Key 9/14/15

Unit 2 – Day 3: Solving Quadratics Algebraically Investigation Name:

Introduction: Today we will find the relationship between 2 **linear** binomials and their product, which is a quadratic expression, represented by the form $ax^2 + bx + c$. First we will generate data and then look for patterns.

Part I. Generate Data
Use the distributive property to multiply and then simplify the following binomials.

1. $(x+3)(x+5)$ $x^2+8x+15$
2. $(x+4)(x-2)$ x^2+2x-8
3. $(x-1)(x-2)$ x^2-3x+2

2. What does it mean for an equation to "hit the ground"? Where do you expect each of the above equations to "hit the ground"?

Part II. Organize Data

Fill in the following chart using the problems from above

FACTORS	PRODUCT ax^2+bx+c	a	b	c
$(x+3)(x+5)$	$x^2+8x+15$	1	8	15
$(x+4)(x-2)$	x^2+2x-8	1	2	-8
$(x-1)(x-2)$	x^2-3x+2	1	-3	2

Part III. Analyze Data
Answer the following questions given the chart you filled in above

1. Initially, what patterns do you see?
   ans. will vary
2. How is the value of "a" related to the factors you see in each problem?
   a = # in front of x^2
3. How is the value of "b" related to the factors you see in each problem?
   b = ~~product~~ sum of values
4. How is the value of "c" related to the factors you see in each problem?
   c = product of values

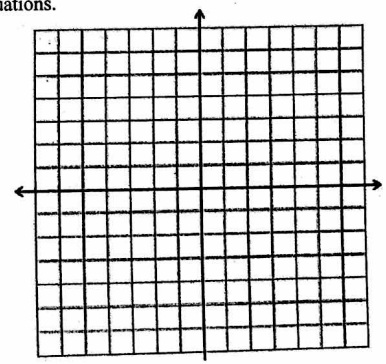
Part IV: Application
Fill in the values for *a*, *b*, and *c* in the following chart. Using your rules from part III, work backwards to find 2 binomial factors for each product. Put these in the first column.

FACTORS	PRODUCT ax^2+bx+c	a	b	c	Hint: List factors of "c"
$(x+4)(x+2)$	x^2+6x+8	1	6	8	4·2 1·8
$(x+4)(x+3)$	$x^2+7x+12$	1	7	12	4·3 6·2 12·1
$(x+12)(x+1)$	$x^2+13x+12$	1	13	12	4·3 6·2 12·1
$(x+5)(x-2)$	$x^2+3x-10$	1	3	-10	-5·2 -2·5 -10·1 -1·10
$(x-5)(x+2)$	$x^2-3x-10$	1	-3	-10	-5·2 -2·5 -10·1 -1·10
$(x-9)(x-6)$	$x^2-15x+54$	1	-15	54	-9·-6 -18·-3 -54·-1 -2·-27

For each of the quadratics above, use your graphing calculator to inspect where the quadratic "hits the ground", or touches the x-axis.

1. What do you notice about the relationship between the factors and the x-intercepts?
   They are opposites. Ex: factor of $(x-2)$ touches x-axis @ $x=2$.
2. Why is factoring a useful skill to learn?
   allows me to locate x-ints w/out graphing.
3. Choose one of the quadratics above and create a rough sketch of the graph using all the information you know about quadratic equations.

ans. will vary.



PART VI: Factoring Quadratics where $a \neq 1$

What if the problem has "a" value that is not equal to 1?

For example $4x^2+8x+3=0$:

How can we algebraically find where this graph = 0? Factor!

The concept of ***un-distributing*** is still the same!!

$$4x^2+8x+3=0$$

In this case we need to find out what multiplies to give us $a \bullet c$ but adds to give us b.

Let's list all the factors of $4 \bullet 3$ or 12:

$1 \bullet 12$
$2 \bullet 6$
$3 \bullet 4$

Which one of those sets of factors of 12 also add to give us the b value, 8? 2 and 6

Now factor the quadratic:

$4x^2 + 8x + 3 = 0$

$(2x+1)(2x+3) = 0$

$2x + 6x = 8x$ ✓

Solve for the zeros:

$2x+1=0$ or $2x+3=0$

$2x=-1$ $2x=-3$

$x=-1/2$ or $x=-3/2$

★ remember: Zero Product Property states that when the product of two numbers equals zero, one of those two numbers must be zero!

U2D3 Homework Name_____

Solving Quadratic Functions by Factoring

Date_____ Period____

Find the Zeros of each by Factoring.

1) $(k+1)(k-5)=0$

2) $(a+1)(a+2)=0$

3) $(4k+5)(k+1)=0$

4) $(2m+3)(4m+3)=0$

5) $x^2-7x-18=0$

6) $p^2-5p-14=0$

7) $m^2-9m+8=0$

8) $7k^2+9k=0$

9) $n^2-10n+22=-2$

10) $n^2+3n-12=6$

11H) For what values of b is the expression factorable?
$x^2+bx+12$

12H) Name four values of b which make the expression factorable:
x^2-3x+b