

Name _____

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Additional Exercises 9.1
Form I
Finding Roots

Evaluate each expression, or state that the expression is not a real number.

1. $\sqrt{49}$ 1. _____

2. $-\sqrt{49}$ 2. _____

3. $\sqrt{-49}$ 3. _____

4. $\sqrt{121}$ 4. _____

5. $\sqrt{\frac{1}{16}}$ 5. _____

6. $-\sqrt{\frac{1}{25}}$ 6. _____

7. $\sqrt{0.25}$ 7. _____

8. $\sqrt{14+11}$ 8. _____

9. $\sqrt{36} + \sqrt{25}$ 9. _____

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10. $\sqrt{36-20}$

10. _____

Find the indicated root, or state that the expression is not a real number.

11. $\sqrt[3]{8}$

11. _____

12. $\sqrt[3]{-8}$

12. _____

13. $\sqrt[3]{64}$

13. _____

14. $\sqrt[4]{1}$

14. _____

15. $\sqrt[4]{256}$

15. _____

16. $\sqrt[4]{-256}$

16. _____

Use a calculator to approximate each square root. Round to three decimal places.

17. $\sqrt{10}$

17. _____

18. $\sqrt{21}$

18. _____

19. $5 + \sqrt{6}$

19. _____

20. $\sqrt{14-9}$

20. _____

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Additional Exercises 9.1
Form II
Finding Roots

Evaluate each expression, or state that the expression is not a real number.

1. $\sqrt{25}$ 1. _____

2. $\sqrt{-81}$ 2. _____

3. $-\sqrt{121}$ 3. _____

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

5. $\sqrt{\frac{4}{9}}$ 5. _____

6. $\sqrt{0.81}$ 6. _____

7. $\sqrt{16+20}$ 7. _____

8. $\sqrt{10-35}$ 8. _____

Find the indicated root, or state that the expression is not a real number.

9. $\sqrt[3]{1}$ 9. _____

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10. $\sqrt[3]{-27}$

10. _____

11. $\sqrt[5]{-32}$

11. _____

12. $-\sqrt[9]{64}$

12. _____

13. $\sqrt[4]{625}$

13. _____

14. $\sqrt[3]{125}$

14. _____

15. $\sqrt[3]{-1000}$

15. _____

Use a calculator to approximate each square root. Round to three decimal places.

16. $\sqrt{26}$

16. _____

17. $\sqrt{41}$

17. _____

18. $\sqrt{25-6}$

18. _____

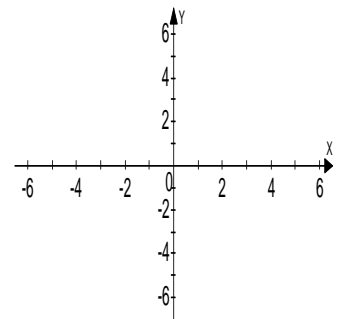
19. $\sqrt{25} - \sqrt{6}$

19. _____

Graph the equation by first making a table and finding five solutions of the equation. Then plot the ordered pairs as points in the rectangular coordinate system. Connect the points with a smooth curve.

20. $y = \sqrt{x-3}$

20.



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Additional Exercises 9.1
Form III
Finding Roots

Evaluate each expression, or state that the expression is not a real number.

1. $\sqrt{-100}$ 1. _____

2. $-\sqrt{64}$ 2. _____

3. $\sqrt[3]{-64}$ 3. _____

4. $\sqrt{-25}$ 4. _____

5. $\sqrt{100-64}$ 5. _____

6. $\sqrt{100}-\sqrt{64}$ 6. _____

7. $\sqrt[4]{1296}$ 7. _____

8. $\sqrt[3]{-125}$ 8. _____

9. $\sqrt[6]{1}$ 9. _____

10. $\sqrt[8]{-1}$ 10. _____

11. $\sqrt[5]{-32}$ 11. _____

12. $-\sqrt[4]{625}$ 12. _____

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13. $\sqrt[3]{\frac{1}{27}}$

13. _____

14. $\sqrt[4]{\frac{16}{81}}$

14. _____

Use a calculator to approximate each square root. Round to three decimal places.

