

4H

Pearson Edexcel
International GCSE

EDEXCEL

IGCSE

MATHEMATICS A

SOLUTIONS

JANUARY 2013

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.

(a) Use your calculator to work out the value of

$$\frac{8.7 + 2.8}{1.4^2}$$

Give your answer as a decimal.

Write down all the figures on your calculator display.

(A2)
5.8673469
(2)

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

5.87 (B1)
(1)

A circle has a diameter of 7.6 cm.

Work out the circumference of the circle.

Give your answer correct to 3 significant figures.

$$C = \pi D \quad (D = 7.6)$$

$$= \pi \times 7.6 \quad (m)$$

$$= 23.876\dots$$

$$\underline{\quad\quad\quad} 23.9 \quad (B) \quad \text{cm}$$

The table shows information about the marks of 20 students in a science test.

Mark (x)	Frequency (f)	xf
6	2	$6 \times 2 = 12$
7	4	$7 \times 4 = 28$
8	5	40
9	8	72
10	1	10

TOTAL = 162

Work out the mean mark of the 20 students.

$$\text{MEAN} = \frac{162}{20} \quad \text{(B1)}$$

$$= \underline{\underline{8.1}}$$

8.1 (A1)

Abid is waiting for a bus.

The probability that his bus will be early is 0.2

The probability that his bus will be on time is 0.7

Work out the probability that his bus will be either early or on time.

$$0.2 + 0.7 \quad (m)$$

$$\underline{0.9} \quad (A)$$

$$\mathcal{E} = \{\text{even numbers}\}$$

$$A = \{2, 4, 6, 8, 10\}$$

(a) B is a set such that $A \cap B = \{4, 8\}$

The set B has 3 members.

List the members of one possible set B .

ANY EVEN NUMBER
OTHER THAN
2, 6, 10
↓
 $\{4, 8, 12\}$
(2) (A2)

(b) C is a set such that $A \cap C = \emptyset$

The set C has 3 members.

List the members of one possible set C .

ANY THREE EVEN
NUMBERS > 10
↓ ↓ ↓
 $\{12, 14, 16\}$
(1) (A1)

$\frac{5}{9}$ of the students in a group are male.

($\frac{4}{9}$ ARE FEMALE)

$\frac{5}{6}$ of the female students in the group are right-handed.

(a) Work out the fraction of students in the group who are right-handed females.

(B1) $\rightarrow \frac{4}{9} \times \frac{5}{6} = \frac{20}{54}$

$\underbrace{\hspace{1.5cm}}$
 (M1)

$\frac{10}{27}$ (A1)

(3)

(b) Find the smallest possible number of students in the group.

SINCE FRACTION OF RIGHT-HANDED FEMALES

IS $\frac{10}{27}$ THERE MUST BE AT LEAST

27 PEOPLE IN THE GROUP

(B2)

27 (OR 54)

(2)

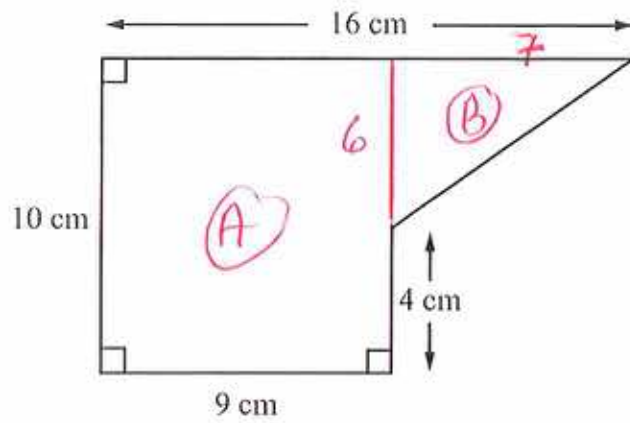


Diagram NOT
accurately drawn

The diagram shows a shape.

