Introduction to Trigonometry

Lesson Plan

Cube Fellow: James Grogan **Teacher Mentor**: Pam Callahan

Goal: Introduce students to basic trigonometric concepts using special triangles.

Grade and Course: 10-12, Geometry

KY Standards: MA-HS-2.1.3

Objectives: The students should be able to understand the basic trigonometric functions and compute their values using the appropriate ratios.

Resources/materials needed: Worksheet, string, protractor

Description of Plan: To give a brief lecture covering the basic concepts, and have students fill in the blanks on their worksheet as the follow along with the lesson. I hope that this approach will help the students maintain focus. Moreover, ideally the students will enjoy creating their own acronym and helping other members in their group. The students will utilize the string and protractors to construct triangles before calculating the the trig ratios for the interior angles.

Lesson Source: Original lesson.

Instructional Mode: Brief lecture followed by class discussion and participation.

Date Given: 02/26/2008 **Estimated Time**: One class period

Date Submitted to $Algebra^3$**:** 04/16/2008

NAME

Follow the lecture closely to fill in the corresponding blanks in your worksheet.

$\sin x = \frac{opp}{\quad}$ Draw a representative diagram below

$\cos x = \frac{\quad}{hyp}$

$\tan x = \frac{sinx}{\quad} = \frac{\quad}{\quad}$

One way of remembering the above is to use an acronym, namely SOHCAHTOA.

SOH stands for $\sin x = \frac{opp}{hyp}$,

CAH means $\cos x = \frac{\quad}{\quad}$, and

TOA represents $\tan x = \frac{\quad}{adj}$

Some people like to use a word for each letter in the acronym to help them remember the Trig Ratios.

For example:

Some **O**ld **H**orse **C**aught **A**nother **H**orse **T**ripping **O**ther **A**nimals.

1. Make up your own sentence to help remember the trigonometric ratios.
2. We are going to construct some special triangles and evaluate their trig ratios.

a. Cut two pieces of string to identical lengths.

b. Use a protractor to connect the strings at right angles on your paper in the space provided on the next page.

c. Draw a line that connects the other ends of the strings. Now we have a right triangle. Draw lines in place of the strings so you can review what the triangle looks like later.

d. You know that one of the interior angles is 90^o, use your protractor to measure the other two. Put their values on the triangle that you drew.

e. Say the length of each piece of string is 1 unit. Use the Pythagorean Theorem to calculate the length of the hypotenuse. Keep your answer in radical form, and label your triangle accordingly.

Now, it can be hard to measure an angle exactly using a protractor but lets see what answers everyone got. If you were very careful in measuring then you probably found that the triangle was a $45^o, 45^o, 90^o$ triangle. And that's for everyone's triangle even though they are not all the same size! How does your triangle compare with your neighbors? Hint: The word I want begins with an "s", these are "s_____ triangles". Use these very precise angles, and the hypotenuse that you calculated above for the following problem. Remember that each side of the triangle has length 1.

3. a. Use the trigonometric ratios to calculate $\sin 45^o$. Fractions and radicals are OK, don't worry about giving a decimal approximation!

b. What is $\cos 45^o$?

c. $\tan 45^o = ?$

4. We are now going to draw another special triangle. Take your two strings from earlier and cut one of them in half, discard the other half of the shorter string. Say that the shorter string has length one unit. Then what would be the length of the longer string?

   a. Use your protractor to connect the longer string to the shorter string at a 60^oangle.

   b. Draw a straight line that connects the other two ends of your strings. Draw lines in place of the strings so you can review what the triangle looks like later.

   c. Use your protractor to measure the unknown interior angles. Add this information to your triangle.

   d. Use the Pythagorean Theorem to find the length of the remaining side. Be careful here, and remember that the unknown side is NOT the hypotenuse this time. Again, label your triangle accordingly.

   Like the $45^o, 45^o, 90^o$ triangle before this is another important triangle. With careful measurements you likely found that the interior angles of the above triangle were $30^o, 60^o \, and \, 90^o$. Use the known lengths of each side and the trig ratios to answer the remaining questions.

5. This triangle is particularly nice, since it will allow us to calculate trig values for 60^o AND for 30^o.

   a. $\cos 60^o = \frac{\quad}{2}$

   b. $\sin 60^o =$

c. $\tan 60^o = \underline{\quad\sqrt{3}\quad}$

d. $\sin 30^o = \underline{\quad 1 \quad}$

e. $\cos 30^o =$

f. $\tan 30^o =$