

3H

Pearson Edexcel
International GCSE

EDEXCEL

IGCSE

MATHEMATICS A

SOLUTIONS

MAY 2013

4MA0/3H

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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.

The table shows information about the mark scored on an examination question by each of 40 students.

Mark (x)	Number of students (f)	$x \times f$
0	13	0
1	2	2
2	3	6
3	8	24
4	14	56

$$\text{TOTAL} = \underline{\underline{88}} \quad (M)$$

Work out the mean mark.

$$\text{MEAN} = \frac{\text{TOTAL MARKS}}{\text{TOTAL NO. OF STUDENTS}}$$

$$= \frac{88}{40}$$

$$= \underline{\underline{2.2}} \quad (A)$$

(a) Work out the value of $\frac{\sqrt{7.4}}{9.8 - 2.1}$ $\rightarrow 2.72029\dots$ (mi)

Give your answer as a decimal.

Write down all the figures on your calculator display.

YOU DON'T NEED
TO SEE THIS

(AD)

0.3532849
(2)

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

0.35 (AD)
(1)

(a) Multiply out $6(n-2)$

$$\frac{6n-12}{(1)} \quad \text{(AI)}$$

(b) Factorise $p^2 - 5p$

$$\frac{p(p-5)}{(2)} \quad \text{(AI)} \quad \text{(AI)}$$

(c) Solve $\frac{7x-3}{2} = x$

Show clear algebraic working.

$$7x-3 = 2x \quad \text{(MI)}$$

$$7x-2x = 3$$

$$5x = 3 \quad \text{(AI)}$$

$$x = \frac{3}{5} \quad \text{(0.6)}$$

$$x = \frac{0.6}{(3)} \quad \text{(AI)}$$

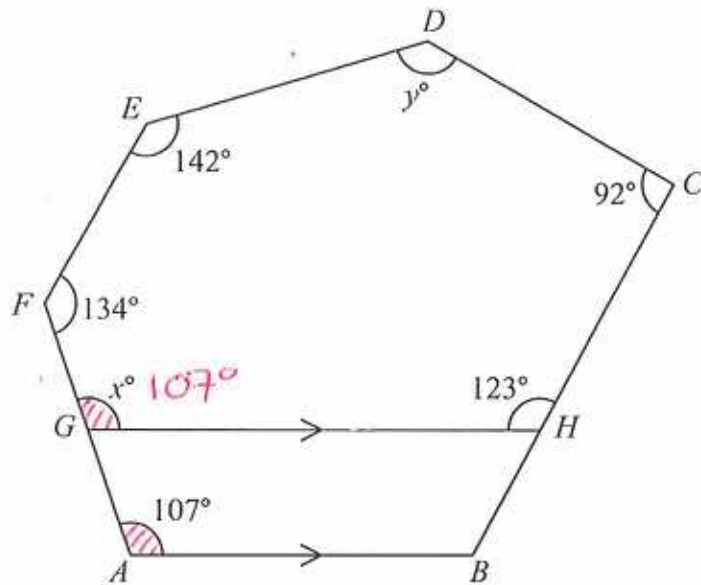


Diagram **NOT**
accurately drawn

$ABCDEF$ is a hexagon.

G is a point on AF .

H is a point on BC .

GH is parallel to AB .

(a) Give a reason why $x = 107$

x AND 107° ARE CORRESPONDING ANGLES

(1)

(b) Work out the value of y .

SUM OF ANGLES IN A HEXAGON = 6×180
= 720°

$$\begin{array}{r}
 107 \\
 134 \\
 142 \\
 92 \\
 + 123 \\
 \hline
 598 \\
 \hline
 \end{array}$$

$$720 - 598 = \underline{\underline{122^\circ}}$$

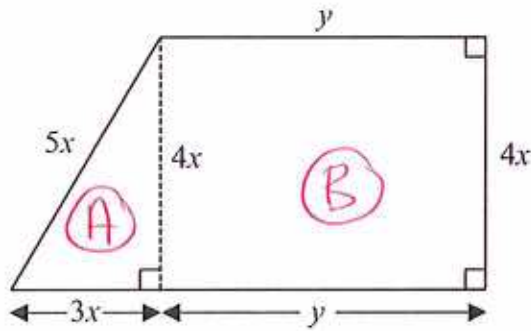


Diagram NOT
accurately drawn

The shape in the diagram is made from a rectangle and a right-angled triangle.
The diagram shows, in terms of x and y , the lengths, in centimetres, of the sides of the rectangle and of the triangle.

