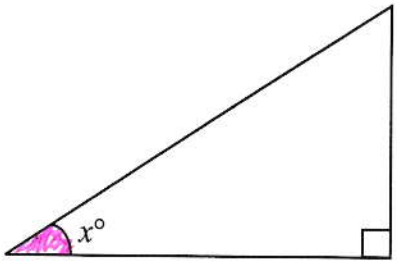
TRIGONOMETRY (SOH CAH TOA)

DATE OF SOLUTIONS: 04/06/2018
MAXIMUM MARK: 73

SOLUTIONS

GCSE (+ IGCSE) EXAM QUESTION PRACTICE

1 [Edexcel, 2008] Trigonometry (SOH CAH TOA) **[3 Marks]**



3 cm [OPP]

Diagram **NOT** accurately drawn

8 cm [ADJ]

SOH CAH TOA

Work out the value of x.
Give your value correct to 1 decimal place.

$\tan x = \frac{\text{OPP}}{\text{ADJ}}$

$\tan x = \frac{3}{8}$ (M1)

$x = \tan^{-1}\left(\frac{3}{8}\right)$ (M1)

$= 20.556...$

(A1)

$x =$ 20.6 cm

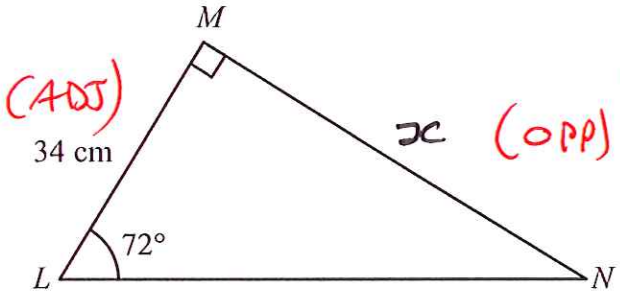


Diagram **NOT** accurately drawn

SOH CAH TOA

Calculate the length of *MN*.
Give your answer correct to 3 significant figures.

$\tan 72° = \frac{OPP}{ADJ}$

$\tan 72° = \frac{x}{34}$ (m1)

$x = 34 \tan 72°$ (m1)

$= 104.64...$

105 (A1)

..... cm

(a) The diagram shows triangle PQR.
$PQ = 4$ cm.
$PR = 8$ cm.
Angle $PQR = 90°$.

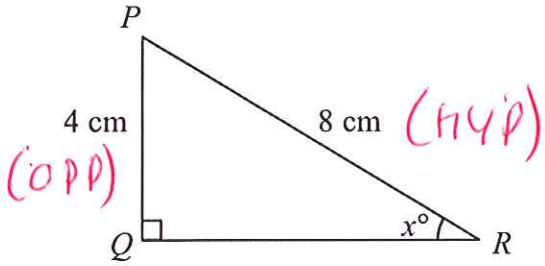


Diagram **NOT** accurately drawn

Calculate the value of x.

SOH CAH TOA

$\sin x° = \frac{OPP}{HYP}$

$\Rightarrow \sin x = \frac{4}{8}$ (M1)

$x = \sin^{-1}\left(\frac{4}{8}\right)$ (M1)

$= 30°$

$x =$ 30 (A1)

(3)

(b) The diagram shows triangle LMN.
$MN = 12$ cm.
Angle $LMN = 32°$.
Angle $MLN = 90°$.

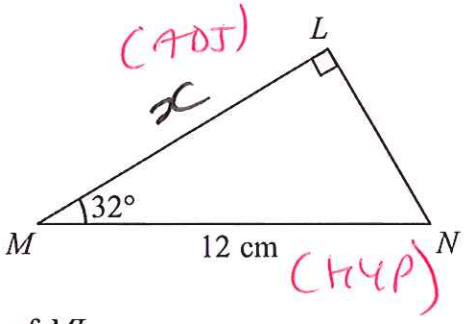


Diagram **NOT** accurately drawn

Calculate the length of ML.
Give your answer correct to 3 significant figures.

