Pythagorean Theorem

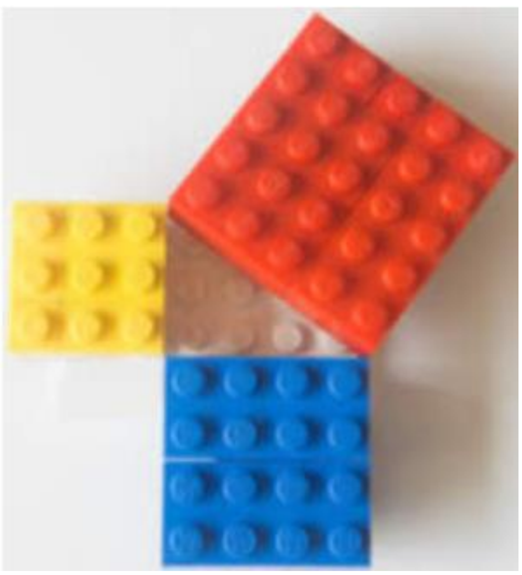
Over 2000 years ago there was an amazing discovery about triangles:

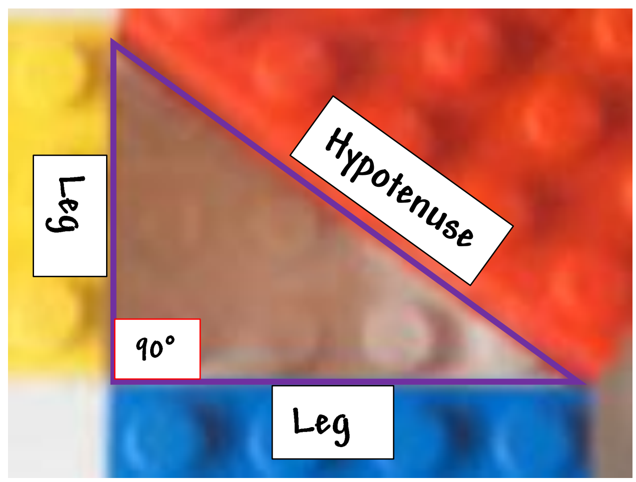
In a right angled triangle:

the square of the hypotenuse is equal to

the sum of the squares of the other two sides.

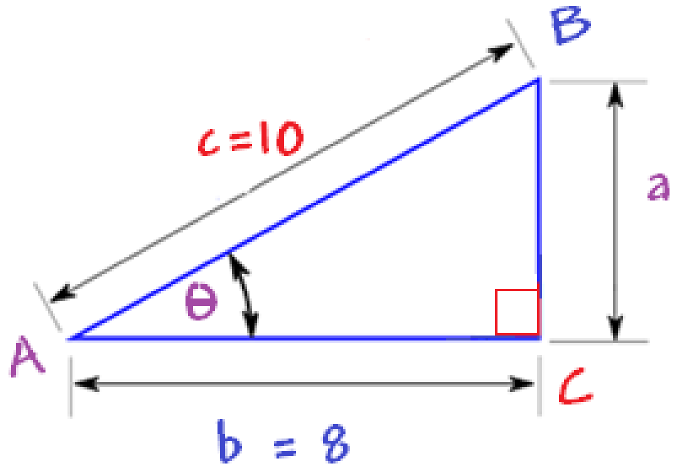
Want to see it in action? Here you go…





Yellow Lego =	3	**Now square it:**	9	Leg^2
Blue Lego =	4	**Now square it:**	16	$+ \ Leg^2$
Red Lego =	5	**Now square it:**	25	$Hypotenuse^2$

Check it out:



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

$$a^2 + 8^2 = 10^2$$

$$a^2 + 64 = 100$$

$$a^2 = 100 - 64$$

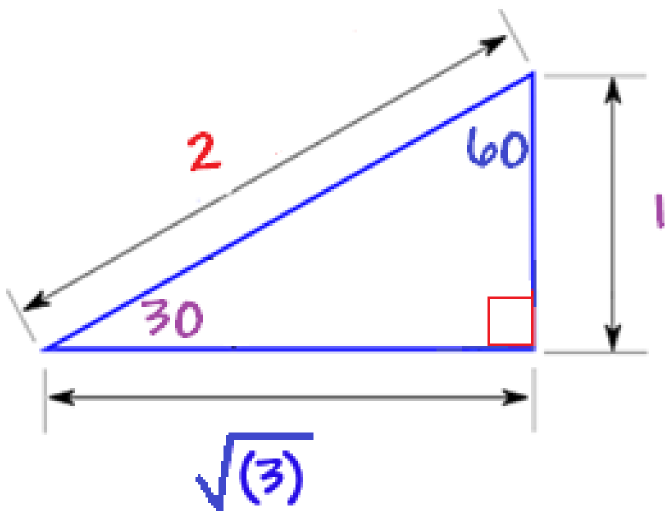
$$a^2 = 36$$

$$a = 6$$

THE 30°-60°-90° TRIANGLE

Why is this the name of a triangle? Well if you guesses it was the measure of its angles you are correct!

