

FINDING PI

Performance Standard (6C/7A/9A/10A/10B).F

Determine the circumference and diameter of 6 different objects, calculate the sum, difference, product, and quotient of the circumference and diameter, and from these calculations determine which relationship produces the value of pi accordingly:

- *Mathematical knowledge:* know how to measure the circumference and diameter of circles as parts of cylindrical objects, use computational relationships to determine the value of pi, and develop a formula for computing the value of the diameter or circumference when one value is known and the other is not.
- *Strategic knowledge:* use appropriate measurement tools and computational methods and collect data from a simple simulation; use and interpret data consistently to draw a conclusion about how the value of pi was found, and
- *Explanation:* explain completely and clearly what was done and why it was done.

Procedures

1. *In order to compute and estimate using mental mathematics, paper-and-pencil methods, calculators, and computers(6C), measure and compare quantities using appropriate units, instruments, and methods (7A), demonstrate and apply geometric concepts involving points, lines, planes, and space (9A), organize, describe, and make predictions from existing data(10A) formulate questions, design data collection methods, gather and analyze data, and communicate findings(10B)*, students should experience sufficient learning opportunities to develop the following:
 - Select and use appropriate operations, methods and tools to compute or estimate using whole numbers.
 - Develop and use formulas for determining the circumference and area of circles.
 - Determine/ describe the relationship between pi, the diameter, the radius, and the circumference of a circle.
 - Construct, read, interpret, predict, draw conclusions, and evaluate data from various displays, including circle graphs.
 - Conduct simple simulations to gather data.
2. Provide each student with a copy of the “Finding Pi” recording sheet and the rubric. Have student review the task to be completed and how the rubric will be used to evaluate it.
3. Have each student write the definition of each term at the top of the recording sheet. Ask: “How could we use the circumference and diameter to find another value related to a circle? On the record sheet there are spaces provided for 4. Fill in the top of each column using C for circumference and d for diameter.” The teacher may have to provide a hint to get the students started. You are looking for $C + d$, $C - d$, $C \times d$, and C / d . Students should be looking for and making observations about the answers to these questions: If I add $C + d$, will I get a somewhat consistent value from all six objects? What about if I subtract d from C? or multiply $C \times d$? or divide C by d?
4. Provide each group of 3-4 students a cylinder, tape measure or piece of string and a metric ruler, a calculator, and a copy of the recording sheet for each student in the group. One student should measure, one should record and one should compute. Rotate the jobs until all cylinders are rotated from group to group.
5. Have group decide on a description of the cylinder and records the name (e.g., soup can, oatmeal container). Then the diameter and circumference of the cylinder will be measured and recorded in the appropriate cells on the record sheet. Computations of different relationships may be completed.
6. While students are working, observe or video tape the students at work measuring, recording, computing and communicating.
7. After measurements and computations are complete and each student has recorded all the data his/her group has collected on his/her recording sheet, time should be provided for the student to reflect on the data, record observations and write about his/her conclusions.
8. Evaluate each student’s work using the rubric and its guide to determine the performance level. Use the rubric while observing student performance and reading the observation/conclusions pieces of writing. Some students will use pencil-and-paper computation for the addition and subtraction and some will use the calculator. You are evaluating the student’s written definitions of terms, the use of a measurement tool, and computational accuracy. In the student writing you will be evaluating the observations made and conclusions drawn. When the diameter is added to, subtracted from, or multiplied by the circumference, there is no consistent pattern to

the sums, differences or products. But when the circumference is divided by the diameter the quotient should be consistently a little more than 3. The circumference of a circle is a little more than 3 times its diameter and thus the value of pi (3.14...).

Examples of Student Work not available

Time Requirements

- One to two class periods

Resources

- 6 - 9 different cylindrical containers
- Tape measure or piece of string and meter stick per group
- Copies of the “Finding Pi” recording sheet
- Calculator for each student
- Mathematics Rubric

NAME _____ DATE _____

FINDING PI
Exploring Circles Through Measurement
Student Recording Sheet

Terms: Write the definition of each term.

Circumference

Diameter

Radius

Pi

Using a string and a metric ruler, measure the circumference and diameter of each object and record your measurements. Use a calculator to compute four relationships between the circumference and the diameter. Record your observations. In writing, tell what you can conclude about the value of pi and its relationship to the circumference, diameter, and radius of a circle. Use the back of the paper to record your observations and write about your conclusions.

Description of object	Circumference (C) in mm.	Diameter (d) in mm.				
1						
2						
3						
4						
5						
6						