SOH CAH TOA

$\cos 32 = \frac{ADJ}{HYP}$

$\Rightarrow \cos 32 = \frac{x}{12}$ (M1)

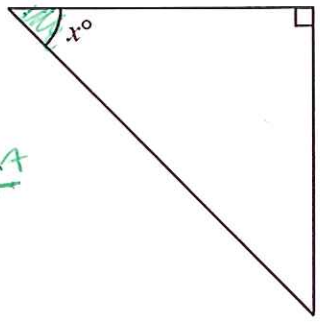
$x = 12 \times \cos 32$ (M1)

$= 10.1765...$

10.2 (A1) cm

(3)

(a)



(ADJ)

(OPP)

Diagram **NOT** accurately drawn

SOH CAH TOA

Calculate the value of x.
Give your answer correct to 3 significant figures.

$\text{TAN}\, x = \frac{\text{OPP}}{\text{ADJ}}$

$\text{TAN}\, x = \frac{5.1}{4.2}$ M1

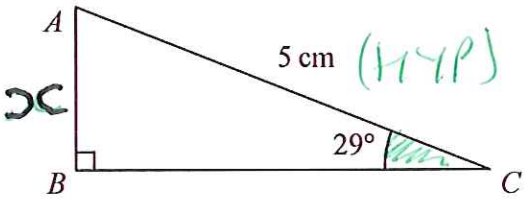
$x = \text{TAN}^{-1}\left(\frac{5.1}{4.2}\right)$ M1

$= 50.5275\ldots$

$x =$ 50.5 A1

(3)

(b)



(OPP) x (HYP)

Diagram **NOT** accurately drawn

Calculate the length of AB.
Give your answer correct to 3 significant figures.

SOH CAH TOA

$\text{SIN}\, 29 = \frac{\text{OPP}}{\text{HYP}}$

$\text{SIN}\, 29 = \frac{x}{5}$ M1

$x = 5 \times \text{SIN}\, 29$ M1

$= 2.4240\ldots$

2.42 cm A1

(3)

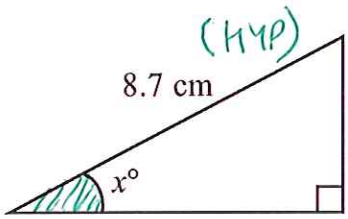


Diagram **NOT** accurately drawn

SOH CAH TOA

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

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

$\cos x = \frac{5.4}{8.7}$ M1

$x = \cos^{-1}\left(\frac{5.4}{8.7}\right)$ M1

$= 51.6334\ldots$

$x =$ 51.6° A1

6 [Edexcel, 2005] Trigonometry (SOH CAH TOA) **[3 Marks]**

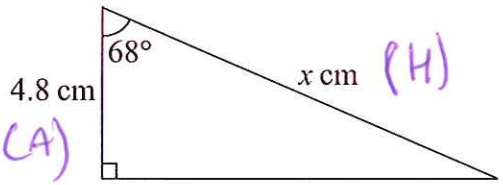


Diagram **NOT** accurately drawn

SOH CAH TOA

Calculate the value of x.

$\cos 68 = \frac{\text{ADJ}}{\text{HYP}}$

$\cos 68 = \frac{4.8}{x}$ (M1)

$x = \frac{4.8}{\cos 68}$ (M1)

$= 12.8134...$

$x =$ 12.8 cm (A1)

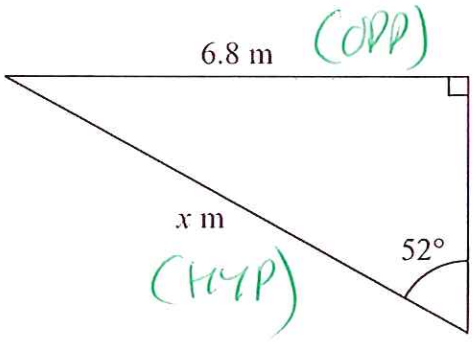


Diagram **NOT** accurately drawn

Calculate the value of x.
Give your answer correct to 3 significant figures.

