Introduction to Trigonometry

Right Triangle Trigonometry

Topic 2

This follows the PowerPoint titled: Labeling Right Triangles

Computing
Trigonometric Ratios

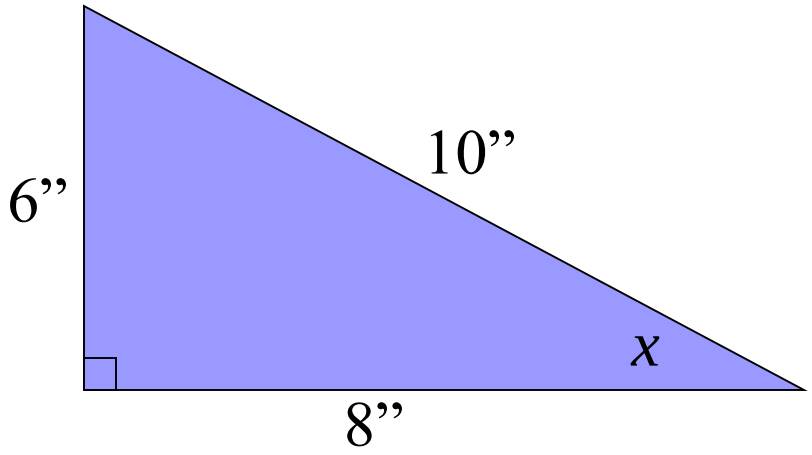
See if you can find the link between this presentation and AA~

Trig Ratios

- Trigonometry is all about comparing the lengths of two sides of a triangle.
- When you compare two numbers, that is a *ratio*.

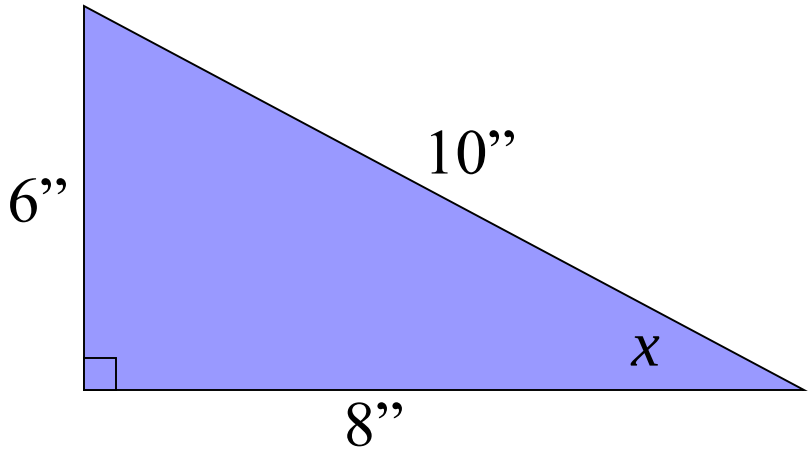
Trig Ratios

- Given this triangle, you can make a ratio of the opposite side and the hypotenuse. (Angle *x* is the reference angle.)



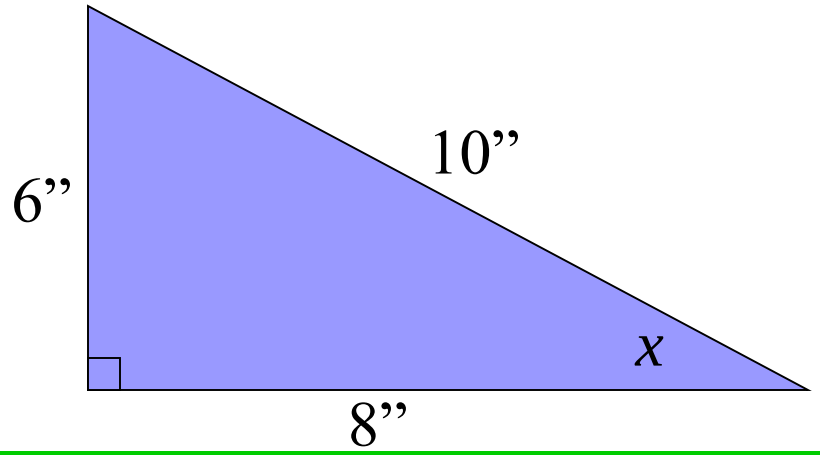
Trig Ratios

- The *ratio* of opposite side to hypotenuse is: 6/10 or 0.6.
- Knowing the ratio of two specific sides can tell you how big angle *x* is...



