

Lab Framework

Text: CORD Applied Mathematics

Unit number and title: Unit 9: Using Ratios and Proportions

Short Description: *This lab will emphasize the discovery of Pi by using the diameter and Circumference of different sized cylinders.*

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Date: June 25, 2010

Lab Title Finding Pi

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
 1. Identify ratios
 2. Identify and write proportions
 3. Formulate and solve equations to discover Pi
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)
 - * Students will need to possess the ability to measure objects accurately
 - * Students will need to understand how to find circumference and diameter
- **Vocabulary**
 - * Ratio
 - * Constant Ratio
 - * Proportion
 - * Circumference
 - * Diameter
 - * Pi
- **Materials List**
 - * 10 objects that are in the shape of a cylinder
 - * String or yarn
 - * Scissors
 - * Writing utensil and scratch paper
 - * Ruler
 - * Calculator
 - * Worksheet complete with a data table
- **State Standards addressed**

Math: **A1.1.A** Select and justify functions and equations to model and solve problems. **A1.2D** Determine whether approximations or exact values of real numbers are appropriate, depending on the context, and justify the selection. **3.3.1** Analyze results using inductive and deductive reasoning. **2.2.1** Analyze strategies, concepts, and procedures to devise a plan to solve the problem. **5.1.1** Apply multiple mathematical concepts and procedures in a given problem or situation. **5.3** Relate mathematical concepts and procedures to real world situations.

Reading: **1.2.2** Apply strategies to comprehend words and ideas.

Writing: **1.2** Use style appropriate to the audience and purpose; use voice, word choice, and sentence fluency for intended style and audience.

- **Leadership Skills**
 - * *SCAN Interpersonal A*: Participates as a member of a team and contributes to group effort
- **SCAN Skills/Workplace Skills**
 - * *Mathematics A*: Approaches practical problems by choosing appropriately from a variety of mathematical techniques.
 - * *Writing B*: Records information completely and accurately
 - * *Responsibility A*: Exerts a high level of effort and perseverance towards goal attainment
 - * *Reasoning B*: For example, uses logic to draw conclusions from available information, extracts rules or principles from a set objects or written text
- **Set-up information**
 - * Ten cylinders of different sizes will be placed at 10 different stations around the classroom. Each station will have string, 1 random cylinder, 1 pair of scissors and a ruler. Each group will take a measurement using the string at each of the 10 stations.
- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)
 - * One 55 minute class period
 - * Students will be placed into groups of 2 and will rotate through each station.
- **Teacher Assessment of student learning** (scoring guide, rubric)
 - * Teacher Observation
 - * Completed data inserted into table provided by instructor
- **Summary of learning** (to be finished after student completes lab)
 - discuss real world application of learning from lab
 - opportunity for students to share/present learning
- **Optional activities**
 - * Find other cylinders not included in the lab to see if the ratio is directly related
- **Career Applications**
 - * There are several professions that demand accurate measurement capabilities and problem solving skills

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LAB TITLE: *Finding Pi*

STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**
 - * Discover the relationship between the diameter and circumference (*constant ratios*) of a cylinder by measuring several different sized cylinders.
- **Grouping instructions and roles**
 - * Students will be paired with one classmate
 - * Students will need to delegate the following responsibilities:
 - Gathering and returning supplies
 - Measure cylinders with string and ruler
 - Record data
 - Solve the calculations on the worksheet
- **Procedures – steps to follow/instructions**
 - * Students will be placed into groups of 2
 - * At each station your group will need to achieve the following:
 - Measure the diameter (*constant ratio*) of the cylinder with a piece of string
 - Mark the string and cut at the mark you made
 - Now, measure the circumference (*constant ratio*) with a piece of string
 - Mark the string and cut the mark you made
 - Keep these two pieces of string together and label them with the corresponding station
 - When you collect all 10 pieces of data from each station, you can return to your seats
 - Now, measure your strings and record the length of each string (diameter and circumference) with your ruler corresponding to its specific cylinder
 - Record your dimensions on your data worksheet
 - Use the formula $\pi = \frac{\text{Circumference}}{\text{Diameter}}$ to find Pi
- **Outcome instructions**
 - * Turn in the recorded dimensions on your data worksheet, accompanied by your calculations for Pi
- **Assessment instructions (peer-teacher)**
 - * Observation
 - * Completed data collection sheet with calculations

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Lab Data Collection

Student: _____ Date: _____

Unit 9: *Using Ratios and Proportions*

Lab Title: *Finding Pi*

Criteria: Write the problem/objective in statement form

Data Collection: Record the collected/given data

Calculations: Complete the given calculations to solve for an answer(s)

Summary Statement:

Other Assessment(s)

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