

LESSON
9.5**Study Guide**

For use with the lesson "Solve Quadratic Equations by Completing the Square"

GOAL Solve quadratic equations by completing the square.**Vocabulary**

For an expression of the form $x^2 + bx$, you can add a constant c to the expression so that the expression $x^2 + bx + c$ is a perfect square trinomial. This process is called **completing the square**.

EXAMPLE 1 Complete the square

Find the value of c that makes the expression $x^2 + 7x + c$ a perfect square trinomial. Then write the expression as the square of a binomial.

Solution

STEP 1 Find the value of c . For the expression to be a perfect square trinomial, c needs to be the square of half the coefficient of x .

$$c = \left(\frac{7}{2}\right)^2 = \frac{49}{4} \quad \text{Find the square of half the coefficient of } x.$$

STEP 2 Write the expression as a perfect square trinomial. Then write the expression as the square of a binomial.

$$\begin{aligned} x^2 + 7x + c &= x^2 + 7x + \frac{49}{4} && \text{Substitute } \frac{49}{4} \text{ for } c. \\ &= \left(x + \frac{7}{2}\right)^2 && \text{Square of a binomial.} \end{aligned}$$

EXAMPLE 2 Solve a quadratic equation

Solve $x^2 + 14x = -13$ by completing the square.

Solution

$$\begin{aligned} x^2 + 14x &= -13 && \text{Write original equation.} \\ x^2 + 14x + (7)^2 &= -13 + 7^2 && \text{Add } \left(\frac{14}{2}\right)^2, \text{ or } 7^2, \text{ to each side.} \\ (x + 7)^2 &= -13 + 7^2 && \text{Write left side as the square of a binomial.} \\ (x + 7)^2 &= 36 && \text{Simplify the right side.} \\ x + 7 &= \pm 6 && \text{Take square roots of each side.} \\ x &= -7 \pm 6 && \text{Subtract 7 from each side.} \end{aligned}$$

The solutions of the equation are $-7 + 6 = -1$ and $-7 - 6 = -13$.