Lesson 11: Completing the Square

Classwork

Opening Exercise

Rewrite the following perfect square quadratic expressions in standard form. Look for patterns in the coefficients, and write two sentences describing what you notice.

FACTORED FORM	WRITE THE FACTORS	DISTRIBUTE	STANDARD FORM
Example: $(x+1)^2$			
$(x+2)^2$			
$(x+3)^2$			
$(x+4)^2$			
$(x+5)^2$			
$(x+20)^2$			

Example

Now try working backwards. Rewrite the following standard form quadratic expressions as perfect squares.

STANDARD FORM	FACTORED FORM
$x^2+12x+36$	
$x^2-12x+36$	
$x^2+20x+100$	
$x^2-3x+\frac{9}{4}$	
$x^2+100x+2{,}500$	
x^2+8x+3	

Exploratory Challenge

Find an expression equivalent to $x^2 + 8x + 3$ that includes a perfect square binomial.

Exercises 1–10

Rewrite each expression by completing the square.

1. $a^2 - 4a + 15$

2. $n^2 - 2n - 15$

3. $c^2 + 20c - 40$

4. $x^2 - 1{,}000x + 60{,}000$

5. $y^2 - 3y + 10$

6. $k^2 + 7k + 6$

7. $z^2 - 0.2z + 1.5$

8. $p^2 + 0.5p + 0.1$

9. $j^2 - \frac{3}{4}j + \frac{3}{4}$

10. $x^2 - bx + c$

Lesson Summary

Just as factoring a quadratic expression can be useful for solving a quadratic equation, completing the square also provides a form that facilitates solving a quadratic equation.

Problem Set

1. $q^2 + 12q + 32$

2. $m^2 - 4m - 5$

3. $x^2 - 7x + 6.5$

4. $a^2 + 70a + 1{,}225$

5. $z^2 - 0.3z + 0.1$

6. $y^2 - 6by + 20$

7. Which of these expressions would be most easily rewritten by factoring? Justify your answer.