# 4H

# EDEXCEL IGCSE

**Pearson Edexcel International GCSE**

# MATHEMATICS A

# SOLUTIONS

**JANUARY 2015** | **4MA0/4H**

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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.

Becky counted the number of matches in each of 50 boxes. NOTE THE 50 BOXES
The table shows information about her results.

| Number of matches | Frequency | $x \times f$ |
|---|---|---|
| 45 | 3 | 135 |
| 46 | 7 | 322 |
| 47 | 12 | 564 |
| 48 | 23 | 1104 |
| 49 | 4 | 196 |
| 50 | 1 | 50 |
| | $\Sigma f = 50$ | $\Sigma = 2371$ |

M1

Work out the mean number of matches.

MEAN = $\frac{\text{TOTAL NUMBER OF MATCHES}}{\text{NUMBER OF BOXES}}$

$= \frac{2371}{50}$ M1

$= 47.42$ A1

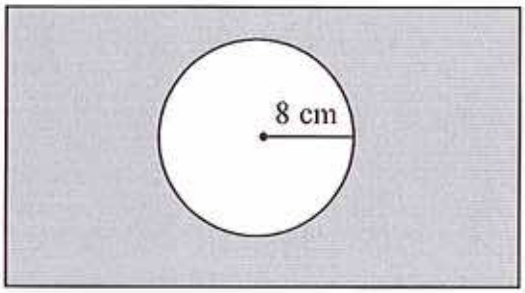



Diagram **NOT** accurately drawn

The diagram shows a circle inside a rectangle.

Work out the area of the shaded region.
Give your answer correct to 3 significant figures.

RECTANGLE

$32 \times 17 = 544$

CIRCLE

$\pi \times 8^2 = 201.06...$

(M) EITHER

SUBTRACT $= 342.93...$

(M1)

343 (A1)

..... $cm^2$

A bag contains only red counters, blue counters and yellow counters.
The number of red counters in the bag is the same as the number of blue counters. → P(R) = P(B)

Mikhail takes at random a counter from the bag.
The probability that the counter is yellow is 0.3

Work out the probability that the counter Mikhail takes is red.

$1 - 0.3 = 0.7$ (M1)

(M1) $\frac{0.7}{2} = 0.35$ (A1)

On the grid, draw the graph of $y = 3x - 4$ for values of $x$ from $-2$ to $3$

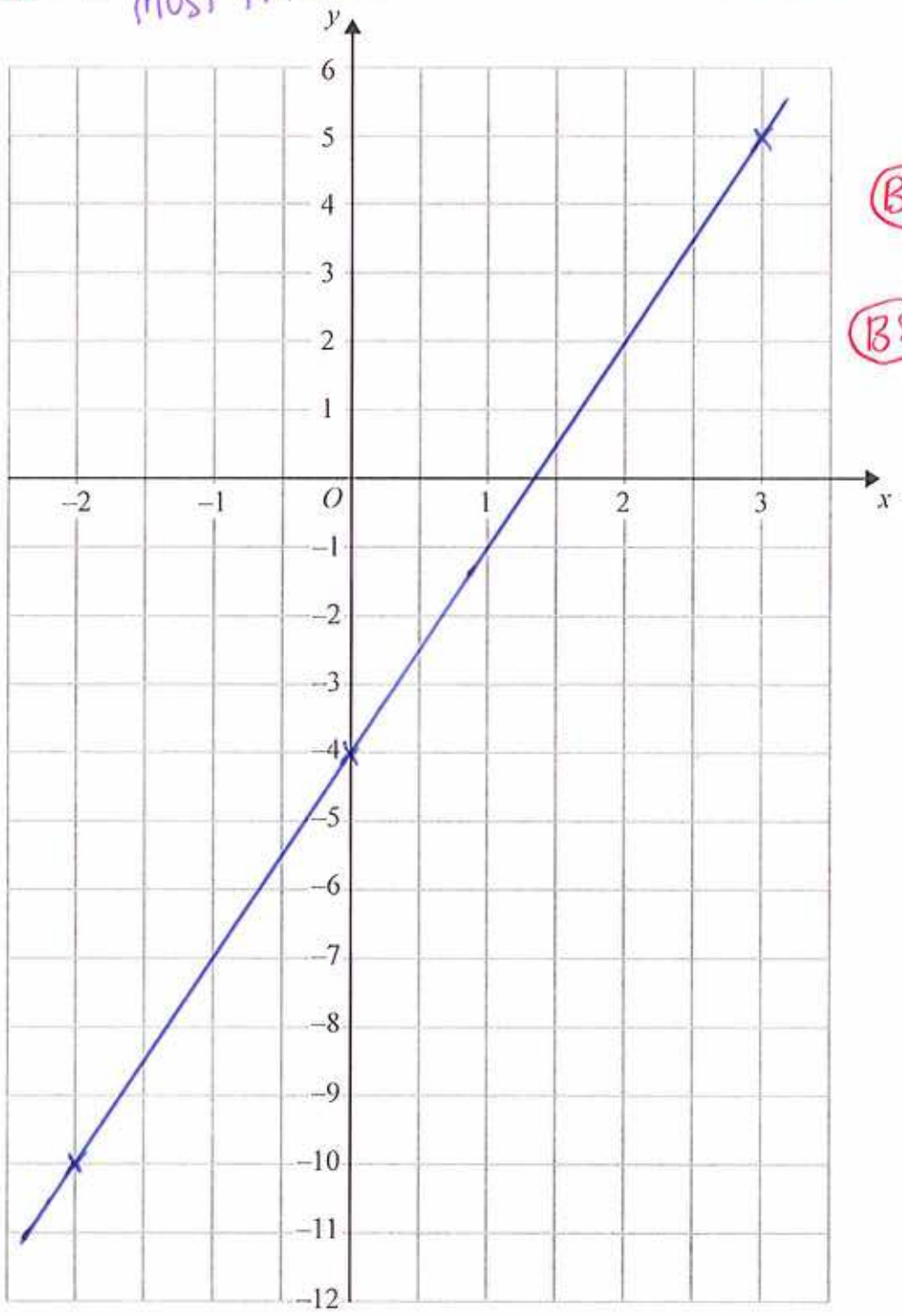
(B1) [TABLE OR EQUIVALENT]

