MATHSDIY

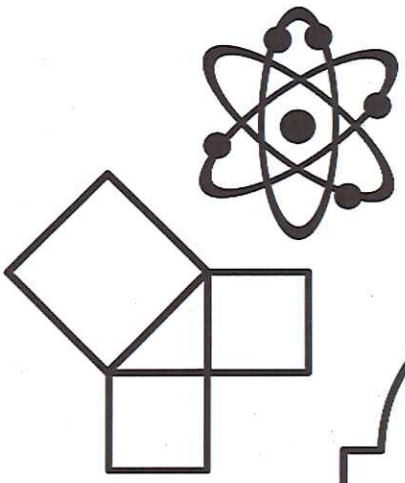
SOLUTIONS

GCSE TOPIC BOOKLET
RIGHT ANGLED TRIGONOMETRY

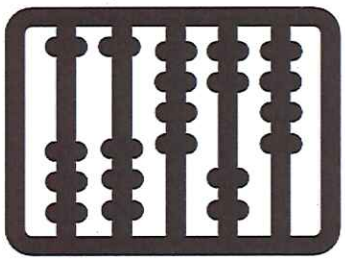
SIN COS TAN

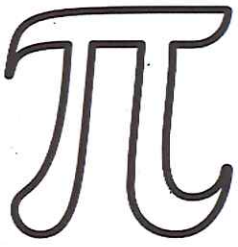
$S\frac{O}{H}$ $C\frac{A}{H}$ $T\frac{O}{A}$

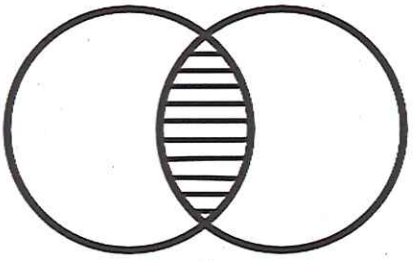
Triangle must have a right angle to use this.

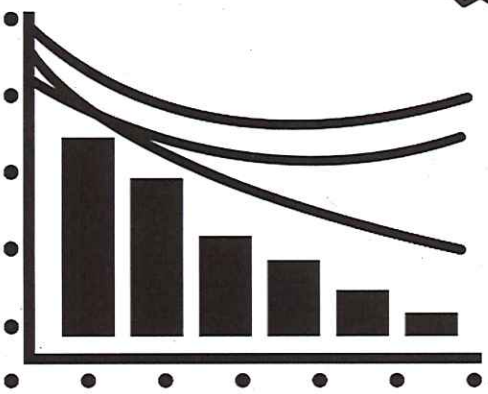


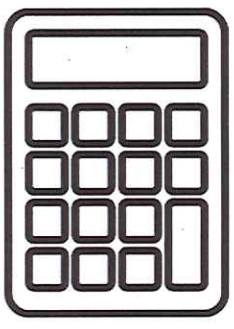
$a^2 = b^2 + c^2$

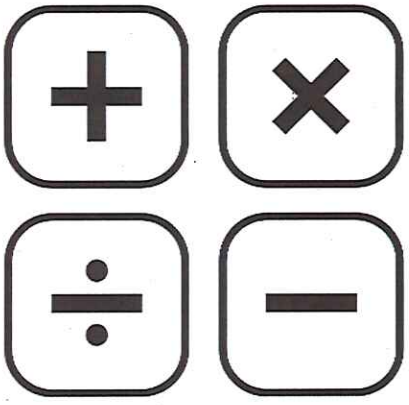












1. *(a)* The triangle EFG is a right-angled triangle with $\hat{EFG} = 90°$. The length $EG = 14{\cdot}8$ cm and $\hat{GEF} = 39°$.