15. $\sqrt{51}$

15. _____

16. $\sqrt{123}$

16. _____

17. $\sqrt{100-58}$

17. _____

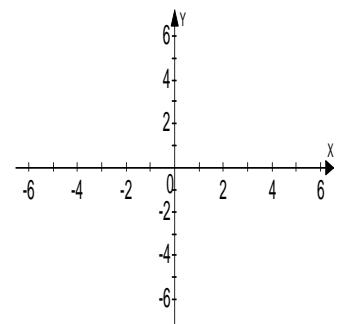
18. $\sqrt{100}-\sqrt{58}$

18. _____

Graph the equation by first making a table and finding five solutions of the equation. Then plot the ordered pairs as points in the rectangular coordinate system. Connect the points with a smooth curve.

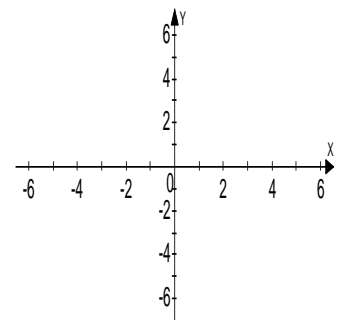
19. $y = \sqrt{x-4}$

19.



20. $y = \sqrt{x+5}$

20.



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Additional Exercises 9.2
Form I
Multiplying and Dividing Radicals

Simplify each expression. If the expression cannot be simplified, so state.

1. $\sqrt{28}$

1. _____

2. $\sqrt{40}$

2. _____

3. $\sqrt{48}$

3. _____

4. $\sqrt{54}$

4. _____

5. $\sqrt{10}$

5. _____

6. $\sqrt{72}$

6. _____

7. $\sqrt{12x^2}$

7. _____

8. $\sqrt{45y^6}$

8. _____

9. $\sqrt[3]{24}$

9. _____

10. $\sqrt[3]{54}$

10. _____

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11. $\sqrt[4]{48}$

11. _____

Multiply and simplify if possible.

12. $\sqrt{6} \cdot \sqrt{5}$

12. _____

13. $\sqrt{10} \cdot \sqrt{10}$

13. _____

14. $\sqrt{6x} \cdot \sqrt{3x}$

14. _____

15. $\sqrt{10y} \cdot \sqrt{5y}$

15. _____

Simplify using the quotient rule for square roots.

16. $\sqrt{\frac{4}{25}}$

16. _____

17. $\frac{\sqrt{10}}{\sqrt{25}}$

17. _____

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

18. _____

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

19. _____

20. $\frac{\sqrt{100}}{\sqrt{10}}$

20. _____

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Additional Exercises 9.2
Form II
Multiplying and Dividing Radicals

Simplify each expression. If the expression cannot be simplified, so state.

1. $\sqrt{44}$ 1. _____

2. $\sqrt{98}$ 2. _____

3. $\sqrt{180}$ 3. _____

4. $\sqrt{20x^4}$ 4. _____

5. $\sqrt{30y}$ 5. _____

6. $\sqrt{121a}$ 6. _____

7. $\sqrt{18y^{10}}$ 7. _____

8. $\sqrt[3]{56}$ 8. _____

9. $\sqrt[3]{108x^3y^6}$ 9. _____

10. $\sqrt[4]{243x^2y^3}$ 10. _____

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Multiply and simplify if possible.

11. $\sqrt{7} \cdot \sqrt{21}$

11. _____

12. $\sqrt{3} \cdot \sqrt{18}$

12. _____

13. $\sqrt{27x} \cdot \sqrt{12x}$

13. _____

14. $\sqrt{2xy} \cdot \sqrt{7xy}$

14. _____

Simplify using the quotient rule for square roots.

15. $\sqrt{\frac{10}{16}}$

15. _____

16. $\frac{\sqrt{90}}{\sqrt{10}}$

16. _____

17. $\sqrt{\frac{50}{64}}$

17. _____

18. $\frac{\sqrt{20}}{\sqrt{5}}$

18. _____

19. $\frac{\sqrt{88x^2}}{\sqrt{11x}}$

19. _____

20. $\sqrt{\frac{20x^3}{49x}}$

20. _____

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Additional Exercises 9.2
Form III
Multiplying and Dividing Radicals

Simplify each expression. If the expression cannot be simplified, so state.

