Name: _____ Date: _____

EQUIVALENT EXPRESSIONS
COMMON CORE ALGEBRA I

The idea of **equivalent expressions**, or **equivalency**, is extremely important. It is the basis of many if not most of our **algebraic manipulations**. The definition of equivalent expressions is given below.

EQUIVALENT EXPRESSIONS

Two (or more) algebraic expressions are **equivalent** if they have the same value for every value of the substitution variable (or variables). In other words, no matter what value you stick in for x (or y or z) the two expressions come out equal.

***Exercise* #1:** Consider the three expressions below. By substituting in the values of x given, determine which two expressions are **equivalent**. Show your calculations of the expressions' values and circle your final answers.

	$5(x-3)$	$5x-3$	$5x-15$
$x=7$			
$x=0$			
$x=1$			

***Exercise* #2:** Which property, the commutative, associative, or distributive, justifies the **equivalency** of the two expressions you determined to be equivalent above?

***Exercise* #3:** Which of the following expressions is equivalent to $5(2x+1)-4$? Show your work to justify your response. Test at least one value of x to check your answer.

(1) $10x-3$ (3) $10x+1$

(2) $7x-3$ (4) $7x+1$

***Exercise* #4:** Which of the following expressions is equivalent to $\frac{4(3x+1)-2}{2}-5$? Again, show your work by thinking carefully about order of operations and the properties we have learned about. Finally, check your answer by substituting a value of *x*. Show this check.

(1) $4x-3$ (3) $6x+3$

(2) $4x+1$ (4) $6x-4$

The last exercise is an example of an expression with a fair number of operations within it. Sometimes, it is just as important to recognize more simple equivalencies.

***Exercise* #5:** Which of the following expressions is equivalent to $10x+15$? Explain how you made your choice in the space provided.

(1) $2(8x+13)$ (3) $5(5x+3)$

(2) $5(2x+3)$ (4) $10(x+5)$

The last problem is an example of what is known as **factoring.**

FACTORING EXPRESSIONS

Factoring is the process of writing an **equivalent expression** as purely the product of other expressions.

Factoring will be one of the most important skills that we want to reach **fluency** with, but for now we will do some fairly easy factoring by simply applying the **distributive property** in "reverse" if you will.

***Exercise* #6:** Factor each of the following expressions by writing an equivalent expression that is in the form of a product. Check your work by using the distributive property.

(a) $6x+21$ (b) $-2x+10$ (c) $14x+14$

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EQUIVALENT EXPRESSIONS
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Use the Associative, Commutative and Distributive properties to write the expression given as an equivalent expression in simplest form.

(a) $2x+8+3x-3$ (b) $3x+(5x+2x)$ (c) $(3x-4)+(2x+1)$

(d) $6(2-3x)+1$ (e) $x+4-2\left(\frac{1}{2}x+3\right)$ (f) $3(x+2)-2(x+1)$

(g) $\frac{12x+18}{6}$ (h) $\frac{2(5x+3)-4}{2}+1$ (i) $\frac{\frac{1}{2}(4x+8)-8}{2}$

2. Factor each of the following by using the distributive property.

(a) $14x+21$ (b) $6-3x$ (c) $(2x+4)+(3x-14)$

APPLICATIONS

3. Four friends have an assortment of Snack bars that cost *S* dollars each, Munch bars that cost *M* dollars each and Chewies that cost *C* dollars each that they sell to raise money for a trip they are taking. They decide to split the money from the sales evenly between the four friends. They create an expression to make sure everyone gets the same amount. The amount each friend receives is given by the complicated expression

$$\frac{(5C+5S)+(2M+4S)+(10C+M)+(C+3S+M)}{4}$$

(a) Write an equivalent expression that simplifies the amount that each friend will earn in terms of the **unit costs** *S*, *M*, and *C*.

(b) If Snack bars cost \$3 each, Munch bars cost \$5 each and Chewies cost \$4.50 each, then how much does each friend earn?

REASONING

4. Taylor is factoring the following expression but notices she got the wrong answer when checking her work. Identify what she did wrong and show her the appropriate way to factor.

Taylor's work:

$12x+3=3(4x)$

Your work:

Taylor's Check:

$3(4x)=12x$ #

Your check:

5. State which property (associative, commutative, or distributive) was used to get from one equivalent expression to the next.

$-2(3x+5)+4(2x-1)$

$=-6x-10+4(2x-1)$ _____

$=-6x-10+8x-4$ _____

$=-6x+8x-10-4$ _____

$=(-6x+8x)+(-10-4)$ _____

$=(-6+8)x-1(10+4)$ _____

$=2x-14$