

9-6-19

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

HW: Packet Page 9

Do Now: Page 6

HOMWORK - SETS OF NUMBERS

****Use the chart we made in class to help you answer these questions!****

Answer the following with...	SOMETIMES	ALWAYS	NEVER
1) Counting Numbers are Whole Numbers.	S	A	N
2) Whole Numbers are Real Numbers.	S	A	N
3) Counting Numbers are Integers.	S	A	N
4) Integers are Counting Numbers.	S	A	N
5) Counting Numbers are Rational..	S	A	N
6) Real Numbers are Irrational.	S	A	N
7) Integers are Rational Numbers.	S	A	N
8) Rational Numbers are Whole Numbers.	S	A	N
9) Whole Numbers are Rational.	S	A	N
10) Rational Numbers are Irrational.	S	A	N

State ALL of the sets of numbers that each of the following belongs to:

	Real	Irrational	Rational	Integer	Whole	Natural
11) 0	<u>R, Rat., I, W</u>					
12) -5	<u>R, Rat, I</u>					
13) 3.421123...	<u>R, Irr</u>					
14) 2.56	<u>R, Rat</u>					
15) 20	<u>R, Rat, I, W, N</u>					
16) $-\frac{3}{5}$	<u>R, Rat.</u>					
17) $0.\bar{6}$	<u>R, Rat.</u>					

Write the OPPOSITE and then ABSOLUTE VALUE of each integer:

18) 7 -7 7

19) -25 25 25

20) 106 -106 106

21) 0 0 0

Complete the Statement with < or >.

22) -6 < 4

23) -2 > -4

24) 0 < 8

Match the integer expression with the verbal expression:

E 25) $-|12|$

~~A.~~ the opposite of negative twelve

D 26) $|-12|$

~~B.~~ the absolute value of twelve

C 27) $-|-12|$

C. the opposite of the absolute value of negative twelve

A 28) $-(-12)$

~~D.~~ the absolute value of negative twelve

B 29) $|12|$

~~E.~~ the opposite of the absolute value of twelve

Simplify the expression:

30) $-(-9)$ 9

31) $|-16|$ 16

32) $-|-16|$ -16

The table below shows the distances of the runners from the finish line when the winner won the race. Use the table to answer Questions 33 - 35.

Runner	Distance (ft)
Sarah	-16
Beth	-2
Juanita	0
Tamika	-9
Ingrid	-36

33) Who won the race? Juanita

34) Who finished further back Sarah or Tamika? _____

35) Arrange the girls' names in order from first-place to last-place finish.

(Hint: use a number line to help you)

J B T S I
 1st Place 2nd Place 3rd Place 4th Place 5th Place

AIM: SWBAT identify properties of addition and multiplication and use the properties to add integers.

"DO NOW"

Write the opposite of each integer.

- 1) 3 -3 2) -5 5 3) -7 7 4) 9 -9

Find the absolute value.

- 5) $|-12|$ 12 6) $|-4|$ 4 7) $|9|$ 9 * 8) $-|18|$ -18

Compare using $<$ or $>$.

- 9) 8 $>$ -6 10) -7 $<$ -4 11) -9 $<$ 5 12) -7 $<$ -3

Order from least to greatest.

- 13) $-1, -6, 0, -3, -5$ $-6, -5, -3, -1, 0$

- 14) $-18, -20, -15, -17$ $-20, -18, -17, -15$

State ALL the sets of numbers each belongs to.

- 15) -20 $\mathbb{R}, \text{Rat.}, \mathbb{I}$

- 16) $-\frac{1}{2}$ \mathbb{R}, Rat

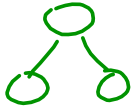
- 17) $0.\bar{5}$ $\mathbb{R}, \text{Rat.}$

- 18) π $\mathbb{R}, \text{Irr.}$

Properties of Addition and Multiplication

1) **Commutative Property of addition and multiplication:** (Commutative, \times ; 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, \times ; Associative, $+$)

Moving the **grouping** symbols without changing the answer.

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

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, \times) 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, \times) (Reciprocal)**

For every number, a , $\frac{a}{1} \cdot \frac{1}{a} = 1$ ***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, \times) (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) $2(3x + 4) = 2 \cdot 3x + 2 \cdot 4$

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

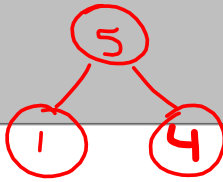

NOTE: You can also use the distributive property backwards by factoring out the GCF

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

Properties of Real Numbers

Properties refer to the behaviors of real numbers under the operations of addition and/or multiplication and help to provide some of the basic foundations of mathematics.

