LESSON 1·3

Tenths and Hundredths

Can you imagine unpacking to make smaller and smaller blocks?

Students unpack a block-of-1000 down to the single blocks. They observe that there are always 10 smaller blocks inside each block. They use this pattern to predict the name, number, and size of the blocks for tenths and for hundredths. The decimal point is introduced as a way to distinguish a whole number from the parts and to identify the "unit." Students read, write, and represent decimal numbers.

Objectives

- To represent decimal numbers using blocks on place value mats
- To read and write decimal numbers
- To observe, describe, and extend patterns

Materials

- 1 block-of-1000 (packed)
- 1 *Imagining Smaller Blocks* activity sheet **per student**

Each group will need:

- 10 blocks of each size (10, 1, 0.1, 0.01)
- 1 or 2 blocks-of-100
- 1 decimal mat

- transparency of the decimal mat (p. A3) (optional)
- 1 *Tenths and Hundredths* activity sheet **per student**

◆ Class Introduction 20 MIN.

- Ask students to think about the following word problems.

There are 5 students in Group A. They have one large candy bar to share equally. What part of the candy bar does each student get? *(1/5 of a candy bar)*

There are 2 students in Group B. They also have one large candy bar to share equally. What part of the candy bar does each student get? *(1/2 of a candy bar)*

Write these fractions on the board (1/5 and 1/2). Discuss how fractions work perfectly fine for describing these quantities. Now ask students to think about comparing and adding these fractions.

Which students get a larger portion of the candy bar? Students in Group A or Group B? *(Group B, because 1/2 > 1/5)* **How much more?** *(Write the answer as the expression, 1/2 - 1/5.)*

If one student is lucky enough to be in both Group A and Group B, how much does this student get? *(Write the answer as the expression, 1/2 + 1/5.)*

Discuss how these problems can be solved with fractions, but that the rules for adding and subtracting fractions are different than for whole numbers. Adding and subtracting using our base ten number system is quite simple.

Is there a way with our base-ten number system (that is one digit for each place, using the pattern of 10s), to describe these pieces smaller than 1?

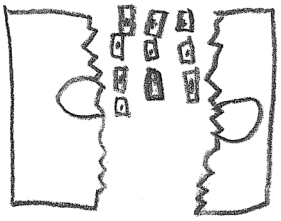
- As a class, consider the block-of-1000. Ask,

What do you expect to see inside? *(Ten smaller blocks; 10 blocks-of-100, 1000 single blocks)*

Open the block-of-1000 and ask students to consider the next smaller block, the block-of-100, and then the next smaller block, the block-of-10. Each time, ask students what they would expect to see inside. Elicit the response that there are always 10 smaller blocks inside.

Continue the progression all the way down to the single blocks. *Do not show the decimal blocks yet.

"Inside a single" (Student Work)



I think that there are ten smaller digis because it should keep on going forever.

- Hold up a single block. Ask,

Can you imagine unpacking a single block? What would you expect to see inside?

Distribute the *Imagining Smaller Blocks* activity sheet. Have students respond to the question in the answer space for #1 *(see figure)*.

Have students share their predictions and drawings for the next smaller block. Elicit the idea that there would be 10 smaller blocks inside a single block if the pattern for the blocks were to continue. Ask,

What do you think we would call this new block? *(One tenth because the single block has been divided into ten equal parts.)*

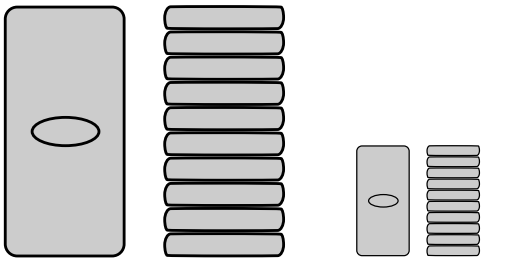
(Note: Because the single block is quite small, it is impractical to manufacture it so that the 10 smaller blocks would fit inside. Students can imagine unpacking the single block and finding these 10 smaller blocks inside.)