SOH CAH TOA

$\sin 52 = \frac{OPP}{HYP}$

$\sin 52 = \frac{6.8}{x}$ (M1)

$x = \frac{6.8}{\sin 52}$ (M1)

$= 8.6293...$

$x =$ 8.63 (A1)

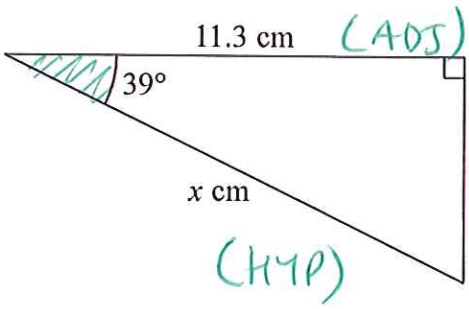


Diagram **NOT** accurately drawn

SOH CAH TOA

Work out the value of x.
Give your answer correct to 2 decimal places.

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

$\cos 39 = \frac{11.3}{x}$ (m1)

$x = \frac{11.3}{\cos 39}$ (m1)

$= 14.540...$

$x =$ 14.54 cm (A1)

ABCD is a trapezium.

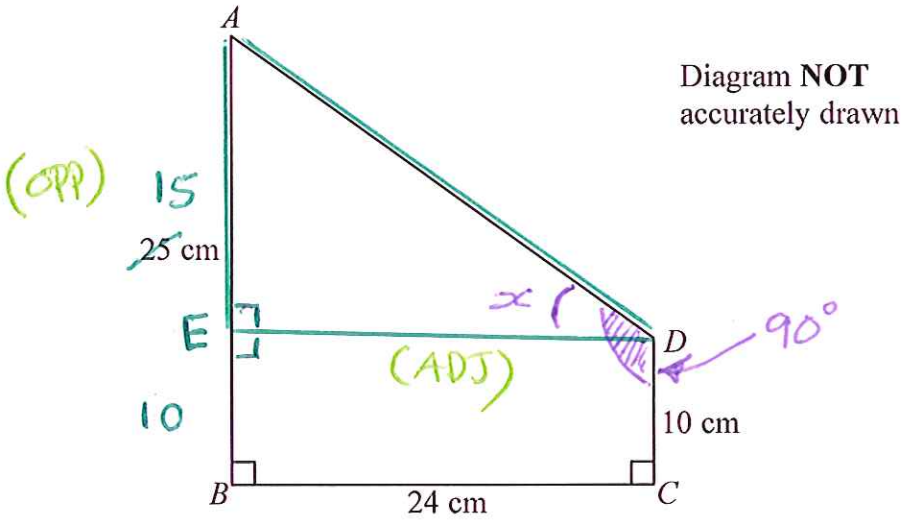
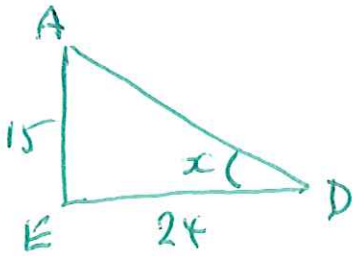


Diagram **NOT** accurately drawn

AB = 25 cm.
BC = 24 cm.
CD = 10 cm.

Angle *ABC* = angle *BCD* = 90°

Calculate the size of angle *CDA*.
Give your answer correct to 3 significant figures.



$$\text{TAN } x = \frac{\text{OPP}}{\text{ADJ}}$$

$$\text{TAN } x = \frac{15}{24} \quad \text{(M1)}$$

$$\therefore \quad x = \text{TAN}^{-1}\left(\frac{15}{24}\right)$$

$$= 32.005... \quad \text{(A1)}$$

$$\therefore \quad \text{CDA} = 32.005 + 90 \quad \text{(M1)}$$

$$= \underline{122^\circ} \quad \text{(A1)}$$

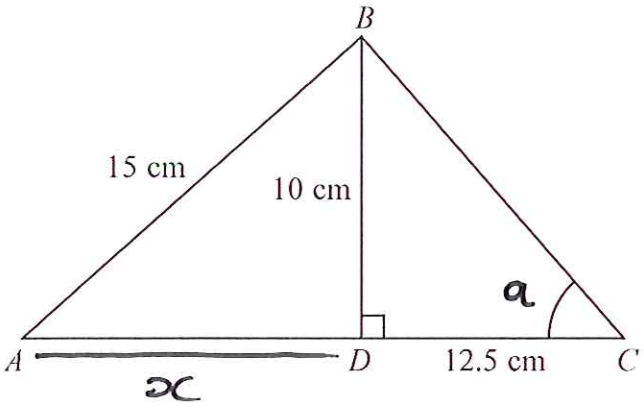


Diagram **NOT** accurately drawn

ABC is a triangle.
The point *D* lies on *AC*.
Angle *BDC* = 90°
BD = 10 cm, *AB* = 15 cm and *DC* = 12.5 cm.

