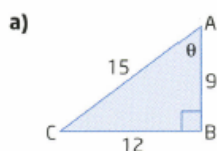


Solutions

1. Find $\sin \theta$, $\cos \theta$, and $\tan \theta$ for each triangle, expressed as fractions in lowest terms.

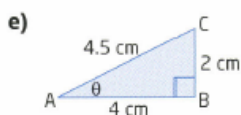


$$\begin{aligned}\sin(\theta) &= \text{opp/hyp} \\ \cos(\theta) &= \text{adj/hyp} \\ \tan(\theta) &= \text{opp/adj}\end{aligned}$$

$$\sin(\theta) = 12/15 = 4/5$$

$$\cos(\theta) = 9/15 = 3/5$$

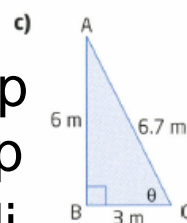
$$\tan(\theta) = 12/9 = 4/3$$



$$\sin(\theta) = 2/4.5 = 4/9$$

$$\cos(\theta) = 4/4.5 = 8/9$$

$$\tan(\theta) = 2/4 = 1/2$$

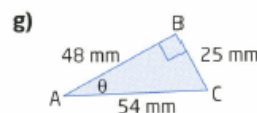


SOHCAHTOA

$$\sin(\theta) = 6/6.7 = 60/67$$

$$\cos(\theta) = 3/6.7 = 30/67$$

$$\tan(\theta) = 6/3 = 2$$



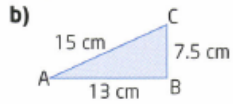
$$\sin(\theta) = 25/54$$

$$\cos(\theta) = 48/54 = 8/9$$

$$\tan(\theta) = 25/48$$

2. Find the three primary trigonometric ratios for $\angle A$, to four decimal places.

SOHCAHTOA

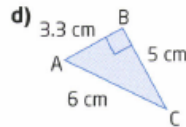


$$\begin{aligned}\sin(A) &= 7.5/15 \\ &= 0.5000\end{aligned}$$

$$\begin{aligned}\cos(A) &= 13/15 \\ &= 0.8667\end{aligned}$$

$$\begin{aligned}\tan(A) &= 7.5/13 \\ &= 0.5769\end{aligned}$$

$$\sin(\theta) = \text{opp/hyp}$$

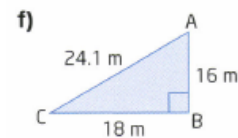


$$\begin{aligned}\sin(A) &= 5/6 \\ &= 0.5000\end{aligned}$$

$$\begin{aligned}\cos(A) &= 3.3/6 \\ &= 0.5500\end{aligned}$$

$$\begin{aligned}\tan(A) &= 5/3.3 \\ &= 1.5152\end{aligned}$$

$$\cos(\theta) = \text{adj/hyp}$$



$$\begin{aligned}\sin(A) &= 18/24.1 \\ &= 0.7469\end{aligned}$$

$$\begin{aligned}\cos(A) &= 16/24.1 \\ &= 0.6639\end{aligned}$$

$$\begin{aligned}\tan(A) &= 18/16 \\ &= 1.125\end{aligned}$$

$$\tan(\theta) = \text{opp/adj}$$

3. Evaluate each of the following with a calculator, rounded to four decimal places.

b) $\sin 45^\circ$ b) 0.7071

d) $\sin 37^\circ$ d) 0.6018

f) $\sin 0^\circ$ f) 0.0000

h) $\sin 30^\circ$ h) 0.5000

Recall:

Not all scientific calculators work the same way. With some, you press



With others, you press



On a graphing calculator, press



Make sure your calculator is in degree mode.

Obviously, TAN could be SIN or COS depending upon the information given in the question.

6. Find the measure of each angle, to the nearest degree.

b) $\sin \theta = 0.5032$ b) $\theta = 30^\circ$

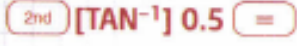

d) $\sin S = \frac{2}{3}$ d) $S = 42^\circ$

f) $\sin A = 0.9511$ f) $A = 72^\circ$

h) $\sin \theta = \frac{2}{5}$ h) $\theta = 24^\circ$

j) $\sin \theta = 0.9976$ j) $\theta = 86^\circ$

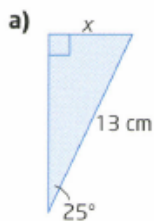
l) $\sin \theta = 0$ l) $\theta = 0^\circ$

Recall: With some scientific calculators, you press

 With others, you press


Obviously, TAN could be SIN or COS depending upon the information given in the question.

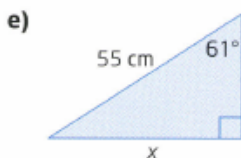
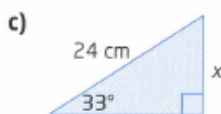
10. Find the length of x , to the nearest tenth of a unit, by applying the sine ratio.

$$\sin(\theta) = \text{opp/hyp}$$



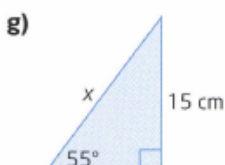
a) $\sin(25) = x/13$
 $13\sin(25) = x$
 $5.5 \text{ cm} = x$

c) $\sin(33) = x/24$
 $24\sin(33) = x$
 $13.1 \text{ cm} = x$



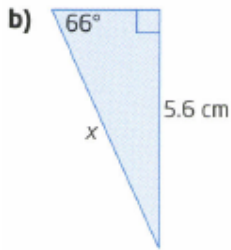
e) $\sin(61) = x/55$
 $55\sin(61) = x$
 $48.1 \text{ cm} = x$

g) $\sin(55) = 15/x$
 $x\sin(55) = 15$
 $x = 15/\sin(55)$
 $x = 18.3 \text{ cm}$



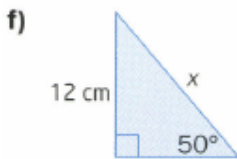
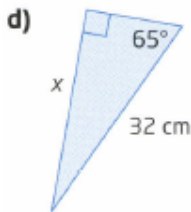
10. Find the length of x , to the nearest tenth of a unit, by applying the sine ratio.

$$\sin(\theta) = \text{opp/hyp}$$



$$\begin{aligned} \text{b) } \sin(66) &= 5.6/x \\ x \sin(66) &= 5.6 \\ x &= 5.6/\sin(66) \\ x &= 6.1 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{d) } \sin(65) &= x/32 \\ 32 \sin(65) &= x \\ 29.0 \text{ cm} &= x \end{aligned}$$



$$\begin{aligned} \text{f) } \sin(50) &= 12/x \\ x \sin(50) &= 12 \\ x &= 12/\sin(50) \\ x &= 15.7 \text{ cm} \end{aligned}$$

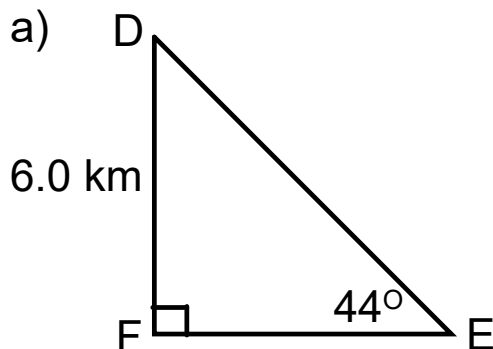
$$\begin{aligned} \text{h) } \sin(41) &= 18/x \\ x \sin(41) &= 18 \\ x &= 18/\sin(41) \\ x &= 27.4 \text{ cm} \end{aligned}$$



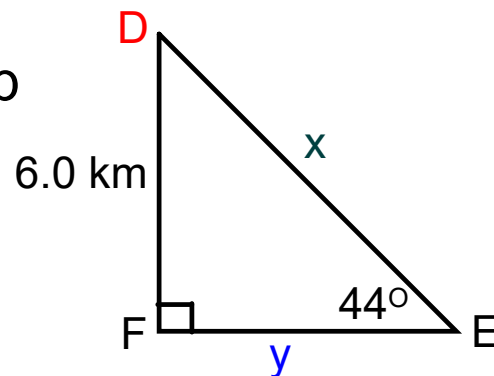
13. In $\triangle DEF$,
 $DF = 6.0 \text{ km}$
 $\angle E = 44^\circ$
 $\angle F = 90^\circ$

- a) Draw this triangle and label the given information.
 b) Solve $\triangle DEF$.

$$\sin(\theta) = \text{opp/hyp}$$



- b) Solving a triangle means to find all the missing information.



$$\angle D = 180 - 90 - 44$$

$$\angle D = 46^\circ$$

$$\sin(44) = 6/x$$

$$x \sin(44) = 6$$

$$x = 6/\sin(44)$$

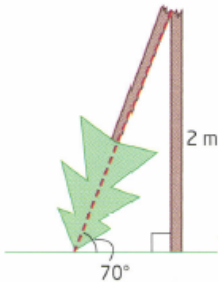
$$x = 8.6 \text{ km}$$

$$\sin(46) = y/8.6$$

$$8.6 \sin(46) = y$$

$$6.2 \text{ km} = y$$

21. A tree is splintered by lightning 2 m up its trunk, so that the top part of the tree touches the ground. The angle the top of the tree forms with the ground is 70° . Before it was splintered, how tall was the tree, to the nearest tenth of a metre?



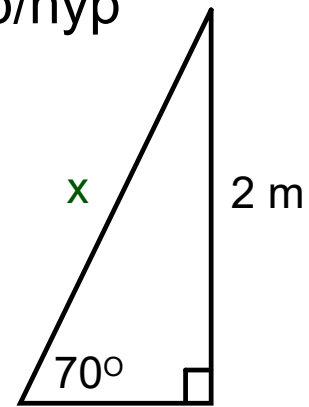
$$\sin(\theta) = \text{opp/hyp}$$

$$\sin(70) = 2/x$$

$$x \sin(70) = 2$$

$$x = 2/\sin(70)$$

$$x = 2.1 \text{ cm}$$

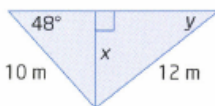


$$\text{Height of tree} = 2 + x$$

$$= 2 + 2.1$$

$$= 4.1 \text{ metres}$$

33. Find the length of x , to the nearest tenth of a metre, then the measure of y , to the nearest degree.



$$\sin(\theta) = \text{opp/hyp}$$

A good strategy is often to solve the variables in alphabetical order. In this case we have to, because we need to know x to solve for y .

$$\sin(48) = x/10$$

$$10\sin(48) = x$$

$$7.4 \text{ cm} = x$$

$$\sin(y) = 7.4/12$$

$$y = \sin^{-1}(7.4/12)$$

$$y = 38^\circ$$