve $7x - 5 = 3x + 2$

Show your working clearly.

$$7x - 3x = 2 + 5 \quad (M1)$$

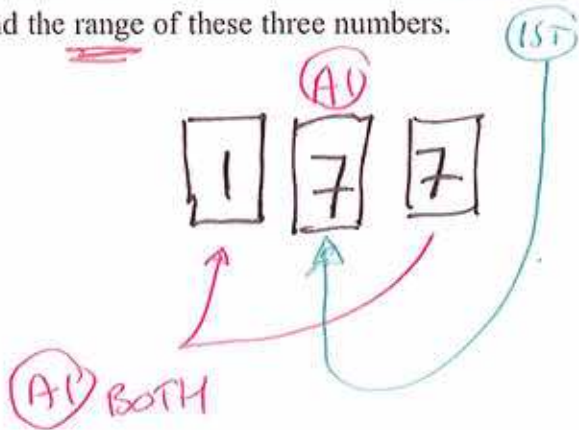
$$4x = 7 \quad (M1)$$

$$x = \frac{7}{4}$$

$$x = \frac{7}{4} \quad (A1)$$

Three positive whole numbers have a median of 7 and a mean of 5. \rightarrow TOTAL = 15

Find the range of these three numbers.



$$15 - 7 = 8 \quad (\text{SO FIRST AND THIRD ADD TO 8})$$

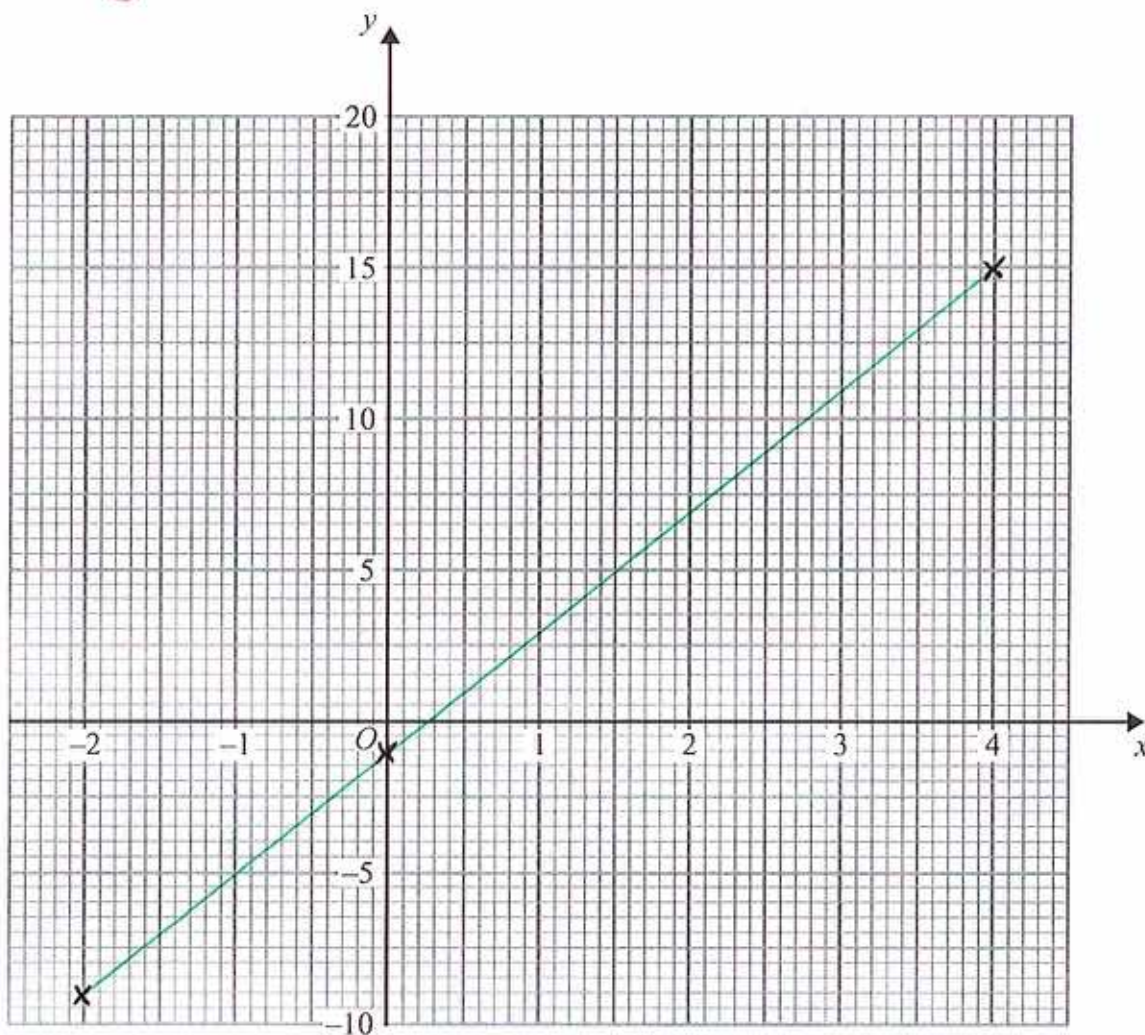
$$\text{RANGE} = 7 - 1 = \underline{\underline{6}} \quad \text{AV}$$