Work out the area of the shape.

$$\textcircled{A} = 9 \times 10 = 90$$

$$\textcircled{B} = \frac{6 \times 7}{2} = 21$$

$$\text{TOTAL } \underline{\underline{111}} \text{ cm}^2$$

$$\underline{\underline{111}} \text{ cm}^2$$

(a) Factorise $n^2 + 8n$

$$\frac{n(n+8)}{(2)}$$

(AI) (AI)

(b) Expand and simplify $3(2x - 5) - 4(x + 3)$

$$6x - 15 - 4x - 12$$

(MI)

$$\frac{2x - 27}{(2)}$$

(AI)

(c) Expand and simplify $(y + 7)(y + 2)$

$$y^2 + 2y + 7y + 14$$

(MI)

F O I L

$$\frac{y^2 + 9y + 14}{(2)}$$

(AI)

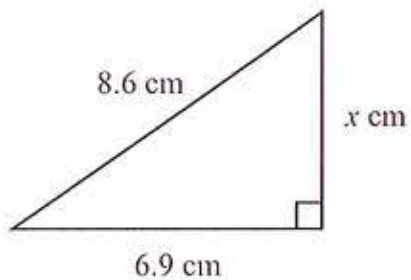


Diagram NOT
accurately drawn

Work out the value of x .

Give your answer correct to 3 significant figures.

$$x^2 = 8.6^2 - 6.9^2 \quad (m1)$$

$$= 26.35$$

$$\Rightarrow x = \sqrt{26.35} \quad (m1)$$

$$= 5.1332 \dots$$

$$x = \underline{\underline{5.13}} \quad (ft)$$

Solve $3x + 16 = 1 - 2x$

Show clear algebraic working.

$$3x + 16 = 1 - 2x$$

$$3x + 2x = 1 - 16$$

$$5x = -15$$

$$x = \frac{-15}{5}$$

$$x = \underline{\underline{-3}}$$

Jack, Kate and Lila share some money in the ratios 5 : 9 : 6
 In total, Jack and Kate receive £56

Work out the amount of money Lila receives.

