

# 4H

Pearson Edexcel  
International GCSE

# EDEXCEL

# IGCSE

# MATHEMATICS A

# SOLUTIONS

## JUNE 2015

## 4MA0/4H

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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.

A bag contains only red bricks and blue bricks.

There is a total of 20 bricks in the bag.

The probability that a brick taken at random from the bag will be red is  $\frac{2}{5}$

How many blue bricks are there in the bag?

$$\begin{aligned} P(\text{RED}) &= \frac{2}{5} \\ &= \frac{8}{20} \end{aligned} \quad \therefore \overset{\textcircled{AI}}{8} \text{ RED} \quad \Rightarrow \quad \underline{\underline{\overset{\textcircled{AI}}{12} \text{ BLUE}}}$$

$\nearrow$   $\textcircled{MI}$

Pritam, Sarah and Emily share some money in the ratios 3 : 6 : 4  
Sarah gets \$15 more than Emily.

Work out the amount of money that Pritam gets.

$$\begin{array}{ccc} P & : & S & : & E \\ 3 & : & 6 & : & 4 \end{array}$$

┌──────────┐  
\$15

$$\begin{aligned} 1 \text{ PART} &= \frac{15}{2} \\ &= 7.5 \end{aligned}$$

(ml)

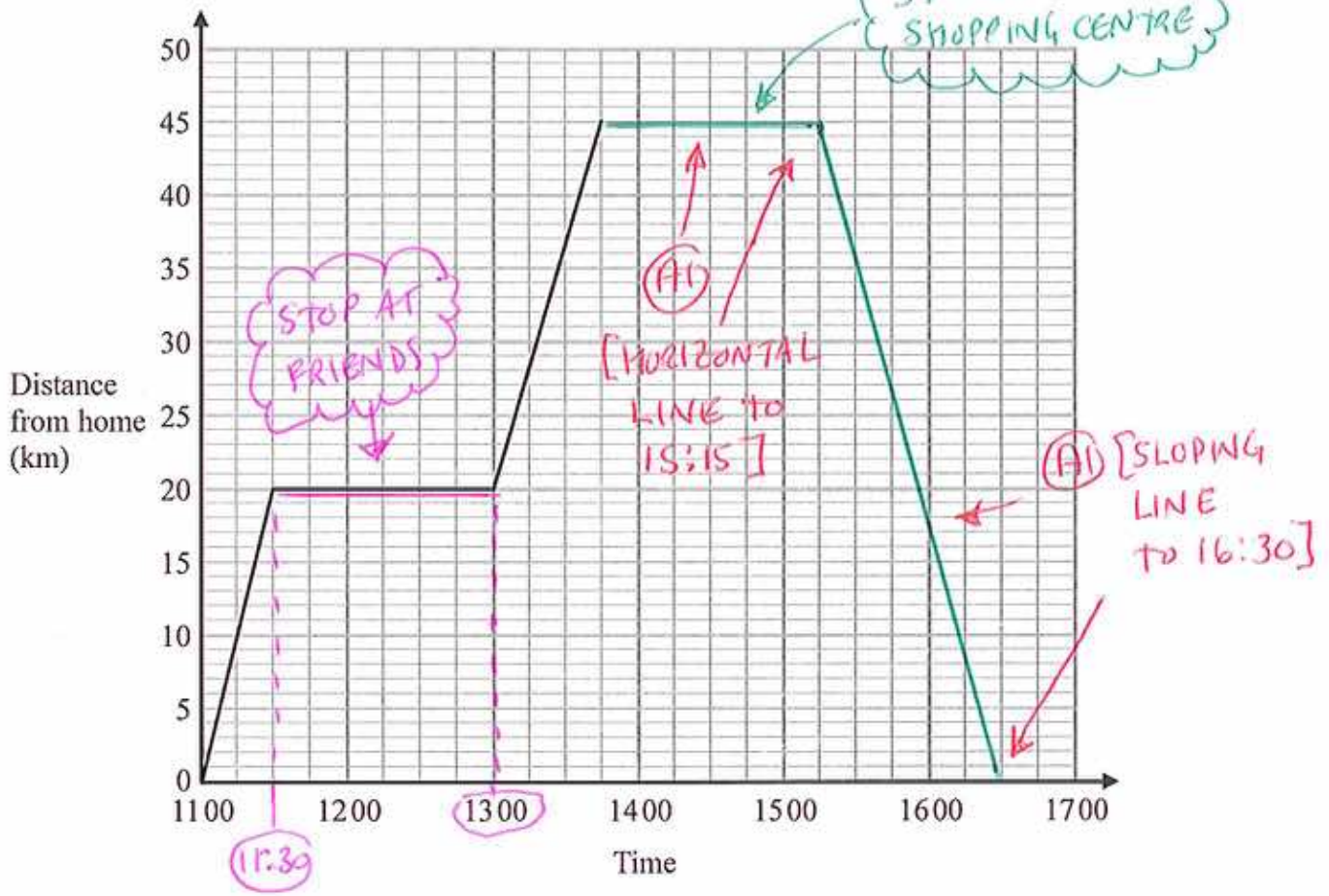
PRITAM GETS

$$\begin{aligned} &7.5 \times 3 \quad (\text{ml}) \\ &= \underline{\underline{\$22.50}} \quad (\text{A1}) \end{aligned}$$

Lia left home at 11 00 to drive to a shopping centre.

