Lesson 11: Completing the Square

Classwork

Opening Exercise

Rewrite the following perfect square quadratic expressions in standard form. Describe patterns in the coefficients for the factored form, $(x + A)^2$, and the standard form, $x^2 + bx + c$.

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 backward. Rewrite the following standard form quadratic expressions as perfect squares.

STANDARD FORM	FACTORED FORM
$x^2 + 12x + 36$	
$x^2 - 12x + 36$	
$x^2 + 20x + 100$	
$x^2 - 3x + \frac{9}{4}$	
$x^2 + 100x + 2500$	
$x^2 + 8x + 3$	

Exploratory Challenge

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

Exercises

Rewrite each expression by completing the square.

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

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

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

4. $x^2 - 1000x + 60\,000$

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

Rewrite each expression by completing the square.

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

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

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

4. $a^2 + 70a + 1225$

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.