EXAMPLE 4 Solve an equation with a rational exponent

Solve $(x + 2)^{3/4} - 1 = 7$.

$(x + 2)^{3/4} - 1 = 7$ — Write original equation.

$(x + 2)^{3/4} = 8$ — Add 1 to each side.

$\left[(x + 2)^{3/4}\right]^{4/3} = 8^{4/3}$ — Raise each side to the power $\frac{4}{3}$.

$x + 2 = (8^{1/3})^4$ — Apply properties of exponents.

$x + 2 = 2^4$ — Simplify.

$x + 2 = 16$ — Simplify.

$x = 14$ — Subtract 2 from each side.

▶ The solution is 14. Check this in the original equation.

GUIDED PRACTICE for Examples 3 and 4

Solve the equation. Check your solution.

5. $3x^{3/2} = 375$

6. $-2x^{3/4} = -16$

7. $-\frac{2}{3}x^{1/5} = -2$

8. $(x + 3)^{5/2} = 32$

9. $(x - 5)^{4/3} = 81$

10. $(x + 2)^{2/3} + 3 = 7$

EXTRANEOUS SOLUTIONS Raising each side of an equation to the same power may introduce extraneous solutions. When you use this procedure, you should always check each apparent solution in the *original* equation.

EXAMPLE 5 Solve an equation with an extraneous solution

Solve $x + 1 = \sqrt{7x + 15}$.

$x + 1 = \sqrt{7x + 15}$ — Write original equation.

$(x + 1)^2 = (\sqrt{7x + 15})^2$ — Square each side.

$x^2 + 2x + 1 = 7x + 15$ — Expand left side and simplify right side.

$x^2 - 5x - 14 = 0$ — Write in standard form.

$(x - 7)(x + 2) = 0$ — Factor.

$x - 7 = 0$ or $x + 2 = 0$ — Zero-product property

$x = 7$ or $x = -2$ — Solve for x.

REVIEW FACTORING
For help with factoring, see p. 252.

CHECK

Check $x = 7$ in the original equation.

$x + 1 = \sqrt{7x + 15}$

$7 + 1 \stackrel{?}{=} \sqrt{7(7) + 15}$

$8 \stackrel{?}{=} \sqrt{64}$

$8 = 8$ ✓

Check $x = -2$ in the original equation.

$x + 1 = \sqrt{7x + 15}$

$-2 + 1 \stackrel{?}{=} \sqrt{7(-2) + 15}$

$-1 \stackrel{?}{=} \sqrt{1}$

$-1 \neq 1$

▶ The only solution is 7. (The apparent solution -2 is extraneous.)