Name _____ Class _____ Date _____

Practice 11-1

Simplifying Radicals

Simplify each radical expression. Assume that all variables under radicals represent positive numbers.

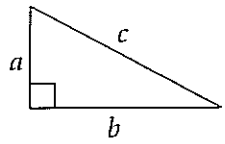
1. $\sqrt{32}$
2. $\sqrt{22} \cdot \sqrt{8}$
3. $\sqrt{147}$
4. $\sqrt{\frac{17}{144}}$
5. $\sqrt{a^2b^5}$
6. $\frac{2}{\sqrt{6}}$
7. $\sqrt{80}$
8. $\sqrt{27}$
9. $\frac{\sqrt{256}}{\sqrt{32}}$
10. $\frac{8}{\sqrt{7}}$
11. $\sqrt{12x^4}$
12. $\frac{\sqrt{96}}{\sqrt{12}}$
13. $\sqrt{200}$
14. $\sqrt{\frac{12}{225}}$
15. $\sqrt{15} \cdot \sqrt{6}$
16. $\sqrt{120}$
17. $\frac{4}{\sqrt{2a}}$
18. $\left(3\sqrt{2}\right)^3$
19. $\sqrt{250}$
20. $\frac{\sqrt{65}}{\sqrt{13}}$
21. $\sqrt{84}$
22. $\sqrt{\frac{18}{225}}$
23. $\sqrt{48s^3}$
24. $3\sqrt{24}$
25. $\sqrt{15} \cdot \sqrt{35}$
26. $\sqrt{160}$
27. $\frac{6}{\sqrt{3}}$
28. $\frac{\sqrt{48n^6}}{\sqrt{6n^3}}$
29. $\sqrt{136}$
30. $\sqrt{\frac{27x^2}{256}}$
31. $\sqrt{m^3n^2}$
32. $\frac{\sqrt{180}}{\sqrt{9}}$
33. $\sqrt{18} \cdot \sqrt{8}$
34. $\left(10\sqrt{3}\right)^2$
35. $\sqrt{\frac{17}{64}}$
36. $\sqrt{50}$
37. $\sqrt{48}$
38. $\sqrt{20}$
39. $\sqrt{8}$
40. $\sqrt{25x^2}$
41. $\sqrt{\frac{7}{9}}$
42. $\sqrt{\frac{17}{64}}$
43. $\frac{\sqrt{48}}{\sqrt{8}}$
44. $\frac{\sqrt{120}}{\sqrt{10}}$
45. $\frac{5}{\sqrt{2}}$
46. $\sqrt{75}$
47. $\sqrt{300}$
48. $\sqrt{49a^3}$
49. $\sqrt{125}$
50. $\sqrt{28x^4}$
51. $\frac{7}{\sqrt{3}}$
52. $\sqrt{\frac{15}{49}}$
53. $\frac{\sqrt{60}}{\sqrt{12}}$
54. $\frac{3}{\sqrt{3}}$
55. $\frac{4}{\sqrt{8}}$
56. $\sqrt{72x^3}$
57. $\sqrt{50y^3}$
58. $\sqrt{45x^2y^3}$
59. $\sqrt{\frac{44x^3}{9x}}$
60. $\frac{\sqrt{4}}{\sqrt{3x}}$
61. $6\sqrt{20}$
62. $\sqrt{ab^3}$
63. $\sqrt{a^5b^6}$
64. $12\sqrt{60x^2}$
65. $\left(2\sqrt{3}\right)^2$
66. $\sqrt{12} \cdot \sqrt{27}$
67. $\left(7\sqrt{5}\right)^2$
68. $\sqrt{14} \cdot \sqrt{8}$
69. $\left(5\sqrt{5}\right)^2$
70. $\sqrt{8x^6y^7}$
71. $\sqrt{16a^3} \cdot \sqrt{5a^2}$
72. $\sqrt{8} \cdot \sqrt{7}$
73. $\sqrt{3x} \cdot \sqrt{5x}$
74. $2\sqrt{5} \cdot 2\sqrt{5}$
75. $4\sqrt{3} \cdot 2\sqrt{2}$
76. $6\sqrt{3} \cdot 7\sqrt{8}$
77. $\frac{10}{\sqrt{x}}$
78. $\frac{\sqrt{9}}{\sqrt{2x}}$
79. $\frac{4}{\sqrt{20}}$
80. $\frac{\sqrt{12x}}{\sqrt{27x}}$
81. $\frac{3\sqrt{7}}{\sqrt{20x}}$
82. $\frac{4\sqrt{5}}{\sqrt{8y}}$

Name _____ Class _____ Date _____

Practice 11-2

The Pythagorean Theorem

Use the triangle at the right. Find the length of the missing side to the nearest tenth.