| $x$ | $-2$ | $0$ | $3$ |
|---|---|---|---|
| $y$ | $-10$ | $-4$ | $5$ |

MUST HAVE $x=-2$ AND $x=3$

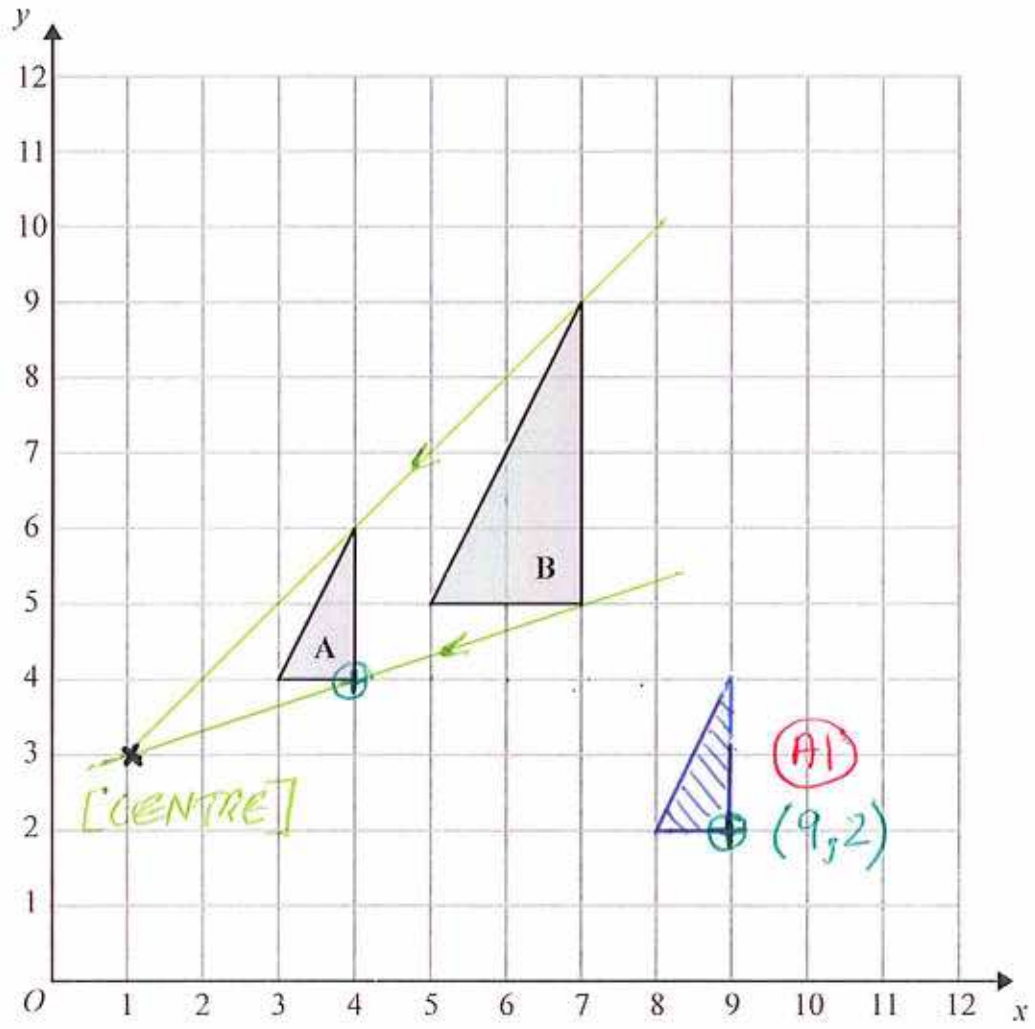
$y = 3(-2) - 4$
$= -10$

ETC...




(B1) POINTS

(B2) FULL LINE




(a) Describe fully the single transformation that maps triangle A onto triangle B.

ENLARGEMENT, B1
SCALE FACTOR = 2, CENTRE (1,3) B1
B1

(3)

(b) On the grid, translate triangle A by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$

(1)

$\mathscr{E}$ = {positive whole numbers less than 19}
$A$ = {odd numbers} → {1, 3, 5, 7, 9, 11, 13, 15, 17}
$B$ = {multiples of 5} → {5, 10, 15}
$C$ = {multiples of 4} → {4, 8, 12, 16}

(a) List the members of the set

(i) $A \cap B$

A1
{5, 15}

(ii) $B \cup C$

{4, 5, 8, 10, 12, 15, 16}

(2) A1

$D$ = {prime numbers} → {2, 3, 5, 7, 11, 13, 17}

(b) Is it true that $B \cap D = \varnothing$ ?

Tick (✓) the appropriate box.

| Yes | No |
