

Simplify:

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|------------------|---------------------|--|
| 1. $\sqrt{8}$ | 26. $\sqrt{108}$ | 51. $\sqrt{2} \cdot \sqrt{3}$ |
| 2. $\sqrt{12}$ | 27. $\sqrt{180}$ | 52. $\sqrt{3} \cdot \sqrt{5}$ |
| 3. $\sqrt{20}$ | 28. $\sqrt{216}$ | 53. $\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{5}$ |
| 4. $\sqrt{24}$ | 29. $\sqrt{98}$ | 54. $\sqrt{5} \cdot \sqrt{6}$ |
| 5. $\sqrt{28}$ | 30. $\sqrt{192}$ | 55. $\sqrt{6} \cdot \sqrt{7}$ |
| 6. $\sqrt{40}$ | 31. $\sqrt{128}$ | 56. $\sqrt{3} \cdot \sqrt{15}$ |
| 7. $\sqrt{44}$ | 32. $\sqrt{147}$ | 57. $\sqrt{5} \cdot \sqrt{12}$ |
| 8. $\sqrt{27}$ | 33. $\sqrt{245}$ | 58. $\sqrt{3} \cdot \sqrt{11}$ |
| 9. $\sqrt{18}$ | 34. $\sqrt{200}$ | 59. $\sqrt{5} \cdot \sqrt{10}$ |
| 10. $\sqrt{45}$ | 35. $\sqrt{294}$ | 60. $\sqrt{a^3} \cdot \sqrt{a^5}$ |
| 11. $\sqrt{54}$ | 36. $\sqrt{400}$ | 61. $\sqrt{3} \cdot \sqrt{8}$ |
| 12. $\sqrt{63}$ | 37. $\sqrt{900}$ | 62. $\sqrt{5} \cdot \sqrt{30}$ |
| 13. $\sqrt{90}$ | 38. $\sqrt{120}$ | 63. $\sqrt{6} \cdot \sqrt{8}$ |
| 14. $\sqrt{16}$ | 39. $\sqrt{242}$ | 64. $\sqrt{7} \cdot \sqrt{7}$ |
| 15. $\sqrt{32}$ | 40. $\sqrt{288}$ | 65. $\sqrt{8} \cdot \sqrt{8}$ |
| 16. $\sqrt{48}$ | 41. $\sqrt{363}$ | 66. $\sqrt{2} \cdot \sqrt{2}$ |
| 17. $\sqrt{80}$ | 42. $\sqrt{500}$ | 67. $\sqrt{3} \cdot \sqrt{3}$ |
| 18. $\sqrt{96}$ | 43. $\sqrt{225}$ | 68. $\sqrt{x} \cdot \sqrt{x}$ |
| 19. $\sqrt{112}$ | 44. $\sqrt{a^4}$ | 69. $\sqrt{10} \cdot \sqrt{9}$ |
| 20. $\sqrt{50}$ | 45. $\sqrt{a^3}$ | 70. $\sqrt{12} \cdot \sqrt{3}$ |
| 21. $\sqrt{75}$ | 46. $\sqrt{x^5}$ | 71. $\sqrt{12} \cdot \sqrt{5}$ |
| 22. $\sqrt{125}$ | 47. $\sqrt{y^6}$ | 72. $\sqrt{32} \cdot \sqrt{2}$ |
| 23. $\sqrt{150}$ | 48. $\sqrt{x^7}$ | 73. $\sqrt{6} \cdot \sqrt{14}$ |
| 24. $\sqrt{175}$ | 49. $\sqrt{x^2y^3}$ | 74. $\sqrt{48} \cdot \sqrt{2}$ |
| 25. $\sqrt{72}$ | 50. $\sqrt{r^3t^5}$ | 75. $\sqrt{3} \cdot \sqrt{6} \cdot \sqrt{7}$ |

Simplify:

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|-----------------------|--------------------------|--|
| 1. $\sqrt{81m^4}$ | 12. $\sqrt{50a^3b^5}$ | 23. $\sqrt{8x^2y^6}$ |
| 2. $\sqrt{100b^{10}}$ | 13. $\sqrt{16a^2b^4c^6}$ | 24. $\sqrt{169a^3b^5}$ |
| 3. $\sqrt{64x^8}$ | 14. $\sqrt{49x^3y^5}$ | 25. $\sqrt{3} \cdot \sqrt{11}$ |
| 4. $\sqrt{36x^2y^4}$ | 15. $\sqrt{144x^3y^9}$ | 26. $\sqrt{5} \cdot \sqrt{4}$ |
| 5. $\sqrt{25xy^2}$ | 16. $\sqrt{400x^4y^5}$ | 27. $\sqrt{2} \cdot \sqrt{2}$ |
| 6. $\sqrt{x^5y^6}$ | 17. $\sqrt{12a^4b^2}$ | 28. $\sqrt{108}$ |
| 7. $\sqrt{81x^3y^3}$ | 18. $\sqrt{50x^6}$ | 29. $\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{6}$ |
| 8. $\sqrt{a^3b^4c^5}$ | 19. $\sqrt{18a^3}$ | 30. $\sqrt{500}$ |
| 9. $\sqrt{18a^2b^2}$ | 20. $\sqrt{24a^5b^5}$ | 31. $\sqrt{900}$ |
| 10. $\sqrt{18a^3}$ | 21. $\sqrt{64a^3y^7}$ | 32. $\sqrt{400}$ |
| 11. $\sqrt{72m^2x^4}$ | 22. $\sqrt{48m^3x^7}$ | |

Simplify:

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|--|---|
| 1. $\sqrt{\frac{1}{3}} \cdot \sqrt{\frac{1}{3}}$ | 8. $\sqrt{\frac{2}{5}}$ |
| 2. $(\sqrt{\frac{2}{5}})^2$ | 9. $\sqrt{\frac{108}{2}}$ |
| 3. $\frac{\sqrt{11}}{\sqrt{44}}$ | 10. $\sqrt{\frac{32}{16}}$ |
| 4. $\frac{2\sqrt{15}}{\sqrt{3}}$ | 11. $\sqrt{\frac{5}{36}}$ |
| 5. $\sqrt{\frac{3}{4}}$ | 12. $\frac{\sqrt{2}}{\sqrt{128}}$ |
| 6. $\sqrt{\frac{5}{9}}$ | 13. $\sqrt{\frac{1}{7}} \cdot \sqrt{\frac{1}{7}}$ |
| 7. $\sqrt{\frac{1}{5}}$ | 14. $(\sqrt{\frac{4}{7}})^2$ |

Simplify:

1. $\sqrt{3} \cdot \sqrt{2}$
2. $\sqrt{5} \cdot \sqrt{2}$
3. $5 \cdot 2\sqrt{3}$
4. $2 \cdot 3\sqrt{15}$
5. $\sqrt{10} \cdot \sqrt{3}$
6. $\sqrt{7} \cdot \sqrt{6}$
7. $\sqrt{11} \cdot \sqrt{5}$
8. $3\sqrt{2} \cdot 7$
9. $8 \cdot 4\sqrt{19}$
10. $4\sqrt{3} \cdot 3\sqrt{2}$
11. $6\sqrt{5} \cdot 2\sqrt{3}$
12. $7\sqrt{5} \cdot 5\sqrt{7}$
13. $\sqrt{12}$
14. $\sqrt{27}$
15. $\sqrt{8}$
16. $\sqrt{45}$
17. $\sqrt{24}$
18. $3\sqrt{18}$
19. $2\sqrt{72}$
20. $5\sqrt{50}$
21. $\sqrt{200}$
22. $7\sqrt{8}$
23. $\sqrt{48}$
24. $2\sqrt{32}$
25. $6\sqrt{63}$
26. $\sqrt{98}$
27. $\sqrt{128}$
28. $\sqrt{3} \cdot \sqrt{6}$
29. $\sqrt{6} \cdot 2\sqrt{10}$
30. $5\sqrt{6} \cdot 2\sqrt{15}$
31. $\sqrt{6} \cdot \sqrt{10} \cdot \sqrt{2}$
32. $3\sqrt{2} \cdot \sqrt{7} \cdot 2\sqrt{6}$
33. $2\sqrt{3} \cdot 3\sqrt{5}$
34. $5\sqrt{7} \cdot 3\sqrt{2}$
35. $\sqrt{5} \cdot \sqrt{50}$
36. $4\sqrt{20} \cdot 5\sqrt{8}$
37. $4\sqrt{2} - \sqrt{8}$
38. $\sqrt{18} + 3\sqrt{8}$
39. $2\sqrt{12} + 5\sqrt{12}$
40. $\sqrt{24} + 7\sqrt{6}$
41. $5\sqrt{8} - 3\sqrt{2}$
42. $\sqrt{27} + 5\sqrt{3}$
43. $\sqrt{40} + \sqrt{90}$
44. $4\sqrt{12} - \sqrt{27}$
45. $5\sqrt{2} + 7 + 3\sqrt{2} + 2$
46. $2\sqrt{18} + \sqrt{8} + 3\sqrt{2}$
47. $\sqrt{32} - 5\sqrt{2} - \sqrt{24}$
48. $2\sqrt{48} + 5\sqrt{27}$
49. $3\sqrt{72} + \sqrt{75} - 3\sqrt{3} - 7\sqrt{18}$
50. $\sqrt{300} - \sqrt{147}$
51. $\sqrt{98} - 8\sqrt{2}$
52. $\frac{\sqrt{72}}{\sqrt{6}}$
53. $\frac{\sqrt{50}}{\sqrt{10}}$
54. $\sqrt{\frac{2}{5}} \cdot \sqrt{\frac{5}{2}}$
55. $\sqrt{\frac{5}{9}} \cdot \sqrt{\frac{9}{20}}$

Simplify:

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|-----------------|-----------------------|--------------------------|
| 1. $\sqrt{8}$ | 16. $\sqrt{72}$ | 31. $\sqrt{320}$ |
| 2. $\sqrt{12}$ | 17. $\sqrt{x^3}$ | 32. $\sqrt{244}$ |
| 3. $\sqrt{18}$ | 18. $\sqrt{a^5}$ | 33. $\sqrt{216}$ |
| 4. $\sqrt{20}$ | 19. $\sqrt{2m^2}$ | 34. $\sqrt{204}$ |
| 5. $\sqrt{24}$ | 20. $\sqrt{3x^2}$ | 35. $\sqrt{189}$ |
| 6. $\sqrt{27}$ | 21. $\sqrt{4a}$ | 36. $\sqrt{300}$ |
| 7. $\sqrt{32}$ | 22. $\sqrt{9c^3}$ | 37. $\sqrt{176}$ |
| 8. $\sqrt{40}$ | 23. $\sqrt{12x^2}$ | 38. $\sqrt{\frac{2}{3}}$ |
| 9. $\sqrt{44}$ | 24. $\sqrt{90x^2y^3}$ | 39. $\sqrt{\frac{3}{5}}$ |
| 10. $\sqrt{45}$ | 25. $\sqrt{200}$ | 40. $\sqrt{\frac{5}{8}}$ |
| 11. $\sqrt{48}$ | 26. $\sqrt{250}$ | 41. $\sqrt{\frac{3}{4}}$ |
| 12. $\sqrt{50}$ | 27. $\sqrt{225}$ | 42. $\sqrt{\frac{2}{9}}$ |
| 13. $\sqrt{56}$ | 28. $\sqrt{189}$ | 43. $\sqrt{\frac{5}{6}}$ |
| 14. $\sqrt{60}$ | 29. $\sqrt{192}$ | 44. $\sqrt{\frac{2}{7}}$ |
| 15. $\sqrt{68}$ | 30. $\sqrt{162}$ | 45. $\sqrt{\frac{8}{3}}$ |

Simplify: (Continued)

46. $\sqrt{\frac{7}{8}}$

47. $\sqrt{\frac{3}{7}}$

48. $\sqrt{\frac{9}{10}}$

49. $\sqrt{\frac{4}{11}}$

50. $\sqrt{\frac{5}{12}}$

51. $\sqrt{\frac{9}{13}}$

52. $\sqrt{\frac{18}{5}}$

53. $\sqrt{\frac{11}{6}}$

54. $\sqrt{\frac{13}{7}}$

55. $\sqrt{\frac{3}{20}}$

56. $\sqrt{\frac{5}{24}}$

57. $\sqrt{\frac{7}{18}}$

58. $\sqrt{\frac{1}{3}}$

59. $\sqrt{\frac{1}{6}}$

60. $2\sqrt{5} \cdot 3\sqrt{5}$

61. $4\sqrt{7} \cdot 2\sqrt{7}$

62. $\sqrt{2} \cdot \sqrt{5} \cdot \sqrt{10}$

63. $\sqrt{15} \cdot \sqrt{3} \cdot \sqrt{5}$

64. $2\sqrt{3} \cdot \sqrt{5} \cdot \sqrt{7}$

65. $3\sqrt{2} \cdot \sqrt{7} \cdot \sqrt{3}$

66. $\sqrt{\frac{2}{5}} \cdot \sqrt{\frac{5}{2}}$

67. $\sqrt{\frac{3}{5}} \cdot \sqrt{\frac{25}{12}}$

68. $\sqrt{\frac{5}{9}} \cdot 2\sqrt{\frac{9}{20}}$

69. $\frac{12\sqrt{6}}{3\sqrt{2}}$

70. $5\sqrt{75}$

71. $\frac{12\sqrt{3}}{4\sqrt{27}}$

72. $\frac{\sqrt{5x}}{\sqrt{x}}$

73. $\frac{4\sqrt{24}}{3\sqrt{4}}$

74. $\frac{\sqrt{80}}{\sqrt{5}}$

75. $\frac{\sqrt{x^7}}{\sqrt{x}}$

76. $\frac{\sqrt{50}}{3\sqrt{10}}$

77. $\sqrt{150}$

78. $\frac{\sqrt{7}}{\sqrt{63}}$

79. $15\sqrt{\frac{8}{3}}$

80. $\frac{\sqrt{72}}{2\sqrt{6}}$

81. $5\sqrt{24}$

82. $3\sqrt{72}$

83. $3\sqrt{\frac{32}{9}}$

84. $6\sqrt{\frac{5}{18}}$

85. $\sqrt{54a^2}$

86. $3\sqrt{72}$

87. $\sqrt{63x^5}$

88. $5\sqrt{\frac{45}{4}}$

89. $8\sqrt{\frac{3}{50}}$

90. $3\sqrt{2}(2\sqrt{6} + \sqrt{3})$

Simplify: (Continued)

91. $4\sqrt{3}(\sqrt{6})(-\sqrt{8})$

92. $\sqrt{2x}(\sqrt{3x})(\sqrt{6})$

93. $\sqrt{14x}(2\sqrt{x})(\sqrt{7})$

94. $\sqrt{b}(3 - \sqrt{b})$

95. $\sqrt{a}(\sqrt{a} + 2)$

96. $5\sqrt{3}(-2\sqrt{6} + \sqrt{15})$

97. $6\sqrt{5} \cdot 2\sqrt{3}$

98. $4\sqrt{3} \cdot 3\sqrt{2}$

99. $\sqrt{6} \cdot \sqrt{10} \cdot \sqrt{2}$

100. $3\sqrt{2} \cdot \sqrt{7} \cdot 2\sqrt{6}$

Simplify each of the following radicals:

1. $\sqrt{\frac{3}{4}}$

14. $\sqrt{\frac{9}{10}}$

27. $\sqrt{\frac{b}{a^4}}$

2. $\sqrt{\frac{7}{9}}$

15. $\sqrt{\frac{25}{32}}$

28. $\sqrt{\frac{2b}{c^2d^4}}$

3. $\sqrt{\frac{15}{64}}$

16. $\sqrt{\frac{16}{7}}$

29. $\sqrt{\frac{a}{b}}$

4. $\sqrt{\frac{11}{36}}$

17. $\sqrt{\frac{24}{25}}$

30. $\sqrt{\frac{m^4}{n}}$

5. $\sqrt{\frac{1}{2}}$

18. $\sqrt{\frac{8}{5}}$

31. $\sqrt{\frac{x^2}{y^3}}$

6. $\sqrt{\frac{3}{10}}$

19. $\sqrt{\frac{18}{7}}$

32. $\sqrt{\frac{3c^6}{b^7}}$

7. $\sqrt{\frac{2}{7}}$

20. $\sqrt{\frac{27}{2}}$

33. $\sqrt{\frac{a}{xy^2}}$

8. $\sqrt{\frac{7}{15}}$

21. $\sqrt{2\frac{1}{4}}$

34. $\sqrt{\frac{d^2}{r^4t}}$

9. $\sqrt{\frac{3}{8}}$

22. $\sqrt{1\frac{3}{4}}$

35. $\sqrt{\frac{bc}{m^3n^4}}$

10. $\sqrt{\frac{5}{12}}$

23. $\sqrt{2\frac{1}{2}}$

36. $\sqrt{\frac{3x}{b^5c^2}}$

11. $\sqrt{\frac{7}{20}}$

24. $\sqrt{1\frac{7}{8}}$

37. $\sqrt{\frac{4a^2b}{x^8y^7}}$

12. $\sqrt{\frac{13}{24}}$

25. $\sqrt{\frac{c}{x^2}}$

38. $\sqrt{\frac{a}{4}}$

13. $\sqrt{\frac{4}{3}}$

26. $\sqrt{\frac{d}{m^2}}$

39. $\sqrt{\frac{b}{3}}$

Simplify each of the following: (Continued)

40. $\sqrt{\frac{x}{5}}$

53. $-3\sqrt{\frac{7xy^2}{12b}}$

66. $\sqrt{\frac{b}{a^2}}$

41. $\sqrt{\frac{m^2}{2}}$

54. $-2a\sqrt{\frac{5c^5}{6a^2b}}$

67. $\sqrt{\frac{x^2}{y}}$

42. $\sqrt{\frac{ab^2}{8}}$

55. $-mx\sqrt{\frac{3r^3x}{2m^4t^2}}$

68. $\sqrt{\frac{2ab^2}{c^2d}}$

43. $\sqrt{\frac{3a}{4b}}$

56. $\frac{2}{3}\sqrt{\frac{x}{2y^2}}$

69. $\sqrt{\frac{x}{2}}$

44. $\sqrt{\frac{13m}{16n}}$

57. $\frac{1}{2}\sqrt{\frac{4m^2n}{5}}$

70. $\sqrt{\frac{2x}{3y}}$

45. $\sqrt{\frac{7a^2}{8cd}}$

58. $-\frac{3}{4}\sqrt{\frac{8cd^3}{9xy}}$

71. $5d\sqrt{\frac{5c}{6d^3}}$

46. $\sqrt{\frac{5a^2y}{12bx^2}}$

59. $\frac{a}{b}\sqrt{\frac{2b^2c}{3ad^2}}$

72. $-\sqrt{\frac{3b^7}{8a^3x^5}}$

47. $\sqrt{\frac{2c^4d^3}{5x^3y}}$

60. $\sqrt{\frac{5}{16}}$

73. $\frac{5bx}{c^2}\sqrt{\frac{4c^4}{5bx^2}}$

48. $2\sqrt{\frac{4}{9y}}$

61. $\sqrt{\frac{2}{3}}$

49. $x\sqrt{\frac{5d}{8x^2}}$

62. $\sqrt{\frac{5}{8}}$

50. $4m\sqrt{\frac{2a^2}{3m^2n}}$

63. $\sqrt{\frac{4}{15}}$

51. $6rt^2\sqrt{\frac{3c^3}{5r^7t^3}}$

64. $\sqrt{\frac{12}{7}}$

52. $-\sqrt{\frac{b^4}{4c^3}}$

65. $\sqrt{3\frac{1}{2}}$

Divide as indicated and simplify:

1. $\frac{\sqrt{12}}{\sqrt{6}}$

14. $\frac{\sqrt{140}}{\sqrt{7}}$

27. $\frac{12\sqrt{b^5c^2}}{3\sqrt{b^3c}}$

2. $\frac{\sqrt{15}}{\sqrt{5}}$

15. $\frac{\sqrt{120}}{\sqrt{5}}$

28. $\frac{16\sqrt{8m^8}}{4\sqrt{4m^3}}$

3. $\frac{\sqrt{30}}{\sqrt{6}}$

16. $\frac{6\sqrt{8}}{3\sqrt{8}}$

29. $\frac{30\sqrt{27x^5y^3}}{6\sqrt{3xy^3}}$

4. $\frac{\sqrt{39}}{\sqrt{3}}$

17. $\frac{8\sqrt{20}}{2\sqrt{5}}$

30. $\frac{42\sqrt{40r^3t^2}}{3\sqrt{5rt}}$

5. $\frac{\sqrt{56}}{\sqrt{8}}$

18. $\frac{12\sqrt{12}}{4\sqrt{4}}$

6. $\frac{\sqrt{75}}{\sqrt{3}}$

19. $\frac{15\sqrt{96}}{5\sqrt{2}}$

7. $\frac{\sqrt{63}}{\sqrt{7}}$

20. $\frac{9\sqrt{125}}{9\sqrt{5}}$

8. $\frac{\sqrt{96}}{\sqrt{6}}$

21. $\frac{\sqrt{ax}}{\sqrt{a}}$

9. $\frac{\sqrt{128}}{\sqrt{2}}$

22. $\frac{\sqrt{x^3y^4}}{\sqrt{xy}}$

10. $\frac{\sqrt{147}}{\sqrt{3}}$

23. $\frac{\sqrt{32b^3}}{\sqrt{8b}}$

11. $\frac{\sqrt{24}}{\sqrt{3}}$

24. $\frac{\sqrt{30m^3n}}{\sqrt{5m}}$

12. $\frac{\sqrt{90}}{\sqrt{2}}$

25. $\frac{\sqrt{x^2y}}{\sqrt{xy^2}}$

13. $\frac{\sqrt{108}}{\sqrt{6}}$

26. $\frac{4\sqrt{a^2b}}{2\sqrt{ab}}$

Rationalize the denominator of each of the following:

1. $\frac{\sqrt{3}}{\sqrt{2}}$

8. $\frac{\sqrt{8}}{\sqrt{12}}$

15. $\frac{2}{\sqrt{3}}$

2. $\frac{\sqrt{4}}{\sqrt{3}}$

9. $\frac{\sqrt{10}}{\sqrt{18}}$

16. $\frac{2}{3\sqrt{2}}$

3. $\frac{\sqrt{7}}{\sqrt{2}}$

10. $\frac{\sqrt{8}}{\sqrt{20}}$

17. $\frac{5}{2\sqrt{5}}$

4. $\frac{\sqrt{8}}{\sqrt{5}}$

11. $\frac{1}{\sqrt{2}}$

18. $\frac{1}{4\sqrt{2}}$

5. $\frac{\sqrt{10}}{\sqrt{6}}$

12. $\frac{4}{\sqrt{6}}$

19. $\frac{3}{5\sqrt{6}}$

6. $\frac{\sqrt{1}}{\sqrt{2}}$

13. $\frac{6}{\sqrt{8}}$

20. $\frac{15}{4\sqrt{10}}$

7. $\frac{\sqrt{5}}{\sqrt{8}}$

14. $\frac{5}{\sqrt{5}}$

Divide as indicated and simplify:

1. $\frac{\sqrt{18} + \sqrt{50}}{\sqrt{2}}$

5. $\frac{\sqrt{x^3y^3} + \sqrt{x^2y^2} - \sqrt{xy}}{\sqrt{xy}}$

2. $\frac{\sqrt{80} + \sqrt{90} - \sqrt{15}}{\sqrt{5}}$

6. $\frac{\sqrt{4a^4b} - \sqrt{2a^5b} + \sqrt{8a^2b^2}}{\sqrt{2a^2b}}$

3. $\frac{6\sqrt{12} - 4\sqrt{27} + 2\sqrt{108}}{2\sqrt{3}}$

7. $\frac{\sqrt{12m^2x^2} - \sqrt{24m^2x} - \sqrt{30mx^2}}{\sqrt{3mx}}$

4. $\frac{\sqrt{a^3} + \sqrt{a^2}}{\sqrt{a}}$

Evaluate each of the following by rationalizing the denominator and using a table of square roots.

1. $\frac{2}{\sqrt{5}}$

2. $\frac{5}{\sqrt{3}}$

3. $\frac{4}{\sqrt{6}}$

4. $\frac{\sqrt{5}}{\sqrt{8}}$

5. $\frac{\sqrt{3}}{3\sqrt{2}}$

6. $\frac{1}{2\sqrt{7}}$

1. $\sqrt{x} \cdot \sqrt{y}$
2. $\sqrt{2x} \cdot \sqrt{3y}$
3. $(-\sqrt{m})(-\sqrt{2n})$
4. $(-\sqrt{5a})(\sqrt{2b})$
5. $\sqrt{5b} \cdot \sqrt{5b}$
6. $\sqrt{2a} \cdot \sqrt{6a}$
7. $\sqrt{8bc} \cdot \sqrt{4bc}$
8. $(-3\sqrt{3mn})(-\sqrt{3mn})$
9. $\sqrt{ax} \cdot \sqrt{a}$
10. $\sqrt{a^3b} \cdot \sqrt{bc^3}$
11. $(\sqrt{2c^3})(-\sqrt{5cd})$
12. $\sqrt{6r^4} \cdot \sqrt{3rs^2}$
13. $3\sqrt{5} \cdot 4\sqrt{3}$
14. $2\sqrt{7} \cdot 2\sqrt{6}$
15. $5\sqrt{5} \cdot 3\sqrt{14}$
16. $6\sqrt{13} \cdot 2\sqrt{3}$
17. $2\sqrt{14} \cdot 4\sqrt{2}$
18. $5\sqrt{8} \cdot 3\sqrt{10}$
19. $4\sqrt{2} \cdot 2\sqrt{27}$
20. $7\sqrt{3} \cdot 9\sqrt{24}$
21. $2\sqrt{2} \cdot 2\sqrt{2}$
22. $5\sqrt{6} \cdot 5\sqrt{6}$
23. $2\sqrt{18} \cdot 6\sqrt{2}$
24. $3\sqrt{20} \cdot 6\sqrt{5}$
25. $5 \cdot 2\sqrt{6}$
26. $8 \cdot 3\sqrt{5}$
27. $2\sqrt{2} \cdot 6$
28. $7\sqrt{6} \cdot 3$
29. $4\sqrt{3} \cdot \sqrt{7}$
30. $5\sqrt{10} \cdot \sqrt{4}$
31. $\sqrt{5} \cdot 2\sqrt{18}$
32. $\sqrt{2} \cdot 3\sqrt{2}$
33. $\frac{1}{3}\sqrt{3} \cdot \sqrt{3}$
34. $\frac{1}{2}\sqrt{2} \cdot 4\sqrt{10}$

(Continued)

35. $\sqrt{15} \cdot \frac{1}{5}\sqrt{5}$

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

36. $\frac{1}{4}\sqrt{20} \cdot \frac{4}{5}\sqrt{5}$

41. $2\sqrt{b} \cdot 3\sqrt{ab^3}$

37. $(-\sqrt{5})(-\sqrt{8})$

42. $a\sqrt{2x} \cdot x\sqrt{6x}$

38. $(-2\sqrt{12})(4\sqrt{5})$

43. $2m\sqrt{7mn} \cdot 3\sqrt{7m}$

39. $(6\sqrt{3})(-\sqrt{18})$

44. $3y\sqrt{6x^3y} \cdot 2x\sqrt{8xy^4}$

Square each of the following as indicated, and simplify:

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

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

2. $(\sqrt{8})^2$

7. $(-4\sqrt{5})^2$

3. $(3\sqrt{3})^2$

8. $(-2\sqrt{2})^2$

4. $(4\sqrt{6})^2$

9. $(-3\sqrt{x})^2$

5. $(x\sqrt{2a})^2$

10. $(-2a\sqrt{3b})^2$

Multiply and simplify:

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

7. $\sqrt{2}(\sqrt{3} + 3)$

2. $3(3 + 5\sqrt{3})$

8. $\sqrt{3}(\sqrt{27} + 4)$

3. $8(2 - 3\sqrt{5})$

9. $\sqrt{8}(2\sqrt{3} - 5)$

4. $4(3\sqrt{7} + \sqrt{6})$

10. $\sqrt{6}(\sqrt{2} - \sqrt{12})$

5. $9(4\sqrt{3} - 2\sqrt{10})$

11. $\sqrt{2}(3\sqrt{2} + \sqrt{18})$

6. $2(3\sqrt{12} - 5\sqrt{8})$

12. $\sqrt{12}(2\sqrt{5} - 4\sqrt{2})$

Multiply and simplify: (Continued)