The perimeter, P cm, of the shape is given by the formula

$$P = 12x + 2y$$

(a) Work out the value of x when $P = 43$ and $y = 6.5$

$$43 = 12x + 2 \times 6.5 \quad (M1)$$

$$43 = 12x + 13$$

$$12x = 43 - 13 \quad (M1)$$

$$= 30$$

$$x = \frac{30}{12}$$

$$= \underline{\underline{2.5}}$$

$$x = \frac{2.5}{(3)} \quad (A1)$$

(b) Find, in terms of x and y , a formula for the area, A cm², of the shape.
Give your answer as simply as possible.

$$(A) = \frac{3x \times 4x}{2} = 6x^2$$

$$(B) = 4x \times y = 4xy$$

$$\text{TOTAL} = \underline{\underline{6x^2 + 4xy}} \quad (A1)$$

$$2x(3x + 2y)$$

An airline increases the prices of its flights by 8%. $\rightarrow 1.08$

- (a) Before the increase, the price of a flight to Cairo was £475

Work out the price of a flight to Cairo after the increase.

$$475 \times 1.08$$

(mi) ← (BI)

$$\begin{array}{r} \text{£ } 513 \\ \hline (3) \end{array} \quad \text{(AV)}$$

- (b) The increase in price of a flight to Mumbai was £48

Work out the price of a flight to Mumbai after the increase.

$$\frac{48}{0.08} = 600 \quad \text{(ORIGINAL PRICE)}$$

(BI)

$$\begin{array}{r} 600 \\ + 48 \\ \hline 648 \end{array} \quad \text{(mi)}$$

$$\begin{array}{r} \text{£ } 648 \\ \hline (3) \end{array} \quad \text{(AV)}$$

$$E = \{s, q, u, a, l, o\}$$

$$F = \{a, e, l, u, o\}$$

List the members of the set

(i) $E \cap F$

INTERSECTION

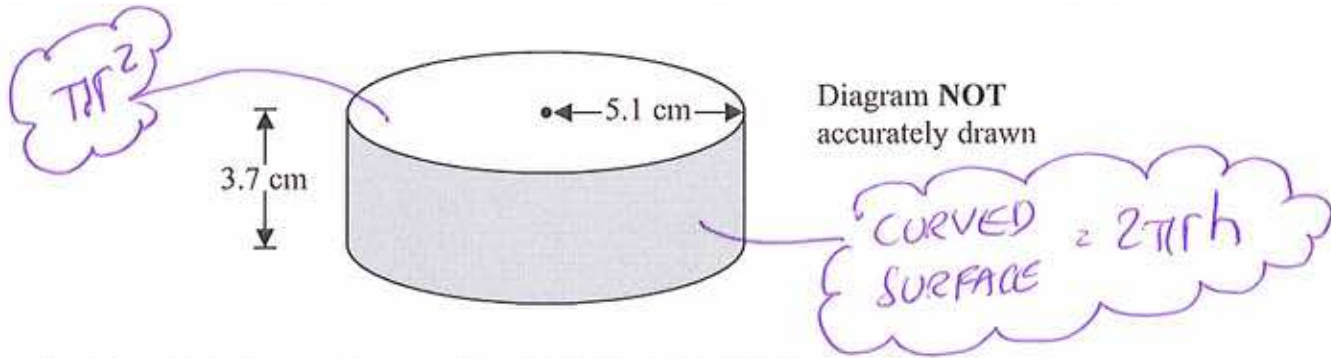
$E \cup F$

UNION

$\{a, e, u\}$ (AI)

$\{s, q, u, a, l, e, i, o\}$

[ANY ORDER] (AI)



A solid cylinder has a radius of 5.1 cm and a height of 3.7 cm.

Work out the total surface area of the cylinder.

