Study the following.

property (**prop**-ur-tee) – a special quality or characteristic of a thing. (Sweetness in a property of sugar.)

commutative (kuh-**myoot**-uh-tiv) – related to the word commute (kuh-**myoot**), which means to travel back and forth. (He commuted to work every day by train.) In math it means the order of numbers can be switched back and forth and it still means the same thing. Example: $7 + 3 = 3 + 7$ or $7 \times 3 = 3 \times 7$.

associative (ah-**soh**-see-uh-tiv) – related to the word associate (ah-**soh**-see-ayt), which means to join or come together as friends or companions; hang out with. (I associate with my friends and I don't associate with my enemies.) In math it means the way the numbers are grouped; which numbers associate with which others.
Example: $6 + (7 + 8)$ is the same as $(6 + 7) + 8$.

additive (**ad**-uh-tiv) – relates to addition

multiplicative (muhl-tuh-**plik**-uh-tiv) – relates to multiplication

distributive (diss-**trib**-yoo-tiv) – related to distribute (diss-**trib**-yoot) which means to divide among two or more. (I will distribute the cookies among the students.) In math the number in front of the parentheses is distributed to each part inside the parentheses.
Example: $2(6 + 7)$ is the same as $2\times6 + 2\times7$.

Say each word out loud and write it in the blank.

property _____
commute_____
commutative _____
associate _____
associative_____
additive_____
multiplicative_____
distribute_____
distributive _____

Write each definition in your own words.
property

commute

commutative

associate

associative

additive

multiplicative

distribute

distributive

Write two sentences using each word.
property
1.

2.

commute
1.

2.

associate
1.

2.

distribute
1.

2.

Matching

property	related to multiplication
commute	to join or come together as friends or companions; hang out with.
associate	to travel back and forth.
commutative	to divide among two or more
associative	related to addition
additive	a special quality or characteristic of a thing.
multiplicative	In math, the order of the numbers can be switched.
distribute	In math, the way numbers are grouped.

Fill in the blanks.

_____ is related to addition.

_____ is related to multiplication.

He _____ by train.

He _____ with his friend Bill.

She will _____ the coats to the children.

Metal has the _____ of being hard and shiny.

The word _____ talks about the way the numbers are grouped.

The word _____ talks about the order of the numbers switching.

Study the following.

identity (eye-**den**-ti-tee) – the fact of being the same; individuality. (He discovered the identity of the crook.) In math, the identity of the number stays the same if you multiply it by one or add zero to it. Examples: $5 \times 1 = 5$ or $5 + 0 = 5$.

opposite (**op**-uh-zit) – being at the other end or other side. (We live on opposite sides of the street.) In math, opposites are the positive and the negative of the same number. Example: 5 and -5 are opposites. They are on opposite sides of the zero on a number line.

reciprocal (ree-**sip**-rah-kl) – opposite, or an equal trade (I gave him a ride to work Monday, so he did a reciprocal favor for me and gave me a ride on Tuesday.) In math, the reciprocal has the opposite effect when you multiply it by a number. Example: 3 and 1/3 are reciprocals . Multiplying by 3 has the opposite effect of multiplying by 1/3.

inverse (**in**-vurs) – opposite in the effect it has on something. (Wind blowing from the east is inverse to wind blowing from the west.) In math inverses sort of undo the previous operation. (You add three, then add –3 and you will be back where you started. Or you multiply by 3 and then multiply by 1/3 and you will be back where you started.)

Note: 1. Opposite relates to addition $-4 + 4 = 0$
2. Reciprocal relates to multiplication $4 \times \frac{1}{4} = 1$
3. Inverse describes either addition or multiplication.

Say each word out loud and write it in the blank.

identity_____
opposite _____
reciprocal _____
inverse_____

Write each definition in your own words.

identity

opposite

reciprocal

inverse

Write two sentences using each word.

identity
1.

2.

opposite
1.

2.

reciprocal
1.

2.

inverse
1.

2.

Matching.

identity	An equal exchange; has the opposite effect when you multiply it by a number.
opposite	being at the other end or other side.(related to addition)
reciprocal	the fact of being the same; individuality.
inverse	opposite in the effect it has on something.(either addition or multiplication)

Fill in the blanks.

Another word for individuality is _____.

He sat _____ from me at the dinner table.

What two words mean opposite? _____ and _____.

_____ relates to addition.

_____ relates to multiplication.

_____ relates to both addition and multiplication.

In a tug-of-war game, Bill pulling on one end of the rope was _____ to Sam pulling on the other end.

