I will be able to determine the side lengths of right angled triangles using the primary trig ratios

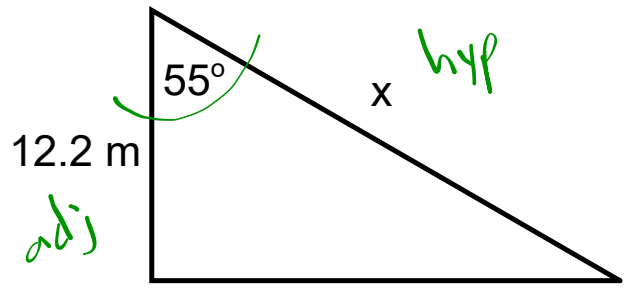
Minds on Opposite operations and solving equations - whiteboards

Action! Solving for angles

Consolidation Practice!

Minds on

What's the side length?



soh cah toa

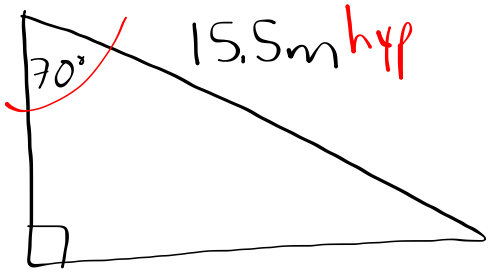
hyp

adj

$\cos 55° = \frac{12.2}{x}$

$x = \frac{12.2}{\cos 55°}$

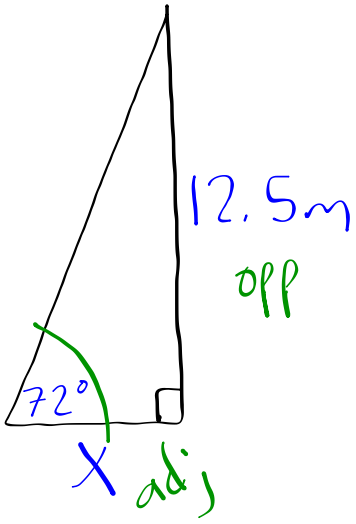
$x = 21.3\text{ m}$



soh cah toa

$15.5 \times \sin 70° = \frac{X}{15.5} \times 15.5$

$X = 14.6m$



soh cah toa

$\tan 72^\circ = \frac{12.5}{x}$

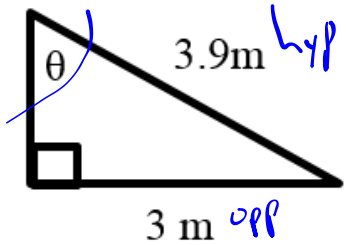
$x = \frac{12.5}{\tan 72^\circ}$

$x = 4.1\ m$

Action!

Yesterday, we developed a method for using trigonometry to solve for an unknown **side**.

But what if he had an **unknown angle** with known sides? We could still set up a ratio:



soh cah toa

hyp

opp

Remember that the Greek letter theta (θ) is used to represent an unknown angle

$$\sin\theta = \frac{opp}{hyp}$$

$$\sin\theta = \frac{3}{3.9}$$

$$\sin\theta = 0.77$$

$$\sin\theta = 0.7692$$

$$\theta = 50.3^{\circ}$$

Action!

It seems like I should be able to solve this . . . but I'd need an inverse operation here, wouldn't I?

Just like how I solved an addition problem using subtraction, or solved a square problem using square roots.

Is there an inverse to a trig function?

In fact, each trig ratio has an inverse. We represent them like this:

$\sin^{-1}$

$\cos^{-1}$

$\tan^{-1}$

Action!

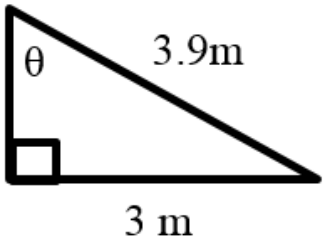
IMPORTANT: These represent “inverse sine” “inverse cosine” and “inverse tangent.” This has nothing at all to do with exponents, even though they look the same.

(If you say "sin to the negative one", people will think you're bananas.)

Action!

To access the inverse functions, most calculators require that you use the "second function" button. If you push on most calculators, you'll get $\sin^{-1}$.

