



# Measuring Area and Volume in a Garden Bed

## Overview:

Students will practically apply the formulas for area and volume to measure a raised or in-ground rectangular bed in their garden. They will predict why they would need to know this information in order to plant seeds or seedlings in their garden beds.

## Objectives:

At the end of the lesson, students will be able to:

-  **Describe** the difference between area and volume.
-  **Write** the formulas for determining area and volume.
-  **Draw and label** pictures of their garden beds with correct measurements for length, width, and depth/height.
-  **Explain** why they would need to know the area and volume when preparing their beds for planting.

## Materials:

-  A yardstick or tape measure for each student
-  Handout: “Measuring Area and Volume in a Garden Bed”
-  Enough rectangular garden beds for students to work in pairs or small groups

## On the Board:

-  Vocabulary
-  Student Reflection Questions

## Suggested Snack:

-  There is no suggested snack for this lesson. See our Healthy Snack Database for ideas.

## Vocabulary:

-  length
-  width
-  depth/height
-  area

-  exponents
-  volume
-  three-dimensional

-  raised bed
-  in-ground bed
-  rounding

## Learning Activities:

- I. Presentation: Defining Area and Volume (15 min.)
  - A. Tell students that in today’s lesson they will use measuring “tools” to measure the area and volume of their garden beds.

- B. Draw a picture of a two-dimensional rectangle on the board. Ask students to tell their partner what the area is and how to solve. Then ask a student to come up and describe what area is and how to calculate it.
- Define *area*: the measurement of a surface.
  - Ask a student to come up and write the formula for the area of a rectangle on the board:
    - $A = \text{length} \times \text{width}$  ( $A = l \times w$ )
    - Area (ft. squared) = Length (ft.) x Width (ft.)
    - Ask student to tell their partner how to show a measurement is squared? Call on one student to so share. ( $\wedge 2$ )
- C. Draw a three-dimensional rectangle on the board and ask a student to come up and describe what volume is and how to calculate it.
- Define *volume*: the amount of three-dimensional space that something occupies.
  - Ask a student to come up and write the formula for the volume of a rectangle on the board:
    - $V = w \cdot l \cdot h$
    - Volume (ft. cubed) = Length (ft.) x Width (ft.) x Height (ft.)
    - Ask student to tell their elbow partner how to show a measurement is cubed? Call on one student to so share out. ( $\wedge 3$ )
    - Challenge students to explain why area is  $\wedge 2$  and volume is  $\wedge 3$ .
- D. Review how to measure with which units to read, starting at zero and not the end, etc.
- E. Review the rules for rounding (to the nearest foot). Have students make a note on their handouts.
2. Garden Activity: Measuring Raised Beds (30 min.)
- A. Distribute Handout: "Measuring Area and Volume in a Garden Bed."
  - B. Divide students into pairs (or small groups, depending on how many garden beds there are).
  - C. Give each pair/group of students a yardstick or tape measure.
  - D. Assign each group of students a garden bed and tell them to use their measuring tools to calculate the area and volume of the bed.
    - If the bed is full of soil they will have to "estimate" the depth/height of the bed.
    - Ask students how they will do this? (They can measure from the ground on which the bed sits to the top of the bed.)
3. Bring the class back together and ask each group to share their findings.
- A. Ask students: Why is it important to know the area of a bed before planting? (Seed packets tell how far plants should be spaced from each

other. So if you know the area of a bed, you will know about how many seeds or seedlings you can plant.)

- B. Ask students: Why is it important to know the volume of a bed before planting?
- If the bed has not yet been filled with soil this will help you know how much soil you need.
  - Also, if the plants you are planting will have long roots (check the seed packet) you will need to know how deep the soil needs to be to accommodate their roots.

4. Snack (5 min.)

5. Have students answer the reflection questions in their garden journals. (5 min.)

### Student Reflection Questions:

1. Did you have any difficulty measuring the area or volume in your beds? Why or why not?
2. Can you think of any other instances in your life when you have needed to measure area or volume? If the answer is no, when do you think it would be good to know the area or volume of something?

### Assessment Questions:

1. Write the formula for area.
  - **Length (ft) x Width (ft) = Area (ft squared)**
2. Write the formula for volume.
  - **Length (ft) x Width (ft) x Depth (ft) = Volume (ft. cubed)**
3. Why is it important to measure the area of a garden bed before planting?
  - **Seed packets tell how far plants should be spaced from each other so if you know the area of a bed where you are going to grow all the same plants you will know about how many seeds or seedlings you can plant.**
4. Why is it important to measure the volume of a garden bed before planting?
  - **If the bed has no soil in it this will help you know how much soil you need.**
  - **If the plants you are planting have long roots, you will need to know how deep the soil needs to be to accommodate their roots.**

### Standards:

#### Review Standards

- CCSS.MATH.CONTENT.2.MD.A.1  
Measure the length of an object by selecting and using appropriate tools such

as rulers, yardsticks, meter sticks, and measuring tapes.

CCSS.MATH.CONTENT.3.MD.C.5

- Recognize area as an attribute of plane figures and understand concepts of area measurement.

- CCSS.MATH.CONTENT.5.MD.C.3

Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

### 6th Grade

- CCSS.Math.Content.6.G.A.2

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas  $V = l w h$  and  $V = b h$  to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

### Mathematical Practices

- Use appropriate tools strategically.
- Attend to precision.