

9-12-18

Aim: SWBAT define and identify properties of addition and multiplication.

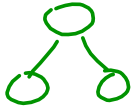
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Do Now: Keep going

Properties of Addition and Multiplication

1) **Commutative Property of addition and multiplication:** (Commutative, x; Commutative, +)

Changing the order of the numbers without changing the answer. (#'s commute)



Examples: A)  $2 + 3 = 3 + 2$  B)  $4 \cdot 5 = 5 \cdot 4$

2) **Associative Property of addition and multiplication:** (Associative, x; Associative, +)

Moving the grouping symbols without changing the answer.

Examples: A)  $6 + (2 + 3) = (6 + 2) + 3$  B)  $7 \cdot (4 \cdot 6) = (7 \cdot 4) \cdot 6$

*order remains the same*

3) **Additive Identity Property:** (Identity, +) Identity of # does not change

Any number plus zero equals that number. \*The identity element of addition is zero.

Examples: A)  $9 + 0 = 9$  B)  $x + 0 = x$

4) **Multiplicative Identity Property:** (Identity, x) Identity of # does not change

Any number times one is that number. \*The identity element of multiplication is one.

Examples: A)  $4 \cdot 1 = 4$  B)  $x \cdot 1 = x$

5) **Additive Inverse Property:** (Inverse, +) (Opposites)

For every number, a,  $a + -a = 0$ . \*Remember: Zero is the identity element

Examples: A)  $9 + -9 = 0$  B)  $-x + x = 0$

6) **Multiplicative Inverse Property:** (Inverse, x) (Reciprocal)

For every number, a,  $a \cdot \frac{1}{a} = 1$  \*Remember: One is the identity element

Examples: A)  $4 \cdot \frac{1}{4} = 1$  B)  $x \cdot \frac{1}{x} = 1$

7) **Multiplicative Property of Zero:** (Zero, x) (Everything becomes zero)

Any number times zero is zero

Examples: A)  $10 \cdot 0 = 0$  B)  $x \cdot 0 = 0$

8) **Distributive Property (over addition or subtraction)**

Multiplying a group by a number (term)

Example: A)  $4(x + y) = 4x + 4y$  B)  $2(3x + 4) = 2 \cdot 3x + 2 \cdot 4$

$2(3x + 4) = 6x + 8$



$6 \cdot 24$   
 $6 \cdot 4 + 6 \cdot 20$

NOTE: You can also use the distributive property backwards by factoring out the GCF

Example:  $4x + 14 = 2(2x + 7)$

Name the property for each of the following:

- 1)  $(13 + 7) + 8 = 13 + (7 + 8)$  Associative, +
- \* 2)  $0 \cdot (x + 3) = 0$  Multiplicative, 0
- 3)  $9 \cdot 5 = 5 \cdot 9$  Commutative, \cdot
- \* 4)  $(62 + 3) + 0 = (62 + 3)$  Identity, +
- 5)  $2(4x + 9) = 8x + 18$  Distributive
- \* 6)  $(19 + 8) + 6 = (8 + 19) + 6$  Commutative, +
- 7)  $(2 \cdot 3) \cdot 7 = 2 \cdot (3 \cdot 7)$  Associative, \cdot
- 8)  $56 \cdot 1 = 56$  Identity, \cdot
- 9)  $2x + 6y = 2(x + 3y)$  Distributive
- 10)  $7 \cdot \frac{1}{7} = 1$  Multiplicative Inverse
- \* 11)  $-6 + (3 \cdot 8) = -6 + (8 \cdot 3)$  Commutative, \cdot
- 12)  $-15 + 15 = 0$  Additive Inverse
- Adding Integers Commutative, +  
 $3 + (2 + 8) = (2 + 8) + 3$

Adding integers means adding with both positive and negative numbers (the whole numbers and their opposites). Before we discuss any rules about adding integers, let's explore . . .

Let's look at some examples together:

- 1)  $\boxed{-2} + \boxed{2} = 0$
- 2)  $\boxed{-4} + \boxed{0} = -4$
- 3)  $\boxed{-5} + \boxed{5} = 0$
- 4)  $\boxed{-2} + \boxed{5} = 3$
- 5)  $\boxed{-5} + \boxed{2} = -3$
- 6)  $-2 + -5 = \boxed{-2} + \boxed{-5} = -7$
- 7)  $\boxed{-2} + \boxed{3} = 1$
- \* 8)  $2 + -3 = \boxed{2} + \boxed{-3} = -1$
- 9)  $-2 + -3 = \boxed{-2} + \boxed{-3} = -5$
- 10)  $\boxed{-6} + \boxed{1} = -5$
- 11)  $\boxed{-1} + \boxed{6} = 5$
- 12)  $-6 + -1 = \boxed{-6} + \boxed{-1} = -7$

## HOMEWORK - Properties &amp; Introduction to Adding Integers

State the name of the property that is shown.

1)  $(x + 9) + 1 = x + (9 + 1)$  1) \_\_\_\_\_

2)  $1 \cdot x = x$  2) \_\_\_\_\_

3)  $(2 + 3) + 5 = 2 + (3 + 5)$  3) \_\_\_\_\_

4)  $(12 + 9) + 15 = (9 + 12) + 15$  4) \_\_\_\_\_

5)  $(2 + 7) \cdot 0 = 0$  5) \_\_\_\_\_

6)  $12 \cdot (7 \cdot 15) = (12 \cdot 7) \cdot 15$  6) \_\_\_\_\_

7)  $0 + (9 + 1) = 9 + 1$  7) \_\_\_\_\_

8)  $3(4x + 9) = 12x + 27$  8) \_\_\_\_\_

9)  $r \cdot 1 = r$  9) \_\_\_\_\_

10)  $(8 \cdot 6) \cdot 9 = 8 \cdot (6 \cdot 9)$  10) \_\_\_\_\_

11)  $106 \cdot 0 = 0$  11) \_\_\_\_\_

12)  $4(a + b) = 4a + 4b$  12) \_\_\_\_\_

13)  $-y + y = 0$  13) \_\_\_\_\_

14)  $(2 + y) + 8 = 8 + (2 + y)$  14) \_\_\_\_\_

15)  $c \cdot \frac{1}{c} = 1$  15) \_\_\_\_\_

16)  $(8 \cdot 6) + 9 = (6 \cdot 8) + 9$  16) \_\_\_\_\_

17)  $-11 + 32 = \underline{\quad}$  18)  $8 + -8 = \underline{\quad}$  19)  $-78 - 15 = \underline{\quad}$  20)  $-25 + 20 = \underline{\quad}$