1. $\sqrt{125}$ 1. _____

2. $\sqrt{52}$ 2. _____

3. $\sqrt{216}$ 3. _____

4. $\sqrt{26x}$ 4. _____

5. $\sqrt{500a^{12}}$ 5. _____

6. $\sqrt[3]{135x^3y^6}$ 6. _____

7. $\sqrt[3]{625b^2}$ 7. _____

8. $\sqrt{90a^5b^3}$ 8. _____

9. $\sqrt[4]{64x^{12}}$ 9. _____

10. $\sqrt[5]{96a^4}$ 10. _____

11. $\sqrt{4x^2 + 12xy + 9y^2}$ 11. _____

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Multiply and simplify if possible.

12. $\sqrt{15x} \cdot \sqrt{3x^3}$ 12. _____

13. $\sqrt{12y^3} \cdot \sqrt{6y^3}$ 13. _____

14. $\sqrt{18xy} \cdot \sqrt{18xy}$ 14. _____

15. $\sqrt[3]{4m} \cdot \sqrt[3]{12m}$ 15. _____

16. $\sqrt[4]{12a^3} \cdot \sqrt[4]{27a}$ 16. _____

Simplify using the quotient rule for square roots.

17. $\sqrt{\frac{80}{16}}$ 17. _____

18. $\sqrt{\frac{39}{81}}$ 18. _____

19. $\frac{\sqrt{50x^3}}{\sqrt{2x}}$ 19. _____

20. $\sqrt[3]{\frac{16}{27}}$ 20. _____

21. $\frac{\sqrt[3]{48}}{\sqrt[3]{3}}$ 21. _____

22. $\frac{\sqrt{80x^5}}{\sqrt{5x}}$ 22. _____

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Additional Exercises 9.3
Form I
Operations with Radicals

Add or subtract as indicated. If terms are not like radicals and cannot be combined, so state.

1. $5\sqrt{6} + 3\sqrt{6}$ 1. _____

2. $12\sqrt{5} - 10\sqrt{5}$ 2. _____

3. $\sqrt{7} + \sqrt{7}$ 3. _____

4. $3\sqrt{10} - 7\sqrt{10}$ 4. _____

5. $2\sqrt{11y} + 4\sqrt{11y}$ 5. _____

6. $6\sqrt{3} + 2\sqrt{5}$ 6. _____

7. $8\sqrt{14} + \sqrt{14} + 4\sqrt{14}$ 7. _____

8. $9\sqrt{21} - \sqrt{21} - 3\sqrt{21}$ 8. _____

Add or subtract as indicated. You may need to simplify terms before they can be combined. If terms cannot be combined, so state.

9. $3\sqrt{8} + 4\sqrt{18}$ 9. _____

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10. $15\sqrt{20} - 10\sqrt{45}$ 10. _____

11. $6\sqrt{90x} - 3\sqrt{40x} - 2\sqrt{10x}$ 11. _____

12. $4\sqrt{6} + 2\sqrt{10}$ 12. _____

Multiply as indicated. Final answers may need to be simplified.

13. $6(\sqrt{3} - \sqrt{5})$ 13. _____

14. $\sqrt{3}(\sqrt{6} - \sqrt{3})$ 14. _____

15. $(4 + \sqrt{2})(2 + \sqrt{3})$ 15. _____

16. $(5 + \sqrt{5})(3 - \sqrt{5})$ 16. _____

17. $(\sqrt{6} - \sqrt{3})(\sqrt{6} + \sqrt{3})$ 17. _____

18. $(4 + \sqrt{6})(4 - \sqrt{6})$ 18. _____

19. $(\sqrt{3} + \sqrt{5})^2$ 19. _____

20. $(\sqrt{2} - \sqrt{x})^2$ 20. _____

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Additional Exercises 9.3
Form II
Operations with Radicals

Add or subtract as indicated. If terms are not like radicals and cannot be combined, so state.

1. $18\sqrt{10} - 7\sqrt{10}$ 1. _____

2. $5\sqrt{x} + 2\sqrt{x}$ 2. _____

3. $\sqrt{6} + \sqrt{6}$ 3. _____

4. $4\sqrt{3xy} - 5\sqrt{3xy}$ 4. _____

5. $\sqrt{5a} - \sqrt{5a}$ 5. _____

6. $10\sqrt{11x} - \sqrt{11x} + 3\sqrt{11x}$ 6. _____

7. $\sqrt{21ab} + 4\sqrt{21ab} - 8\sqrt{21ab}$ 7. _____

Add or subtract as indicated. You may need to simplify terms before they can be combined. If terms cannot be combined, so state.

