

# 4-1 The Quadratic Formula

**Content Objective:** The student recognizes the advantages of being able to use the quadratic formula for any quadratic equation.

**Language Objective:** Students will communicate the quadratic formula by singing a song and practicing algorithmic procedures with a partner. Student should also be able to communicate using the following vocabulary:

- Quadratic Formula
- roots
- solution
- zeros

$\textcircled{13} \eta(x) = -(x-5)^2 - 3$ 
 $\textcircled{14} x^2 - 25$

$\textcircled{15} x^2 + 10x + 25 = (x+5)^2$   
 $(\frac{b}{a})^2 = c$

$\textcircled{16} x^2 - 14x + 49 = (x-7)^2$   
 $\textcircled{17} x^2 - 8x + 16 = (x-4)^2$   
 $\textcircled{18} x^2 + 2x + 1 = (x+1)^2$

$\textcircled{19} f(x) = (x^2 + 4x + 4) - 4$   
 $f(x) = (x+2)^2 - 4$   
 $V: (-2, -4)$   
 $AoS: x = -2$

$\textcircled{20} f(x) = (x^2 + 8x + 16) - 16$   
 $f(x) = (x+4)^2 - 16$   
 $V: (-4, -16)$   
 $AoS: x = -4$

$\textcircled{21} f(x) = (x^2 - 8x + 16) - 16 - 3$   
 $f(x) = (x-4)^2 - 19$   
 $V: (4, -19)$   
 $AoS: x = 4$

$\textcircled{22} f(x) = (2x^2 + 4x + 1) - 2 + 1$   
 $f(x) = 2(x^2 + 2x + 1) - 1$   
 $f(x) = 2(x+1)^2 - 1$   
 $V: (-1, -1)$   
 $AoS: x = -1$

$\textcircled{23} h = -5t^2 + 60t$ 
  
 $h = -5t^2 + 60t$   
 $h = -5(t^2 - 12t + 36) + 180$   
 $h = -5(t-6)^2 + 180$   
 $V: (6, 180)$   
 6 seconds, 180 meters

Appreciating the Quadratic Formula  
Task

Solve each equation by "Completing the Square."

1.  $x^2 - 2x - 24 = 0$

2.  $3a^2 - 6a - 34 = 0$

4.  $4n^2 + 11n = 15$

Solve Completing the Square Yikes!

$$4n^2 + 11n = 15$$

Honors: Deriving the quadratic formula

Quadratic Formula - "Short Cut"

"Complete the square" of a general equation in standard form to discover a "short cut"

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

## Quadratic Formula

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

Solve each equation using the Quadratic Formula  
(equations on task)

1.  $x^2 - 2x - 24 = 0$

2.  $3a^2 - 6a - 34 = 0$

3.  $4n^2 + 11n = 15$

4.  $4n^2 + 11n = 15$

Practice (simplify completely):

Solve for x.  $ax^2+bx+c=0$      $a=1$     $b=-2$     $c=-10$

$$x^2 - 2x - 10 = 0$$

$$x = \frac{2 \pm \sqrt{(-2)^2 - 4(1)(-10)}}{2(1)} \quad 9+40$$

$$x = \frac{2 \pm \sqrt{44}}{2} < 4 \left( \frac{2}{2} \right) \quad \text{---} x = \quad \frac{2 \pm 2\sqrt{11}}{2}$$

$$x = \frac{2}{2} \pm \frac{2\sqrt{11}}{2}$$

$$x = 1 \pm \sqrt{11}$$

$$1 + \sqrt{11} \quad 1 - \sqrt{11}$$

Solve for x.

$$\begin{array}{r} 3x^2 + 4x + 8 = 2x^2 + 7 \\ -2x^2 \quad -7 \quad -2x^2 \quad -7 \\ \hline \end{array}$$

$$x^2 + 4x + 1 = 0 \quad a=1 \quad b=4 \quad c=1$$

$$x = \frac{-4 \pm \sqrt{16 - 4(1)(1)}}{2(1)} = \frac{-4 \pm \sqrt{12}}{2} \quad \left( \frac{2}{2} \right)$$

$$= \frac{-4 \pm 2\sqrt{3}}{2} = \boxed{-2 \pm \sqrt{3}} = x$$

$$x^2 + 9x = -7$$

$$x = \frac{-9 \pm \sqrt{81 - 4(1)(7)}}{2}$$

$$x = \frac{-9 \pm \sqrt{53}}{2}$$

$$x^2 - 2x - 24 = 0$$

$$\begin{aligned} a &= 1 \\ b &= -2 \\ c &= -24 \end{aligned}$$

$$x = \frac{2 \pm \sqrt{4 - 4(1)(-24)}}{2(1)}$$

$$x = \frac{2 \pm \sqrt{100}}{2} = \frac{2 \pm 10}{2}$$

$$\begin{aligned} \frac{2+10}{2} &= 6 \\ \frac{2-10}{2} &= -4 \end{aligned}$$