|---|---|
| ☐ | ☑ |

Explain your answer.

BECAUSE '5' IS IN BOTH SETS B AND D

A1

(1)

Lisa, Max and Punita share £240 in the ratio 3 : 4 : 8 — THIS IS THE TOTAL

How much more money than Lisa does Punita get?

L : M : P TOTAL

3 : 4 : 8 15

$\frac{240}{15} = 16$ (B1)

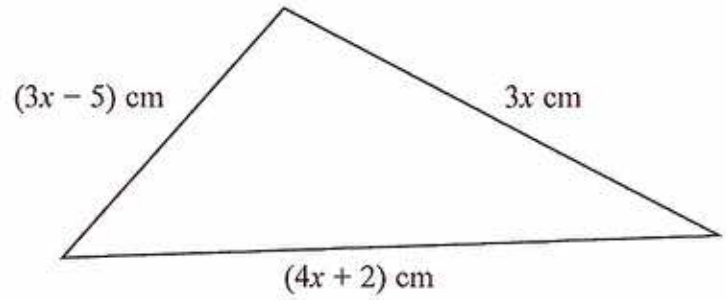
PUNITA = 16 × 8 = 128

LISA = 16 × 3 = 48 (B1)

128 − 48 = £80 (A1)

The diagram shows a triangle.

Diagram **NOT** accurately drawn




The lengths of the sides of the triangle are $3x$ cm, $(3x - 5)$ cm and $(4x + 2)$ cm.

The perimeter of the triangle is 62 cm.

Work out the value of $x$.
Show clear algebraic working.

$(3x-5)+(4x+2)+3x = 62$ M1

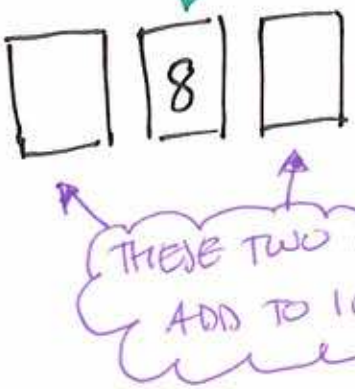
$\Rightarrow 10x - 3 = 62$ M1

$10x = 65$ M1

$x = 6.5$ A1

Three positive whole numbers are all different.
The numbers have a median of 8 and a mean of 6
Find the three numbers.

