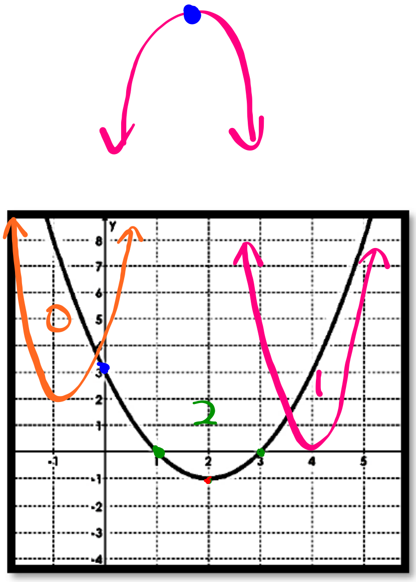
Solving Quadratics (GCF, when a = 1, when a not 1)

Standard(s):
MGSE9-12.A.REI.4 Solve quadratic equations in one variable.

Take a look at the following graph. Do you know what type of graph it is? List some of the things you see:



The Main Characteristics of a Quadratic Function

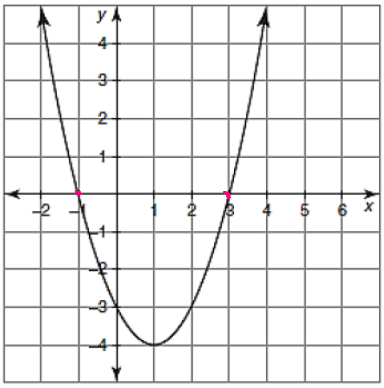
- A quadratic function always has an exponent of 2.
- The standard form of a quadratic equation is $ax^2+bx+c=0$
- The U-shaped graph is called a Parabola.
- The highest or lowest point on the graph is called the Vertex.
- The points where the graph crosses the x-axis are called the x-intercepts
- The points where the graph crosses the x-axis are also called the Solutions to the quadratic equation. A quadratic equation can have 1, 2, or 0 solutions.

Exploration with Factoring and Quadratic Graphs

In this unit, we are going to explore how to **solve quadratic equations**.

Solving a quadratic equation really means:
Finding its Solution, x-intercept, roots **or** Zeros.

Create an equation to represent the following graphs:



Zeros: x = -1 & 3

$y = (x+1)(x-3)$

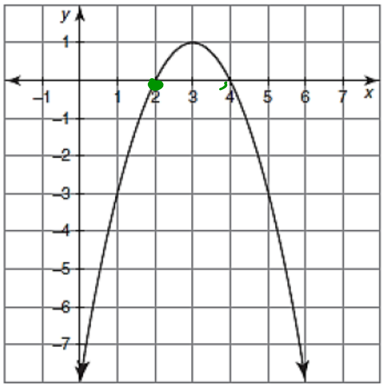
change signs

$x(+1) = 0$

$x = -1$

$x(-3) = 0$

$x = 3$



Zeros: x = 2 & 4

$y = (x-2)(x-4)$

Zero Product Property (ZPP)

$(x+a)(x+b) = 0$

$x+a = 0$

$x+b = 0$

Zero Product Property and Factored Form

Zero Product Property

- The ***zero-product property*** is used to Solve an equation when one side is zero and the other side is a product of binomial factors.
- The zero product property states that if $a \cdot b = 0$, then $a = 0$ or $b = 0$

I do

Examples: Identify the zeros of the functions:

a. $(x - 2)(x + 4) = 0$

$x - 2 = 0$

$x = 2$

$x + 4 = 0$

$x = -4$

b. $x(x + 4) = 0$

$x = 0$

$x + 4 = 0$

$x = -4$

c. $(x + 3)^2 = 0$

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

$x + 3 = 0$

$x = -3$

Practice: Identify the Zeros of the function - You do

d. $y = (x + 4)(x + 3)$

$(x+4)(x+3) = 0$

$x+4=0$ $x+3=0$

$x=-4$ $x=-3$

e. $y = x(x - 9)$

$x=0$ $x-9=0$

$x=9$

f. $f(x) = 5(x - 4)(x + 8)$

$5(x-4)(x+8) = 0$

$x-4=0$ $x+8=0$

$x=4$ $x=-8$

1: Factoring & Solving Quadratic Equations - GCF

Solve the following quadratic equations by factoring (GCF) and using the Zero Product Property.

Practice - I do: Solve the following equations by factoring out the GCF.

1. $3x^2 = 18x$

$3x^2 - 18x = 0$

$3x$

$3x = 0$, $\frac{3x}{3} = \frac{0}{3}$, $x = 0$

$x - 6 = 0$, $x = 6$

Factored Form: $3x(x-6) = 0$

Zeros: $x = 0$; $x = 6$

Practice - You do

Solve the following equations by factoring out the GCF:

2. $-3x^2 - 12x = 0$

$-3x$

$-3x(x+4)=0$

$x=0$; $x=-4$

Factored Form: $-3x(x+4)=0$

Zeros: $x=0$; $x=-4$

2: Factoring & Solving Quadratic Equations when a =1 we do

Solve the following quadratic equations by factoring and using the Zero Product Property.