(a) Calculate the length of *AD*.
Give your answer correct to 3 significant figures.

$x^2 = 15^2 - 10^2$ (M1)

$= 125$

$x = \sqrt{125}$ (M1)

$= 11.1803...$

11.2 (A1) cm

(3)

(b) Calculate the size of angle *BCD*.
Give your answer correct to 1 decimal place.

$\text{TAN } a = \frac{\text{OPP}}{\text{ADJ}}$

$\text{Tan } a = \frac{10}{12.5}$ (M1)

(M1) $a = \text{TAN}^{-1}\left(\frac{10}{12.5}\right)$

$= 38.659...$

$= 38.7$ (A1)

Here is a triangle QRS.

USE $A = \frac{1}{2}bxh$

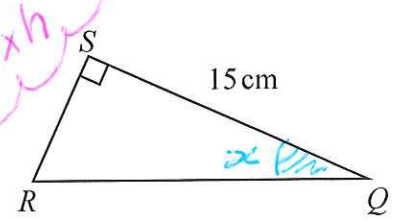
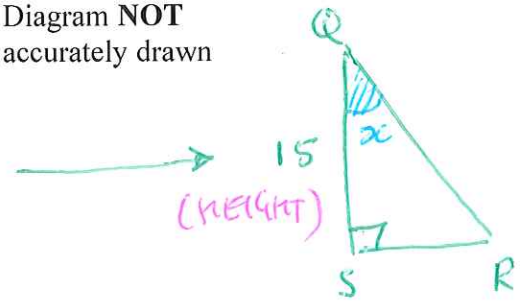


Diagram **NOT** accurately drawn



$SQ = 15$ cm
Angle $RSQ = 90°$
Area of triangle $QRS = 60\,\text{cm}^2$

Work out the size of angle SQR.
Give your answer correct to 1 decimal place.

1ST FIND SR

$\frac{1}{2} b \times h = 60$

$\frac{1}{2} SR \times 15 = 60$

$SR \times 15 = 120$

$SR = \frac{120}{15}$

$= 8$ (m1)

2ND

$TAN x = \frac{OPP}{ADJ}$

$TAN x = \frac{8}{15}$ (m1)

$\therefore x = TAN^{-1}\left(\frac{8}{15}\right)$ (m1)

$= 28.0724...$

$= 28.1°$ (A1)

The diagram shows a circle, centre O.
PTQ is the tangent to the circle at T.
$PO = 6$ cm.
Angle $OPT = 40°$.

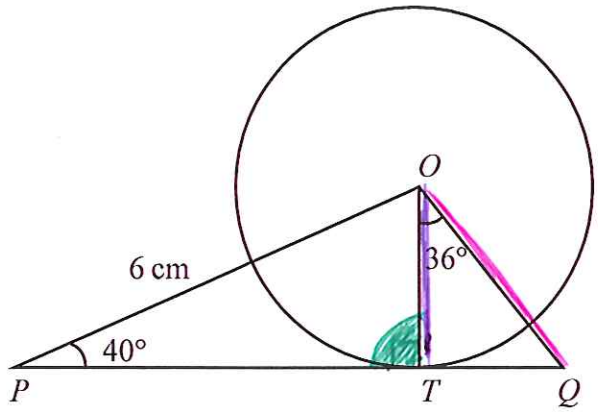


Diagram **NOT** accurately drawn

(a) Explain why angle $OTP = 90°$.

THE ANGLE BETWEEN A RADIUS AND ITS TANGENT IS 90° A1

(1)

(b) Calculate the length of OT.
Give your answer correct to 3 significant figures.

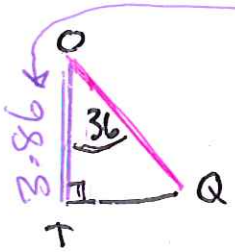
$\sin 40 = \frac{OT}{6}$ M1

$\Rightarrow OT = 6 \times \sin 40$ M1 $= 3.8567...$

3.86 M1 cm

(3)

(c) Angle $QOT = 36°$.
Calculate the length of OQ.
Give your answer correct to 3 significant figures.



