

Sample Grade 4 Unit—Volume/Capacity

Unit Introduction

In this unit, students:

- Explore, estimate, and measure volume and capacity.
- Use the formula for finding the volume of a rectangular prism.
- Calculate volume in centimeters, meters, inches, and yards.
- Calculate the volume of irregular shapes.
- Solve problems involving volume and capacity.
- Convert customary units of measure.
- Read metric measuring tools.
- Compare capacities within customary and metric systems.

Assessment

A unit test in multiple-choice format is provided on page Assessment • 4.

KWL



Use a KWL chart to activate prior knowledge and set learning goals as a class. A reproducible KWL chart is provided on page BLM • 23.

Games for Practice and Review

Use the MeasureWorks Game Board to reinforce learning. Game rules begin on page BLM • 30.

Have students keep the KWL chart in their math folders and add to it as they work through this unit.

Focus on Vocabulary

capacity (p. T-1)

conversion (p. T-10)

cubic centimeter (p. T-3)

cubic foot (p. T-3)

cubic inch (p. T-3)

cubic meter (p. T-3)

cubic unit (p. T-2)

cubic yard (p. T-3)

cup (p. T-9)

gallon (p. T-9)

liter (p. T-6)

milliliter (p. T-6)

pint (p. T-9)

quart (p. T-9)

rectangular prism (p. T-2)

volume (p. T-1)

Have students make a two-column chart in their math journals with the column heads *Volume* and *Capacity*. Under *Volume* write, *Volume can be measured using cubic ____*. Under *Capacity* write, *Capacity can be measured using ____*. Write the vocabulary words related to units of measure on index cards. Have students select a card one at a time and then write the word in the proper column in their math journals.

Heads Up!

When measuring the volume of rectangular prisms, students may have difficulty distinguishing length from width. Some students may find it more helpful to refer to side 1 and side 2 rather than to length and width.

When using graduated cylinders, be sure students understand that the unmarked lines have different meanings, depending on the capacity of the cylinder.

Book Nook

*Carrot Holes
and Frisbee
Trees*

by
N. M. Bodecker

1983: Atheneum

This amusing story about carrots and the holes they make will give students an opportunity to think about volume and capacity as they relate to real-life objects.

Sample Grade 4 Unit—Volume/Capacity

Pages	Learning Goals	Manipulatives			
		Graduated cylinders	Tape measures	PopCubes	Metersticks
T-1-1	Understand the difference between volume and capacity. Sort by volume and capacity.			✓	
T-2-2	Measure volume with PopCubes. Find the volume formula for rectangular prisms.			✓	
T-3-3	Calculate volume in cubic centimeters, meters, inches, and yards. Choose an appropriate unit of measure.		✓		✓
T-4-4	Estimate the volume of composite solids. Count PopCubes to find the volume of composite solids.			✓	
T-5-5	Make solids that have specific volumes. Understand that solids of different shapes can have the same volume.			✓	
T-6-6	Read metric measuring tools. Choose an appropriate tool.	✓			
T-7-7	Estimate capacity in metric units. Choose the tool that gives the most accurate measure.	✓			
T-8-8	Use problem-solving strategies to solve problems involving capacity. Compare metric capacities.	✓			
T-9-9	Measure capacity in customary units: cups, pints, quarts, and gallons. Choose an appropriate unit of measure.	✓			
T-10-10	Discover conversion factors for customary units.	✓			
T-11-11	Use formulas to convert units within the customary system. Compare capacities written in different units.				

Sample Grade 4 Unit—Volume/Capacity

Estimate Capacity in Metric Units

Planning Your Time		
Intro & Demo	Activity	Sum It Up
10 min	15 min	5 min
		

Objective

Estimate capacity in metric units. Choose the tool that gives the most accurate measure.

Materials

- Graduated cylinders
- Sets of containers labeled A–D, of different sizes, shapes, and capacities
- Pitchers of water
- Foil pans to catch spillage

Grouping

Whole class, then small groups

Open It Up

Display the graduated cylinders.

Say: I am a graduated cylinder. The number by my top is 250 milliliters. Which graduated cylinder am I? [the 250-mL cylinder]

Repeat for the other graduated cylinders. Guide students to see that each graduated cylinder is called by its topmost number.