If I add 0 to 6, the 6 will keep its _____.

I said hi to the neighbor, so he did a _____ action, and said hi to me.

Study the following.

Commutative Property of Addition

The order in which numbers are added does not change their sum.

$7 + 3 = 10$ is the same as $3 + 7 = 10$

or you could say $7 + 3 = 3 + 7$

Commutative Property of Multiplication

The order that numbers are multiplied does not change the product.

$2 \times 3 = 3 \times 2$ or $4 \times 5 \times 6 = 6 \times 5 \times 4$

Associative Property of Addition

The way three or more numbers are grouped does not change their sum.

$(2 + 3) + 4 = 9$ is the same as $2 + (3 + 4) = 9$

or you could say $(2 + 3) + 4 = 2 + (3 + 4)$

Associative Property of Multiplication

The way three or more numbers are grouped does not change the product.

$2 \times (3 \times 4) = 24$ or $(2 \times 3) \times 4 = 24$

or you could say $2 \times (3 \times 4) = (2 \times 3) \times 4$

Write each definition in your own words.

Commutative Property of Addition

Commutative Property of Multiplication

Associative Property of Addition

Associative Property of Multiplication

Write 5 examples of each.

Commutative Property of Addition

Commutative Property of Multiplication

Associative Property of Addition

Associative Property of Multiplication

Matching.

Commutative Property of Addition	The order that numbers are multiplied does not change the product.
Associative Property of Addition	The way three or more numbers are grouped does not change the product.
Commutative Property of Multiplication	The order in which numbers are added does not change their sum.
Associative Property of Multiplication	The way three or more numbers are grouped does not change their sum.

Name that property.

1. $4 + 3 = 3 + 4$

2. $(2)(8) = (8)(2)$

3. $(1 + 4) + 5 = 1 + (4 + 5)$

4. $(2 \times 3) \times 4 = 2 \times (3 \times 4)$

5. $6 \times 7 = 7 \times 6$

6. $6 \times (7 \times 9) = (6 \times 7) \times 9$

7. $9 + 10 = 10 + 9$

8. $2 + (7 + 3) = (2 + 7) + 3$

Study the following.

Additive Identity of Addition

A number plus zero is always that number.

$8 + 0 = 8$ $-6 + 0 = -6$

Multiplicative Identity Property

Any number multiplied by one, is that number.

$6 \times 1 = 6$ $(-5) \times 1 = -5$

Property of Opposites (also called Additive Inverse Property)

A number and its opposite equal 0.

$-2 + 2 = 0$ or $(-7) + 7 = 0$ $9 + (-9) = 0$

Property of Reciprocals (also called Multiplicative Inverse Property)

A number times its reciprocal is 1.

$4 \times \frac{1}{4} = 1$ or $5 \times \frac{1}{5} = 1$

Write each definition in your own words.

Additive Identity of Addition

Multiplicative Identity Property

Property of Opposites

Property of Reciprocals

Write 5 examples of each.

Additive Identity of Addition

Multiplicative Identity Property

Property of Opposites

Property of Reciprocals

Matching.

Additive Identity of Addition	A number multiplied by zero is zero.
Multiplicative Identity Property	A number and its opposite equal 0.
	Any number multiplied by one, is that number.
Property of Opposites	A number times its reciprocal is 1.
Property of Reciprocals	

Name that property.

1. $17 + 0 = 17$

2. $-4 + 4 = 0$

3. $-3 \times 1 = -3$

4. $7 \times \frac{1}{7} = 1$

5. $0 + 5 = 5$

6. $-5 + 0 = -5$

7. $5 + (-5) = 0$

8. $1 \times 8 = 8$

9. $9 \times \frac{1}{9} = 1$

10. $4 \times 1 = 4$

Study the following.

Zero Property of Multiplication

A number times zero is equal to zero.

$3 \times 0 = 0$ (Also zero divided by a number is zero. $0 \div 3 = 0$ or $\frac{0}{5} = 0$.)

$-4 \times 0 = 0$

Distributive Property

Each integer inside the parenthesis must by multiplied by the integer in front of the parentheses.

$2(3 + 4)$ $\quad\quad$ $-3(2 + 5)$

$2 \times 3 + 2 \times 4$ $\quad\quad$ $(-3)(2) + (-3)(5)$

Dividing by zero is undefined. (Remember: zero divided by a number is zero. $0 \div 7 = 0$. See Zero Property of Multiplication above.)

