

Quadratics 3c: Solving Quadratics by Factoring

Standards: A-REI.4b, A-SSE.3a, F-IF.8a

Math Practices: Make sense of problems and persevere in solving them.

GLOs: #3 - Complex Thinker **HW#12:** Quads 3c #1-8

Learning Target:

- How do you use factoring to find solutions of a quadratic equation?

Warmup:

1) $2(x+3)(x-5) = 0$

$$\cancel{2=0} \quad \cancel{x+3=0} \quad \cancel{x-5=0}$$

$$-3 \quad -3 \quad +5 \quad +5$$

$$x = -3 \quad x = 5$$

$$x = -3 \text{ \& } 5$$

2) $5(2x-3)(x+6) = 0$

$$\cancel{5=0} \quad \cancel{2x-3=0} \quad \cancel{x+6=0}$$

$$+3 \quad +3 \quad -6 \quad -6$$

$$\cancel{2x=3} \quad x = -6$$

$$\frac{2x}{2} = \frac{3}{2}$$

$$x = \frac{3}{2}$$

$$x = \frac{3}{2} \text{ \& } -6$$

3) $3(x-1)^2 = 0$

$$3(x-1)(x-1) = 0$$

$$\cancel{3=0} \quad \cancel{x-1=0} \quad \cancel{x-1=0}$$

$$+1 \quad +1 \quad +1 \quad +1$$

$$x = 1 \quad x = 1$$

$$x = 1$$

4) Write in standard form: $f(x) = 3(x-4)(x+1)$

$$f(x) = ax^2 + bx + c$$

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

$$f(x) = 3x^2 - 9x - 12$$

Today we will learn to solve a quadratic equation that is not in factored form. Remember, once we're able to solve quadratic equations we can find the zeros for the corresponding quadratic function, which yields the x-intercepts, which in turn then gives us the vertex.

Lesson: if it's NOT in factored form, try to factor it!

"Solving Quadratic Equations by Factoring"

(erase to show)

1. Write the equation in **Standard Form**:

By setting the equation equal to zero.
(Make sure the ax^2 is positive)

$$ax^2 + bx + c = 0$$

2. **Factor** the quadratic expression.

a. Factor out any common factors (**GCF**) of each term.

b. Try to factor the remaining expression.

« If it has **3** terms, use the **ABC**-Box Method

« If it has **2** terms, check if you can use the Difference of Squares Pattern.

3. Solve using the **Zero Product Property**

If $AB=0$ then either $A=0$ or $B=0$

Example 1: Solve $x^2 - x - 5 = 1$

Solution: $x^2 - x - 5 = 1$

$$x^2 - x - 6 = 0 \quad \text{Subtract 1 from both sides}$$

$$(x - 3)(x + 2) = 0 \quad \text{Factor}$$

$$x - 3 = 0 \text{ or } x + 2 = 0 \quad \text{Use Zero-Product Property}$$

$$x = 3 \quad x = -2 \quad \text{Solve both linear equations}$$

To solve Quadratic Equations in non-factored form follow these steps...

Ex 2: Solve for x. Use factoring when appropriate.

a) $12x^2 + 27 = 36x$

$12x^2 - 36x + 27 = 0$

② $12x^2 - 36x + 27$

• GCF = 3

$3(4x^2 - 12x + 9)$

$4x^2 - 12x + 9$
 $a=4$
 $b=-12$
 $c=9$

$a \cdot c = 36$ $b = -12$

- 1 -36
- 2 -18
- 3 -12
- 4 -9
- 6 -6

	$2x - 3$
$2x$	$4x^2 - 6x$
-3	$-6x + 9$

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

③ $2x-3=0$ $2x-3=0$

$\frac{2x}{2} = \frac{3}{2}$ $\frac{2x}{2} = \frac{3}{2}$
 $x = \frac{3}{2}$ $x = \frac{3}{2}$

$x = \frac{3}{2}$

b) $9x^2 - 25 = 0$

② $9x^2 - 25$

$(3x)^2 - (5)^2$

$(a+b)(a-b)$

$(3x+5)(3x-5) = 0$

③ $3x+5=0$ $3x-5=0$

$\frac{3x}{3} = \frac{-5}{3}$ $\frac{3x}{3} = \frac{5}{3}$

$x = -\frac{5}{3}$ $x = \frac{5}{3}$

$x = -\frac{5}{3} \neq \frac{5}{3}$

① $-7x - 7x$

$x^2 - 7x = 0$

② GCF = $7x$

$x(x-7) = 0$

③ $x=0$ $x-7=0$
 $x=7$

$x = 0 \neq 7$

d) $x^2 = 4x + 45$

$x^2 - 4x = 45$

$x^2 - 4x - 45 = 0$

② • No GCF

$x^2 - 4x - 45$
 $a=1$
 $b=-4$
 $c=-45$

$a \cdot c = -45$ $b = -4$

- 1 -45
- 3 -15
- 5 -9

	$x + 5$
x	$x^2 + 5x$
-9	$-9x - 45$

$(x+5)(x-9) = 0$

③ $x+5=0$ $x-9=0$

$x = -5$ $x = 9$

$x = -5 \neq 9$