Name: ______________________ Date: ______________________ Hour: ____Alg 1____

Unit 7C Day 29: The "Why" of Factoring and Factoring Binomials

Focus Question: What is factoring and why is it useful? Can I factor a binomial?

A. One case for factoring: $0=a(x-h)^2+k$

1. To solve a quadratic in vertex form we had to reverse order of op.
2. To solve a quadratic in standard form we could…
   - do the quadratic formula $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

   OR

   - Use the process of complete the square then solve
3. To solve a quadratic in intercept form we had to $x-p=0$ (or 2step eq.
4. Which of the ways above was easiest to you? ↗
5. Most people prefer solving from intercept form and believe it is easiest. What was the other name for intercept form? Factored form
6. What does it mean to be a factor? its part of a multiplication prob.

Factoring is the process of turning a standard form polynomial into the polynomials that were multiplied to create it. For a quadratic we will be finding the monomials or binomials that were multiplied to make our trinomial. **Most people believe factoring is the easiest way to solve a quadratic. BUT…**

7. Do ALL quadratics have real rational x intercepts? No!
8. So will the process we are going to learn work for EVERY quadratic? No!
9. What helps us determine if a quadratic has real rational x – intercepts?

   discriminant $b^2-4ac>0$ & perfect sq.
10. If a quadratic won't factor, what will you have to remember to solve it?

    quad. form or comp. the sq.

B. The Second Case for Factoring

The reason you learned to write numbers as factors was so you could reduce fractions. . $\frac{10}{12}\rightarrow\frac{\cancel{2}\cdot5}{\cancel{2}\cdot6}\rightarrow\frac{5}{6}$

Remember that fractions are division problems.

So when you are in algebra II and required to divide polynomials, you will be using the process of finding the factors. $\frac{x^2+3x-4}{x-1}\rightarrow\frac{\cancel{(x-1)}(x+4)}{\cancel{(x-1)}}\rightarrow x+4.$

C. Factoring Binomials (two terms…starting easy with the opposite of distributing.)

1. Distribute showing all work $3(x+7)$

   $3(x)+3(7)$

   $3x+21$

In factoring, you are "undoing" the distribution of a factor that has occurred.

Distributing	What's happening	Factoring	What's happening
$3(x+7)$ $3(x)+3(7)$ $3x+21$	The two factors being multiplied are 3 and the expression x + 7. We know that we distribute (or **multiply**) the 3 to each term in the second factor	$3x+21$ $3(x)+3(7)$ $3(x+7)$	The common factor of 3x and 21 is 3 When 3x is **divided** by 3, x is left When 21 is **divided** by 3, 7 is left So when the factor 3 is pulled to the front, the x + 7 remains as the other factor.

2. Factor each degree 1 expression below (you did this in 6th grade!)

a. 6x + 9 b. 20y - 5 c. $2m + \frac{2}{3}$ d. -4x – 40 e. -3x + 20

$3(2x)+3(3)$ $5(4y)-5(1)$ $2(m)+2(\frac{1}{3})$ $-4(x)$ $-4(10)$ $-1(3x)-1(-20)$

$3(2x+3)$ $5(4y-1)$ $2(m+\frac{1}{3})$ $-4(x+10)$ $-1(3x-20)$

3. A quadratic with a y intercept of (0,0) will look like $f(x) = ax^2 + bx$. This will always factor because __x__ is a factor of both terms.

4. In an intercept form quadratic, $f(x)=a(x-p)(x-q)$, which value tells you how it opens? __a__

So even though we say "greatest" common factor, if *a* (or the leading coefficient) is negative, we want to factor out the negative.

5. Turn each function below into intercept form

a. $f(x) = x^2 - 8x$ b. $g(x) = -6x^2 + 15x$ c. $h(x) = 4x^2 - 20x$ d. $j(x) = \frac{1}{2}x^2 + 10x$

a. $= x(x) + x(-8)$
$= x(x-8)$

b. $-3x(2x) - 3x(-5)$
$-3x(2x-5)$

c. $4x(x) + 4x(-5)$
$4x(x-5)$

d. $\frac{1}{2}x(x) + \frac{1}{2}x(20)$
$= \frac{1}{2}x(x+20)$

6. Rather than use the quadratic formula, solve each quadratic by factoring

a. $f(x) = 2x^2 - 10x$ b. $g(x) = -x^2 + 12x$ c. $h(x) = \frac{1}{2}x^2 + 6x$

a. $0 = 2x(x) + 2x(-5)$
$0 = 2x(x-5)$
$\boxed{x=0}$ or $x-5=0$
$+5\ +5$
$\boxed{x=5}$

b. $0 = -1x(x) - 1x(-12)$
$0 = -1x(x-12)$
$\boxed{x=0}$ or $x-12=0$
$+12\ +12$
$\boxed{x=12}$

c. $0 = \frac{1}{2}x(x) + \frac{1}{2}x(12)$
$0 = \frac{1}{2}x(x+12)$
$\boxed{x=0}$ or $x+12=0$
$-12\ -12$
$\boxed{x=-12}$