8. $8\sqrt{12} + 3\sqrt{27} - \sqrt{27}$ 8. _____

9. $5\sqrt{44x} - 3\sqrt{99x} + 2\sqrt{11x}$ 9. _____

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10. $3y\sqrt{8y} + 3y\sqrt{18y} - 3y\sqrt{32y}$ 10. _____

11. $5xy\sqrt{45xy^2} - 2y^2\sqrt{20x^3} + 3xy^2\sqrt{5x}$ 11. _____

12. $7a\sqrt{12ab} + 3a\sqrt{3ab}$ 12. _____

Multiply as indicated. Final answers may need to be simplified.

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

14. $\sqrt{5}(\sqrt{4} - \sqrt{5})$ 14. _____

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

16. $(5 + \sqrt{5})(2 - \sqrt{10})$ 16. _____

17. $(\sqrt{7} - \sqrt{3})(\sqrt{7} + \sqrt{3})$ 17. _____

18. $(2\sqrt{3} + \sqrt{7})(3\sqrt{4} - \sqrt{3})$ 18. _____

19. $(\sqrt{11} - \sqrt{5})^2$ 19. _____

20. $(4\sqrt{10} + 2\sqrt{2})^2$ 20. _____

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Additional Exercises 9.3
Form III
Operations with Radicals

Add or subtract as indicated. If terms are not like radicals and cannot be combined, so state.

1. $-14\sqrt{17} + 8\sqrt{17}$ 1. _____

2. $7\sqrt{y} - 3\sqrt{y}$ 2. _____

3. $25\sqrt{5} - \sqrt{5}$ 3. _____

4. $8x\sqrt{2y} + 4x\sqrt{2y}$ 4. _____

5. $7\sqrt{3ab} - 2\sqrt{3ab} + \sqrt{3ab}$ 5. _____

6. $9a\sqrt{6} - 5\sqrt{6a}$ 6. _____

7. $12xy\sqrt{xy} - 10xy\sqrt{xy} + 15xy\sqrt{xy}$ 7. _____

Add or subtract as indicated. You may need to simplify terms before they can be combined. If terms cannot be combined, so state.

8. $5\sqrt{2} + 5\sqrt{18}$ 8. _____

9. $3\sqrt{27} - 5\sqrt{3} + 2\sqrt{27}$ 9. _____

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10. $\sqrt{48} + 2\sqrt{48} - 8\sqrt{3}$

10. _____

11. $4\sqrt{32a^2} - 2\sqrt{8a^2} + a\sqrt{18}$

11. _____

12. $7x^2y^3\sqrt[3]{8y^4} + 3y^3\sqrt{x^6y^4} - 2xy^3\sqrt{x^3y^4}$

12. _____

Multiply as indicated. Final answers may need to be simplified.

13. $\sqrt{5}(\sqrt{5} - \sqrt{10})$

13. _____

14. $\sqrt{2x}(\sqrt{3x} + \sqrt{12x})$

14. _____

15. $(12 + \sqrt{6})(3 - \sqrt{6})$

15. _____

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

16. _____

17. $(3\sqrt{6} + 4\sqrt{2})(3\sqrt{3} - 6\sqrt{2})$

17. _____

18. $(2\sqrt{7} + 5\sqrt{6})(2\sqrt{7} - 5\sqrt{6})$

18. _____

19. $(\sqrt{10} - \sqrt{15})^2$

19. _____

20. $(8\sqrt{3} + 2\sqrt{6})^2$

20. _____

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Additional Exercises 9.4
Form I
Rationalizing the Denominator

Rationalize each denominator. Then simplify the rationalized expression if possible.

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

1. _____

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

2. _____

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

3. _____

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

4. _____

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

5. _____

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

6. _____

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

7. _____

Simplify each expression. Then rationalize the denominator.

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

8. _____

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

9. _____

10. $\sqrt{\frac{1}{24}}$

10. _____

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

11. _____

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

12. _____

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

13. _____

14. $\frac{15}{\sqrt{40}}$

14. _____

15. $\sqrt{\frac{3}{50}}$

15. _____

Rationalize each denominator. Then simplify if possible.

16. $\frac{1}{5-\sqrt{3}}$

16. _____

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

17. _____

18. $\frac{10}{10-\sqrt{6}}$

18. _____

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

19. _____

20. $\frac{4}{\sqrt{6}-\sqrt{5}}$

20. _____

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Additional Exercises 9.4
Form II
Rationalizing the Denominator

Rationalize each denominator. Then simplify the rationalized expression if possible.

