Scaffolding/Constructing Task: Base Ten Activity

This task was adapted from the following website http://argyll.epsb.ca/jreed/math7/strand1/1201.htm

In this task, students will create rectangular arrays as a representation of multiplication and division of decimals.

STANDARDS FOR MATHEMATICAL CONTENT

Perform operations with multi-digit whole numbers and with decimals to the hundredths.

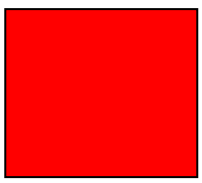
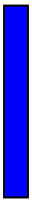
MCC5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

STANDARDS FOR MATHEMATICAL PRACTICE

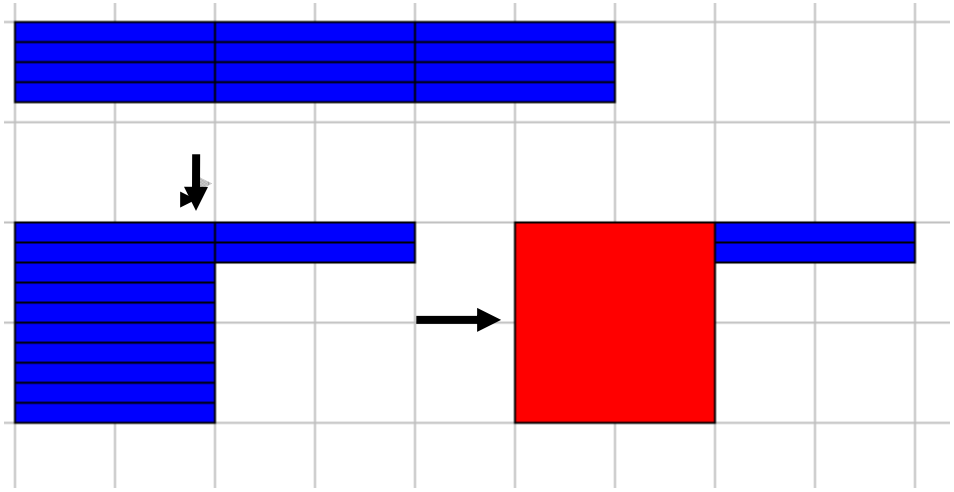
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

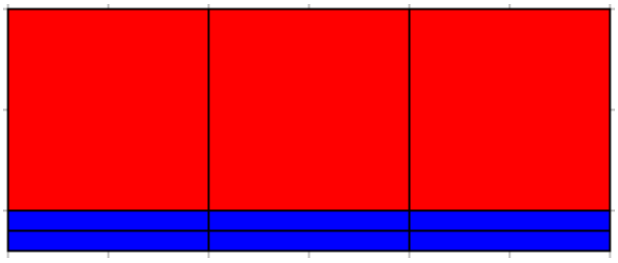
This activity will also allow you to work with decimal numbers by using the place value representation provided. In this case, the red block (flat) represents 1 square unit, the blue (long) represents one tenth of the square unit or 0.1 square units, and the green (unit) represents one hundredth or 0.01 square units. You can use this system to introduce decimal numbers and the place value with decimal numbers. Also, students can explore addition and subtraction of decimals using base-ten blocks in a manner similar to adding and subtracting whole numbers using base ten blocks.

Decimal Block Values		
1 (flat)	0.1 (long)	0.01 (unit)
		

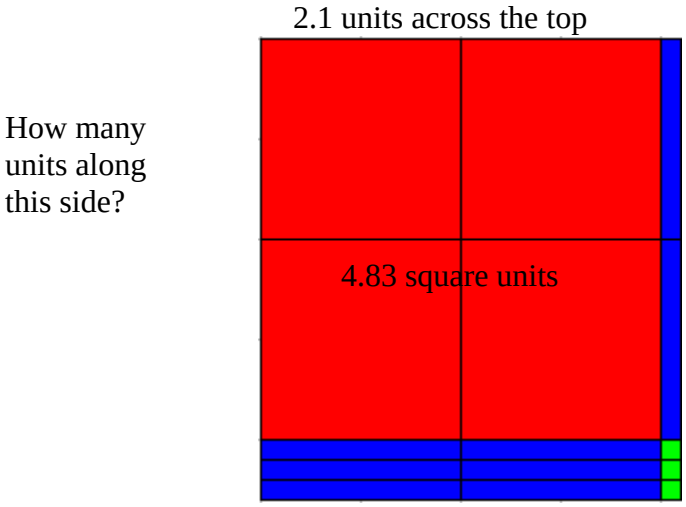
In addition to the example shown below, you can do multiplication as repeated addition. For example, to multiply 3 x 0.4 you pull out 3 sets of 0.4, represented by 3 sets of 4 longs. Arrange them in a 3 by 0.4 array as shown below. There are a total of 12 longs. 10 longs can be traded for a flat, with 2 longs left over. Or you can think of 12 tenths as being one whole and 2 tenths, therefore, 3 x 0.04 = 1.2.



