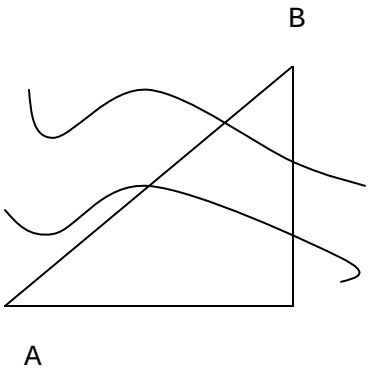
Objective

· To discover the tangent ratio in a right triangle using similar triangles.

The Tangent Ratio

Introduction

Since the ancient Egyptians, surveyors have used triangles to plot land, and lay out foundations for structures. Surveyors need accuracy, but may not be able to collect all the necessary measurements because of geographical features of the land. Knowing an angle measurement and one side length of a right triangle is enough to find all the other important measurements in the triangle. For example suppose a surveyor is measuring the distance across a river so they can build a bridge as shown below.



A surveyor at point A measures the angle shown in the triangle at point A. The surveyors also know the distance from point A to the point directly across the river from point B. So with that information can they find the distance across the river?

Construction & Exploration

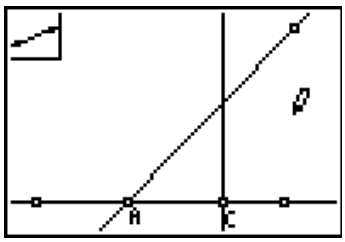
Part I Construct right triangle

1. Construct a horizontal line near the bottom of the screen.

2. Place two points on the line. Label the points A and C.

3. Construct a perpendicular through point C perpendicular the line AC.

4. Construct a line through point A so that it intersects the perpendicular line you constructed in step 3 above. Be sure the other point that defines the line does not lie on the perpendicular line.



5. Find the point of intersection of the line through A and the perpendicular line constructed in step 3. Label the point B.

Part II. Measuring angles and sides.

1. Measure $\angle BAC$.

2. Measure BC and AC.

3. Calculate the ratio of BC/AC.

Questions and Conjectures

1. Move point C, observe the measurement of $\angle BAC$. The new triangles formed by moving point C are considered to be _____.

2. Observe the ratio as you move point C. What occurs with regard to the ratio?

3. Change $\angle BAC$ to a different measurement less than 90. Observe the ratio while moving point C.

4. Conjecture about the ratio of the two sides in similar right triangles.