RATIONALIZING THE DENOMINATOR Suppose the denominator of a fraction has the form $\sqrt{b}$, $a + \sqrt{b}$, or $a - \sqrt{b}$ where a and b are rational numbers. The table shows how to eliminate the radical from the denominator. This is called **rationalizing the denominator**.

Form of the denominator	Multiply numerator and denominator by:
$\sqrt{b}$	$\sqrt{b}$
$a + \sqrt{b}$	$a - \sqrt{b}$
$a - \sqrt{b}$	$a + \sqrt{b}$

The expressions $a + \sqrt{b}$ and $a - \sqrt{b}$ are called **conjugates** of each other. Their product is always a rational number.

EXAMPLE 2 Rationalize denominators of fractions

Simplify (a) $\sqrt{\frac{5}{2}}$ and (b) $\frac{3}{7 + \sqrt{2}}$.

Solution

a. $$\sqrt{\frac{5}{2}} = \frac{\sqrt{5}}{\sqrt{2}} = \frac{\sqrt{5}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{10}}{2}$$

b. $$\frac{3}{7 + \sqrt{2}} = \frac{3}{7 + \sqrt{2}} \cdot \frac{7 - \sqrt{2}}{7 - \sqrt{2}} = \frac{21 - 3\sqrt{2}}{49 - 7\sqrt{2} + 7\sqrt{2} - 2} = \frac{21 - 3\sqrt{2}}{47}$$

SOLVING QUADRATIC EQUATIONS You can use square roots to solve some types of quadratic equations. For example, if $s > 0$, then the equation $x^2 = s$ has two real-number solutions: $x = \sqrt{s}$ and $x = -\sqrt{s}$. These solutions are often written in condensed form as $x = \pm\sqrt{s}$ (read as "plus or minus the square root of s").

EXAMPLE 3 Solve a quadratic equation

Solve $3x^2 + 5 = 41$.

$3x^2 + 5 = 41$	**Write original equation.**
$3x^2 = 36$	**Subtract 5 from each side.**
$x^2 = 12$	**Divide each side by 3.**
$x = \pm\sqrt{12}$	**Take square roots of each side.**
$x = \pm\sqrt{4} \cdot \sqrt{3}$	**Product property**
$x = \pm 2\sqrt{3}$	**Simplify.**

▶ The solutions are $2\sqrt{3}$ and $-2\sqrt{3}$.

CHECK Check the solutions by substituting them into the original equation.

$3x^2 + 5 = 41$	$3x^2 + 5 = 41$
$3(2\sqrt{3})^2 + 5 \stackrel{?}{=} 41$	$3(-2\sqrt{3})^2 + 5 \stackrel{?}{=} 41$
$3(12) + 5 \stackrel{?}{=} 41$	$3(12) + 5 \stackrel{?}{=} 41$
$41 = 41$ ✓	$41 = 41$ ✓

AVOID ERRORS
When solving an equation of the form $x^2 = s$ where $s > 0$, make sure to find both the positive and negative solutions.