

## Lab Framework

**Text: CORD**

**Unit number and title: Unit 15 Using Formulas to Solve Problems**

**Short Description:** Students will calculate the volume of two different spheres by measuring their dimensions. Students will check their calculations using a graduated cylinder with water and measuring the displacement of water.

**Developed by: S. Feil and S. Sears**

**Contact Information:** [feil.s@mail.wsd.wednet.edu](mailto:feil.s@mail.wsd.wednet.edu) [sears.susan@mail.wsd.wednet.edu](mailto:sears.susan@mail.wsd.wednet.edu)

**Date: 6/25/08**

### Lab Title

## Radius and Volume of a Sphere

### LAB PLAN

**TEACHER:** Teacher Prep/ Lesson Plan

- **Lab Objective**
  - Measure accurately using a micrometer.
  - Read and write formulas.
  - Calculate volume using appropriate formulas and values.
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)
  - Formulas used for calculating volume
  - Measure using a micrometer
  - Vocabulary: Formula, Equation, Mathematical Expression, Variable, Sphere, and Absolute Value
- **Vocabulary**
  - Graduated Cylinder
  - Volume by Displacement
  - Calculated Volume
- **Materials List**
  - 10-ml. graduated cylinder
  - Micrometer caliper
  - Five 3/8" ball bearings
  - 100 BBs
  - Calculator
- **GLEs (State Standards) addressed**
  - Math: 1.2.3 Apply unit conversions within measurement systems, U.S. or metric, to maintain an appropriate level of precision. W
  - 1.5.6 Apply properties to solve multi-step equations and systems of equations. W
  - 1.5.4 Use variables to write expressions, linear equations, and inequalities that represent situations involving rational numbers, whole number powers, and square roots. W
  - Reading: 2.1.4 Apply comprehension monitoring strategies for informational and technical materials, complex narratives, and expositions: use prior knowledge.
  - 1.2.2 Apply strategies to comprehend words and ideas.

1.3.2 Understand and apply content/academic vocabulary critical to the meaning of the text, including vocabularies relevant to different contexts, cultures, and communities. W

Writing: 2.2.1 Demonstrates understanding of different purposes for writing.

- **Leadership Skills**

2.1 Communicate, participate and advocate effectively in pairs, small groups, teams, and large groups in order to reach common goals.

1.1 Analyze, refine and apply decision-making skills through classroom, family community, business and industry experiences.

- **SCAN Skills/Workplace Skills**

Basic Skills: C. Identifies relevant details, facts and specifications

Writing: A. Communicates thoughts, ideas, information, and messages in writing

B. Records information completely and accurately

Arithmetic: A. Performs basic computations

Mathematics: C. Expresses mathematical ideas and concepts orally and in writing

- **Set-up information**

Students are divided into groups of three. Each group is given the materials listed above. Each student will measure the sphere as directed in the lab worksheet and record their measurements. Students will then measure the volume by submerging in water and finding the displacement.

- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)

1 Class Period

Students divided into groups of three

- **Teacher Assessment of student learning** (scoring guide, rubric)

Teacher and student questions and answers.

Accurate measurements and calculations using micrometer.

Accurately completed student lab worksheet.

- **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**

- **Career Applications**

Using formulas to calculate measurements are used in most careers.

Contractors use them when building a house or pouring cement. Formulas are used in business with investments.

<https://wa-appliedmath.org/>

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

## Unit 15 - Activity 2: Radius and Volume of a Sphere

**Directions:** Calculate the volume of two different spheres by measuring their dimensions. Then, check your calculation by using a graduated cylinder with water and measuring the displacement.

What is your first sphere? \_\_\_\_\_

What is your second sphere? \_\_\_\_\_

**Measurements:** Use a micrometer to measure both spheres to the nearest .001cm. Enter that measurement in the table below.

	Diameter	Radius	Volume (calculated)	Volume (by displacement)	Error
1st Sphere					
2nd Sphere					

**Calculations:** Use the relationship between diameter and radius to find each radius. Enter it in the table above.

What is the relationship between diameter and radius? \_\_\_\_\_

What is the formula for volume of a sphere? \_\_\_\_\_

Use the formula for volume of a sphere to calculate the volume of each sphere and enter your result in the table above.

**Displacement:** Fill the graduated cylinder about half full of water.

How much water did you put in (initial volume in ml)? \_\_\_\_\_

Put a given number of your first sphere in making sure they are fully submerged.

How many did you put in (quantity)? \_\_\_\_\_

What is the new measurement of water in the cylinder (final volume)? \_\_\_\_\_

Subtract the initial volume from the final volume. Difference= \_\_\_\_\_

This is the displacement of all of them. Divide this by the number you put in to find the average volume of each.

Average volume (by displacement) = \_\_\_\_\_

Do the same for the other sphere and enter the info below.

Initial volume= \_\_\_\_\_ Quantity= \_\_\_\_\_

Final volume= \_\_\_\_\_ Difference= \_\_\_\_\_

Average volume (by displacement)= \_\_\_\_\_

Any difference between the two volumes is your error. Subtract the two volumes for each sphere and record the absolute value of that difference as error in your table.

What might account for any error? \_\_\_\_\_