Unit
13

MATHEMATICS IN THIS UNIT
Cubes, Volume, and Repeated Addition
Taken from the *Math Trailblazers* digital Teacher Guide

> "With well-designed activities, appropriate tools, and teachers' support, students can make and explore conjectures about geometry and can learn to reason carefully about geometric ideas from the earliest years of schooling. Geometry is more than definitions; it is about describing relationships and reasoning. The notion of building understanding in geometry across the grades, from informal to more formal thinking, is consistent with the thinking of theorists and researchers . . . ."
>
> From the National Council of Teachers of Mathematics, *Principles and Standards for School Mathematics,* 2000.

This unit's activities focus on developing spatial visualization, communication skills, and strategies for finding volume. Students find volume by counting the number of cubes that compose an object. They discover that different shapes can have the same volume. Concrete explorations with volume lay the foundation for later study.

This unit also provides students a context to explore partitioning larger numbers to add. Students find the volume of buildings, towers, and cubic animals by grouping, skip counting, and using repeated addition strategies. These repeated addition strategies not only lay the foundation for multiplication but also for mental math strategies for addition. Students who are proficient with partitioning numbers can more easily break numbers into manageable parts to facilitate mental arithmetic.

In the first lesson, students discover that a specific volume (8 cubic units) can result in a variety of shapes. Students use connecting cubes to make buildings that have a volume of 8 cubic units. Students also copy their classmates' cube model buildings. They organize the buildings by height, which is measured by the number of floors in each model. Students guide the teacher in making a group data table to display the information.

In the second lesson, students build cube models of classroom objects. They evaluate how closely each cube model reflects the size of the actual object. Students make decisions about whether the model is smaller than, larger than, or very close to the size of the real object.

In the third lesson, students work collaboratively to construct buildings based on three-dimensional drawings. They determine the volume of these buildings using counting strategies, such as grouping the cubes and skip counting.

In the fourth lesson, students build on their strategies for determining volume by grouping and skip counting. They write number sentences to show repeated addition. They read *A World of Cubic Animals* in the *Adventure Book* story. In this story, Manuel dreams that the animals in his life have changed into animals made of cubes. Students use the drawings in the book to re-create the cubic animals and compare the volumes.

Tell time with digital clocks. Digital clocks are introduced after students have a basic understanding of the units used to measure time using an analog clock to tell time to the hour and half hour. Digital clocks allow students to read times easily; however, the digital format does not represent the size or relationship between the units (e.g., hours, minutes) of time. For example, in order for a student to understand the 6:30 on a digital clock means that it is half way between 6 o'clock and 7 o'clock, he or she must first know that there are 60 minutes in an hour and that 30 minutes is half of 60 minutes. The analog clock provides a visual representation of the units of time; for example, when it is 30 minutes after the hour the minute hand has moved halfway around the clock and the hour hand has moved halfway between the hours of 6 and 7 on the clock face.

Math Facts and Mental Math

Addition Facts with Sums to Ten. In this unit students continue to systematically review the addition facts. Daily Practice and Problem items in this unit can be used to assess students' fluency with the addition facts in Group B (3 + 0, 4 + 0, 4 + 1, 5 + 1, 6 + 1, 5 + 2, 6 + 2, 5 + 3, 7 + 1, 8 + 1.) Students should be able to easily use counting strategies to solve these facts.

Fact Families for Addition Facts. Students have been connecting addition to subtraction and using the addition facts to solve subtraction problems since Unit 6. A student proficient with the addition facts can also find the related subtraction facts. Daily Practice and Problem items in this unit can be used to assess students' abilities to name the fact families related to each fact with a sum to ten in Group B.

Resources

- Carpenter, T.P., M.L. Franke, and L. Levi. *Thinking Mathematically: Integrating Arithmetic & Algebra in Elementary School.* Heinemann, Portsmouth, NH, 2003.

- Carpenter, T.P., and J.M. Moser. "The Acquisition of Addition and Subtraction Concepts in Grades One through Three." In *Journal for Research in Mathematics Education,* 15 (3). National Council of Teachers of Mathematics, Reston, VA, 1984.

- Council of Chief State School Officers. *Common Core State Standards for Mathematics,* 2010.

- *Principles and Standards for School Mathematics,* National Council of Teachers of Mathematics. Reston, VA, 2000.

- Worth, Joan. "Developing Problem-Solving Abilities and Attitudes." In *Mathematics for the Young Child,* J.N. Payne (Ed.). National Council of Teachers of Mathematics, Reston, VA, 1990.