Easy Triangles

Solve for side lengths and angle measurements (in Euclidean <flat> space).

It is well known by those who well know it. - Unknown

As a review, we will start with right triangles.

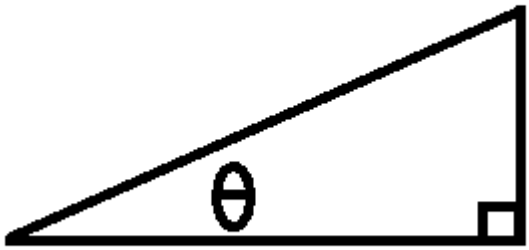
The three basic trigonometric functions are sin(theta), cosine(theta), and tangent(theta)

Some of us have seen the greek symbol for theta.

θ = theta

Where theta is an angle measurement of a 90 degree right triangle.

See image

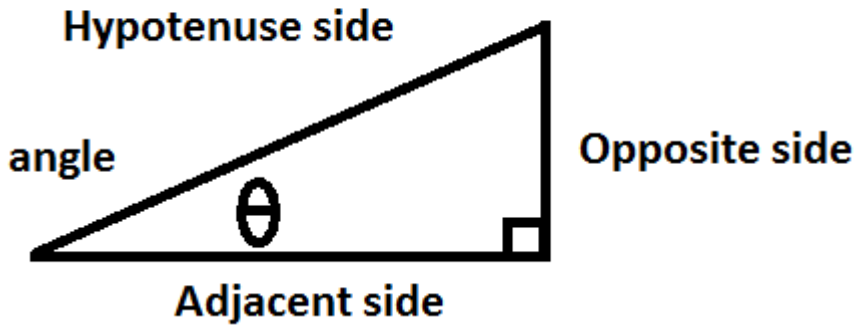


We have here a right triangle, with the known angle in the lower left hand corner.

Know that the sum of the three angles in a right triangle is 180 degrees.

180 degrees is sometimes called a straight angle.

Here is more about right triangles.



The three sides of a right triangle are usually labeled – Adjacent, Opposite, and Hypotenuse

Also,

Adjacent can be shortened to A,
Opposite can be shortened to O, and
Hypotenuse can be shortened to H

Here is a nice mnemonic for the definition of sine, cosine, and tangent.

Imagine Indians sitting around a campfire, learning trigonometry ☺

chanting

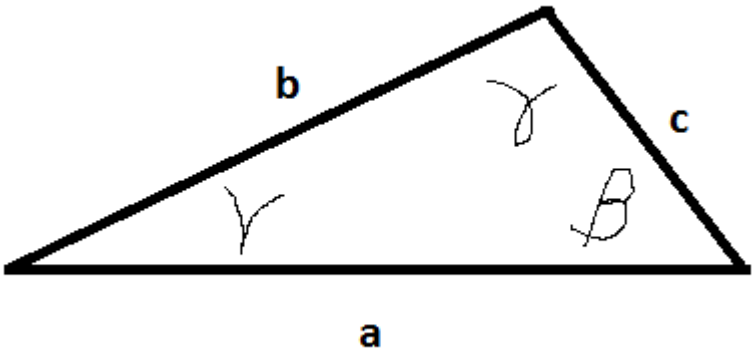
SOH-CAH-TOA

That is the word to learn, because

Sin(theta) = Opposite/Hypotenuse,
Cosine(theta) = Adjacent/Hypotenuse
and
Tangent(theta) = Opposite/Adjacent

There is still more to learn, for when the triangle does not have a right angle.
Namely, Law of Sines, and Law of Cosines.

A general triangle in flat space looks like this.



Notice that the side lengths are labeled a, b and c.

Also, see that the angle measurements, in degrees, are alpha, beta, and gamma.

