Name: ____________________________________ Date: __________________

MORE COMPLEX EQUIVALENCY
COMMON CORE ALGEBRA I

We should now have a better ability to work with exponents. In this lesson we will continue to explore expressions that are **equivalent** but look different. We will be primarily sticking with linear expressions (those where x is only raised to the first power) and quadratic expressions (where x is raised to the second power). Recall that two expressions are **equivalent** if they return equal values when values are substituted into them.

***Exercise* #1:** Consider the product $(x-2)(x+5)$. It is equivalent to one of the expressions below. Determine which by substituting in two values of x to check.

	$(x-2)(x+5)$	x^2-10	$x^2+3x-10$
$x=3$			
$x=5$			

The last exercise is pretty interesting. It would seem that if you were just **mindlessly manipulating** the product of the two binomials, then you would likely think two expressions were equivalent, when they are not. Let's find out in the next exercise how to multiply out two simple binomials using a variety of properties.

***Exercise* #2:** The steps in finding the product of $(x+3)(x+5)$ are shown below. Write down the justification for each step.

Step 1: $(x+3)(x+5)=(x+3)\cdot x+(x+3)\cdot 5$ Justification: ______________________________

Step 2: $(x+3)\cdot x+(x+3)\cdot 5=x\cdot x+3\cdot x+x\cdot 5+3\cdot 5$ Justification: ______________________________

Step 3: $x\cdot x+3\cdot x+x\cdot 5+3\cdot 5=x\cdot x+x(3+5)+3\cdot 5$ Justification: ______________________________

$=x^2+8x+15$

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Wow! That's a lot of justification. The process of multiplying binomials is very important in algebra, so it's another skill we would like to get **fluent** with. Get some practice in the next exercise. Keep in mind that you are simply doing the distributive property twice.

***Exercise* #3:** Write out each of the following as equivalent trinomials (an expression involving three terms).

(a) $(x+6)(x+3)$

(b) $(x-4)(x+6)$

(c) $(x-3)(x-3)$

(d) $(2x+3)(3x+1)$

(e) $(3x-4)(3x+2)$

(f) $(4x-1)(x-7)$

***Exercise* #4:** Jeremy has noticed a pattern that he thinks is always true. If he picks any number and finds the product of one number larger and one number smaller than it, the result is always one less than the square of his number.

(a) Test some numbers out and see if Jeremy's pattern holds.

(b) Give an algebraic explanation that shows that Jeremy's pattern will work for any number. Use **let statements** to clearly **define** your variables.

***Exercise* #5:** Which of the following expressions is equivalent to the product $(x-2)(x-4)$? Show the calculations that you use to find your choice and test using a value of *x*.

(1) x^2+8

(3) x^2-6x+8

(2) x^2-6x-8

(4) x^2-8

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More Complex Equivalency
Common Core Algebra I Homework

Fluency

1. Rewrite each expression as a simpler, equivalent expression by first using the Distributive Property and then combining terms.

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

(d) $4x(2x+3)$ (e) $(3x-4)(3x+2)$ (f) $(x+3)(x-3)$

(g) $(3x+4)(2x-1)$ (h) $(x-3)(x-3)$ (i) $(x-2)^2$

2. Which of the following expressions is equivalent to $(x+7)^2$? Test with a value of *x*. Show your test.

(1) x^2+49 (3) $(x+7)(x+7)$

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

3. Continuing with the expression $(x+7)^2$, do the following.

(a) By using the Distributive Property twice, show that this expression is equivalent to $x^2+14x+49$.

(b) Test the equivalency by finding the value of $(x+7)^2$ and $x^2+14x+49$ when $x=3$.

$(x+7)^2$ $x^2+14x+49$

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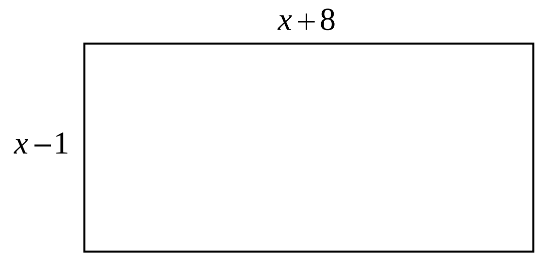
APPLICATION

4. When reading some schematics of a rectangular garden you see the binomial $x+8$ feet represents the length and the binomial $x-1$ feet represents the width. Write an expression that represents the total area of the garden in the form x^2+bx+c by using the distributive property.

Recall that $\text{Area} = \text{Length} \times \text{Width}$



(b) Test to make sure that your expression from above is equivalent to $(x-1)(x+8)$ using the following values of *x*. Show your tests for equivalency.

$x=3$ $\quad (x-1)(x+8) \quad$ Your Expression:

$x=10$ $\quad (x-1)(x+8) \quad$ Your Expression:

REASONING

5. Mariah thinks that the following rule should always hold true. Should it? Find evidence for or against the following equivalency rule by substituting various values in for *a* and *b*.

$$(a+b)^2 = a^2 + b^2$$

6. Using your understanding of the distributive property, write an equivalent expression of $(a+b)^2$ in terms of *a* and *b*. Hint: if you're having trouble, try referencing problem #2 and #3.

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