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

$x^2 - 6x + 9 = 0$

9

-3 -3

-6

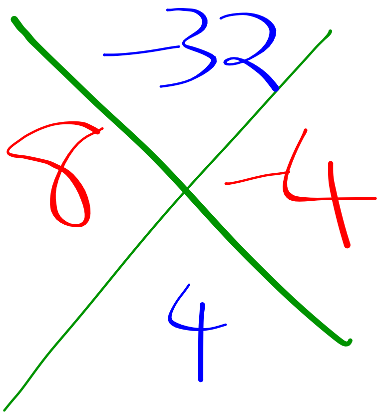
Factored Form: $(x-3)^2 = 0$

Zeros: $x = 3$

Practice - You do

Solve the following equations by factoring and using the ZPP:

4. $x^2 + 4x = 32$ $x^2 + 4x - 32 = 0$



$x - 4 = 0$
$x = 4$

$x + 8 = 0$
$x = -8$

Factored Form: $(x-4)(x+8) = 0$

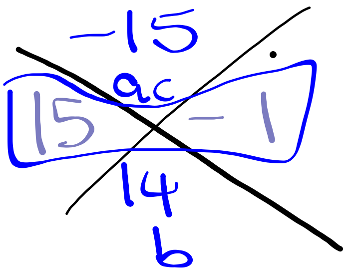
Zeros: $x = 4$; $x = -8$

3: Factoring & Solving Quadratic Equations when a not 1

Solve the following quadratic equations by factoring and using the Zero Product Property. Practice - I do:

5. $y = 5x^2 + 14x - 3$

$5x^2 + 14x - 3 = 0$



	$5x$	-1
x	$5x^2$	$-1x$
$+3$	$15x$	-3

Factored Form: $(x+3)(5x-1) = 0$

Zeroes: $x = -3$; $x = \frac{1}{5}$

$5x - 1 = 0$

$\frac{5x}{5} = \frac{1}{5}$

$x = \frac{1}{5}$

Practice - You do:

6. $2x^2 - 8x = 42$

Factored Form: ____________________

Zeroes: ____________________

$2x^2 - 8x = 42$

$2x^2 - 8x - 42 = 0$

2

$2(x^2 - 4x - 21) = 0$

-21

$-7 \quad 3$

-4

$2(x-7)(x+3) = 0$

$x = 7 ; x = -3$

Solve the quadratic

$$\overset{a}{2}x^2 - \overset{b}{7}x - \overset{c}{4} = 0$$

ac = −8, b = −7: −8 and 1

	$2x$	$+1$
x	$2x^2$	$1x$
-4	$-8x$	-4

$(2x+1)(x-4) = 0$

$2x+1=0$

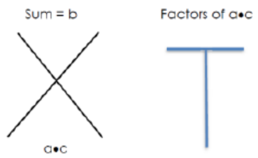
$\frac{2x}{2} = \frac{-1}{2}$

$x = -1/2$

$x = 4$

Review: Methods for Factoring

Before you factor any expression, you must always check for and factor out a **Greatest Common Factor (GCF)!**

	Looks Like	How to Factor	Examples
GCF (Two Terms)	$ax^2 - bx$	Factor out what is common to both terms (mentally or list method) $2m^2$: 2 m m $-8m$: -1 2 2 2 m $2m(m-4)$	$x^2 + 5x = x(x + 5)$ $18x^2 - 6x = 6x(3x - 1)$ $-9x^2 - x = -x(9x + 1)$
A = 1	$x^2 + bx + c$	Think of what two numbers multiply to get the c term and add to get the b term (Think of the diamond). You also need to think about the signs: $x^2 + bx + c = (x + \#)(x + \#)$ $x^2 - bx + c = (x - \#)(x - \#)$ $x^2 - bx - c / x^2 + bx - c = (x + \#)(x - \#)$	$x^2 + 8x + 7 = (x + 7)(x + 1)$ $x^2 - 5x + 6 = (x - 2)(x - 3)$ $x^2 - x - 56 = (x + 7)(x - 8)$
A not 1	$ax^2 + bx + c$	**Area Model:** $3x^2 - 5x - 12$ Columns: 3x, +4 Row x: $3x^2$, +4x Row -3: -9x, -12  **Factored Form :** $(x - 3)(3x + 4)$	$9x^2 - 11x + 2 = (9x - 2)(x - 1)$ $2x^2 + 15x + 7 = (2x + 1)(x + 7)$ $3x^2 - 5x - 28 = (2x + 7)(x - 4)$
Difference of Two Squares	$x^2 - c$	Both your "a" and "c" terms should be perfect squares and since there is no "b" term, it has a value of 0. You must also be subtracting the a and c terms. Your binomials will be the exact same except for opposite signs. **Difference of Squares** $a^2 - b^2 = (a + b)(a - b)$	$x^2 - 9 = (x + 3)(x - 3)$ $x^2 - 100 = (x + 10)(x - 10)$ $4x^2 - 25 = (2x + 5)(2x - 5)$
Perfect Square Trinomials	$x^2 + bx + c$ "c" is a perfect square "b" is double the square root of c	Factor like you would for when a = 1	$x^2 - 6x + 9 = (x - 3)(x - 3) = (x - 3)^2$ $x^2 + 16x + 64 = (x + 8)(x + 8) = (x + 8)^2$

Attachments

- Functions notation.ppt
- Functions Practice HW.docx
- Functions notation notes.ppt
- Factoring Quiz Review.ks-ia1