On the grid, draw the graph of $y = 4x - 1$ from $x = -2$ to $x = 4$

x	-2	0	4
y	-9	-1	15

$y = 4x(-2) - 1$ etc

→ FITS $y = mx + c$ WHICH IS A STRAIGHT LINE GRAPH.
(ONLY THREE POINTS NEEDED!)



(a) There are 32 students in a class.

All the students are either left-handed or right-handed.

The ratio of the number of left-handed students to the number of right-handed students is 1 : 7

Work out the number of right-handed students.

$$\begin{array}{l} L : R \\ 1 : 7 \end{array} \quad \begin{array}{l} \text{TOTAL} \\ 8 \end{array}$$

$$\frac{32}{8} = 4 \longrightarrow 4 \times 7 = 28$$

28

(2)

(b) Sajid makes a scale model of a lorry.

He uses a scale of 1 : 32

The length of Sajid's model lorry is 45 cm.

Chitra makes a scale model of the same lorry.

She uses a scale of 1 : 72

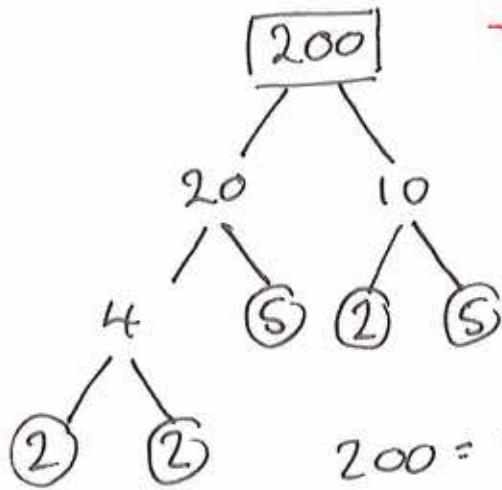
Work out the length of Chitra's model lorry.

$$\begin{aligned} \text{LENGTH OF ACTUAL LORRY} &= 32 \times 45 \\ &= \underline{\underline{1440}} \text{ (m)} \end{aligned}$$

$$\text{LENGTH OF CHITRA'S MODEL} = \frac{1440}{72} \text{ (m)}$$

$$= \underline{\underline{20}} \text{ (A) cm}$$

Express 200 as a product of powers of its prime factors.



[OTHER METHODS ARE ACCEPTABLE]

$$200 = 2 \times 2 \times 2 \times 5 \times 5$$

$$2^3 \times 5^2$$

$$\frac{y^3 \times y^n}{y} = y^6$$

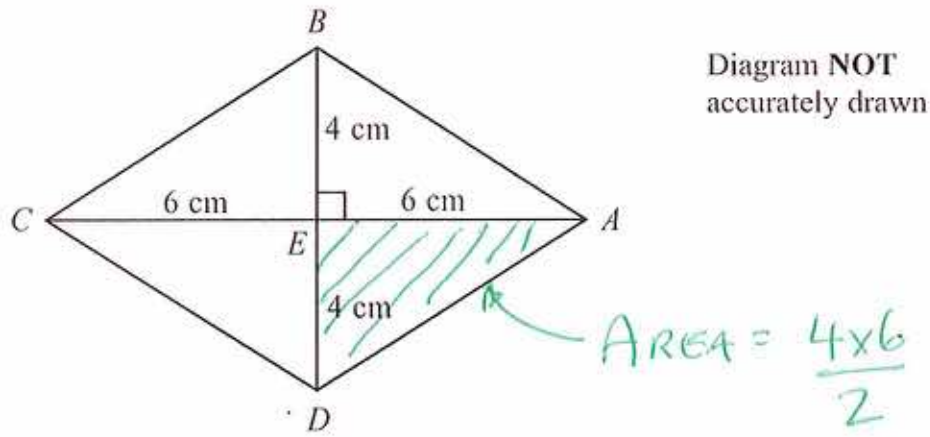
Find the value of n .

$$\frac{y^3 \times y^n}{y} = y^6$$

$$\Rightarrow y^2 \times y^n = y^6 \quad \left. \vphantom{\Rightarrow} \right\} \text{(M1) (EITHER)}$$

$$\Rightarrow 2 + n = 6$$
$$n = \underline{\underline{4}}$$

$$n = \underline{\underline{4}} \quad \text{(A1)}$$



$ABCD$ is a rhombus.