On her way, she stopped at a friend's house.

Here is the distance-time graph for her journey to the shopping centre.



(a) (i) For how many minutes did Lia stay at her friend's house?

11:30 UNTIL 13:00

90 (A1) minutes

(ii) How far is it from her friend's house to the shopping centre?

45 - 20

25 (A1) km  
(2)

Lia stayed at the shopping centre for  $1\frac{1}{2}$  hours.

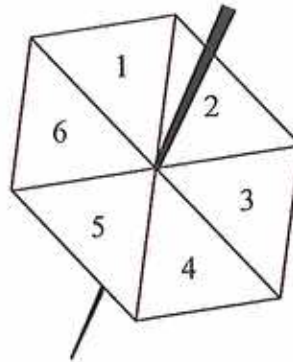
She then drove back home.

She arrived home at 16 30

(b) Show all this information on the distance-time graph.

Becky has a biased 6-sided spinner.  
She spins the spinner 25 times.  
She records the score for each spin.  
The table shows information about her scores.

Score	Frequency
1	9
2	6
3	3
4	2
5	1
6	4



(a) Find her median score.

$$\frac{25+1}{2} = 13\text{TH VALUE}$$

(mi)

$$\frac{2}{2}$$

(2)

(b) Work out her mean score.

$$\frac{1 \times 9 + 2 \times 6 + \dots + 6 \times 4}{25}$$

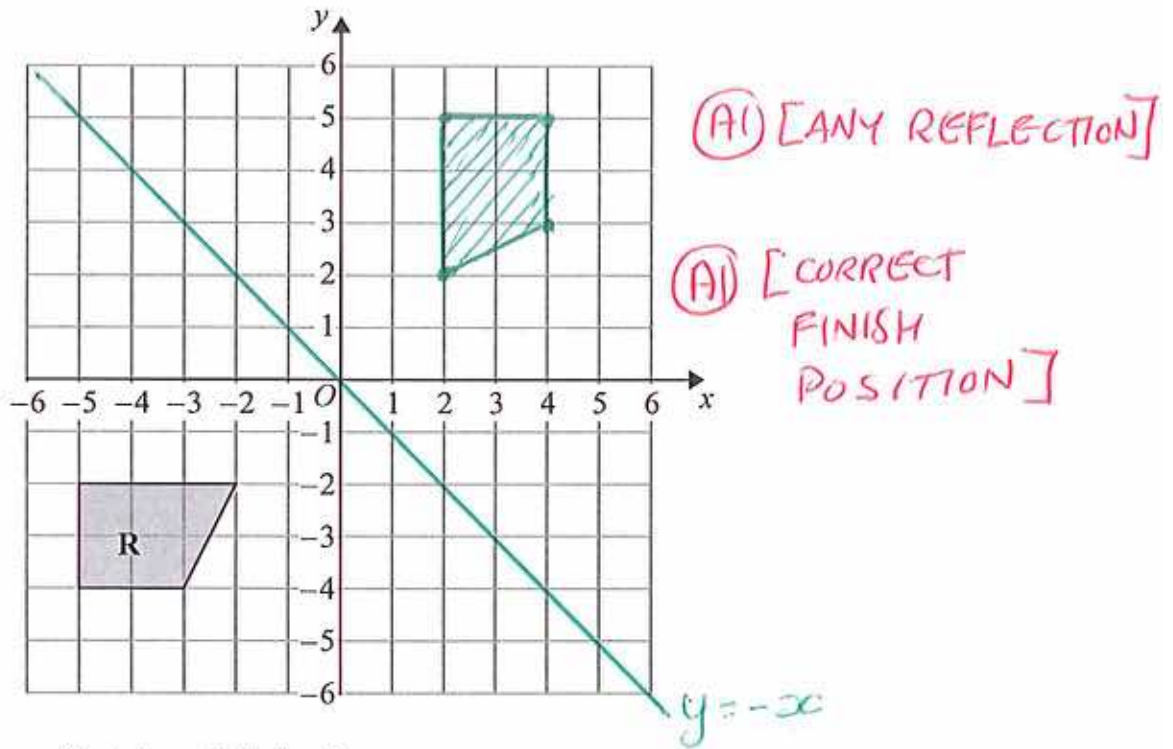
(mi) [EITHER]

$$= \frac{9 + 12 + 9 + 8 + 5 + 24}{25}$$

(mi) [DIVIDE BY 25]

