

VOLUME OF RECTANGULAR PRISMS

Volume 29



Developed with Kristin Hotter

Grade 5

TIME

Activity 45 minutes

CONTENT

- Practice using a ruler to round to the nearest inch during the introduction of the activity to set students up for success as they apply their knowledge of rectangular prisms to a real world situation. Students will use a variety of rectangular prisms to create a structure. Upon completing that structure, students will measure the volume of each individual component of the structure. From those measurements, they will be able to determine the volume of the entire structure.

OBJECTIVES

Students will:

- Design and construct a structure using a variety of rectangular prisms.
- Apply the formula for finding the volume of a rectangular prism to real world problems.
- Compare the volume and size of their structures to the volume and size of others' structures.

MATERIALS

- Ruler
- 5 rectangular prisms per pair of students (tissue boxes, books, shipping boxes, shoe boxes, cereal boxes, cracker boxes, rice boxes, etc.)
- Activity sheet
- Worksheet and answer key

COMMON CORE STATE STANDARDS

CCSS.Math.Content.5.MD.C.3 — Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

CCSS.Math.Content.5.MD.C.5.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.

CCSS.Math.Content.5.MD.C.5.C — Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.



PRIOR TO THE ACTIVITY

Ask students and colleagues to help you collect a variety of rectangular prisms that students can use to create their structures. Students will work in pairs for this activity. You should have at least five boxes for each pair of students.

INTRODUCTION (5 Minutes)

1. Begin the lesson by reviewing the uses of a ruler. Ask students what a ruler is traditionally used for (*to find the length of an object*) and what measurement units are found on a ruler (*centimeters and inches*). Indicate that for the activity today, students should use the inches side of the ruler, and to always double check to make sure they are using the correct side of the ruler when they are measuring items.
2. Have students use their ruler to measure the length of their pencil. Ask several students to tell you their pencil measurements and record them on the board. Some of these measurements will probably be in mixed numbers. Point those out and remind them what a mixed number is (*whole numbers with a fraction, such as $1\frac{1}{4}$ and $2\frac{3}{8}$*).
3. Tell students that for today's activity, they will be rounding their measurements to the nearest whole number. Go through the pencil measurements written on the board with your students and round each one to the nearest inch. If students need additional practice with this skill, measure the length of another item together before proceeding to the activity.



ACTIVITY (10 minutes for whole group; 20 minutes for partner activity)

1. Put students in pairs and give each student an activity sheet. Tell students that for the activity, they will be doing more than simply measuring the length of various objects. They will also calculate the volume of rectangular prisms. Ask what the formula for measuring a rectangular prism is ($L \times W \times H$). Have them record the formula on their activity sheet. Ask what the L stands for (*length*), the W stands for (*width*), and the H stands for (*height*).
2. Hold up one of the boxes you collected. It should not be one of the boxes that students can choose from when building their structures. Tell students they are going to determine the volume of the rectangular prism you're holding. In the box labeled "Sample Prism" on the activity sheet, have students create a quick sketch of the prism.
3. Ask a student to come forward and show which edge of the prism can be measured to determine the prism's length. Have the student measure the length. Round the length to the nearest inch and have all students record that length. Call two other students to come forward to determine the width and height of the prism. **See Figure 1.**
4. Indicate the length, width, and height measurements you have written on the board, then ask what students need to do with those measurements in order to determine the volume of the rectangular prism (*multiply the length times the width times the height*). Have students do that and ask what the answer is (*answers will vary based on your rectangular prism sample*). Remind students that the sides were measured using inches, then ask what the measurement of the volume is (*inches³*).
5. Now it's time to put students' skills to use in using a ruler, rounding to the nearest inch, and calculating volume to use. Tell students that they and their partner will choose five rectangular prisms, from which they will create a structure. Once they have built a structure they are both happy with, they will draw it in the box on their activity sheet. Each prism should be given a name using the letters A-E.
6. Tell students that once the structure is built and drawn on their sheet, they will measure the volume of the entire structure. Ask how they would go about doing that (*determine the volume of each individual rectangular prism*). Ask what they need to do with each of those totals (*add them together*).
7. Recap what students will be doing. They will spend several minutes creating a structure with their partner using their rectangular prisms. They will sketch and label their structure on their activity sheet. They will measure each rectangular prism to determine the volume of each, then determine the volume of the entire structure.
8. Release pairs of students to work in different areas of the room. As you release a pair, either give them or let them quickly choose the five rectangular prisms they will work with on the activity.

