

## *Radical Equations*

**Objective** To solve square root and other radical equations



### Lesson Vocabulary

- radical equation
- square root equation

## Radical Equations

$$\sqrt{4x + 1} - 5 = 0 \quad \cdot \quad 3\sqrt[5]{(x + 1)^3} + 1 = 25?$$

A **radical equation** is an equation that has a variable in a radicand or a variable with a rational exponent. If the radical has index 2, the equation is a **square root equation**. In this lesson, assume that all radicals and expressions with rational exponents represent real numbers.

**Essential Understanding** Solving a square root equation may require that you square each side of the equation. This can introduce **extraneous solutions**.

To solve a radical equation, **isolate the radical on one side of the equation**. Then raise each side to the power suggested by the index.

## *Radical Equations*



### **Problem 1** Solving a Square Root Equation

What is the solution of  $3 + \sqrt{2x - 3} = 8$ ?

$$\begin{array}{r} -3 \qquad \qquad -3 \\ \hline \end{array}$$

$$\sqrt{2x - 3} = 5$$

*Square both sides*

$$2x - 3 = 25$$

$$\begin{array}{r} +3 \qquad +3 \\ \hline \end{array}$$

$$2x = 28$$

$$x = 14$$

## *Radical Equations*



**Got It?** 1. What is the solution of  $\sqrt{4x + 1} - 5 = 0$ ?

## *Radical Equations*



### **Problem 2** Solving Other Radical Equations

**A** What is the solution of  $3(x + 1)^{\frac{2}{3}} = 12$ ?

Since the numerator of  $\frac{2}{3}$  is even,  $(x^{\frac{2}{3}})^{\frac{3}{2}} = |x|$

*Radical Equations*

**B** What is the solution of  $3\sqrt[5]{(x + 1)^3} + 1 = 25$ ?

## *Radical Equations*



**Got It?**

2. What are the solution(s) of  $2(x + 3)^{\frac{2}{3}} = 8$ ?

Since the numerator of  $\frac{2}{3}$  is even,  $(x^{\frac{2}{3}})^{\frac{3}{2}} = |x|$

## *Radical Equations*

### **Checking for Extraneous Solutions**

What is the solution of  $\sqrt{x + 7} - 5 = x$ ? Check your results.

## *Radical Equations*



**Got It?** 4. a. What is the solution of  $\sqrt{5x - 1} + 3 = x$ ?



## ***Radical Equations***

### **Solving an Equation With Two Radicals**

What is the solution of  $\sqrt{2x + 1} - \sqrt{x} = 1$ ?

## *Radical Equations*

### Solving a Real-World Problem

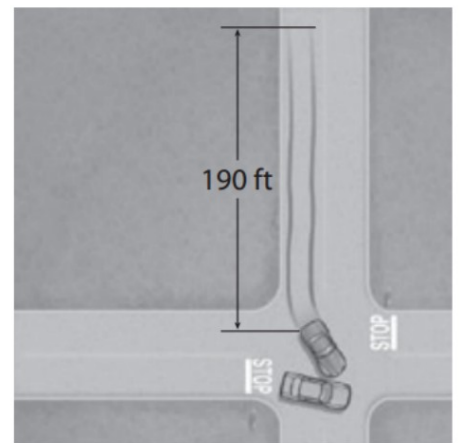
**Driving** The speed  $s$  in miles per hour that a car is traveling when it goes into a skid can be estimated by using the formula  $s = \sqrt{30fd}$ , where  $f$  is the coefficient of friction and  $d$  is the length of the skid marks in feet.

After an accident, a driver claims to have been traveling the speed limit of 55 mi/h. The coefficient of friction under the conditions at the time of the accident was 0.6, and the length of the skid marks is 190 feet. Is the driver telling the truth about the car's speed? Explain.

$$55 = \sqrt{30(0.6)d}$$

$$168 \approx d$$

If the driver had been traveling at 55 mi/h, the skid marks would measure about 168 feet. Because the skid marks actually measure 190 feet, the driver must have been driving faster than 55 mi/h.



*Radical Equations*

***ANY QUESTIONS?***

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**Essential Understanding** Solving a square root equation may require that you square each side of the equation. This can introduce extraneous solutions.

To solve a radical equation, isolate the radical on one side of the equation. Then raise each side to the power suggested by the index.

### Radical Equations

$$\sqrt{4x + 1} - 5 = 0$$

$$3\sqrt[5]{(x + 1)^3} + 1 = 25?$$

**Classwork:**

***Worksheet 11.3***