TOTAL = 6 × 3
= 18




POSSIBLES:

0 8 10 ✗ ZERO IS NOT POSITIVE

1 8 9

2 8 8 ✗ NOT ALL DIFFERENT

B1 8 IS MEDIAN

B1 ALL POSITIVE AND ADD TO 18

1, 8, 9

(a) Solve the inequality $3x + 8 < 35$

$3x < 35 - 8$ M1

$3x < 27$

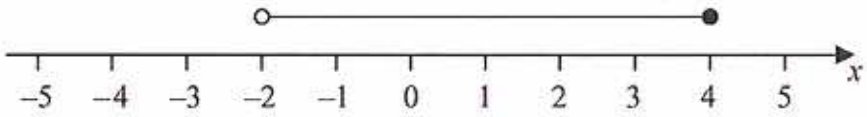
$x < 9$

A1

$x < 9$

(2)

(b) Write down the inequality shown on the number line.




A1 A1

$-2 < x \leq 4$

(2)

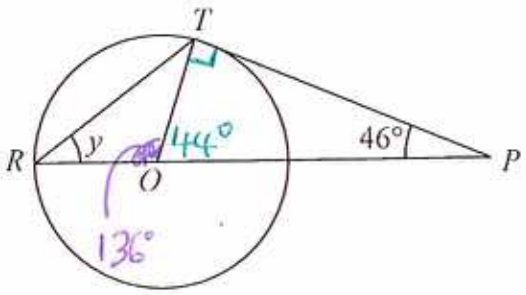



Diagram **NOT** accurately drawn

*R* and *T* are points on a circle, centre *O*.
*ROP* is a straight line.
*PT* is a tangent to the circle.
Angle *TPO* = 46°

(a) Explain why angle *OTP* = 90°

BECAUSE OT IS A RADIUS AND PT IS A TANGENT (A1)

(1)

(b) Work out the size of angle *y*.

ROT = 180 - 44

= 136° (B1)

$y = \frac{180 - 136}{2}$ (M1)

= 22° (A1)

(a) Factorise $c^2 - 5c$

A1 A1

$c(c-5)$

(2)

(b) Simplify $d^5 \times d^7$

A1 $d^{12}$

(1)

(c) Factorise $x^2 + x - 30$

A1 FOR 6 AND 5

A1 FOR CORRECT + AND − $(x+6)(x-5)$

(2)

(d) Make $b$ the subject of $P = \frac{1}{2}ab^2$

$2P = ab^2$

$b^2 = \frac{2P}{a}$ M1

$b = \sqrt{\frac{2P}{a}}$ A1

(2)

(e) Solve $\frac{2x+1}{3} + \frac{x-5}{2} = 4$

Show clear algebraic working.

$2(2x+1) + 3(x-5) = 4 \times 3 \times 2$ M1

$4x + 2 + 3x - 15 = 24$ M1

$7x - 13 = 24$ M1

$7x = 37$

$x = \frac{37}{7}$

$= 5\frac{2}{7}$ A1

(a) Write 0.000076 in standard form.

0.000076

5 PLACES

A1

$7.6 \times 10^{-5}$

(1)

The area covered by the Pacific Ocean is $1.6 \times 10^8$ km$^2$
The area covered by the Arctic Ocean is $1.4 \times 10^7$ km$^2$

(b) Write $1.6 \times 10^8$ as an ordinary number.

A1

160 000 000

(1)

The area covered by the Pacific Ocean is $k$ times the area covered by the Arctic Ocean.

(c) Find, correct to the nearest integer, the value of $k$.

$$\frac{\text{PACIFIC}}{\text{ARCTIC}} = \frac{1.6 \times 10^8}{1.4 \times 10^7}$$ M1

$$= 11.428...$$

A1

$k =$ 11

(2)

