SIMPLIFYING SQUARE ROOTS In cases where you need to take the square root of a fraction whose numerator and denominator are perfect squares, the radical can be written as a fraction. For example, $\sqrt{\frac{16}{25}}$ can be written as $\frac{4}{5}$ because $\left(\frac{4}{5}\right)^2 = \frac{16}{25}$.

EXAMPLE 2 Take square roots of a fraction

Solve $4z^2 = 9$.

Solution

$$4z^2 = 9 \qquad \text{Write original equation.}$$

$$z^2 = \frac{9}{4} \qquad \text{Divide each side by 4.}$$

$$z = \pm\sqrt{\frac{9}{4}} \qquad \text{Take square roots of each side.}$$

$$z = \pm\frac{3}{2} \qquad \text{Simplify.}$$

▸ The solutions are $-\frac{3}{2}$ and $\frac{3}{2}$.

APPROXIMATING SQUARE ROOTS In cases where d in the equation $x^2 = d$ is not a perfect square or a fraction whose numerator and denominator are not perfect squares, you need to approximate the square root. A calculator can be used to find an approximation.

EXAMPLE 3 Approximate solutions of a quadratic equation

Solve $3x^2 - 11 = 7$. Round the solutions to the nearest hundredth.

Solution

$$3x^2 - 11 = 7 \qquad \text{Write original equation.}$$

$$3x^2 = 18 \qquad \text{Add 11 to each side.}$$

$$x^2 = 6 \qquad \text{Divide each side by 3.}$$

$$x = \pm\sqrt{6} \qquad \text{Take square roots of each side.}$$

$$x \approx \pm 2.45 \qquad \text{Use a calculator. Round to the nearest hundredth.}$$

▸ The solutions are about -2.45 and about 2.45.

✓ GUIDED PRACTICE for Examples 1, 2, and 3

Solve the equation.

1. $c^2 - 25 = 0$
2. $5w^2 + 12 = -8$
3. $2x^2 + 11 = 11$
4. $25x^2 = 16$
5. $9m^2 = 100$
6. $49b^2 + 64 = 0$

Solve the equation. Round the solutions to the nearest hundredth.

7. $x^2 + 4 = 14$
8. $3k^2 - 1 = 0$
9. $2p^2 - 7 = 2$