Review how to read the markings on the cylinders.

Tell students to be sure they put the graduated cylinder on a flat surface and look at it at eye-level to read the measure accurately.

Demonstrate & Discuss

Pour 225 milliliters of water into the 500-mL graduated cylinder.

Have several volunteers state the measure. If the volunteers all give the same measure, point out that the measure could be rounded to a different measure. Discuss why. [The water is between two measurement marks; it does not fall exactly at a measurement mark.]

Ask: What must we do to get the most accurate measure? [Use a different graduated cylinder.] How will you decide which graduated cylinder to use? [I know the measurement is between 220 and 230, so I will use a graduated cylinder that lets me measure accurately between those two measures.] Guide students to see that they may have to use a different graduated cylinder to get the most accurate measurement.

Student Activity

Prepare ahead: Each small group will need a set of graduated cylinders, a pitcher of water, a foil pan, and four containers of different capacities labeled A–D. Students work in small groups. Each student selects a container, fills it with water, estimates its capacity in milliliters, and records the estimate. Students use their estimates to select a graduated cylinder and record its name. Students then pour the contents from the container into the graduated cylinder. If the measure is between two lines, students repeat the process with a different graduated cylinder. When they are satisfied that they have the most accurate measure, students read and record the measure, and then record the last cylinder they used.

Informal Assessment

As students work, notice whether their choice of cylinder is appropriate based on the estimate.

Ask: How did you decide which cylinder to use? [Sample: I think the container holds about 85 milliliters, so I need to select a cylinder that holds at least 85 milliliters and measures in 5s. The 250-mL cylinder could work for this measure.] / COMPREHENSION /

Sum It Up

Say: Today we estimated and measured capacity in metric units. We also learned how to get the most precise measure possible.

Ask: If you found that the 250-mL graduated cylinder wasn't accurate enough, which cylinder would you try next? Why? [Sample: I would try the 100-mL cylinder next.] / HYPOTHESIZE /

Bulletin Board Idea

Have students bring in labels from various products showing customary and metric measures for capacity. Post the labels on a bulletin board titled Proper Measuring Tools. Number each label.

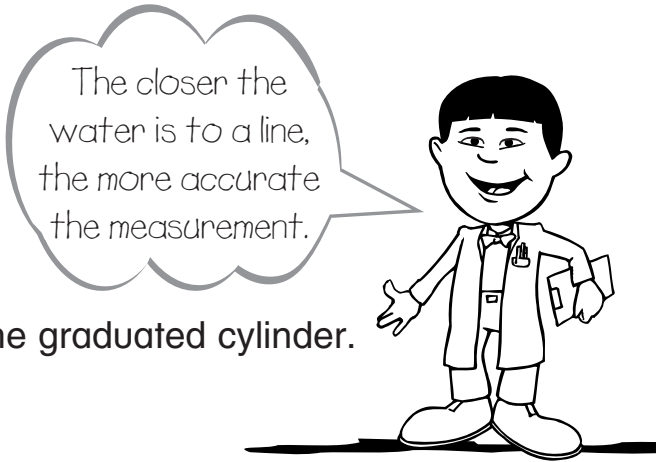
Display the customary measuring tools and metric cylinders near the bulletin board. Have students write the number of each label, and then next to the number have students identify the measuring tool they would use to show the exact measure written on the label.

Name _____

How Close Can You Get?

Try This

- Estimate the capacity of a container. Record.
- Record the name of the graduated cylinder you plan to use.
- Pour the water from the container into the graduated cylinder.
- Read and record the measure.
- If the water is between two lines, repeat with a different cylinder.
- Record the graduated cylinder that gave the most accurate measurement.



Container	Estimate	Cylinder selected first	Measure	Cylinder used for final measure
A	_____ mL	_____ mL	_____ mL	_____ mL
B	_____ mL	_____ mL	_____ mL	_____ mL
C	_____ mL	_____ mL	_____ mL	_____ mL
D	_____ mL	_____ mL	_____ mL	_____ mL

Put a ★ by the container with the greatest capacity.