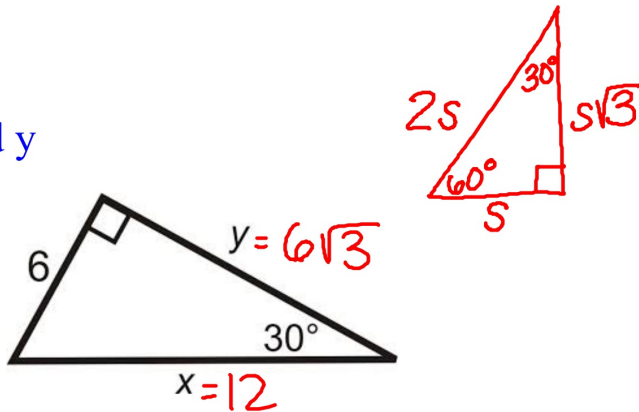


Launch:

Find x and y



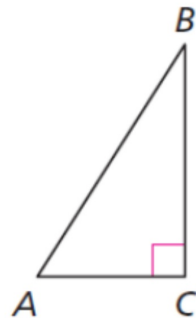
6.7

Some Special Ratios

Objective: To use the sine, cosine, and tangent functions and their inverses to find missing side lengths and angle measures in triangles.

Trigonometry: The study of triangles dealing with the relationship between the sides and angles.

Trigonometric functions are sine, cosine, and tangent.

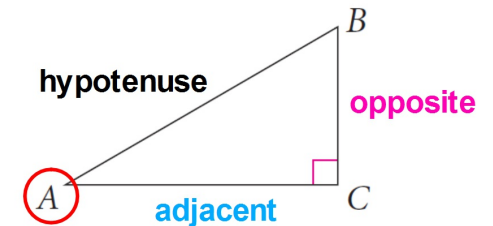


Trigonometric Ratios

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$

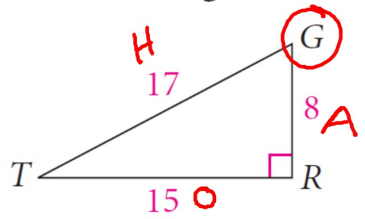


Soh-Cah-Toa

* Some Old Horse Came A Hoppin Through Our Alley *

Example 1

Use the triangle to write each ratio.



SOH-CAH-TOA

a. $\sin T = \frac{8}{17}$

b. $\cos T = \frac{15}{17}$

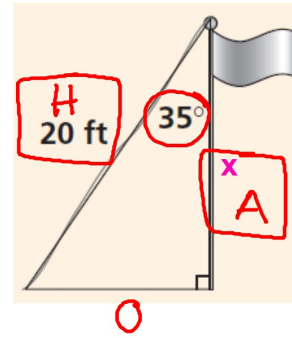
c. $\sin G = \frac{15}{17}$

d. $\cos G = \frac{8}{17}$

Example 2

SOH-CAH-TOA

a) A 20-ft wire supporting a flagpole forms a 35 degree angle with the flagpole. To the nearest foot, how high is the flagpole?



$\cos 35^\circ = \frac{x}{20}$

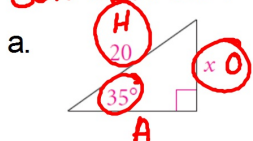
$0.8192 = \frac{x}{20}$

$x = 16.38 \text{ ft.}$

16ft

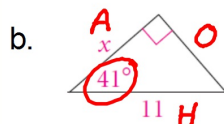
Find the value of x. Round answers to the nearest tenth.

SOH-CAH-TOA



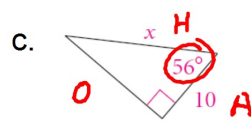
$\sin 35^\circ = \frac{x}{20}$
 $0.5736 = \frac{x}{20}$

$x = 11.5$



$\cos 41^\circ = \frac{x}{11}$
 $0.7547 = \frac{x}{11}$

$x = 8.3$

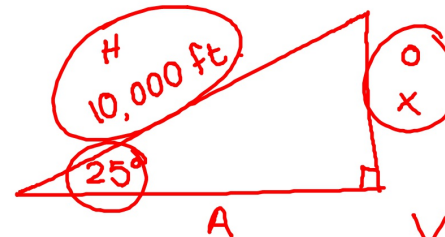


$\cos 56^\circ = \frac{10}{x}$
 $0.5592 = \frac{10}{x}$

$0.5592x = 10$
 $\div .5592 \quad \div .5592$
 $x = 17.9$

5. An airplane takes off and flies 10,000 feet in a straight line, making a 25 degree angle with the ground. How high above the ground does the airplane rise?

