Hamilton Hardison

Lesson 2

The Unit Circle, Coordinates, and Reference Angles

Class: Math IV or Accelerated Math III

Time: One 50-Minute Class Period

Goals:

- Students will be introduced to a unit quarter circle in order to explore the positive values of sine and cosine.
- Students will develop the notion of sine and cosine of a given angle as the coordinates of the intersection of the terminal side of the angle and the unit circle.
- Students will explain why the above relationship works.
- Students will discover the angles for which sine and cosine are equal to one or zero.
- Students will be introduced to the unit circle in its entirety and be asked to extend the coordinate relationship of the first quadrant sine and cosine to the remaining quadrants.
- Students will be introduced briefly to reference angles and will investigate the magnitudes of sine and cosine in terms of reference angles.
- Students will investigate the sign changes of sine and cosine in terms of the quadrant in which the terminal side of an angle lies.
- Students will come up with the remaining similarity ratios that define the remaining four trig functions.

GPS Standards Addressed:

- MM4A2. Students will use the circle to define the trigonometric functions.
  a. Understand and apply the six trigonometric functions as functions of general angles in standard position.
  b. Find values of trigonometric functions using points on the terminal sides of angles in the standard position.
  c. Understand and apply the six trigonometric functions as functions of arc length on the unit circle.
  d. Find values of trigonometric functions using the unit circle.

Supplies Needed:

- Computers with Geometer's Sketchpad Software
- Provided Procedure Worksheet

Assessment: Students will be assessed on the Procedure worksheet and Class Discussion. Out of 25 points, the breakdown is as follows.

- Participation in Class Discussion – 5 pts.
- Completion of Procedure Worksheet – 10 pts.
- Mathematical Reasoning Demonstrated in Procedure Worksheet – 10 pts.

Timeline:

- Introduction and Getting Started – 5 minutes
- Exploration Using the Procedure – 30 minutes
  - Students will be working independently or in small groups on the assigned tasks in the procedure.
  - During this time the instructor should be walking around the room. Assistance on questions in the procedure should not be given unless absolutely necessary; Allow the students to work with partners to arrive at solutions. Teacher assistance should be focused on issues dealing with software usage as opposed to content.
- Class Discussion – 15 minutes
  - Ensure that proper mathematical terminology is being used and that the terminology is understood.
  - Discuss the proof of the coordinate interpretation of sine and cosine on the unit circle.
  - Discuss the sign changes of sine and cosine based on quadrants and the coordinate interpretation.
  - Discuss the magnitudes of sine and cosine for angles with the same reference angles.
  - Discuss the advantages of reference angles and inform students that they will be used in future lessons.
  - Remind students of their homework assignment.
  - Discuss any questions that come up or portions of the activity that seem to be problematic for students.
  - Discuss anything particularly interesting or unexpected that students have discovered in the exploration.