Give your answer correct to 3 significant figures.

$$\begin{aligned} \underline{\underline{\text{TOP}}} &= \pi \times 5.1^2 = 81.712... \quad (M1) \\ \underline{\underline{\text{BOTTOM}}} &= 81.712... \\ \underline{\underline{\text{CURVED SURFACE}}} &= 2 \times \pi \times 5.1 \times 3.7 = 118.56... \quad (B1) \end{aligned} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \text{TOTAL} \\ = 281.98... \end{array}$$

282 cm^2 (A1)

The number of runners in the London Marathon on 25th April, 2010 was 37 527.

Work out an estimate for the number of these runners whose birthday was on that day.

$$\begin{array}{r} \textcircled{M1} \quad 37\ 527 \\ \hline 365 \end{array} \quad \begin{array}{r} 22 \\ 365\ 00 \quad \leftarrow \textcircled{B1} \\ \hline 365 \quad \leftarrow \textcircled{B1} \end{array}$$

$$\begin{array}{r} 22 \\ \hline 100 \end{array}$$

100 $\textcircled{A1}$

(ACCEPT ANY REASONABLE APPROXIMATIONS)

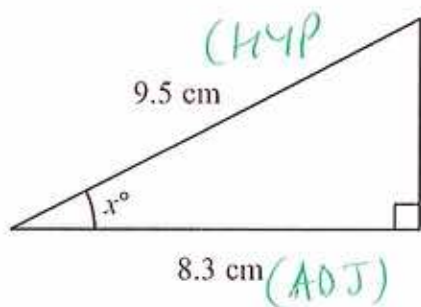


Diagram NOT
accurately drawn

Work out the value of x .

Give your answer correct to 1 decimal place.

SOH CAH TOA

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

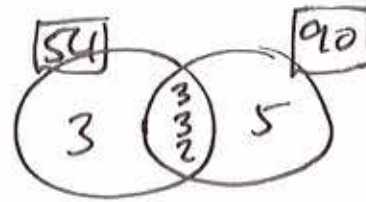
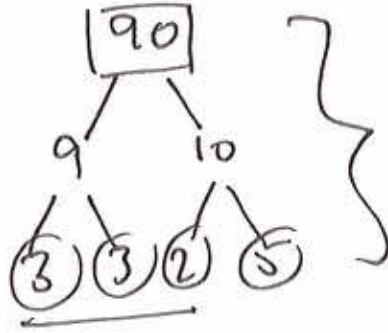
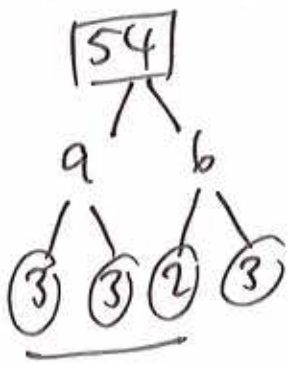
$$\cos x = \frac{8.3}{9.5}$$

$$x = \cos^{-1}\left(\frac{8.3}{9.5}\right)$$

$$= 29.1103\dots$$

$$x = \underline{29.1}$$

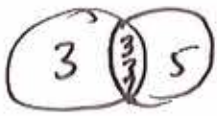
(a) Find the Highest Common Factor (HCF) of 54 and 90



HCF = $3 \times 3 \times 2$
 (mi)

$\frac{18}{(2)}$ (AI)

(b) Find the Lowest Common Multiple (LCM) of 54 and 90



LCM = $3 \times (3 \times 3 \times 2) \times 5$
 (mi)

$\frac{270}{(2)}$ (AI)