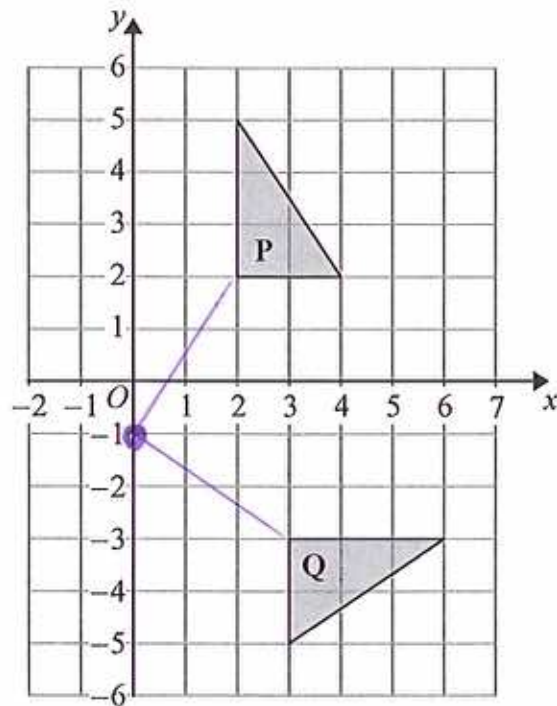
$$= \frac{67}{25}$$

$$= \underline{\underline{2.68}} \quad \text{(AI)}$$



(a) On the grid above, reflect shape **R** in the line  $y = -x$

(2)



(b) Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

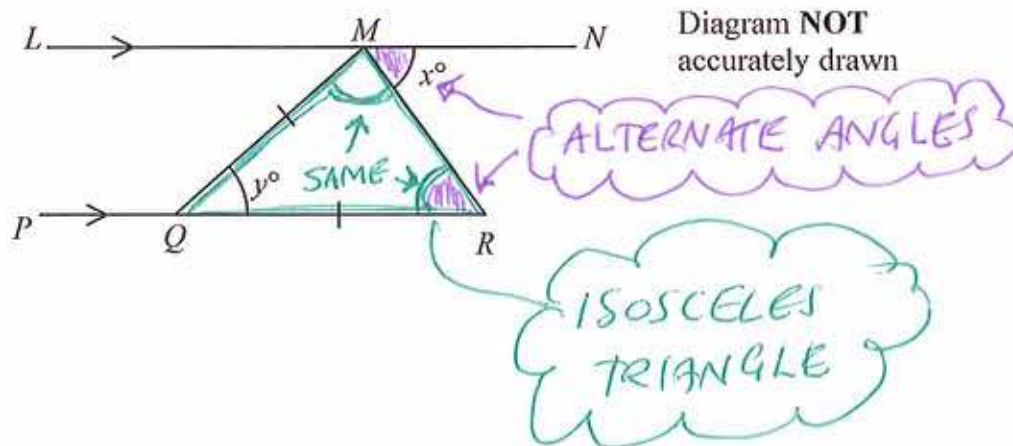
ROTATION, 90° CLOCKWISE, CENTRE (0, -1)

(A1)

(A1)

(A1)

(3)



LMN is parallel to PQR.  
 $QM = QR$ .  
 Angle  $RMN = x^\circ$   
 Angle  $MQR = y^\circ$

(a) Write down an expression for  $y$  in terms of  $x$ .

(M1) [ANY CORRECT IDENTIFICATION OF ALTERNATE ANGLES OR ANGLES IN ISOSCELES TRIANGLE]

(A1)

$$y = \frac{180 - 2x}{2}$$

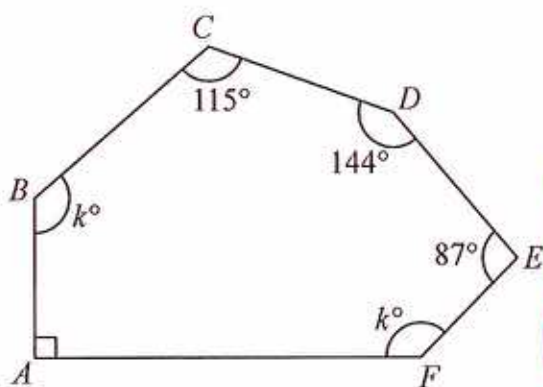


Diagram NOT accurately drawn

INTERIOR ANGLES OF A HEXAGON ADD TO  $720^\circ$

ABCDEF is a hexagon.

