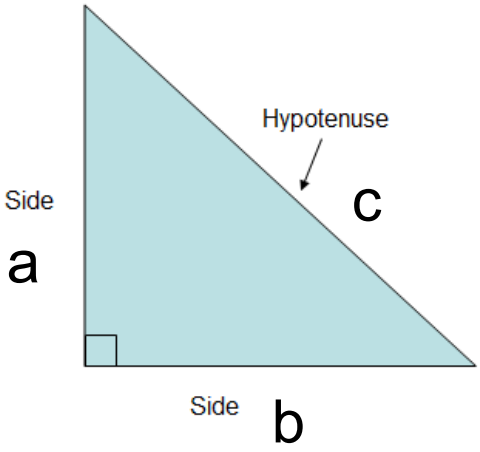
Trigonometry

- The branch of mathematics that deals with triangles, specifically right angled triangles

What do we already know how to calculate using right triangles?



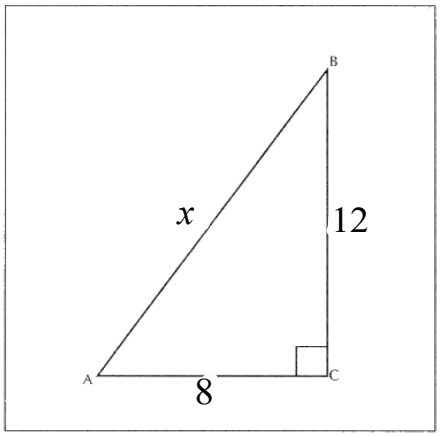
$a^2 + b^2 = c^2$

where the 'c' represenets the hypotenuse and 'a' and 'b' represent the 'arms' of the right angle. Use addition when you know the sides that make the right angle and need to find the hypotenuse.

You must use subtraction when you know the hypotenuse and need to find one of the other sides. $c^2 - a^2 = b^2$

Mar 9-8:52 AM

Solving for missing sides in right triangles....PYTHAGORAS!!!



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

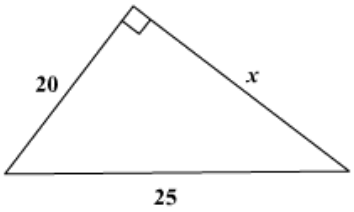
$8^2+12^2=x^2$

$64+144=x^2$

$208=x^2$

$\sqrt{208}=\sqrt{x^2}$

$14.4\cong x$



$c^2-a^2=b^2$

$25^2-20^2=x^2$

$625-400=x^2$

$225=x^2$

$\sqrt{225}=\sqrt{x^2}$

$15=x$

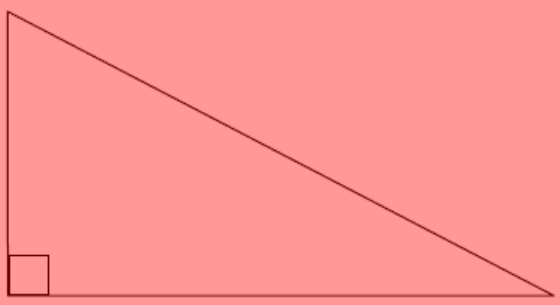
Mar 9-9:02 AM

Trigonometry

trig - o - nom - e - tree...

- A branch of mathematics which deals with relations between sides and angles of triangles

Trigonometry is one of those names you always hear about in mathematics. The topic of trigonometry starts off being about *right-angled triangles*. It's actually all about *ratios* between the side lengths in right-angled triangles. Let's start with a typical right-angled triangle:



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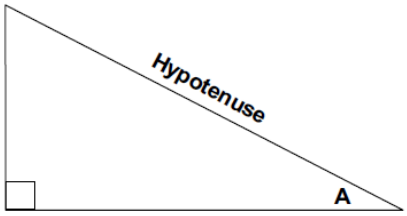
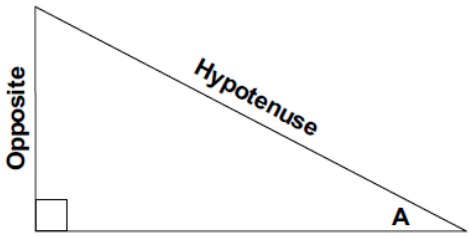
Naming the sides of triangles is EXTREMELY important!!

