8.6 Solve Rational Equations

Before	You solved polynomial equations.
Now	You will solve rational equations.
Why?	So you can model mobile phone costs, as in Ex. 38.

Key Vocabulary
• cross multiplying
• extraneous solution, p. 52

You can use **cross multiplying** to solve a rational equation when each side of the equation is a single rational expression.

EXAMPLE 1 Solve a rational equation by cross multiplying

Solve: $\dfrac{3}{x+1} = \dfrac{9}{4x+5}$

$\dfrac{3}{x+1} = \dfrac{9}{4x+5}$ **Write original equation.**

$3(4x+5) = 9(x+1)$ **Cross multiply.**

$12x + 15 = 9x + 9$ **Distributive property**

$3x + 15 = 9$ **Subtract 9x from each side.**

$3x = -6$ **Subtract 15 from each side.**

$x = -2$ **Divide each side by 3.**

▶ The solution is −2. Check this in the original equation.

EXAMPLE 2 Write and use a rational model

ALLOYS An *alloy* is formed by mixing two or more metals. Sterling silver is an alloy composed of 92.5% silver and 7.5% copper by weight. Jewelry silver is composed of 80% silver and 20% copper by weight. How much pure silver should you mix with 15 ounces of jewelry silver to make sterling silver?

Solution

Percent of copper in mixture $= \dfrac{\text{Weight of copper in mixture}}{\text{Total weight of mixture}}$

$\dfrac{7.5}{100} = \dfrac{0.2(15)}{15+x}$ **x is the amount of silver added.**

$7.5(15 + x) = 100(0.2)(15)$ **Cross multiply.**

$112.5 + 7.5x = 300$ **Simplify.**

$7.5x = 187.5$ **Subtract 112.5 from each side.**

$x = 25$ **Divide each side by 7.5.**

▶ You should mix 25 ounces of pure silver with the jewelry silver.