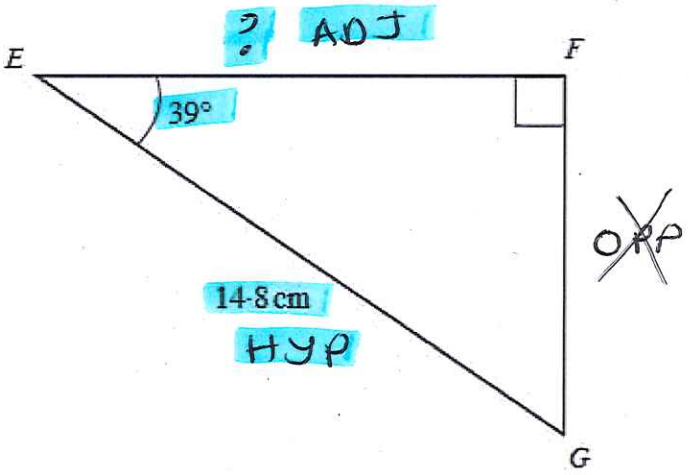


Diagram not drawn to scale.

Calculate the length of EF.

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

$\cos 39 = \frac{EF}{14{\cdot}8}$

$14{\cdot}8 \times \cos 39 = EF$

[3]

$EF = 11{\cdot}50$ cm (2dp)

(b) The triangle RST is a right-angled triangle with $\hat{TRS} = 90°$. The length $RT = 12{\cdot}8$ cm and the length $RS = 18{\cdot}5$ cm.

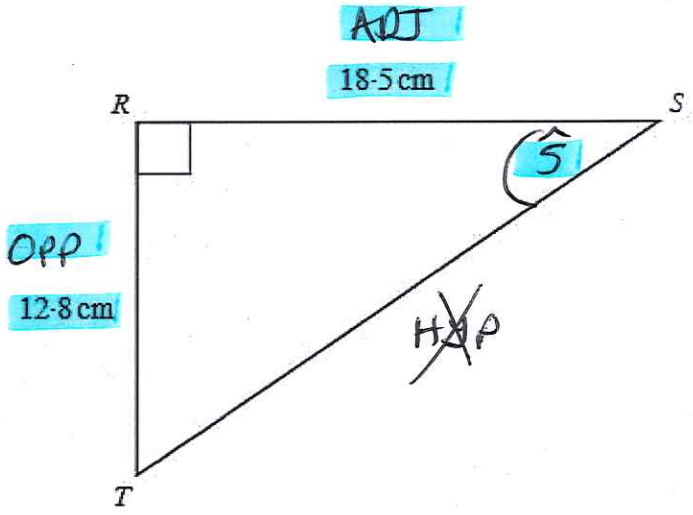


Diagram not drawn to scale.

Calculate the size of the angle $\hat{RST}$.

$\tan \hat{S} = \frac{OPP}{ADJ}$

$\tan \hat{S} = \frac{12{\cdot}8}{18{\cdot}5}$

$\hat{S} = \text{shift tan}\left(\frac{12{\cdot}8}{18{\cdot}5}\right)$

[3]

$\hat{S} = 34.7°$

$\hat{RST} = 34.7°$ (1dp)

2. (a)

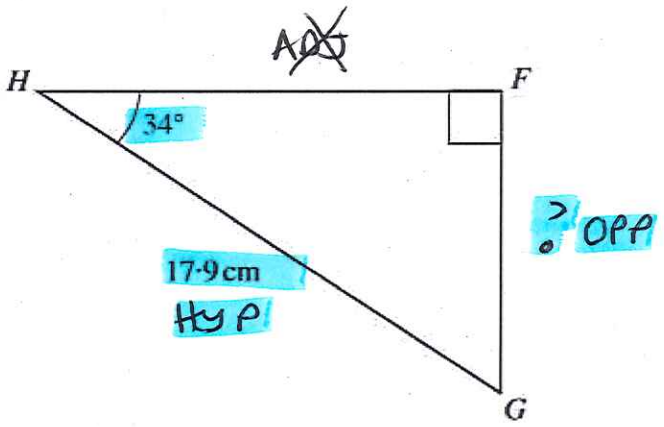


Diagram not drawn to scale.

