Multiplication Representations

Strand: Computation and Estimation

Topic: Representing multiplication facts
Creating and solving multiplication problems with two whole numbers

Primary SOL: 3.4 The student will
a) represent multiplication and division through 10 x 10, using a variety of approaches and models

Related SOL: 3.17

Materials

- Area with Colored Squares Recording Sheet (attached)
- Product Cards (attached)
- Colored tiles or construction paper squares (at least 72 per student)
- Grid paper with squares that are the same size as the tiles or paper squares (optional)
- Paper bag

Vocabulary

area, equation, fact sentences, factor, inverse relationship, multiplication, multiply, number sentence, partial product, product, related fact

Student/Teacher Actions – What should students be doing? What should teachers be doing?

Note: There are various models for representing multiplication. This lesson only focuses on arrays.

1. Group students into pairs, and give each pair a set of at least 72 colored tiles or paper squares.
2. Explain that students will work in pairs to create area models in order to find multiplication facts related to a product (answer to a multiplication problem).
3. Ask students to build a rectangle using 10 tiles. Students may build a 1 by 10, 10 by 1, 2 by 5, or 5 by 2 rectangle. Ask, *"How did you build a rectangle with 10 tiles?"* Have students share what they built. Model how you can record their responses on graph paper with a document camera or use large graph paper. Under each rectangle, record the number sentence that matches the array.
4. Ask, *"Why is it possible to build more than one rectangle with 10 tiles?"* Have students share their thinking. This is a good time to introduce the term *factor*. Share with students that the number of rows is one factor, the number of columns is another factor, and the total number of tiles is our product.
5. Bring students back to the different types of rectangles they built. Focus on one of the rectangles (example, 2 x 5), ask student to turn their array the other direction (turn it so it models 5 x 2). Ask students the following questions:
    - Did the product change?

- Did the number sentence for the array change?
- What do you notice about the order of the factors in your new equation?

At this time, establish a definition for the commutative property of multiplication.

6. You may need to do one more class example to reinforce vocabulary and to reinforce that more than one array can be built with each product. If students are showing understanding, move on to partner practice.
7. Explain to students that they will work with their partner and draw a "Product Card" out of a paper bag and then place that number of tiles on their desk to create a square or rectangle as an area model. Direct students to record the number of rows and the number of columns of their area models on their recording sheets under the appropriate headings. Have each pair complete the multiplication fact for their area model. Finally, have each student draw on a separate sheet of grid paper the area model he/she helped to create using the tiles, and write the multiplication fact on the drawn model. Have them also draw the area model that will show the commutative property of the original rectangle they built. Walk around the room to check for student understanding and address misconceptions as you see them.
8. Have each pair repeat step 3 several times in order to gain experience representing multiplication, using area models.

Assessment

- **Questions**
  - What could the area model look like for a product of 12?
  - Is there more than one way to build a model for a product of 12?
  - What array would represent the commutative property of multiplication for 5 x 3?
- **Journal/writing prompts**
  - Explain why it is helpful to use an area model when solving a multiplication problem.
  - Explain how using an area model can be related to the commutative property of multiplication.
- **Other Assessments (include informal assessment ideas)**
  - Have students match multiplication and division facts with their corresponding array or on a number line printed on index cards.
  - Provide students with a set of multiplication and division problems, and allow them to model each problem, using an array or a number line.

Extensions and Connections (for all students)

- Have students use number lines to represent addition and subtraction facts.
- Help students make connects between the array and number-line model to the other strategies for multiplying and dividing. Can students see how repeated addition makes a nice connection to the array, number line, and /or set model? Do students see the

connection between repeated subtraction and how it relates to division using arrays, number line, and/or set model?

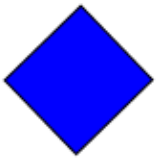
Strategies for Differentiation

- Create smaller numbers with the product cards.
- Discuss how the array model is like or different from the number line, repeated addition, or set model.
- Provide students with large grid paper to build arrays. It will be easier for them to turn the array and see the commutative property.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Area with Colored Squares Recording Sheet





Name: _____ **Date:** _____

Number of rows (factor)	Number of columns (factor)	Number of tiles all together (number on the Product Card)	My Multiplication Fact

Product Cards

Copy on card stock, and cut apart on the dotted lines.

24	**12**	**18**
15	**21**	**8**
42	**10**	**63**
25	**64**	**72**