3. Practice

Assignment Guide

1 Objective

- A B Core 1–53
- C Extension 54–58

Standardized Test Prep 59–64

Mixed Review 65–90

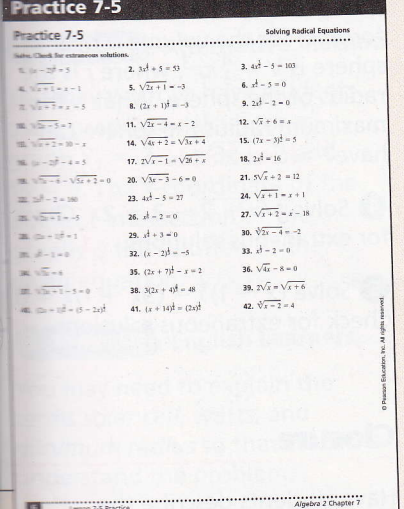
English Learners

Exercises 15–20 Remind students that *extra*neous solutions are *extra* solutions. When substituted into the equation they do not make the statement true.

Enrichment 7-5

Reteaching 7-5

Practice 7-5



Practice 7-5 — Solving Radical Equations

Solve. Check for extraneous solutions.

1. $(x - 2)^{\frac{2}{3}} = 5$
2. $3x^{\frac{2}{3}} + 5 = 53$
3. $x^{\frac{2}{3}} - 5 = 103$
4. $\sqrt{x + 1} = x - 1$
5. $\sqrt{2x + 1} = -3$
6. $x^{\frac{2}{3}} - 5 = 0$
7. $\sqrt{x + 7} = x + 5$
8. $(2x + 1)^{\frac{2}{3}} = -3$
9. $2x^{\frac{2}{3}} - 2 = 0$
10. $\sqrt{5x - 5} = 7$
11. $\sqrt{2x - 4} = x - 2$
12. $\sqrt{x} + 6 = x$
13. $\sqrt{x + 2} = 10 - x$
14. $\sqrt{4x + 2} = \sqrt{3x + 4}$
15. $(7x - 3)^{\frac{2}{3}} = 5$
16. $(x - 2)^{\frac{2}{3}} - 4 = 5$
17. $2\sqrt{x - 1} = \sqrt{2x + x}$
18. $2x^{\frac{2}{3}} = 16$
19. $\sqrt{5x - 8} - \sqrt{5x + 2} = 0$
20. $\sqrt{3x - 3} - 6 = 0$
21. $5\sqrt{x} + 2 = 12$
22. $2x^{\frac{2}{3}} - 2 = 100$
23. $4x^{\frac{2}{3}} - 5 = 27$
24. $\sqrt{x + 1} = x + 1$
25. $\sqrt{2x + 1} = -5$
26. $x^{\frac{2}{3}} - 2 = 0$
27. $\sqrt{x + 2} = x - 18$
28. $(2x + 1)^{\frac{2}{3}} = 1$
29. $x^{\frac{2}{3}} + 3 = 0$
30. $\sqrt[3]{5x - 4} = -2$
31. $x^{\frac{2}{3}} - 1 = 0$
32. $(x - 2)^{\frac{2}{3}} = -5$
33. $x^{\frac{2}{3}} - 2 = 0$
34. $\sqrt{5x} = 4$
35. $(2x + 7)^{\frac{2}{3}} - x = 2$
36. $\sqrt{4x} - 8 = 0$
37. $\sqrt{3x + 1} - 5 = 0$
38. $3(2x + 4)^{\frac{2}{3}} = 48$
39. $2\sqrt{x} = \sqrt{x + 6}$
40. $(2x + 1)^{\frac{2}{3}} = (5 - 2x)^{\frac{2}{3}}$
41. $(x + 14)^{\frac{2}{3}} = (2x)^{\frac{2}{3}}$
42. $\sqrt[3]{x - 2} = 4$

Investigation: Checking for Extraneous Solutions

You can use a graphing calculator to check for extraneous solutions.

