FACTORING SPECIAL PRODUCTS Factoring quadratic expressions often involves trial and error. However, some expressions are easy to factor because they follow special patterns.

KEY CONCEPT — *For Your Notebook*

Special Factoring Patterns

Pattern Name	Pattern	Example
Difference of Two Squares	$a^2 - b^2 = (a + b)(a - b)$	$x^2 - 4 = (x + 2)(x - 2)$
Perfect Square Trinomial	$a^2 + 2ab + b^2 = (a + b)^2$	$x^2 + 6x + 9 = (x + 3)^2$
	$a^2 - 2ab + b^2 = (a - b)^2$	$x^2 - 4x + 4 = (x - 2)^2$

EXAMPLE 2 Factor with special patterns

Factor the expression.

a. $x^2 - 49 = x^2 - 7^2$ — Difference of two squares

$= (x + 7)(x - 7)$

b. $d^2 + 12d + 36 = d^2 + 2(d)(6) + 6^2$ — Perfect square trinomial

$= (d + 6)^2$

c. $z^2 - 26z + 169 = z^2 - 2(z)(13) + 13^2$ — Perfect square trinomial

$= (z - 13)^2$

✓ GUIDED PRACTICE for Example 2

Factor the expression.

4. $x^2 - 9$ **5.** $q^2 - 100$ **6.** $y^2 + 16y + 64$ **7.** $w^2 - 18w + 81$

SOLVING QUADRATIC EQUATIONS You can use factoring to solve certain *quadratic equations*. A **quadratic equation** in one variable can be written in the form $ax^2 + bx + c = 0$ where $a \neq 0$. This is called the **standard form** of the equation. The solutions of a quadratic equation are called the **roots** of the equation. If the left side of $ax^2 + bx + c = 0$ can be factored, then the equation can be solved using the *zero product property*.

KEY CONCEPT — *For Your Notebook*

Zero Product Property

Words If the product of two expressions is zero, then one or both of the expressions equal zero.

Algebra If A and B are expressions and $AB = 0$, then $A = 0$ or $B = 0$.

Example If $(x + 5)(x + 2) = 0$, then $x + 5 = 0$ or $x + 2 = 0$. That is, $x = -5$ or $x = -2$.