$$J : K : L$$

$$5 : 9 : 6$$

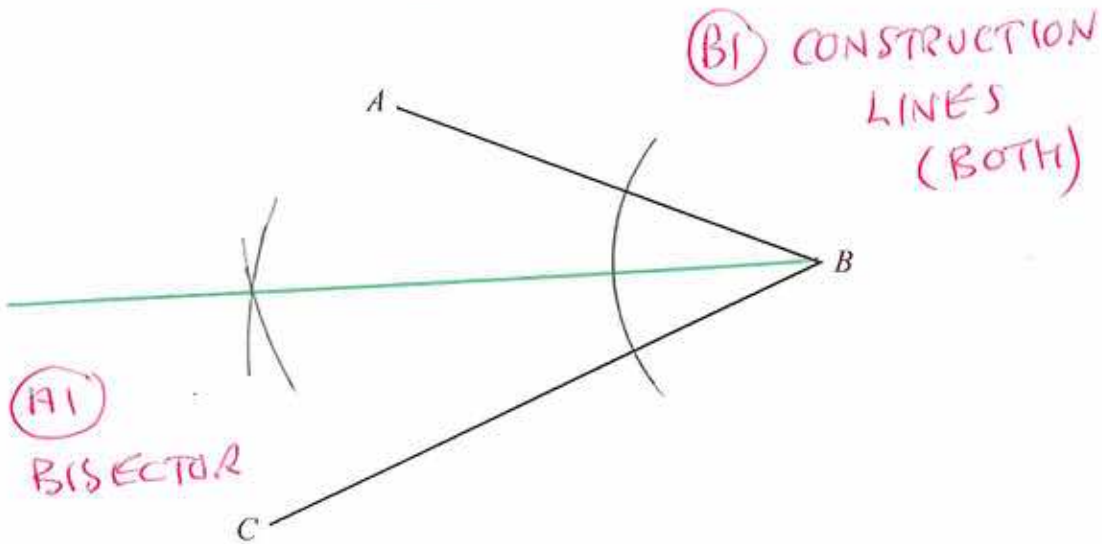
$$\text{TOTAL PARTS} = 20$$

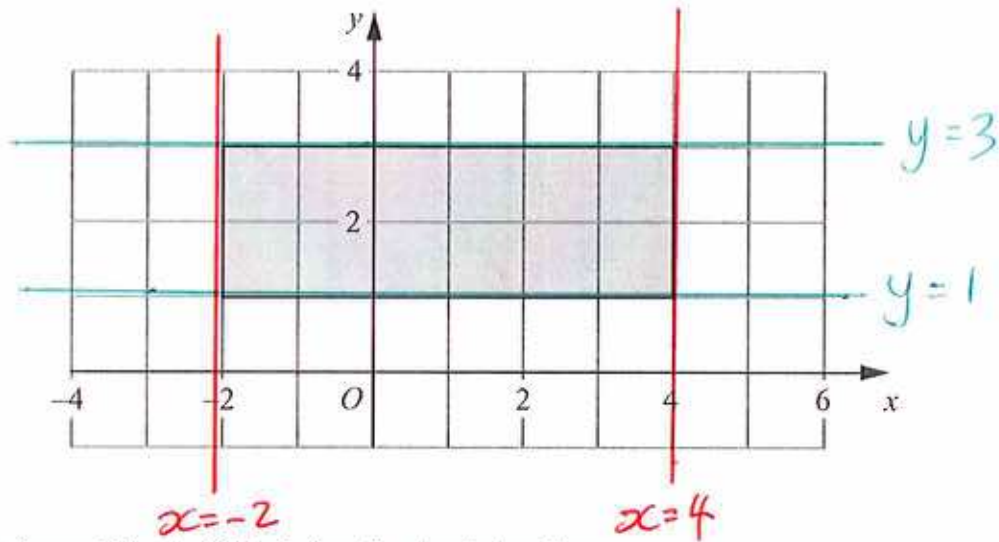
$\underbrace{\hspace{2cm}}$
 $\text{£}56$
 $\frac{14}{20} = \text{£}56$ (B1)
 $\Rightarrow \frac{1}{20} = 4$ (B1)
 $\text{LILA} = 4 \times 6 = \underline{\underline{24}}$ (A1)
 $\text{£ } \underline{\underline{24}}$ (A1)

METHOD 2

$\frac{56}{14} = 4$ (B1), $6 \times 4 = \underline{\underline{24}}$ (A1)
 (B1)

Use ruler and compasses to construct the bisector of angle ABC .
You must show all your construction lines.





Write down inequalities to fully define the shaded region.

$$x \geq -2, \quad x \leq 4, \quad y \geq 1, \quad y \leq 3$$

OR

$$-2 \leq x \leq 4, \quad 1 \leq y \leq 3$$

Solve $\frac{2}{5x-2} = \frac{3}{6x+1}$

Show clear algebraic working.

$$2(6x+1) = 3(5x-2) \quad (M1)$$

$$12x + 2 = 15x - 6 \quad (M1)$$

$$12x - 15x = -6 - 2$$

$$-3x = -8 \quad (M1)$$

$$x = \frac{-8}{-3}$$

$$= \underline{\underline{2\frac{2}{3}}}$$

$$x = \underline{\underline{2\frac{2}{3}}} \quad (A1)$$

(a) Simplify $\frac{5x^5y^6}{x^2y^4}$

$$\frac{5x^3y^2}{(2)}$$

(b) Simplify $(2n^4)^3$

$$2^3 \times n^{4 \times 3}$$

$$\frac{8n^{12}}{(2)}$$

The grouped frequency table gives information about the lengths of 160 pythons.

