Week 7

5-26 through 5-29 Algebra math

Main Topic: Converting to General form
You are going to learn how to convert the quadratic forms of both factored form and vertex form to general form
Why does this learning matter?
When working with quadratic functions we can convert from one form to another for several different uses. There are often times when general form is the most useful form and therefore being able to convert a quadratic function to general form is useful.
The plan for the week :
• Monday: Memorial day (Goal: Enjoy your time) • Tuesday: Read and recall how to use the distributive property (Goal: Be able to use the distributive property and recognize it's use with quadratic functions) • Wednesday: Convert from factored form to general form. Use FOIL and combine like terms to go from factored form to general form (Goal: Know how to use FOIL to convert from factored form to general form) • Thursday: Convert from vertex form to general form. You will use FOIL and combine like terms. (Goal:Be able to convert from vertex form to general form) • Friday: Sudoku (Goal: Have fun with a challenge)
Who To Ask For Help and How To Reach Them
Mr. Humphrey e-mail or phone are great. E-mail: Khumphrey@fernridge.k12.or.us Phone 541.782.8255

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We just finished being able to understand all three forms of quadratic functions. Those are of course Vertex Form, General Form and Factored form. All quadratic functions can be written in any one of these forms even though they may not always appear to. Moving forward we are going to use *Algebra in order to manipulate functions to get something useful* out of them. Keep this in mind as we move forward and then the math will make more sense.

Again those functions we have learned are:

- Vertex Form: $f(x) = a \cdot (x-h)^2 + k$
- General Form: $f(x) = ax^2 + bx + c$
- Factored Form: $f(x) = a(x-r_1)(x-r_2)$

Today we are going to explore the general math involved in understanding changing from one form ie factored form to vertex form. It is helpful to be able to move between the different forms of a quadratic function. In this lesson, you will convert quadratic functions in vertex or factored form into general form. In order to do this, you must know how to multiply two binomials. ***Binomials*** are expressions involving **two terms** like “x − 2”. They are not like terms therefore we cannot put them together.

Let’s review one piece recall the **distributive property** it allows you to distribute a term when multiplying to multiple terms.

Examples

1. Distribute. Easiest

$4(x+2)$

Distribute the four to both terms the x and the +2

$4(x+2)$

This is essentially using the orders of operations and we get

4 times x and 4 times 2

$4x+8$

2. Distribute a little more complicated

$-2(3x-1)$ Distribute the negative 2 to the 3x and the negative two to the negative 1and you get

$-2(3x-1) = -6x+2$

3. Distribute

$x(x-10)$ Distribute the negative x to the x and the x to the negative ten and you get

$x(x-10) = x^2-10x$

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Step 1: Recall the Distributive Property. Rewrite each expression without parentheses using the Distributive Property.

a. $4(x - 5)$ **b.** $-3(2x + 1)$ **c.** $6(2x + 3)$ **d.** $x(x - 3)$

Now look at the quadratic expression $(x + 6)(x + 2)$. In order to multiply the binomials, you must multiply each term of the first binomial by the terms in the second binomial; thus you distribute twice.

$$(x + 6)(x + 2) = x^2 + 2x + 6x + 12$$

Step 2: The expression above can be simplified into general form by combining like terms. Rewrite the expression in general form.

$$(x + 6)(x + 2) = \_\_\_\_\_ + \_\_\_\_\_ + \_\_\_\_\_$$

Step 3: Convert each of the factored form expressions to general form by "double distributing".

a. $(x + 5)(x + 3)$ **b.** $(x - 2)(x + 9)$ **c.** $(x - 10)(x - 1)$

Step 4: Some binomials have variables with coefficients. Multiply the two binomials in the quadratic function below.

$$f(x) = (2x - 1)(2x - 7)$$

Step 5: What are the values of *a*, *b* and *c* in the quadratic function in **Step 4**?

Step 6: Remember that the axis of symmetry for a quadratic function in general form is found at $x = -\frac{b}{2a}$. Find the equation of the axis of symmetry for the function in **Step 4**.

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Step 7: Find the vertex of the parabola. Is this a maximum or a minimum? How do you know?

Step 8: Convert $g(x) = (x + 3)(x + 9)$ into general form. Find the location of the vertex using

$$x = -\frac{b}{2a}.$$

Step 9: What are the *x*-intercepts of the function in **Step 8**? How can you use this to verify the location of the vertex?

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Today we will be converting from factored form to general form. The basis of this is just to combine like terms. Often this is referred to as the ***FOIL*** method after you use the FOIL method you combine like terms. Where you

FOIL stands for Multiplying
First terms
Outside terms
Inside terms
Last terms

Convert each quadratic expression from factored form to general form.

a. $(x + 4)(x - 3)$

a. Distribute each term in the first binomial to the terms in the second binomial.

$$(x + 4)(x + -3) = x^2 - 3x + 4x - 12$$

Combine like terms.

$$x^2 - 3x + 4x - 12 = x^2 + x - 12$$

F $x \cdot x = x^2$
O $x \cdot -3 = -3x$
I $4 \cdot x = +4x$
L $4 \cdot 3 = +12$

Combine like terms which is really just combining the negative 3x and the positive 4x and those combined equal x

So the quadratic function $(x+4)(x-3) = x^2 + x - 12$ hence factored form to general form. If you put these two equations into a graph it would be the same graph.

b. $(5x - 2)(x + 7)$

b. Distribute each term in the first binomial to the terms in the second binomial.

$$(5x - 2)(x + 7) = 5x^2 + 35x - 2x - 14$$

Combine like terms.

$$5x^2 + 35x - 2x - 14 = 5x^2 + 33x - 14$$

F $5x \cdot x = 5x^2$
O $5x \cdot 7 = 35x$
I $-2 \cdot x = -2x$
L $-2 \cdot 7 = -14$

When a quadratic function is in factored form, $f(x) = a(x - r_1)(x - r_2)$, there may be a leading a value in front of the factors. If this is the case, multiply through by the factor <u>after</u> multiplying the binomials.

