Simplifying Expressions: **7. EE.1** **Saturday, December 14, 2013**

Name: _____ Class: _____ Date: _____

Lesson 3: Properties of Operations to Simplify Algebraic Expressions

OBJECTIVES: SWBA to

Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. **(7. EE.1)**

INTRODUCTION:

We use expressions and equations frequently in our lives. We observe and look for patterns in nature, school, work patterns and making generalizations to explain certain behaviors. For instance,

1. In Chemistry--when combining elements and find prices (of the mixture) or percentages (of, say, acid or salt).
2. In manufacturing when involving two or more people or things working together to complete a task, and finding how long they took
3. In computer programming to write computer codes
4. Entertainment and social events—to determine how of a product you can buy with certain amount of money
5. Forensic scientists use expressions to estimate length of bones, time of death, etc.

MINI-LESSON + Vocabulary (I DO):

Variable (description): A *variable* is a symbol (such as a letter) that represents a number, i.e., it is a placeholder for a number.

Equivalent Expressions: Two expressions are *equivalent* if both expressions evaluate to the same number for every substitution of

Term (description): Each summand of an expression in expanded form is called a *term.* For example, the expression $2x + 3x + 5$ consists of 3 terms: $2x$, $3x$, and 5.

Coefficient of the Term (description): The number found by multiplying just the numbers in a term together. For example, given the product $2 \cdot x \cdot 4$, its equivalent term is $8x$. The number 8 is called the coefficient of the term $8x$.

An Expression in Standard Form: An expression in expanded form with all its like terms collected is said to be in *standard form.* For example, $2x + 3x + 5$ is an expression written in expanded form; however, to be written in standard form, the like terms $2x$ and $3x$ must be combined. The equivalent expression $5x + 5$ is written in standard form.

For the next two weeks, I am going to use the properties of operations (commutative, associative, and distributive properties) to simplify algebraic expressions. Today, I am going use the distributive property to add and/or **subtract** algebraic expressions with rational coefficients. In order to simplify an algebraic expression, we must follow the following steps:

1. Apply the distributive property

2. Combine ***like terms***: terms that have the same variable and exponent. For instance, 3x and x, or $3x^2$ and $4x^2$, and 5 and 6 are like terms. Now, 4x and $2x^2$ are not like terms because even though they have the same variable, x, they have different exponents (powers).

Simplifying Expressions: **7. EE.1** **Saturday, December 14, 2013**

Name: _____ Class: _____ Date: _____

Modeling (I do continues)

Problem 1: Simplify ***4(x + 5) + 10x + 3***

Step	***What***	***why***
1	4(x + 5) + 10x+ 3	**Original expression**. This expression involves the **distributive property** because of the parentheses.
2	4•x +4•5 + 10x +3 4x + 20 + 10x +3	***Apply the distributive property***. Distribute 4 over (x+5).
3	14x + 23	**Combine or collect like-terms**: 4x and 10x, 20 and 3 are like terms.
4	14X + 23	**Solution:** The expression is now in **standard form** and it equivalent to the original expression.

Guided Practice: (We Do):

Simplify the expression below.

$$(3x^2 + 4x - 3) - (2x - 1)$$

Show your work.

Solution:

Step	***What***	***why***
1	$(3x^2+4x-3)-(2x-1)$	**Original expression**. This expression, believe or not, involves the **distributive property** because of the parentheses.
2	$1(3x^2+4x-3)-1(2x-1)=$ $1\bullet3x^2+1\bullet4x-1\bullet3+(-1)\bullet2x+(-1)(-1)=$ $3x^2+4x-3-2x+1$	***Apply the distributive property***. Distribute 1 over the first set of ( ) and -1 over the second set of ( ) from left to right.
3	$3x^2+4x-3-2x+1=$ $3x^2-2x-2$	**Combine or collect like-terms**: 4x and -2x, -3 and 1 are like terms. $4x^2$ cannot be combined with any of the terms.
4	$3x^2-2x-2$	**Solution:** The expression is now in **standard form** and it equivalent to the original expression.

Lesson Summary

Terms that contain exactly the same variable can be combined by addition or subtraction because the variable represents the same number. Any order, any grouping can be used where terms are added (or subtracted) in order to group together like terms. Changing the orders of the terms in a sum does not affect the value of the expression for given values of the variable(s) because addition is commutative.

Designed by Alejandro Rivera, MS319 Mathematics Coach

Simplifying Expressions: **7. EE.1** **Saturday, December 14, 2013**

Name: _____ Class: _____ Date: _____

Independent Practice (You do):

Problem 1:

Rewrite $\mathbf{5}\boldsymbol{a} - (\boldsymbol{a} - \mathbf{3}\boldsymbol{b})$ in standard form. Justify each step applying the rules for subtracting and the distributive property.

Show your work:

Problem 2:

Expand this expression and **combine** like terms: $-\mathbf{3}(\mathbf{2}\boldsymbol{p} - \mathbf{3}\boldsymbol{q})$**.**

Show your work.

Simplifying Expressions: **7. EE.1** **Saturday, December 14, 2013**

Name: _____ Class: _____ Date: _____

Problem 3:

Write this expression in standard form: $\mathbf{6(-5r-4)-2(r-7s-3)}$

Show your work:

Problem 4:

What is the sum of $(x^2 - 3x + 2)$ and $(5x^2 - 3x - 8)$?

Show your work.

Answer _____

Simplifying Expressions: **7. EE.1** **Saturday, December 14, 2013**

Name: _____ Class: _____ Date: _____

Problem 5:

Write this expression in standard form: $\frac{1}{4}(4x + 8)$.

Show your work.

Problem 6:

Write this expression in standard form: $(10x - 5) - 3$.

Show your work.

Problem 7: Challenge

If $P = a^2 + a - 1$ and $R = -a - 1$, which expression represents $P + R$?

A $a^2 + 2$

B $a^2 - 2$

C $a^2 + 2a$

D $a^2 + 2a - 2$

Simplifying Expressions: **7. EE.1** **Saturday, December 14, 2013**

Name: _____ Class: _____ Date: _____

Final Summary

In a U-Shape:

1. Re-state the objective to assess if students learn it
2. Elicit from students what they have learned and what they want to learn more about.
3. Tie what they learn to the lesson, and upcoming lessons (Next Saturday, they will learn about proportion, a comparison of two ratios!)