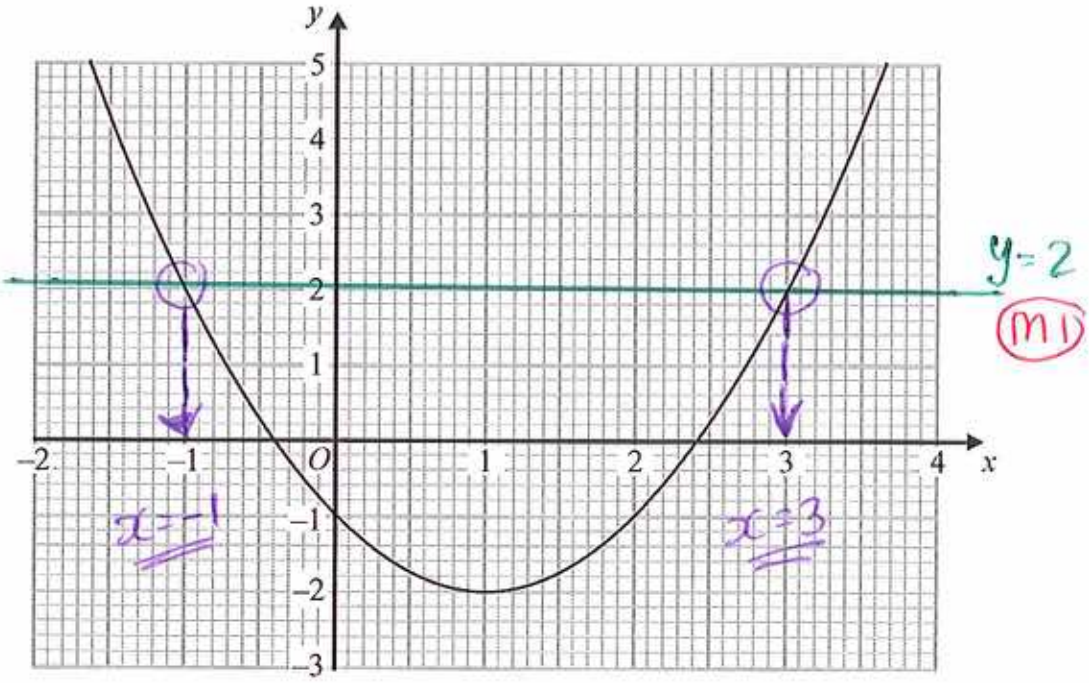
Kwo invests HK$ 40000 for 3 years at 2.5% per year compound interest.
Work out the value of the investment at the end of 3 years.

1·025

$40\,000 \times 1{\cdot}025^3$

HK$ 43 075·63

Here is the graph of $y = x^2 - 2x - 1$




(a) Use the graph to solve the equation $x^2 - 2x - 1 = 2$

CURVE THAT'S ALREADY DRAWN

$y = 2$ (STRAIGHT LINE)

$x = -1, x = 3$ (2) A1

The equation $x^2 + 5x - 7 = 0$ can be solved by finding the points of intersection of the line $y = ax + b$ with the graph of $y = x^2 - 2x - 1$

(b) Find the value of $a$ and the value of $b$.

