

**Objectives:**

- Today we will learn how to solve quadratic equations using the quadratic formula

**Methods to solving a quadratic:**

Factoring	Taking the Square root	Completing the Square	Quadratic Formula
$x^2 + 7x = 12$	$x^2 + 16 = 25$ $(x - 7)^2 = 8$	$x^2 - 4x + 2 = 0$	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

**What is the best method to solve the quadratic equation?**

1.  $x^2 - x - 30 = 0$     2.  $x^2 - 6x = -90$     3.  $x^2 - 4 = 0$     4.  $\frac{1}{4}(x - 4)^2 = 16$     5.  $2x^2 - 12x = 81$
- FACTORING  
AC Method
- $+90 +90$   
 $x^2 - 6x + 90 = 0$   
COMPLETING  
THE SQUARE
- SQUARE  
ROOT
- SQUARE  
ROOT
- $-81 -81$   
 $2x^2 - 12x - 81 = 0$   
QUAD  
FORMULA

Quadratic Formula:  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

**Example 1:** What is a? What is b? What is c?

Identify a, b, and c in the quadratic equation:  $2x^2 - 3x + 6 = 0$

$a=2$      $b=-3$      $c=6$

**Example 2:** Solve the quadratic equation  $2x^2 + x = 5$  using the quadratic formula.

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

$a=2$   
 $b=1$   
 $c=-5$

$x = \frac{-1 \pm \sqrt{(1)^2 - 4(2)(-5)}}{2(2)}$

$x = \frac{-1 \pm \sqrt{1 - 4(-40)}}{4}$

$x = \frac{-1 \pm \sqrt{41}}{4}$

$x = \frac{-1 + \sqrt{41}}{4}$      $x = \frac{-1 - \sqrt{41}}{4}$

**Practice Problems:** Solve each quadratic equation using any method.

1.  $x^2 - 5x - 14 = 0$

**ac** FACTORING

$-14$   
 $\frac{-14}{-7, 2}$   
 $1, 14$

$x^2 - 7x + 2x - 14 = 0$   
 $x(x-7) + 2(x-7) = 0$   
 $(x-7)(x+2) = 0$   
 $x-7=0 \quad x+2=0$

$x=7 \quad x=-2$

QUAD FORMULA

$a=1 \quad b=-5 \quad c=-14$

$x = \frac{+5 \pm \sqrt{(-5)^2 - 4(1)(-14)}}{2(1)}$

$x = \frac{5 \pm \sqrt{25 + 56}}{2}$

$x = \frac{5 \pm \sqrt{81}}{2} = \frac{5 \pm 9}{2}$

$x = \frac{5+9}{2} \quad x = \frac{5-9}{2}$

$x=7 \quad x=-2$

2.  $x^2 - 2x = 4$

COMPLETE THE SQUARE

$x^2 - 2x - 4 = 0$   
 $x^2 - 2x + (\frac{2}{2})^2 = 4 + (\frac{2}{2})^2$   
 $(x-1)^2 = 5$

$(x-1) = \pm\sqrt{5}$

$x-1 = +\sqrt{5} \quad x-1 = -\sqrt{5}$

$x=1+\sqrt{5} \quad x=1-\sqrt{5}$

QUAD FORMULA

$a=1 \quad b=-2 \quad c=-4$

$x = \frac{+2 \pm \sqrt{(-2)^2 - 4(1)(-4)}}{2(1)}$

$x = \frac{2 \pm \sqrt{4 + 16}}{2}$

$x = \frac{2 \pm \sqrt{20}}{2}$

3.  $16x = -x^2 - 46$

$+x^2 + 16x + 46 = 0$

$x^2 + 16x + 46 = 0$   
 $-46 \quad -46$

$x^2 + 16x + (\frac{16}{2})^2 = -46 + (\frac{16}{2})^2$

$\sqrt{(x+8)^2} = \sqrt{18}$

$x+8 = \pm\sqrt{18}$

$x = -8 + \sqrt{18} \quad x = -8 - \sqrt{18}$

**ac**  
 $46$   
 $1, 46$   
 $2, 23$

4.  $5x^2 - x - 3 = 0$

QUAD FORM

$a=5 \quad b=-1 \quad c=-3$

$x = \frac{+1 \pm \sqrt{(-1)^2 - 4(5)(-3)}}{2(5)}$

$x = \frac{1 \pm \sqrt{1 + 60}}{10}$

$x = \frac{1 \pm \sqrt{61}}{10}$

$x = \frac{1 + \sqrt{61}}{10}$

$x = \frac{1 - \sqrt{61}}{10}$

5.  $x^2 + 4x = -20$

$3x^2 - 8 = 0$

$3x^2 + 0x - 8 = 0$

$x = \frac{-0 \pm \sqrt{0^2 - 4(3)(-8)}}{2(3)}$

$x = \frac{0 \pm \sqrt{0 + 96}}{6}$

$x = \frac{+\sqrt{96}}{6} \quad x = \frac{-\sqrt{96}}{6}$

6.  $2x^2 + x - 15 = 0$

FACTORING

$2x^2 + 6x - 5x - 15 = 0$

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

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

$x+3=0$

$2x-5=0$

$x=-3$

$x=5/2$

**ac**

$-30$   
 $2, -15$

$-5, +6$