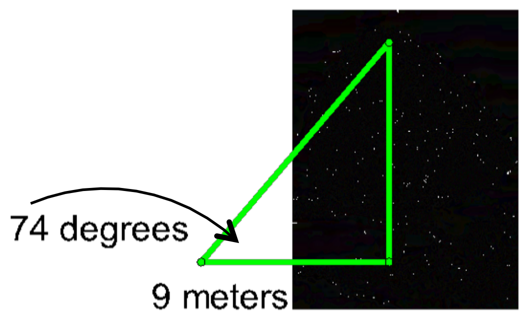
Tangents **Name ______________**

We saw in class and in the dome that you can measure an inaccessible length using similar triangles. You can draw a smaller triangle or use a table of pre-determined *within-figure* ratios. For a triangle, there are three main ratios: sine, cosine, and tangent. Each involves a different pair of sides. Finding heights by doing our own drawings is inherently imprecise due to the unavoidable errors that crop up when measuring lengths and angles with rulers and protractors. Given an angle and a side's length for a right triangle, there should be one exact length for the other side.

The ratio of the two sides that we were interested in was provided by the **tangent** formula:

Tangent of an angle = $\frac{length\ of\ the\ side\ opposite\ the\ angle}{length\ of\ the\ side\ adjacent\ to\ the\ angle}$ or, in shorthand, tan *x* = $\frac{opp.}{adj.}$

Given these tree measurements:



We can can set up this ratio: tan 74° = $\frac{opp.}{adj.}$ = $\frac{unknown\ height}{9}$.

Grabbing our calculator, we find that tan 74° = 3.49, so

$$3.49 = \frac{height}{9}$$

So, solving for height, we get the height of the tree is 9 * 3.49 or 31.41 meters.

Solve these problems. Draw a <u>diagram</u> for each situation and <u>show all calculations</u>.

An ant is 2 feet from a picnic table. Looking up at the table the ant has to crane its neck 67° upward. Determine the height of the table.	A student determines that the angle from where they are standing of the top of a tree is 12°. They are 41 meters from the tree. How tall is the tree?