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

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

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

4. $\frac{8}{\sqrt{10}}$ 4. _____

5. $\frac{3}{\sqrt{15}}$ 5. _____

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

7. $\sqrt{\frac{4}{7}}$ 7. _____

Simplify each expression. Then rationalize the denominator.

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

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

10. $\sqrt{\frac{1}{32}}$ 10. _____

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11. $\sqrt{\frac{7}{24}}$

11. _____

12. $\frac{5}{\sqrt{32}}$

12. _____

13. $\sqrt{\frac{8}{30}}$

13. _____

14. $\frac{\sqrt{3}}{\sqrt{22}}$

14. _____

Rationalize each denominator. Then simplify if possible.

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

15. _____

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

16. _____

17. $\frac{4}{\sqrt{6}-\sqrt{2}}$

17. _____

18. $\frac{6}{\sqrt{5}+\sqrt{3}}$

18. _____

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

19. _____

20. $\frac{5+\sqrt{3}}{\sqrt{6}-\sqrt{3}}$

20. _____

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Additional Exercises 9.4**Form III****Rationalizing the Denominator**

Rationalize each denominator. Then simplify the rationalized expression if possible.

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

1. _____

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

2. _____

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

3. _____

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

4. _____

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

5. _____

6. $\sqrt{\frac{2}{5xy}}$

6. _____

Simplify each expression. Then rationalize the denominator.

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

7. _____

8. $\frac{2}{\sqrt{48}}$

8. _____

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

9. _____

10. $\sqrt{\frac{4y}{28y}}$

10. _____

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11. $\frac{\sqrt{10}}{\sqrt{32}}$

11. _____

12. $\sqrt{\frac{5}{72x^3}}$

12. _____

13. $\frac{\sqrt{12x}}{\sqrt{27xy^3}}$

13. _____

14. $\sqrt{\frac{6}{40ab^5}}$

14. _____

Rationalize each denominator. Then simplify if possible.

15. $\frac{8}{6-\sqrt{5}}$

15. _____

16. $\frac{14}{7+\sqrt{5}}$

16. _____

17. $\frac{\sqrt{6}}{\sqrt{5}-\sqrt{3}}$

17. _____

18. $\frac{\sqrt{5}}{\sqrt{10}+\sqrt{3}}$

18. _____

19. $\frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}}$

19. _____

20. $\frac{2\sqrt{6}+\sqrt{10}}{\sqrt{10}-\sqrt{6}}$

20. _____

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Additional Exercises 9.5
Form I
Radical Equations

Solve each radical equation.

1. $\sqrt{x} = 7$

1. _____

2. $\sqrt{x} = 19$

2. _____

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

3. _____

4. $\sqrt{a} = -4$

4. _____

5. $\sqrt{x-12} = 3$

5. _____

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

6. _____

7. $\sqrt{6y-5} = 5$

7. _____

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

8. _____

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9. $\sqrt{y} + 1 = 3$

9. _____

10. $\sqrt{9 - y} = 5$

10. _____

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

11. _____

12. $\sqrt{4y + 5} = 2y - 5$

12. _____

Solve each problem.

13. Six is equal to the square root of the sum of a number and 5.
-
- Find the number.

13. _____

14. A formula used to determine the velocity
- v
- in feet per second of an object (neglecting air resistance) after it has fallen a certain height is
- $v = \sqrt{2gh}$
- , where
- g
- is the acceleration due to gravity and
- h
- is the height the object has fallen. If the acceleration
- g
- due to gravity on Earth is approximately 40 feet per second per second, find the velocity of a bowling ball after it has fallen 27 feet.
-
- (Round to the nearest tenth.)

14. _____

15. Police use the formula
- $s = \sqrt{30fd}$
- to estimate the speed
- s
- of a car in miles per hour, where
- d
- is the distance in feet that the car skidded and
- f
- is the coefficient of friction. If the coefficient of friction on a certain gravel road is 0.17 and a car skidded 280 feet, find the speed of the car, to the nearest mile per hour.

15. _____

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Additional Exercises 9.5
Form II
Radical Equations

Solve each radical equation.

