

## Unit Problem for Unit 1

Name \_\_\_\_\_

Update 12/28/03

### Objectives:

1. Use unit analysis and the concepts of area and volume to solve multi-step problems.
2. Practice the steps in a general problem-solving process.
3. Construct and use tables and graphs to make predictions.
4. Explain math reasoning and show work in an organized manner.

**Activity:** Sometimes when a garden is planted in a spot for the first time, the soil may need preparation beyond fertilization. This is particularly true in parts of Contra Costa County where the soil is a hard and heavy clay. In such cases, you dig up the existing soil and replace it with more fertile soil.

1. For the following recipe for soil replacement, use the problem-solving process outlined below to determine how many cubic feet of soil are in one batch of the recipe. Round your final answer to the nearest half-cubic foot.

*Given:* You are given the information below.

<u>Soil Replacement Recipe</u>	<u>Common conversion factors:</u>
1.5 bales of peat moss	1 bale = 6 cu. ft.
$\frac{1}{6}$ of a cubic yard of sand	1 gallon = 0.1337 cu. ft.
1 large bag (25 gallons) of vermiculite	4 quarts = 1 gallon
4 cubic feet of compost	1 gallon = 231 cu. in.
1 paper grocery sack of wood ash or charcoal (a standard grocery sack measures 11.5 in. x 7 in. x 13in.)	1 liter ~ 1.06 quarts
1 liter of fertilizer	2 cups = 1 pint
3 cups of lime	2 pints = 1 quart
	1 foot = 12 inches
	1 yard = 3 feet

*Task:* Paraphrase the task

*Estimate:* Do you think the recipe will yield more or less than 15 cubic feet? Explain your reasoning using only “mental math” .

*Useful facts or formulas:* Read through the given information. Write additional conversion factors that you will need that are not in the list provided. Write formulas that will be useful.

*Work out the solution here in an organized manner. Include units.*

*Answer:* State your answer in a complete sentence that communicates the meaning.

2. When the recipe is actually mixed together, the “whole does not equal the sum of the parts”. This happens because some of the smaller particles, such as the sand, move into the empty spaces of the more porous ingredients. When the recipe is mixed well, the actual volume is 20 cubic feet.

Suppose that you have the ingredients to make two batches of the soil replacement recipe. Can you fill a circular garden with a radius of 3 feet dug to a depth of 1.5 feet? Use a general problem-solving process and show your work in a clear and organized manner.

3. Suppose that you want to make a rectangular vegetable garden that measures 4 feet by 12 feet. Since your soil is heavy clay, you will dig out the soil and replace it with the recipe given above.
- a. Fill in the table to calculate the volume of soil, in cubic feet, that must be removed for each depth. Increase the inputs (depths) by the same amount as you complete the table.

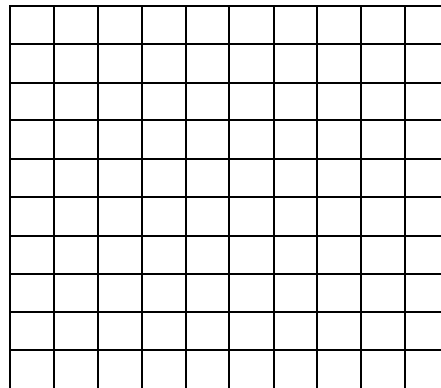
*In this space, explain or give an example to show what you are doing to calculate volume.*

Depth (in feet)	Volume of soil removed (in cubic feet)
$\frac{1}{4}$	
$\frac{1}{2}$	
$\frac{3}{4}$	
1	

- b. Graph the information in your table.

(Stop and think: Which value will be on the horizontal axis? What scale makes sense?)

Label each axes with a description of the quantity and clearly show the scale.



- c. What depth will require three batches of the soil replacement recipe? Explain your answer using your table and your graph. Is your answer a good estimate or an exact value?
- d. What depth will require four batches of soil replacement recipe? Clearly show your reasoning. Is your answer a good estimate or an exact value?

4. Reflection:

a. Which picture best depicts your experience with or feelings about this assignment? Write a few sentences explaining your choice.



b. **Clearest point:** What key concept or central task in this assignment do you feel the most confident about?

**Muddiest point:** What key concept or central task in this assignment do you feel the least confident about?