

# Unit 7 Lesson 16: The Quadratic Formula

## 1 Evaluate It (Warm up)

### Student Task Statement

Each expression represents two numbers. Evaluate the expressions and find the two numbers.

1.  $1 \pm \sqrt{49}$

2.  $\frac{8 \pm 2}{5}$

3.  $\pm\sqrt{(-5)^2 - 4 \cdot 4 \cdot 1}$

4.  $\frac{-18 \pm \sqrt{36}}{2 \cdot 3}$

## 2 Pesky Equations

### Student Task Statement

Choose one equation to solve, either by rewriting it in factored form or by completing the square. Be prepared to explain your choice of method.

1.  $x^2 - 2x - 1.25 = 0$

2.  $5x^2 + 9x - 44 = 0$

3.  $x^2 + 1.25x = 0.375$

4.  $4x^2 - 28x + 29 = 0$

### 3 Meet the Quadratic Formula

#### Student Task Statement

Here is a formula called the **quadratic formula**.

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

The formula can be used to find the solutions to any quadratic equation in the form of  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$ , and  $c$  are numbers and  $a$  is not 0.

This example shows how it is used to solve  $x^2 - 8x + 15 = 0$ , in which  $a = 1$ ,  $b = -8$ , and  $c = 15$ .

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	original equation
$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(15)}}{2(1)}$	substitute the values of $a$ , $b$ , and $c$
$x = \frac{8 \pm \sqrt{64 - 60}}{2}$	evaluate each part of the expression
$x = \frac{8 \pm \sqrt{4}}{2}$	
$x = \frac{8 \pm 2}{2}$	
$x = \frac{10}{2} \quad \text{or} \quad x = \frac{6}{2}$	
$x = 5 \quad \text{or} \quad x = 3$	

Here are some quadratic equations and their solutions. Use the quadratic formula to show that the solutions are correct.

1.  $x^2 + 4x - 5 = 0$ . The solutions are  $x = -5$  and  $x = 1$ .
2.  $x^2 + 7x + 12 = 0$ . The solutions are  $x = -3$  and  $x = -4$ .
3.  $x^2 + 10x + 18 = 0$ . The solutions are  $x = -5 \pm \frac{\sqrt{28}}{2}$ .
4.  $x^2 - 8x + 11 = 0$ . The solutions are  $x = 4 \pm \frac{\sqrt{20}}{2}$ .
5.  $9x^2 - 6x + 1 = 0$ . The solution is  $x = \frac{1}{3}$ .
6.  $6x^2 + 9x - 15 = 0$ . The solutions are  $x = -\frac{5}{2}$  and  $x = 1$ .