EXAMPLE 2 Convert $y = 3(x - 2)(x - 1)$ to general form.

SOLUTION

1. FOIL
2. Combine like terms (this always uses orders of operations)

Distribute each term in the first binomial to the terms in the second binomial. $y = 3(x - 2)(x - 1) = 3(x^2 - x - 2x + 2)$

Combine like terms. $= 3(x^2 - 3x + 2)$

Distribute the leading coefficient by multiplying each term. $= 3x^2 - 9x + 6$

$y = 3x^2 - 9x + 6$

EXERCISES

Convert each quadratic expression from factored form to general form.

1. $(x-7)(x+4)$

2. $(x+5)(x-6)$

3. $(x-8)(x-4)$

4. $(x+2)(x+9)$

5. $(3x+2)(x+5)$

6. $(x+1)(8x-3)$

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

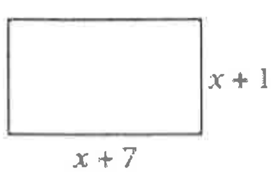
8. $3(2x-1)(x-7)$

9. $2(x+2)(2x+5)$

10. $(3x-4)(4x+1)$

Find the area of the rectangle

11.



There may also be times when you will need to convert a quadratic function from vertex form to general form. In order to convert one form to the other, you must follow the order of operations.

$f(x) = a \cdot (x - h)^2 + k$ → $f(x) = ax^2 + bx + c$

Vertex Form **General Form**

EXAMPLE 3 **Convert $f(x) = 3(x + 4)^2 - 8$ to general form.**

SOLUTION

Rewrite $(x + 4)^2$.	$f(x) = 3(x + 4)(x + 4) - 8$
Multiply the binomials.	$f(x) = 3(x^2 + 4x + 4x + 16) - 8$
Combine like terms inside the parentheses.	$f(x) = 3(x^2 + 8x + 16) - 8$
Multiply by the leading coefficient.	$f(x) = 3x^2 + 24x + 48 - 8$
Combine like terms.	$f(x) = 3x^2 + 24x + 40$

Let's break one down into all of it's parts

Convert to general form $3(x-2)^2 - 4$

Step 1 rewrite $(x-2)^2$ so it is in factored form that mean $(x-2)^2 = (x-2)(x-2)$

Therefore now it's in factored form so we can work with it similiarly to what we did yesterday

so $3(x-2)^2 - 4 = 3(x-2)(x-2) - 4$

Step 2 Now just combine like terms (when you multiply order doesn't matter so we will stay consistent to eliminate confusion but you can also use orders of operations to multiply and you will get the same answer) There are three things to multiply and then you subtract 4

Multiply $3(x-2)(x-2)$ then subtract 4

Use foil $3(x^2 - 2x - 2x + 4) - 4$

Combine like term $3(x^2 - 4x + 4) - 4$

Use the distributive property

Combine like terms $3x^2 - 12x + 12 - 4$

Add the constants $3x^2 - 12x + 8$

Your work will look like this

$$3(x-2)^2 - 4 = 3(x-2)(x-2) - 4$$
$$= 3(x^2 - 2x - 2x + 4) - 4$$
$$= 3(x^2 - 4x + 4) - 4$$
$$= 3x^2 - 12x + 12 - 4$$
$$= 3x^2 - 12x + 8$$

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Excuse the numbering I needed to copy and paste the best problems for you.

Convert the quadratic functions from vertex form to general form.

9. $y=(x+5)^2+1$

10. $g(x)=3(x-2)^2-4$

12. $y=(x+3)^2-4$

13. $g(x)=2(x-1)^2+8$

14. $y=-3(x+2)^2+1$

18. $p(x)=(x-1)^2+5$

19. $f(x)=2(x+2)^2-3$

20. $y=\frac{1}{2}(x+4)^2$

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Week 6 5- 29 Friday Sudoku Name___________________

Pick the one you like best and give it go

Easy

	9		2			5		3
						9	2	
		5		9			1	7
	6		4		7			9
7		9				3		8
8			5		9		7	
5	8			2		7		
	3	6						
1		2			8		9	

Medium

	6							8
1	5				9	3		
	2	3		8		7	9	
			9	5	3	2		
2		5	1		4	6		3
		4	2	6	8			
	1	7		9		5	3	
		2	3				6	9
9							1	

Hard

	7				1			9
		6			9	2	4	
				5				
		5	4	9		6		8
8								2
2		7		8	6	3		
				4				
	8	3	7			9		
5			9				6	