Solving Right Triangles

Reminder:

Sine	**C**osine	**T**angent
Opposite	**A**djacent	**O**pposite
Hypotenuse	**H**ypotenuse	**A**djacent

So far we've learned to find missing side measures, but today we'll learn how to solve missing angle measures, too.

What if we get an equation like the ones below? How will we solve them?

Example 1

$\sin x = \frac{5}{13}$

$x \approx 22.6°$

Example 2

$\cos x = \frac{7}{10}$

$x \approx 45.6°$

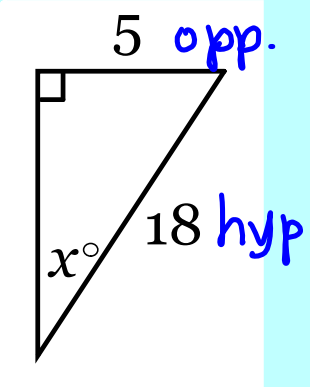
Example 3

$\tan x = \frac{4}{21}$

$x \approx 10.8°$

Example 4

Solve for x.

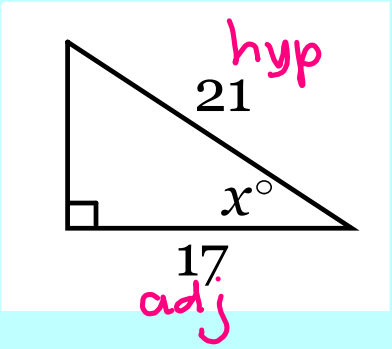


$\sin^{-1}(\sin x) = \sin^{-1}\left(\frac{5}{18}\right)$

$x \approx 16.1°$

Example 5

Solve for x.

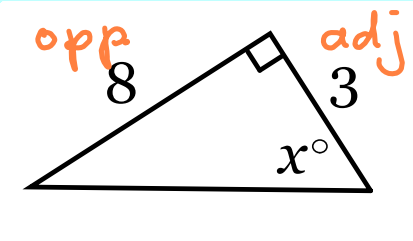


$\cos^{-1}(\cos x) = \cos^{-1}\left(\frac{17}{21}\right)$

$x \approx 36.0°$

Example 6

Solve for x.



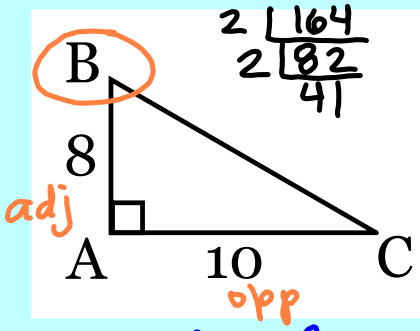
$\tan^{-1}(\tan x) = \tan^{-1}\left(\frac{8}{3}\right)$

$x \approx 69.4°$

To solve a right triangle means to determine the measures of all six parts (3 angles, 3 sides).

Example 7

Solve the right triangle. Round decimals to the nearest tenth.



$2 \mid 164$
$2 \mid 82$
41

$8^2 + 10^2 = c^2$

$64 + 100 = c^2$

$\sqrt{164} = \sqrt{c^2}$

$2\sqrt{41} = c$

$m\angle A = 90°$

$m\angle B \approx 51.3°$

$m\angle C \approx 38.7°$

$\tan^{-1}(\tan B) = \tan^{-1}\left(\frac{10}{8}\right)$

$m\angle B \approx 51.3°$

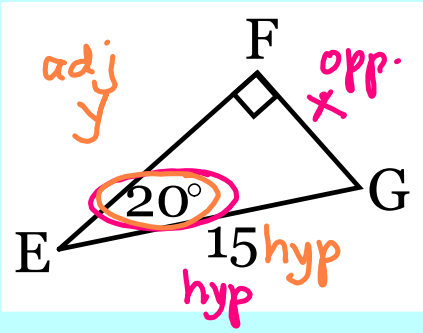
$AB = 8$

$BC = 2\sqrt{41}$

$CA = 10$

Example 8

Solve the right triangle. Round decimals to the nearest tenth.



$m\angle E = 20°$ $EF \approx 14.1$

$m\angle F = 90°$ $FG \approx 5.1$

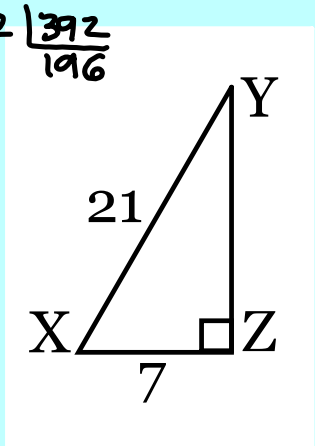
$m\angle G = 70°$ $GE = 15$

$15 \cdot \sin 20° = \frac{x}{15} \cdot 15$ $15 \cdot \cos 20° = \frac{y}{15} \cdot 15$

$5.1 \approx x$ $14.1 \approx y$

Example 9

Solve the right triangle. Round decimals to the nearest tenth.



$m\angle X \approx 70.5°$ $XY = 21$

$m\angle Y \approx 19.5°$ $YZ = 14\sqrt{2}$

$m\angle Z = 90°$ $ZX = 7$

$\cos^{-1}(\cos X) = \cos^{-1}\left(\frac{7}{21}\right)$

$m\angle X \approx 70.5°$

$2 \mid 392$
196

$7^2 + b^2 = 21^2$

$49 + b^2 = 441$

$-49 \quad -49$

$\sqrt{b^2} = \sqrt{392}$

$b = 14\sqrt{2}$