Calculate the length of *FG*.

$\sin 34 = \frac{OPP}{Hyp}$

$\sin 34 = \frac{FG}{17.9}$

$17.9 \times \sin 34 = FG$

$FG = 10.01$ cm (2dp)

[3]

(b)

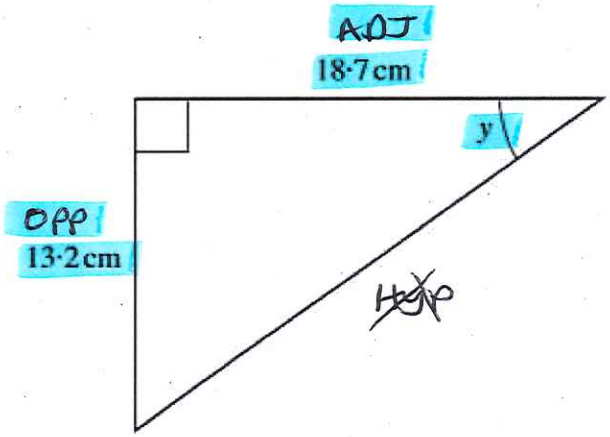


Diagram not drawn to scale.

Calculate the size of the angle *y*.

$\tan \hat{y} = \frac{OPP}{ADJ}$

$\tan \hat{y} = \frac{13.2}{18.7}$

$\hat{y} = \text{shift tan}\left(\frac{13.2}{18.7}\right)$

$\hat{y} = 35.2°$ (1dp)

[3]

3. (a) The triangle ABC is such that $\hat{CAB} = 90°$, $CB = 32$ mm and $\hat{ACB} = 52°$.

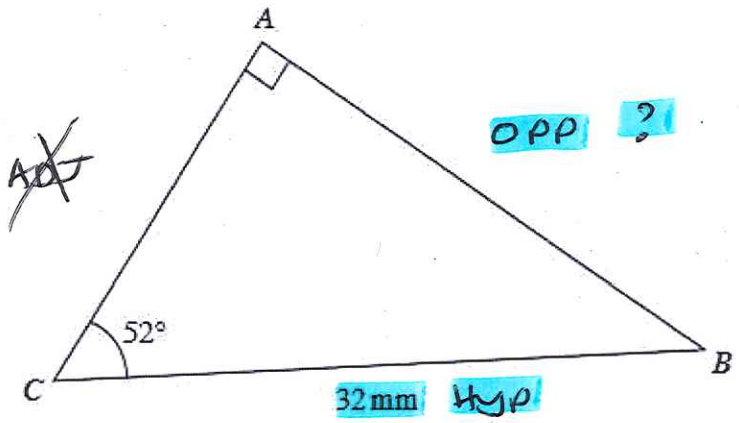


Diagram not drawn to scale.

Calculate the length of AB.

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

$\sin 52 = \frac{AB}{32}$

$32 \times \sin 52 = AB$

$AB = 25.22$ cm (2dp) [3]

(b) The triangle STU is such that $\hat{TUS} = 90°$, $SU = 32\text{-}5$ cm and $ST = 43\text{-}8$ cm.

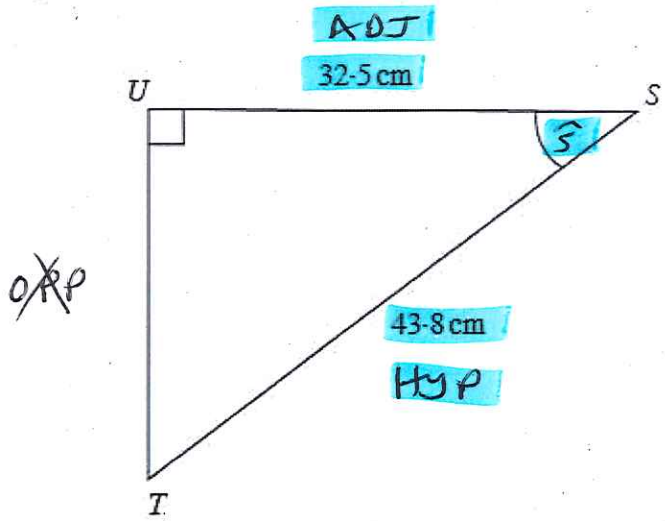


Diagram not drawn to scale.