Division can be represented by using the dividend as the total area and arranging the blocks in groups according to the divisor. The number of groups created is the quotient. For the fifth problem, 3.6 ÷ 1.2, ask the students how many groups of 1 flat and 2 longs can be made with a group of 3 flats and 6 longs.

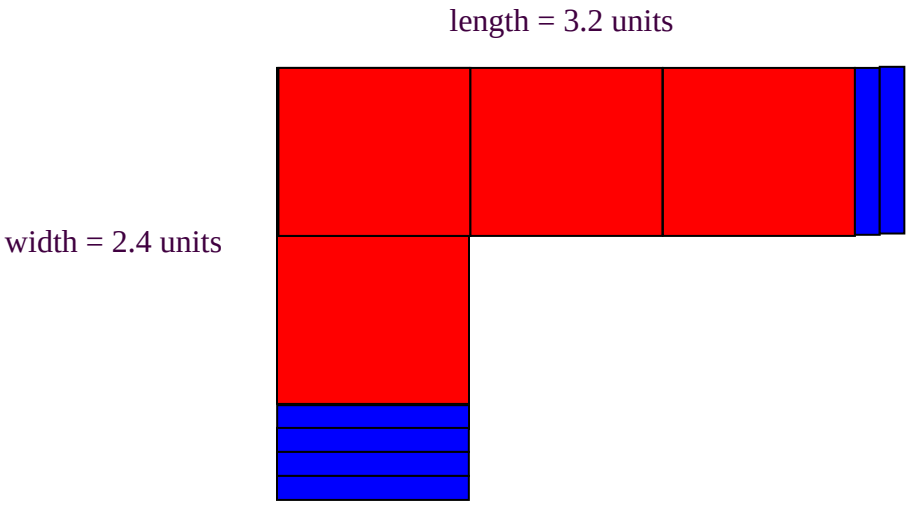


In the example below (4.83 ÷ 2.1), we are dividing a total of 4.83 blocks into equal groups of 2.1. The quotient or number of groups is 2.3. One dimension of this array is the divisor, or 2.1 given in the problem. The other dimension is 2.3 which is the quotient.

