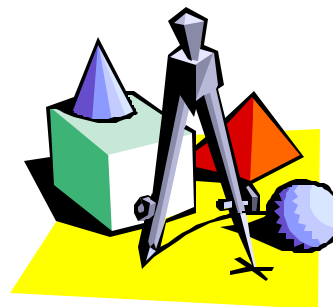# Algebra/Geometry Institute Summer 2003

Lesson Plan 3

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School: John F Kennedy Memorial
City: Mound Bayou, MS
Grade Level: Grade 9 Pre-Algebra

1   Teaching Objective(s)
   ❖ To investigate the relationship between the circumference and the diameter of a circle.
   ❖ To demonstrate that the slope of a straight line represents the relationship of the dependent variable to the independent variable.
   ❖ MS 2a,2e6a,4a,7b : benchmark 22,30,32,46

2   Instructional Activities

   ❖ Before class begins make up six kits – into a kraft grocery size bag place a roll of cotton string, an empty coffee can, an empty soup can, a Frisbee®, a dinner plate, a bread and butter plate, a lid from a round margarine tub container, a pair of blunt school scissors, a tally sheet and 2 sheets of quarter inch squared paper.
   ❖ Have a copy of the tally sheet ready to show on an overhead projector or make a reasonable facsimile on the front white board.
   ❖ Start the class with a motivational cheer from the file such as – I am a winner, I am a winner, I am a winner, I fear no challenge!
   ❖ Divide the class into groups of four students each. Instruct each group to appoint a spokesperson, a record keeper, a string wrangler, and a measurer.
   ❖ Have the measurer from each group come up to the front and get a meter stick from the teacher.
   ❖ Ask the groups to take the following things out of their paper bags and place them on their work surface: the coffee can, the ball of string, the scissors, and the tally sheet.
   ❖ Instruct the students acting as team recorders to take the tally sheet and in the first blank line write 'coffee can ' in the column labeled 'source object '.
   ❖ Ask the string wranglers to now get their ball of cotton string and show them how to place it around the top of the coffee can (the circumference) and cut it off with the scissors at the place where it just makes one lap around the rim.
   ❖ Instruct the students acting a team measurers to use their meter stick to measure the length of the string that went around the coffee can to the closest $\frac{1}{8}$ inch. Also instruct the measurers how to measure the diameter, using the meter stick (also, to the closest $\frac{1}{8}$ inch) of the coffee can by taking three measurements that are as

close as they can estimate through the center of the circle and use the largest one (remind them that the diameter is the largest chord cutting a circle). Have them write the length of the string in the column labeled circumference and the diameter of the top circle in the column labeled diameter, all on the same row as the 'coffee can '. Tell them to leave the last column with the question marks for a label blank for the moment.

❖ When every team has completed this activity tell them they can go ahead and measure and record the circumference and diameter for the other five objects that have a circular shape, reminding them not to forget to record the name of the object in the first column.

❖ When all the teams have measured and recorded all their data on the tally sheet ask the team spokesperson to take the piece of quarter inch squared paper from their paper bag. Have them draw a vertical and a horizontal axis three squares from the left edge and the bottom respectively. Mark the vertical axis ' circumference ' (also, remind the class that this will represent the dependant variable) and mark the horizontal axis ' diameter ' (again remind them that this is the independent variable). Tell them to look at their data and take a couple of minutes to determine appropriate scales for the two axis. After a minute or so ask the spokesperson for each group to tell you the scale their team has chosen for the axis. Write them on the white board and initiate a discussion as to what might be the best scales to use. Have the class as a whole decide on one scale and mark their graphs accordingly.

❖ Instruct the spokespersons to plot on their graph the six ordered pairs they have measured. Each ordered pair will be in the form (diameter, circumference) for each object measured.

❖ When this is complete ask each team to decide by observation the best-fit straight line to draw through their data and then to calculate the slope of that line to two decimal points.

❖ Have the spokesperson for each group report the slope their group found and record it on the front board. Lead a discussion as to how similar all the slopes are and direct the discussion if necessary to the observation that this is very nearly equal to π (pi) .

❖ Now have the recorder fill in the last column on the tally sheet by dividing the circumference by the diameter. When this is complete ask the spokesperson for each group to report their values for the last unnamed column and write all the answers on the front board.

❖ Ask the class if they can think of a good name for the last column, leading them if necessary to calling the column π (pi).

❖ Have the students put the names of all their team members on their tally sheet and graph and hand them in.

❖ During the next class period have the students write a journal entry titled How Does Circumference and Diameter Relate to π (pi).

3   Materials and Resources

- ❖ 6 rolls cotton string
- ❖ 6 kraft paper grocery size bags
- ❖ 6 pairs of blunt school scissors
- ❖ 6 meter sticks
- ❖ 6 Frisbees®
- ❖ 6 coffee cans (empty)
- ❖ 6 dinner plates
- ❖ 6 round margarine lids
- ❖ 6 bread and butter plates
- ❖ 6 soup cans (empty)
- ❖ 1 pad of quarter inch squared paper
- ❖ 6 tally sheets (see attached)
- ❖ Overhead projector
- ❖ Several colored vis-a$^{/}$-vis® markers

4   Assessment

- ❖ Observation. An individual grade will be given to each student for team participation.
- ❖ This activity will be graded as a Group activity – each group will hand in one tally sheet and one graph of circumference as a function of diameter, with all group members' names attached.
- ❖ An individual grade for each student will be given for their journal entry.

TALLY SHEET

Source Object	Diameter	Circumference	???