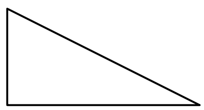
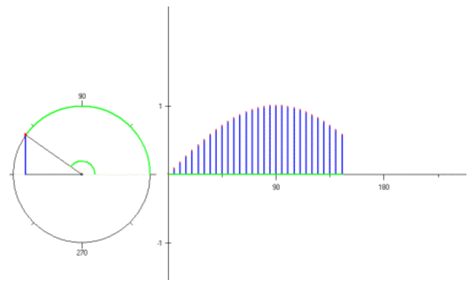
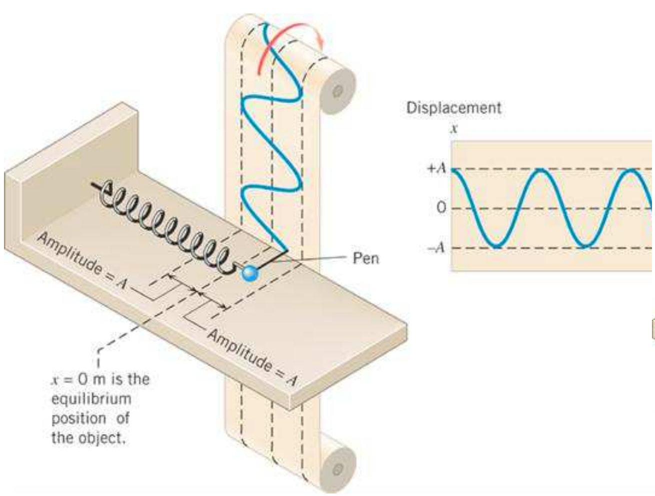
A Poor ~~Man's~~ Student's Guide to Trigonometry

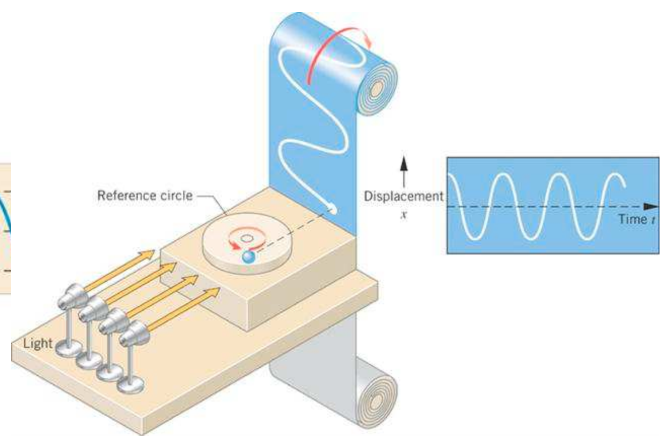
Trigonometric Functions (just ratios with fancy names)

Triangles & Rotation & Oscillations: motions are related

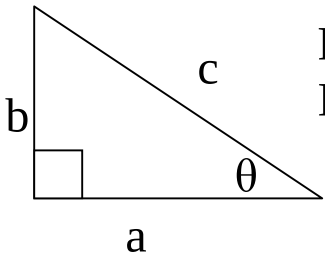






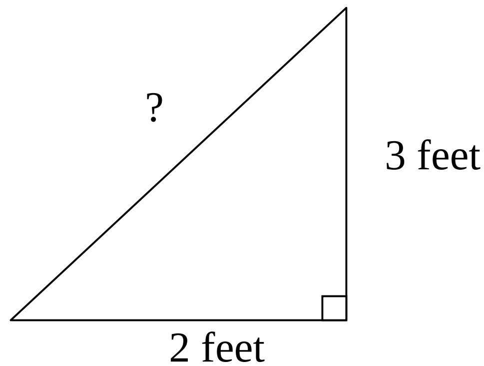


We will use the Trig functions when working
with __________ triangles.

