

Example 3 Solve $\sqrt{11x^2 - 63} - 2x = 0$.

Solution $\sqrt{11x^2 - 63} - 2x = 0$

$$\sqrt{11x^2 - 63} = 2x \quad \left\{ \begin{array}{l} \text{Set apart the radical on} \\ \text{one side of the equation.} \end{array} \right.$$

$$11x^2 - 63 = 4x^2 \quad \left\{ \begin{array}{l} \text{Square both sides.} \end{array} \right.$$

$$7x^2 = 63$$

$$x^2 = 9$$

$$x = 3 \quad \text{or} \quad x = -3$$

$$\text{Check: } \sqrt{11(3)^2 - 63} - 2(3) \stackrel{?}{=} 0$$

$$\sqrt{99 - 63} - 6 \stackrel{?}{=} 0$$

$$\sqrt{36} - 6 \stackrel{?}{=} 0$$

$$6 - 6 = 0 \quad \checkmark$$

$$\sqrt{11(-3)^2 - 63} - 2(-3) \stackrel{?}{=} 0$$

$$\sqrt{99 - 63} + 6 \stackrel{?}{=} 0$$

$$\sqrt{36} + 6 \stackrel{?}{=} 0$$

$$6 + 6 \neq 0$$

-3 is not a solution.

\therefore the solution set is $\{3\}$. **Answer**

Oral Exercises

Solve.

1. $\sqrt{x} = 7$

2. $\sqrt{y} = 8$

3. $\sqrt{d} = 10$

4. $\sqrt{y} = 5$

5. $\sqrt{4a} = 10$

6. $\sqrt{4m} = 8$

7. $\sqrt{m} = -1$

8. $\sqrt{k} = 0$

9. $\sqrt{z^2} = 6$

State the first step in the solution of each equation.

10. $\sqrt{3x} = 9$

11. $\sqrt{5a + 9} = 12$

12. $\sqrt{5z - 1} = 7$

13. $\sqrt{x - 5} + 1 = 8$

14. $2\sqrt{5b} = 6$

15. $\sqrt{9x} - 5 = 13$

Written Exercises

Solve.

A 1. $\sqrt{x} = 3$

2. $\sqrt{y} = 14$

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

4. $9 = \sqrt{3a}$

5. $\sqrt{8x} = \frac{2}{5}$

6. $\sqrt{4n} = \frac{1}{3}$

7. $1 = \sqrt{m} - 3$

8. $7 = \sqrt{z} - 2$

9. $\frac{2}{3} + \sqrt{b} = 1$

10. $\sqrt{y} - \frac{1}{2} = 2$

11. $3 = \sqrt{\frac{x}{2}}$

12. $8 = \sqrt{\frac{s}{5}}$

13. $\sqrt{x + 1} = 3$

14. $\sqrt{m + 5} = 1$

15. $20 = 5\sqrt{2x}$

16. $5 = 2\sqrt{3x}$

17. $\sqrt{4x} + 2 = 6$

18. $\sqrt{3x} + 4 = 7$

19. $4 = \sqrt{8a} + 3$

20. $3 = \sqrt{4x + 1}$

21. $\sqrt{5y - 2} + 3 = 9$

22. $\sqrt{5m - 5} + 6 = 7$

23. $\sqrt{x} = 3\sqrt{7}$

24. $\sqrt{r} = 5\sqrt{2}$

B 25. $8 = \sqrt{\frac{5a}{4}} - 2$

26. $14 = \sqrt{\frac{7x}{3}} + 2$

27. $\sqrt{\frac{2x + 9}{5}} = 3$

28. $\sqrt{\frac{2n - 4}{8}} = 2$

29. $4 = \sqrt{\frac{7k - 10}{9}}$

30. $3 = \sqrt{\frac{4x - 5}{7}}$

31. $15\sqrt{2} = 5\sqrt{t}$

32. $5\sqrt{10} = 6\sqrt{m}$

33. $\sqrt{2a^2 - 5} = 11$

34. $\sqrt{2m^2 - 10} = 4$

35. $10 = 2\sqrt{3c^2 - 2}$

36. $36 = 4\sqrt{4m^2 + 5}$

37. $\sqrt{5b^2 - 36} = 2b$

38. $\sqrt{19x^2 - 51} = 4x$

39. $\sqrt{x^2 + 1} = 1 - x$

40. $\sqrt{x^2 + 9} = 3 - x$

41. $\sqrt{3a^2 - 32} = a$

42. $\sqrt{13b^2 + 33} = 4b$

C 43. $\sqrt{x^2 + 6x} = 4$

44. $\sqrt{a^2 + 3a} = 2$

45. $\sqrt{15x^2 - 12x} = 9x$

46. $\sqrt{20y^2 - 13y} = 5y$

47. $\sqrt{x} + 6 = \sqrt{16x}$

48. $3\sqrt{a} + 7 = \sqrt{16a}$

Solve each system of equations.