The diagonals AC and BD cross at the point E .

$AE = CE = 6$ cm.

$BE = DE = 4$ cm.

Angle $AEB = 90^\circ$

(a) Work out the area of the rhombus.

$$A = \frac{4 \times 4 \times 6}{2} \text{ (mi)}$$

$$\frac{48 \text{ (AI)}}{(3)} \text{ cm}^2$$

(b) Work out the length of AB .

Give your answer correct to 3 significant figures.

$$AB^2 = 4^2 + 6^2 \text{ (mi)}$$

$$= 52$$

$$AB = \sqrt{52} \text{ (mi)}$$

$$= 7.2111\dots$$

$$\frac{7.21 \text{ (AI)}}{\dots} \text{ cm}$$

(i) Solve the inequalities $-6 < 4x \leq 8$

$$-\frac{6}{4} < x \leq \frac{8}{4}$$



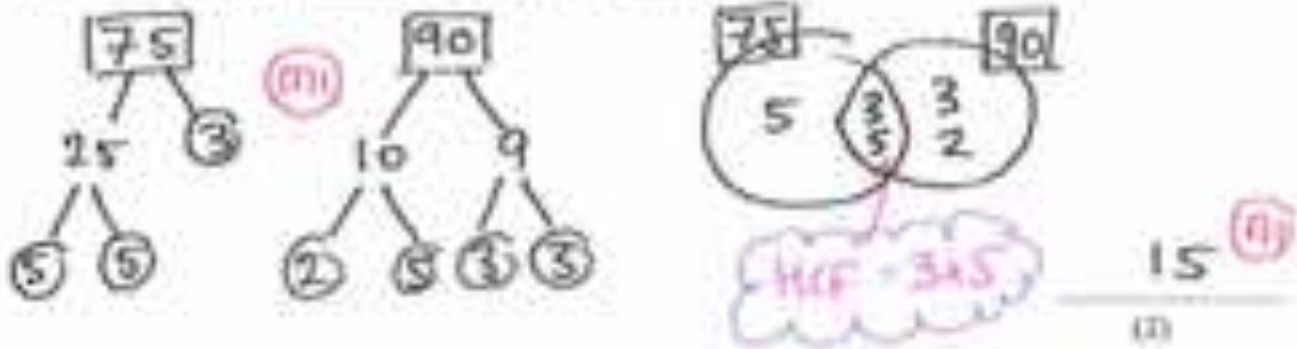
$$\textcircled{A1} \quad -1.5 < x \leq 2 \quad \textcircled{A2}$$

(ii) n is an integer.

