"News from the right angle"

Trigonometric Review

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The mystery of the derivation of SOH CAH TOA, the acronym for trigonometric ratios has finally been solved. Recently, investigators have traced its true roots to a tribe called the Hypotens.

This ancient clan had an amplitude of customs that modern civilization would consider odd. Only lately has it been discovered how these practices gave birth to SOH CAH TOA.

The Hypotens lived in dwellings that looked like lean-tos and rested against trees. These dwellings did not look like hexagons or pentagons but simple three-sided polygons called "Trigons". Often Hypotens would describe one of these homes as "trigon on my tree" Hence the land of ***Trigonometry.***

Another curious fact about the Hypotens is they did not speak but used only "sine" language. They had very sensitive ears and even the most subtle noise would cause them excruciating pain. Not only did they avoid speaking but they kept their hands over their ears. Since their hands were always occupied in this way, they would have to sit and gesture with their feet when they wanted to talk. Naturally, communication was a difficult process.

Because talking was so arduous the Hypotens published a daily periodical of events which became known as ***"The Hypoten News." "The Hypoten News"*** was not a very reliable journal because the Hypotens could not agree on what was to be printed. The leaders of the two major political parties would meet daily to discuss the editorials and interpolations of the day's events.

The conservatives called, "Degrees," because most of them had Ph.D's and the radicals, known as Radians, short for "Radical Hypotens", would sit in a circle so that all could see the conversation. Invariably, at this so-called "circular function" one of two things would happen.

If the factions could not agree on how to present an article, they would get very angry and separate to sit at opposite sides of the room. If this situation persisted, a sine would be given there was an "opposite sit" over The Hypoten News:

$$\text{SINE} = \frac{\text{opposite}}{\text{hypotenuse}}$$

Sometimes everyone would agree on the news. If the Degrees could be converted to the Radians' angle on a story or vice-versa, they would remain seated next to each other in adjacent seats. When this occurred, the cooperation signal would be given, the cosine, so named because the leaders were sitting adjacent over The Hypoten News:

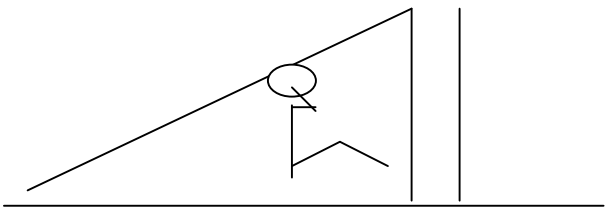
$$\text{COSINE} = \frac{\text{adjacent}}{\text{Hypotenuse}}$$

Now this sequence continued for many years until a visitor arrived from Argentina, observed such a meeting, and offered a suggestion. He pointed out that if they could not agree, the rational thing to do was to publish two bulletins, one for each of the divergent views. In other words, the "tan gent" said they could remain "opposite over adjacent" and still publish *The Hypoten News.*

$$\text{TANGENT} = \frac{\text{opposite}}{\text{adjacent}}$$

Upon hearing this radical suggestion, the Hypotens fell into a violent argument. A change of such a hallowed tradition was bound to waggle a few toes. The Hypotens argued long into the night until their feet were exhausted. Not only did they never agree on the "tan gent's" suggestion but days of soaking their toes were required before the acute pain subsided and many of them could converse again.

From that day forward, the famous argument became known as the great "SOH CAH TOA."



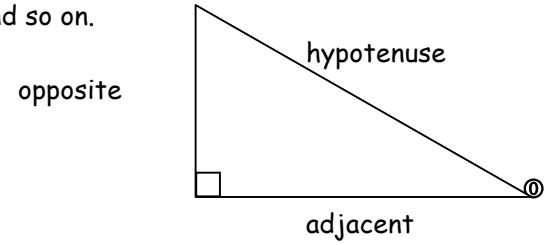
Basic Trig Functions

The functions sine, cosine and tangent describe relationships in a right triangle that relate the sides to the angles of the triangle.

Knowing that the sine, cosine and tangent functions can be applied to a right triangle and are defined as **(NOTE the ⓪ stands for the angle in the triangle)**

$$\text{Sine } ⓪ = \frac{\text{opposite}}{\text{hypotenuse}} \qquad \text{cosine } ⓪ = \frac{\text{adjacent}}{\text{hypotenuse}} \qquad \tan ⓪ = \frac{\text{opposite}}{\text{adjacent}}$$

So, the sine of the angle is equal to the opposite side of the angle being used divided by the hypotenuse and so on.



We are going to use this to find the height of stationary objects and then use them to find the altitude our rockets reach upon launch.

In this diagram,

1- the opposite side represents the object we want to find the height of.

2- We will then use a tape measure to measure the adjacent side.

3- The only thing we need then is the angle. The angle will be found using an altitude tracker.

4- We can use the tangent function $\tan ⓪ = \frac{\text{opposite}}{\text{Adjacent}}$

5- Since we have the angle and the adjacent side, and want to find the opposite side, we should change our equation to read:

Opposite (or height) = adjacent side x (tan ⓪)

EXAMPLE: Find the height of a flagpole if you are standing 125 meters away from the pole and the angle to see the top is 42°.

Opposite (height) = adjacent side x (tan ⓪)

= 125 m x (.90)
= 113 m

The tan of the angle ⓪, can be found by typing in the angle, like 42° and then hitting the tan key on the calculator. A graphing calculator requires hitting the tan key first then the angle, like 42° in this case. The same is true for sine or cosine although we will not use those as much. (Make sure graphing calculators are in degrees mode. See me if you have questions about this)