

Lesson: Number Properties (Identity, Commutative, associative, and distributive)

4th Grade Objective: 5.03b Order of Operations and the identity, commutative, associative, and distributive properties.

Lesson:

There are four properties involving addition and multiplication that will help make problems easier to solve. They are the commutative, associative, multiplicative identity and distributive properties.

Commutative property: When **two** numbers are multiplied or added together, the product or sum is the same regardless of the order of the multiplicands. (Move stuff around)

For example; $4 \times 2 = 2 \times 4$

*Think of the commutative property this way: Many people **commute** to work. They get up at home in the morning, dress, eat breakfast, brush their teeth, then drive or take the train or a bus to work. In other words, they change places.*

*In the afternoon they change places again and drive or ride home. So we call them **commuters**. The commutative property means "to change places."*

Associative Property: When three or more numbers are multiplied, the product is the same regardless of the order of multiplication. (Regroup)

For example; $(2 \times 3) \times 4 = 2 \times (3 \times 4)$

Meet Lisa, Teresa, and Felicia. Yesterday Lisa and Teresa were great friends--that is, they were "associating" with each other. They were, however, not speaking to Felicia.

Over night, I'm sorry to say, Lisa and Teresa got into a big fight while talking on the phone. Teresa said never mind, she would just be friends with Felicia. So today, Teresa and Felicia are associating with each other, and neither of them is speaking to Lisa. (Not a happy story, but such is life.)

Notice how in the first part of the story the parentheses, or grouping symbols, grouped Lisa and Teresa together, and in the second part, the parentheses grouped Teresa and Felicia together. None of the girls moved, just the parentheses shifted.

Multiplicative Identity Property: The product of any number and one is that number.

For example; $5 \times 1 = 5$

Just like each of us has our own identity, a number has its own identity as well. We are all unique in that every person has their own identity which is themselves, a number has its own identity as well, itself.

Distributive property: The sum of two numbers times a third number is equal to the sum of each addend times the third number. (They factored)

For example; $4 \times (6 + 3) = 4 \times 6 + 4 \times 3$

It's the day of the big math test. You are quaking in your shoes. You're just hoping that your teacher, Mr. Wilson, has somehow forgotten about the test. (After all, you did.) Mr. Wilson marches into class carrying a thick sheaf of papers still hot from the copier. Stalking over to your desk, he towers over you.

"Edward!" he barks like a Doberman.

"Y-e-s-s-s-s, s-i-r?" you quaver. Your stomach feels like you ate cold pizza for lunch. In fact, you did eat cold pizza for lunch.

*"Would you please **distribute** the math test for me?" Mr. Wilson actually sounds friendly.*

"Yes, sir!" you exclaim jumping up from your seat. Maybe Mr. Wilson will take into account your prompt and enthusiastic helpfulness when he grades your paper.

Walking up and down the rows, you place one test on each desk. (You certainly aren't going to keep them all for yourself.) When you have finished, you return to your seat.

"Thank you, Edward," Mr. Wilson says politely. "You did a very nice job of distributing those math tests."

"No problem," you say nonchalantly.

*The distributive property is a little like passing out the math tests you have a choice in the order that you **distribute** the tests, just as long as everyone gets a test at the end.*

Practice:

1. $x + 9 = 9 + x$ is an example of which property?
2. $2(x + 3) = 2x + 6$ is an example of which property?
3. $x + (y + 3) = x + (3 + y)$ is an example of which property?
4. $(5y) \cdot (1) = 5y$ is an example of which property?

5. $(x y) z = x (y z)$ is an example of which property?

6. $(x + 5)(7 + x) = (x + 5) \cdot (7) + (x + 5) \cdot (x)$ is an example of which property?

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1. You are interchanging two, therefore commutative
 2. You are taking elements of addition inside the parenthesis and multiplying each by the number outside the parenthesis therefore it is the distributive property
 3. You are interchanging only the two numbers in the parenthesis therefore it is the commutative property of addition
 4. The expression is being multiplied by one, therefore it is the identity property.
 5. Since you are re-grouping the elements of the problem, it is the associative property.
 6. You are taking the first number times each other number, therefore it is the distributive property.