$3 \div 0$ = undefined or $\frac{3}{0}$ is undefined

$-8 \div 0$ = undefined or $\frac{-8}{0}$ is undefined

Write each definition in your own words.

Zero Property of Multiplication

Distributive Property

Dividing by Zero

Write 5 examples of each.

Zero Property of Multiplication

Distributive Property

Dividing by Zero

Matching

Zero Property of Multiplication	A number times zero is equal to zero
	Undefined
Distributive Property	Each integer inside the parentheses must by multiplied by the integer in front of the parentheses.
Dividing by Zero	

Name that property.

1. $5 \times 0 = 0$

2. $\frac{100}{0}$ = undefined

3. $\frac{0}{100} = 0$

4. $6(3 + 4) = 6 \times 3 + 6 \times 4$

5. $-7 \times 0 = 0$

6. $0 \div 17 = 0$

7. $-8(2 + 7) = (-8)(2) + (-8)(7)$

8. $\frac{-4}{0}$ = undefined

Summary of Properties.

PROPERTIES OF ADDITION

Commutative Property of Addition

The order in which numbers are added does not change their sum.

$7 + 3 = 10$ is the same as $3 + 7 = 10$

or you could say $7 + 3 = 3 + 7$

Associative Property of Addition

The way three or more numbers are grouped does not change their sum.

$(2 + 3) + 4 = 9$ is the same as $2 + (3 + 4) = 9$

or you could say $(2 + 3) + 4 = 2 + (3 + 4)$

Additive Identity of Addition

A number plus zero is always that number.

$8 + 0 = 8$ $\quad -6 + 0 = -6$

Property of Opposites (also called Additive Inverse Property)

A number and its opposite equal 0.

$-2 + 2 = 0$ or $(-7) + 7 = 0$ $\quad 9 + (-9) = 0$

PROPERTIES OF MULTIPLICATION

Commutative Property of Multiplication

The order that numbers are multiplied does not change the product.

$2 \times 3 = 3 \times 2$ or $4 \times 5 \times 6 = 6 \times 5 \times 4$

Associative Property of Multiplication

The way three or more numbers are grouped does not change the product.

$2 \times (3 \times 4) = 24$ or $(2 \times 3) \times 4 = 24$

or you could say $2 \times (3 \times 4) = (2 \times 3) \times 4$

Multiplicative Identity Property

Any number multiplied by one, is that number.

$6 \times 1 = 6$ $\quad (-5) \times 1 = -5$

Property of Reciprocals (also called Multiplicative Inverse Property)

A number times its reciprocal is 1.

$4 \times \frac{1}{4} = 1$ or $5 \times \frac{1}{5} = 1$

Zero Property of Multiplication

A number times zero is equal to zero.

$3 \times 0 = 0$ (Also zero divided by a number is zero. $0 \div 3 = 0$ or $\frac{0}{5} = 0$.)

$-4 \times 0 = 0$

DISTRIBUTIVE PROPERTY

Distributive Property

Each integer inside the parenthesis must by multiplied by the integer in front of the parentheses.

$2(3 + 4)$ $\quad\quad$ $-3(2 + 5)$

$2 \times 3 + 2 \times 4$ $\quad\quad$ $(-3)(2) + (-3)(5)$

DIVIDING BY ZERO RULE

Dividing by zero is undefined. (Remember: zero divided by a number is zero. $0 \div 7 = 0$. See Zero Property of Multiplication above.)

$3 \div 0$ = undefined or $\frac{3}{0}$ is undefined

$-8 \div 0$ = undefined or $\frac{-8}{0}$ is undefined

Write 3 examples of each.

Commutative Property of Addition

Associative Property of Addition

Additive Identity of Addition

Property of Opposites (or Additive Inverse Property)

Commutative Property of Multiplication

Associative Property of Multiplication

Multiplicative Identity Property

Property of Reciprocals or (Multiplicative Inverse)

Zero Property of Multiplication

Distributive Property

Dividing by Zero Rule

Matching.

Commutative Property of Addition	A number divided by zero is undefined.
Associative Property of Addition	A number multiplied by zero is zero.
Additive Identity of Addition	A number and its opposite equal 0.
Property of Opposites (or Additive Inverse)	Any number multiplied by one, is that number.
Commutative Property of Multiplication	The order that numbers are multiplied does not change the product.
Associative Property of Multiplication	The order in which numbers are added does not change their sum.
Multiplicative Identity Property	The way three or more numbers are grouped does not change the product.
Property of Reciprocals (or Multiplicative Inverse)	A number times its reciprocal is 1.
Zero Property of Multiplication	Each term inside the parenthesis must by multiplied by the term in front of the parentheses.
Distributive Property	The way three or more numbers are grouped does not change their sum.
Dividing by Zero Rule	A number plus zero is always that number.