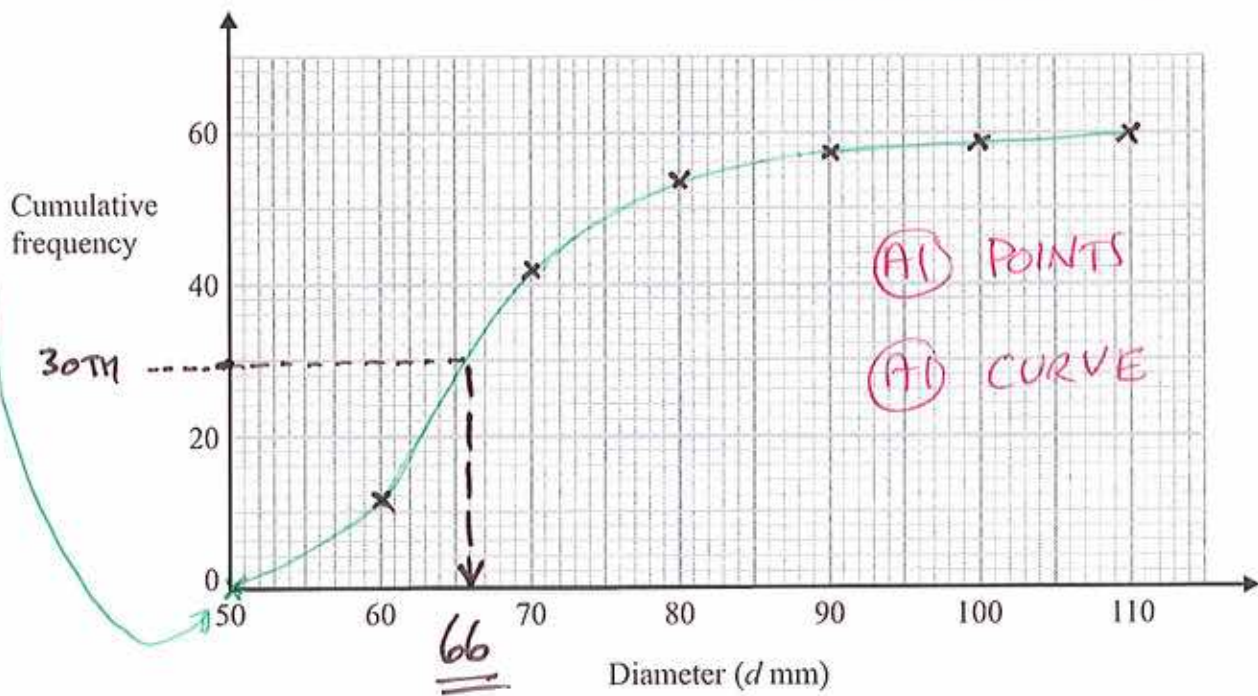
The cumulative frequency table shows information about the diameters of 60 oranges.

Diameter (d mm)	Cumulative frequency	COORDINATES
$50 < d \leq 60$	12	(60, 12)
$50 < d \leq 70$	42	(70, 42)
$50 < d \leq 80$	54	(80, 54)
$50 < d \leq 90$	57	(90, 57)
$50 < d \leq 100$	59	(100, 59)
$50 < d \leq 110$	60	(110, 60)

COORDINATE
is (50, 0)

STARTS AT 60! (2)

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



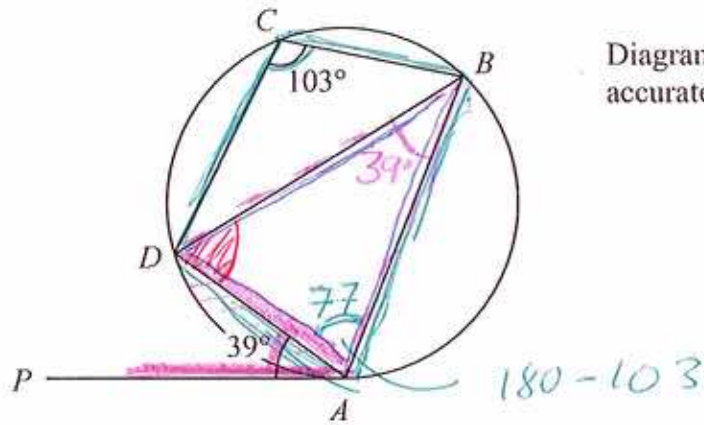
(b) Use your graph to find an estimate for the median diameter of the 60 oranges.

$$\text{MEDIAN} = \frac{60}{2} = \underline{\underline{30\text{TH VALUE}}}$$

(M1)

$$= \underline{\underline{66}}$$

(A1) (LOOKED UP ON GRAPH)




A , B , C and D are points on a circle.

PA is a tangent to the circle.