Write down all the values of n which satisfy $-6 < 4n \leq 8$

$$\textcircled{A2} \quad -1, 0, 1, 2$$

(a) Find the Highest Common Factor (HCF) of 75 and 90



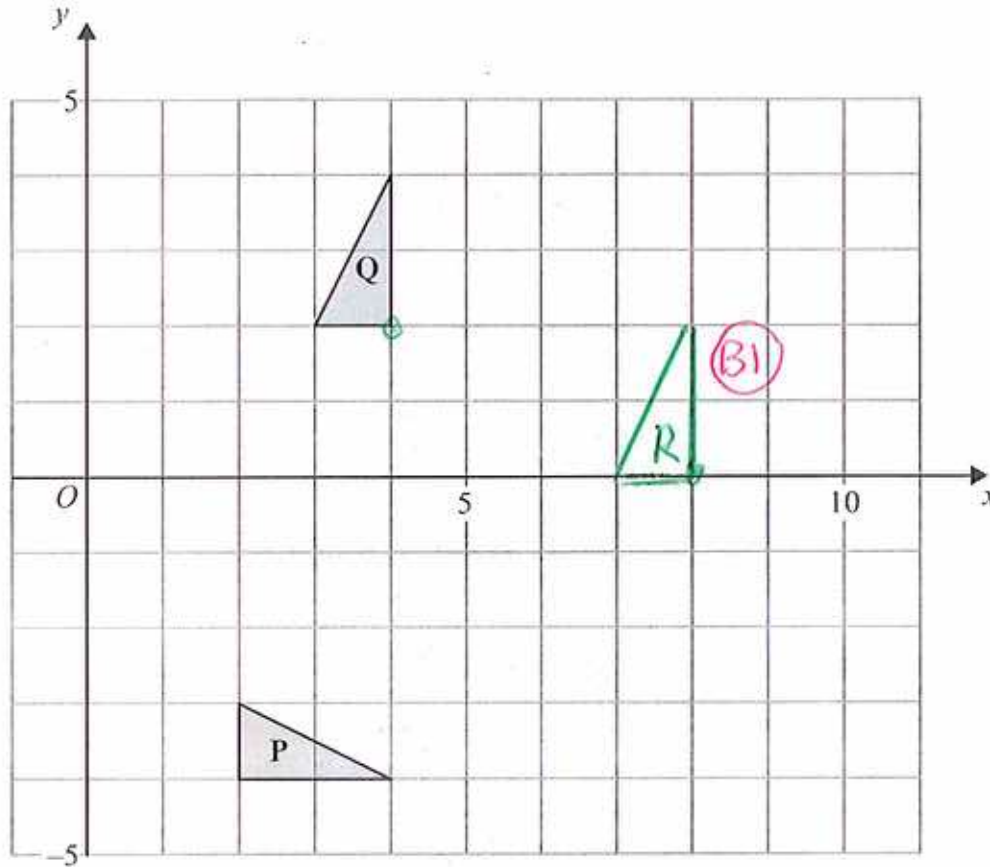
(b) Find the Lowest Common Multiple (LCM) of 75 and 90

Handwritten solution for finding the LCM of 75 and 90:

Formula: $HCF \times LCM = A \times B$

$\Rightarrow LCM = \frac{75 \times 90}{15}$ (15)

Final result: $\frac{450}{15}$ (450)



(a) Describe fully the single transformation which maps triangle P onto triangle Q.

(B1) ROTATION, 90° ANTI-CLOCKWISE (B1)
CENTRE (0,0) (B1)

(3)

(b) On the grid, translate triangle Q by the vector $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$

Label the new triangle R.

(1)

(c) Describe fully the single transformation which maps triangle P onto triangle R.

ROTATION, 90° ANTICLOCKWISE (B1) BOTH
CENTRE (3,1) (B1)

(2)

(a) Find the gradient of the line with equation $3x + 4y = 10$

$$\longrightarrow y = mx + c$$

$$4y = 10 - 3x \quad (\text{ml})$$

$$y = \frac{10}{4} - \frac{3}{4}x \quad (\text{ml})$$

$$y = -\frac{3}{4}x + 2.5$$

↑
m

$$\frac{-\frac{3}{4}}{(3)} \quad (\text{AC})$$

(b) Find the coordinates of the point of intersection of the line with equation $3x + 4y = 10$ and the line with equation $5x - 6y = 23$
Show your working clearly.

$$\begin{array}{r} 3x + 4y = 10 \quad \text{--- (1)} \quad \times 3 \\ 5x - 6y = 23 \quad \text{--- (2)} \quad \times 2 \end{array}$$

$$\begin{array}{r} 9x + 12y = 30 \quad \text{--- (3)} \\ 10x - 12y = 46 \quad \text{--- (4)} \end{array} \quad (\text{ml})$$

ADD

$$\begin{array}{r} 19x \quad \quad = 76 \quad (\text{ml}) \end{array}$$

$$x = \frac{76}{19}$$

$$= \underline{4}$$

SUBSTITUTE $x=4$ INTO (1)

$$3 \times 4 + 4y = 10 \quad (\text{ml})$$

$$4y = 10 - 12$$

$$4y = -2$$

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

$$\begin{array}{r} (\text{AC}) \quad (\text{AC}) \\ \underline{4} \quad \underline{-0.5} \\ \text{(5)} \end{array}$$

The grouped frequency table gives information about the ages of 200 elephants.