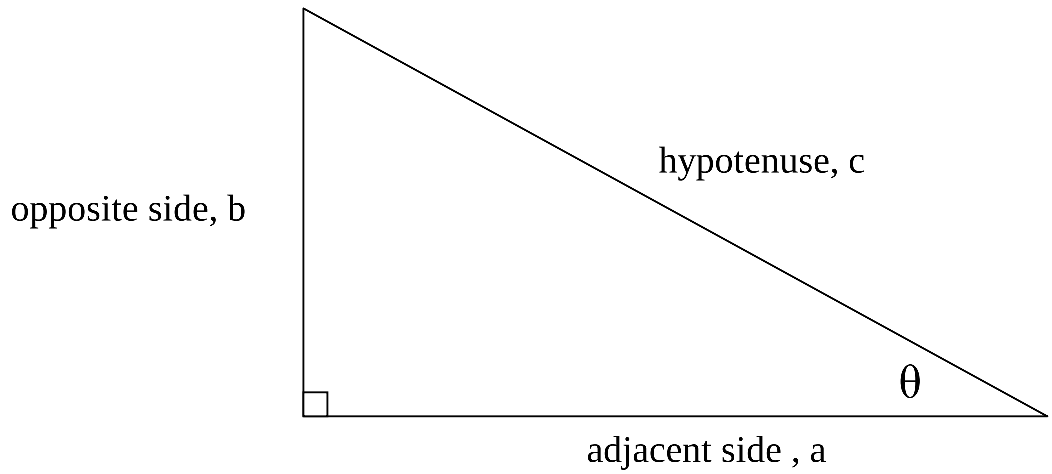


Pythagorean Th$^{\underline{m}}$: $a^2 + b^2 = c^2$
Is true only for _________ triangles.

Ex:



There are a few important ratios that are given fancy names:



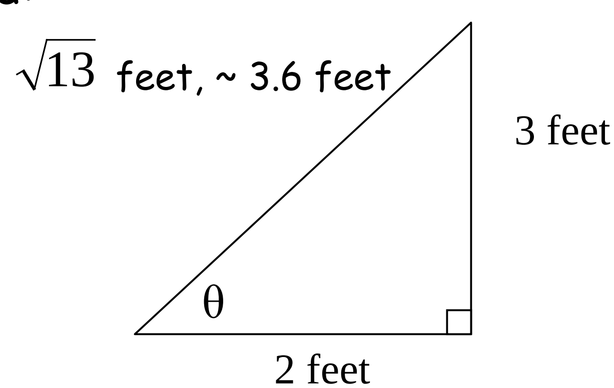
The sine of θ: $\sin\theta = \frac{op}{hyp}$

The cosine of θ: $\cos\theta = \frac{adj}{hyp}$

sinθ, cosθ, and tanθ are all just ratios of two sides.

The tangent of θ: $\tan\theta = \frac{op}{adj}$

For the triangle we just had:



The sine of θ: $\sin\theta = \frac{op}{hyp} = \frac{3\,feet}{\sqrt{13}\,feet} = 0.832$

The cosine of θ: $\cos\theta = \frac{adj}{hyp} = \frac{2\,feet}{\sqrt{13}\,\,feet} = 0.555$

The tangent of θ: $\tan\theta = \frac{op}{adj} = \frac{3\,feet}{2\,feet} = 1.5$

We can use these ratios to find the angle θ.

We had sin θ = 0.832

Now we have to find the angle whose sine ("whose ratio of op/hyp") is 0.832.

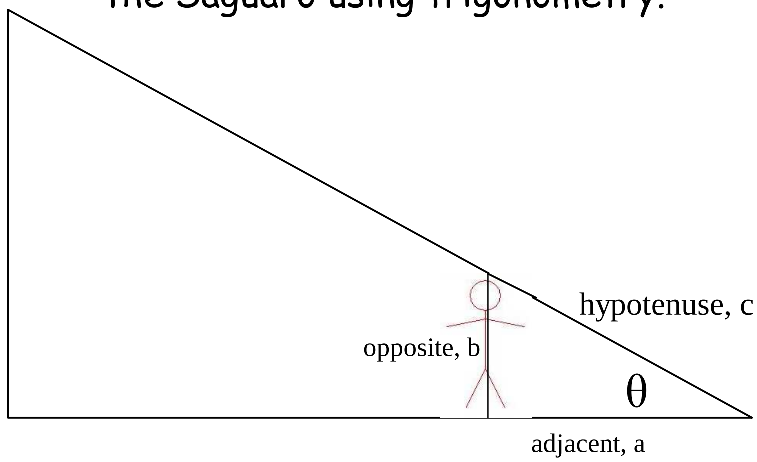
This is done on your 

You would write: $\theta = \sin^{-1} 0.832$

This is read: "θ equals the inverse sine of 0.832".