Angle $PAD = 39^\circ$

Angle $BCD = 103^\circ$

Calculate the size of angle ADB . 

$$\begin{aligned}
 \angle ADB &= 180 - (39 + 77) \\
 &= \underline{\underline{64^\circ}}
 \end{aligned}$$

(a) Simplify $4p^3q^5 \times 6p^2q$

$$\frac{\textcircled{AI}}{24} \frac{\textcircled{AI}}{p^5 q^6}$$

(2)

(b) Simplify $(5x^2y^4)^3$

$$= 5^3 \times x^{2 \times 3} \times y^{4 \times 3}$$

$$\frac{\textcircled{AI}}{125} \frac{\textcircled{AI}}{x^6 y^{12}}$$

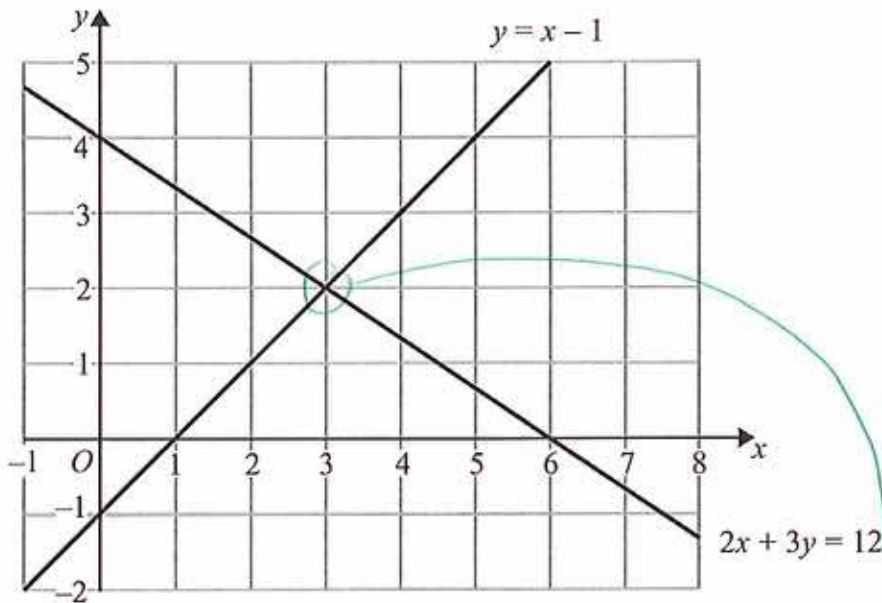
(2)

(c) Factorise $9a^2 - b^2$

DOTS

$$\textcircled{BI} \rightarrow \frac{\textcircled{AI}}{(3a-b)(3a+b)}$$

(2)



The diagram shows two straight lines.
The equations of the lines are $y = x - 1$ and $2x + 3y = 12$

(a) Write down the solution of the simultaneous equations

$$\begin{aligned} y &= x - 1 \\ 2x + 3y &= 12 \end{aligned}$$

(A1)

$x = \underline{3}, y = \underline{2}$
(1)

(b) Find an equation of the line which is parallel to the line with equation $2x + 3y = 12$ and passes through the point $(0, 10)$

$2x + 3y = 12$

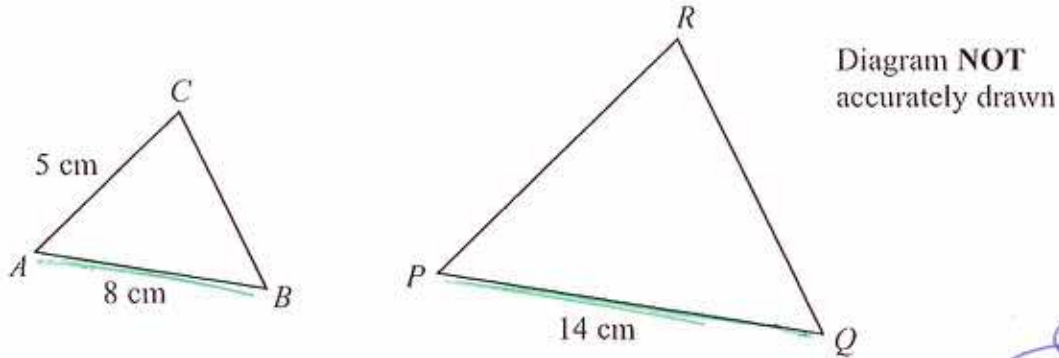
$\Rightarrow 3y = -2x + 12$

$y = -\frac{2}{3}x + 4$ } (m1) EITHER

GRADIENT = $-\frac{2}{3}$ (m1) \rightarrow PARALLEL LINE IS

$y = -\frac{2}{3}x + 10$ (A1)