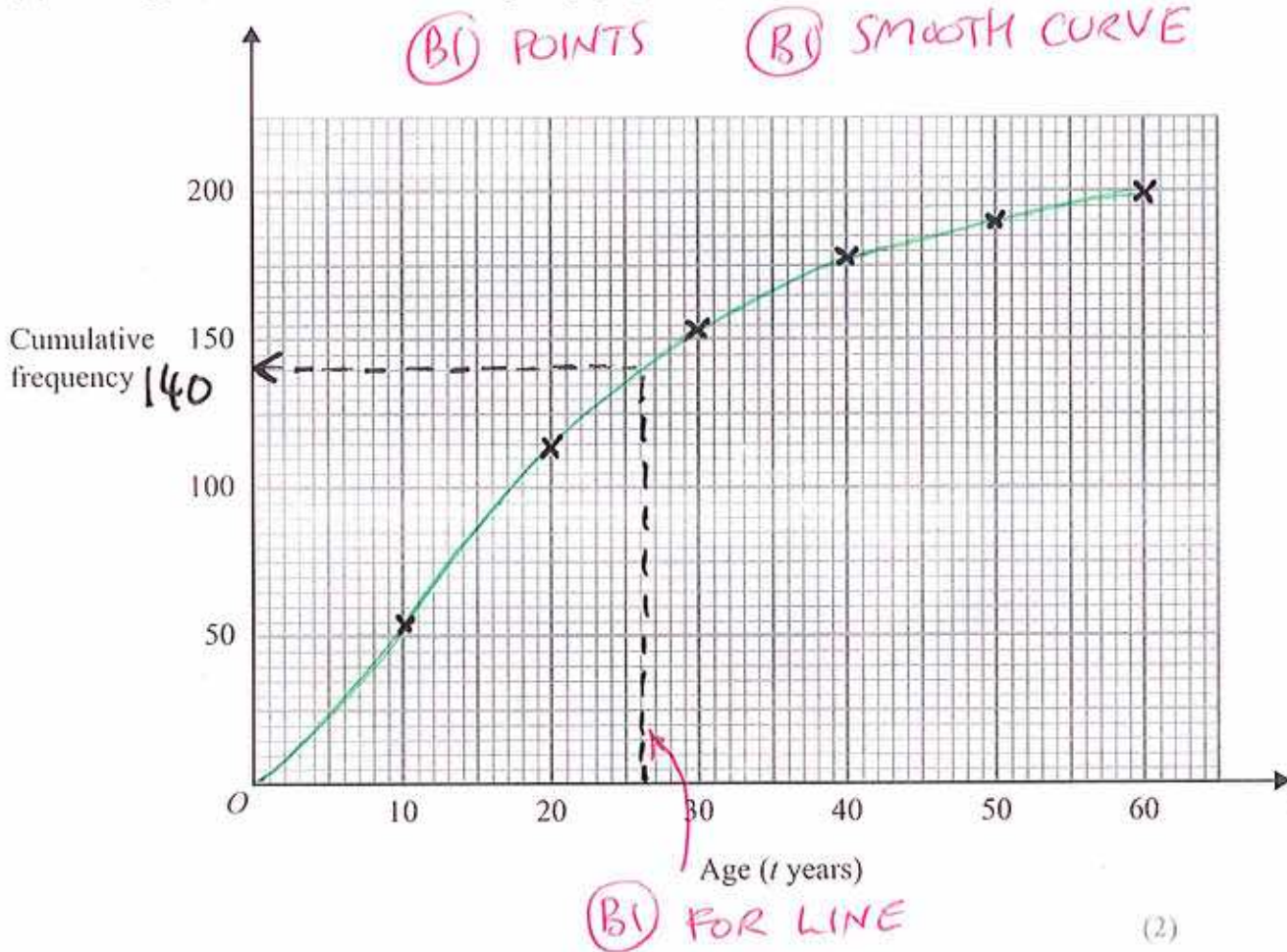
Age (t years)	Frequency
$0 < t \leq 10$	55
$10 < t \leq 20$	60
$20 < t \leq 30$	40
$30 < t \leq 40$	22
$40 < t \leq 50$	13
$50 < t \leq 60$	10

(a) Complete the cumulative frequency table.

Age (t years)	Cumulative frequency
$0 < t \leq 10$	55
$0 < t \leq 20$	115
$0 < t \leq 30$	155
$0 < t \leq 40$	177
$0 < t \leq 50$	190
$0 < t \leq 60$	200

(A1)

(b) On the grid, draw a cumulative frequency graph for your table.