We have,

 corresponds with the Greek letter alpha

 corresponds with the Greek letter beta

And similarly,

 corresponds with the Greek letter gamma

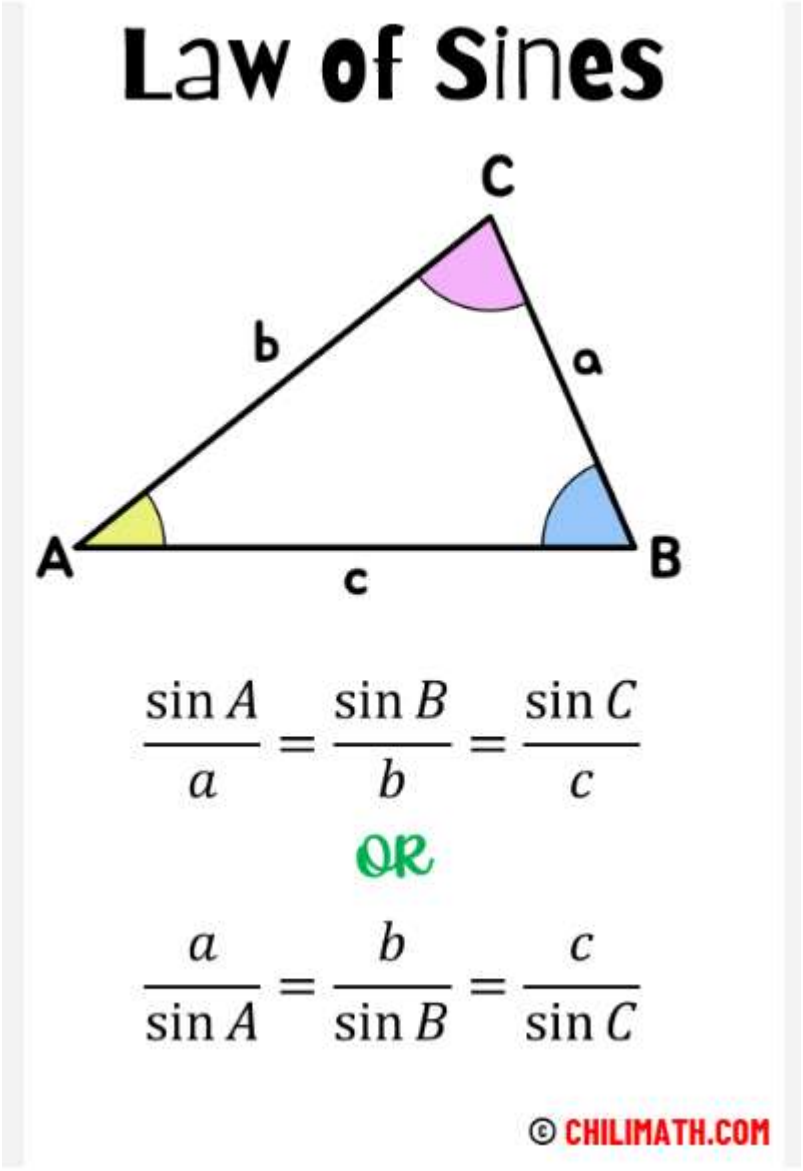
Hope that is all clear, so far.

The next thing to consider is the law of sines.

Now, the sine function is a function of an angle.

Similarly, the inverse sine function has a ratio as input, and an angle as output.

See this image from Google,



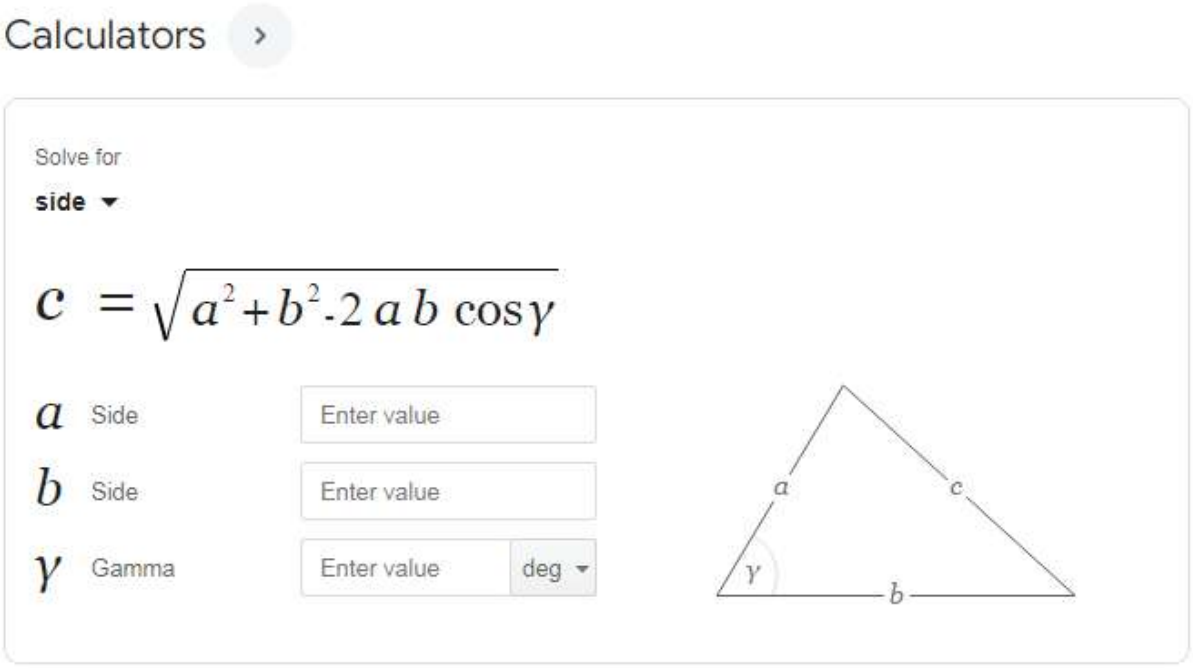
Note that in this copied image, they do not use Greek letters, but they use capitol and lower case letters.

But wait, there is more

The next thing is the Law of Cosines

I did a Google search for Law of Cosines, and this nifty little calculator popped up.

See image –



Hopefully, if you do some exercises with this mathematical expression, you will feel comfortable with it.

A little massaging of the above expression yields another form of Law of Cosines.

Namely

$c^2 = a^2 + b^2 - 2*a*b*\cos(\text{gamma})$

Where gamma is the angle measure defined before.

Have a nice day