Trig Ratios

- In this case, an *opposite*/*hypotenuse* ratio of 0.6 means that the ref. angle is 36.9 degrees.
- Don't worry how you get that answer yet!



i.e. You would not have that ratio if the angle was different

Student Activity

- In order to participate with the activities discussed in the next several slides you will need a protractor and a ruler with a metric scale (millimeters).

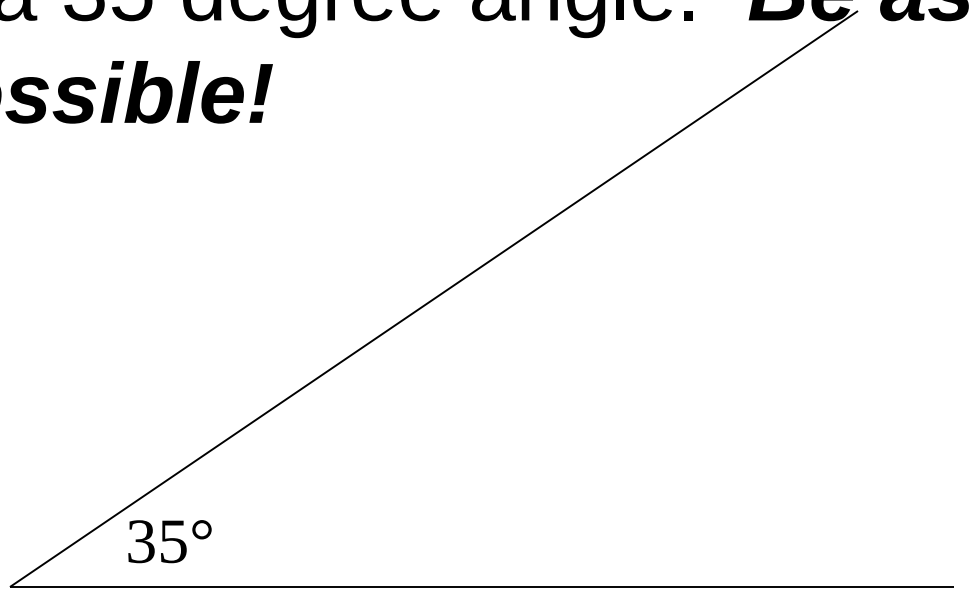
Trig Ratios

- To practice writing trig ratios, make a small table like this:

Ratio:	1^{st} Triangle	2^{nd} Triangle	3^{rd} Triangle
opp/hyp			
adj/hyp			
opp/adj			