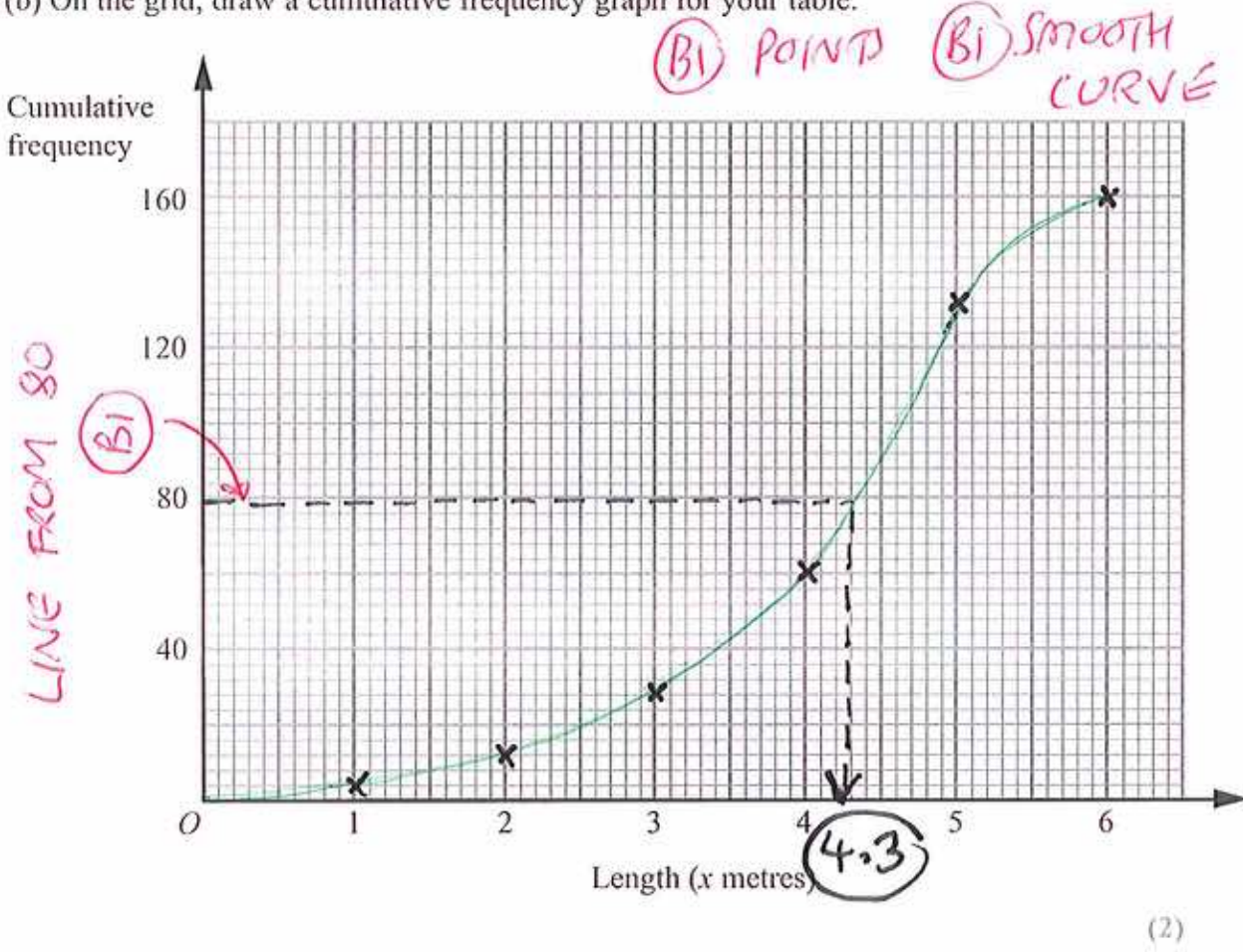
Length (x metres)	Frequency
$0 < x \leq 1$	4
$1 < x \leq 2$	8
$2 < x \leq 3$	16
$3 < x \leq 4$	32
$4 < x \leq 5$	72
$5 < x \leq 6$	28

(a) Complete the cumulative frequency table.

