Trigonometry is useful because it tells us what unknown parts of a triangle are. It allows us to determine hypothetical distances, we can measure something without even actually doing a direct measure. This is very helpful in determining heights and difficult to measure lengths.

With only two other pieces of information we can determine all the angles and sides of any right angle triangle. There are four ways of obtaining this information:

1) Determining a missing side when one side and one angle are known.

Example: \( \tan \theta = \frac{\text{opposite}}{\text{adjacent}} \). \( \tan 42^\circ = \frac{x}{10} \). \( .9004 \times 10 = x \). \( x = 9 \text{ cm} \)

**Activity 1:** Determine the length of the indicated lines.

2) Determine a missing angle when two sides are known.

Example: \( \cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}} \). \( \cos \theta = \frac{14}{17} \). \( \cos \theta = .8235 \). \( \theta = 35^\circ \)

**Activity 2:** Determine the missing angles.

3) When two sides are known (as above), you can use the Pythagorean Theorem to determine the missing side. Remember to use \( c^2 = a^2 + b^2 \) or \( a^2 = c^2 - b^2 \)

Example \( a^2 = c^2 - b^2 \). \( a^2 = 17^2 - 14^2 \). \( a^2 = 289 - 196 \). \( a^2 = 93 \). \( a = \sqrt{93} = 9.6 \text{ in} \)

**Activity 3:** Determine the missing lines of the two above triangles used in activity 2.

4) The last one is simple, determine the missing angle when one other angle is known. Since we have a right angle triangle, we know the right angle is 90°. We also know that all the interior angles of any triangle always add up to 180°. So if we know any one of the two other angles, the last angle is going to be 180° - (90° + x), where x is the known angle.

Example: In example 2 above, \( \theta \) was 35°. The other angle then is \( 180 - (90 + 35) = 55^\circ \)

**Activity 4:** Determine the missing angle if the other known angle is:

a) 25°  b) 52°  c) 78°  d) 81°
Homework:

1. You will be given a right angle triangle with two pieces of information. Your goal is to determine what the missing values are. For each question to be finished, you should know what the values of all three angles and what the length of all three sides are.