(b) Work out the value of  $k$ .

(B1)

$$2k = 720 - (90 + 115 + 144 + 87)$$

$$= 720 - 436$$

$$= 284$$

(M1)

$$\Rightarrow k = \frac{284}{2}$$

$$= \underline{\underline{142}}$$

(A1)

$$k = \underline{\underline{142^\circ}}$$

EITHER LEARN IT OR WORK IT OUT!

(a) Expand  $6(4 - 3y)$ 

$$\frac{24 - 18y}{(1)} \text{ (A1)}$$

(b) Factorise  $e^2 + 4e$ 

$$\frac{e(e + 4)}{(1)} \text{ (A1)}$$

(c) Solve  $7x + 8 = 2x - 3$   
Show clear algebraic working.

$$7x - 2x = -3 - 8 \text{ (M1)}$$

$$5x = -11$$

$$x = -\frac{11}{5}$$

(M1) [EITHER]

$$x = \frac{-2.2}{(3)} \text{ (A1)}$$

(d) Expand and simplify  $(y + 10)(y - 2)$ 

$$y^2 - 2y + 10y - 20 \text{ (M1)}$$

$$\frac{y^2 + 8y - 20}{(2)} \text{ (A1)}$$

(e) Factorise fully  $20e^5 f^2 - 16e^2 f$ 

$$\frac{4e^2 f}{(A1)} (5e^3 f - 4) \text{ (A1)}$$

[ALLOW (A1) FOR  
PARTIAL FACTORISATION]



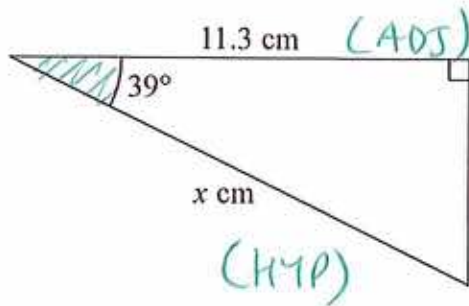


Diagram NOT  
accurately drawn

SOH CAH TOA

Work out the value of  $x$ .

Give your answer correct to 2 decimal places.

$$\cos 39 = \frac{\text{ADJ}}{\text{HYP}}$$

$$\cos 39 = \frac{11.3}{x}$$

$$x = \frac{11.3}{\cos 39}$$

$$= 14.540\dots$$

$$x = 14.54 \text{ cm}$$

(a) Solve the inequalities  $-5 < x + 4 \leq 3$

$$-9 < x \leq -1 \quad [\text{SUBTRACT } 4]$$

$$\frac{\textcircled{A1}}{-9 < x \leq -1}$$

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$$\frac{\textcircled{A1}}{-9 < x \leq -1}$$

(2)

(b)  $n$  is an integer.