1. a. Solve $x = \sqrt{x + 7} + 5$. How many apparent solutions do you get? 2
   b. Any or all of the apparent solutions may be extraneous. One wa to find out is to let y_1 equal the left side of the equation and let y_2 equal the right side. Graph the two equations. In how many points do they intersect? 1 1c. 2 is extraneous
   c. The x-values of the points of intersection are solutions of the original equation. Are any of the apparent solutions extraneous
   d. Substitute the apparent solutions in the original equation. Does this algebraic check agree with the calculator check? yes
2. Use a graphing calculator to determine the number of solutions of each equation.
   a. $\sqrt{x} = x - 2$ 1 b. $\sqrt{x^2 + 3} = 2x - 1$ 1 c. $x + 8 = 4\sqrt{x}$

EXERCISES

For more practice, see *Extra Pra*

Practice and Problem Solving

A Practice by Example

Example 1 (page 385)

Solve.

1. $3\sqrt{x} + 3 = 15$ 16
2. $4\sqrt{x} - 1 = 3$ 1
3. $\sqrt{x + 3} = 5$ 22
4. $\sqrt{3x + 4} = 4$ 4
5. $\sqrt{2x + 3} - 7 = 0$ 23
6. $\sqrt{6 - 3x} - 2 = 0$ $\frac{2}{3}$

Example 2 (page 386)

Solve.

7. $(x + 5)^{\frac{2}{3}} = 4$ 3, −13
8. $(x - 2)^{\frac{2}{3}} = 9$ 29, −25
9. $3(x - 2)^{\frac{3}{4}} = 24$ 18
10. $3(x + 3)^{\frac{3}{4}} = 81$ 78
11. $(x + 1)^{\frac{3}{2}} - 2 = 25$ 8
12. $3 + (4 - x)^{\frac{3}{2}} = 11$ 0

Example 3 (page 386)

13. **Volume.** A spherical water tank holds 15,000 ft^3 of water. Find the diam of the tank. (*Hint:* $V = \frac{\pi}{6}d^3$) 30.6 ft
14. **Hydraulics** The maximum flow of water in a pipe is modeled by the form $Q = Av$, where A is the cross-sectional area of the pipe and v is the veloc of the water. Find the diameter of a pipe that allows a maximum flow of 50 ft^3/min of water flowing at a velocity of 600 ft/min. Round your answ the nearest inch. 2 in.

Example 4 (page 387)

Solve. Check for extraneous solutions.

15. $\sqrt{11x + 3} - 2x = 0$ 3
16. $(5x + 4)^{\frac{1}{2}} - 3x = 0$ 1
17. $\sqrt{3x + 13} - 5 = x$ −3, −4
18. $\sqrt{x + 7} + 5 = x$ 9
19. $(x + 3)^{\frac{1}{2}} - 1 = x$ 1
20. $(5 - x)^{\frac{1}{2}} = x + 1$ 1

Example 5 (page 387)

Solve. Check for extraneous solutions.

21. $\sqrt{3x} = \sqrt{x+6}$ **3**

22. $(x+5)^{\frac{1}{2}} - (5-2x)^{\frac{1}{4}} = 0$ **−2**

23. $(7x+6)^{\frac{1}{2}} = (9+4x)^{\frac{1}{2}}$ **1**

24. $\sqrt{3x+7} = x - 1$ **6**

25. $\sqrt{x+7} - x = 1$ **2**

26. $\sqrt{-3x-5} = x + 3$ **−2**

27. $(3x+2)^{\frac{1}{2}} - (2x+7)^{\frac{1}{2}} = 0$ **5**

28. $x + 8 = (x^2+16)^{\frac{1}{2}}$ **−3**

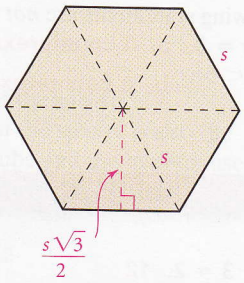
29. $(2x)^{\frac{1}{2}} = (x+5)^{\frac{1}{2}}$ **5**

30. $1 = (3+x)^{\frac{1}{2}}$ **−2**

B Apply Your Skills

31. **Geometry** The formula for the area A of a square whose side is s units long is $A = s^2$. Solve the formula for s. Find the length of the side of a square that has an area of 32 m^2. **$s = \sqrt{A}$; $4\sqrt{2}$ m, or about 5.7 m**