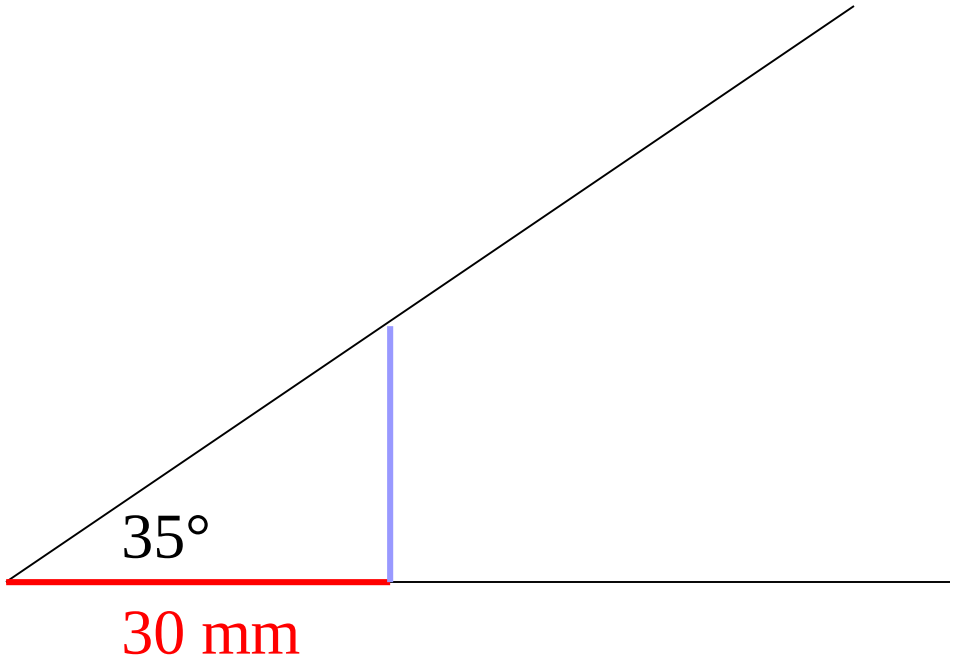
Trig Ratios

- On a blank piece of paper, make a 6” (or so) long line. At the left end of this line, draw a 35 degree angle. ***Be as precise as possible!***



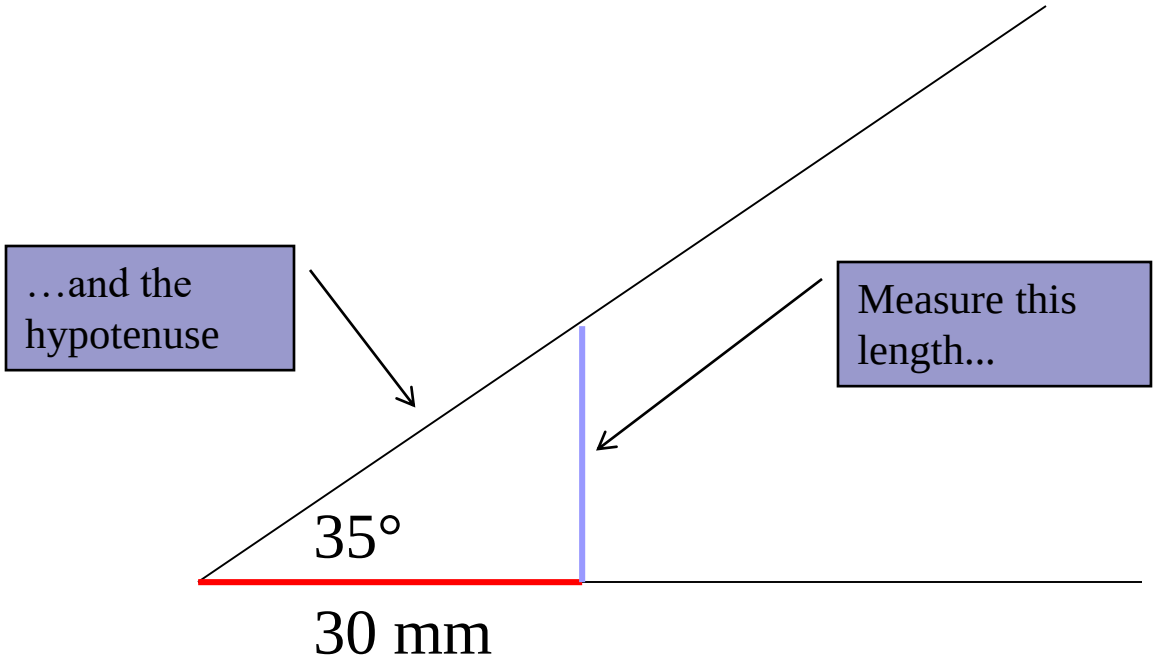
Trig Ratios

- Now measure across 30 mm from the vertex, then draw a line straight up. This will form a right triangle.



Trig Ratios

- Now measure the vertical line and the hypotenuse in millimeters.



Trig Ratios

- With these measurements, fill in the column under the heading: **1st Triangle**.
  - Click to see how this is done…

Trig Ratios

- The first box has been filled-in and computed for you. Finish the two below it...