(c) Use the graph to find an estimate for the number of elephants with ages of more than 26 years.

$$\text{LESS THAN 26} = 140$$

$$\begin{aligned} \therefore \text{MORE THAN 26} &= 200 - 140 \\ &= \underline{\underline{60}} \end{aligned}$$

60 (A1)

Solve the inequality $x^2 < 16$

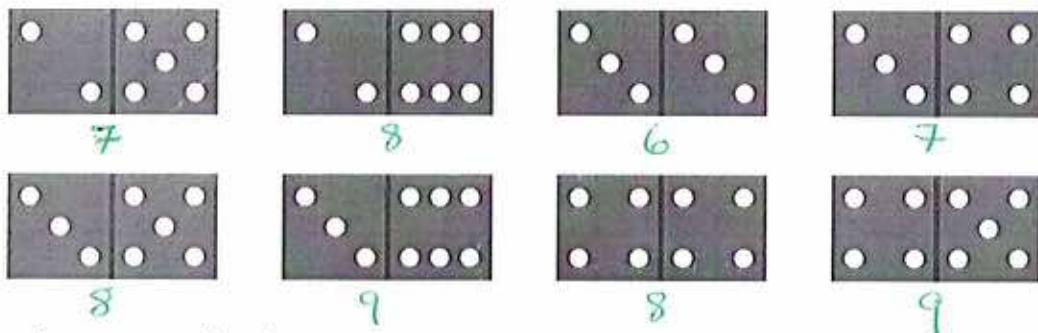
$-\sqrt{16} < x$
 $-4 < x$

$x < +\sqrt{16}$
 $x < +4$

COMBINE!

$-4 < x < 4$

Here are 8 dominoes.



The 8 dominoes are put in a bag.

Riaz takes at random a domino from the bag.

- (a) Find the probability that he takes a domino with a total of 8 spots or a domino with a total of 9 spots.

$$\frac{3}{8} + \frac{2}{8} \quad (\text{mc})$$

$$\frac{5}{8} \quad (\text{AI})$$

Helima takes at random 2 dominoes from the bag of 8 dominoes without replacement.

(b) Work out the probability that

(i) the total number of spots on the two dominoes is 18

ONLY WAY TO GET 18 IS WITH TWO NINES!

$$P(9,9) = \frac{2}{8} \times \frac{1}{7} = \frac{2}{56} \quad \leftarrow \text{[ACCEPT]}$$

(M1)

(A1)

$$\frac{1}{28}$$

(ii) the total number of spots on the two dominoes is 17

$$P(9,8) = \frac{2}{8} \times \frac{3}{7} = \frac{6}{56} \quad \text{(M1)}$$

$$P(8,9) = \frac{3}{8} \times \frac{2}{7} = \frac{6}{56} \quad \text{(M1)}$$

$$\left. \begin{array}{l} P(9,8) \\ P(8,9) \end{array} \right\} \text{TOTAL} = \frac{12}{56} \quad \text{[ACCEPT]}$$

(A1)

$$\frac{3}{14}$$

(5)

$$f(x) = \sqrt{x-6}$$

(a) Find $f(10)$

$$\sqrt{10-6} = \sqrt{4}$$

2 (A1)
(1)

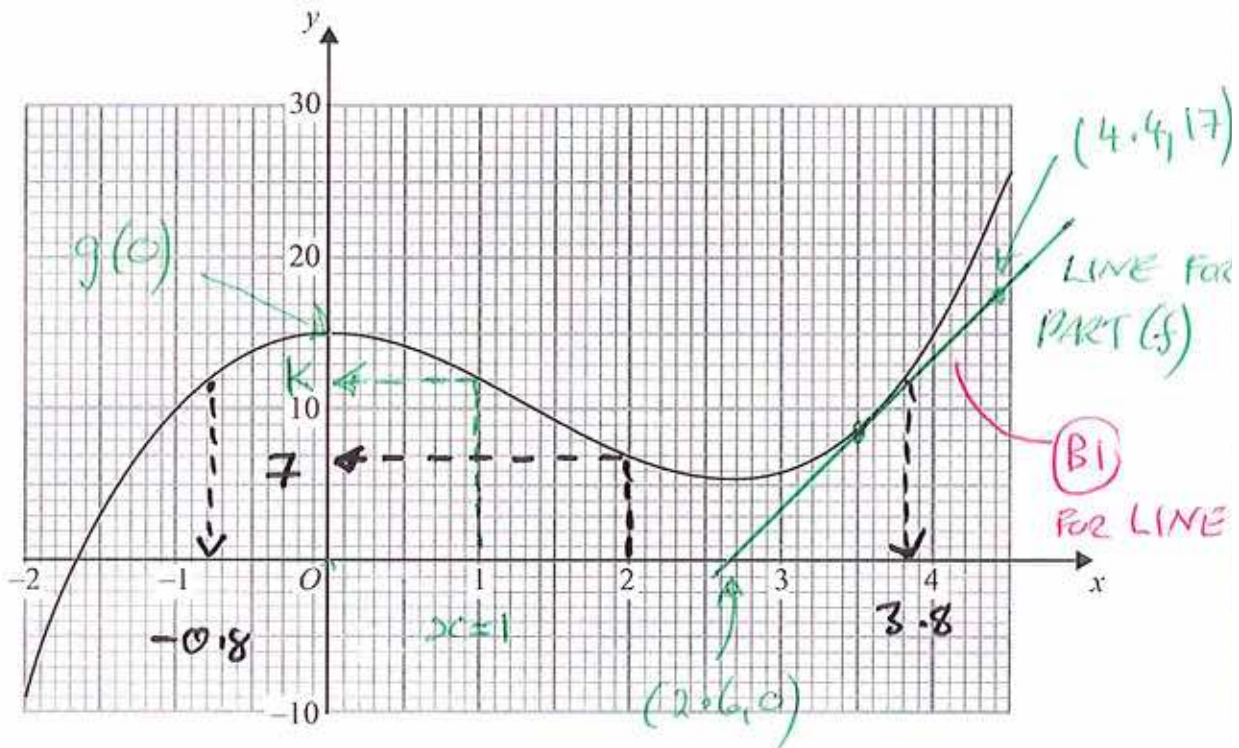
(b) State which values of x must be excluded from a domain of f