So why is this combination special? They are special because, with simple geometry, we can know the ratios of their sides



$$\text{Cos}(60) = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{1}{2}$$

$$\text{Sin}(30) = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{1}{2}$$

$$\text{Tan}(60) = \frac{\text{opposite}}{\text{adjacent}} = \frac{\sqrt{3}}{1} = \sqrt{3}$$

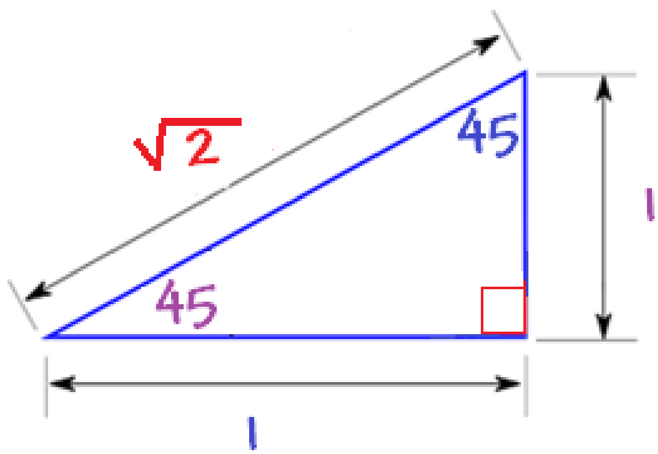
Quick question aren't these values 30-60-90 angles that are on my unit circle? ….. YES

So couldn't I just use my unit circle to find these also? ….. YES

THE 45°-45°-90° TRIANGLE

Why is this the name of a triangle? Well if you guesses it was the measure of its angles you are correct!

So why is this combination special? They are special because, with simple geometry, we can know the ratios of their sides



$$\text{Cos}(45) = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\text{Sin}(45) = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\text{Tan}(45) = \frac{\text{opposite}}{\text{adjacent}} = \frac{1}{1} = 1$$

Quick question aren't these values 45-45-90 angles that are on my unit circle? ….. YES

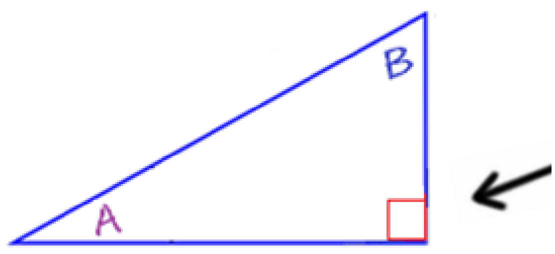
So couldn't I just use my unit circle to find these also? ….. YES

Co-Function

No, you won't stumble over co-functions if you find yourself in Dysfunction Junction…really bad math joke I know

We know that all the angles in a triangle add up to 180° and let's say

A= 65° then that means B= 90-65 = 25°

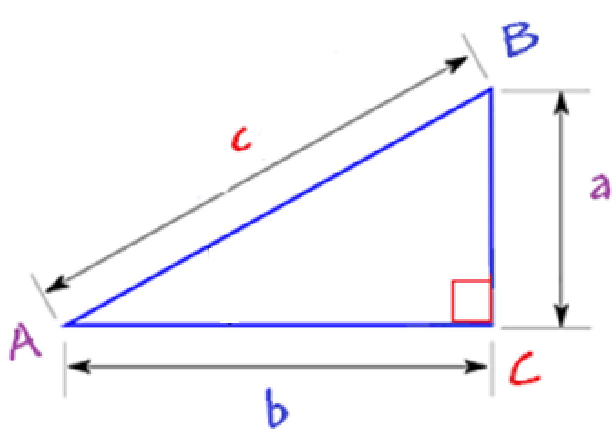


That red square means that the angle is 90°

Now let's remember what the word complimentary means. Two angles are complimentary if they add up to 90°

So with A= 65° and B= 90-65 = 25° that means that A and B are compliments…Yay!

But where are we going with this?

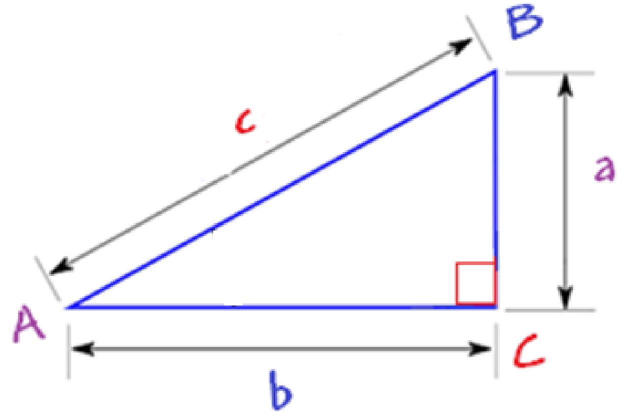


$\cos A = \sin B$

$\cos A = \sin(90° - A)$

I'm sorry WHAT??

Let's work this one out



$$\cos A = \sin B$$

$$(\text{adj} / \text{hyp}) = (\text{opp} / \text{hyp})$$

$$(b / c) = (b / c)$$

We can play this game with all the trig functions but instead I'll just list them for you

$\cos(A) = \sin(90° - A)$	$\sin(A) = \cos(90° - A)$
$\sec(A) = \csc(90° - A)$	$\csc(A) = \sec(90° - A)$
$\tan(A) = \cot(90° - A)$	$\cot(A) = \tan(90° - A)$

These can be written for radian also ($90° = \pi/2$)

Check it out:

Find a co-function with the same value

$\sin(72°)$

First you see what trig. function you have.

we have SINE

Next go to your handy dandy cart and pick the right equation

$\sin A = \cos(90 - A)$

$\sin 72° = \cos(90° - 72°)$

$= \cos(18°)$