Calculate the size of $\hat{UST}$.

$\cos\hat{S} = \frac{adj}{hy}$

$\cos\hat{S} = \frac{32\cdot5}{43\cdot8}$

$\hat{S} = \text{shift cos}\left(\frac{32\cdot5}{43\cdot8}\right)$

$\hat{S} = 42\cdot1°$ (1dp)

[3]

4.

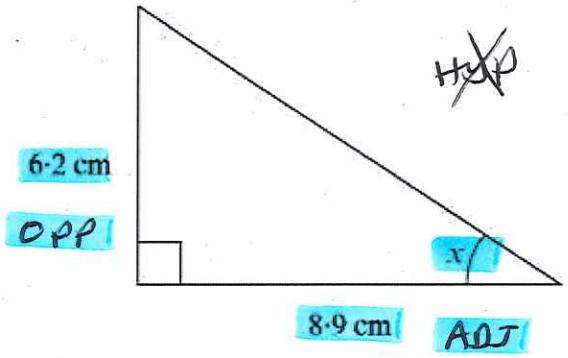


Diagram not drawn to scale.

Find the size of the angle marked x.

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

$\tan \hat{x} = \frac{6.2}{8.9}$

$\hat{x} = \text{shift tan}\left(\frac{6.2}{8.9}\right)$

[3]

$\hat{x} = 34.9°$

5. *(a)* A vertical post AB is 15 m from a point C on horizontal ground. The angle of elevation of the top of the post from the point C is 67°. Calculate the height of the post.