$\cos 36 = \frac{3.86}{OQ}$ M1

$\Rightarrow OQ = \frac{3.86}{\cos 36}$ M1 $= 4.7671...$

$= 4.77$ cm A1

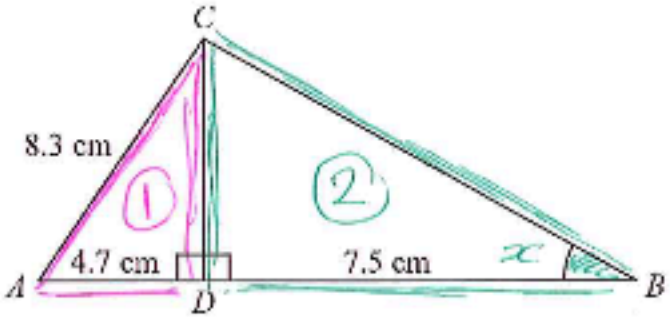


Diagram **NOT** accurately drawn

The diagram shows triangle ABC.
D is the point on AB, such that CD is perpendicular to AB.
$AC = 8.3$ cm.
$AD = 4.7$ cm.
$BD = 7.5$ cm.

Calculate the size of angle ABC.
Give your answer correct to 1 decimal place.

1ST

$CD^2 = 8.3^2 - 4.7^2$ (M1)

$= 46.8$

$\Rightarrow CD = \sqrt{46.8}$

$= 6.84105...$ (A1)

2ND

$\text{TAN}\, x = \frac{\text{OPP}}{\text{ADJ}}$

$\Rightarrow \text{TAN}\, x = \frac{6.84105}{7.5}$ (M1)

$x = \text{TAN}^{-1}\left(\frac{6.84105}{7.5}\right)$

$= 42.369...$

$= 42.4°$ (A1)

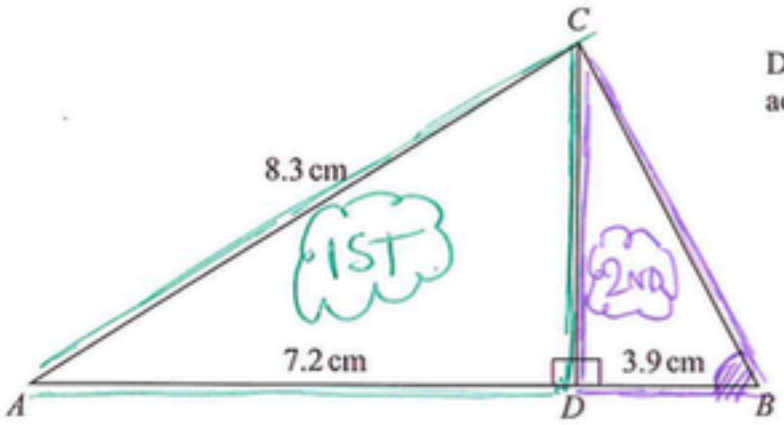


Diagram **NOT** accurately drawn

ABC is a triangle.
D is a point on *AB*.
CD is perpendicular to *AB*.
AD = 7.2 cm, *DB* = 3.9 cm, *AC* = 8.3 cm.

Calculate the size of angle *DBC*.
Give your answer correct to 1 decimal place.

1ST

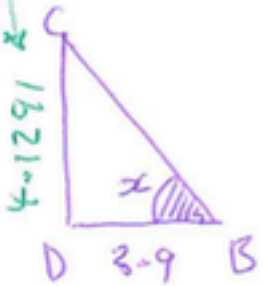
$CD^2 = 8.3^2 - 7.2^2$ M1

$= 17.05$

$\Rightarrow CD = \sqrt{17.05}$

$= 4.1291...$ M1

2ND



$\tan x = \frac{4.1291}{3.9}$ M1

$x = \tan^{-1}\left(\frac{4.1291}{3.9}\right)$ M1

$= 46.634...$

A1

46.6 °

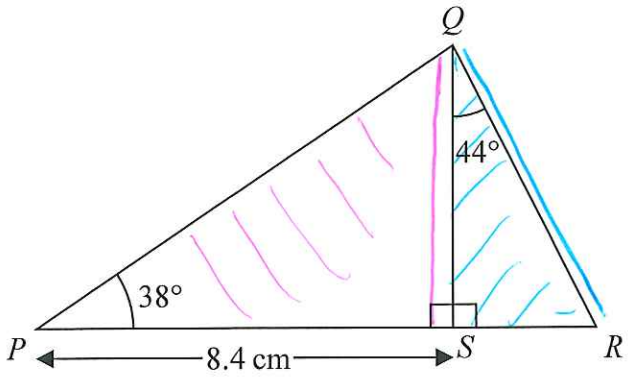


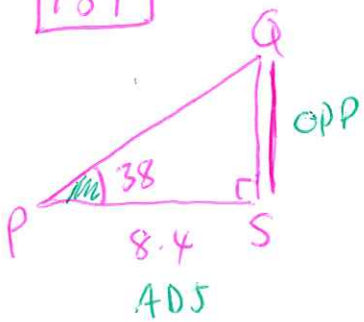
Diagram **NOT** accurately drawn

PSR is a straight line.

Angle $PSQ = 90°$
$PS = 8.4$ cm
Angle $QPS = 38°$
Angle $SQR = 44°$

Work out the length of QR.
Give your answer correct to 3 significant figures.

1ST



SOH CAH TOA

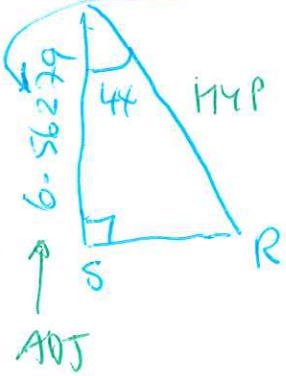
$\tan 38 = \frac{OPP}{ADJ}$

$\tan 38 = \frac{OPP}{8.4}$ (M1)

$OPP = 8.4 \tan 38$

$= 6.56279$ (M1)

2ND



SOH CAH TOA

$\cos 44 = \frac{ADJ}{HYP}$

$\cos 44 = \frac{6.56279}{QR}$ (M1)

$QR = \frac{6.56279}{\cos 44}$

$= 9.12336...$

9.12 (A1) ..... cm

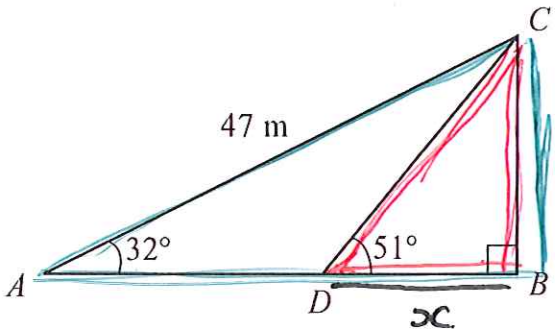
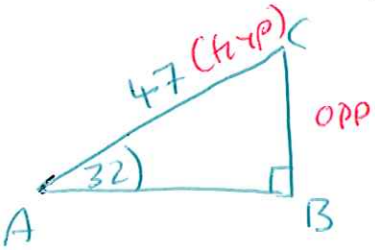


Diagram **NOT** accurately drawn

Triangle ABC is right-angled at B.
Angle $BAC = 32°$
$AC = 47$ m.
D is the point on AB such that angle $BDC = 51°$

Calculate the length of BD.
Give your answer correct to 3 significant figures.

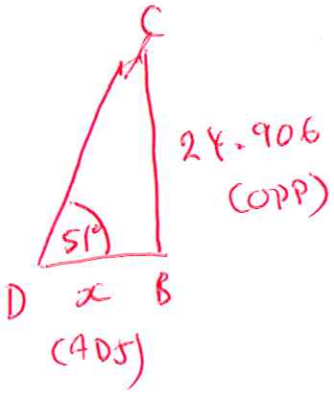


$$\text{SIN } 32 = \frac{\text{OPP}}{\text{HYP}}$$

$$\text{SIN } 32 = \frac{BC}{47} \quad \text{(B1)}$$

$$\Rightarrow BC = 47 \times \text{SIN } 32 \quad \text{(M1)}$$

$$= 24.906 \quad \text{(A1)}$$



$$\text{TAN } 51 = \frac{\text{OPP}}{\text{ADJ}}$$

$$\text{TAN } 51 = \frac{24.906}{x}$$

$$\Rightarrow x = \frac{24.906}{\text{TAN } 51} \quad \text{(M1)}$$

$$= 20.168\ldots$$

20.2 m (A1)

