

## Lab Framework

**Text: CORD Applied Math**

**Unit number and title: Unit 12 Scientific Notation**

**Short Description:** Using scientific notation measuring and computing varying amounts of water on an acre of land, including potential cost(if you are buying it), volume, mass, weight, moles, number of molecule, impurities, etc.

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**Date: January 18, 2008**

### Lab Title Water Per Acre

#### LAB PLAN

**TEACHER:** Teacher Prep/ Lesson Plan

- **Lab Objective**

Using scientific notation, students will measure and/or compute the volume, mass, weight, moles, number of molecule, impurities, etc. of varying amounts of water on an acre of land, including potential cost(if you are buying it).

- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

Know how to compute area, volume, moles, molecules/mole.

How to read a tape measure, Pythagorean Theorem(squaring corners), factoring.

- **Vocabulary**

Scientific Notation, base, exponent, powers of 10, factors.

- **Materials List**

Open area 220' X 250' or so. It can have other dimensions just as long as it is an acre in size.(Short on space?, try other dimensions like a parking lot, football field, etc.

Measuring device to measure distances of 250'. Of course if you measure 50' at a time you can move your tape along.

Clear plastic tube with one end sealed. Measurements marked on tube in inch increments up to 4 feet.

Bucket to carry water to pour into tube.

Water to fill tube

Scientific calculators.

Paper, pencils

Computers, projector, Power Point software.

- **GLEs (State Standards) addressed**

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Math: 1.1.1 Understand and use scientific notation.

1.1.5 Compute using scientific notation. W

Reading: 1.1.2 Analyzes task and composes multiple drafts when appropriate.

2.2.1 Demonstrates understanding of different purposes for writing

Writing: 1.1.2 Analyzes task and composes multiple drafts when appropriate.

2.2.1 Demonstrates understanding of different purposes for writing.

- **SCAN Skills/Workplace Skills**
  - 2.1 The student will communicate, participate, and advocate effectively in pairs, small groups, teams, and large groups in order to reach common goals.
- **Set-up information**
  - Factor 43,560 square feet to determine dimensions for an acre that will fit your space. Gather and prepare measuring equipment.
- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required**)
  - Day 1: (Entire class)Survey your school grounds. Research water cost.
  - Day 2: (Entire class)Measure acre.
  - Day 3: (Entire class)Pour water into tube at your acre.
  - Day 4 and possibly 5: (Pairs) Students do calculations.
  - Day 6 and 7: (Pairs) Prepare presentations.
  - Day 8 and 9: (Pairs and entire class) Presentations.
- **Teacher Assessment of student learning** (scoring guide, rubric)
  - Participation: Setup, decision making, measuring of the acre, water group pouring and measuring. Not present or disruptive: 0; Minimal participation 1; Adequate participation 2
  - Calculations should be accurate, reasonable, and defensible.
  - Presentations: None 0; Minimal 1; Adequate 2; Superior 3.
- **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
  - Student presentations
- **Optional activities**
  - Research impurities and pollutants and calculate amounts and concentrations in the water. Consider differences in rainwater and groundwater. Students could also present these findings to the class. This would give students more practice using scientific notation, i.e. ppm, ppb, ppt, etc.
- **Career Applications**
  - Farmers, irrigation equipment engineers, salesmen, farmers, foresters, wildlife biologists, dam operators, hydrologists, climatologists, meteorologists,

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**LAB TITLE: Water Per Acre**  
**STUDENT INSTRUCTIONS:**

- **Statement of problem addressed by lab**  
Use scientific notation to measure and compute varying amounts of water that cover an acre of land.
- **Grouping instructions and roles**  
Measuring an acre on your school grounds and collecting data involves the whole class. Each student will observe the water level in the plastic tube to visualize the water on the acre. Students will work in pairs to make the computations and make the presentations. The entire class will participate in discussions after each presentation. Presenters will be prepared to defend conclusions.
- **Procedures – steps to follow/instructions**
  1. Survey your school grounds, parking lot, etc. Decide on an appropriate area to lay out an acre. Factor dimensions of an acre to fit your space. As homework, students need to research their cost of purchased water used for irrigation purposes.
  2. Measure, square, lay out, and mark off your acre.
  3. In the presence of your acre, pour varying amounts of water into the tube so students can visualize that much water over the entire acre.
  4. Students calculate volumes, mass, number of moles, cost, etc. on the acre of varying amounts of water using scientific notation.
  5. Students prepare a Powerpoint presentation using their data.
  5. Each pair of students presents their findings to the class, answers questions, and defends data and calculations.
- **Outcome instructions**  
Students will have data and a drawing showing the area and dimensions of the acre(or other possibly smaller area)they are surveying. Students will have data of collected data of the water levels in the tube. All calculations will be shown with accurate labeling of units of measure. Powerpoint presentations will be defendable and show accurate information.
- **Assessment instructions (peer-teacher)**  
Pairs of students compare calculations to check for accuracy. Each pair of students should agree on a defendable argument for their conclusions. Each pair of students should be prepared to answer questions after their presentation.

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## Lab Data Collection

Student: \_\_\_\_\_ Date: \_\_\_\_\_

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Criteria: Write the problem/objective in statement form

Using scientific notation, measure and/or compute the volume, mass, weight, moles, number of molecule, impurities, etc. of varying amounts of water on an acre of land, including potential cost(if you are buying the water). Use the following table as a resource:

	Pounds	Grams	Kilograms
Cubic cm.	0.002205	1	0.001
Cubic inch	0.036127	16.387064	0.0163871
Liter	2.204684	1000.028	1.000028
Gallon	8.345404	3785.4118	3.7854118
Cubic foot	62.42796	28316.847	28.316847

Data Collection: Record the collected/given data

Dimensions of the acre or plot of land used:

Square feet of the acre or plot of land used:

Square inches of the acre or plot of land used:

Water depths you recorded.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Calculations: Complete the given calculations to solve for answers. Calculations and answers should be expressed using scientific notation:

Water depth      cubic inches      cubic feet      mass of water (lbs)      tons  
Moles of water(1 mole =18 grams)      Number of molecules(1 mole =  $6.023 \times 10^{23}$  molecules)

Summary Statement:

How many tons of water fall on 1 acre of land per inch of rain or equivalent?

Using your cost for water, how much would it cost you for water to irrigate the acre for every inch of water you sprinkled on the land? Prepare a powerpoint presentation to show your calculations and conclusions.

**Other Assessment(s)**

# **Washington Applied Math Council**

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