

Focus on: Area and Volume

This lesson is meant to be a real world application of area and volume. Students will understand concepts of volume and relate volume to multiplication and to addition. Students will recognize volume as an attribute of three-dimensional space.

Clarifying Objectives:

5.NF.4b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5. MD.5 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole number products as volumes, e.g., to represent the associative property of multiplication.

b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

Key Vocabulary

Definitions can be found at <http://learnersdictionary.com>

- measurement
- attribute
- volume
- solid figure
- right rectangular prism
- unit
- gap
- overlap
- cubic yards, feet, inches
- multiplication
- addition
- edge lengths
- height
- area of base

Focus Question(s):

How can we figure out how much mulch to order for the walking areas of our school garden?

Materials:

School Garden
Science Notebooks
Measuring Tape
Calculators???

Activities:

1. Tell students that in the spring we will need to order more mulch/wood chips for the walking area of the garden.
2. Tell the students they will work in groups to figure out how much we mulch we will need to order.
3. Divide the students into groups of 4 and then ask: *What will we need to do first to figure out how much mulch we will need to order?* Have groups share out their ideas and then confirm that the first step will be to figure out the area of the entire garden. *How do we figure out the area?* Students should respond with length X width. Tell the students that you wish they could measure the entire length and width of the garden, but we do not have a measuring tape long enough so you are going to tell them this part. (The garden is 100 feet long and 30 feet wide.) Have the students figure out the area of the entire garden.
4. Ask: *Now we know the area of the entire garden. BUT... will we be putting mulch on the entire area of the garden?* (Hopefully this will prompt the students to realize that we won't need to put mulch on the raised beds.) Ask: *If we don't need to put mulch in the area of the raised beds, what do we need to do?* (Subtract the areas of the raised beds.
5. Send groups of students to measure the length and width of the raised beds. Ask: *Do we need to measure all of the raised beds and subtract the area from the total area one at a time or can we multiply the area of one bed and subtract that total?* Then have students do that step to find the real area of the walking areas of the garden.
6. Ask: *OK, we have found the area, but we want to fill the mulch up in that area to be at least 3 inches deep so what do we need to figure out next?* (Hopefully the students will suggest to figure out the volume they will need to multiply the area times 3 inches to figure out the volume.) Then have the students complete this step.
7. Tell the students that we now have one more step left. Since we have figured out the volume in square feet, we now have to convert it into cubic yards because the businesses that sell mulch don't sell it by square feet. They sell it by cubic yards. So we will need divide our answer by 324.
8. Share answers to see if groups came up with the same number. If a group has a different answer, have groups share their steps to see who is correct and to identify places where incorrect calculations may have occurred.

Guiding Questions:

- *What will we need to do first to figure out how much mulch we will need to order for our garden? How do we figure out the area?*
- *Now we know the area of the entire garden. BUT... will we be putting mulch on the entire area of the garden? What will we need to do next?*
- *Do we need to measure all of the raised beds and subtract the area from the total area one at a time or can we multiply the area of one bed and subtract that total?*
- *OK, we have found the area, but we want to fill the mulch up in that area to be at least 3 inches deep so what do we need to figure out next?*
- *Once you have your total and have divided that by 324, what is the number of cubic yards we will need to order for the garden?*

9. Thanks the students for helping us do the math work for helping our garden. Explain that we also use this type of math to figure out how much soil, compost or soil amendments to order for our garden.	
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