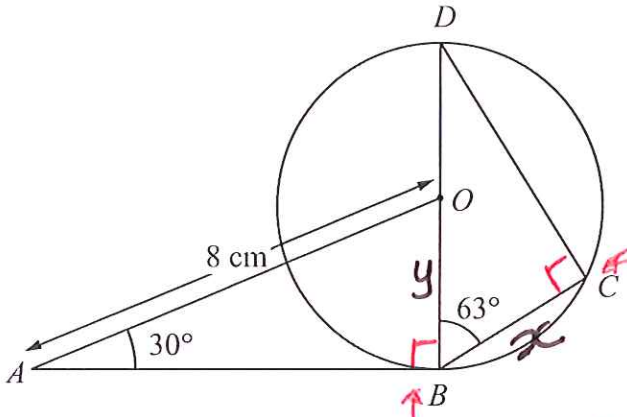


Diagram **NOT** accurately drawn

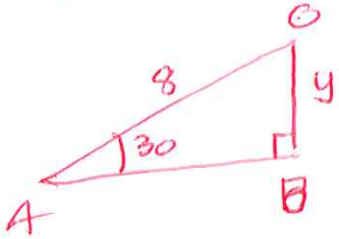
ANGLE FROM DIAMETER = 90°

TANGENT WITH RADIUS = 90°

B, *C* and *D* are points on a circle, centre *O*.
BOD is a diameter of the circle.
AB is the tangent to the circle at *B*.
AO = 8 cm. Angle *BAO* = 30° Angle *CBD* = 63°

Calculate the length of *BC*. (x)
Give your answer correct to 3 significant figures.

USING TRIANGLE AOB:



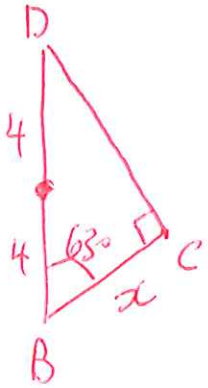
$\sin 30 = \frac{y}{8}$

$\Rightarrow y = 8 \times \sin 30$

$= 4$

THIS IS RADIUS OF THE CIRCLE!

USING TRIANGLE BCD:



$\cos 63° = \frac{x}{8}$

$\Rightarrow x = 8 \cos 63$

$= 3.6319...$

$= \underline{3.63}$ cm

Disclaimer

While reasonable endeavours have been used to verify the accuracy of these solutions, these solutions are provided on an "as is" basis and no warranties are made of any kind, whether express or implied, in relation to these solutions.

There is 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.

Please report any errors or omissions that You find*. These solutions will be updated to correct errors that are discovered. It is recommended that You always check that You have 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 there is no claim that the method that is used is necessarily the most efficient or 'best' method. From time to time, a solution to a question might be updated to show a different method if it is judged 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 You should consider to keep using your existing method and not change to the method that is used here. However, the choice of method is always up to You and it is often useful if You know more than one method to solve a particular type of problem.

Within these solutions there is an indication of where marks **might** be awarded for each question. B marks, M marks and A marks have been used in a similar, but **not identical**, way that an exam board uses these marks within their mark schemes. This slight difference in the use of these marking symbols has been done for simplicity and convenience. Sometimes B marks, M marks and A marks have been interchanged, when compared to an examiners' mark scheme and sometimes the marks have been awarded for different aspects of a solution when compared to an examiners' mark scheme.

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. Method marks have been shown in places where they might be awarded for the method that is shown. If You use a different method to get a correct answer, then the same number of method marks would be awarded but it is not practical to show all possible methods, and the way in which marks might be awarded for their use, within these particular solutions. 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 a method) and all of the accuracy marks.

Note that some questions contain the words 'show that', 'show your working out', or similar. These questions require working out to be shown. Failure to show sufficient working out is likely to result in no marks being awarded, even if the final answer is correct.

* The best way to inform of errors or omissions is a direct Twitter message to @Maths4Everyone