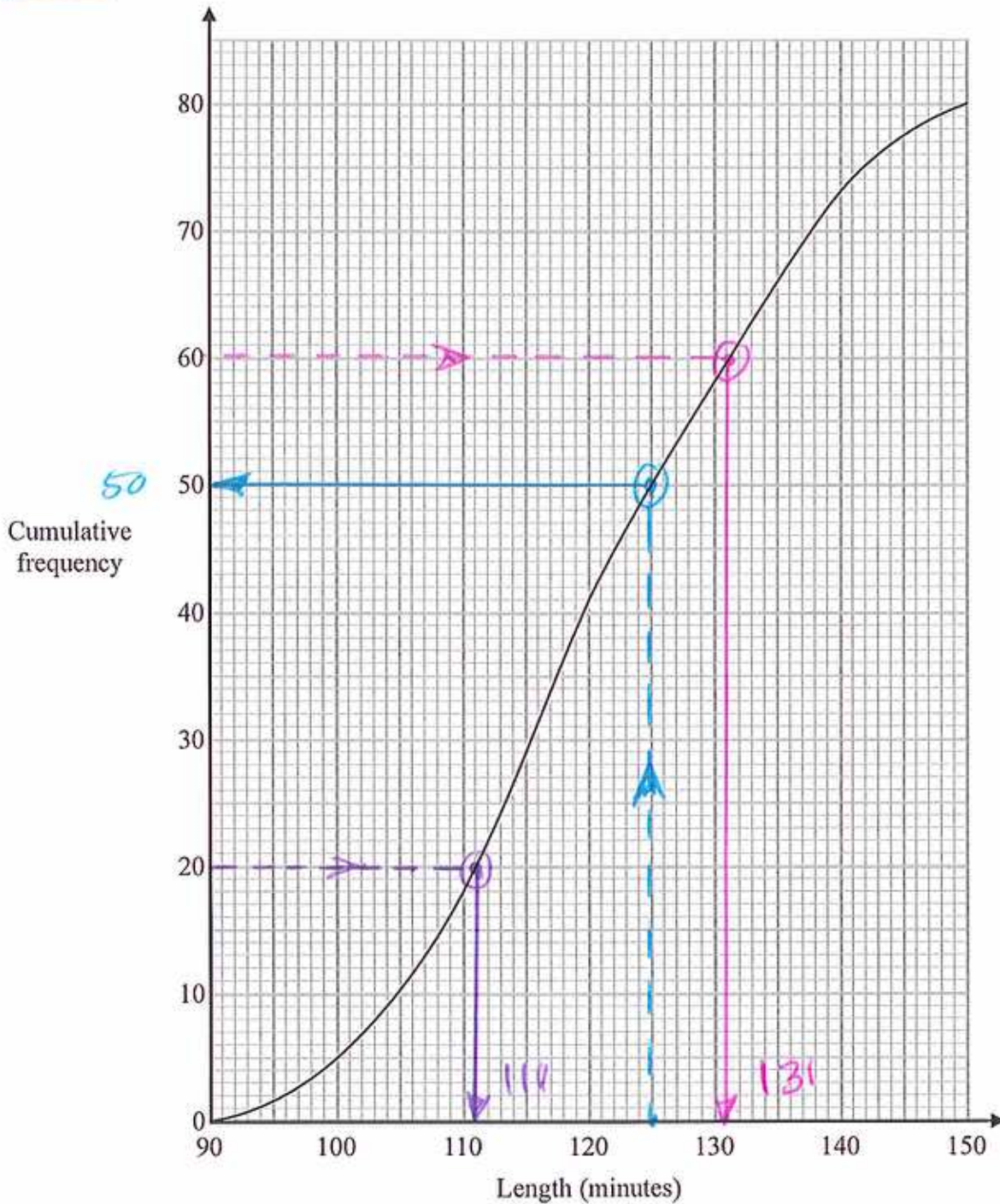
Write down all the values of  $n$  that satisfy  $-3 \leq n < 2$

$$\frac{\textcircled{A2}[-1, 0, 1]}{-3, -2, -1, 0, 1}$$

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(2)

The cumulative frequency graph shows information about the length, in minutes, of each of 80 films.



(a) Find an estimate for the interquartile range.

$$Q_1 = \frac{80}{4}$$

$$= \underline{20}^{\text{th}} \text{ VALUE}$$

$$= 111$$

$$Q_3 = 3 \times \frac{80}{4}$$

$$= \underline{60}^{\text{th}} \text{ VALUE}$$

$$= 131$$

↖ (m) [EITHER] ↗

$$IQR = Q_3 - Q_1$$

$$= 131 - 111$$

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

(b) Find an estimate for the percentage of the 80 films that lasted more than 125 minutes.

LESS THAN 125 MINUTES = 50 (M) 

$\therefore$  MORE THAN 125 MINUTES = 80 - 50 (M)  
= 30 (A)

$x$  is an integer.

The Lowest Common Multiple (LCM) of  $x$  and 12 is 120

The Highest Common Factor (HCF) of  $x$  and 12 is 4

$$\text{HCF} \times \text{LCM} = A \times B$$

Work out the value of  $x$ .

$$12 \times x = \text{HCF} \times \text{LCM}$$

$$\Rightarrow 12x = 4 \times 120 \quad (\text{mi})$$

$$12x = 480$$

$$x = \frac{480}{12}$$

$$= \underline{\underline{40}} \quad (\text{AI})$$

The value of a boat depreciates by 16% each year.  
At the end of 2012, the value of the boat is £65 000

84% = 0.84

Work out the value of the boat at the end of 2015

THREE YEARS

$$65\,000 \times 0.84^3$$

(ml) (BI)

(AI)

$$£ 38\,525.76$$

[ACCEPT CORRECTLY ROUNDED ANSWERS]

Solve  $3x^2 + 2x - 7 = 0$

Give your solutions correct to 3 significant figures.

Show your working clearly.

$$a = 3, b = 2, c = -7$$

USE

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

$$x = \frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-7)}}{2(3)}$$

(M1) [CORRECT SUBSTITUTIONS]

$$= \frac{-2 \pm \sqrt{4 + 84}}{6}$$

(M2) [SIMPLIFYING]

$$\underline{\underline{1.23}}$$

$$\underline{\underline{-1.90}}$$

(A1) [BOTH ANSWERS]

L and M are two mathematically similar prisms.