$x^2 - 2x - 1 = ax + b$

$\Rightarrow x^2 - 2x - ax - 1 - b = 0$

$x^2 + 5x - 7 = 0$

$-1 - b = -7 \Rightarrow b = 6$

$-2x - ax = 5x$

$-2 - a = 5$

$-a = 7$

A1

$a = -7$

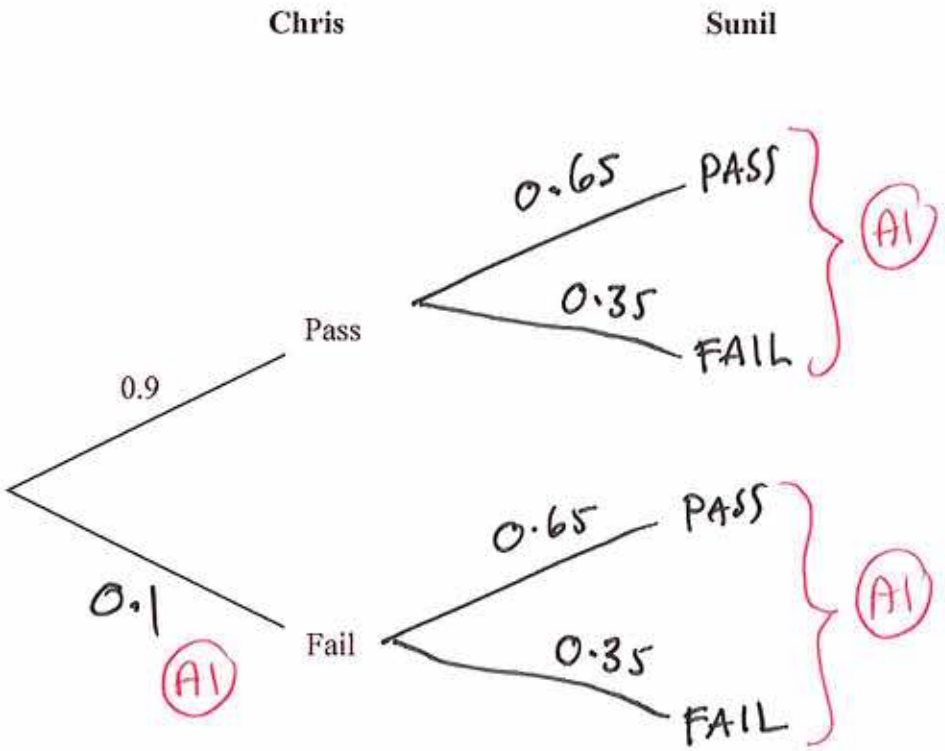
$b = 6$

A1

Chris and Sunil each take a driving test.

The probability that Chris passes the driving test is 0.9
The probability that Sunil passes the driving test is 0.65

(a) Complete the probability tree diagram.




(3)

(b) Work out the probability that exactly one of Chris or Sunil passes the driving test.

$P(C, \bar{S}) = 0.9 \times 0.35 = 0.315$

M1 [ADDING]

$P(\bar{C}, S) = 0.1 \times 0.65 = 0.065$

TOTAL $= 0.38$

A1

M1 ADDING

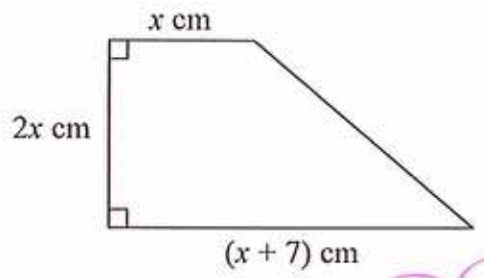



Diagram **NOT** accurately drawn

The diagram shows a trapezium.
The trapezium has an area of 17 cm²

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

(a) Show that $2x^2 + 7x - 17 = 0$

$\frac{1}{2}(x + x+7) \times 2x = 17$ (B1) [EQUATION]

$x(2x+7) = 17$ (m1) [SIMPLIFY]

$2x^2 + 7x = 17$ (m1) [EXPAND BRACKETS]

$\Rightarrow 2x^2 + 7x - 17 = 0$ QED!

(b) Work out the value of $x$.
Give your answer correct to 3 significant figures.
Show your working clearly.

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

$a = 2,\ b = 7,\ c = -17$

$x = \frac{-(7) \pm \sqrt{(7)^2 - 4(2)(-17)}}{2(2)}$ (m1) [CORRECT SUBSTITUTIONS]

$= \frac{-7 \pm \sqrt{49+136}}{4}$

$\rightarrow -5.15$

(m1) [TWO ANSWERS]

[-VE ANSWER IS NOT POSSIBLE!]

$\rightarrow 1.65$

(A1)

$x = 1.65$

(3)

An athlete runs 400 metres, correct to the nearest metre.
The athlete takes 50.2 seconds, correct to the nearest 0.1 of a second.

Work out the upper bound of the athlete's average speed.
Give your answer correct to 3 significant figures.

$400 \pm 0.5$

$50.2 \pm 0.05$

M1 [ANY!]

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

$$= \frac{400 + 0.5}{50.2 - 0.05}$$ M1 [UPPER / LOWER]

$= 7.986...$

7.99 m/s A1

$\mathbf{a} = \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 1 \\ 7 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -7 \\ 0 \end{pmatrix}$

(a) Write, as a column vector, 2a

$2\underline{a} = 2 \times \begin{pmatrix} 5 \\ -2 \end{pmatrix}$ A1

$\begin{pmatrix} 10 \\ -4 \end{pmatrix}$

(1)

(b) Write, as a column vector, 3b – c

$3 \times \begin{pmatrix} 1 \\ 7 \end{pmatrix} - \begin{pmatrix} -7 \\ 0 \end{pmatrix} = \begin{pmatrix} 3 \\ 21 \end{pmatrix} - \begin{pmatrix} -7 \\ 0 \end{pmatrix}$ M1

3 − −7

21 − 0

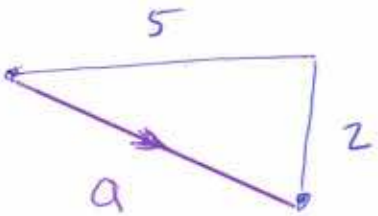
A1

$\begin{pmatrix} 10 \\ 21 \end{pmatrix}$

(2)

(c) Work out the magnitude of a
Give your answer as a surd.

USE PYTHAGORAS




M1

$a^2 = 5^2 + 2^2$

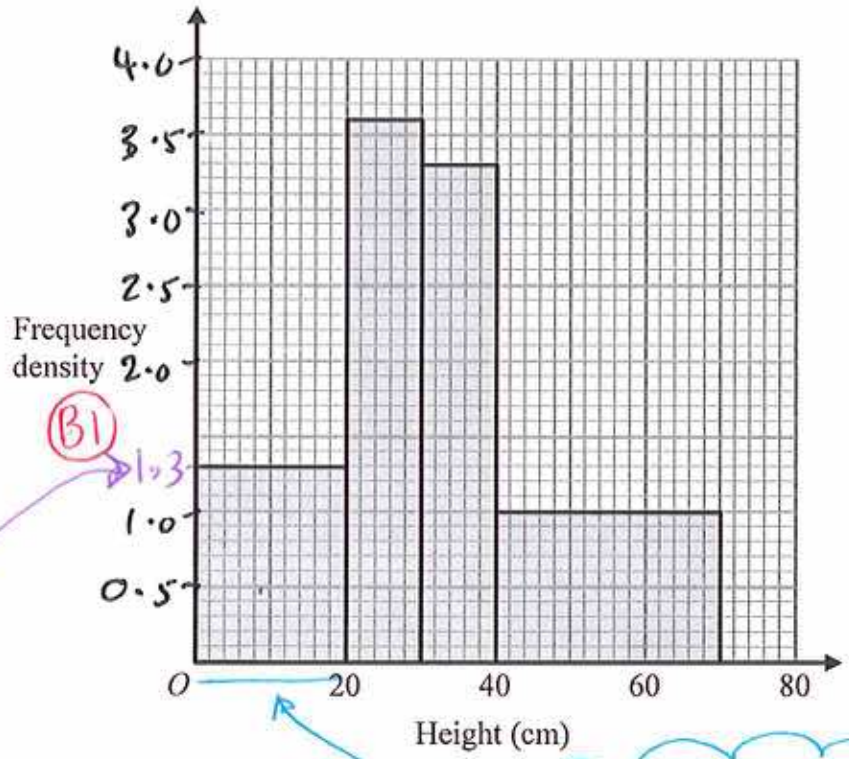
$= 25 + 4$

$= 29$

MAGNITUDE MEANS 'SIZE'

$\Rightarrow a = \sqrt{29}$ A1

The histogram shows information about the heights of some tomato plants.




B1

26 plants have a height of less than 20 cm.

AREA OF 1ST BAR IS 26!

Work out the total number of tomato plants.

1ST

AREA = WIDTH × HEIGHT

$\Rightarrow$ HEIGHT = $\frac{\text{AREA}}{\text{WIDTH}}$

$= \frac{26}{20}$

$= 1.3$

AREA OF ALL THE BARS! [2ND]

$20 \times 1.3 = 26$
$10 \times 3.6 = 36$
$10 \times 3.3 = 33$
$30 \times 1.0 = 30$

M1

TOTAL 125 A1

The diagram shows a cylinder and a sphere.

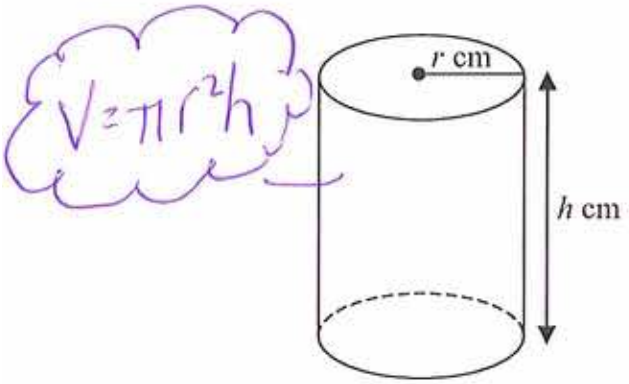
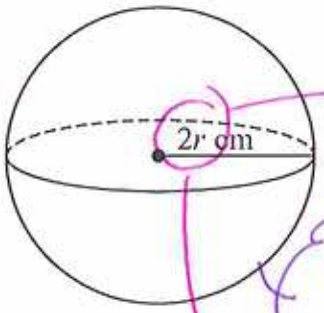



Diagram **NOT** accurately drawn




$V = \pi r^2 h$

NOTE!

$V = \frac{4}{3}\pi r^3$

BUT $r = 2r$!