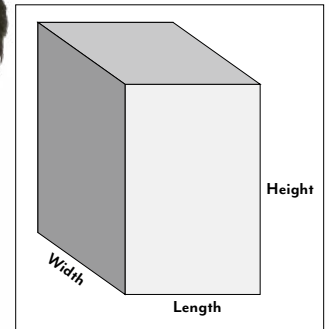
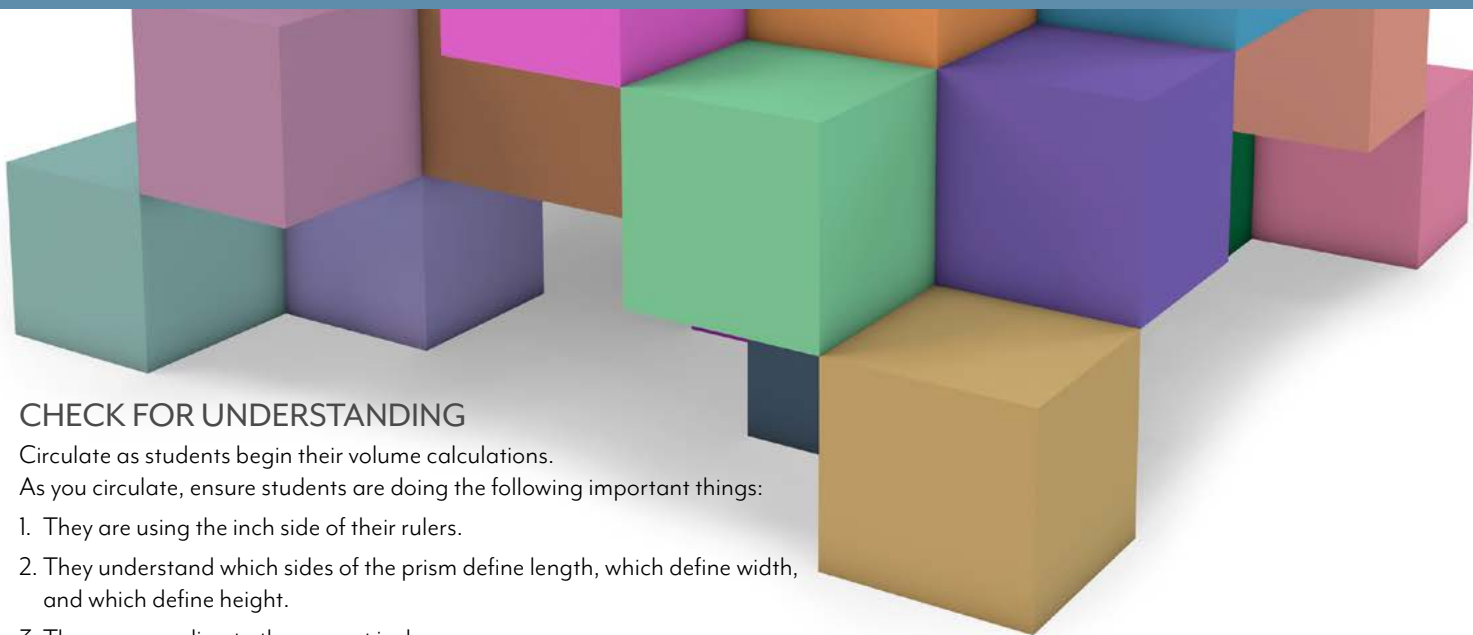


Figure 1



L x W x H



CHECK FOR UNDERSTANDING

Circulate as students begin their volume calculations.

As you circulate, ensure students are doing the following important things:

1. They are using the inch side of their rulers.
2. They understand which sides of the prism define length, which define width, and which define height.
3. They are rounding to the nearest inch.
4. They are multiplying the three measurements together.
5. They are labeling each volume measurement as in^3 .