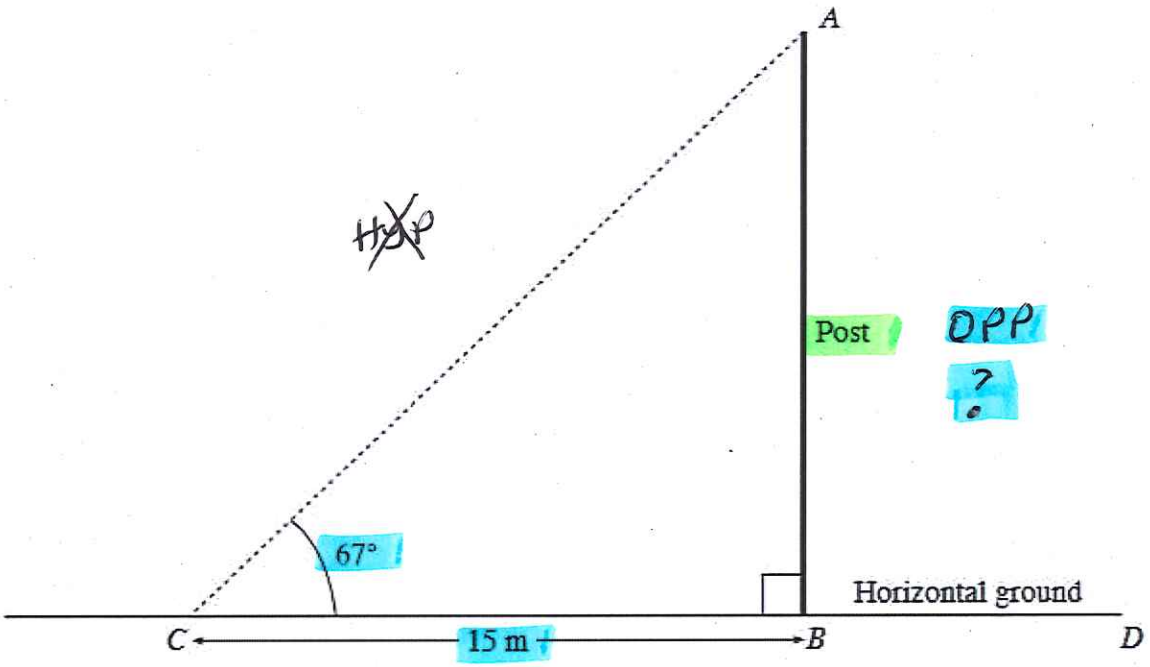


Diagram not drawn to scale.

$\tan 67 = \frac{OPP}{ADJ}$

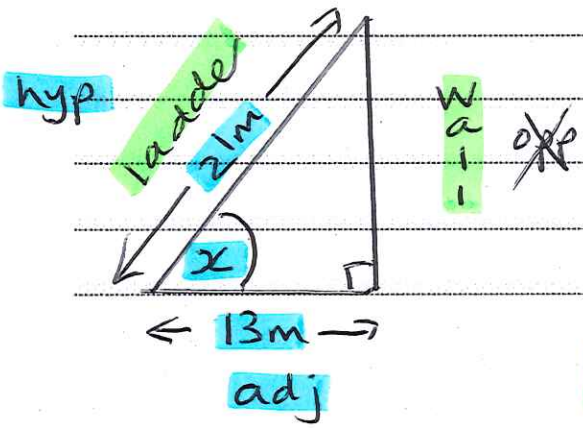
$\tan 67 = \frac{AB}{15}$

$15 \times \tan 67 = AB$

$AB = 35.34\text{ m}$ (2dp)

[3]

(b) A ladder, 21 m long, is placed against a vertical wall. The foot of the ladder is 13 m from the wall on horizontal ground. Calculate the angle which the ladder makes with the horizontal.



$\cos \hat{x} = \frac{adj}{hyp}$

$\cos \hat{x} = \frac{13}{21}$

$\hat{x} = \text{shift cos}\left(\frac{13}{21}\right)$

$\hat{x} = 51.8°$ (1dp)

[3]

6. In the diagram below, the triangle ABE is right-angled at E and the triangle ADC is right-angled at D.

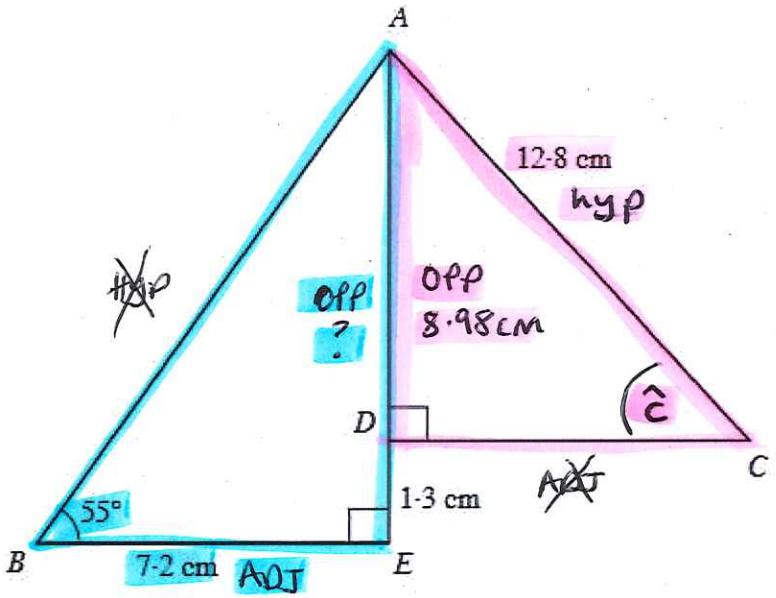


Diagram not drawn to scale.

Given that $BE = 7{\cdot}2$ cm, $DE = 1{\cdot}3$ cm, $AC = 12{\cdot}8$ cm and $A\hat{B}E = 55°$,

(a) find the length of AE. In blue triangle

$\tan 55 = \frac{OPP}{ADJ}$

$\tan 55 = \frac{AE}{7{\cdot}2}$

$7{\cdot}2 \times \tan 55 = AE$, $AE = 10{\cdot}28$ cm (2dp)

[3]

(b) calculate the size of $A\hat{C}D$. In pink triangle

$AD = AE - DE = 10{\cdot}28 - 1{\cdot}3 = 8{\cdot}98$ cm

$\sin \hat{C} = \frac{8{\cdot}98}{12{\cdot}8}$

$\hat{C} = \text{shift sin}\left(\frac{8{\cdot}98}{12{\cdot}8}\right)$

$A\hat{C}D = 44{\cdot}6°$ (1dp)

[3]

7. In the following diagram, $AB = 17{\cdot}5$ m, $DC = 19{\cdot}6$ m, $BDC = 27°$ and $DCA = 90°$.

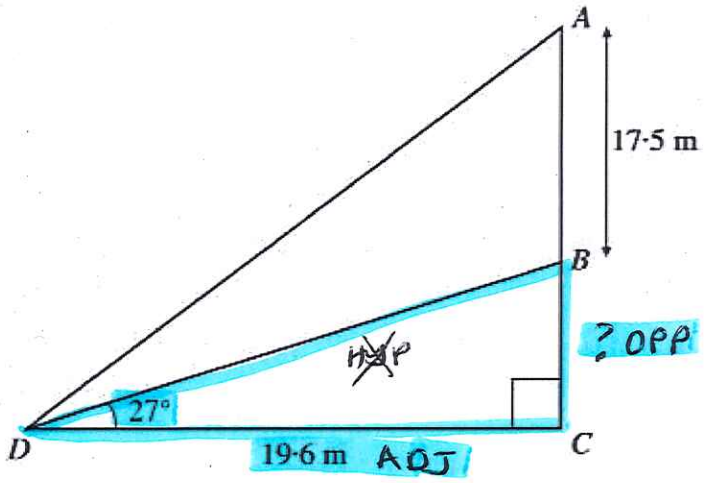


Diagram not drawn to scale.

Calculate the size of $A\hat{D}C$.

① Work out BC in ΔBDC

$\tan 27 = \frac{OPP}{ADJ}$

$\tan 27 = \frac{BC}{19{\cdot}6}$

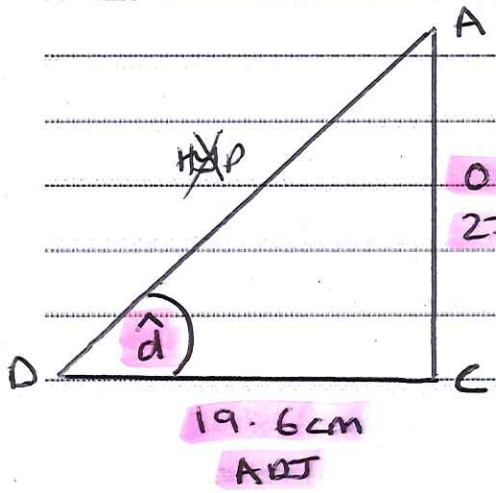
$19{\cdot}6 \times \tan 27 = BC$

$BC = 9{\cdot}987\text{ cm}$

② Now in ΔADC

$AC = 17{\cdot}5 + 9{\cdot}987$

$AC = 27{\cdot}487\text{ cm}$



$\tan \hat{d} = \frac{OPP}{ADJ}$

$\tan \hat{d} = \frac{27{\cdot}487}{19{\cdot}6}$

$\hat{d} = \text{shift tan}\left(\frac{27{\cdot}487}{19{\cdot}6}\right)$ [8]

$\hat{d} = 54{\cdot}5°$

$A\hat{D}C = 54{\cdot}5°$

8. In the diagram, ABC is a straight line and BD is a straight line perpendicular to it. It is given that $AD = 57$ cm, $BC = 65$ cm, $D\hat{A}B = 46°$ and $D\hat{B}C = 90°$.

