

# Unit 7 Lesson 12: Completing the Square (Part 1)

## 1 Perfect or Imperfect? (Warm up)

### Student Task Statement

Select all expressions that are perfect squares. Explain how you know.

1.  $(x + 5)(5 + x)$

2.  $(x + 5)(x - 5)$

3.  $(x - 3)^2$

4.  $x - 3^2$

5.  $x^2 + 8x + 16$

6.  $x^2 + 10x + 20$

## 2 Building Perfect Squares

### Student Task Statement

Complete the table so that each row has equivalent expressions that are perfect squares.

standard form	factored form
1. $x^2 + 6x + 9$	
2. $x^2 - 10x + 25$	
3.	$(x - 7)^2$
4. $x^2 - 20x + \underline{\hspace{2cm}}$	$(x - \underline{\hspace{2cm}})^2$
5. $x^2 + 16x + \underline{\hspace{2cm}}$	$(x + \underline{\hspace{2cm}})^2$
6. $x^2 + 7x + \underline{\hspace{2cm}}$	$(x + \underline{\hspace{2cm}})^2$
7. $x^2 + bx + \underline{\hspace{2cm}}$	$(x + \underline{\hspace{2cm}})^2$

### 3 Dipping Our Toes in Completing the Square

#### Student Task Statement

One technique for solving quadratic equations is called **completing the square**. Here are two examples of how Diego and Mai completed the square to solve the same equation.

Diego:

$$\begin{aligned}x^2 + 10x + 9 &= 0 \\x^2 + 10x &= -9 \\x^2 + 10x + 25 &= -9 + 25 \\x^2 + 10x + 25 &= 16 \\(x + 5)^2 &= 16 \\x + 5 &= 4 \quad \text{or} \quad x + 5 = -4 \\x &= -1 \quad \text{or} \quad x = -9\end{aligned}$$

Mai:

$$\begin{aligned}x^2 + 10x + 9 &= 0 \\x^2 + 10x + 9 + 16 &= 16 \\x^2 + 10x + 25 &= 16 \\(x + 5)^2 &= 16 \\x + 5 &= 4 \quad \text{or} \quad x + 5 = -4 \\x &= -1 \quad \text{or} \quad x = -9\end{aligned}$$

Study the worked examples. Then, try solving these equations by completing the square:

1.  $x^2 + 6x + 8 = 0$
2.  $x^2 + 12x = 13$
3.  $0 = x^2 - 10x + 21$

4.  $x^2 - 2x + 3 = 83$

5.  $x^2 + 40 = 14x$