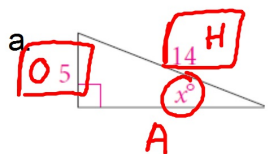
SOH-CAH-TOA



$\sin 25^\circ = \frac{x}{10,000}$
 $0.4226 = \frac{x}{10,000}$

$x = 4,226 \text{ ft.}$

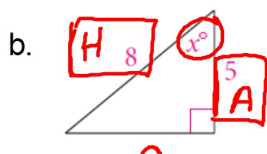
Find the value of x . Round answers to the nearest degree. SOH-CAH-TOA



$$\sin x = \frac{5}{14}$$

$$\sin x = 0.3571$$

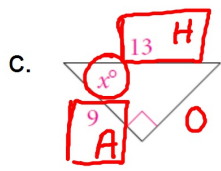
$$x \approx 21^\circ$$



$$\cos x = \frac{8}{10}$$

$$\cos x = 0.8$$

$$x \approx 37^\circ$$



$$\sin x = \frac{9}{13}$$

$$\sin x = 0.6923$$

$$x \approx 44^\circ$$

On Your Own

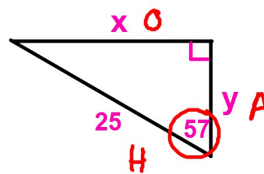
Page 478: 6

6. In $\triangle TUB$, $m\angle T = 90^\circ$, $m\angle U = 70^\circ$, and $TU = 8$ cm. Find the rest of the side lengths and angle measures.

Launch:

SOH-CAH-TOA

Find x and y .



$$\sin 57^\circ = \frac{x}{25}$$

$$0.8387 = \frac{x}{25}$$

$$x = 20.9675$$

$$\cos 57^\circ = \frac{y}{25}$$

$$0.5446 = \frac{y}{25}$$

$$y = 13.615$$

6.7

Some Special Ratios

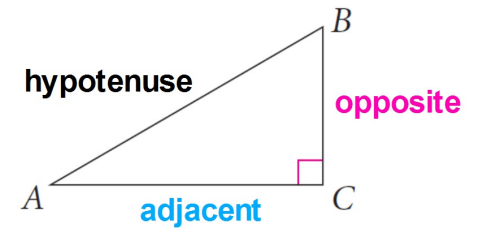
Objective: To use the sine, cosine, and tangent functions and their inverses to find missing side lengths and angle measures in triangles.

Trigonometric Ratios

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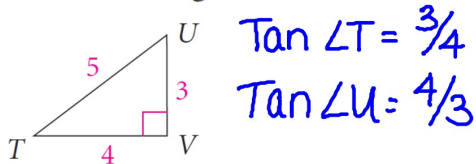


Soh-Cah-Toa

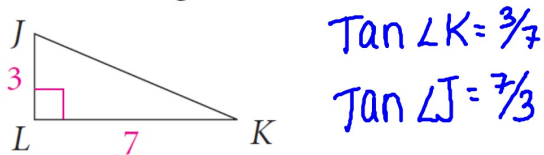
Some Qld Horse Came A Hoppin Through Our Alley

Example 1

a) Write the tangent ratios for $\angle T$ and $\angle U$.

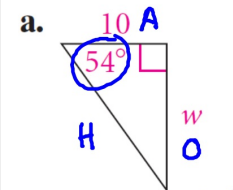


b) Write the tangent ratios for $\angle K$ and $\angle J$.