49. $3\sqrt{a} + 5\sqrt{b} = 31$

50. $5\sqrt{x} - 2\sqrt{y} = 4\sqrt{2}$

$5\sqrt{a} - 5\sqrt{b} = -15$

$2\sqrt{x} + 3\sqrt{y} = 13\sqrt{2}$

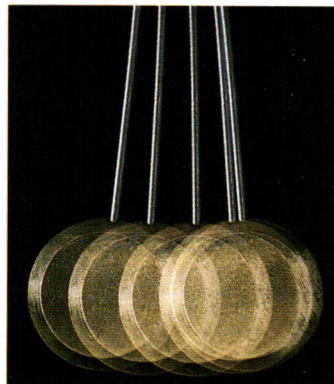
Problems

Solve.

- A**
- The square root of three times a number is 15. Find the number.
 - Twice the square root of a number is 22. Find the number.
 - One eighth of the square root of a number is 3. Find the number.
 - The square root of one eighth of a number is 3. Find the number.
 - When 4 times a number is increased by 5, the square root of the result is 11. Find the number.
 - When 23 is subtracted from the square root of three times a number, the result is 16. Find the number.
- B**
- The radius (r) of a cylinder is related to its volume (V) and its height (h) by the formula $r = \sqrt{\frac{V}{\pi h}}$. Find the volume of a cylinder whose radius is 15 cm and whose height is 36 cm. Express your answer in terms of π .
 - The time it takes a free-falling object to fall can be found by using the formula $t = \sqrt{\frac{2s}{g}}$, where t is in seconds, $g = 9.8 \text{ m/s}^2$, and s is the distance in meters. Find the distance an object falls in 15 s.

9. The current I that flows through an electrical appliance is determined by $I = \sqrt{\frac{P}{R}}$, where P is the power required and R is the resistance of the appliance. The current is measured in amperes (A), the power in watts (W), and the resistance in ohms (Ω). An electric hair dryer has a resistance of 60Ω and draws 4.5 A of current. How much power does it use?

- C** 10. The geometric mean of two positive numbers is the positive square root of their product. Find two consecutive positive even integers whose geometric mean is $4\sqrt{39}$.
11. The period of a pendulum (T) is the amount of time (in seconds) it takes the pendulum to make a complete swing back and forth. The period is determined by the formula $T = 2\pi\sqrt{\frac{l}{9.8}}$ where l is the length of the pendulum in meters. Find the length of a pendulum with a period of 8 seconds. Give your answer to the nearest tenth. (Use 3.14 for π .)



Mixed Review Exercises

Express in simplest form.

1. $(5 + \sqrt{6})(5 - \sqrt{6})$

2. $(2 + \sqrt{5})^2$

3. $\frac{2}{3 + \sqrt{11}}$

4. $\frac{2 + \sqrt{5}}{1 - \sqrt{5}}$

5. $3\sqrt{5}(\sqrt{15} - 2\sqrt{5})$

6. $(2\sqrt{3} + 1)(\sqrt{3} - 4)$

Factor completely.

7. $7a^2 - 14a + 7$

8. $t^3 - 4t^2 - 45t$

9. $6x(x + 2) + 4(x + 2)$

10. $y^3 + y^2 - 6y - 6$

11. $4g^5 - 100g$

12. $36x^2 + 24xy + 4y^2$

Self-Test 3

Vocabulary simplest form of a radical (p. 537) conjugate (p. 544)
rationalizing the denominator (p. 537) radical equation (p. 547)

Simplify.

1. $2\sqrt{3} \cdot 5\sqrt{3}$

2. $\sqrt{\frac{5}{4}} \cdot \sqrt{\frac{12}{15}}$

Obj. 11-7, p. 537

3. $6\sqrt{7} + \sqrt{13} - 4\sqrt{13} + \sqrt{7}$

4. $5\sqrt{48} - 8\sqrt{27}$

Obj. 11-8, p. 540

5. $(3 - \sqrt{6})^2$

6. $(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})$

Obj. 11-9, p. 544