Using Right Triangles to Investigate Trigonometric Functions

Investigation 1:

A. Draw triangle ABC with angle C = 90°, angle B = 35° and any size measure you wish. Use a ruler and protractor, measure carefully and label all sides and angles.

B. Draw a second triangle, XYZ with angle Z = 90°, angle Y = 35° and any side measure you want, but not the same as for triangle ABC. Use a ruler and protractor, measure carefully and label all sides and angles.

C. Visually, how are your triangles the same? Different? In terms of the measures, how are the triangles related, if at all?

Investigation 2:

A. Use 'a' to mean the side opposite angle A, 'b' to mean the side opposite angle B, and 'c' to mean the side opposite angle C. Find the following ratios: $\frac{a}{c}$, $\frac{b}{c}$, and $\frac{a}{b}$.

B. Similary mark sides x, y, and z on triangle XYZ. Find $\frac{x}{z}$, $\frac{y}{z}$, and $\frac{x}{y}$.

C. What patterns do you see? Why does this make sense?

Investigation 3:

A. The definition of sine angle B is
sine $\angle B = \frac{\text{length of side opposite } \angle B}{\text{length of hypotenuse}}$, what is true about the triangle?
Which of the ratios in Investigation 2A refer to the sine of 35°?

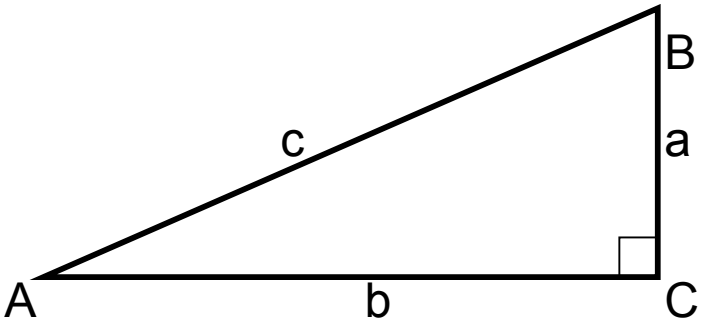
B. Sine $\angle Y = \frac{\text{length of side opposite } \angle Y}{\text{length of hypotenuse}}$, which ratio in Investigation 2B refers to sin 35°?

C. Which ratio in Investigation 2C refers to sin 35°?

D. How does the value of sine of 35° change from right triangle to right triangle?

E. Can you find the sine of 55° from your earlier work?

TRIGONOMETRIC RATIOS



There is a special name for these ratios. These are called the trigonometric ratios.

$$\sin(A) = \frac{a}{c} = \frac{\text{length of side opposite } \angle A}{\text{length of hypotenuse}}$$

$$\cos(A) = \frac{b}{c} = \frac{\text{length of side adjacent to } \angle A}{\text{length of hypotenuse}}$$

$$\tan(A) = \frac{a}{c} = \frac{\text{length of side opposite } \angle A}{\text{length of side adjacent to } \angle A}$$