Once groups have finished the calculations for their own structures, have them trade places with another group. This gives them the opportunity to get additional practice with calculating volume, as they should find the volume of the other group's structure. Students can complete the calculations on the back of their own activity sheet.

WRAP UP (10 minutes)

After students have had a chance to calculate the volume of at least one other group's structure, ask some follow-up questions.

1. How did the volume of your structure compare with the volume of the other group's structure? *(Students will determine their volume was either greater or less than the other group's volume.)*
2. How did the volume of your individual rectangular prisms compare? *(Students will determine if the individual volumes were greater than or less than.)*
3. How did the size of your structure compare to the other group's structure? *(It was either larger or smaller.)*
4. What can you determine about the volume of a structure compared to its size? *(The larger an object is, the greater its volume. The smaller an object, the less its volume.)*

For additional practice, students can complete the independent practice worksheet provided.

INTERVENTION

1. Measure the volumes of many rectangular prisms together prior to students working in pairs to find the measurements. Create a list of volumes together and allow students to choose some of their boxes from that list.
2. Use centimeters rather than inches for measurement to reduce the amount of rounding students are required to do before making calculations.

EXTENSION

1. Include three other dimensional shapes, such as cones and cylinders, as items that can be used to create structures. Students will need to have a prior understanding of how to find the volume of these shapes.
2. Have students measure the volume of their structures to the nearest half inch rather than the nearest inch. Students will need a firm grasp of multiplying mixed numbers.



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Name: _____ Partner's Name: _____

Activity Sheet 1

Formula for finding the volume of rectangular prisms: _____

Sample Prism: L = _____ W = _____ H = _____ V = _____

Draw the structure you and your partner have created in the space below. Label each prism as A, B, C, D, and E.

Determine the volume of each rectangular prism. Remember to round each measurement to the nearest inch.

Rectangular Prism A L = _____ W = _____ H = _____ V = _____

Rectangular Prism B L = _____ W = _____ H = _____ V = _____

Rectangular Prism C L = _____ W = _____ H = _____ V = _____

Rectangular Prism D L = _____ W = _____ H = _____ V = _____

Rectangular Prism E L = _____ W = _____ H = _____ V = _____

What is the volume of your entire structure? _____

Justify your answer. _____

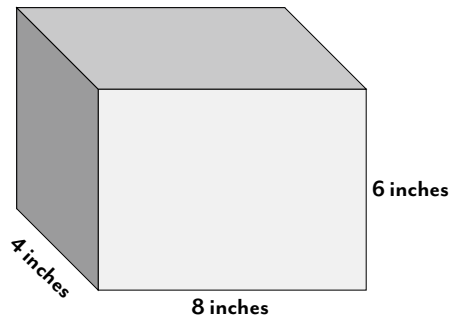
If you demolished your structure and built a new one using the same rectangular prisms, would the volume of your structure be different than the original volume? _____ Why or why not? _____

Name: _____ Partner's Name: _____

Activity Sheet 2: Independent Practice

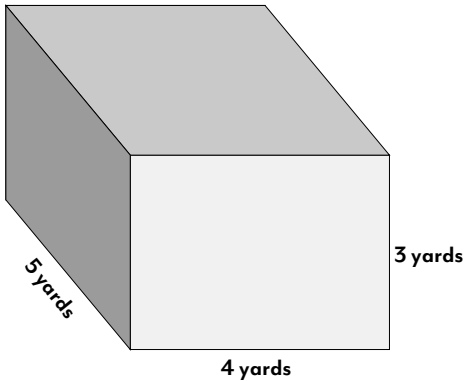
Directions: Find the volume of each rectangular prism.