Naming the sides

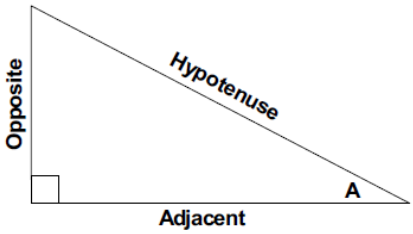
Now, first up, there are three different names for the three different sides of a right-angled triangle. The names are opposite, hypotenuse and adjacent. Now we've come across the hypotenuse before – it is the longest side of the triangle. This is always easy to spot. The other two names, opposite and adjacent, depend on which angle you're currently looking at in the triangle. For instance, say I was looking at angle A:



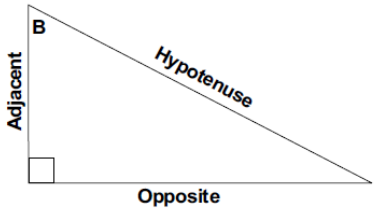
The opposite side is the side opposite the angle we're looking at. We're looking at angle A at the moment, so the side opposite it is the side on the left:



This leaves us with the adjacent side. The adjacent side is the side of the triangle that touches the angle we're looking at, but which is not the hypotenuse. There are two sides touching our angle A – one is the hypotenuse. The other side therefore is the adjacent side:



What about if we'd picked another angle, say angle B in the following diagram? Well, the hypotenuse would stay the same, but the adjacent and opposite sides would change, like this:



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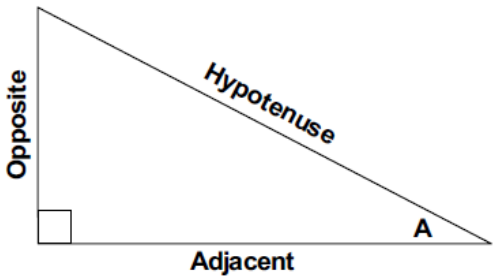
Ratios between the side lengths...

Trigonometry is all about the ratio of the side lengths in the triangle. For instance, when we're looking at the angle A, we could talk about the ratio between the length of the adjacent side and the length of the hypotenuse:



$$\text{Ratio} = \frac{\text{Length of adjacent side}}{\text{Length of hypotenuse side}}$$

This ratio has a special name, it is called the cosine ratio.

There are 3 PRIMARY trigonometric ratios...

$$\text{cosine A} = \cos A = \frac{\text{Length of adjacent side}}{\text{Length of hypotenuse side}}$$

$$\text{sine A} = \sin A = \frac{\text{Length of opposite side}}{\text{Length of hypotenuse side}}$$

$$\text{tangent A} = \tan A = \frac{\text{Length of opposite side}}{\text{Length of adjacent side}}$$

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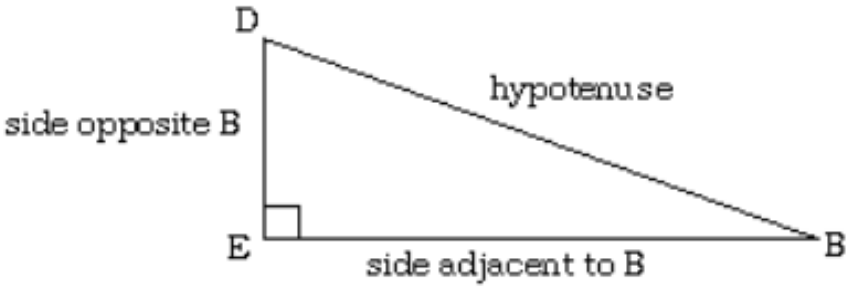
The Basic Trigonometric Ratios



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

$$\cos B = \frac{adj}{hyp}$$

$$\tan B = \frac{opp}{adj}$$

Abbreviations for side lengths:

opp : opposite
adj : adjacent
hyp : hypotenuse

Use SOH CAH TOA to remember!

Mar 10-11:44 PM

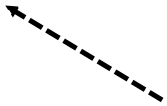
Trigonometric Ratios

ALWAYS MAKE SURE YOUR CALCULATOR IS SET TO DEGREES!!!!

- Each angle has a specific trigonometric ratio

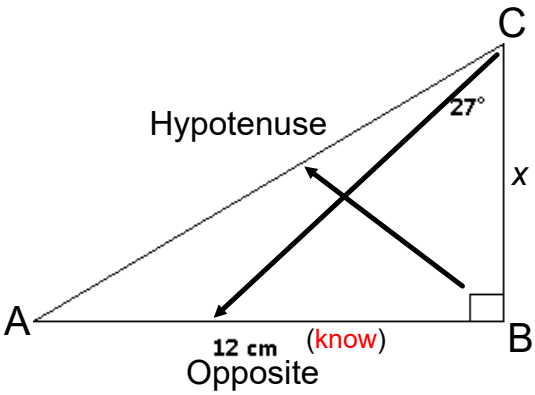
ie. $\tan 56^{o} = 1.4826$ (ALWAYS carry 4 decimal places!!)