Length (x metres)	Cumulative frequency
$0 < x \leq 1$	4
$0 < x \leq 2$	12
$0 < x \leq 3$	28
$0 < x \leq 4$	60
$0 < x \leq 5$	132
$0 < x \leq 6$	160

(B1)

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



(c) Use your graph to find an estimate for the median length of the pythons.

$$\begin{aligned} \text{MAX} = 160 &\Rightarrow \text{MEDIAN} = \frac{160}{2} \\ &= 80\text{th VALUE} \end{aligned}$$

$$\underline{\underline{4.3}} \text{ (A1) metres}$$

(2)

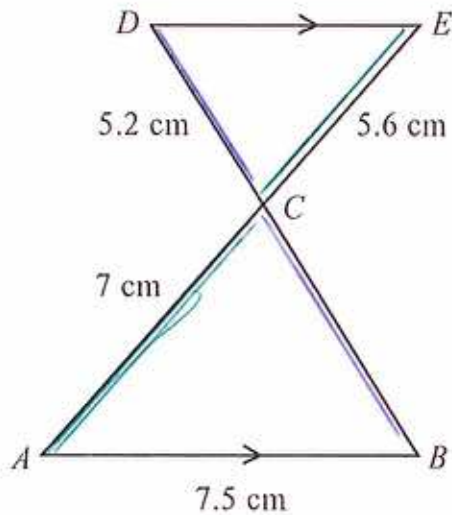


Diagram NOT accurately drawn

$$SF = \frac{7}{5.6} = 1.25$$

AB is parallel to DE .

The lines AE and BD intersect at C .

$AB = 7.5$ cm, $AC = 7$ cm, $CD = 5.2$ cm, $CE = 5.6$ cm.

(a) Calculate the length of BC .

$$5.2 \times 1.25 \quad \text{(B1)}$$

$$\begin{array}{r} 6.5 \text{ cm} \\ \hline (2) \end{array} \quad \text{(A1)}$$

(b) Calculate the length of DE .

$$\left. \begin{array}{r} 7.5 \\ \hline 1.25 \end{array} \right\} \text{(M1) DIVIDE}$$

$$\begin{array}{r} 6 \text{ cm} \\ \hline (2) \end{array} \quad \text{(A1)}$$

(c) The area of triangle ABC is 21 cm^2
Calculate the area of triangle EDC .

$$\text{(M1) DIVIDE} \left\{ \frac{21}{1.25^2} = \underline{\underline{13.44}} \right. \quad \text{(M1)}$$

$$\underline{\underline{13.44 \text{ cm}^2}} \quad \text{(A1)}$$

Solve $5x^2 + 2x - 4 = 0$

Give your solutions correct to 3 significant figures. \rightarrow USE FORMULA!

Show your working clearly.

$a = 5, b = 2, c = -4$

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

$$= \frac{-2 \pm \sqrt{2^2 - 4 \times 5 \times (-4)}}{2 \times 5} \quad (M1)$$

$$= \frac{-2 \pm \sqrt{4 + 80}}{10}$$

$$x = \frac{-2 + \sqrt{84}}{10}$$

$$= \underline{\underline{0.717}} \quad (A1)$$

$$x = \frac{-2 - \sqrt{84}}{10}$$

$$= \underline{\underline{-1.12}} \quad (A1)$$

$(3+\sqrt{a})(4+\sqrt{a})=17+k\sqrt{a}$ where a and k are positive integers.

Find the value of a and the value of k .