So, now we can solve this triangle with the inverse sine:



$$\sin\theta = \frac{opp}{hyp}$$

$$\sin\theta = \frac{3}{3.9}$$

$$\sin\theta = 0.77$$

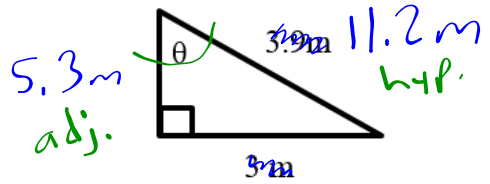
$\sin\theta = 0.7692$

$\theta = \sin^{-1}(0.7692)$

$\theta = 50.3°$

Example 1: Solve for the unknown angle indicated.

HINT: Use SOH CAH TOA like yesterday but you check off both side lengths you HAVE for the angle you NEED.



soh cah toa

$\cos\theta = \frac{5.3}{11.2}$

$\cos\theta = 0.4732$

$\theta = \cos^{-1}(0.4732)$

$\theta = 61.9^\circ$

Example 2: Now, use your calculator to calculate:

a) $\sin^{-1} 0.5$ $= 30°$

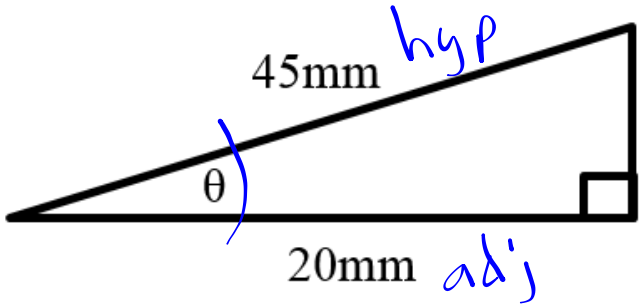
b) $\cos^{-1} 0.5$ $= 60°$

c) $\tan^{-1} 0.5$ $= 26.6°$

d) $\cos^{-1} 0.62$ $= 51.7°$

Example 3: Solve for the unknown angle indicated.

soh cah toa



$\cos\theta = \frac{20}{45}$

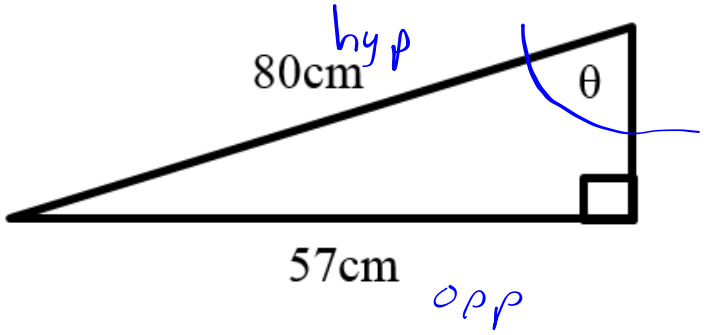
$\cos\theta = 0.4444$

$\theta = \cos^{-1}(0.4444)$

$\theta \doteq 63.6^\circ$

Example 4: Solve for the unknown angle indicated.

SOH CAH TOA



$\sin\theta = \frac{57}{80}$

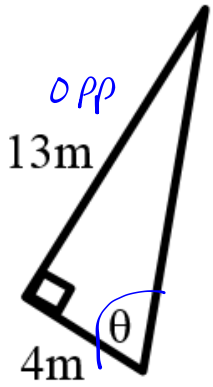
$\sin\theta = 0.7125$

$\theta = \sin^{-1}(0.7125)$

$\theta \doteq 45.4°$

Example 5: Solve for the unknown angle indicated.

a)



soh cah toa

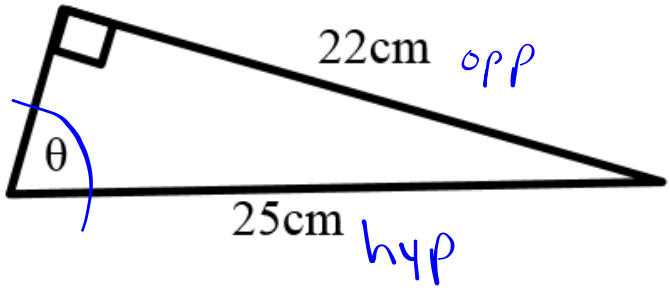
$\tan\theta = \frac{13}{4}$

$\tan\theta = 3.25$

$\theta = \tan^{-1}(3.25)$

$\theta \doteq 72.9^\circ$

b)



SOH CAH TOA

$\sin\theta = \frac{22}{25}$

$\sin\theta = 0.88$

$\theta = \sin^{-1}(0.88)$

$\theta \doteq 61.6^\circ$

Practice: Page 398 # 3, 6, 7, 12, 16, 17