Ratio:	1st Triangle	2nd Triangle	3rd Triangle
opp/hyp	21/37 = **0.57**		
adj/hyp			
opp/adj			

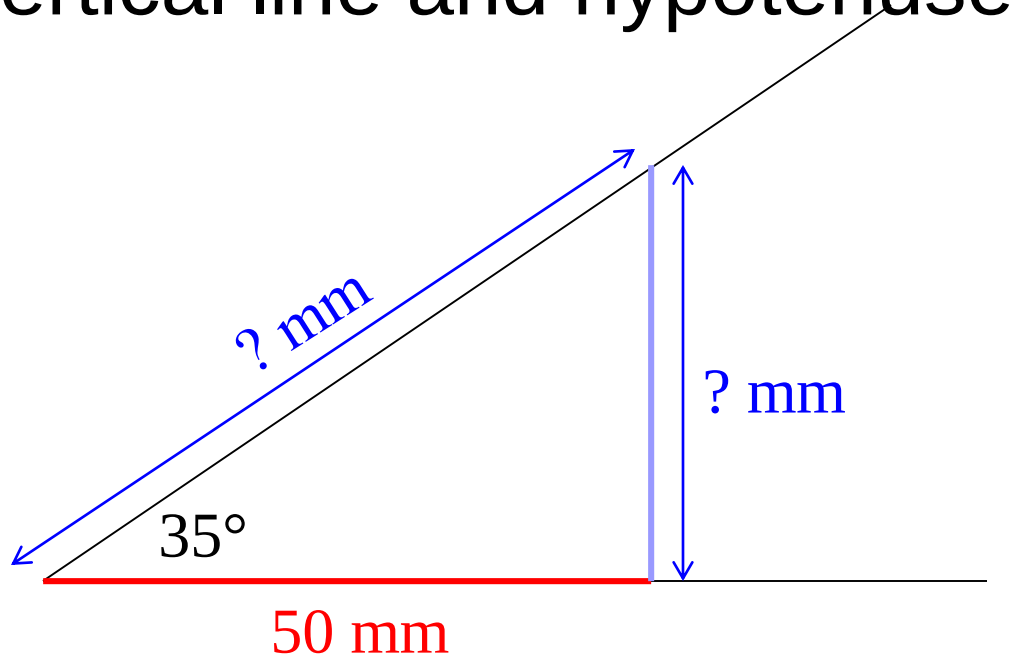
Trig Ratios

- Hopefully your answers are similar to these:

Ratio:	1st Triangle	2nd Triangle	3rd Triangle
opp/hyp	21/37 = **0.57**		
adj/hyp	30/37= **0.81**		
opp/adj	21/30= **0.7**		

Trig Ratios

- Now measure 50 mm from the vertex, and make a vertical line. As before, measure the vertical line and hypotenuse.



Trig Ratios

- Then fill-in the column headed 2nd Triangle.

Ratio:	1st Triangle	2nd Triangle	3rd Triangle
opp/hyp	21/37 = **0.57**		
adj/hyp	30/37= **0.81**		
opp/adj	21/30= **0.7**		

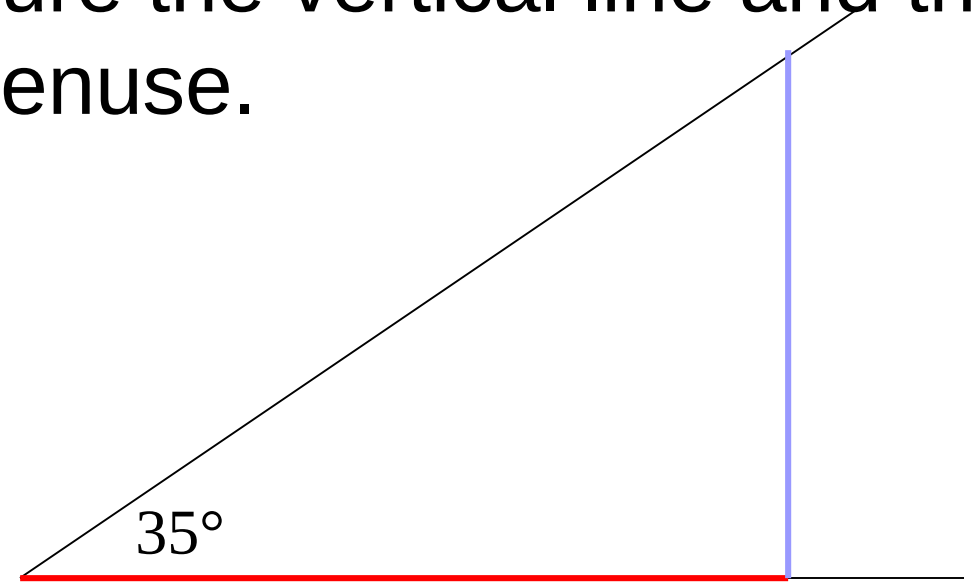
Trig Ratios

- Your answers should be close to these:

Ratio:	1st Triangle	2nd Triangle	3rd Triangle
opp/hyp	21/37 = **0.57**	35/61= **0.57**	
adj/hyp	30/37= **0.81**	50/61= **0.82**	
opp/adj	21/30= **0.7**	35/50= **0.7**	

Trig Ratios

- Lastly, measure *any* distance from the vertex. Create a right triangle, and measure the vertical line and the hypotenuse.



Trig Ratios

- Fill-in the column 3rd Triangle with your data:

Ratio:	1st Triangle	2nd Triangle	3rd Triangle
opp/hyp	21/37 = **0.57**	35/61= **0.57**	
adj/hyp	30/37= **0.81**	50/61= **0.82**	
opp/adj	21/30= **0.7**	35/50= **0.7**	

Trig Ratios

- Now compare your data.
- Due to measurement error, there might be a few discrepancies when comparing one column to the next, but not much.
- Your ratios going across a given row should end up being about the same.

Trig Ratios

Note how all of the opp/hyp ratios are essentially the same.

Note how all of the adj/hyp ratios are essentially the same.

Ratio:	1st Triangle	2nd Triangle	3rd Triangle
opp/hyp	21/37 = **0.57**	35/61= **0.57**	53/92= **0.58**
adj/hyp	30/37= **0.81**	50/61= **0.82**	75/92= **0.82**
opp/adj	21/30= **0.7**	35/50= **0.7**	53/75= **0.7**

Trig Ratios

- These ratios are unique to a certain angle.
- If you had created a 70° angle, and filled-in the three columns as before, your ratios (such as opp/hyp) would all be the same but the value would be different. It would be unique to a 70° degree angle.

Student Activity

- Draw a 75° angle.
- Create any three right triangles you want from it. (Just like you did with the 35° angle.)
- Fill in a chart just like you did for the last problem and compute the ratios.

More on trig ratios

- In a perfect world the results for your second table, *the 75° angle*, should look like this:

Ratio:	1st Triangle	2nd Triangle	3rd Triangle
opp/hyp	**.966**	**.966**	**.966**
adj/hyp	**.259**	**.259**	**259**
opp/adj	**3.73**	**3.73**	**3.73**

Trig Ratios

- So what do these results tell you?
- First, every angle has a *unique result* for each of these ratios

$$\frac{opp}{hyp}$$

$$\frac{adj}{hyp}$$

$$\frac{opp}{adj}$$

Trig Ratios

- For example, here are the ratios for a 20° angle:

	20°
$\frac{opp}{hyp}$	**0.342**
$\frac{adj}{hyp}$	**0.940**
$\frac{opp}{adj}$	**0.364**

Trig Ratios

- A different angle, say 40°, will have different ratios:

	20°	40°
$\frac{opp}{hyp}$	0.342	0.643
$\frac{adj}{hyp}$	0.940	0.766
$\frac{opp}{adj}$	0.364	0.839

Trig Ratios

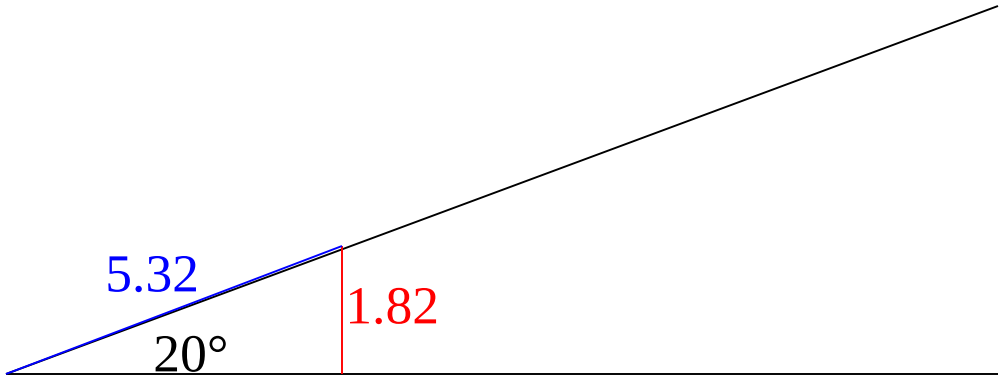
The other thing to remember is that for a given angle, the *size* of the triangle you are working with is irrelevant to how the ratios turn out.