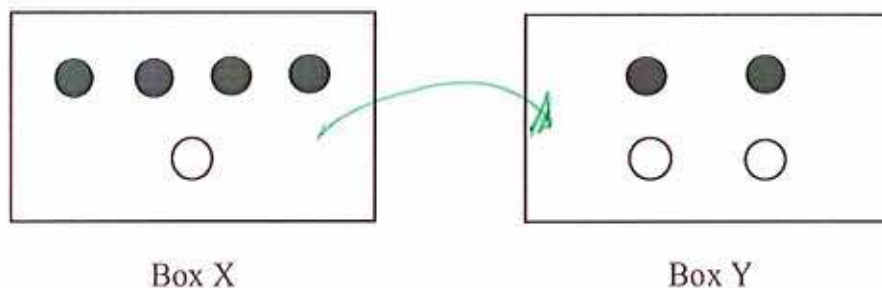
$$\begin{aligned}(3+\sqrt{a})(4+\sqrt{a}) &= 12 + 3\sqrt{a} + 4\sqrt{a} + a && \text{(MI)} \\ &= \underbrace{12+a}_{17} + \underbrace{7\sqrt{a}}_{k\sqrt{a}}\end{aligned}$$

$$12 + a = 17$$

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

$$a = \dots 5 \dots \text{(AI)}$$

$$k = \dots 7 \dots \text{(BI)}$$



In Box X, there are 4 black discs and 1 white disc.
In Box Y, there are 2 black discs and 2 white discs.

Vikram takes at random a disc from Box X and puts it in Box Y.
He then takes at random a disc from Box Y.

- (a) Calculate the probability that the disc he takes from Box X and the disc he takes from Box Y will both be black discs.

$$P(BB) = \frac{4}{5} \times \frac{3}{5} \quad (\text{mi})$$

$$= \frac{12}{25}$$

$$\frac{12}{25} \quad (\text{AI})$$

(2)

- (b) Calculate the probability that the disc he takes from Box Y will be a white disc.

$$P(BW) = \frac{4}{5} \times \frac{2}{5} = \frac{8}{25}$$

$$P(WW) = \frac{1}{5} \times \frac{3}{5} = \frac{3}{25}$$

(mi) EITHER

$$\frac{11}{25} \quad (\text{AI})$$

(mi) For ADDING.

When a photograph is taken, the exposure time, t , is directly proportional to the square of the size, f , of the opening in the camera lens.

$$t = 0.02 \text{ when } f = 8$$

(a) Find a formula for t in terms of f .

$$t = k \times f^2 \quad (t = 0.02, f = 8) \quad \text{(MI)}$$

$$\Rightarrow 0.02 = k \times 8^2$$

$$\Rightarrow k = \frac{0.02}{8^2}$$

$$= \frac{1}{3200} \quad \text{(AI)}$$

$$t = \frac{1}{3200} \times f^2 \quad \text{(AI)}$$

(3)

(b) Calculate the value of f when $t = 0.0098$

$$t = \frac{f^2}{3200} \quad (t = 0.0098)$$

$$0.0098 = \frac{f^2}{3200}$$

$$f^2 = 0.0098 \times 3200$$

$$= 31.36$$

$$f = \sqrt{31.36}$$

$$= \underline{\underline{5.6}}$$

$$f = \underline{\underline{5.6}} \quad \text{(AI)}$$

(2)

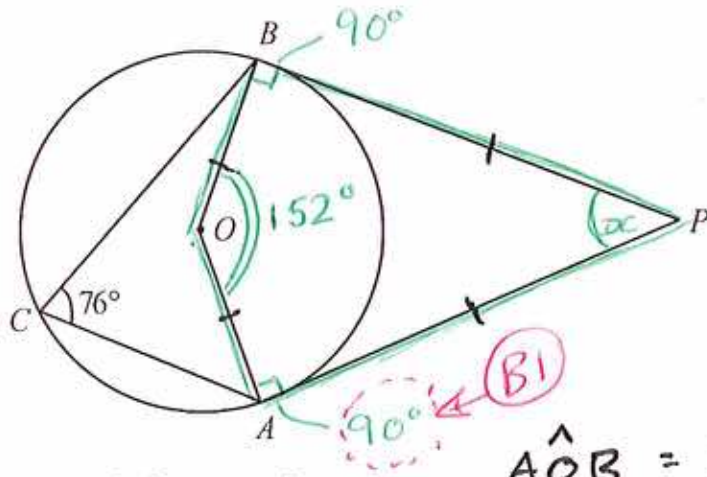


Diagram NOT
accurately drawn

A , B and C are points on a circle, centre O .