1. $\sqrt{y} = 15$

1. _____

2. $\sqrt{x-4} = 9$

2. _____

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

3. _____

4. $\sqrt{4-y} = 7$

4. _____

5. $\sqrt{x} + 12 = 9$

5. _____

6. $\sqrt{2y-1} = 7$

6. _____

7. $5\sqrt{x} = \sqrt{19x+30}$

7. _____

8. $\sqrt{2a} = a - 4$

8. _____

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9. $\sqrt{2x+1} = x-7$ 9. _____

10. $\sqrt{5x-5} = \sqrt{4x+15}$ 10. _____

11. $\sqrt{3x+3} + \sqrt{x+2} = 5$ 11. _____

12. $\sqrt{4x+9} = 2 - \sqrt{x+5}$ 12. _____

Solve each problem.

13. Five is equal to the square root of the sum of a number and 4. Find the number. 13. _____

14. A formula used to determine the velocity v in feet per second of an object (neglecting air resistance) after it has fallen a certain height is $v = \sqrt{2gh}$, where g is the acceleration due to gravity and h is the height the object has fallen. If the acceleration g due to gravity on Earth is approximately 32 feet per second per second, find the velocity of a bowling ball after it has fallen 30 feet. (Round to the nearest tenth.) 14. _____15. Police use the formula $s = \sqrt{30fd}$ to estimate the speed s of a car in miles per hour, where d is the distance in feet that the car skidded and f is the coefficient of friction. If the coefficient of friction on a certain gravel road is 0.23 and a car skidded 300 feet, find the speed of the car, to the nearest mile per hour. 15. _____

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Additional Exercises 9.5
Form III
Radical Equations

Solve each radical equation.

1. $\sqrt{x+4} = 16$

1. _____

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

2. _____

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

3. _____

4. $\sqrt{4y+1} + 3 = 2$

4. _____

5. $\sqrt{5a+1} + 3 = 7$

5. _____

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

6. _____

7. $\sqrt{2x+13} = y+7$

7. _____

8. $\sqrt{7x-1} = \sqrt{2x+4}$

8. _____

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9. $\sqrt{a+3} + 3 = a$ 9. _____

10. $\sqrt{x-3} = 4 - \sqrt{x+5}$ 10. _____

11. $\sqrt{2x+9} + \sqrt{x+5} = 2$ 11. _____

Solve each problem.

12. Police use the formula $s = \sqrt{30fd}$ to estimate the speed s of a car in miles per hour, where d is the distance in feet that the car skidded and f is the coefficient of friction. If the coefficient of friction on a certain dry road is 0.85 and a car was traveling on it at a rate of 30 mph, how far will the car skid? (Round to the nearest foot.) 12. _____

13. The maximum distance d in kilometers that you can see from a height h in meters is given by the formula $d = 3.5\sqrt{h}$. How far can you see from the top of a 482-meter building? (Round to the nearest tenth of a kilometer.) 13. _____

14. The formula $v = \sqrt{2.5r}$ can be used to estimate the maximum safe velocity v , in miles per hour, at which a car can travel along a curved road with a radius of curvature r in feet. To the nearest whole number, find the radius of curvature if the maximum safe velocity is 20. 14. _____

15. One number is 5 more than another number. The square root of the largest number is 7 less than the smaller number. What are the two numbers? 15. _____

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Additional Exercises 9.6
Form I
Rational Exponents

Simplify each expression by first writing the expression in radical form. You may want to use a calculator to verify your answer.

1. $36^{\frac{1}{2}}$

1. _____

2. $64^{\frac{1}{2}}$

2. _____

3. $1^{\frac{1}{3}}$

3. _____

4. $8^{\frac{1}{3}}$

4. _____

5. $32^{\frac{1}{5}}$

5. _____

6. $36^{-\frac{1}{2}}$

6. _____

7. $8^{-\frac{1}{3}}$

7. _____

8. $\left(\frac{1}{25}\right)^{\frac{1}{2}}$

8. _____

9. $-36^{\frac{1}{2}}$

9. _____

10. $16^{\frac{3}{2}}$

10. _____

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11. $27^{\frac{2}{3}}$

11. _____

12. $27^{\frac{2}{3}}$

12. _____

13. $-16^{\frac{1}{4}}$

13. _____

14. $25^{\frac{3}{2}}$

14. _____

15. $16^{\frac{1}{4}}$

15. _____

16. $1^{\frac{3}{4}}$

16. _____

17. $\left(\frac{4}{25}\right)^{\frac{1}{2}}$

17. _____

18. $\left(\frac{1}{8}\right)^{\frac{1}{3}}$

18. _____

19. $4^{\frac{1}{4}} \cdot 4^{\frac{1}{4}}$

19. _____

20. $8^{\frac{1}{3}} \cdot 8^{\frac{2}{3}}$

20. _____

Name _____

Date _____

Additional Exercises 9.6
Form II
Rational Exponents

Simplify each expression by first writing the expression in radical form. You may want to use a calculator to verify your answer.

