

# Lesson 21: Quadratic Equations

## Review of Quadratic Equations

### Review of the Definition of a Quadratic Equation in One Variable

A quadratic equation in one variable is any second-degree equation that can be written in the form  $ax^2 + bx + c = 0$  where  $a, b,$  and  $c$  are real numbers and  $a \neq 0$ .

If the equation is in this form, we call it the **standard form** of a quadratic equation in one variable,  $x$ .

[  $a$  cannot be zero. If  $a$  were zero then the  $x^2$  term would be zero and one would have a first-degree (linear) equation, not a quadratic equation.]

### Review of the Zero Product Property

Given real numbers  $p$  and  $q$ , if  $pq = 0$ , then  $p = 0$  or  $q = 0$ .

### Review of the steps for Solving a Quadratic Equation by Factoring

1. Write the quadratic equation in standard form ( $ax^2 + bx + c = 0$ ) with the leading coefficient *positive*.  
If the first term is negative, multiply every term of the equation by  $-1$  to **make it positive**.
2. Completely factor the quadratic expression.
3. Use the zero factor property to set each of the factors containing the variable equal to 0.
4. Solve the simpler linear equations.
5. Check the solution(s) in the original equation.

Examples:

$$\begin{aligned}x^2 + 6x + 8 &= 0 \\(x + 4)(x + 2) &= 0 \\x + 4 = 0 \text{ or } x + 2 &= 0 \\x = -4 \text{ or } x = -2 \\ \{-4, -2\}\end{aligned}$$

$$\begin{aligned}w^3 - 25w &= 0 \\w(w - 5)(w + 5) &= 0 \\w = 0 \text{ or } w - 5 = 0 \text{ or } w + 5 = 0 \\w = 0 \text{ or } w = 5 \text{ or } w = -5 \\ \{-5, 0, 5\}\end{aligned}$$

TRY:

$$x^2 - 11x + 18 = 0$$

$$8x^3 + 4x^2 - 8x - 4 = 0 \text{ Solve by grouping, factor completely.}$$