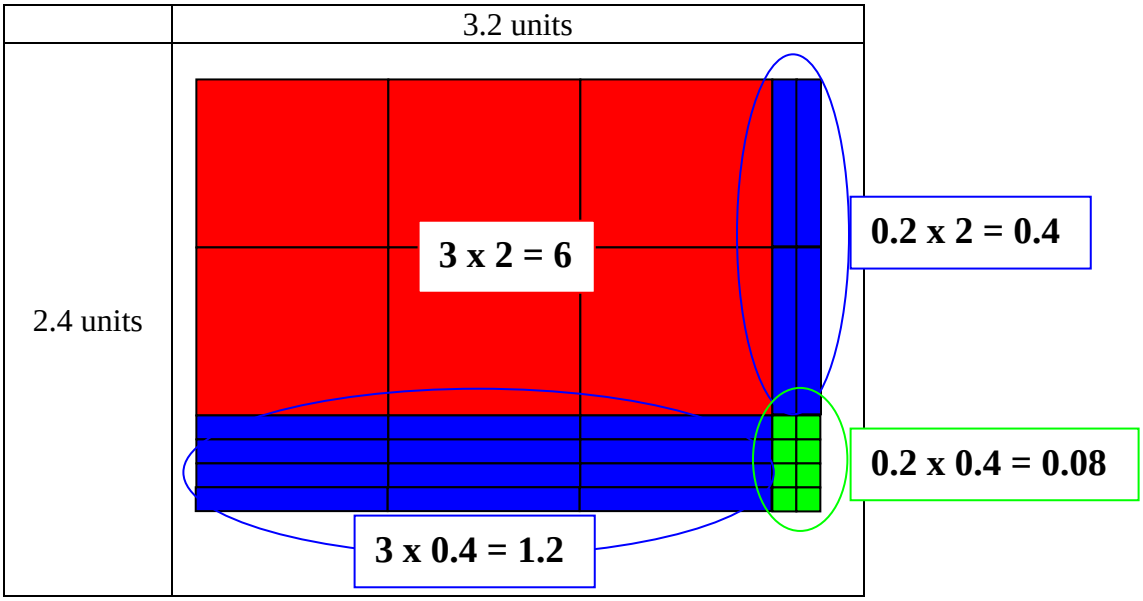


Example:

To illustrate the product of 3.2 x 2.4 you will need to combine blocks in a rectangular array. Start with the length and the width.



Then complete the rectangle.



Area = 3.2 x 2.4 = (3 x 2) + (3 x 0.4) + (0.2 x 2) + (0.2 x 0.4) = 6 + 1.2 + 0.4 + 0.08 = 7.68
Therefore, **3.2 units x 2.4 units = 7.68 units^2** as shown above.

TASK:

Students will follow the directions below from the "Base 10 Activity" Recording Sheet.

Your task is to use the base-ten blocks to represent multiplication and division with decimals. Use the decimal block values below to help you find the product or quotient of each decimal problem.

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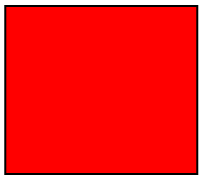	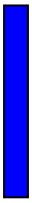	

1. 4.8 times 3
2. 2.1 x 5.4
3. 0.6 x 1.9
4. 12 ÷ 0.3
5. 3.6 divided by 1.2

COMMON MISCONCEPTIONS

- *Multiplication can increase or decrease a number*. From previous work with computing whole numbers, students understand that the product of multiplication is greater than the factors. However, multiplication can have a reducing effect when multiplying a positive number by a decimal less than one or multiplying two decimal numbers together. We need to put the term *multiplying* into a context with which we can identify and which will then make the situation meaningful. Also using the terms *times* and *groups of* interchangeably can assist with the contextual understanding.

ESSENTIAL QUESTIONS

- How are multiplication and division related?
- What happens when we multiply a decimal by a decimal?
- What happens when we divide a decimal by a decimal?
- How can we use models to demonstrate decimal values?
- How can we use models to demonstrate multiplication and division of decimals?

MATERIALS

- Base-ten recording sheet
- Base-ten blocks (or virtual base-ten blocks)
- Grid paper (or plain paper) to record work
- Colored pencils, crayons, or markers

GROUPING

Small group/Partner task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION:

Comments: When making rectangles to represent decimal multiplication, you are actually using the length and the width of each block to represent the factors. Therefore, a flat is actually 1 unit by 1 unit, a long is 1 unit by 0.1 unit, and a unit block is 0.1 unit by 0.1 unit. (area model)

FORMATIVE ASSESSMENT QUESTIONS

- If the flat is 1 unit, what does a long represent? What does a unit block represent?
- How many groups do you need to represent? How many do you have in all?
- How can you create an array using the dividend? How do you represent the divisor in the array? Where is the quotient represented?

DIFFERENTIATION

Extension

- Have students create their own practice problems with solutions and then switch them with a partner. Have the partner work the problems using the base-ten blocks. When finished, students can compare solutions.

Intervention

- Have students work with a partner or with a teacher in small groups to help develop these concepts. Scaffold student understanding by initially providing arrays for students to use to find the product or quotient. Then provide a partially completed array or the outline of an array. Slowly remove scaffolding as students become more independent with finding a product or quotient using the base ten blocks.

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Name _____ Date _____

Base Ten Activity

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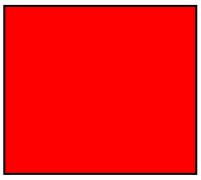	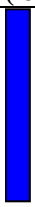	

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