32. a. **Package Design** The formula for the area A of a hexagon with a side s units long is $A = \frac{3s^2\sqrt{3}}{2}$. See the figure below. Solve the formula for s and rationalize the denominator. **$s = \frac{\sqrt{2\sqrt{3}A}}{3}$**



b. A package designer wants the hexagonal base of a hat box to have an area of about 200 in.^{2}. About how long is each side? **about 8.8 in.**

c. What is the distance between opposite sides of the hat box? **about 15.2 in.**

33. a. Form a pair of simultaneous equations by letting y_1 equal the left side and y_2 equal the right side of $\sqrt{5} - x = 1$. Graph the equations. **a–d. See margin.**

b. Repeat part (a) with the equivalent equation $\sqrt{5} = x + 1$.

c. Repeat part (a) with the equivalent equation $\sqrt{5} - x - 1 = 0$.

d. **Writing** Describe the similarities and differences among the graphs of the three sets of simultaneous equations.

Solve. Check for extraneous solutions.

34. $3\sqrt{2x} - 3 = 9$ **8**

35. $2(2x)^{\frac{1}{3}} + 1 = 5$ **4**

36. $\sqrt{2x-1} - 3 = 0$ **5**

37. $(2x+3)^{\frac{1}{2}} - 7 = 0$ **23**

38. $\sqrt{x^2+3} = x + 1$ **1**

39. $\sqrt{x-5} - \sqrt{x} = -2$ **5.0625**

40. $(2x+3)^{\frac{3}{4}} - 3 = 5$ **6.5**

41. $2(x-1)^{\frac{4}{3}} + 4 = 36$ **9, −7**

42. $x^{\frac{1}{2}} - (x-5)^{\frac{1}{2}} = 2$ **$\frac{81}{16}$**

43. $\sqrt{x} = \sqrt{x-8} + 2$ **9**

44. $\sqrt{5x+1} - \sqrt{4x+3} = 0$ **2**

45. $\sqrt{x+10} + \sqrt{3-x} = 5$ **−1, −6**

46. $(3x+2)^{\frac{1}{2}} = 8(3x+2)^{-\frac{1}{2}}$ **2**

47. $\sqrt{4x-10} = 3\sqrt{x-5}$ **7**

48. $(x-9)^{\frac{1}{2}} + 1 = x^{\frac{1}{2}}$ **25**

49. $\sqrt{10x} - 2\sqrt{5x-25} = 0$ **10**

50. $(2x+1)^{\frac{1}{3}} = (2+3x)^{\frac{1}{3}}$ **−1**

51. $(2x-1)^{\frac{1}{3}} = (x+1)^{\frac{1}{6}}$ **$\frac{5}{4}$**

4. Assess

Lesson Quiz 7-5

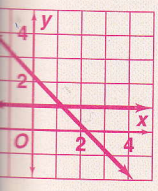
Solve each equation. Check for extraneous solutions.

1. $7 + \sqrt{2x-1} = 10$ **5**
2. $4(x-9)^{\frac{1}{3}} = 8$ **17**
3. $\sqrt{2x-1} = x - 8$ **13**
4. $(4x+3)^{\frac{2}{3}} = (16x+44)^{\frac{1}{3}}$ **$-\frac{7}{4}, \frac{5}{4}$**
5. A circular table is to be made that will have a top covered with material that costs \$3.50 per square foot. The covering is to cost no more than \$60. What is the maximum radius for the top of the table? **about 2.34 ft**

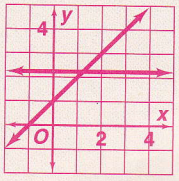
Alternative Assessment

Ask students to select a whole number and then *work backward* to write two radical equations that have that whole number as a solution. One equation should involve square roots and the other cube roots. Students may need to experiment to find a whole number for which they can most easily write radical equations. Have students share their equations within small groups and solve each equation.

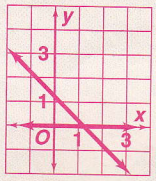
388–390 Exercises



b.



c.



d. **The graph of each pair consists of two straight lines, one of which is horizontal. They intersect at different points, but these points have the same x-value, about 1.236.**

FCAT Practice

A sheet of blank grids is available in the FCAT Daily Practice and Strategies Transparencies booklet. Give this sheet to students for practice with filling in the grids.