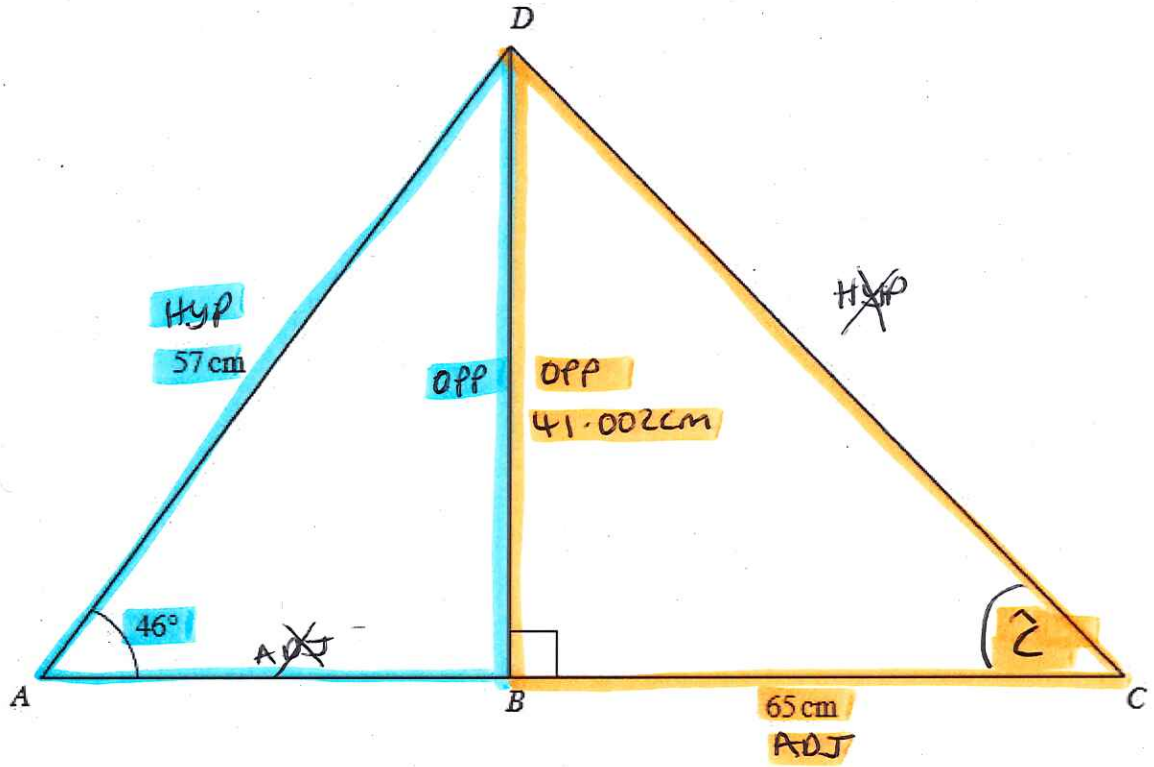


Diagram not drawn to scale.

Calculate the size of $D\hat{C}B$.

① First find BD in △ABD

$\sin 46 = \frac{OPP}{HYP}$

$\sin 46 = \frac{BD}{57}$

$57 \times \sin 46 = BD$, $BD = 41.002\text{cm}$

② Now find $\hat{C}$ in △BDC

$\tan \hat{C} = \frac{OPP}{ADJ}$

$\tan \hat{C} = \frac{41.002}{65}$

$\hat{C} = \text{shift tan}\left(\frac{41.002}{65}\right)$

$D\hat{C}B = 32.2°$

[6]

9.