Angle $ACB = 76^\circ$

PA and PB are tangents to the circle.

Calculate the size of angle APB .

$$\hat{AOB} = 152$$

[ANGLE AT CENTRE =
 $2 \times$ ANGLE AT CIRC.]

$$360 - [152 + 90 + 90]$$

(M1)

28

(A1)

f is a function such that

$$f(x) = \frac{1}{x^2 + 1}$$

(a) Find $f\left(\frac{1}{2}\right)$

$$= \frac{1}{(0.5)^2 + 1}$$

$$= \frac{1}{0.25 + 1}$$

$$\frac{1}{1.25} = \underline{\underline{0.8}}$$

$$\underline{\underline{0.8}} \quad \text{(B1)}$$

(1)

g is a function such that

$$g(x) = \sqrt{x-1} \quad x \geq 1$$

(b) Find $fg(x)$

Give your answer as simply as possible.

$$\frac{1}{(\sqrt{x-1})^2 + 1} = \frac{1}{(x-1) + 1}$$

(B1) EITHER

$$fg(x) = \underline{\underline{\frac{1}{x}}} \quad \text{(A1)}$$

(2)

On Monday, Nalim made a journey.

On Tuesday, she made the same journey.

Her average speed on Tuesday was 25% greater than her average speed on Monday.

Calculate the percentage reduction in the time her journey took on Tuesday compared with Monday.

$$S_M = \frac{d}{t_M} \quad S_T = \frac{d}{t_T}$$

$$S_T = 1.25 \times S_M$$

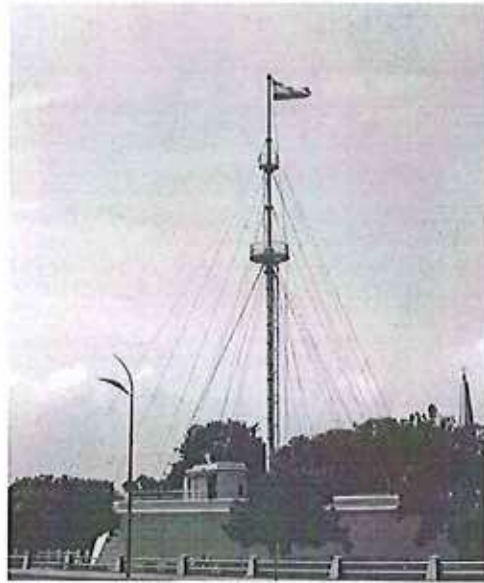
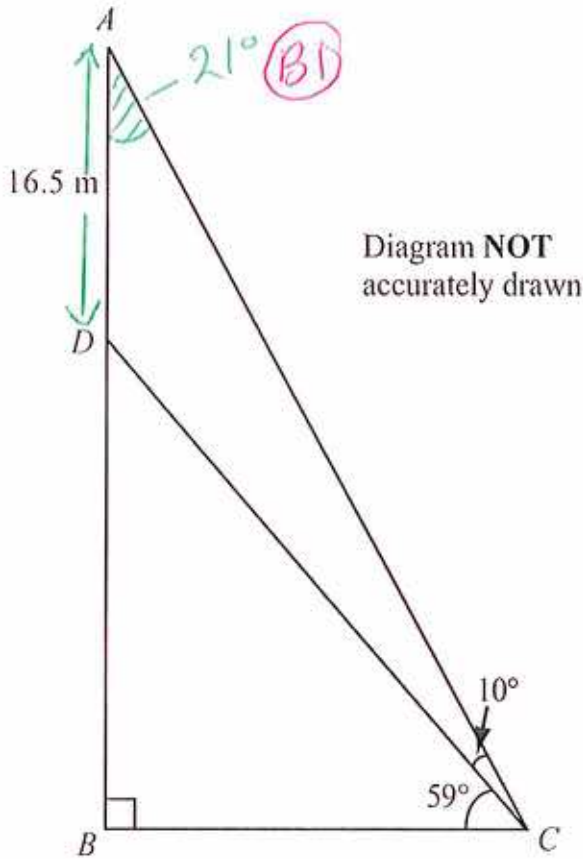
$$\Rightarrow \frac{d}{t_T} = 1.25 \times \frac{d}{t_M} \quad (M1)$$

