Associative Property

When we add or multiply real numbers, it doesn't matter how those numbers are grouped; the result of the multiplication will always be the same.

Associative property

Intuitively we already know this, but now we want to formally say that this is the **Associative Property** of multiplication.

Associative Property of Addition $(a+b)+c=a+(b+c)$

Associative Property of Multiplication $(a \cdot b) \cdot c = a \cdot (b \cdot c)$

In these formulas, a, b, and c represent numbers. The Associative Property of Addition tells us that it doesn't matter if we first add b to a, and then add c to the result, or if we first add c to b, and then add the result to a. We'll get the same answer both ways.

Similarly, the Associative Property of Multiplication tells us that it doesn't matter if we first multiply a by b, and then multiply the result by c, or if we first multiply b by c, and then multiply a by the result. We'll get the same answer both ways.

"Associative" comes from the word "associate," so we want to remember that "associate," in terms of math, refers to grouping with parentheses. In

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other words, in an example of the Associative Property, the numbers will stay in the same order but the parentheses will move.

Example

Use the Associative Property to write the expression a different way, without performing the addition.

$$3 + (6 + 7)$$

We know that when we apply the Associative Property of Addition, the parentheses move but the numbers don't. So we could keep the numbers where they are, but move the parentheses to rewrite $3 + (6 + 7)$ as

$$(3 + 6) + 7$$

We didn't have to perform the addition to solve this problem, but we can also see that the two expressions are equal.

$$3 + (6 + 7) = 3 + (13) = 16$$

$$(3 + 6) + 7 = (9) + 7 = 16$$

We get 16 as the answer, regardless of the order in which we perform the addition.

Let's try another example, this time with the Associative Property of Multiplication.

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Example

Is the equation true or false?

$$(2 \cdot 3) \cdot 5 = 2 \cdot (3 \cdot 5)$$

The equation is true, because of the Associative Property of Multiplication. The order of the numbers stayed the same but the parentheses moved.

We can see that the expressions on both sides of the equation each simplify to 30.

$$(2 \cdot 3) \cdot 5 = (6) \cdot 5 = 30$$

$$2 \cdot (3 \cdot 5) = 2 \cdot (15) = 30$$

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