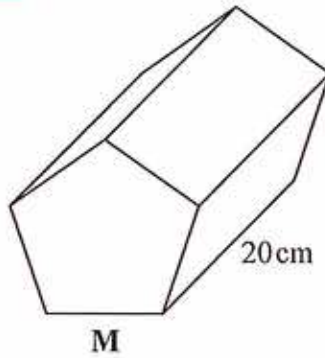
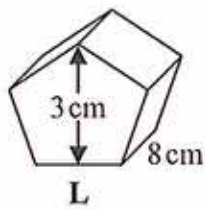


Diagram NOT accurately drawn

Prism L has length 8 cm.  
Prism M has length 20 cm.

SCALE FACTOR =  $\frac{20}{8} = 2.5$

Prism L has height 3 cm.

(a) Work out the height of prism M.

$$3 \times 2.5 = 7.5$$

(B1)

7.5 (A1) cm  
(2)

Prism M has a volume of 1875 cm<sup>3</sup>

(b) Work out the volume of prism L.

$$\frac{1875}{2.5^3} = 120$$

(B1)

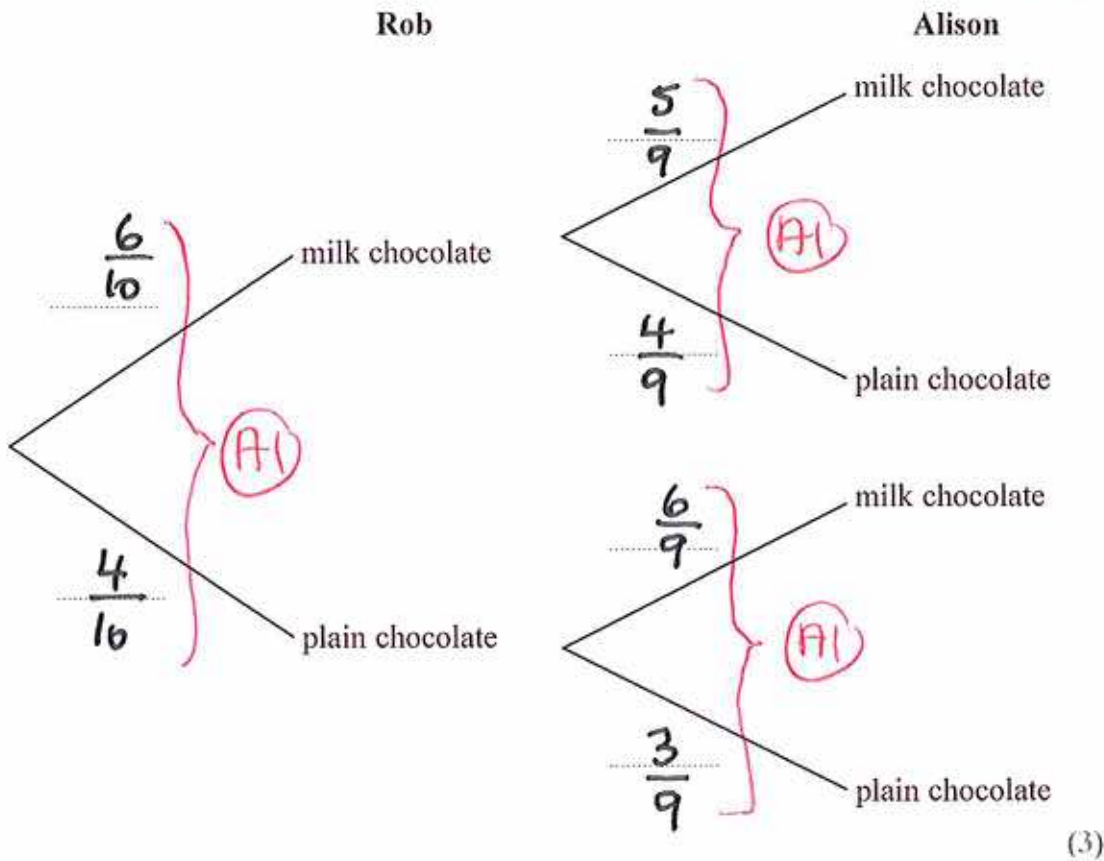
120 (A1) cm<sup>3</sup>  
(2)



There are 6 milk chocolates and 4 plain chocolates in a box. Rob takes at random a chocolate from the box and eats it. Then Alison takes at random a chocolate from the box and eats it.

PROBABILITIES CHANGE!

(a) Complete the probability tree diagram.



(b) Work out the probability that there are now exactly 3 plain chocolates in the box.

AT START THERE WERE 4 PLAIN CHOCOLATES.