Resources

For additional practice with a variety of test item formats:

- FCAT Practice, p. 419
- Strategies, p. 414
- FCAT Daily Practice and Strategies Transparencies

Error Prevention

Exercise 61 It is important to move one of the radical expressions to the right side of the equation before raising both sides to a power.

pages 388–390 Exercises

57. Plan 1: Use a calculator to evaluate $\sqrt{2}$ and record it. Add 2, take the square root, and record it. Add 2, take the square root, and record it. Continue this procedure about seven times until it becomes clear that the values are approaching 2. Plan 2: The given equation is equivalent to $x = \sqrt{2 + x}$. Solve this equation to find that $x = 2$.

85. 3, 4

86. 3, 5

87. −5, −4

88. $-2, -\frac{2}{3}$

89. $-\frac{1}{3}, -\frac{4}{3}$

90. $-2, -\frac{3}{4}$

52. **Physics** The velocity v of an object dropped from a tall building is given formula $v = \sqrt{64d}$, where d is the distance the object has dropped. Solve formula for d. $d = \frac{v^2}{64}$

53. **Open-Ended** Write an equation that has two radical expressions and no real roots. Answers may vary. Sample: $\sqrt{x - 3} = \sqrt{3x + 5}$

Challenge

Solve. Check for extraneous solutions.

54. $\sqrt{x + 1} + \sqrt{2x} = \sqrt{5x + 3}$ 1

55. $\sqrt{x + \sqrt{2x}} = 2$ 2

56. $\sqrt{\sqrt{x + 25}} = \sqrt{x + 5}$ 0

57. **Critical Thinking** Devise a plan to find the value of x. See margin.

$$x = \sqrt{2 + \sqrt{2 + \sqrt{2 + \ldots}}}$$

58. **Critical Thinking** You have solved equations containing square roots by squaring both sides. You were using the property that if $a = b$ then $a^2 =$ Show that the following statements are *not* true for all real numbers.

a. If $a^2 = b^2$ then $a = b$. a. A counterexample is $a = 3, b = -3$.

b. If $a < b$ then $a^2 < b^2$. b. A counterexample is $a = -5, b = 3$.

FCAT Practice

Gridded Response

59. Solve $\sqrt{4x - 23} - 3 = 2$. 12

60. Solve $(x + 2)^{\frac{3}{4}} = 27$. 79

61. Solve $\sqrt{2x + 1} - \sqrt[4]{x + 11} = 0$. $\frac{5}{4}$

62. Solve $5\sqrt{x} + 7 = 8$. $\frac{1}{25}$

63. Solve $-\sqrt[3]{x} + 3 = 0$. 27

64. Solve $\sqrt{x + 2} = x$. 2

FCAT Online

FCAT Format quiz at www.PHSchool.com
Web Code: aga-0705

Mixed Review

Lesson 7-4 **Simplify each expression.**

65. $64^{\frac{2}{3}}$ 16 66. $25^{1.5}$ 125 67. $6^{\frac{1}{2}} \cdot 12^{\frac{1}{2}}$ $6\sqrt{2}$ 68. $8^{\frac{1}{2}} \cdot 40^{\frac{1}{2}}$ $8\sqrt{5}$ 69. $3^{\frac{1}{3}} \cdot 18^{\frac{1}{3}}$ $3\sqrt[3]{2}$

70. $81^{-0.25}$ $\frac{1}{3}$ 71. $4^{3.5}$ 128 72. $125 \cdot 125^{-\frac{1}{3}}$ 25 73. $32 \cdot 256^{-\frac{1}{2}}$ 2 74. $100^{-\frac{3}{2}} \cdot$ $\frac{1}{10}$

Lesson 6-7 **Evaluate each expression.**

75. ${}_7P_1$ 7 76. ${}_7P_3$ 210 77. ${}_5P_3$ 60 78. ${}_8P_4$ 1680 79. ${}_4P$

80. ${}_5C_2$ 10 81. ${}_7C_5$ 21 82. ${}_5C_5$ 1 83. ${}_6C_5$ 6 84. ${}_7C$

Lesson 5-5 **Solve each equation by factoring.** 85–90. See margin.

85. $x^2 - 7x + 12 = 0$ 86. $x^2 - 8x + 15 = 0$ 87. $x^2 + 9x + 2$

88. $3x^2 + 8x + 4 = 0$ 89. $9x^2 + 15x + 4 = 0$ 90. $4x^2 + 11x +$