13. $3\sqrt{2}(\sqrt{3} - 5\sqrt{8})$

29. $(2\sqrt{12} - 5)(3\sqrt{12} - 4)$

14. $5\sqrt{5}(3\sqrt{5} + 2\sqrt{6})$

30. $(5\sqrt{6} - 2\sqrt{3})(5\sqrt{6} + 2\sqrt{3})$

15. $\frac{1}{3}\sqrt{3}(\sqrt{3} - \frac{1}{3}\sqrt{6})$

31. $(\sqrt{5} + \sqrt{3})(\sqrt{5} + \sqrt{3})$

16. $-2(5\sqrt{3} - 4\sqrt{7})$

32. $(3\sqrt{6} - 2\sqrt{3})(2\sqrt{6} - 4\sqrt{3})$

17. $-\sqrt{2}(-\sqrt{8} + 2\sqrt{2})$

33. $(3\sqrt{8} - \sqrt{6})(3\sqrt{8} - \sqrt{6})$

18. $-3\sqrt{3}(3\sqrt{2} - 5\sqrt{6})$

34. $(6\sqrt{5} - 3\sqrt{10})(4\sqrt{5} + \sqrt{10})$

19. $(\sqrt{2} + 4)(\sqrt{2} - 4)$

35. $(6\sqrt{10} + 7\sqrt{18})(6\sqrt{10} + 7\sqrt{18})$

20. $(\sqrt{2} + 2)(\sqrt{2} + 2)$

36. $(2\sqrt{12} + 5\sqrt{8})(4\sqrt{12} - 2\sqrt{8})$

21. $(2\sqrt{3} - 3)(2\sqrt{3} + 3)$

37. $(\sqrt{8} + 2)^2$

22. $(5 + 3\sqrt{3})(5 + 3\sqrt{3})$

38. $(2\sqrt{3} - 1)^2$

23. $(6 - 3\sqrt{8})(6 + 3\sqrt{8})$

39. $(\sqrt{2} + \sqrt{3})^2$

24. $(5\sqrt{18} - 3)(5\sqrt{18} - 3)$

40. $(5\sqrt{6} - 6\sqrt{5})^2$

25. $(\sqrt{3} + 4)(\sqrt{3} + 2)$

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

27. $(3\sqrt{2} - 4)(2\sqrt{2} + 7)$

28. $(6\sqrt{5} + \sqrt{7})(6\sqrt{5} - \sqrt{7})$

Simplify:

1. $2\sqrt{2} + 7\sqrt{2} - 5\sqrt{2}$
2. $3\sqrt{5} - 7\sqrt{5} + \sqrt{5}$
3. $\sqrt{18} + \sqrt{32}$
4. $\sqrt{80} + \sqrt{45} - \sqrt{125}$
5. $\sqrt{98} + \sqrt{18} - \sqrt{32}$
6. $\sqrt{50} - \sqrt{128} - \sqrt{32}$
7. $\sqrt{175} + \sqrt{63} - \sqrt{28}$
8. $4\sqrt{45} - 3\sqrt{125} - 2\sqrt{50}$
9. $3\sqrt{2} - 2\sqrt{50} + 4\sqrt{18}$
10. $3\sqrt{175} - 5\sqrt{28} + 2\sqrt{63}$
11. $2\sqrt{50b} - 3\sqrt{18b}$
12. $5\sqrt{8c} + 2\sqrt{128c}$
13. $2\sqrt{3x} + 3\sqrt{108x} - 4\sqrt{75x}$
14. $\sqrt{12} + \sqrt{27}$
15. $\sqrt{75} - \sqrt{48}$
16. $\sqrt{18} + \sqrt{32}$
17. $\sqrt{28} - 3\sqrt{7} - \sqrt{63}$
18. $\sqrt{50} - \sqrt{18} + \sqrt{8}$
19. $\sqrt{80} - \sqrt{45} + \sqrt{5}$
20. $\sqrt{48} - 2\sqrt{3} + \sqrt{300}$
21. $4\sqrt{48} - 2\sqrt{3} + 2\sqrt{300}$
22. $\sqrt{2} \cdot \sqrt{5}$
23. $\sqrt{2} \cdot \sqrt{18}$
24. $\sqrt{3} \cdot \sqrt{5}$
25. $\sqrt{5} \cdot \sqrt{20}$
26. $\sqrt{2} \cdot \sqrt{32}$
27. $\sqrt{6} \cdot \sqrt{2}$
28. $2\sqrt{3} \cdot \sqrt{6}$
29. $\sqrt{6} \cdot \sqrt{8}$
30. $2\sqrt{6} \cdot 5\sqrt{3}$
31. $3\sqrt{5} \cdot 2\sqrt{10}$
32. $3\sqrt{6} \cdot 2\sqrt{8}$
33. $2\sqrt{2} \cdot 2\sqrt{2}$
34. $\sqrt{12} \cdot \sqrt{6}$
35. $\sqrt{5} \cdot \sqrt{15}$
36. $\sqrt{3} \cdot \sqrt{21}$
37. $\sqrt{7} \cdot \sqrt{14}$
38. $5\sqrt{3} \cdot 6\sqrt{3}$

Simplify:

1. $3\sqrt{5} + 2\sqrt{5}$
2. $4\sqrt{2} + 7\sqrt{2}$
3. $8\sqrt{7} - 3\sqrt{7}$
4. $4\sqrt{10} - 3\sqrt{10}$
5. $12\sqrt{11} + 12\sqrt{11}$
6. $17\sqrt{3} - 8\sqrt{3}$
7. $2\sqrt{5} + \sqrt{5}$
8. $8\sqrt{15} - 7\sqrt{15}$
9. $7\sqrt{5} - \sqrt{5}$
10. $9\sqrt{3} + 5\sqrt{3}$
11. $\sqrt{6} + \sqrt{6}$
12. $10\sqrt{10} - \sqrt{10}$
13. $\sqrt{3} + 2\sqrt{3} + 3\sqrt{3}$
14. $3\sqrt{17} + 2\sqrt{17} - \sqrt{17}$
15. $3\sqrt{8} + 5\sqrt{8}$
16. $2\sqrt{12} + 5\sqrt{12}$
17. $\sqrt{27} + 5\sqrt{3}$
18. $4\sqrt{2} - \sqrt{8}$
19. $\sqrt{24} + 7\sqrt{6}$
20. $\sqrt{40} + \sqrt{90}$
21. $\sqrt{18} + 3\sqrt{8}$
22. $5\sqrt{8} - 3\sqrt{2}$
23. $4\sqrt{12} - \sqrt{27}$
24. $5\sqrt{2} + 7 + 3\sqrt{2} + 2$
25. $6\sqrt{5} - 3 + 2\sqrt{5} + 8$
26. $15 - 3\sqrt{2} - 2\sqrt{2} - 7$
27. $3\sqrt{3} + 2\sqrt{5} + 2\sqrt{5} + 8\sqrt{3}$
28. $2\sqrt{18} + \sqrt{8} + 3\sqrt{2}$
29. $5\sqrt{12} + 3\sqrt{12} - 3\sqrt{3}$
30. $\sqrt{32} - 5\sqrt{2} - \sqrt{24}$
31. $\sqrt{50} + 2\sqrt{18} - 10\sqrt{2}$
32. $2\sqrt{48} + 5\sqrt{27}$
33. $\sqrt{98} - 8\sqrt{2}$
34. $\sqrt{300} - \sqrt{147}$
35. $3\sqrt{72} + \sqrt{75} - 3\sqrt{3} - 7\sqrt{18}$
36. $3\sqrt{12} - 5\sqrt{27}$

Simplify: (Continued)

37. $\sqrt{128} + 3\sqrt{8} - 4\sqrt{18}$

55. $15\sqrt{\frac{2}{5}} + 6\sqrt{\frac{5}{2}} - \sqrt{160}$

38. $3\sqrt{2} - 5\sqrt{3} + \sqrt{8} - \sqrt{12}$

56. $2\sqrt{\frac{3}{8}} + \sqrt{\frac{8}{3}} - 4\sqrt{24}$

39. $2\sqrt{32} - 3\sqrt{50}$

40. $2\sqrt{50} - 3\sqrt{18}$

41. $3\sqrt{63} + \frac{1}{4}\sqrt{28}$

42. $2\sqrt{150} - \frac{3}{8}\sqrt{96}$

43. $\sqrt{2} - \sqrt{\frac{1}{2}}$

44. $\sqrt{6} + \sqrt{\frac{2}{3}}$

45. $\sqrt{3} - 4\sqrt{48} + 3\sqrt{75}$

46. $\sqrt{7} + 4\sqrt{28} - 3\sqrt{63}$

47. $\sqrt{3} + 2\sqrt{27} - 6\sqrt{\frac{1}{3}}$

48. $10\sqrt{\frac{2}{5}} + \sqrt{\frac{5}{2}} - \frac{1}{4}\sqrt{40}$

49. $3\sqrt{10} - 4\sqrt{90} + 5\sqrt{\frac{1}{10}}$

50. $\sqrt{\frac{3}{4}} + \sqrt{\frac{4}{3}} - \frac{1}{6}\sqrt{75}$

51. $12\sqrt{\frac{2}{3}} - 2\sqrt{\frac{3}{2}} + \sqrt{54}$

52. $6\sqrt{\frac{5}{12}} + \sqrt{\frac{12}{5}} - \frac{1}{5}\sqrt{60}$

53. $2\sqrt{54} + \sqrt{96} - 9\sqrt{\frac{2}{3}}$

54. $6\sqrt{\frac{5}{4}} - 15\sqrt{\frac{1}{5}} + 5\sqrt{45}$

Combine as indicated:

1. $8\sqrt{6} + 3\sqrt{6} + \sqrt{6}$

3. $3\sqrt{3} - 8\sqrt{3} - 5\sqrt{3}$

2. $3\sqrt{7} - 4\sqrt{7} + 2\sqrt{7}$

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

Add each of the following:

1. $\sqrt{2}$ and $\sqrt{3}$

4. $-4\sqrt{3}$ and $8\sqrt{15}$

2. $7\sqrt{6}$ and $3\sqrt{5}$

5. $5\sqrt{17}$ and $\sqrt{6}$

3. $8\sqrt{7}$ and $2\sqrt{11}$

6. $3\sqrt{10}$ and $4\sqrt{2}$

Subtract each of the following:

1. Subtract $2\sqrt{6}$ from $5\sqrt{2}$

4. From $\sqrt{17}$ subtract $\sqrt{2}$

2. From $10\sqrt{3}$ take $6\sqrt{7}$

5. Subtract $9\sqrt{11}$ from $8\sqrt{11}$

3. Take $3\sqrt{5}$ from $\sqrt{10}$

6. From $8\sqrt{6}$ take $3\sqrt{6}$

Simplify and combine:

1. $\sqrt{48} + \sqrt{12} + \sqrt{27}$

8. $\frac{1}{3}\sqrt{147} + \frac{2}{3}\sqrt{27} - \sqrt{108}$

2. $\sqrt{98} - \sqrt{8} - \sqrt{32}$

9. $\sqrt{\frac{1}{5}} + \sqrt{\frac{5}{4}} + \sqrt{\frac{4}{5}}$

3. $\sqrt{80} + \sqrt{45} - \sqrt{20}$

10. $\sqrt{\frac{2}{25}} + \sqrt{\frac{1}{2}} - \sqrt{\frac{9}{2}}$

4. $\sqrt{50} - \sqrt{72} + \sqrt{18}$

11. $10\sqrt{\frac{2}{5}} - \sqrt{\frac{9}{10}} - \sqrt{\frac{1}{10}}$

5. $2\sqrt{40} + 7\sqrt{90} + 5\sqrt{160}$

12. $\sqrt{1\frac{1}{8}} + 4\sqrt{\frac{1}{8}} + \sqrt{\frac{8}{9}}$

6. $8\sqrt{150} - 4\sqrt{96} - 3\sqrt{600}$

13. $\sqrt{18} + 4\sqrt{\frac{1}{2}} + 3\sqrt{32}$

7. $2\sqrt{162} - \sqrt{32} + 6\sqrt{128}$

14. $5\sqrt{\frac{1}{5}} + 7\sqrt{5} - 2\sqrt{20}$

Simplify and combine: (Continued)

15. $6\sqrt{3} - 2\sqrt{75} + 4\sqrt{\frac{3}{16}}$

16. $\sqrt{24} - 12\sqrt{\frac{1}{6}} + 6\sqrt{\frac{2}{3}}$

17. $2\sqrt{a} + 7\sqrt{a} - 3\sqrt{a}$

18. $3x\sqrt{b} - 2x\sqrt{b} + 4x\sqrt{b}$

19. $2a\sqrt{xy} + a\sqrt{xy} + 4b\sqrt{xy} - 2b\sqrt{xy}$

20. $5\sqrt{mn} - 3\sqrt{mn} + b\sqrt{mn}$

21. $\sqrt{100x} - \sqrt{9x} + \sqrt{25x}$

22. $\sqrt{x^3y} + \sqrt{4x^3y} + 2x\sqrt{xy}$

23. $a\sqrt{ab^3} + ab\sqrt{ab} + b\sqrt{a^3b}$

24. $3\sqrt{27xy^4} - y\sqrt{48xy^2} + 2y^2\sqrt{75x}$

25. $\sqrt{50} + \sqrt{98} - \sqrt{75} + \sqrt{27}$

26. $2\sqrt{63} + 5\sqrt{54} - \sqrt{28} - 3\sqrt{24}$

27. $8\sqrt{12} - 10\sqrt{\frac{1}{5}} - \sqrt{108} + \sqrt{125}$

28. $4\sqrt{\frac{3}{8}} + \frac{1}{4}\sqrt{48} + 2\sqrt{96} - 8\sqrt{\frac{3}{4}}$

Combine:

1. $3\sqrt{17} + 5\sqrt{11} + 9\sqrt{17} + 6\sqrt{11}$

2. $9\sqrt{2} + 3\sqrt{5} - 8\sqrt{5} + 5\sqrt{2}$

3. $6\sqrt{a} + 5\sqrt{a} - 3\sqrt{b} + 4\sqrt{b}$

4. $2b\sqrt{3c} + b\sqrt{5c} + b\sqrt{3c} - 2b\sqrt{5c}$

Find the simplest radical form:

1. $(5 + \sqrt{3})(4 + \sqrt{3})$
2. $(2 - \sqrt{5})(3 + \sqrt{5})$
3. $(\sqrt{5} - 4)(\sqrt{5} + 4)$
4. $(7 + \sqrt{6})(7 - \sqrt{6})$
5. $(3 + \sqrt{6})(2 - \sqrt{6})$
6. $(4 - 3\sqrt{2})(4 + \sqrt{2})$
7. $(6 - \sqrt{3})(6 + \sqrt{3})$
8. $(3 + 2\sqrt{3})(3 - 2\sqrt{3})$
9. $(2 + \sqrt{3})(2 - \sqrt{3})$
10. $(1 + \sqrt{7})^2$
11. $(4 - \sqrt{5})(4 + \sqrt{5})$
12. $(\sqrt{2} - \sqrt{3})(\sqrt{2} + \sqrt{3})$
13. $(5 - \sqrt{10})^2$
14. $(5\sqrt{2} - 1)^2$
15. $(3\sqrt{7} + 2)^2$
16. $(\sqrt{7} + \sqrt{6})(\sqrt{7} - \sqrt{6})$
17. $(2\sqrt{3} - 5)(2\sqrt{3} + 3)$
18. $(5\sqrt{2} - 4)(5\sqrt{2} + 1)$
19. $(4\sqrt{3} + 1)(2\sqrt{3} - 3)$
20. $(5\sqrt{7} - 2)(\sqrt{7} + 2)$
21. $(2\sqrt{6} - \sqrt{3})(\sqrt{6} + 3\sqrt{3})$
22. $(6\sqrt{15} + \sqrt{5})(2\sqrt{15} - 3\sqrt{5})$
23. $(3 - \sqrt{2})(3 + \sqrt{2})$
24. $(4 + \sqrt{5})^2$
25. $(2\sqrt{5} + 5)^2$
26. $(3\sqrt{2} - 1)(3\sqrt{2} + 1)$
27. $(3 + \sqrt{2})(3 - \sqrt{2})$
28. $(5 - \sqrt{7})(5 + \sqrt{7})$
29. $(5 + \sqrt{5})^2$
30. $(\sqrt{5} - \sqrt{2})(\sqrt{5} + \sqrt{2})$
31. $(3 - \sqrt{6})^2$
32. $(\sqrt{3} + \sqrt{6})(\sqrt{3} - \sqrt{6})$
33. $(2\sqrt{3} - 3)^2$
34. $(3\sqrt{5} + 1)(\sqrt{5} - 2)$
35. $(4\sqrt{5} + 3)^2$
36. $(2\sqrt{3} - 1)(3\sqrt{3} + 2)$
37. $(3\sqrt{5} + \sqrt{2})(2\sqrt{5} - \sqrt{2})$
38. $(4\sqrt{3} + 5)(3\sqrt{3} - 4)$
39. $(4\sqrt{2} + 3\sqrt{6})(2\sqrt{2} - \sqrt{6})$
40. $(2\sqrt{10} + \sqrt{5})(3\sqrt{10} - 2\sqrt{5})$
41. $(2 + \sqrt{3})(1 - \sqrt{3})$
42. $(4 - \sqrt{2})^2$
43. $(3 + \sqrt{7})^2$
44. $(5 - \sqrt{6})(5 + \sqrt{6})$
45. $(2\sqrt{3} - 1)(2\sqrt{3} + 1)$
46. $(\sqrt{7} - 5)^2$
47. $(4\sqrt{5} - 2)(4\sqrt{5} + 2)$
48. $(3\sqrt{6} + 5)^2$
49. $(\sqrt{2} - 5)(2\sqrt{3} + 1)$
50. $(3\sqrt{3} + 2)(2\sqrt{3} - 4)$
51. $(\sqrt{7} + 2)(3\sqrt{7} - 5)$
52. $(\sqrt{5} - 7)(3\sqrt{5} + 2)$

Rationalize, express in simplest form:

- | | | |
|---|---|---|
| 1. $\frac{14}{3 + \sqrt{2}}$ | 14. $\frac{\sqrt{6} - 5}{\sqrt{6} + 2}$ | 27. $\frac{4}{3\sqrt{5} - 2}$ |
| 2. $\frac{7}{4 - \sqrt{2}}$ | 15. $\frac{3 + \sqrt{2}}{3 - \sqrt{2}}$ | 28. $\frac{1}{\sqrt{5} - 1}$ |
| 3. $\frac{16}{2\sqrt{3} - 2}$ | 16. $\frac{\sqrt{5} - 3}{\sqrt{5} + 3}$ | 29. $\frac{1}{\sqrt{7} + 1}$ |
| 4. $\frac{8}{\sqrt{5} - 3}$ | 17. $\frac{5 + \sqrt{2}}{3 - \sqrt{2}}$ | 30. $\frac{\sqrt{2}}{\sqrt{2} + 3}$ |
| 5. $\frac{4}{3 + \sqrt{5}}$ | 18. $\frac{7 + \sqrt{3}}{2 - \sqrt{3}}$ | 31. $\frac{\sqrt{6}}{5 - \sqrt{6}}$ |
| 6. $\frac{26}{5 - 2\sqrt{3}}$ | 19. $\frac{\sqrt{8} - 6}{\sqrt{8} + 6}$ | 32. $\frac{3 - \sqrt{5}}{2 - \sqrt{5}}$ |
| 7. $\frac{4}{3 + \sqrt{7}}$ | 20. $\frac{1}{1 + \sqrt{2}}$ | 33. $\frac{\sqrt{6} - 1}{3 + \sqrt{6}}$ |
| 8. $\frac{7}{2\sqrt{2} + 1}$ | 21. $\frac{2}{\sqrt{5} - 1}$ | 34. $\frac{2}{3\sqrt{2} - 2}$ |
| 9. $\frac{24}{6 - 3\sqrt{2}}$ | 22. $\frac{\sqrt{3}}{\sqrt{3} - 2}$ | 35. $\frac{6}{3 + 2\sqrt{3}}$ |
| 10. $\frac{\sqrt{3} + 1}{\sqrt{3} - 1}$ | 23. $\frac{\sqrt{5}}{3 + \sqrt{5}}$ | 36. $\frac{2\sqrt{2} - 1}{2\sqrt{2} + 1}$ |
| 11. $\frac{4 + \sqrt{5}}{3 + \sqrt{5}}$ | 24. $\frac{2 + \sqrt{3}}{1 - \sqrt{3}}$ | 37. $\frac{\sqrt{5} - \sqrt{3}}{\sqrt{5} + \sqrt{3}}$ |
| 12. $\frac{10 + \sqrt{5}}{3 - \sqrt{5}}$ | 25. $\frac{3 + \sqrt{2}}{2 - \sqrt{2}}$ | 38. $\frac{3\sqrt{2} - 1}{2\sqrt{2} + 1}$ |
| 13. $\frac{2\sqrt{2} - 1}{2\sqrt{2} + 1}$ | 26. $\frac{5}{2\sqrt{7} + 3}$ | 39. $\frac{3 - 2\sqrt{2}}{2 + \sqrt{2}}$ |

Rationalize, express in simplest form: (Continued)

40.
$$\frac{\sqrt{6} - \sqrt{3}}{\sqrt{6} + \sqrt{3}}$$

41.
$$\frac{3\sqrt{2} - \sqrt{3}}{2\sqrt{2} + \sqrt{3}}$$

42.
$$\frac{\sqrt{2} + \sqrt{3}}{\sqrt{2} - \sqrt{3}}$$

43.
$$\frac{5\sqrt{3} - 2\sqrt{2}}{3\sqrt{3} + \sqrt{2}}$$

44.
$$\frac{\sqrt{6} + \sqrt{3}}{4 + 2\sqrt{2}}$$

45.
$$\frac{2\sqrt{5} + 3\sqrt{2}}{2\sqrt{5} - 3\sqrt{2}}$$

46.
$$\frac{\sqrt{15} - \sqrt{5}}{10 - 2\sqrt{3}}$$

47.
$$\frac{\sqrt{7} - \sqrt{3}}{10 - 2\sqrt{21}}$$

48.
$$\frac{2\sqrt{3} - 1}{13 - 4\sqrt{3}}$$

Solve and check:

1. $\sqrt{x} = 3$
2. $\sqrt{2n} = 4$
3. $3\sqrt{y} = 6$
4. $\sqrt{x} + 1 = 5$
5. $\sqrt{3x} - 2 = 4$
6. $2\sqrt{2y + 3} = 11$
7. $\sqrt{x + 2} = 3$
8. $4\sqrt{2x - 1} = 12$
9. $\sqrt{x^2 + 8} = x + 2$
10. $8 - \sqrt{2x} = 2$
11. $\sqrt{\frac{x}{2}} = 5$
12. $\sqrt{\frac{2n}{3}} = 6$
13. $2\sqrt{2y} = 5$
14. $3\sqrt{3x - 2} = 4$
15. $\sqrt{x} = 2$
16. $\sqrt{n} = 5$
17. $\sqrt{y} = 4$
18. $6 = \sqrt{x}$
19. $\sqrt{3x} = 6$
20. $\sqrt{5x} = 5$
21. $\sqrt{4n} = 8$
22. $10 = \sqrt{2w}$
23. $4\sqrt{x} = 8$
24. $2\sqrt{n} = 10$
25. $3\sqrt{2x} = 12$
26. $5\sqrt{3y} = 60$
27. $\sqrt{x} + 4 = 6$
28. $\sqrt{2y} + 11 = 15$
29. $12 + \sqrt{4x} = 20$
30. $15 = \sqrt{3x} + 9$
31. $\sqrt{x} - 2 = 3$
32. $\sqrt{5y} - 8 = 2$
33. $6 = \sqrt{3x} - 3$
34. $\sqrt{4n} - 7 = 1$

