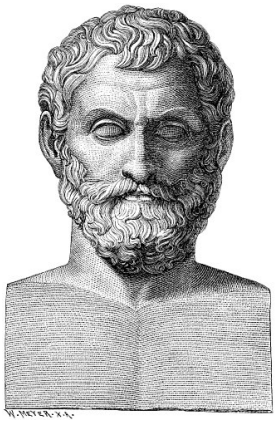
MATH CIRCLE TTU

Geometry

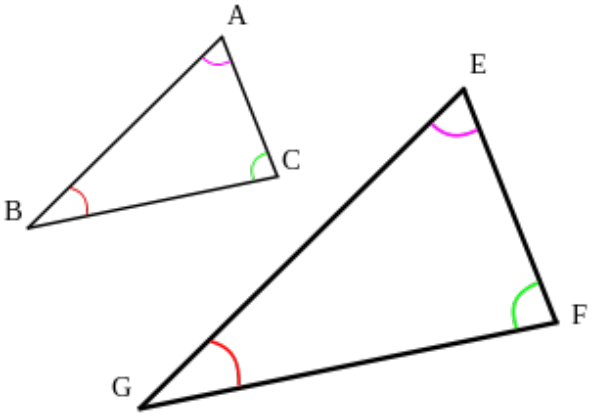
Trigonometry



Similar Triangles

Similar triangles are the triangles that have corresponding sides in proportion to each other and corresponding angles equal to each other. Similar triangles look the same but the sizes can be different. Mathematically:

$$\frac{AB}{GE} = \frac{AC}{EF}.$$



Measuring Height Using Shadow

Problem. Imagine you travel to Egypt to visit the Great Pyramid of Giza. At $10AM$ you are standing in front of it (you can walk around but cannot climb it). Without using Internet, how can you compute the height of the Great Pyramid of Giza?

Example. Imagine you are the manager of a hotel. Christmas is around the corner and you wish to decorate your lobby with a real tree from the forest and to save money you plan to chop the tree down yourself.

The ceiling of your lobby measures 20 feet and you would like your tree to measure less than that. You go to the forest and (after obtaining the proper permit, of course) you find what you believe to be the perfect tree.

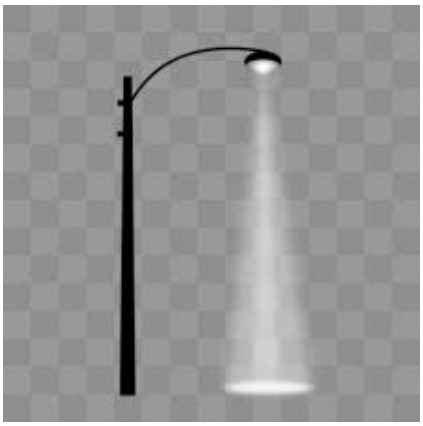
The problem is, you are not sure that it measures under 20 feet. Climbing the tree would be dangerous and unnecessary, so you use the method described in the previous problem to determine the height of the tree.

Assume you are 6 feet tall, that your shadow under the sun measures 5 feet, and the shadow of the tree under the sun is 15 feet. What is the height of the tree?

Problem. Now, measuring height this way is all well and good if you are using shadows produced by the sun, but if you try to use the light of a much nearer light source you may encounter a problem.

Say you have a street lamp as your light source and you wish to measure the height of a tree as before. The measures of the two angles are **not** equal, and so the triangles are **not** similar (in general).

What must you do to make the triangles similar, i.e., where should you stand relative to the tree's shadow?



Measuring Height Without Shadow?