EXCLUDE $x-6 < 0$
I.E. $x < 6$

(A2)
 $x < 6$

[A1 FOR SOMETHING (2)
VERY SIMILAR]

The diagram shows part of the graph of $y = g(x)$



(c) Find $g(2)$

7 (A1)
(1)

(d) Find $fg(0)$ $g(0) = 15$ (FROM GRAPH)

$$f(15) = \sqrt{15-6}$$

$$= \sqrt{9}$$

(B1)

3 (A1)

(2)

(e) One of the solutions of $g(x) = k$, where k is a number, is $x = 1$

Find the other solutions.

Give your answers correct to 1 decimal place.

$$k = 12$$
 (FROM GRAPH)

(B1)

\therefore OTHER SOLUTIONS ARE 0.8 AND

(A1)

3.8 (A1)

(3)

(f) Find an estimate for the gradient of the curve at the point where $x = 3.5$

Show your working clearly.

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

$$= \frac{17-0}{4.4-2.6}$$

(M1)

$$= \underline{9.4}$$
 (A1) [ACCEPT ± 2]

9.4 ± 2

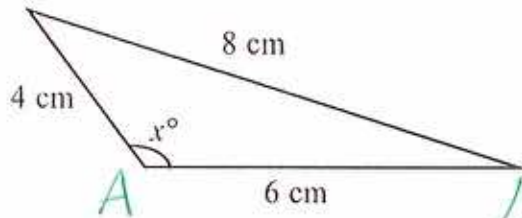


Diagram NOT
accurately drawn

Calculate the value of x .
Give your answer correct to 1 decimal place.

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos x = \frac{4^2 + 6^2 - 8^2}{2 \times 4 \times 6} \quad (M1)$$

$$= -0.25 \quad (A1)$$

$$\Rightarrow x = \cos^{-1}(-0.25)$$

$$= 104.477\dots$$

$$x = \underline{104.5} \quad (A1)$$

9 A and B are two sets.

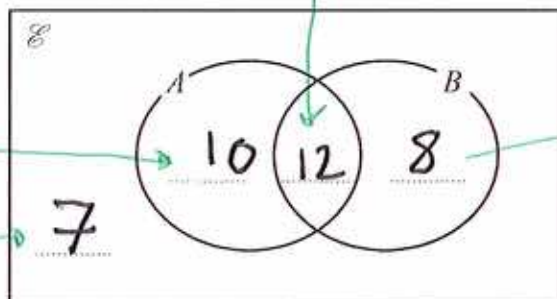
$n(\mathcal{E}) = 37$

$n(A) = 22$ 2ND

$n(A \cap B) = 12$ 1ST

$n(A \cup B) = 30$ 3RD

(a) Complete the Venn Diagram to show the numbers of elements.

