

## 6-5

## Solving Square Root and Other Radical Equations

## Content Standards

**A.REI.2** Solve simple rational and radical equations in one variable, and ... show how extraneous solutions may arise.

**A.CED.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

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

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.

**Problem 1** Solving a Square Root Equation

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



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

Solve.

See Problem 1.

9.  $3\sqrt{x} + 3 = 15$

10.  $4\sqrt{x} - 1 = 3$

11.  $\sqrt{x + 3} = 5$

15.  $\sqrt{3x + 4} = 4$

16.  $\sqrt{2x + 3} - 7 = 0$

17.  $\sqrt{6 - 3x} - 2 = 0$

## 6-5

## Practice

Form G

## Solving Square Root and Other Radical Equations

Solve.

1.  $5\sqrt{x} + 2 = 12$

2.  $3\sqrt{x} - 8 = 7$

3.  $\sqrt{4x} + 2 = 8$

4.  $\sqrt{2x - 5} = 7$

5.  $\sqrt{3x - 3} - 6 = 0$

6.  $\sqrt{5 - 2x} + 5 = 12$

7.  $\sqrt{3x - 2} - 7 = 0$

8.  $\sqrt{4x + 3} + 2 = 5$

9.  $\sqrt{33 - 3x} = 3$

10.  $\sqrt[3]{2x + 1} = 3$

11.  $\sqrt[3]{13x - 1} - 4 = 0$

12.  $\sqrt[3]{2x - 4} = -2$

To solve equations of the form  $x^{\frac{m}{n}} = k$ , raise each side of the equation to the power  $\frac{n}{m}$ , the reciprocal of  $\frac{m}{n}$ . If either  $m$  or  $n$  is even, then  $(x^{\frac{m}{n}})^{\frac{n}{m}} = |x|$ .



## Problem 2 Solving Other Radical Equations

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

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

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

Solve.

18.  $(x + 5)^{\frac{3}{2}} = 4$

19.  $(x + 2)^{\frac{2}{3}} = 9$

20.  $3(x - 2)^{\frac{3}{4}} = 24$

See Problem 2.

$$21. 3(x + 3)^{\frac{1}{3}} = 81$$

$$22. (x + 1)^{\frac{3}{2}} - 2 = 25$$

$$23. 3 + (4 - x)^{\frac{3}{2}} = 11$$

$$13. (x - 2)^{\frac{1}{3}} = 5$$

$$14. (2x + 1)^{\frac{1}{3}} = -3$$

$$15. 2x^{\frac{3}{4}} = 16$$

$$16. 2x^{\frac{1}{3}} - 2 = 0$$

$$17. x^{\frac{1}{2}} - 5 = 0$$

$$18. 4x^{\frac{3}{2}} - 5 = 103$$

$$19. (7x - 3)^{\frac{1}{2}} = 5$$

$$20. 4x^{\frac{1}{2}} - 5 = 27$$

$$21. x^{\frac{1}{6}} - 2 = 0$$