$$\Rightarrow t_M = 1.25 \times t_T$$

$$\Rightarrow t_T = \frac{t_M}{1.25} = 0.8 \times t_M \quad (M1) [ANY]$$

\therefore TIME IS REDUCED BY 0.2

$$= \underline{\underline{20\%}} \quad (A1)$$



The diagram shows a vertical flagpole in Chennai, India.

The point A is at the top of the flagpole.

The point B is at the foot of the flagpole.

There is a platform at the point D on the flagpole.

B and C are points on horizontal ground.

$AD = 16.5$ m

The angle of elevation of A from C is 69°

The angle of elevation of D from C is 59°

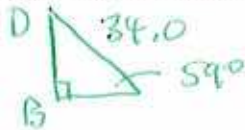
Calculate the height, AB , of the flagpole.

Give your answer correct to 3 significant figures.

$$\textcircled{1} \frac{CD}{\sin 21} = \frac{16.5}{\sin 10} \quad (\text{MI})$$

$$CD = \frac{16.5}{\sin 10} \times \sin 21 \quad (\text{MI})$$

$$= \underline{\underline{34.052 \dots}} \quad (\text{AI})$$



$$\textcircled{2} \sin 59 = \frac{\text{OPP}}{\text{HYP}}$$

$$\sin 59 = \frac{BD}{34}$$

$$\rightarrow BD = 34 \times \sin 59$$

$$= \underline{\underline{29.188 \dots}} \quad (\text{AI})$$

$$\textcircled{3} AB = 29.188 \dots + 16.5$$

$$= 45.688 \dots$$

$$= \underline{\underline{45.7 \text{ m}}} \quad (\text{BI})$$

Solve the simultaneous equations

$$y = 3x + 2 \quad \text{--- (1)}$$

$$x^2 + y^2 = 20 \quad \text{--- (2)}$$

Show clear algebraic working.

SUBSTITUTE EQ. (1) INTO EQ. (2)

$$x^2 + (3x+2)^2 = 20 \quad \text{(M1)}$$

$$x^2 + (3x+2)(3x+2) = 20$$

$$x^2 + 9x^2 + 6x + 6x + 4 = 20 \quad \text{(M1)}$$

$$10x^2 + 12x + 4 = 20$$

$$10x^2 + 12x - 16 = 0$$

$$5x^2 + 6x - 8 = 0 \quad \text{(B1)}$$

$$(5x - 4)(x + 2) = 0 \quad \text{(M1)}$$

$$x_1 = \underline{\underline{\frac{4}{5}}}$$

$$x_2 = \underline{\underline{-2}} \quad \text{(A1) BOTH}$$

SUBSTITUTE INTO EQ. (1)

$$y_1 = 3 \times \frac{4}{5} + 2$$

$$= \underline{\underline{4.4}}$$

$$y_2 = 3 \times (-2) + 2$$

$$= \underline{\underline{-4}}$$

$$\text{(A1) BOTH}$$