Now hold up a sample of the tenth blocks for students to see or show on the overhead and then distribute some to each group. Have students compare their drawings to the actual size of the block. Ask,

Can you prove to me that these little blocks are really tenths?

How many tenth blocks do we need to put together to make a single block? *(10)*

Let students consider ways to show that the tenth blocks are the correct size. The most obvious way is to line up 10 tenth blocks next to a single block to see if they are the same size *(see figure)*.



1 = 10 tenths

0.1 = 10 hundredths

Reiterate the name of these smaller blocks: **tenth blocks**.

- Hold up the tenth block. Ask,

Can you imagine unpacking a tenth block? What would you find inside? *(10 smaller blocks)*

Have students respond to the question and make a drawing in the answer space for #2 on the activity sheet.

Have students share their predictions and drawings for the next smaller block. Elicit the idea that again there would be 10 smaller blocks inside if the pattern for the blocks were to continue. Ask,

What do you think we would call this smaller block? *(One hundredth. If the name hundredth is not obvious to students, discuss how 100 of them put together are the size of one single block.)*

Distribute the hundredth blocks and allow students to compare their drawings to the actual blocks. Ask,

How many hundredth blocks do we need to put together to make a tenth block? *(10)* **How many hundredth blocks do we need to put together to make a single block?** *(100)*

- Explain how in English we add -th to the names of these decimal blocks: 1 whole broken into 10 pieces equals tenths; 1 whole broken into 100 pieces equals hundredths.

◆ Group Activity 20 MIN.

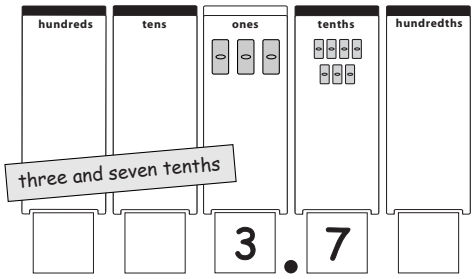
- Distribute a decimal mat to each group. Tell students that they are going to practice modeling decimal numbers.

  Have students put 3 single blocks and 7 tenth blocks on their mat and write the digits on the bottom of each column *(see figure)*. Have students explain how this number is more than 3 but less than 4, or **between 3 and 4.**

  Next, ask students how to read the number.

We can't simply read the number as it is written or we might think it says "thirty-seven." We need a way to tell which blocks are the ones.

Explain the placement of the decimal point and how it signifies which blocks are the ones. Read the number as **three and seven tenths**. Explain that the word "and" indicates the decimal point.



The decimal point separates the whole portion of the number from the fractional portion. We put a decimal point to the right of the digits that represent the ones.

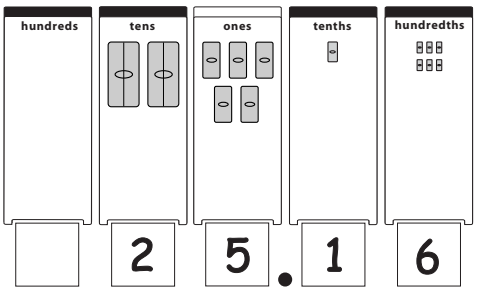
(Note on the location of the decimal point: Although it seems that the center of the place value system is at the decimal point, it is really at the ones place. Everything is symmetrical around the ones place: tens and tenths, hundreds and hundredths, and so on. If the decimal point were over the ones place instead of to the side of it, it would do a much better job of communicating the symmetry of the place value system. Instead, the convention is to place the point to the right showing the demarcation between whole numbers and fractional parts.)

Ask students to read the number, 3.7, as **3 and 7 tenths.**

- Discuss how to read and write decimal numbers in the hundredths. For example, have students model 25.16 with blocks and read, **twenty-five and sixteen hundredths** *(see figure)*.

To make this method of reading a decimal number clearer, students can imagine unpacking all the decimal blocks to the smallest place. For example, instead of saying "1 tenth and 6 hundredths" for 0.16, the convention is to say "16 hundredths" because we use "and" after the whole number.

- Distribute the *Tenths and Hundredths* activity sheet for students to complete with their groups.