Now use your calculator to find θ = 56.3°.

Ex: Let’s find the height of the Saguaro using trigonometry.

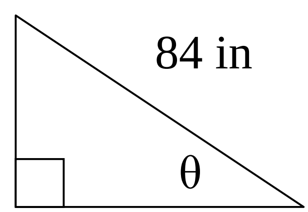


In the above picture:

I measured a = 50 inches, and b = 67 inches.

Use the Pythagorean Th$^{\underline{m}}$ to solve for c: c = ~ 84 inches.

Now pick one of the trig functions to find θ.



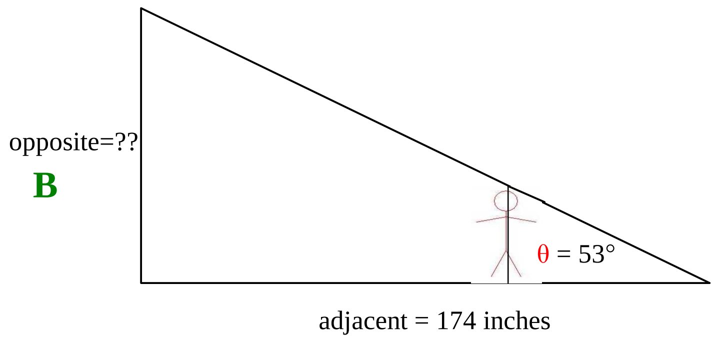
$\sin \theta = \dfrac{op}{hyp}$ so $\sin \theta = \dfrac{67\,inches}{84\,inches} = 0.80$

so $\sin \theta = 0.80$, and $\theta = \sin^{-1} 0.8$

and we get $\theta = 53°$.

So what's the height of the cactus???

I also measured this bottom length to be 14.5 feet, or 174 inches.



We know: 1) the angle θ

2) an adjacent side,

and we want to find the *opposite* side **B** (that's the height of the cactus).

So which trig function should we use?

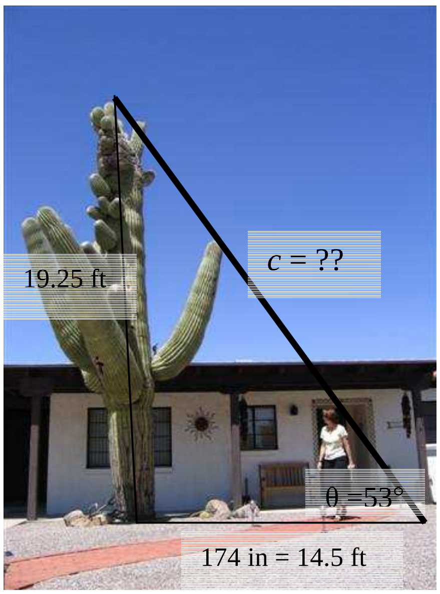
$\sin\theta = \frac{op}{hyp}$ $\cos\theta = \frac{adj}{hyp}$ $\tan\theta = \frac{op}{adj}$

$\tan\theta = \frac{op}{adj}$ $\tan 53° = \frac{B}{174\,inches}$ Solving this for the opposite side gives:

$B = 174 \text{ inches} * \tan 53°$

B = 231 inches = 19 ¼ feet.

Let's find the distance *c*.
We could use Pythagorean Th$^{\underline{m}}$ or Trig.



$\sin\theta = \dfrac{op}{hyp}$ $\cos\theta = \dfrac{adj}{hyp}$ $\tan\theta = \dfrac{op}{adj}$

1. $\sin\theta = \dfrac{op}{c}$ so $c = \dfrac{op}{\sin\theta}$ $c = \dfrac{19.25\,ft}{\sin 53^\circ}$ c = 24.1 ft

or

2. $\cos\theta = \dfrac{adj}{c}$ so $c = \dfrac{adj}{\cos\theta}$ $c = \dfrac{14.5\,ft}{\cos 53^\circ}$ c = 24.1 ft

Again, we could have used the Pythagorean Th$^{\underline{m}}$ to find *c*, $a^2 + b^2 = c^2$,

but if only the angle θ and one side is known, we *have* to use trigonometry.