(0, c) INTERCEPT = 10 (A1)



Triangle ABC is similar to triangle PQR .
 AB corresponds to PQ .
 AC corresponds to PR .
 $AB = 8$ cm.
 $AC = 5$ cm.
 $PQ = 14$ cm.

$SF = \frac{14}{8} = 1.75$

(a) Calculate the length of PR .

5×1.75
 (mi)

8.75 cm
 (2)
 (AI)

The area of triangle ABC is 16 cm²

(b) Calculate the area of triangle PQR .

16×1.75^2
 (mi)

SCALE FACTOR IS SQUARED BECAUSE WE'RE COMPARING AREAS!

49 cm²
 (AI)

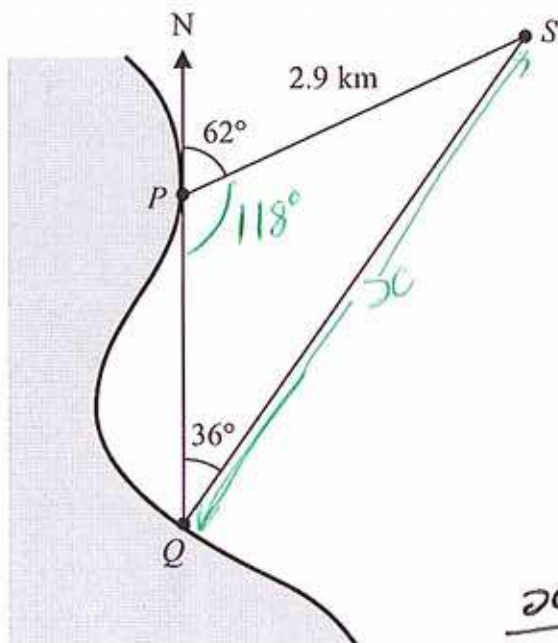


Diagram NOT
accurately drawn

P and Q are two points on a coast.

P is due North of Q .

A ship is at the point S .

$PS = 2.9$ km.

The bearing of the ship from P is 062°

The bearing of the ship from Q is 036°

Calculate the distance QS .

Give your answer correct to 3 significant figures.

$$\frac{x}{\sin 118} = \frac{2.9}{\sin 36} \quad (M1)$$

$$\Rightarrow x = \frac{2.9}{\sin 36} \times \sin 118 \quad (M1)$$

$$= 4.3562 \dots$$

$$= \underline{\underline{4.36 \text{ km}}} \quad (A1)$$

(a) Correct to the nearest millimetre, the length of a side of a regular hexagon is 3.6 cm.

Calculate the upper bound for the perimeter of the regular hexagon.

$$6 \times 3.65 \quad \text{(M1)}$$

$$3.6 \pm 0.05$$

$$\begin{array}{r} 21.9 \quad \text{(A1)} \\ \hline \end{array} \text{ cm}$$

(2)

(b) Correct to 1 significant figure, the area of a rectangle is 80 cm².
Correct to 2 significant figures, the length of the rectangle is 12 cm.

Calculate the lower bound for the width of the rectangle.
Show your working clearly.