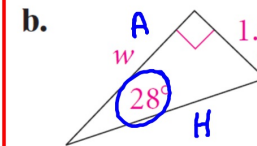


Example 2 SOH-CAH-TOA

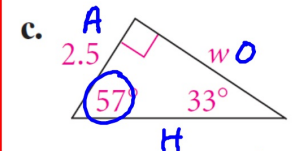
Find the value of w to the nearest tenth.



$$\begin{aligned} \tan 54^\circ &= \frac{w}{10} \\ 1.3764 &= \frac{w}{10} \\ \cdot 10 &\quad \cdot 10 \\ \boxed{w = 13.8} \end{aligned}$$



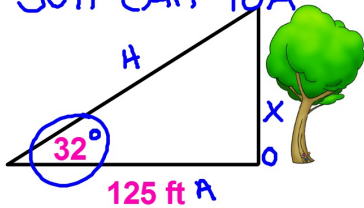
$$\begin{aligned} \tan 28^\circ &= \frac{w}{1} \\ 0.5317 &= \frac{w}{1} \\ \cdot w &\quad \cdot w \\ 0.5317w &= 1 \\ \div 0.5317 &\quad \div 0.5317 \\ \boxed{w = 1.9} \end{aligned}$$



$$\begin{aligned} \tan 57^\circ &= \frac{w}{2.5} \\ 1.5399 &= \frac{w}{2.5} \\ \cdot 2.5 &\quad \cdot 2.5 \\ \boxed{w = 3.8} \end{aligned}$$

- d) To measure the height of a tree, Alma walked 125 ft from the tree and measured a 32 degree angle from the ground to the top of the tree. Estimate the height of the tree.

SOH-CAH-TOA



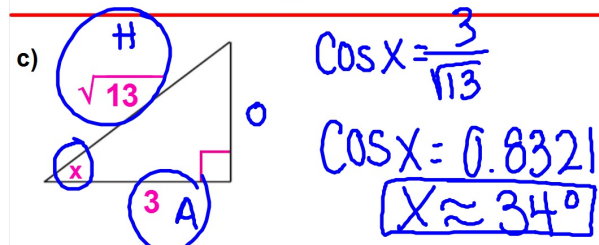
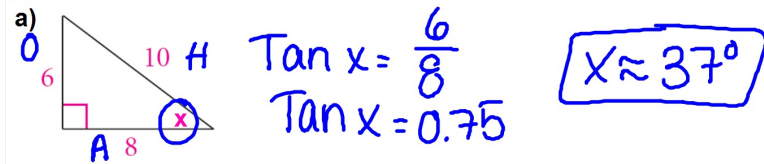
$$x = 78.1 \text{ ft}$$

$$\begin{aligned} \tan 32^\circ &= \frac{x}{125} \\ 0.6249 &= \frac{x}{125} \\ \cdot 125 &\quad \cdot 125 \end{aligned}$$

Example 3

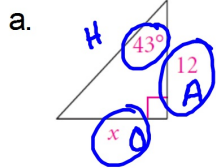
SOH-CAH-TOA

Find x.

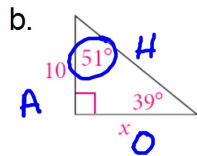


Find the value of x to the nearest tenth.

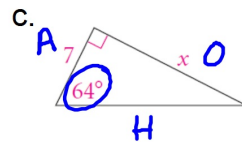
SOH-CAH-TOA



$$\begin{aligned} \tan 43^\circ &= \frac{x}{12} \\ 0.9325 &= \frac{x}{12} \\ \cdot 12 &\quad \cdot 12 \\ \boxed{11.2 = x} \end{aligned}$$



$$\begin{aligned} \tan 51^\circ &= \frac{x}{10} \\ 1.2349 &= \frac{x}{10} \\ \cdot 10 &\quad \cdot 10 \\ \boxed{12.3 = x} \end{aligned}$$

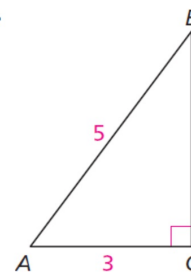


$$\begin{aligned} \tan 64^\circ &= \frac{x}{7} \\ 2.0503 &= \frac{x}{7} \\ \cdot 7 &\quad \cdot 7 \\ \boxed{14.4 = x} \end{aligned}$$

In Exercises 2 and 3,

- Find $\sin A$, $\cos A$, and $\tan A$ for each triangle.
- Find $\sin B$, $\cos B$, and $\tan B$ for each triangle.
- Which of your answers from parts (a) and (b) are the same? Explain.

2.



$$\begin{aligned} \sin A &= \frac{4}{5} & \sin B &= \frac{3}{5} \\ \cos A &= \frac{3}{5} & \cos B &= \frac{4}{5} \\ \tan A &= \frac{4}{3} & \tan B &= \frac{3}{4} \end{aligned}$$