Prism 1



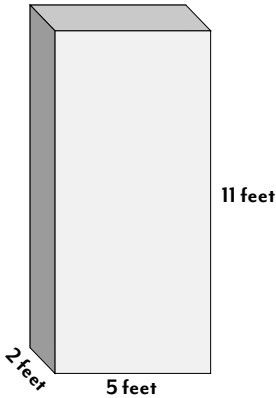
Volume _____

Prism 2



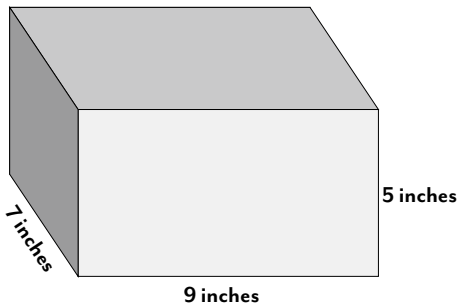
Volume _____

Prism 3



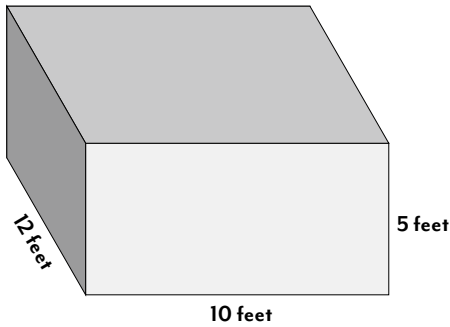
Volume _____

Prism 4



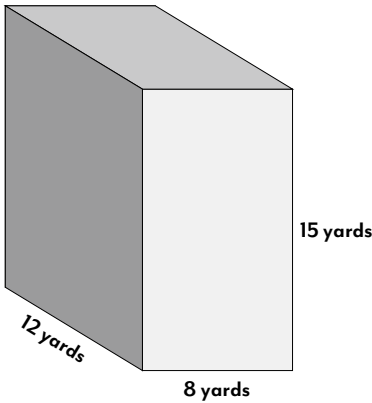
Volume _____

Prism 5



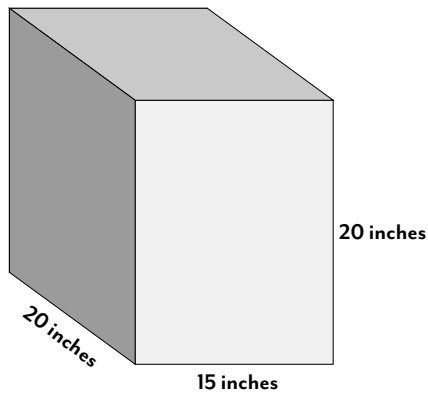
Volume _____

Prism 6



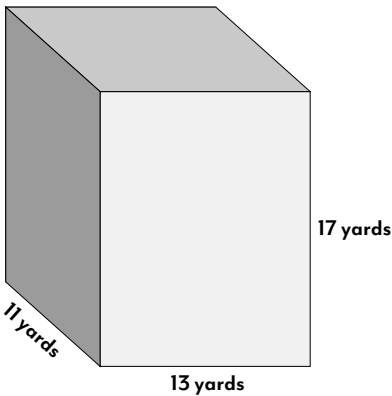
Volume _____

Prism 7



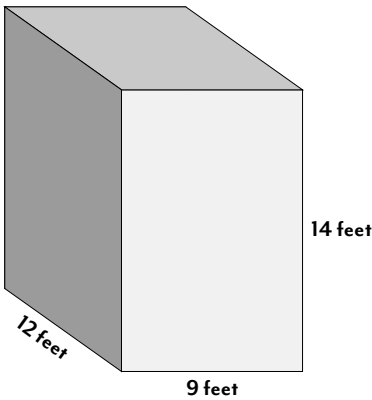
Volume _____

Prism 8



Volume _____

Prism 9



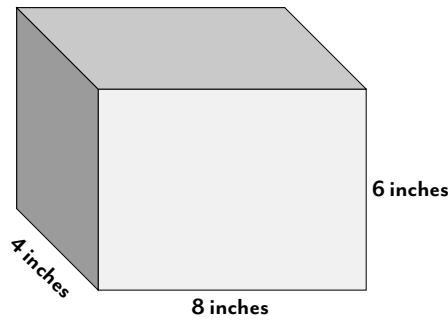
Volume _____

Name: _____ Partner's Name: _____

Activity Sheet 2: Independent Practice (Answer key)

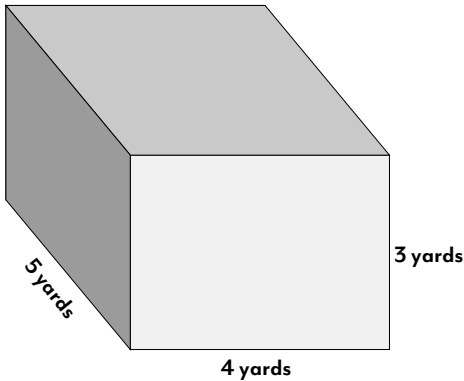
Directions: Find the volume of each rectangular prism.