$$80 \pm 5$$

$$12 \pm 0.5$$

$$\text{AREA} = \text{LENGTH} \times \text{WIDTH.}$$

$$\Rightarrow \text{WIDTH} = \frac{\text{AREA}}{\text{LENGTH}} \quad \begin{array}{l} \text{[LOWER BOUND]} \\ \text{[UPPER BOUND]} \end{array}$$

$$= \frac{75}{12.5} \quad \begin{array}{l} \text{(M1) [DIVIDING]} \\ \text{(M1) [CORRECT BOUNDS]} \end{array}$$

$$= \underline{\underline{6}} \quad \text{(A1)}$$

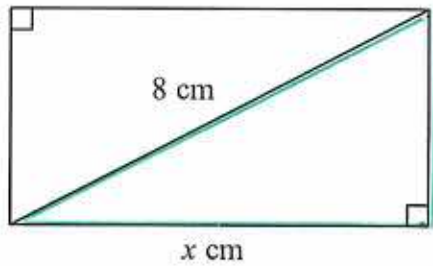


Diagram NOT accurately drawn

1ST

$$\text{HEIGHT} = \sqrt{8^2 - x^2} \quad (B1)$$

(USING PYTHAGORAS)

2ND

$$\text{HEIGHT} = 10 - x$$

The diagram shows a rectangle.
 The length of the rectangle is x cm.
 The length of a diagonal of the rectangle is 8 cm.
 The perimeter of the rectangle is 20 cm. \rightarrow

(a) Show that $x^2 - 10x + 18 = 0$

$$10 - x = \sqrt{8^2 - x^2} \quad (M1)$$

$$(10 - x)^2 = 8^2 - x^2 \quad (M1)$$

$$100 - 20x + x^2 = 64 - x^2 \quad (EITHER)$$

$$36 - 20x + 2x^2 = 0 \quad (M1)$$

$$2x^2 - 20x + 36 = 0$$

$$x^2 - 10x + 18 = 0$$

(4)

(b) Solve $x^2 - 10x + 18 = 0$

Give your solutions correct to 3 significant figures.
 Show your working clearly.

$$a = 1, b = -10, c = 18$$

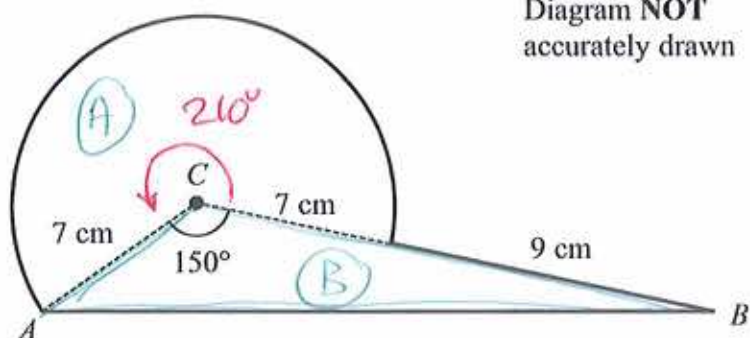
USE $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(18)}}{2(1)} \quad (M1)$$

$$= \frac{10 \pm \sqrt{100 - 72}}{2} \quad (M1)$$

\swarrow 7.65 \searrow 2.35 (A1) [BOTH]

Here is a shape.



The shape is made from triangle ABC and a sector of a circle, centre C and radius CA .

$CA = 7$ cm.

$CB = 16$ cm.

Angle $ACB = 150^\circ$

Calculate the area of the shape.

Give your answer correct to 3 significant figures.

$$\begin{aligned} \text{AREA OF SECTOR} &= \frac{210}{360} \times \pi \times 7^2 && \text{(M1)} \\ &= 89.797\dots && \text{(A1)} \end{aligned}$$

$$\begin{aligned} \text{AREA OF TRIANGLE} &= \frac{1}{2} \times 7 \times 16 \times \sin 150^\circ && \text{(M1)} \\ &= 28 && \text{(A1)} \end{aligned}$$

$$\begin{aligned} \text{TOTAL} &= 89.797\dots + 28 \\ &= 117.797 \\ &= \underline{\underline{118 \text{ cm}^2}} && \text{(A1)} \end{aligned}$$

Make y the subject of $\frac{y}{x} + \frac{2y}{x+4} = 3$

Show your working clearly and give your answer as simply as possible.

$$\begin{aligned} \text{(mi)} \quad y(x+4) + 2xy &= 3x(x+4) \quad \text{(mi)} \\ \Rightarrow y(x+4+2x) &= 3x(x+4) \quad \text{(mi)} \\ y(3x+4) &= 3x^2+12 \quad \text{(mi)} \\ y &= \frac{3x^2+12}{3x+4} \quad \text{(A1)} \end{aligned}$$