∴ WE WANT TO EAT JUST ONE PLAIN CHOCOLATE

$$\begin{aligned}
 P(PM) &= \frac{4}{10} \times \frac{6}{9} = \frac{24}{90} \\
 P(MP) &= \frac{6}{10} \times \frac{4}{9} = \frac{24}{90}
 \end{aligned}
 \left. \vphantom{\begin{aligned} P(PM) \\ P(MP) \end{aligned}} \right\} \text{TOTAL} = \frac{48}{90}$$

↑  
 (m) [BOTH OUTCOMES]      (m) [MULTIPLYING]

$$= \frac{8}{15}$$

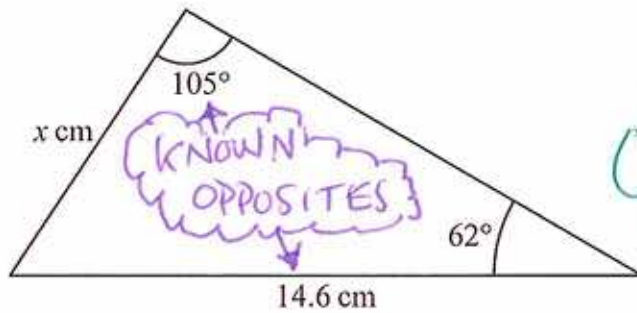


Diagram **NOT**  
accurately drawn

NON-RIGHT ANGLED

Work out the value of  $x$ .

Give your answer correct to 1 decimal place.

$$\frac{x}{\sin 62} = \frac{14.6}{\sin 105} \quad (M1) \Rightarrow x = \frac{14.6}{\sin 105} \times \sin 62 \quad (M1)$$

$$= 13.3457\dots$$

$$x = \underline{13.3 \text{ cm}} \quad (A1)$$

$ABCD$  is a parallelogram.

$$\vec{BC} = \begin{pmatrix} 5 \\ -1 \end{pmatrix} \quad \vec{DC} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

Find  $\vec{BD}$  as a column vector.

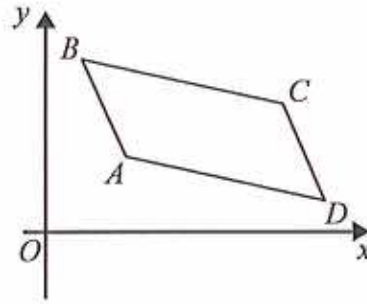


Diagram NOT  
accurately drawn

$$\begin{aligned} \vec{BD} &= \vec{BC} + \vec{CD} \\ &= \begin{pmatrix} 5 \\ -1 \end{pmatrix} + \begin{pmatrix} 2 \\ -3 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 7 \\ -4 \end{pmatrix} \begin{matrix} (A) \\ (A) \end{matrix}$$

A and B are two sets.

$n(\mathcal{E}) = 36$  → [4TH] → [2ND]  
 $n(B) = 21$  → [2ND]  
 $n(A \cap B) = 8$  → [1ST]  
 $n(A') = 18$  → [3RD]

(a) Complete the Venn diagram to show the number of elements in each region of the Venn diagram.

(3)

(b) Find  $n(A \cup B)$



$$10 + 8 + 13$$

$$\begin{array}{r} 31 \text{ (AI)} \\ \hline (1) \end{array}$$

(c) Find  $n(A \cap B')$



$$\begin{array}{r} 10 \text{ (AI)} \\ \hline (1) \end{array}$$

(a) Show that  $(5 - \sqrt{8})(7 + \sqrt{2}) = 31 - 9\sqrt{2}$

Show each stage of your working.

$$\begin{aligned}
 (5 - \sqrt{8})(7 + \sqrt{2}) &= 35 + 5\sqrt{2} - 7\sqrt{8} - \sqrt{8}\sqrt{2} && \text{(M1)} \\
 &= 35 + 5\sqrt{2} - 7 \times 2\sqrt{2} - \sqrt{16} && \text{(M1)} \\
 &= 35 - 9\sqrt{2} - 4 && \text{(M1)} \\
 &= \underline{\underline{31 - 9\sqrt{2}}} && \text{(M1)}
 \end{aligned}$$

(3)

Given that  $c$  is a prime number,

(b) rationalise the denominator of  $\frac{3c - \sqrt{c}}{\sqrt{c}}$

Simplify your answer.

$$\begin{aligned}
 \frac{3c - \sqrt{c}}{\sqrt{c}} \times \frac{\sqrt{c}}{\sqrt{c}} &= \frac{3c\sqrt{c} - \sqrt{c}\sqrt{c}}{\sqrt{c}\sqrt{c}} \\
 &= \frac{3c\sqrt{c} - c}{c} && \text{(M1)} \\
 &= \frac{c(3\sqrt{c} - 1)}{c} \\
 &= \underline{\underline{3\sqrt{c} - 1}} && \text{(A1)}
 \end{aligned}$$

$n$  is a positive integer.