Properties of Addition

Commutative (Commutative, +) 	Property	Example
	$a + b = b + a$	$2 + 3 = 3 + 2$
	When two real numbers are added in any order, the sum will always be the same.	
Associative (Associative, +) 	Property	Example
	$(a + b) + c = a + (b + c)$	$6 + (2 + 3) = (6 + 2) + 3$
	When adding three real numbers, the sum is always the same regardless of their grouping.	
Additive Identity (Identity, +)	Property	Example
	$a + 0 = a$	$2 + 0 = 2$
	When a real number is added in to zero, the sum will always be the original real number.	
Additive Inverse (Inverse, +)	Property	Example
	$a + (-a) = 0$	$5 + (-5) = 0$
	When a real number and its opposite are added, the sum will always be zero.	

Properties of Multiplication

	Property	Example
Commutative (Commutative, \cdot)	$a \cdot b = b \cdot a$	$7 \cdot 8 = 8 \cdot 7$
	When two real numbers are multiplied in any order, the product will always be the same.	

	Property	Example
Associative (Associative, \cdot)	$(a \cdot b) \cdot c = a \cdot (b \cdot c)$	$5 \cdot (3 \cdot 2) = (5 \cdot 3) \cdot 2$
	When multiplying three real numbers, the product is always the same regardless of their grouping.	

	Property	Example
Multiplicative Identity (Identity, \cdot)	$a \cdot 1 = a$	$4 \cdot 1 = 4$
	When a real number is multiplied with 1, the product will always be the original real number.	

	Property	Example
Multiplicative Inverse (Inverse, \cdot)	$a \cdot \frac{1}{a} = 1 \quad (a \neq 0)$	$5 \cdot \frac{1}{5} = 1$
	When a nonzero real number and its inverse (reciprocal) are multiplied, the product will always be one.	

	Property	Example
Multiplicative Property of Zero (Zero, \cdot)	$a \cdot 0 = 0$	$4 \cdot 0 = 0$
	When a real number is multiplied with zero, the product will always be zero.	

Property of Multiplication Combined with Addition

	Property	Example
Distributive	$a(b + c) = ab + ac$	$5(3 + 2) = 5 \cdot 3 + 5 \cdot 2$
	Multiplying a real number by a sum is the same as completing each multiplication separately and combining the products.	

Identify the illustrated property.

- 1) $(13 + 7) + 8 = 13 + (7 + 8)$ _____
- 2) $0 \cdot (x + 3) = 0$ _____
- 3) $9 \cdot 5 = 5 \cdot 9$ _____
- 4) $(62 + 3) + 0 = (62 + 3)$ _____
- 5) $2(4x + 9) = 8x + 18$ _____
- 6) $(19 + 8) + 6 = (8 + 19) + 6$ _____
- 7) $(2 \cdot 3) \cdot 7 = 2 \cdot (3 \cdot 7)$ _____
- 8) $56 \cdot 1 = 56$ _____
- 9) $2x + 6y = 2(x + 3y)$ _____
- 10) $7 \cdot \frac{1}{7} = 1$ _____
- 11) $-6 + (3 \cdot 8) = -6 + (8 \cdot 3)$ _____
- 12) $-15 + 15 = 0$ _____

Name the property for each of the following:

1) $(13 + 7) + 8 = 13 + (7 + 8)$ _____

2) $0 \cdot (x + 3) = 0$ _____

3) $9 \cdot 5 = 5 \cdot 9$ _____

4) $(62 + 3) + 0 = (62 + 3)$ _____

5) $2(4x + 9) = 8x + 18$ _____

6) $(19 + 8) + 6 = (8 + 19) + 6$ _____

7) $(2 \cdot 3) \cdot 7 = 2 \cdot (3 \cdot 7)$ _____

8) $56 \cdot 1 = 56$ _____

9) $2x + 6y = 2(x + 3y)$ _____

10) $7 \cdot \frac{1}{7} = 1$ _____

11) $-6 + (3 \cdot 8) = -6 + (8 \cdot 3)$ _____

12) $-15 + 15 = 0$ _____

Associative, +

Multiplicative, 0

Commutative, •

Distributive

Adding Integers

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) $-2 + 2 =$ _____

2) $-4 + 0 =$ _____

3) $-5 + 5 =$ _____

4) $-2 + 5 =$ _____

5) $-5 + 2 =$ _____

6) $-2 + -5 =$ _____

7) $-2 + 3 =$ _____

8) $2 + -3 =$ _____

9) $-2 + -3 =$ _____

10) $-6 + 1 =$ _____

11) $-1 + 6 =$ _____

12) $-6 + -1 =$ _____

HOMEWORK - Properties & 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) $-11 + 32 = \underline{\hspace{2cm}}$ 18) $8 + -8 = \underline{\hspace{2cm}}$ 19) $-78 - 15 = \underline{\hspace{2cm}}$ 20) $-25 + 20 = \underline{\hspace{2cm}}$