1. $121^{\frac{1}{2}}$ 1. _____

2. $125^{\frac{1}{3}}$ 2. _____

3. $256^{\frac{1}{4}}$ 3. _____

4. $-8^{\frac{1}{3}}$ 4. _____

5. $32^{\frac{1}{5}}$ 5. _____

6. $-64^{\frac{1}{2}}$ 6. _____

7. $-64^{\frac{1}{2}}$ 7. _____

8. $9^{\frac{3}{2}}$ 8. _____

9. $81^{\frac{3}{4}}$ 9. _____

10. $16^{\frac{-3}{4}}$ 10. _____

Name _____

Date _____

11. $\left(\frac{4}{49}\right)^{-\frac{1}{2}}$

11. _____

12. $32^{\frac{4}{5}}$

12. _____

13. $9^{-\frac{3}{2}}$

13. _____

14. $\left(\frac{25}{9}\right)^{-\frac{1}{2}}$

14. _____

15. $-81^{\frac{3}{4}}$

15. _____

16. $27^{-\frac{1}{3}}$

16. _____

17. $-625^{-\frac{1}{4}}$

17. _____

18. $49^{-\frac{1}{4}} \cdot 49^{\frac{3}{4}}$

18. _____

19. $8^{\frac{2}{15}} \cdot 8^{\frac{1}{5}}$

19. _____

20. $25^{\frac{3}{2}} - 27^{\frac{2}{3}}$

20. _____

Name _____

Date _____

Additional Exercises 9.6
Form III
Rational Exponents

Simplify each expression. You may need to first write the expression in radical form.

1. $32^{\frac{1}{5}}$ 1. _____

2. $-81^{\frac{1}{4}}$ 2. _____

3. $81^{\frac{3}{4}}$ 3. _____

4. $27^{\frac{2}{3}}$ 4. _____

5. $243^{\frac{2}{5}}$ 5. _____

6. $\left(\frac{8}{64}\right)^{\frac{2}{3}}$ 6. _____

7. $49^{\frac{3}{2}}$ 7. _____

8. $\left(\frac{216}{1331}\right)^{-\frac{2}{3}}$ 8. _____

9. $\left(-\frac{1}{8}\right)^{-\frac{4}{3}}$ 9. _____

10. $\left(\frac{1}{36}\right)^{-\frac{1}{2}}$ 10. _____

Name _____

Date _____

11. $\left(\frac{1}{16}\right)^{\frac{1}{4}} + \left(\frac{1}{49}\right)^{\frac{1}{2}}$ 11. _____

12. $\left(\frac{1}{8}\right)^{-\frac{2}{3}} + \left(\frac{1}{4}\right)^{-\frac{1}{2}}$ 12. _____

13. $81^{\frac{5}{12}} \cdot 81^{\frac{1}{3}}$ 13. _____

14. $8^{\frac{5}{6}} \cdot 8^{-\frac{1}{2}}$ 14. _____

15. $49^{\frac{1}{4}} \cdot 49^{-\frac{3}{4}}$ 15. _____

16. $8^{\frac{4}{3}} - 16^{\frac{3}{2}}$ 16. _____

17. $25^{\frac{3}{2}} - 32^{\frac{3}{5}}$ 17. _____

18. $125^{\frac{2}{3}} - 16^{\frac{3}{4}} + 27^{\frac{2}{3}}$ 18. _____

19. A research study collected data for the presence of a certain environment sensitive chemical in the sap of trees within a 19. _____

particular geographical region. The formula $P = \frac{60 - 8t^{\frac{1}{3}}}{t^{\frac{2}{3}}}$

models the percentage, P , of trees that tested positive for the chemical t years after 1875. What percentage of those tested in 1883?

20. In a computer model, $P = 215t^{\frac{1}{6}}$ represents the number of people, P , in millions, who will use a proposed government service in 20. _____

year t after the service has begun. In this same model, $E = 387t^{\frac{2}{3}}$ equals the expense, in millions of dollars, of providing that service in year t after the service has begun. What is the average cost per user of that service in year 8 after the service has begun?