Prism 1



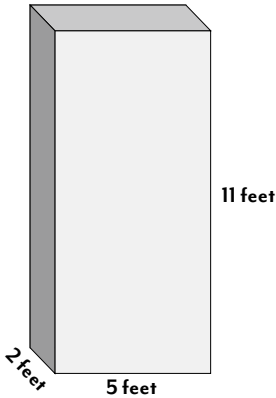
Volume 192 inches³

Prism 2



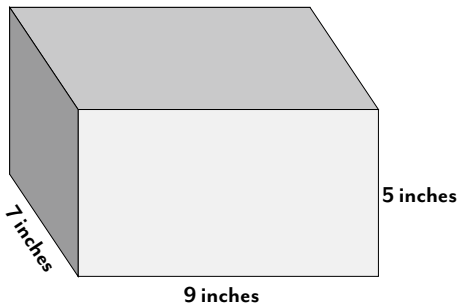
Volume 60 yards³

Prism 3



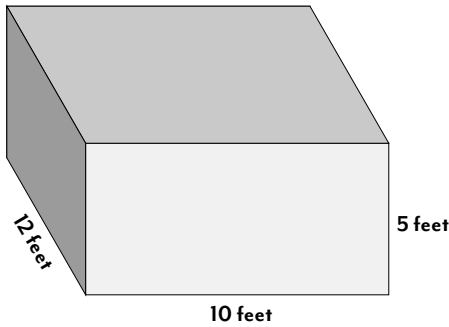
Volume 110 feet³

Prism 4



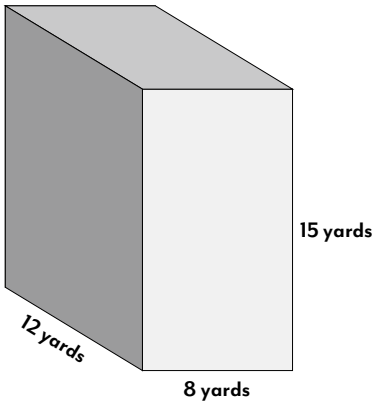
Volume 315 inches³

Prism 5



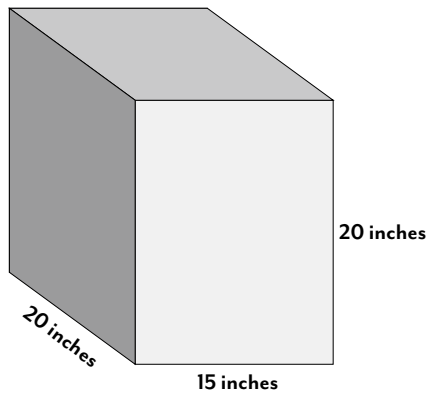
Volume 600 feet³

Prism 6



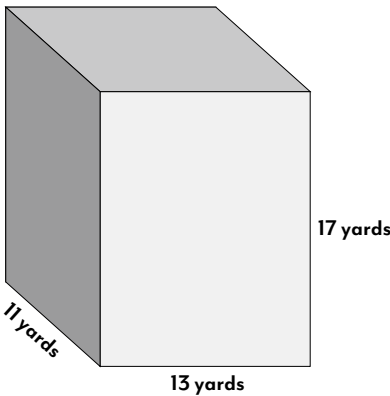
Volume 1,440 yards³

Prism 7



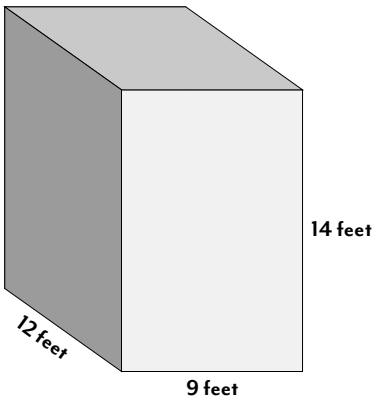
Volume 6,000 inches³

Prism 8



Volume 2,431 yards³

Prism 9



Volume 1,512 feet³