$\cos 50^{o} = 0.6428$



These ratios will be found using a scientific calculator

Using trigonometry to find the length of a side:



Step 1: Label

Step 2: What side do you know? (has number on it)

What side do you need to find? (has a letter on it)

Step 3: Determine trig. function

Step 4: Set up the equation

Step 5: Substitute

Step 6: Solve

Example:

Know 'opposite'; find 'adjacent' = tangent

tan27=o/a

tan27=12/x

x(tan27)=x(12/x)

x(tan27)=12

x(0.5095)/0.5095=12/0.5095

x=23.6

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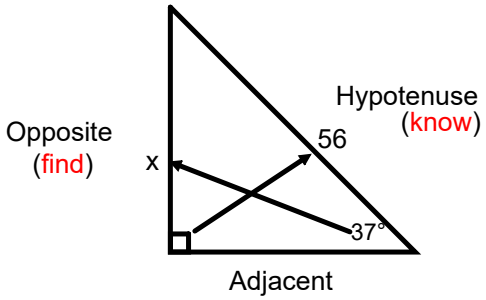
Example:



Step 1: Label

Step 2: What side do you know? (has number on it)

What side do you need to find? (has a letter on it)

Step 3: Determine trig. function

Step 4: Set up the equation

Step 5: Substitute

Step 6: Solve

know 'H'; find 'O' = sine

sin37=O/H

sin37=x/56

56(sin37)=~~56~~(x/~~56~~)

56(0.6018)= x

33.7=x

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Using trigonometry to find the length of an angle:

Step 1: Label

Step 2: What sides do you know? (have numbers on them)

Step 3: Determine trig. function

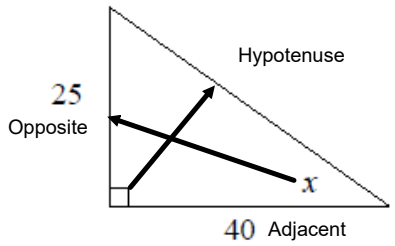
Step 4: Set up the equation

Step 5: Substitute

Step 6: Divide

Step 7: Press 'Shift' or '2nd', your trig. function, the answer you got when you divided and '='

Step 8: Round your answer to the nearest degree



know 'O' and 'A' = tangent

tan x= O/A

tan x= 25/40

tan x= 0.625

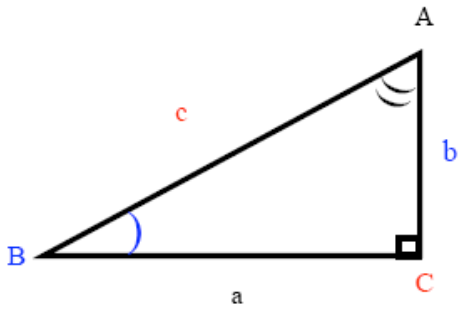
$x = \tan^{-1} 0.625$

x= 32°

Solving Right Triangles

To **solve a right triangle** means to determine the measure of all six parts (3 lengths, and 3 angles by using basic trigonometric functions and/or Pythagorean Theorem)

Something else to remember: All angles in a triangle add up to 180°



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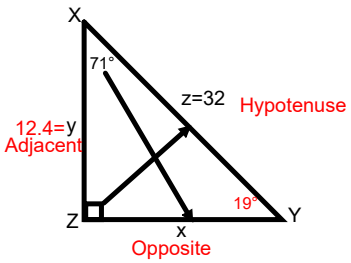
Example: This is only one method, there are several



Solve for 'Y'

180°-90°-71°=19°

Solve for 'y'

know 'H', find 'A' = cosine

cos71=A/H

cos71=y/32

32(cos71)=~~32~~(y/~~32~~)

32(0.3256)=y

10.4=y

Solve for 'x'

know 'H', find 'O' = sine

sin71=O/H

sin71=x/32

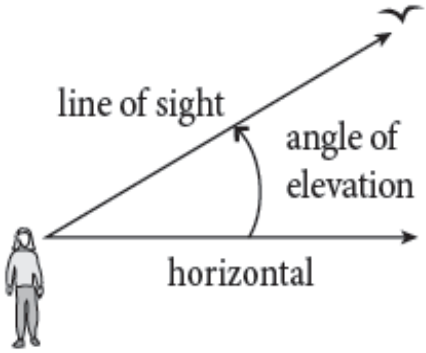
32(sin71)=~~32~~(x/~~32~~)

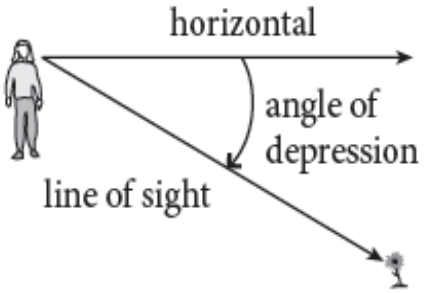
32(0.9456)=x

30.3=x

Angles of Elevation and Depression

- An *angle of elevation* is measured from the horizontal upwards.
- An *angle of depression* is measured from the horizontal downwards.





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