

Discovering Pi

Benchmarks 5,6,7

Geometry and Spatial Sense

B. Draw circles, and identify and determine the relationships among radius, diameter, center and circumference.

Data Analysis and Probability

B. Interpret data by looking for patterns and relationships, draw and justify conclusions, and answer related questions.

F. Determine and use the range, mean, median, and mode to analyze and compare data, and explain what each indicates about the data.

Materials

1. Many different circles of different sizes- they can be made out of paper or objects you have collected. (I prefer to use lots of lids and other actual objects rather than paper cutouts.)
2. Flexible measuring tapes
3. Pi Worksheet

Math Background

By the time students get to junior high, many of them think they know that pi is 3.14. However, they have no idea why they use 3.14 for pi or that pi is actually a ratio of circumference to the diameter. This lesson helps students to truly understand what pi is and come up with a value for pi. In the process, they can develop a formula to come up with the circumference of a circle compared to its diameter (some may already know this).

Procedure

1. Begin by talking about circles. Review the vocabulary necessary for talking about circles in this lesson- radius, diameter, arc, circumference, center, etc. Talk about pi. Ask the kids what pi is. (Usually, the only answer I get is 3.14.) Discuss what pi is, but don't give away what they should find in their worksheet. I also show a print out page that gives many digits of pi. Talk about how it is an irrational number.
2. Pass out the materials. Explain that the kids that they will be measuring the diameter of the circle and the circumference. Remind them that the diameter must go through the center of the circle. Give the accuracy you want for the measurements. (This depends on the ability of the group you are working with.) Put them with partners/groups to work through the worksheet. They could also work alone if you choose.

3. Once the kids have their measurements and ratios finished and have found their mean, median, mode, and range, put the class data together. Discuss the following questions.
 - a. Do you notice anything or was anything surprising about the number we are getting when we divide the circumference by the diameter?
 - b. How do you think mathematicians discovered pi?
 - c. What do you think our range should be? Why is it not that?
 - d. What kind of formula could you come up with to find the diameter of a circle? Why would this kind of formula be useful?

Assessment

As the students work, you can walk around the room and check on what they are doing. Listen to their answers during the discussion and guide them into more critical thinking. Have them turn in their worksheet and group-work evaluations.



EASY AS PI



WITH YOUR PARTNER, MEASURE THE DIAMETER AND CIRCUMFERENCE OF THE OBJECTS GIVEN TO YOUR GROUP. ROUND YOUR DIVISION TO FOUR DECIMAL PLACES.

| BRIEF DESCRIPTION OF OBJECT | CIRCUMFERENCE | DIAMETER | CIRCUMFERENCE DIVIDED BY DIAMETER |
|-----------------------------|---------------|----------|-----------------------------------|
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USING THE DATA YOU GENERATED BY DIVIDING CIRCUMFERENCE BY DIAMETER, FIND THE MEAN, MEDIAN, MODE, AND RANGE.

DO YOU NOTICE ANYTHING ABOUT THE RATIO OF CIRCUMFERENCE TO DIAMETER?

HOW DO YOU THINK MATHEMATICIANS DISCOVERED PI?

WHAT SHOULD OUR RANGE BE? WHY DO YOU THINK THAT? IF YOUR RANGE ISN'T, WHY ISN'T IT?

USING THIS INFORMATION, CAN YOU COME UP WITH A FORMULA FOR FINDING THE CIRCUMFERENCE OF A CIRCLE IF YOU KNOW THE DIAMETER? WHY WOULD THIS WORK? WHY WOULD THIS FORMULA BE IMPORTANT?