



Building a System of Tens Session 2

The base-ten structure of numbers

Overview

Agenda		
Main idea of Session 2 Sharing exit-card comments	Whole group	10 minutes
Discussion: Norms for learning	Whole group	20 minutes
Math activity: Multiplying by 10	Small groups Whole group	25 minutes 20 minutes
Video: Session 2	Whole group	25 minutes
Break		15 minutes
Case discussion: Chapter 2	Small groups Whole group	30 minutes 25 minutes
Homework and exit cards	Whole group	10 minutes

Mathematical themes

- The value of a number is determined by multiplying the value of each digit by the value of the place that it occupies and then summing. For all whole numbers, the value of the place farthest to the right is one; the value of all other places is ten times the value of the place to its right.
- A study of the result of multiplying any number by 10 reveals aspects of the base-ten structure of the number system.

- Examining the different ways in which number lines can be used to represent numbers highlights the relative magnitude of powers of ten.
- As students work to learn the number system, their errors highlight the mathematics that underlie the system; for example, we say *one hundred ninety-five*, but we write 195, not 100905.

Connections to the Common Core State Standards for Mathematics

Standards for Mathematical Practice

Practice 3 Construct viable arguments and critique the reasoning of others.

Practice 7 Look for and make use of structure.

Standards for Mathematical Content

Kindergarten: Number and operations in base ten

K.NBT.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (e.g., $18 = 10 + 8$); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Grade 1: Number and operations in base ten

1.NBT. 2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

- 10 can be thought of as a bundle of ten ones — called a “ten.”
- The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
- The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

Grade 2: Number and operations in base ten

2.NBT.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

- 100 can be thought of as a bundle of ten tens — called a “hundred.”
- The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

Grade 3: Number and operations in base ten

3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80 , 5×60) using strategies based on place value and properties of operations.

Grade 4: Number and operations in base ten

4.NBT.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that $700 \div 70 = 10$ by applying concepts of place value and division.

Grade 5: Number and operations in base ten

5.NBT.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

5.NBT.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.