LESSON 5·1

Multiply with Tenths and Hundredths

Does multiplication with decimals work the same way as it does with whole numbers?

Students model multiplication problems where one of the factors is a decimal number. They explore the meaning of problems where the number of groups is not a whole number. Students model a series of problems and record their answers with numbers and drawings.

Objectives

- To become familiar with multiplying using the block models for tenths and hundredths
- To understand the concept of multiplying by a number less than 1 (fewer than 1 group of something)
- To use the commutative property to solve problems in the easiest way

Materials

Each group will need:

- 1 decimal mat
- tenth and hundredth blocks
- 1 *Mulitplicity* activity sheet **per student**

◆ Class Introduction 20 MIN.

- Write the following multiplication problem on the board:

$$4 \times 0.2$$

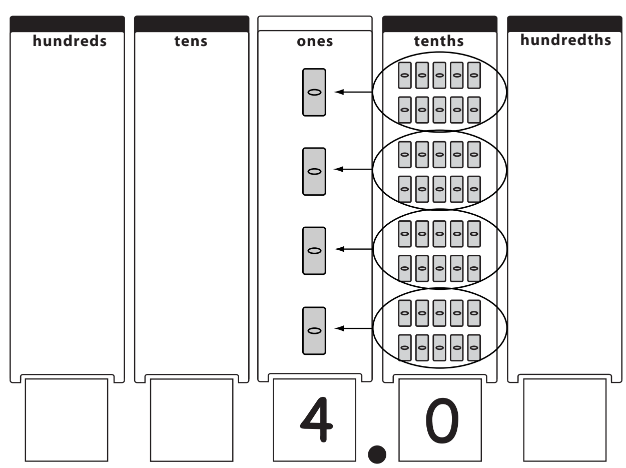
What does this mean? *(Four groups of two tenths)*

Have students model the 4 groups of 0.2 on their mats. Then have them combine the blocks and write the digits for the product at the bottom of the mat.

- Give the students another problem,

$$8 \times 0.5$$

Again, have them model the 8 groups first, then push the blocks together and write the digits for the product.



What is the answer? *(4 or 4.0)* **What did you have to do before you could write the digits this time?** *(We had to visualize packing the tenth blocks. We had 40 tenths, and those would pack to become 4 single blocks.)*

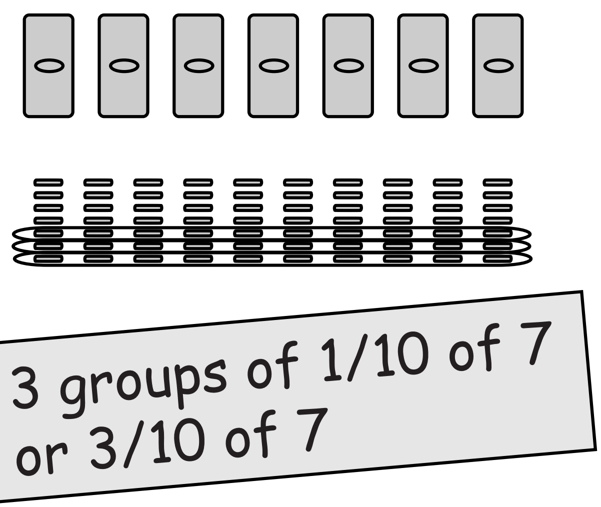
- Now give the problem,

0.3 × 7

What does this mean? *(0.3 groups of 7)*

Hmm… I know how to build 1 group of 7, but what does it mean to think about less than 1 group of 7?

Another way to think about this is 3/10 of a group of 7. So if we make a group of 7, find one tenth of it then take 3 of those, we should have the answer.



Have students model 7 blocks, then visualize unpacking those to reveal tenths. Students exchange the 7 single blocks for 70 tenth blocks.

Show students how they can now think of each row of tenth blocks as 1/10 of the entire group. They can find the solution by taking 3/10 of the group. That is 21 tenth blocks or 2.1.

For a different approach, remind students of the commutative property.

Can we also model this as 7 × 0.3? *(Yes)* **Why? Is that model easier to build** *(Yes, using the commutative property, we will get 21 tenth blocks or 2.1)*

- Let the students practice on more examples if necessary. Suggestions include:

$0.4 \times 6 = 2.4$

$9 \times 0.03 = 0.27$

$6 \times 3.25 = 19.50$

$12 \times 0.74 = 8.88$

◆ Group Activity 35 MIN.

- Pass out the activity sheet. Students will work in pairs or small groups to model each problem with blocks and write the solutions. Students will pick one problem to draw what they did. Drawings should show the groups of blocks they built as well as the regrouping they did to reach the final answer.

  In some of the problems, students will need to use the commutative property of multiplication to allow them to model the problems with blocks. For example, 0.05×9 implies 0.005 is the number of groups. Since they cannot model this with blocks, students should model the reverse problem of 9×0.05

- While students are working, encourage them to predict the outcome of the problems.

What do you think the answer will be?

Will you have to pack blocks to find the solution?

What single digit fact can you use to help you predict the answer?

Also encourage them to think about the concept of multiplying by numbers smaller than 1—this is not an easy idea to grasp.

What does that problem mean? How can you solve it?

◆ Closure 10 MIN.

- Review students' answers for the activity sheet. Copy the first 6 problems on the board and discuss patterns with the class:

$$2 \times 0.6 = 1.2$$
$$7 \times 0.3 = 2.1$$
$$0.05 \times 9 = 0.045$$
$$4 \times 0.12 = 0.48$$
$$0.9 \times 3 = 2.7$$
$$8 \times 0.08 = 0.64$$

For each example, ask students to name the related whole-number multiplication fact they could use to help solve it. (Example: for 2×0.6, the related fact used is $2 \times 6 = 12$.)

Help students notice that in every case, the digits in the answer match a familiar fact, but the digits have been shifted. Students will explore this shift further in the next two lessons.

◆ Assessment

- Are students able to model the problems with tenth and hundredth blocks?
- Do students visualize packing blocks when they need to regroup decimal blocks, trading the 10 blocks that would be packed for 1 block the next size larger?
- Do students have at least one mental image for what it means to multiply by a number less than one? (For instance, building less than one group or taking a fraction of a group.)
- Do students use the commutative property when necessary to enable them to model the problems?
- Do students understand they can trade 10 blocks for 1 larger block? Do they see it as the same as packing?

Name

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Multiplicity

Use blocks to solve each problem.
At the bottom, pick one of the problems and draw what your block solution looked like.

1. $2 \times 0.6 =$

2. $4 \times 0.12 =$

3. $7 \times 0.3 =$

4. $0.9 \times 3 =$

5. $0.05 \times 9 =$

6. $8 \times 0.08 =$

7. Chef Jones purchased 3 cans of tomato paste. Each can holds 6.8 ounces. How many ounces did the chef buy?

8. Marie found $1.32 at the bottom of her purse. When she opened her wallet in order to put this money away, she said, "I already have 5 times this amount in my wallet." How much did Marie have in her wallet already?

9. There are 4 members of the Archimedes Middle School cross-country relay team. Each member of the team runs 3.6 miles to complete his or her portion of the race. How long is the race?

10. Jose wants to build a bookcase. Each shelf should measure 3.4 meters. If he wants 5 shelves, how many meters of wood should he purchase just for the shelves?

Here is a drawing of my solution to problem number ________: