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## Factoring to Solve Quadratic Equations

Unit 9 Lesson 4

# FACTORIZING TO SOLVE QUADRATIC EQUATIONS

## Students will be able to:

Understand how to solve quadratic equations by factoring the quadratic equations.

## Key Vocabulary:

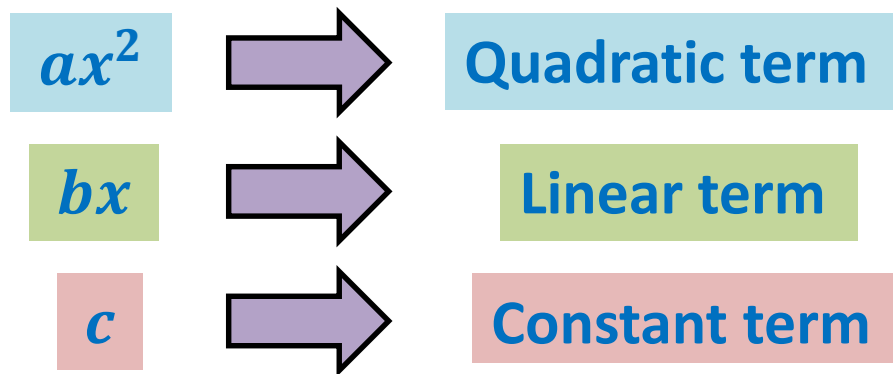
- Quadratic Equation
- Zero-Product Property
- Solution By Factorization

# FACTORIZING TO SOLVE QUADRATIC EQUATIONS

A **quadratic equation** is of the form:

$$f(x) = ax^2 + bx + c = 0$$

Where,  $a \neq 0$ .



# FACTORING TO SOLVE QUADRATIC EQUATIONS

## Zero-Product Property

This property is important when solving the quadratic equations.

If the product of two or more numbers is zero, one of them must be equal to zero.

$$ab = 0 \quad \Rightarrow \quad a = 0 \quad \text{or} \quad b = 0$$

## FACTORING TO SOLVE QUADRATIC EQUATIONS

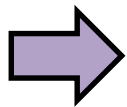
**Problem 1:** What are the solutions of the quadratic equation  $y = (x + 2)(x - 3)$ ?

## FACTORIZING TO SOLVE QUADRATIC EQUATIONS

**Problem 1:** What are the solutions of the quadratic equation  $y = (x + 2)(x - 3)$ ?

Apply the zero-product property:

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



$$(x + 2) = 0$$

or

$$(x - 3) = 0$$

$$x = -2$$

$$x = 3$$

# FACTORING TO SOLVE QUADRATIC EQUATIONS

## Solution by Factorization

In this method, the middle term of the quadratic equation  $ax^2 + bx + c = 0$  i.e.  $bx$  is re-written as a sum of two terms  $mx$  and  $nx$  such that:

$$\Rightarrow (\pm mx) + (\pm nx) = (\pm bx)$$

$$\Rightarrow (\pm mx) \times (\pm nx) = (\pm acx^2)$$

- The algebraic **sum** of two terms is equal to the middle term.
- The algebraic **product** of two terms is equal to the product of the quadratic term and the constant term.

After this, the equation can be simplified and written as  $(x \pm m)(x \pm n) = 0$  and zero product property can be applied to find the values of  $x$ .

## FACTORING TO SOLVE QUADRATIC EQUATIONS

**Problem 2: Find the solution of the quadratic equation  $x^2 - x - 6$ .**



## FACTORING TO SOLVE QUADRATIC EQUATIONS

**Problem 2:** Find the solution of the quadratic equation  $x^2 - x - 6$ .

Break the middle term i.e.  $-x$  into two terms such that their sum is  $-x$  and product is  $1x^2 \cdot (-6) = -6x^2$ .

Take  $-3x$  and  $2x$ :

$$\Rightarrow (-3x) + (2x) = (-x)$$

$$\Rightarrow (-3x) \times (2x) = (-6x^2)$$

$$x^2 - x - 6 = 0 \Rightarrow x^2 + 2x - 3x - 6 = 0 \Rightarrow x(x + 2) - 3(x + 2) = 0$$

$$\Rightarrow (x - 3)(x + 2) = 0 \Rightarrow (x - 3) = 0 \text{ or } (x + 2) = 0$$

$$\Rightarrow x = 3, -2$$