

Associative Property of Multiplication

Student Probe

Solve the following open number sentence:

$$3 \times 4 \times 5 = 3 \times 4 \times \square$$

If the student cannot correctly identify the missing number as 5, or if the student has to first compute $3 \times 4 \times 5$ and 3×4 then tries to figure out what to multiply by 12 to get that product, he needs this lesson.

Lesson Description

This lesson is intended to help students understand and apply the associative property of multiplication.

Rationale

Although the associative property of multiplication may seem obvious to adults, it is not necessarily obvious to children. They may see that it works in individual cases, but not understand that it works all the time. Since the associative property is useful in problem solving, mastering basic facts, and mental math, it is important that students are able to understand the concept and apply it. Children may know that when multiplying three numbers they can only multiply two at a time. They may not realize that it does not matter which two they multiply first. This becomes very critical when they start manipulating algebraic expressions and have to apply this understanding to expressions and equations that have numbers and variables. (It is not so important that children are able to name the property.)

Preparation

None

At a Glance

What: Applying the Associative Property to solve problems.

Common Core State Standard: CC.3.OA.5. Apply properties of operations as strategies to multiply and divide.

Mathematical Practices:

Look for and make use of structure.

Who: Students who do not understand problem solving using the associative property.

Grade Level: 3

Prerequisite Vocabulary: Associative Property, parenthesis, multiplication

Prerequisite Skills: Knowledge of multiplication facts

Delivery Format: Small group

Lesson Length: 15-30 minutes

Materials, Resources, Technology:

Prepared number cards 1-9

Student Worksheets: None

Lesson

The teacher says or does...	Expect students to say or do...	If students do not, then the teacher says or does...
1. Ask the students to take one of the cards numbered 1-4. Write the numbers on a white board as a number sentence using multiplication symbols. (Example: $2 \times 3 \times 4$)		
2. Ask someone to solve this problem. How did you do it?	24 $2 \times 3 = 6$ and $6 \times 4 = 24$	Prompt student responses.
3. So you multiplied the 2 and 3 together first? Let me write it this way to show that: $2 \times 3 \times 4$		
4. Did someone do it another way?	Answers may vary, but listen for $3 \times 4 = 12$ and $2 \times 12 = 24$.	If no one offers this solution, present it to the students.
5. Let me write it this way to show what we did: $2 \times 3 \times 4$		
6. How are the methods different?	Answers may vary, but listen for, "In the first one we multiplied the 2 and 3 first. In the second one we multiplied the 3 and 4 first."	What did we multiply first?
7. How are these two methods alike?	Answers may vary, but listen for, "They are both 24."	Did we get the same answer?
8. Do you think it will always work out to the same answer? Let's work some more problems to see.	Answers may vary.	

The teacher says or does...	Expect students to say or do...	If students do not, then the teacher says or does...
9. Repeat the steps above with different sets of three numbers until students realize that the products will be the same.		
10. Mathematicians call this the Associative Property of Multiplication. Whenever we need to multiply three or more numbers, it doesn't matter which two we multiply together first.		
11. This is a strategy we can use when solving multiplication problems. Think of putting numbers in groups together. Grouping numbers together to find answers makes it easier to solve these problems mentally.		

Teacher Notes

1. The associative property of multiplication is necessary because multiplication is a binary operation (only two numbers may be multiplied at a time). It is not a part of the order of operations.
2. Make sure students understand that the parentheses indicate which two numbers were multiplied together first.
3. Students who have difficulty remembering certain multiplication facts can apply the associative property to break it into two other facts. For example, 8×7 can be thought of as $2 \times 4 \times 7 = 2 \times 28 = 56$.

Variations:

Instead of drawing cards, students could generate numbers on their own. Keep the numbers single digit 1-9 and easier in the beginning so that the concept of associative property isn't lost due to a lack of multiplication fact knowledge.

Formative Assessment

Solve the following open number sentence:

$$2 \times 4 \times 3 = 2 \times 4 \times \square$$

Answer: 3

Students should be able to say the answer quickly, with no computation necessary.

References

Russell Gersten, P. (n.d.). *RTI and Mathematics IES Practice Guide - Response to Intervention in Mathematics*. Retrieved Feb. 25, 2011, from rti4success