Solve and check: (Continued)

35. $3\sqrt{n} + 4 = 10$

52. $12 - \sqrt{2n} = 4$

36. $4\sqrt{3y} + 9 = 21$

53. $25 - 2\sqrt{5x} = 5$

37. $6\sqrt{2x} - 3 = 45$

54. $50 - 3\sqrt{8x} = 2$

38. $25 = 2\sqrt{5x} - 5$

55. $\sqrt{\frac{x}{3}} = 1$

39. $\sqrt{x + 1} = 4$

56. $\sqrt{\frac{y}{5}} = 2$

40. $\sqrt{n - 3} = 8$

57. $\sqrt{\frac{x}{3}} = 5$

41. $5 = \sqrt{2x + 3}$

58. $2 = \sqrt{\frac{x}{4}}$

42. $\sqrt{5y - 4} = 9$

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

43. $2\sqrt{n + 3} = 10$

60. $\sqrt{\frac{3x}{5}} = 6$

44. $18 = 6\sqrt{y - 4}$

61. $\sqrt{\frac{5n}{2}} = 10$

45. $3\sqrt{2x + 5} = 9$

62. $3 = \sqrt{\frac{3x}{4}}$

46. $4\sqrt{3x - 2} = 16$

63. $2\sqrt{n} = 3$

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

64. $5\sqrt{y} = 4$

48. $\sqrt{x^2 - 35} = x - 5$

65. $4\sqrt{5x} = 6$

49. $x - 4 = \sqrt{x^2 - 32}$

66. $3 = 6\sqrt{3y}$

50. $\sqrt{y^2 + 27} = y + 3$

67. $3\sqrt{3y - 1} = 1$

51. $9 - \sqrt{x} = 2$

68. $4\sqrt{5x - 4} = 2$

Solve and check:

1. $2\sqrt{x-1} = 3$
2. $\sqrt{2x-5} = 3$
3. $\sqrt{7x-3} + 3 = 2x$
4. $\sqrt{4x+5} - 4 = 3x$
5. $\sqrt{10-3y} + y - 4 = 0$
6. $\sqrt{1-5y} + 7 = 1$
7. $\sqrt{15x+11} = 3(x+1)$
8. $\sqrt{12x+7} + 5 = 12x$
9. $\sqrt{4x+5} = 3x+4$
10. $\sqrt{y^2+11} - 1 = y$
11. $\sqrt{x^2-13} + 1 = x$
12. $\sqrt{y+4} = y+2$
13. $\sqrt{x+2} = x-4$
14. $\sqrt{7t-3} + 2t - 3$
15. $\sqrt{3a+10} = a+4$
16. $\sqrt{y^2+2} = 2-y$
17. $\sqrt{x^2-2} = x+10$
18. $\sqrt{3x+1} = x-1$
19. $\sqrt{a^2+9} = a+3$
20. $\sqrt{b^2-16} = b-4$
21. $\sqrt{x^2+4} - 1 = x$
22. $\sqrt{x^2-4} - 2 = x$
23. $\sqrt{2k-4} = k-2$
24. $\sqrt{3r-9} = r-3$
25. $\sqrt{19-x} = x-7$
26. $\sqrt{y+3} = y-9$
27. $\sqrt{x+2} = -3$
28. $1 + \sqrt{x+4} = 0$
29. $\sqrt{2s-1} + 3 = 2$
30. $\sqrt{2x-2} - x = 1$
31. $\sqrt{3y+13} = y+3$
32. $\sqrt{9x^2-1} = 3x$
33. $\sqrt{11x+20} + x = 2$
34. $\sqrt{x^2-9} = x+9$
35. $\sqrt{9x^2-5x} + 1 = 3x$
36. $\sqrt{x^2+6} + 2 = x$
37. $2\sqrt{x} = 5 - \sqrt{x}$
38. $3\sqrt{y} = 4 + \sqrt{y}$
39. $5\sqrt{x} = 24 - \sqrt{x}$
40. $x = 6 + \sqrt{x^2-12}$
41. $\sqrt{x^2+5} - x = 3$
42. $\sqrt{3x+2} + 5 = 2$
43. $\sqrt{x-5} - 6 = -15$
44. $3\sqrt{x+1} = 12$
45. $15\sqrt{x-3} = 45$
46. $2 = 3\sqrt{x} - 4$
47. $4 - 3\sqrt{x} = 3$
48. $3\sqrt{y-1} = 3$
49. $\sqrt{y} = 9 - 3\sqrt{y}$
50. $4\sqrt{x} = 15 - \sqrt{x}$

Solve and check:

1. $\sqrt{x} = 3$
2. $\sqrt{2x} = 5$
3. $\sqrt{x} = 4$
4. $\sqrt{3x} = 3$
5. $2\sqrt{x} = 5$
6. $3\sqrt{x} = 2$
7. $\sqrt{3y} = 6$
8. $\sqrt{2x} = 8$
9. $\sqrt{7a} = \frac{1}{2}$
10. $\sqrt{x} - \frac{2}{3} = 3$
11. $3\sqrt{2x} = 6$
12. $\sqrt{x} + \frac{3}{5} = 2$
13. $5\sqrt{3x} = 15$
14. $\sqrt{\frac{x}{3}} = 1$
15. $\sqrt{2t} + 3 = 1$
16. $\sqrt{6t} = \frac{2}{3}$
17. $\sqrt{\frac{k}{5}} = 2$
18. $\sqrt{6n} + 5 = 2$
19. $\sqrt{n} - 2 = -1$
20. $\sqrt{r} + 3 = 5$
21. $\sqrt{\frac{4a}{3}} - 2 = 6$
22. $\sqrt{2y} = 2$
23. $\sqrt{t} - \frac{1}{2} = 2$
24. $\sqrt{3x} = \frac{1}{3}$
25. $\sqrt{5x} = \frac{5}{2}$
26. $\sqrt{2y - 3} = 3$
27. $\sqrt{3y + 4} = 1$
28. $4\sqrt{5m} = 20$
29. $\sqrt{x + 10} = 3$
30. $\frac{1}{2}\sqrt{10m} = \frac{5}{2}$
31. $\sqrt{x - 4} = 9$
32. $\sqrt{p} + 5 = 3$
33. $\sqrt{4y - 3} + 7 = 10$
34. $\sqrt{5y - 1} - 8 = -1$

Solve and check: (Continued)

$$35. \sqrt{\frac{3x - 1}{4}} = 2$$

$$36. \sqrt{\frac{5y + 1}{6}} = 1$$

$$37. \sqrt{x} = 2\sqrt{5}$$

$$38. 3\sqrt{k} = 4\sqrt{3}$$

$$39. 4\sqrt{5t^2 + 5} = 20$$

$$40. 2\sqrt{3x^2 - 12} = 12$$

$$41. \sqrt{n + 2} = 4$$

$$42. \sqrt{3x + 2} - 1 = 1$$

$$43. \sqrt{5y - 2} + 3 = 6$$

$$44. \sqrt{\frac{2n + 6}{5}} = 4$$

$$45. \sqrt{\frac{3t - 1}{6}} = 3$$

$$46. 3\sqrt{2t^2 - 28} = 6$$

$$47. 3\sqrt{5x^2 - 11} = 9$$