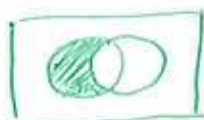


$30 - (10 + 12)$
 (B2) ALL

$(37 - 30)$

(2)

(b) Find (i) $n(A \cap B')$



10 (A1)

(ii) $n(A' \cup B')$



$7 + 10 + 8$

25 (A1)
 (2)

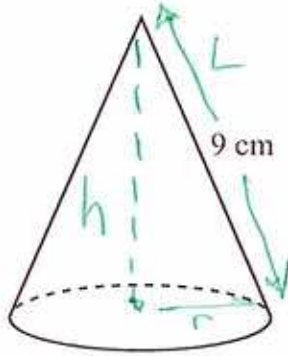


Diagram NOT
accurately drawn

$$CS = \pi r \times L$$

$$\pi \times r \times 9 = 100 \quad (m)$$

$$\Rightarrow r = \frac{100}{9\pi}$$

$$= 3.5367... \quad (AI)$$

$$V = \frac{1}{3} \times \pi r^2 h$$

$$h = \sqrt{9^2 - 3.5367^2} \quad (m)$$

$$= 8.2759... \quad (AI)$$

$$= \frac{1}{3} \times \pi \times (3.5367)^2 \times 8.2759...$$

$$= 108.403...$$

$$\underline{108} \quad (AI) \quad \text{cm}^3$$

A solid cone has a slant height of 9 cm.
The **curved** surface area of the cone is 100 cm².

Calculate the volume of the cone.
Give your answer correct to 3 significant figures.

(a) Simplify $(16y^8)^{\frac{3}{4}}$

$$\begin{aligned}
 & 16^{\frac{3}{4}} \times (y^8)^{\frac{3}{4}} \\
 &= (4\sqrt[4]{16})^3 = y^{8 \times \frac{3}{4}} \\
 &= 2^3 = y^6
 \end{aligned}$$

$$\begin{aligned}
 & \text{(BI)} \quad \text{(BI)} \\
 & \downarrow \quad \downarrow \\
 & \underline{8y^6} \\
 & \quad (2)
 \end{aligned}$$

(b) Given that $2^p \times 8^q = 2^n$

express n in terms of p and q .

$$2^p \times (2^3)^q = 2^n$$

$$\Rightarrow 2^p \times 2^{3q} = 2^n$$

$$2^{p+3q} = 2^n$$

$$\Rightarrow n = p + 3q$$

$$\begin{aligned}
 & \text{(BI)} \quad \text{(BI)} \\
 & n = \underline{p + 3q} \\
 & \quad (2)
 \end{aligned}$$

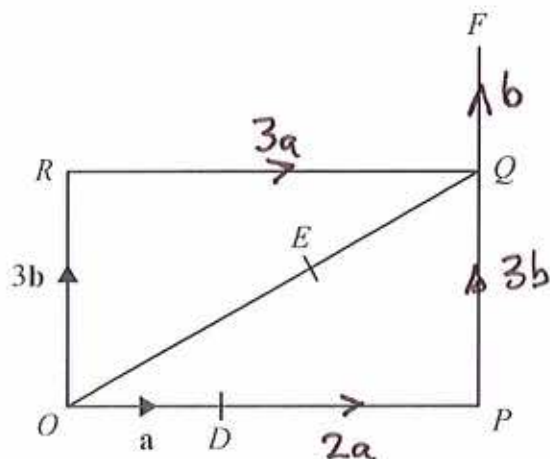


Diagram NOT
accurately drawn

$OPQR$ is a rectangle.

D is the point on OP such that $OD = \frac{1}{3} OP$.

E is the point on OQ such that $OE = \frac{2}{3} OQ$.

PQF is the straight line such that $QF = \frac{1}{3} PQ$.

$$\vec{OD} = \mathbf{a} \quad \vec{OR} = 3\mathbf{b}$$

(a) Find, in terms of \mathbf{a} and \mathbf{b} ,

$$\begin{aligned} \text{(i)} \quad \vec{OQ} &= \vec{OR} + \vec{RQ} \\ &= 3\mathbf{b} + 3\mathbf{a} \end{aligned}$$

$$\underline{3(\mathbf{a} + \mathbf{b})}$$

$$\begin{aligned} \text{(ii)} \quad \vec{OE} &= \frac{2}{3} \vec{OQ} \\ &= \frac{2}{3} \times 3(\mathbf{a} + \mathbf{b}) \\ &= 2(\mathbf{a} + \mathbf{b}) \end{aligned}$$

$$\underline{2(\mathbf{a} + \mathbf{b})}$$

$$\begin{aligned} \text{(iii)} \quad \vec{DE} &= \vec{DO} + \vec{OE} \\ &= -\mathbf{a} + 2(\mathbf{a} + \mathbf{b}) \\ &= -\mathbf{a} + 2\mathbf{a} + 2\mathbf{b} \\ &= \mathbf{a} + 2\mathbf{b} \end{aligned}$$

$$\underline{\underline{\mathbf{a} + 2\mathbf{b}}}$$

(3)