Lab Framework

Text: Cord Classic

Unit number and title: Unit 29 Geometry in the Workplace 2

Short Description: Putting in a new septic tank

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Lab Title
New Septic System

LAB PLAN

TEACHER: Teacher Prep/ Lesson Plan

- **Lab Objective**
  1. Calculate volume of a cylinder
  2. Calculate cubic feet
  3. Convert cubic feet to cubic yards
  4. Calculate associated projected costs associated with the work
- **Statement of pre-requisite skills needed** (i.e., vocabulary, measurement techniques, formulas, etc.)

  Basic understanding of geometry and related vocabulary

  Using formulas $(L \times \pi) \times R^2$
- **Vocabulary**

  Basic geometry vocabulary
- **Materials List**

  Calculator and Data Sheet
- **State Standards addressed**

  Math: G-I-3 Explain and perform constructions related to circles

  G-7-A Analyze a problem situation and represent it mathematically

  G-7-B Select and apply strategies to solve problems

  G-6-C Apply formulas for surface area volume of three-dimensional figures to solve problems

  G-6-F Solve problems involving measurement conversions within and between systems, including those involving derived units and analyze solutions in terms of reasonableness of solutions and appropriate units

  Reading: 1.1 Use word recognition and word meaning skills to read and comprehend text

  3.2 Read to perform a task

  3.3 Read for career applications

  Writing: 2.2 Writes for different purposes

  2.4 Writes for career applications
- **Leadership Skills**

  1.1 The student will analyze, refine and apply decision-making skills through classroom, family, community and business and industry (work related) experiences.

  1.4 The student will be involved in activities that require applying theory, problem-solving and using critical and creative thinking skills while understanding outcomes of related decisions.

- **SCAN Skills/Workplace Skills**

- **Set-up information**
  This lab is designed to follow the completion of Unit 29 and works with the life simulation used at Sumner High School.
- **Lab organization**(-Grouping/leadership opportunities/cooperative learning expectations; -**Timeline required)**
  The time required should not need to exceed one 50 minute period.
- **Teacher Assessment of student learning** (scoring guide, rubric)
  Accuracy of calculations and answers to guided questions.
- **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
  Students will discuss other applications of finding volume of various shapes and how they may be faced with such situations throughout their lives whether in career or personal settings.

- **Optional activities**

- **Career Applications**
  Construction and Equipment Rental

LAB TITLE: New Septic System
STUDENT INSTRUCTIONS:

- **Statement of problem addressed by lab**
  A new septic tank needs to be installed. The student needs to determine the correct size tank needed, equipment needs, and total cost of installing the tank

- **Grouping instructions and roles**
  Individually the students will solve the problems related to the new septic tank

- **Procedures** – steps to follow/instructions
  Students will read through the situation and develop a problem solving strategy.

- **Outcome instructions**
  Students will complete the data sheet and answer the related questions

- **Assessment instructions** (peer-teacher)
  Students will compare and discuss their solutions and problems solving strategies.

Lab Data

Student: _____ **Date:** _____

Unit: 29

Lab Title: New Septic System

Situation:

You are helping a friend put in a new septic system. If you are able to come up with all the correct information you will receive $500 from your friend as a "Thanks". If you don't provide correct information you agree to pay the additional costs created by your miscalculations (a minimum of 10 percent of the actual costs).

Sort through the information below and use the data that will help you make correct decisions.

- The septic tank is a round cylinder.
- The tank must be buried at least 3 feet under ground when finished.
- The hole for the tank will be considered a rectangle.
- The hole must have at least 1 foot clearance on all sides.
- Your friend has a 4 bedroom house which must have a septic tank with a minimum capacity of 190 cubic feet.
- A county permit is needed if more than 25 cubic yards of dirt is moved. The fine for moving dirt with a permit is needed is $1,000.
- The formula for calculating the volume of a cylinder is:

  $(L \times \pi) \times R^2 = \text{Cubic Feet}$

  Where: L is the length in feet
  π is the value for Pi to 5 decimal places (3.14159)
  R is the radius of the tank (half the diameter)
- Cubic feet = L x W x H (length x width x height)
- Cubic Yards = Cubic feet / 27 (a yard is 3 feet, a cubic yard is 3 x 3 x 3)

Available Tanks:

1. 6' diameter, 10' long	Cost	$1,000
2. 5' diameter, 10' long		$ 750
3. 5' diameter, 8' long		$ 400
4. 3' diameter, 8' long		$ 250

Available Equipment:

1. The friend has a small backhoe Cost Free
   Specs: Reach 4' wide, Depth 6' deep, digs 3 cubic yards per hour

2. Rental $150 per hour, $300 half day (4 hours) $600 per day (up to 10 hours)
   Specs: Reach 6' wide, Depth 8' deep, digs 6 cubic yards per hour

3. Rental $175 per hour, $500 half day (4 hours) $800 per day (up to 12 hours)
   Specs: Reach 8' wide, Depth 10' deep, digs 7 cubic yards per hour

Other Available Equipment:

1. Another friend owns a small dump truck with a 5 cubic yard capacity which you can use at no cost. But you will provide the cost of fuel used, 1.5 gallons of fuel per dump trip at a cost of $3.09 per gallon.

2. You will be able to use a small tractor with a bucket to fill in the hole at no cost.

What you need to find:

1. What is the actual volume of the tank that most closely meets the minimum requirements for a 4 bedroom home? _____

2. How many cubic yards of dirt must be removed to bury the tank? _____

3. Based on your answer to # 2 above, will your friend need to purchase an additional permit? _____

4. Which backhoe is capable of doing the job and is the most economical (cheapest) to use? _____

5. How many yards of dirt will be needed to fill in the hole? _____

6. How many truck loads of dirt will be removed from the hole? _____

7. How long should it take to dig the hole? _____

8. Calculate the total cost below:

   A) Cost of the backhoe if a rental is used $_____

   B) Cost of the tank $_____

   C) Cost of permit if needed $_____

   D) Cost of fuel for the dump truck $_____

9. Total cost of putting in the tank $_____