


MasterMath

Algebra
PROPERTIES OF ADDITION AND
MULTIPLICATION



These students are commuting to school on the bus. **Commute** means “to travel”



Properties of Addition and Multiplication

The **Commutative Property of Addition and Multiplication** is similar. Numbers can move around within an expression (travel) without changing the results.

$5 + 2 = 7$	$5 \times 2 = 10$
$2 + 5 = 7$	$2 \times 5 = 10$

if $5 + x = 7$ then $x + 5 = 7$	if $5 * x = 10$ then $x * 5 = 10$
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Properties of Addition and Multiplication

The ***Cummutative Property*** of ***Addition and Multiplication*** does not work for subtraction or division:

$$6 \div 2 = 3 \quad 5 - 2 = 3$$

$$2 \div 6 = .333 \quad 2 - 5 = -3$$

If $6 \div x = 3$
then $x \div 6 \neq 3$

Properties of Addition and Multiplication

These people are associating with each other. ***Associate*** means to “join together” or “combine”.



Properties of Addition and Multiplication

In math, we “***associate***” numbers by putting brackets around them.

$$(3 + 5) \text{ or } [3 - 5]$$

This normally means that you should perform the operations within the brackets first.

Properties of Addition and Multiplication

The ***Associative Property of Addition and Multiplication*** means that how we associate numbers won't effect the results, so long as we are using the same operands.

$$(1 + 2) + 3 = 1 + (2 + 3)$$

$$(3 \times 4) \times 5 = 3 \times (4 \times 5)$$

$$12 \times 5 = 3 \times 20$$

$$60 = 60$$

Properties of Addition and Multiplication

The ***Associative Property of Addition and Multiplication*** means that how we associate numbers won't effect the results, so long as we are using the same operands.

$$(2 * 3) * 5 = 30 \quad 2 * (3 * 5) = 30$$

$$(2 + x) + 5 = 2 + (x + 5)$$

Properties of Addition and Multiplication

However, if the operand changes, then we can't change the associations without changing the results.

$$(2 * 3) + 5 = 11 \quad 2 * (3 + 5) = 16$$

Properties of Addition and Multiplication

The ***Associative Property*** of Addition and Multiplication also doesn't work if we are subtracting or dividing.

$$(10 - 3) - 2 = 5 \quad 10 - (3 - 2) = 9$$

$$(24 / 4) / 2 = 3 \quad 24 / (4 / 2) = 12$$

Properties of Addition and Multiplication

Summary

Cummutative Property:

- Addition and Multiplication, only
- Operant can change
- We can use any order (numbers can commute)

Associative Property:

- Addition and Multiplication, only
- Operant can't change
- We can combine or associate the numbers anyway we want

Properties of Addition and Multiplication

You try it!

Are these expressions equal:

$$(3 + 2) + 5$$

$$3 + (2 + 5)$$

Properties of Addition and Multiplication

You try it!

Are these expressions equal:

$$(3+2)+5 = (5)+5 = 10$$

$$3+(2+5) = 3+(7) = 10$$

They are equal: ***Associative Property.***

Properties of Addition and Multiplication

You try it!

Are these expressions equal:

$$(6 - 2) + 5$$

$$6 - (2 + 5)$$

Properties of Addition and Multiplication

You try it!

Are these expressions equal:

$$(6 - 2) + 5 = 4 + 5 = 9$$

$$6 - (2 + 5) = 6 - 7 = -1$$

They are unequal. The Associative Property doesn't work for subtraction, or when the operands change.

Properties of Addition and Multiplication

You try it!

Are these expressions equal?

$$5 + 3 + 8$$

$$3 + 8 + 5$$

Properties of Addition and Multiplication

You try it!

Are these expressions equal?

$$5 + 3 + 8 = 16$$

$$3 + 8 + 5 = 16$$

They are equal: **Commutative Property****Properties of Addition and Multiplication**

Reminder:

- ❖ When we add or subtract a zero, nothing changes.

$$8 + 0 = 8$$

- ❖ When we multiply by zero, the answer is always zero

$$8 \times 0 = 0$$

- ❖ When we divide by zero, the answer is always ∞ .

$$8 \div 0 = \infty$$

- ❖ When we multiply or divide by 1, nothing changes.

$$8 \div 1 = 8$$

Properties of Addition and Multiplication