"Twenty-five and sixteen hundredths"

Some students may start by taking 16 hundredth blocks. They must visualize packing the blocks to make 1 tenth block and 6 hundredth blocks in order to write the digits for the number.

◆ Closure 20 MIN.

- Discuss problems from the activity sheet as needed. Review how to read, write, and model decimal numbers.
- Revisit the original story problems with the fractional answers, 1/5 and 1/2. Begin by considering a single block as the candy bar in each problem. Ask,

How can we divide up the single block into smaller pieces? *(Trade it for 10 tenth blocks.)*

So how much should each of the 5 students get? *(Make 5 equal groups out of the 10 tenths, so each student gets 2 tenths: 0.2)*

So how much should each of the 2 students get? *(Make 2 equal groups out of the 10 tenths, so each student gets 5 tenths: 0.5)*

Explain how now we can easily compare, add, and subtract to find the answers to our original question. Write the problems on the board and have students model them with blocks.

1/2 - 1/5 → 0.5 - 0.2 = 0.3
1/2 + 1/5 → 0.5 + 0.2 = 0.7

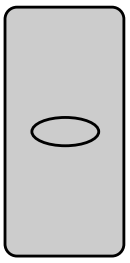
- Have studenets share real-world examples of decimal numbers and why they are needed (e.g., money, measurements, etc.) If there is time, they can look through newspapers and magazines for examples.

◆ Assessment

- Do students recognize a pattern in the way the blocks unpack?
- Do students make reasonable predictions about the sizes and names of the decimal blocks?
- Do students correctly model, read, and write decimal numbers?

Name

Imagining Smaller Blocks



1. Imagine unpacking a single block. Draw what you think would be inside.

Why do you think this?

2. Imagine unpacking a tenth block. Draw what you think would be inside.

Why do you think this?

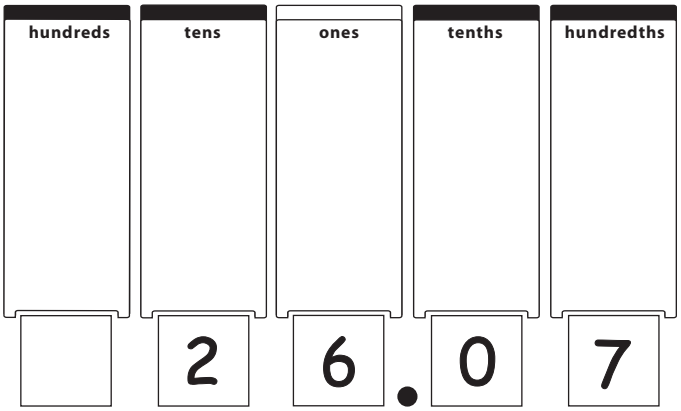
Name

Tenths and Hundredths

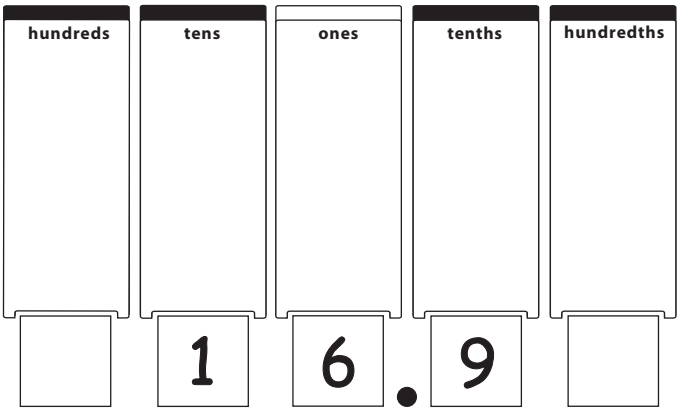
1. Use blocks to model these numbers on your mat:

   3.24 18.9 0.07 1.39 42.5

2. Draw the blocks for this number.



3. Draw the blocks for this number.



4. Fill in the blank spaces with the number or the number word.

	Number:	Number Word:
example:	*3.67*	*three and sixty-seven hundredths*
	2.5	_____
	_____	fourteen and six tenths
	62.01	_____