Thursday, January 23, 2014
9:14 AM

Right Triangle Trigonometry

SOH CAH TOA

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

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

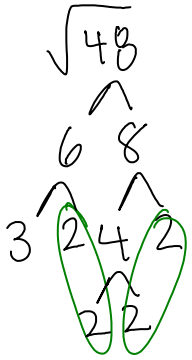
$\tan x = \frac{\text{opposite}}{\text{adjacent}}$

cosecant
$\csc x = \frac{\text{hypotenuse}}{\text{opposite}}$

secant
$\sec x = \frac{\text{hypotenuse}}{\text{adjacent}}$

cotangent
$\cot x = \frac{\text{adjacent}}{\text{opposite}}$

Prerequisite skill: simplifying radicals
rationalizing denominator

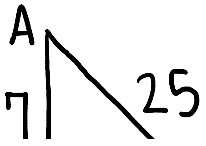


$\frac{2}{3\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{2\sqrt{6}}{3\sqrt{36}} = \frac{2\sqrt{6}}{18} = \frac{\sqrt{6}}{9}$

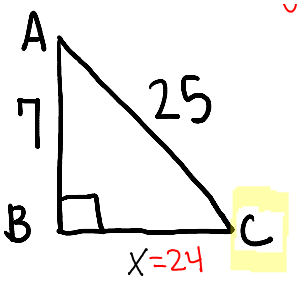
$\sqrt{36} = 6$

Example 1: Writing Trig Ratios

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



$\sin C = \frac{7}{25}$ $\csc C = \frac{25}{7}$

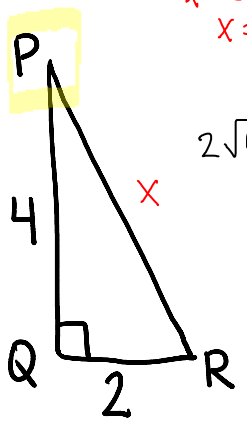


$\sin C = \frac{7}{25}$ $\csc C = \frac{25}{7}$

$\cos C = \frac{24}{25}$ $\sec C = \frac{25}{24}$

$\tan C = \frac{7}{24}$ $\cot C = \frac{24}{7}$

$7^2 + x^2 = 25^2$
$49 + x^2 = 625$
$x^2 = 576$
$x = 24$



$2\sqrt{5}$

$4^2 + 2^2 = x^2$
$\sqrt{20}$
$4\ 5$
$2\sqrt{5}$

$\sin P = \frac{2}{2\sqrt{5}} = \frac{1}{\sqrt{5}}$ $\csc P = \sqrt{5}$

$\frac{1}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5}$

$\cos P = \frac{4}{2\sqrt{5}} = \frac{2}{\sqrt{5}}$ $\sec P = \frac{\sqrt{5}}{2}$

$\frac{2}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$

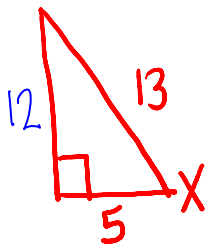
$\tan P = \frac{2}{4} = \frac{1}{2}$ $\cot P = 2$

Example 2: Given one ratio ...

Given $\cos X = \frac{5}{13}$, find other 5 ratios.

$\frac{5}{13} \rightarrow \frac{A}{H}$

1. draw and label a picture.
2. find missing side
3. find remaining ratios.



$5^2 + \underset{12}{\_}^2 = 13^2$

$\sin x = \frac{12}{13}$ $\csc x = \frac{13}{12}$

$\cos x = \frac{5}{13}$ $\sec x = \frac{13}{5}$

$\tan x = \frac{12}{5}$ $\cot x = \frac{5}{12}$

Example 3: Solving Trig Equations

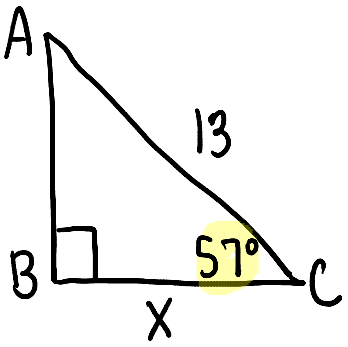
① make sure calculator is in degrees (MODE)

② Set up an equation and solve

trig angle = ratio

- if variable is on top, multiply.
- if variable is on bottom, divide
- if variable is angle, use inverse (2ND SIN → $\sin^{-1}$)

a.



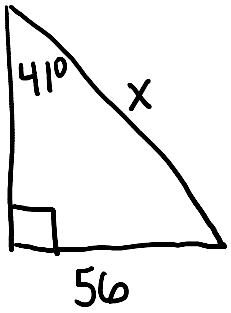
57
O =
A = X
H = 13

$\cos 57 = \frac{X}{13}$

$13 \cos 57 = X$

$7.08 = X$

b.



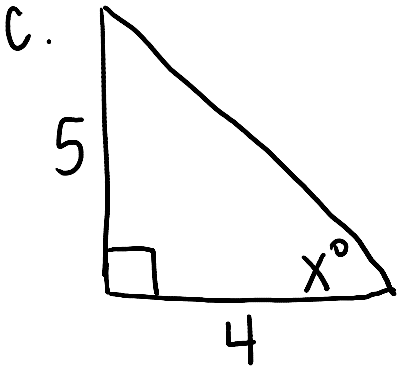
41°
O = 56
A =
H = X

$\sin 41 = \frac{56}{X}$

$56 / \sin 41 = X$

$85.36 = X$

C.



x°
O = 5
A = 4
H =

$\tan x = \frac{5}{4}$

$\tan^{-1}(5/4) = x$

2ND TAN (5/4) = X

51.34 = X