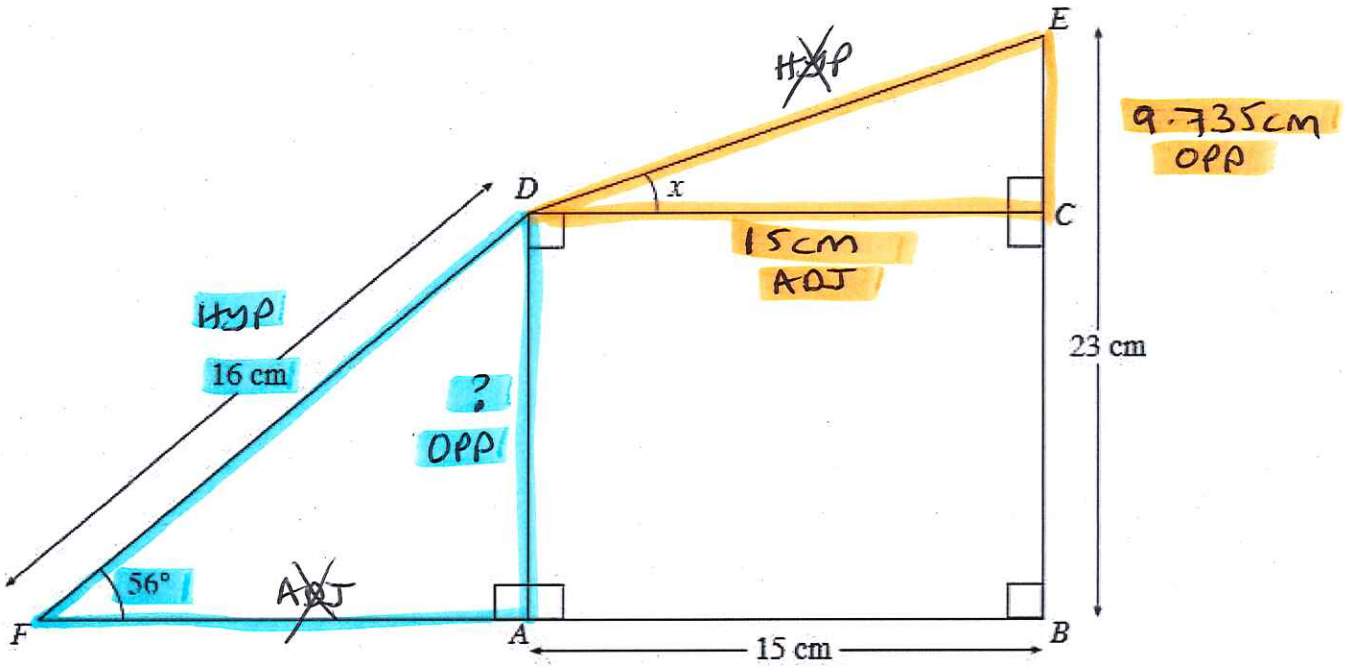


Diagram not drawn to scale.

Find the size of the angle marked x in the above diagram.

① Find AD in ΔFAD

$\sin 56 = \frac{OPP}{HYP}$

$\sin 56 = \frac{AD}{16}$

$16 \times \sin 56 = AD$

$AD = 13.265\text{ cm}$

② Now, if $AD = 13.265\text{cm}$, $CB = 13.265\text{cm}$

$\therefore EC = 23 - 13.265$, $EC = 9.735\text{cm}$

and $DC = AB = 15\text{cm}$

③ Find $\hat{x}$ in ΔDEC

$\tan \hat{x} = \frac{OPP}{adj}$

$\tan \hat{x} = \frac{9.735}{15}$

$\hat{x} = \text{shift tan}\left(\frac{9.735}{15}\right)$

$\hat{x} = 32.98°$

[6]