Accelerated Math Notes Properties of Numbers (Lesson 1 - 4+)

In Algebra, _properties_ are statements that are true for any numbers.

Identity Property of Addion

Any number added to zero will stay the same. It maintains its identity.

Ex. $3 + 0 = 3$ Ex. $a + 0 = a$

Identity Property of Subtraction

Subtracting zero from any number ensures that the number will remain the same. It maintains its identity.

Ex. $9 - 0 = 9$ Ex. $a - 0 = a$

Identity Property of Multiplication

Any number multiplied by one will stay the same. It maintains its identity.

Ex. $3(1) = 3$ Ex. $a(1) = a$

Identity Property of Division

Any number divided by one will stay the same. It maintains its identity.

Ex. $9 \div 1 = 9$ Ex. $a \div 1 = a$

Commutative Property of Multiplication

You can change the _order_ of the factors and the product will stay the same.

Ex. $3(5) = (5)3$ Ex. $ab = ba$

Commutatiave Property of Addition

You can change the _order_ of the addends and the sum will stay the same.

Ex. $9 + 6 = 6 + 9$ Ex. $a + b = b + a$

Associative Property of Multiplication

You can change the underlined grouping of the factors and the product will stay the same.

Ex. $(3 \cdot 5)(2) = (3)(5 \cdot 2)$ Ex. $(ab)c = a(bc)$

$15(2) \qquad 3(10)$

$30 = 30$

Associative Property of Addition

You can change the underlined grouping of the addends and the sum will stay the same.

Ex. $(9 + 6) + 2 = 9 + (6 + 2)$

$15 + 2 \qquad 9 + 8$

$17 = 17$

Ex. $(a + b) + c = a + (b + c)$

Multiplicative Property of Zero

When any number is multiplied by zero, the product is zero.

Ex. $6(0) = 0$ Ex. $a(0) = 0$

Distributive Property

This property combines two operations to make equivalent expressions like this:

Ex. $8(3 + 4) = 8(3) + 8(4)$ Ex. $a(b+c) = ab + ac$

$= 24 + 32$

$= 56$

Be able to name property shown:

1) $(15 + 12) + 8 = 15 + (12 + 8)$ Assoc. +

2) $5(0) = 0$ Mult Prop O

3) $5(1) = 5$ Mult Identity

4) $5(9) = 9(5)$ Comm X

5) $13 + 0 = 13$ Identity +

6) $2(3 + 6) = 2(3) + 2(6)$ Distributive

Be able to test a hypothesis:

Hypothesis: There is an associative property of subtraction.

Think...What would that look like?

$(24 - 12) - 2 \overset{?}{=} 24 (12 - 2)$

$12 - 2 \qquad 24 - 10$

$10 \neq 14$

No Hyp. False

called a counterexample

Be able to use properties to do mental math:

$8(53) = \quad 8(50+3)$

$\qquad 8(50) + 8(3)$ $\Big\}$ Distributive

$8(2\tfrac{1}{4}) = \quad 8(2+\tfrac{1}{4})$

$\qquad 8(2) + 8(\tfrac{1}{4})$ $\Big\}$ Distrib.

$\qquad 16 + 2 \quad \boxed{18}$

$25 \times 63 \times 4 =$

$25 \times 4 \times 63 \qquad$ comm $\times$

$(25 \times 4) \times 63 \qquad$ Assoc.

$\qquad 100 \times 63$

$\qquad 6300$

series of properties.

Use properties to simplify an algebraic expression:

$(5 + a) + 7 = (a + 5) + 7$

$\qquad = a + (5 + 7)$

$\qquad = \boxed{a + 12}$

Properties

comm +

Assoc +

Arithmetic

(Using facts/properties to get to a conclusion is called **deductive reasoning**.)

Use properties to simplify each of the following:

$6(7x) = (6 \cdot 7)x \qquad$ assoc. $\times$

$\qquad \boxed{42x}$

$7(a + 0) = 7(a) \qquad$ Identity Add

$\qquad \boxed{7a} \qquad$ Best form

$4(x \cdot 1) = \boxed{4x} \qquad$ Ident. $\times$

$9 + (y + 2) = \boxed{y + 11}$

$\qquad 11 + y$

True or False? If false give a counterexample.

Division of integers is commutative.

$9 \div 2 \overset{?}{=} 2 \div 9$

$4\tfrac{1}{2} \neq \tfrac{2}{9} \qquad$ False

Subtraction of integers is associative.

False

See previous slide