Mr. Rogove   Date:_____

LEARNING OBJECTIVE: We will define identity and inverse properties and use them in creating equivalent expressions (G7M3L6)

CONCEPT DEVELOPMENT:
Additive Inverse: This is the opposite of a number (or expression). When you add a number and its additive inverse, the result is 0.
Examples:
The additive inverse of -4 is $4, -4 + 4 = 0$
The additive inverse of $(-4d + 3)$ $is -(-4d + 3) \rightarrow (-4d + 3) + (-(-4d + 3)) = 0$

Multiplicative Inverse (also called reciprocal): The reciprocal of a number n is $\frac{1}{n}$ (*where* $n \neq 0$). A number multiplied by its multiplicative inverse equals 1.
Examples:
The multiplicative inverse of $-\frac{5}{4}$ is $-\frac{4}{5}$, $\left(-\frac{5}{4}\right)\left(-\frac{4}{5}\right) = 1$

$\frac{23}{12} \cdot \frac{12}{23} = 1$

The multiplicative inverse of $\frac{x-4}{3}$ is $\frac{3}{x-4}$, $\left(\frac{x-4}{3}\right)\left(\frac{3}{x-4}\right) = 1$

$-\frac{51}{4} \cdot \frac{4}{51} = 1$

GUIDED PRACTICE:
Steps for Creating Equivalent Expression using the Additive Inverse
1. Rewrite your expression using operations (addition and/or multiplication)
2. Reorganize your expression by using the commutative and associative properties.
3. Follow the rules of addition and subtraction to simplify your expression.

Write the sum of the following expressions.

-4 and $4b + 4$	-3 and $6x + 3$
$-4 + 4b + 4$	$6x + 3 + (-3)$
$\boxed{4b}$	$6x + 0$
$4b + \boxed{4 + (-4)}$	$\boxed{6x}$
Additive inverses	

$5r - 16$ and $- 5r$	$-17y$ and $81 + 17y$
$5r - 16 + (-5r)$ $5r + (-16) + (-5r)$ $5r + (-5r) + (-16)$ $0 + (-16) = \boxed{-16}$	$-17y + 81 + 17y$ $-17y + 17y + 81$ $\boxed{81}$
$2x$ and the opposite of $2x + 3$	$2y$ and the opposite of $1 + 2y$
$2x + (-1(2x+3))$ $2x + (-2x) + (-3)$ $\boxed{-3}$	
The opposite of $(-7 - 4v)$ and $- 4v$	The opposite of $(-12y - 1)$ and $- 12y$
The opposite of $(5x - 1)$ and $5x$	The opposite of $(32 - 4x)$ and 32
$-(5x-1) + 5x$ $(-1(5x + (-1)) + 5x$ $-5x + 1 + 5x$ $\boxed{1}$	$4x$

$3y + 5$

OPPOSITES

$-3y - 5$

or

$-3y + (-5)$

or

$-(3y+5)$

> **Steps for Creating Equivalent Expressions Using the Multiplicative Inverse**
> 1. Rewrite your expression using multiplication.
> 2. Use the distributive property as necessary to simplify your expression.

Write the product of the following expressions.

The multiplicative inverse of $-\frac{1}{5}$ and $\left(2x - \frac{1}{5}\right)$ $-5\left(2x - \frac{1}{5}\right)$ $-5\left(2x + \left(-\frac{1}{5}\right)\right)$ $\boxed{-10x + 1}$	The multiplicative inverse of $-\frac{1}{2}$ and $\left(\frac{1}{2}y + 5\right)$ $-2\left(\frac{1}{2}y + 5\right)$ $-y + (-10)$ $\boxed{-y - 10}$
The reciprocal of $\frac{1}{3x+5}$ and $\frac{1}{3}$ $(3x+5)\left(\frac{1}{3}\right)$ $\frac{1}{3}(3x+5)$ $x + \left(\frac{1}{3} \cdot \frac{5}{1}\right)$ $\boxed{x + \frac{5}{3}}$	The reciprocal of $\frac{1}{5x-7}$ and 3 $3(5x-7)$ $\boxed{15x - 21}$
The reciprocal of 3 and $-6y - 3x$	The reciprocal of 5 and $-5x + 20$

Independent Practice:

Write the sum of the following expressions.

The opposite of $-10t$ and $t-10t$	$5x$ and $2-5x$
$-x-11$ and the opposite of -11	The opposite of $(1-2g)$ and $-2g$

Write the product of the following expressions.

The reciprocal of $-\frac{4}{3}$ and $(-4x+8)$	$7h-1$ and the multiplicative inverse of 7
The reciprocal of 5 and $(10v-5)$.	The multiplicative inverse of $\frac{1}{4}$ and $5t-\frac{1}{4}$

Activating Prior Knowledge:

We already know how to make 1 and make 0 and can recognize the structure of equations and solve. Solve!

$-4x + 15 = 31$	$5(x - 2) = 15$
$-15 \quad -15$	$5x - 10 = 15$
$\dfrac{-4x}{-4} = \dfrac{16}{-4}$	$+10 \quad +10$
$\boxed{x = -4}$	$\dfrac{5x}{5} = \dfrac{25}{5}$
	$\boxed{x = 5}$

Closure:

Is the opposite of $-45x - 30y$ equivalent to $-15(-3x - 2y)$? Why or why not?

Teacher Notes: