

Math 7 Notes

Properties of Operations
(Lesson 5-3)

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

Additive Identity

(Identity Property of Addition)

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

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

Multiplicative Identity

(Identity Property of Multiplication)

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

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

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Commutative Property of Multiplication and Addition

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

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

Ex. $ab = ba$

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 and Addition

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

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

Ex. $(ab)c = a(bc)$

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

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

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

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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

$a(b + c) = ab + ac$

$7(x + 4)$

$7 \cdot x + 7 \cdot 4$

$7x + 28$

$2(n + 8)$

$2 \cdot n + 2 \cdot 8$

$2n + 16$

$3(a + 5)$

$3 \cdot a + 3 \cdot 5$

$3a + 15$

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Name the property shown:

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

2) $5(0) = 0$ Mult Prop of zero

3) $5(1) = 5$ Identity of x

4) $5(9) = 9(5)$ Comm of x

5) $8(x + 2) = 8x + (8)(2)$ Distributive

6) $13 + 0 = 13$ Identity Prop of +

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Be able to test a hypothesis:

Hypothesis: There is an associative property of subtraction.

Think...What would that look like?

$$(20 - 15) - 3 \stackrel{?}{=} 20 - (15 - 3)$$

$$5 - 3 \qquad 20 - 12$$

$$\textcircled{2} \neq \textcircled{8}$$

There is not an assoc. prop of -

Be able to use properties to do mental math:

$$25 \times 63 \times 4$$

$$\begin{array}{l} \swarrow \quad \searrow \\ 100(63) \quad 25 \cdot 4 \cdot 63 \\ \textcircled{6300} \quad \underline{100 \cdot 63} \end{array}$$

$$18 + 99 + -18$$

$$\begin{array}{l} \swarrow \quad \searrow \\ 0 + 99 \\ \textcircled{99} \end{array}$$

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

$$\begin{array}{l} 8 \cdot 50 + 8 \cdot 3 \\ 400 + 24 \\ 424 \end{array}$$

$$8(2\frac{1}{4}) = 8 \cdot (2 + \frac{1}{4})$$

$$\begin{array}{l} 8 \cdot 2 + 8 \cdot \frac{1}{4} \\ 16 + 2 \\ \textcircled{18} \end{array}$$

Use properties to simplify an algebraic expression:

Simplify $(5 + a) + 7 = (a + 5) + 7$ **Properties** *Commut of +*

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

Assoc of +

$$= \textcircled{a + 12}$$

Arithmetic

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

Use properties to simplify each of the following:

$$6(7a) = \textcircled{42a}$$

Assoc. prop x Arithmetic

$$7(\underline{a} + 0) = 7(a)$$

Ident of + $\textcircled{7a}$

$$4(\underline{a} \cdot 1) = 4(a)$$

Ident of x $\textcircled{4a}$