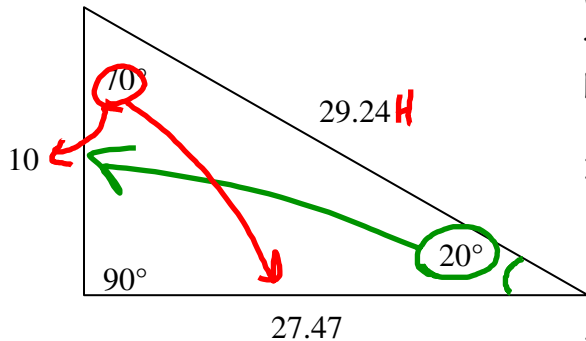


8-5 Using Tangent Ratios to Solve Right Triangles

In the last lesson we learned how to use two special right triangles and proportions to find missing values. This lesson will teach another method for solving right triangles with different degree measures than our special triangles.



Using the given triangle, find the following measures to the nearest hundredth.

1) $\frac{\text{leg opposite } 20^\circ}{\text{leg adjacent } 20^\circ}$

$$\frac{10}{27.47} = 0.36$$

2) $\tan 20^\circ = 0.36$

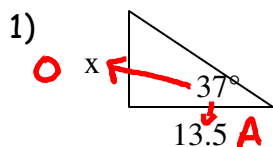
3) $\frac{\text{leg opposite } 70^\circ}{\text{leg adjacent } 70^\circ}$

$$\frac{27.47}{10} = 2.747$$

4) $\tan 70^\circ = 2.747$

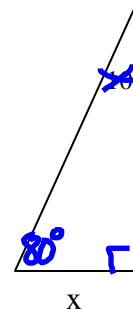
We define $\tan \angle x = \frac{\text{leg opposite } \angle x}{\text{leg adjacent } \angle x}$

Use this proportion to solve the following.



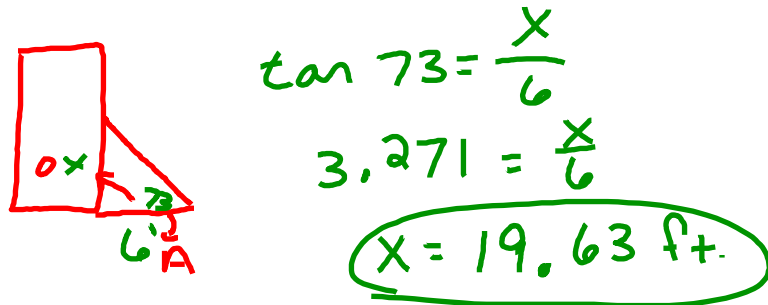
$$\begin{aligned} \tan 37^\circ &= \frac{x}{13.5} \\ (13.5) \cdot 0.754 &= \frac{x}{13.5} (13.5) \\ x &= 10.17 \end{aligned}$$

2)



$$\begin{aligned} \tan 80^\circ &= \frac{12}{x} \\ 5.671 &= \frac{12}{x} \\ 5.671x &= 12 \\ \frac{5.671x}{5.671} &= \frac{12}{5.671} \\ x &= 2.116 \end{aligned}$$

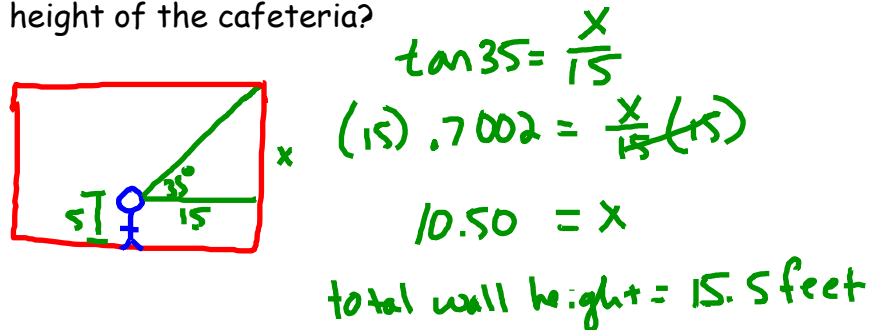
- 3) A ladder makes a ~~43°~~^{73°} with the ground and sits 6 feet away from the wall. How far up the wall can the ladder reach?



- 4) Ms. Boyd's students complete a measuring activity using clinometers. One group got the following measurements in the cafeteria:

angle = 35° distance from wall = 15 feet eyeball height = 5 feet

What was the height of the cafeteria?



We can also use this ratio to find angle measures. The opposite of tangent is \tan^{-1} (in your calculator push the 2nd then tan buttons). Use this to find the following angles.

5)

Diagram for problem 5: A right triangle with a vertical side of 8.5 and a horizontal side of 15. The angle x is at the bottom right.

$$\tan x = \frac{8.5}{15}$$

$$\tan^{-1}(\tan x) = \tan^{-1}(.5667)$$

$$x = 29.54^\circ$$

6)

Diagram for problem 6: A right triangle with a vertical side of 7.25 and a horizontal side of 10.3. The angle x is at the bottom right.

$$\tan x = \frac{7.25}{10.3}$$

$$\tan^{-1}(\tan x) = \tan^{-1}(.7039)$$

$$x = 35.14^\circ$$

- 7) A rhombus has diagonals of length 4 and 10. Find the angles of the rhombus to the nearest degree.

