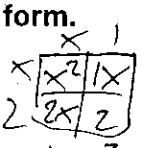
CCSS Advanced Algebra 4 Name:_____

Factoring Polynomials

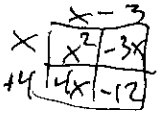
Recall that factoring is the distributive property in reverse. When you distribute polynomials, you use an area model to keep track of like terms. When you factor, you also use an area model.

1. Distributing: Use an area model to distribute each product of polynomials. The answer you get is called **standard form.**
   a. (x + 1)(x + 2)



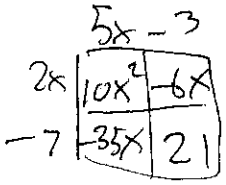
x^2+3x+2

   b. (x - 3)(x + 4)



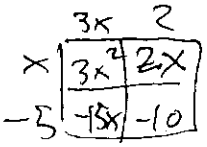
x^2+x-12

   c. (3x + 2)(x - 5)



$10x^2-41x+21$

   d. (5x - 3)(2x - 7)

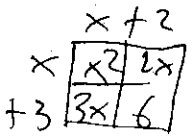


$3x^2-13x-10$

2. What patterns did you notice when you distributed the products of polynomials?

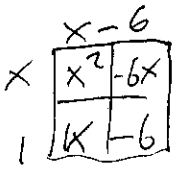
The product goes in the bottom right. The sum goes in the top left & bottom right.

3. Factoring: Use an area model to work backwards and "undistribute" each polynomial. The answer you get is called **factored form.**
   a. $x^2 + 5x + 6$



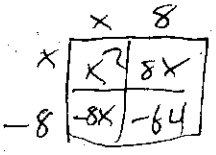
$(x+2)(x+3)$

   b. $x^2 - 5x - 6$



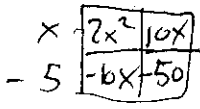
$(x+1)(x-6)$

   c. $x^2 - 64$



$(x+8)(x-8)$

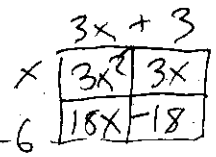
   d. $2x^2 - 50$



$(x-5)(2x+10)$

$2(x-5)(x+5)$

   e. $3x^2 - 15x - 18$



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

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

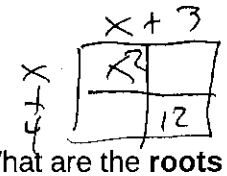
4. What patterns did you notice when you factored the polynomials? Write notes to help remember what you figure out.

Find #'s that multiply to be the constant term.

5. Factoring and Graphing: *What does factoring tell us about the graph of a polynomial?*
   a. Graph $f(x) = x^2 + 7x + 12$. What are the roots of the **standard form** of *f*? (**roots** are a synonym for x-intercepts, or zeroes).

$x = -3, \quad x = -4$

   b. Factor f(x) using an area model



$(x+3)(x+4)$

   c. Graph the **factored form** of f(x). What are the **roots** of the **factored form** of *f*?

$x = -3, \quad x = -4$

   d. What is similar about the graphs in part (a) and part (c)?

Exactly the same graph.

   e. Which version of the equation tells you the roots? Which version tells you the y-intercept? Be sure to write notes about what you figure out.

Factored tells you roots. Standard tells you y-int

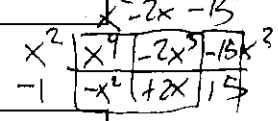
6. For each polynomial, write the **standard form**, the **factored form**, and identify the **roots** and **y-intercept**
   a. $y = (x - 5)(x + 3)$

Standard Form	Factored Form	Roots	y-intercept
$x^2 - 2x - 15$	$(x-5)(x+3)$	$5, -3$	-15

   b. $y = x^2 - 3x - 18$

Standard Form	Factored Form	Roots	y-intercept
$x^2 - 3x - 18$	$(x-6)(x+3)$	$6, -3$	-18

   c. $y = (x-1)(x+1)(x-5)(x+3) = (x^2-1)(x^2-2x-15)$



Standard Form	Factored Form	Roots	y-intercept
$x^4 - 2x^3 - 16x^2 + 2x + 15$		$1, -1, 5, -3$	15

   d. $y = x^3 - 3x^2 - 18x = x(x^2 - 3x - 18) = x(x-6)(x+3)$

Standard Form	Factored Form	Roots	y-intercept
$x^3 - 3x^2 - 18x$	$x(x-6)(x+3)$	$0, 6, -3$	0