

# 10-4 Reteaching

## Solving Radical Equations

You can solve some radical equations by isolating the radical, squaring both sides, and then solving for the variable.

### Problem

What is the solution of the radical equation  $\sqrt{5w-4} - 9 = 0$ ?

To find the value of  $w$ , you need to get it alone on one side of the equation. You have not found the solution if  $w$  is in the radicand. Eliminate the radical by squaring both sides. Check the solution to the equation in the original equation.

**Solve**  $\sqrt{5w-4} - 9 = 0$

Add 9 to both sides of the equation so the radical is alone on one side of the equation.

$$\begin{array}{|c|} \hline \sqrt{5w-4} \\ \hline \boxed{A=81} \\ \hline \end{array} \sqrt{5w-4}$$

$$(\sqrt{5w-4})(\sqrt{5w-4}) = 5w-4$$

Imagine the equation is describing the side of a square.

Each side measures  $\sqrt{5w-4}$ . Since  $\sqrt{5w-4} = 9$ , the area of the square is  $9^2$  or 81.

When you multiply the length of the sides together, you eliminate the radical.

$$5w - 4 = 81$$

Write the equation for the area of the square.

$$5w = 85$$

Add 4 to each side.

$$w = 17$$

Divide both sides by 5.

**Check**  $\sqrt{5(17)-4} - 9 \stackrel{?}{=} 0$

Substitute 17 for  $w$ .

$$\sqrt{85-4} - 9 \stackrel{?}{=} 0$$

Multiply.

$$\sqrt{81} - 9 \stackrel{?}{=} 0$$

Subtract.

$$0 = 0 \checkmark$$

Solution checks.

Solution: The solution of the radical equation  $(\sqrt{5w-4}) - 9 = 0$  is  $w = 17$ .

### Exercises

Solve each radical equation. Check your solution.

1.  $\sqrt{5r} + 10 = 15$

2.  $\sqrt{x-7} = 6$

3.  $8 - \sqrt{c} = 6$

4.  $2 = \sqrt{-5w-2}$

5.  $\sqrt{\frac{s}{4}-15} + 27 = 38$

6.  $\sqrt{d+7} = \sqrt{3d-1}$

7.  $\sqrt{\frac{a}{3}} = \sqrt{\frac{4a+11}{9}}$

8.  $\sqrt{8-2f} = \sqrt{3f+5}$

9.  $\sqrt{h^2+24} = \sqrt{(h+4)^2}$

An extraneous solution is not a solution of the original equation.

### Problem

What is the extraneous solution of  $b = \sqrt{5-4b}$  ?

Square both sides to remove the radical and solve for the solutions. Substitute each solution into the original equation to find the solution that does not work.

**Solve**  $b^2 = (\sqrt{5-4b})^2$

$$\begin{array}{c} \sqrt{5-4b} \\ \boxed{A = b^2} \sqrt{5-4b} \end{array}$$

$$b^2 = 5 - 4b$$

$$b^2 + 4b - 5 = 0$$

$$(b + 5)(b - 1) = 0$$

$$b + 5 = 0 \quad \text{or} \quad b - 1 = 0$$

$$b = -5 \quad b = 1$$

Square each side to remove the radical.

Think of the equation as the formula for the area of a square, where each side measures  $\sqrt{5-4b}$ .

Write an equation for the area of the square.

Because of the  $b^2$ -term, the equation is a quadratic equation. Write the quadratic equation in standard form by adding  $4b$  and subtracting 5 from each side.

Factor the trinomial.

Set each factor equal to zero.

Solve for  $b$ .

Check the solutions in the original equation to find the solution that does not satisfy the original equation.

**Check**  $-5 \stackrel{?}{=} \sqrt{5-4(-5)}$

$$-5 \neq 5 \quad \times$$

$$1 \stackrel{?}{=} \sqrt{5-4(1)}$$

$$1 = 1 \quad \checkmark$$

Check  $x = -5$ .

Solution does not check.

Check  $x = 1$ .

Solution checks.

Solution: 1 satisfies the original equation.  $-5$  does not satisfy the original equation, so  $-5$  is the extraneous solution.

### Exercises

Identify the extraneous solution for each radical equation.

10.  $y = \sqrt{6y+16}$

11.  $-n = \sqrt{n+20}$

12.  $f = \sqrt{-2f+63}$

13.  $\frac{m}{2} = \sqrt{\frac{-3m+18}{4}}$

14.  $e = \sqrt{2e+8}$

15.  $-g = \sqrt{-2g+3}$