SOLVING EQUATIONS The method of completing the square can be used to solve any quadratic equation. To use completing the square to solve a quadratic equation, you must write the equation in the form $x^2 + bx = d$.

EXAMPLE 2 Solve a quadratic equation

Solve $x^2 - 16x = -15$ by completing the square.

Solution

$x^2 - 16x = -15$	Write original equation.
$x^2 - 16x + (-8)^2 = -15 + (-8)^2$	Add $\left(\frac{-16}{2}\right)^2$, or $(-8)^2$, to each side.
$(x - 8)^2 = -15 + (-8)^2$	Write left side as the square of a binomial.
$(x - 8)^2 = 49$	Simplify the right side.
$x - 8 = \pm 7$	Take square roots of each side.
$x = 8 \pm 7$	Add 8 to each side.

▶ The solutions of the equation are $8 + 7 = 15$ and $8 - 7 = 1$.

AVOID ERRORS When completing the square to solve an equation, be sure you add the term $\left(\frac{b}{2}\right)^2$ to both sides of the equation.

CHECK You can check the solutions in the original equation.

If $x = 15$:

$(15)^2 - 16(15) \stackrel{?}{=} -15$

$-15 = -15$ ✓

If $x = 1$:

$(1)^2 - 16(1) \stackrel{?}{=} -15$

$-15 = -15$ ✓

EXAMPLE 3 Solve a quadratic equation in standard form

Solve $2x^2 + 20x - 8 = 0$ by completing the square.

Solution

$2x^2 + 20x - 8 = 0$	Write original equation.
$2x^2 + 20x = 8$	Add 8 to each side.
$x^2 + 10x = 4$	Divide each side by 2.
$x^2 + 10x + 5^2 = 4 + 5^2$	Add $\left(\frac{10}{2}\right)^2$, or 5^2, to each side.
$(x + 5)^2 = 29$	Write left side as the square of a binomial.
$x + 5 = \pm\sqrt{29}$	Take square roots of each side.
$x = -5 \pm \sqrt{29}$	Subtract 5 from each side.

▶ The solutions are $-5 + \sqrt{29} \approx 0.39$ and $-5 - \sqrt{29} \approx -10.39$.

AVOID ERRORS Be sure that the coefficient of x^2 is 1 before you complete the square.

✓ GUIDED PRACTICE for Examples 2 and 3

Solve the equation by completing the square. Round your solutions to the nearest hundredth, if necessary.

4. $x^2 - 2x = 3$ **5.** $m^2 + 10m = -8$ **6.** $3g^2 - 24g + 27 = 0$