(a) Explain why  $2n + 1$  is an odd number for all values of  $n$ .

$2n$  WILL ALWAYS BE EVEN BECAUSE

IT IS A MULTIPLE OF 2. THEREFORE

$2n + 1$  MUST ALWAYS BE ODD

(A1)

(1)

(b) Show, using algebra, that the sum of any 4 consecutive odd numbers is always a multiple of 8

LET THE FIRST ODD NUMBER BE  $2n+1$   
WHERE  $n$  IS AN INTEGER AND  $n \geq 0$ .

$\therefore$  SUM OF FOUR CONSECUTIVE ODDS IS...

$$(2n+1) + (2n+3) + (2n+5) + (2n+7) \quad (B1)$$

$$= 8n + 16 \quad (B1)$$

$$= 8(n+2) \quad (B1)$$

SINCE  $n$  IS AN INTEGER, ANSWER IS  
A MULTIPLE OF 8

$$y = x^3 + 6x^2 + 5$$

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

$$\frac{dy}{dx} = \frac{3x^2 + 12x}{(2)}$$

The curve with equation  $y = x^3 + 6x^2 + 5$  has two turning points.

(b) Work out the coordinates of these two turning points.  
Show your working clearly.

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

$$3x^2 + 12x = 0 \quad (M1)$$

$$\Rightarrow x^2 + 4x = 0$$

$$x(x+4) = 0$$

$$x = \underline{\underline{0}}$$

$$x = \underline{\underline{-4}} \quad (A1) [BOTH]$$

$$\Rightarrow y = 0^3 + 6 \times 0^2 + 5$$

$$= \underline{\underline{5}}$$

$$y = (-4)^3 + 6(-4)^2 + 5 \quad (M1)$$

$$= \underline{\underline{37}} \quad (A1) [BOTH]$$

$$\underline{\underline{(0, 5) \text{ AND } (-4, 37)}} \quad (4)$$

The diagram shows two triangles, A and B.



The area of triangle B is 3 times the area of triangle A.

Given that  $b > 4$ , find an expression for  $a$  in terms of  $b$ .

$$\frac{(b+2)(a+1)}{2} = 3 \times \left[ \frac{1}{2} ab \sin 150 \right] \quad \text{(M1) [EQUATION]}$$

$$(b+2)(a+1) = 6 \times \left[ \frac{1}{2} ab \times \frac{1}{2} \right] \quad \text{(B1) [EVALUATE SIN 150]}$$

$$(b+2)(a+1) = \frac{3}{2} ab$$

$$ab + b + a + 2 = \frac{3}{2} ab$$

$$\left. \begin{aligned} \frac{3}{2} ab - ab - a &= b + 2 \\ \Rightarrow \frac{1}{2} ab - a &= b + 2 \end{aligned} \right\} \text{(M1) [EITHER; a ON LHS]}$$

$$\Rightarrow \frac{1}{2} ab - a = b + 2$$

$$\Rightarrow a(0.5b - 1) = b + 2 \quad \text{(M1) [FACTORISING]}$$

$$\Rightarrow \underline{\underline{a = \frac{b+2}{0.5b-1}}} \quad \text{(A1)}$$



$$\begin{aligned} \text{Solve } x^2 + y^2 &= 20 & \text{--- (1)} \\ y &= 10 - 2x & \text{--- (2)} \end{aligned}$$

Show clear algebraic working.

$$x^2 + (10 - 2x)^2 = 20 \quad \text{(M1) [SUBSTITUTING (2) INTO (1)]}$$

$$x^2 + (10 - 2x)(10 - 2x) = 20$$

$$x^2 + 100 - 20x - 20x + 4x^2 = 20 \quad \text{(M1) [EXPANDING BRACKETS]}$$

$$x^2 + 4x^2 - 20x - 20x + 100 - 20 = 0$$

$$5x^2 - 40x + 80 = 0 \quad \text{(M1) [EITHER]}$$

$$x^2 - 8x + 16 = 0$$

$$(x - 4)(x - 4) = 0 \quad \text{(M1) [FACTORISING]}$$

$$\begin{aligned} &\swarrow \\ x &= 4 \\ &= \end{aligned}$$

$$\begin{aligned} &\searrow \\ x &= 4 \quad \text{[IDENTICAL ROOTS]} \end{aligned}$$

SUBSTITUTE INTO (2)

$$\begin{aligned} y &= 10 - 2(4) \\ &= 10 - 8 \\ &= \underline{\underline{2}} \end{aligned}$$

$$x = 4, y = 2 \quad \text{(A1) [BOTH]}$$