Similar Triangles

Trig Ratios

- To illustrate this, the angle below (20°) is drawn, then several right triangles are formed. In each triangle the ratio of *opp/hyp* is the same no matter the size of the triangle.

opp/hyp= 1.82/5.32 **= .342**

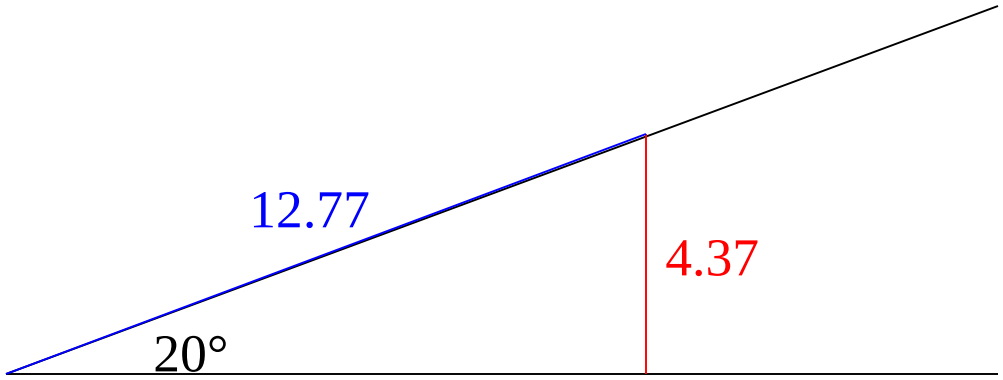


Similar Triangles

Trig Ratios

- To illustrate this, the angle below (20°) is drawn, then several right triangles are formed. In each triangle the ratio of *opp/hyp* is the same no matter the size of the triangle.

opp/hyp= 4.37/12.77 **= .342**

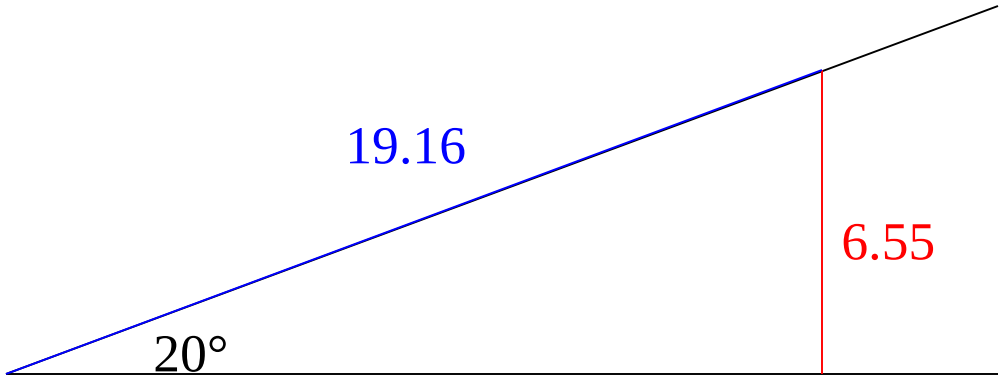


Similar Triangles

Trig Ratios

- To illustrate this, the angle below (20°) is drawn, then several right triangles are formed. In each triangle the ratio of *opp/hyp* is the same no matter the size of the triangle.

opp/hyp= 6.55/19.16 **= .342**



Similar Triangles

See if you can find the link between this presentation and AA~

All Right triangles with a given angle, say 47 degrees, are similar due to AA~ so the ratios will all be the same