Changes in the Circumference

Problem Statement: What happens to the circumference of a circle if you double the diameter? If you triple the diameter? If you halve the diameter? As the diameter increases (or decreases) in measure, how does the circumference change? Why does this change occur?

GPS Alignment: M6D1. Students will pose questions, collect data, represent and analyze date, and interpret results.

 b. Using data, construct frequency distributions, frequency tables, and graphs.

 c. Choose appropriate graphs to consistent with the nature of the data. Graphs should

 include pictographs, histograms, bar graphs, line graphs, circle graphs, and line

 plots.

 d. Use tables and graphs to examine variation that occurs within a group and variation

 that occurs between groups.

M6M2. Students will use appropriate units of measure for finding length, perimeter, area and

Volume and will express each quantity using the appropriate unit.

1. Measure length to the nearest half, fourth, eights and sixteenth of an inch.
2. Select and use units of appropriate size and type to measure length, perimeter,

area and volume.

Problem Setup: We are going to look at changes in the circumference of a circle if the circle’s diameter is doubled, tripled or halved. Explain what these changes do to the circumference of the circle and why?

 I recently worked many problems just like this one. For six weeks, I tutored eleventh grade students struggling with math. Circles were one area we addressed. The students had to solve problems finding area, circumference, diameter and radius. I spent much time discussing the relationship between these components and working problems with them.

Plans to Solve this Problem: The circle is a fundamental shape in our universe. The moon, sun and all the planets are circles. They even revolve in circular patterns. The circle deserves our attention. There is a definite relationship between circumference and diameter. This is what I plan to investigate while working on this problem.

Investigation/Exploration of the Problem: The formula of a circle is C=πd, so circumference divided by diameter is always equal to pi (π), or 3.14. This is an optimum place to discuss the relationship of circumference and diameter. If a piece of string is cut at the exact measure of the circumference of a circle it will stretch across the exact middle of the circle, the diameter, three times with a little left over or 3.14 times. This is standard; proven hundreds of years ago; it will not change or vary. I knew when I read this problem the circumference would act the same as the diameter. If the diameter is doubled or tripled, the circumference will also double or triple. For example if the diameter of the circle starts at 3 the circumference is 9.42. If the diameter is doubled to 6 then the circumference is also doubled to 18.84. This will happen as different combinations are used because the center of a circle is the same distance from any and all points on the circumference.

Extensions of this Problem: I will use this problem in a sixth, seventh or eighth grade math classroom. I will have my students view the you tube video, in my links, to open a lesson on circles. It is a good explanation of π.

 In my links section, I have also listed a hands on math lesson that I will use. In the lesson students will measure 5-7 circles and fill in a chart with the measures of circumference, diameter and radius. After all the circles are measured, the students then divide circumference by diameter. All will equal 3.14. It makes the relationship between circumference and diameter perfectly clear and the students find the relationship on their own.

Author and Contact Information: Kim Gibbs, Augusta State University

 ksgibbs@aug.edu

Links to resources, references, lesson plans, and other materials: Below you will find two links that I considered when solving this problem. They were used as reference materials. I also used a calculator to solve this problem. The you tube explanation of pi was informative and stated on a level that middle school students would understand easily. I would use both links in my classroom.

<http://www.youtube.com/watch?v=jyLRpr2P0MQ>

<http://mypages.iit.edu/~smile/ma9709.html>

Visual Representation:

 Diameter = 1 cm.

 Circumference = 3.14

 Diameter = 3 cm

 Circumference = 9.42

 Diameter = 6 cm

 Circumference = 18.84

This picture representation shows what happens to the circumference when the diameter is tripled and doubled. It can be viewed the opposite direction as well, what happens when the diameter is halved (6 to 3) and divided by 3 (3 to 1).