Name that property.

1. $8 + 0 = 8$
2. $4 \times (2 \times 3) = (4 \times 2) \times 3$
3. $3 \times 1/3 = 1$
4. $7 + 3 = 3 + 7$
5. $-5 + 5 = 0$
6. $0 \times (-5) = 0$
7. $2(3 + 8) = (2)(3) + (2)(8)$
8. $(4 + 9) + 1 = 4 + (9 + 1)$
9. $2 \times 6 = 6 \times 2$
10. $7 \div 0$ is undefined
11. $0 \div (-8) = 0$
12. $-12 \times 1 = -12$
13. $2(5 + 6) = 2 \times 5 + 2 \times 6$
14. $(-9) + 2 = 2 + (-9)$
15. $1/6 \times 6 = 1$
16. $6 – 6 = 0$
17. $(4 \times 5) \times 6 = 4 \times (5 \times 6)$
18. $(-3)(-10) = (-10)(-3)$

Study the following.

HOW THE PROPERTIES ARE APPLIED.

1. Commutative Property of Addition

90 + 18 + 10 can be solved more easily by switching the 18 and the 10.
90 + 10 + 18 (It is easier to add 90 and 10, than 90 and 18.)
100 + 18 (It is easy to add 100 to 18.)
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2. Associative Property of Addition

(6 + 25) + 75 can be solved more easily by changing the grouping to the following
6 + (25 + 75) (25 and 75 can be easily added to get 100)
6 + 100 (It is easy to add 100 and 6.)

3. Commutative Property of Multiplication

5 × 7 × 20 can be solved more easily by switching the 7 and the 20.
5 × 20 × 7 (5 and 20 can be multiplied to get 100)
100 × 7 (100 and 7 are easy to multiply.)
700

4. Associative Property of Multiplication

(7 × 50)×2 can be solved more easily by regrouping the 50 and the 2 together.
7 × (50 × 2) Now 50 × 2 is easy to multiply.
7 × 100 And 7 × 100 is also easy to multiply.

5. Distributive Property

4 × 15 can be solved more easily by splitting the 15 up into 10 + 5
4 (10 + 5)
4×10 + 4×5
40 + 20
60

Make up one problem for each and solve it, showing how the property makes solving the problem easier.

1. Commutative Property of Addition

2. Associative Property of Addition

3. Commutative Property of Multiplication

4. Associative Property of Multiplication

5. Distributive Property

Study the following.

More practice with the distributive property.

Example 1: $-6(2 + 9)$

$(-6)(2) + (-6)(9)$ Notice how the (-6) gets distributed, not just the 6.

$-12 + -54$

-66

Example 2: $3(2 - 4)$

$(3)(2) - (3)(4)$ Notice how the subtraction symbol stays.

$6 - 12$

-6

Example 3: $-2(4 - 3)$

The (-2) gets distributed and the subtraction symbol stays.

$(-2)(4) - (-2)(3)$

$(-8) - (-6)$

$-8 + 6$

-2

Solve using the distributive property. Show all steps.

1. $2(3 + 7)$	8. $-5(2 - 4)$
2. $6(1 + 3)$	9. $-6(8 - 6)$
3. $-9(1 + 2)$	10. $-3(10 - 5)$
4. $-3(4 + 5)$	11. $4(2 - 8)$
5. $-1(4 + 8)$	12. $4(3 + 6)$
6. $6(1 - 3)$	13. $-2(9 - 6)$
7. $8(4 - 3)$	14. $-2(2 + 3)$

Solve the following by using properties. Name the properties you use.

1. $\frac{79}{0}$ =	10. $(28 \times 5) \times 2$ =
2. -8×1 =	11. $25 \times 7 \times 4$ =
3. $\frac{0}{79}$ =	11. $15 + 8 + 5$ =
4. $(17 + 8) + 2$ =	12. $\frac{25}{0}$ =
5. $3 \times \frac{1}{3}$ =	13. $\frac{-18}{0}$ =
6. $-525 + 525$ =	14. $-6(3 - 2)$ =
7. $-4 + 0$ =	15. $\frac{0}{-200}$ =
8. $25(4 + 3)$ =	16. $13 \times \frac{1}{13}$ =
9. 8×1 =	17. $(-3)(0)$ =
	18. $-2(4 + 3)$ =