

Unit 7 Lesson 14: Completing the Square (Part 3)

1 Perfect Squares in Two Forms (Warm up)

Student Task Statement

Elena says, " $(x + 3)^2$ can be expanded into $x^2 + 6x + 9$. Likewise, $(2x + 3)^2$ can be expanded into $4x^2 + 6x + 9$."

Find an error in Elena's statement and correct the error. Show your reasoning.

2 Perfect in A Different Way

Student Task Statement

1. Write each expression in standard form:

a. $(4x + 1)^2$

b. $(5x - 2)^2$

c. $(\frac{1}{2}x + 7)^2$

d. $(3x + n)^2$

e. $(kx + m)^2$

2. Decide if each expression is a perfect square. If so, write an equivalent expression of the form $(kx + m)^2$. If not, suggest one change to turn it into a perfect square.

a. $4x^2 + 12x + 9$

b. $4x^2 + 8x + 25$

3 When All the Stars Align

Student Task Statement

1. Find the value of c to make each expression in the left column a perfect square in standard form. Then, write an equivalent expression in the form of squared factors. In the last row, write your own pair of equivalent expressions.

standard form $(ax^2 + bx + c)$	squared factors $(kx + m)^2$
$100x^2 + 80x + c$	
$36x^2 - 60x + c$	
$25x^2 + 40x + c$	
$0.25x^2 - 14x + c$	

2. Solve each equation by completing the square:

$$25x^2 + 40x = -12$$

$$36x^2 - 60x + 10 = -6$$

4 Putting Stars into Alignment (Optional)

Student Task Statement

Here are three methods for solving
 $3x^2 + 8x + 5 = 0$.

Try to make sense of each method.

Method 1:

$$\begin{aligned}3x^2 + 8x + 5 &= 0 \\(3x + 5)(x + 1) &= 0 \\x = -\frac{5}{3} \quad \text{or} \quad x &= -1\end{aligned}$$

Method 2:

$$\begin{aligned}3x^2 + 8x + 5 &= 0 \\9x^2 + 24x + 15 &= 0 \\(3x)^2 + 8(3x) + 15 &= 0 \\U^2 + 8U + 15 &= 0 \\(U + 5)(U + 3) &= 0 \\U = -5 \quad \text{or} \quad U &= -3 \\3x = -5 \quad \text{or} \quad 3x &= -3 \\x = -\frac{5}{3} \quad \text{or} \quad x &= -1\end{aligned}$$

Method 3:

$$\begin{aligned}3x^2 + 8x + 5 &= 0 \\9x^2 + 24x + 15 &= 0 \\9x^2 + 24x + 16 &= 1 \\(3x + 4)^2 &= 1 \\3x + 4 = 1 \quad \text{or} \quad 3x + 4 &= -1 \\x = -1 \quad \text{or} \quad x &= -\frac{5}{3}\end{aligned}$$

Once you understand the methods, use each method at least one time to solve these equations.

1. $5x^2 + 17x + 6 = 0$
2. $6x^2 + 19x = -10$
3. $8x^2 - 33x + 4 = 0$

4. $8x^2 - 26x = -21$

5. $10x^2 + 37x = 36$

6. $12x^2 + 20x - 77 = 0$