The cylinder has radius $r$ cm and height $h$ cm.
The sphere has radius $2r$ cm.

The volume of the cylinder is equal to the volume of the sphere.
Find an expression for $h$ in terms of $r$.
Give your answer in its simplest form.

$$\pi r^2 h = \frac{4}{3}\pi (2r)^3 \quad \text{(M1)}$$

$$\Rightarrow \pi r^2 h = \frac{4}{3}\pi \times 8r^3$$

$$\Rightarrow h = \frac{4}{3} \times 8r \quad \text{(M1)} \qquad (\div \pi r^2)$$

$$\Rightarrow h = \frac{32}{3} r \quad \text{(A1)}$$

(a) Write $\frac{1}{32}$ as a power of 2

$\frac{1}{32} = \frac{1}{2^5}$ (B1) $= 2^{-5}$ (A1)

(b) Show that $(4 + \sqrt{12})(5 - \sqrt{3}) = 14 + 6\sqrt{3}$
Show each stage of your working clearly.

$(4+\sqrt{12})(5-\sqrt{3})$

$= 20 - 4\sqrt{3} + 5\sqrt{12} - \sqrt{3}\sqrt{12}$ (M1)

$= 20 - 4\sqrt{3} + 5 \times 2\sqrt{3} - \sqrt{36}$ (B1)

$= 20 + 6\sqrt{3} - 6$ (B1) [EITHER]

$= 14 + 6\sqrt{3}$

Write $5-(x+2)\div\left(\frac{x^2-4}{x-3}\right)$ as a single fraction.

Simplify your answer fully.

$5-(x+2)\times\frac{(x-3)}{x^2-4}$ (M1) [CHANGING TO MULTIPLY]

$=5-\frac{(x+2)\times(x-3)}{(x+2)(x-2)}$ (B1) [FACTORISING]

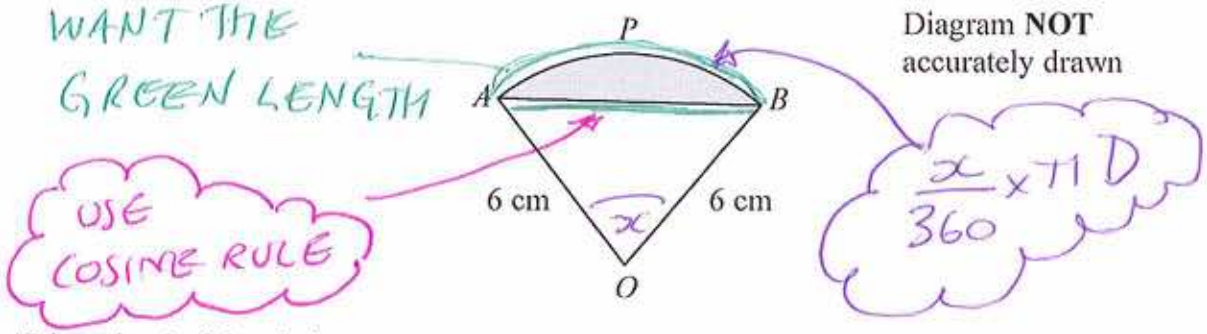
$=5-\frac{x-3}{x-2}$

$=\frac{5(x-2)-(x-3)}{x-2}$ (M1) [SINGLE FRACTION]

$=\frac{5x-10-x+3}{x-2}$

$=\frac{4x-7}{x-2}$ (A1)

The diagram shows a sector $OAPB$ of a circle, centre $O$.




$AB$ is a chord of the circle.
$OA = OB = 6$ cm.

The area of sector $OAPB$ is $5\pi$ cm$^2$

Calculate the perimeter of the shaded segment.
Give your answer correct to 3 significant figures.

STEP 1:

$\frac{x}{360} \times \pi \times 6^2 = 5\pi$ (M1)

$\Rightarrow \frac{x}{360} \times 36 = 5$

$\Rightarrow x = \frac{5 \times 360}{36}$

$= 50^\circ$ (B1)

STEP 2:

ARC APB

$= \frac{50}{360} \times \pi \times 12$

$= \frac{5}{3}\pi$ (B1)

STEP 3:

$AB^2 = 6^2 + 6^2 - 2 \times 6 \times 6 \times \cos 50$ (M1)

$= 25.719\ldots$

$\Rightarrow AB = 5.0714$ (A1)

TOTAL $= 5.0714 + \frac{5}{3}\pi = 10.3$ cm (A1)