2.1 Properties of Real Numbers

Name: ____________________

Write your questions here!

Commutative Property

For each property below let *a*, *b*, and *c* represent real numbers.

Property	***Verbal Description***
Commutative Property of Addition	Two real numbers can be added in either order. Example:

The commutative property <u>does not</u> work for **subtraction.**

Example:

Trick to make it work:

Property	***Verbal Description***
Commutative Property of Multiplication	Two real numbers can be multiplied in either order. Example:

The commutative property <u>does not</u> work for **division.**

Example:

Trick to make it work:

Associative Property	
For each property below let *a*, *b*, and *c* represent real numbers.	

Property	***Verbal Description***
Associative Property of Addition	When three real numbers are added, it makes no difference which to are added first. Example:

Property	***Verbal Description***
Associative Property of Multiplication	When three real numbers are multiplied, it makes no difference which to are multiplied first. Example:

For the same reason as the commutative property, the associative property <u>does not</u> work for **subtraction or division.**

Trick to make it work
You can use the same trick from earlier to:

- Convert subtraction into addition by ________________________

  ____.

- Convert division into multiplication ________________________

  ____.

Identity Property	
For each property below let *a*, *b*, and *c* represent real numbers. 	
Property	***Verbal Description***
Additive Identity Property	The sum of a real number and zero equals the number itself. Example:
Property	***Verbal Description***
Multiplicative Identity Property	The product of a real number and one equals the number itself. Example:

*The identity property <u>does not</u> work for **subtraction or division.***

Inverse Property	
For each property below let *a*, *b*, and *c* represent real numbers. 	
Property	***Verbal Description***
Additive Inverse Property	The sum of a real number and its opposite equals zero. Example:
Property	***Verbal Description***
Multiplicative Inverse Property	The product of a nonzero real number and its reciprocal is one. Example:

*The inverse property <u>does not</u> work for **subtraction or division.***

Using your notes, fill in the chart and answer the questions below.

Property	Addition	Multiplication	Way to Remember
Commutative	$a+b\ =$ Example:	$a\cdot b\ =$ Example:	
Associative	$(a+b)+c\ =$ Example:	$(ab)c\ =$ Example:	
Identity	$a+(?)\ =a$ $a+(\_\_\_)=a$ Example:	$a\cdot(?)\ =a$ $a\cdot(\_\_\_)=a$ Example:	
Inverse	$a+(?)\ =0$ $a+(\_\_\_)=0$ Example:	$a\cdot(?)\ =1$ $a\cdot(\_\_\_)=1$ Example:	

A) Give a counter example to prove why subtraction is not commutative.

B) What is a trick you can use on your counter example to be able to use the commutative property.

C) Give a counter example to prove why division is not commutative.

D) What is a trick you can use on your counter example to be able to use the commutative property.

Name the property of real number that justifies the statement.

Shorthand:

Commutative = Com. Associative = Assoc. Identity = Ind. Inverse = Inv.

1. $3 + (-5) = -5 + 3$	**2.** $-5(7) = 7(-5)$	**3.** $25 - 25 = 0$	**4.** $5 + 0 = 5$
5. $6(-10) = -10(6)$	**6.** $2(6 \cdot 3) = (2 \cdot 6)3$	**7.** $7 \cdot 1 = 7$	**8.** $4 \cdot \frac{1}{4} = 1$
9. $25 + 35 = 35 + 25$	**10.** $(-4 \cdot 10) \cdot 8 = -4(10 \cdot 8)$	**11.** $3 + (12 - 9) = (3 + 12) - 9$	
12. $(16 + 8) - 5 = 16 + (8 - 5)$		**13.** $(5 + 10)(8) = 8(5 + 10)$	
14. $5(2a) = (5 \cdot 2)a$	**15.** $10(2x) = (10 \cdot 2)x$	**16.** $1 \cdot (5t) = 5t$	**17.** $8y \cdot 1 = 8y$
18. $3x + 0 = 3x$	**19.** $-x + x = 0$	**20.** $8y \cdot 1 = 8y$	**21.** $4x + (-4x) = 0$
22. $0 + 8w = 8w$	**23.** $\frac{1}{y} \cdot y = 1$	**24.** $10x \cdot \frac{1}{10x} = 1$	**25.** $y - y = 0$
26. $(x + 1) - (x + 1) = 0$		**27.** $(6 + x) - m = 6 + (x - m)$	

Use the property of real numbers to fill in the missing part of the statement.

Associative Property of Multiplication **28.** $3(6y) =$	Commutative Property of Addition **29.** $10 + (-6) =$
Commutative Property of Multiplication **30.** $15(-3) =$	Associative Property of Addition **31.** $6 + (5 - y) =$
Commutative Property of Addition **32.** $25 + (-x) =$	Additive Inverse Property **33.** $13x - 13x =$
Multiplicative Identity Property **34.** $(x + 8) \cdot 1 =$	Additive Identity Property **35.** $8x + 0 =$

Give (a) the additive inverse and (b) the multiplicative inverse of the quantity.

36. 10 (a) Additive inverse = (b) Multiplicative Inverse =	**37.** 18 (a) Additive inverse = (b) Multiplicative Inverse =
38. -16 (a) Additive inverse = (b) Multiplicative Inverse =	**39.** -52 (a) Additive inverse = (b) Multiplicative Inverse =
40. $6z,\ z \neq 0$ (a) Additive inverse = (b) Multiplicative Inverse =	**41.** $2y,\ y \neq 0$ (a) Additive inverse = (b) Multiplicative Inverse =
42. $x + 1,\ x \neq -1$ (a) Additive inverse = (b) Multiplicative Inverse =	**43.** $y - 4,\ y \neq 4$ (a) Additive inverse = (b) Multiplicative Inverse =

Rewrite the expression using the Associative Property of Addition or the Associative Property of Multiplication

44. $(x + 5) - 3$	**45.** $(z - 6) + 10$	**46.** $32 + (-4 + y)$	**47.** $15 + (3 + x)$
48. $3(4 \cdot 5)$	**49.** $(10 \cdot 8) \cdot 5$	**50.** $6(2y)$	**51.** $8(3x)$

The right side of the equation is *not* equalt to the left side. Change the right side so that it *is* equal to the left side.

52. $3\left(\frac{0}{3}\right) \neq 1$	**53.** $6\left(\frac{1}{6}\right) \neq 0$

True or False? Determine whether the statement is true or false. Justify your Answer

54. $-6x + 6x = 0$	**55.** $-9 + 5 = -5 + 9$

Find the Error

56. Mr. Kelly refuses to believe that the associative property doesn't work for subtraction. He works the following problem to "prove" that it does work. He is wrong. Circle the mistake in his "proof". Correct his "proof" by showing that both sides are NOT equal to each other.

$$9 - (8 - 4) = (9 - 8) - 4$$
$$9 - 12 = 1 - 4$$
$$-3 = -3$$

57. Mr. Sullivan refuses to believe that the associative property doesn't work for division. He works the following problem to "prove" that it does work. He is wrong. Circle the mistake in his "proof". Correct his "proof" by showing that both sides are NOT equal to each other.

$$16 \div \left(8 \div \frac{1}{2}\right) = (16 \div 8) \div \frac{1}{2}$$
$$16 \div 16 = 2 \div \frac{1}{2}$$
$$1 = 1$$