Reverse and Compare

Grade 3

Activity #327

Relevant Chapters in the *Digi-Block Comprehensive Teacher's Guide:*

Book III, 3-1: Developing Meaning for Multiplication, pages 75-79
Book III, 3-2: Combining Equal Groups of Single Blocks, pages 80-83

Overview

Students use blocks to explore the commutative property of multiplication.

Objectives

Thinking Skills: Students reverse the order of the factors in multiplication problems in order to compare the two models. They discover that changing the order of the factors does not matter when modeling multiplication. Yet, changing the order can make the multiplication easier.

Mastery Skills: Students learn to reverse the order of the factors if the computation is more efficient.

Materials

Each small group of students needs:

- 1 block-of-100 (Students can unpack to get the blocks they need..)
- Access to two number lines
- Blank paper

Class Introduction **(10-15 minutes)**

Begin the lesson by writing and defining a multiplication problem.

* Write the following problem on the board: **5 x 8**.
* Define the problem as **5 groups of 8**. Explain that the first number tells the number of groups and the second number tells how many in each group. Emphasize that in multiplication the groups must be of equal size.
* Have a student volunteer model 5 groups of 8. (Note: Some students find it helpful to organize the blocks in holders.)
* Ask, **How can you find the total number of blocks?** As a class identify several ways; students can simply count all the blocks, they can count by eights, or they can pack them.
* Put the blocks on a number line and offset each of the five groups of eight to model how to skip count by 8s.
* Ask students to consider how to write an addition sentence for what they just did. Write: **8 + 8 + 8 + 8 + 8 = 40**.

Have students model the reverse of the problem by changing the order of the factors.

* Have students to look at the problem again and ask, **What if I can't remember which number tells me how many groups and which number tells me how many to put in each group? What if I model 8 groups of 5?**
* Ask how to write the number sentence for 8 groups of 5 and write: **8 x 5**.
* Have a student volunteer model **8 groups of 5**.
* Ask, **How can we find the total number of blocks?** Again there are several ways. However, in this case, students may count by fives. Many students already know how to count by fives.
* Put the blocks on a number line to model how to skip count by 5s.
* Ask students to tell how to write an addition sentence for what they just did. Write: **5 + 5 + 5 + 5 + 5 + 5 + 5 + 5 = 40**.

Compare the two models.

* Discuss how the two models yield the same product: 40.
* Ask students to consider which model they prefer: 8 x 5 or 5 x 8. (Note: Many students may prefer 8 groups of 5 because it is easier for them to count by fives.)

* Explain that they have a choice when multiplying. They can model a problem either way and still get the same product. This will be very useful to them when they are learning their multiplication facts.

Try a problem with a larger factor, for example: 23 x 3 and 3 x 23.

* To make the point that one way may be more efficient than another way, ask **Would you rather model 23 groups of 3 or 3 groups of 23? Which would be easier to set up using the blocks?**
* If needed, begin to model both ways. Before long, students should recognize that modeling 3 groups of 23 would be much more efficient.

Small Group Activity (15-20 minutes)

Have students model other multiplication problems as equal groups and check to see that the reverse order yields the same result.

* Write several multiplication problems and definitions in one column on the board. Write the reverse order of each problem in another column.

7 x 3 (7 groups of 3)	3 x 7 (3 groups of 7)
6 x 4 (6 groups of 4)	4 x 6 (4 groups of 6)
9 x 2 (9 groups of 2)	2 x 9 (2 groups of 9)
12 x 3 (12 groups of 3)	3 x 12 (3 groups of 12)

* Have students work with a partner. Distribute blocks, holders, and blank paper to each pair of students. Provide access to number lines for students to use if they choose.

Explain the activity:

* One partner models the problem in the left column.
* The other partner models the problem in the right column.
* Both students write a repeated addition sentence for their actions and then find and compare products.
* Students may want to model both problems on two adjacent number lines,skip count, and the compare products.

Closure **(10 minutes)**

Encourage students to discuss their results. Then present the following problem:

> **After the game on Friday, each of the seventeen members of the baseball team enjoyed 4 pieces of pizza. How many pieces of pizza were eaten on Friday?**

As a class, discuss which model is suggested by the story: 17 groups of 4 (17 x 4). Ask, **Which would you rather model, 17 groups of 4 or 4 groups of 17? Is the answer going to be the same? As we work with the blocks, do the groups look the same?**

Have students respond in writing and collect their responses.

Assessment

- Do the students use the blocks to model equal groups?
- Do the students use blocks-of-10 to model 2-digit factors (such as 3 groups of 12)?
- Can students explain/demonstrate why the order of the factors does not matter?
- Do students know which model is more efficient?

Extension

- Have students choose the more efficient model to solve story problems. For example:

  Elizabeth put 3 cookies in each bag. She brought 27 bags of cookies to school. How many cookies did Elizabeth bring to school?
  (Students should notice that the story suggests 27 groups of 3. However, it is more efficient to build 3 groups of 27.)