1. $a = 12, b = 35, c =$ ▩
2. $a = 10, b =$ ▩$, c = 26$
3. $a = 11, b =$ ▩$, c = 61$
4. $a = 36, b = 15, c =$ ▩
5. $a = 8, b = 15, c =$ ▩
6. $a =$ ▩$, b = 24, c = 40$
7. $a = 18, b =$ ▩$, c = 35$
8. $a = 17, b =$ ▩$, c = 49$
9. $a = 42, b = 37, c =$ ▩
10. $a =$ ▩$, b = 80, c = 90$
11. $a = 8, b = 8, c =$ ▩
12. $a = 19, b =$ ▩$, c = 26$
13. $a =$ ▩$, b = 27, c = 33$
14. $a =$ ▩$, b = 13, c = 24$
15. $a = 9, b =$ ▩$, c = 13$
16. $a = 19, b = 45, c =$ ▩
17. $a =$ ▩$, b = 24, c = 39$
18. $a = 14, b = 14, c =$ ▩

Determine whether the given lengths are sides of a right triangle.

19. 20, 21, 29
20. 16, 30, 34
21. 24, 60, 66
22. 23, 18, 14
23. 10, 24, 28
24. 45, 28, 53
25. $\frac{4}{5}, \frac{3}{5}, 1$
26. $\frac{2}{3}, \frac{4}{3}, \frac{1}{3}$
27. 3.5, 4.4, 5.5
28. 10.5, 11.3, 13.8
29. 3.3, 6.5, 5.6
30. 24, 70, 74
31. 4.2, 7.0, 5.6
32. 5.2, 6.5, 3.9
33. 2.1, 3.5, 2.8
34. 4.8, 7.5, 5.4
35. 7.5, 4.3, 6.7
36. $\frac{1}{9}, \frac{1}{15}, \frac{1}{18}$
37. $\frac{1}{2}, \frac{6}{5}, \frac{13}{10}$
38. $\frac{1}{5}, \frac{1}{4}, \frac{1}{3}$

Find the missing length to the nearest tenth.

39. A ladder is 25 ft long. The ladder needs to reach to a window that is 24 ft above the ground. How far away from the building should the bottom of the ladder be placed?

40. Suppose you are making a sail in the shape of a right triangle for a sailboat. The length of the longest side of the sail is 65 ft. The sail is to be 63 ft high. What is the length of the third side of the sail?

41. Suppose you leave your house and travel 13 mi due west. Then you travel 3 mi due south. How far are you from your house?

42. A wire is run between the tips of two poles. One pole is 23 ft taller than the other pole. The poles are 37 ft apart. How long does the wire need to be to reach between the two poles?

43. A 20-ft-long wire is used to support a television antenna. The wire is connected to the antenna 15 ft above the ground. How far away from the base of the tower will the other end of the wire be located?

Name _____ Class _____ Date _____

Practice 11-3

The Distance and Midpoint Formulas

Find the midpoint of $\overline{XY}$.

1. $X(8, 14)$ and $Y(2, 6)$
2. $X(11, 7)$ and $Y(3, 19)$
3. $X(-7, 6)$ and $Y(11, -2)$
4. $X(-3, -2)$ and $Y(7, 8)$
5. $X(-4, -1)$ and $Y(-8, 5)$
6. $X(6, 15)$ and $Y(4, 8)$
7. $X(-3, 5)$ and $Y(8, 9)$
8. $X(16, -8)$ and $Y(5, 9)$
9. $X(0, -15)$ and $Y(9, -15)$
10. $X(9\frac{1}{2}, 7)$ and $Y(7\frac{1}{2}, 5)$
11. $X(6, -2)$ and $Y(9, -1)$
12. $X(8, -13)$ and $Y(1, -7)$
13. $X(-7, -5)$ and $Y(-3, 16)$
14. $X(-7, -17)$ and $Y(11, 4)$
15. $X(11, 19)$ and $Y(6, -4)$
16. $X(3, -8)$ and $Y(-5, -13)$
17. $X(-2, 2)$ and $Y(6, -13)$
18. $X(-9, -4)$ and $Y(16, 12)$

Find the distance between each pair of points. If necessary, round to the nearest tenth.

19. $(3, 0), (0, 4)$
20. $(3, 5), (12, 17)$
21. $(-4, 2), (2, -6)$
22. $(5, -7), (9, -2)$
23. $(4, 9), (15, 4)$
24. $(-7, 4), (2, -9)$
25. $(6, -1), (-5, 5)$
26. $(9, 8), (1, 12)$
27. $(13, -8), (2, 15)$
28. $(16, -7), (-2, -3)$
29. $(9, 15), (5, 12)$
30. $(7, 5), (-9, -6)$
31. $(-7, 15), (19, 2)$
32. $(9, -1), (11, -28)$
33. $(14, -29), (10, -25)$
34. $(2, -8), (8, -1)$
35. $(-11, 1), (7, 13)$
36. $(-1, 9), (19, 23)$
37. $(-9, 33), (13, 31)$
38. $(7, 2), (1, -2)$

39. $\overline{AB}$ is a diameter of a circle. The coordinates of A are $(-1, 3)$, and the coordinates of B are $(-5, 9)$. Find the center of the circle.

40. $\overline{CD}$ is a diameter of a circle. The coordinates of C are $(-2, -3)$, and the coordinates of D are $(-12, -5)$. Find the center of the circle.

41. A quadrilateral is a parallelogram if the diagonals bisect each other. Quadrilateral $EFGH$ has vertices a $E(-4, 3)$, $F(2, 1)$, $G(4, 7)$, and $H(-2, 9)$. Find the midpoint of each diagonal. Is $EFGH$ a parallelogram? Explain.

42. A large building is on fire. Fire trucks from two different stations respond to the fire. One station is 1 mi east and 2 mi north of the fire. The other station is 2 mi west and 1 mi south of the fires. How far apart are the two fire stations?

43. The Anderson and McCready families decide to go to a concert together. The Andersons live 4 km west and 6 km north of the concert hall. The McCreadys live 5 km east and 2 km south of the concert hall. How far apart do the two families live?

44. According to the map, a ball field is 4 km west and 2 km north of where you live. A theater is 1 km east and 4 km south of where you live. How far apart are the ball field and the theater?

Name _____ Class _____ Date _____

Practice 11-4

Operations with Radical Expressions

Simplify each expression.

1. $3\sqrt{7} + 5\sqrt{7}$
2. $10\sqrt{4} - \sqrt{4}$
3. $4\sqrt{2}(2 + 2\sqrt{3})$
4. $\sqrt{45} + 2\sqrt{5}$
5. $12\sqrt{11} + 7\sqrt{11}$
6. $\sqrt{2}(2\sqrt{3} - 4\sqrt{2})$
7. $\sqrt{28} + \sqrt{63}$
8. $3\sqrt{6} - 8\sqrt{6}$
9. $\sqrt{3}(\sqrt{6} - \sqrt{12})$
10. $\sqrt{18} - \sqrt{50}$
11. $4\sqrt{2} + 2\sqrt{8}$
12. $13\sqrt{15} - 11\sqrt{15}$
13. $3(8\sqrt{3} - 7)$
14. $8(2\sqrt{5} + 5\sqrt{2})$
15. $17\sqrt{21} - 12\sqrt{21}$
16. $\sqrt{6}(7 + 3\sqrt{3})$
17. $8(4 - 3\sqrt{2})$
18. $2\sqrt{12} + 6\sqrt{27}$
19. $19\sqrt{3} + \sqrt{12}$
20. $8\sqrt{26} + 10\sqrt{26}$
21. $\sqrt{10}(3 - 2\sqrt{6})$
22. $9\sqrt{2} - \sqrt{50}$
23. $10\sqrt{13} - 7\sqrt{13}$
24. $12\sqrt{6} - 4\sqrt{24}$
25. $5\sqrt{7} + \sqrt{28}$
26. $8\sqrt{13} - 12\sqrt{13}$
27. $13\sqrt{40} + 6\sqrt{10}$
28. $-3\sqrt{3}(\sqrt{6} + \sqrt{3})$
29. $12\sqrt{29} - 15\sqrt{29}$
30. $10\sqrt{6} - 2\sqrt{6}$
31. $8\sqrt{3} - \sqrt{75}$
32. $3\sqrt{6}(2\sqrt{3} + \sqrt{6})$
33. $17\sqrt{35} + 2\sqrt{35}$
34. $\sqrt{19} + 4\sqrt{19}$
35. $12\sqrt{9} - 4\sqrt{9}$
36. $\sqrt{8}(\sqrt{2} - 7)$
37. $\dfrac{1}{\sqrt{2} - \sqrt{3}}$
38. $\dfrac{5}{\sqrt{7} - \sqrt{3}}$
39. $\dfrac{3}{\sqrt{5} + 5}$
40. $(\sqrt{6} - 3)^2$
41. $(3\sqrt{5} + \sqrt{5})^2$
42. $\dfrac{7}{\sqrt{2} - \sqrt{7}}$
43. $\dfrac{3 - \sqrt{6}}{5 - 2\sqrt{6}}$
44. $\dfrac{-12}{\sqrt{6} - 3}$
45. $\dfrac{2\sqrt{3} - \sqrt{6}}{5\sqrt{3} + 2\sqrt{6}}$

Solve each exercise by using the golden ratio $(1 + \sqrt{5}) : 2$.

46. The ratio of the height : width of a window is equal to the golden ratio. The width of the door is 36 in. Find the height of the door. Express your answer in simplest radical form and in inches.

47. The ratio of the length : width of a flower garden is equal to the golden ratio. The width of the garden is 14 ft. Find the length of the garden. Express your answer is simplest radical form and in feet.

48. The ratio of the width : height of the front side of a building is equal to the golden ratio. The height of the building is 40 ft. Find the width of the building. Express your answer in simplest radical form and in feet.

Name _____ Class _____ Date _____

Practice 11-5

Solving Radical Equations

Solve each radical equation. Check your solutions. If there is no solution, write *no solution*.

1. $\sqrt{x} + 3 = 11$
2. $\sqrt{x + 2} = \sqrt{3x - 6}$
3. $x = \sqrt{24 - 10x}$
4. $\sqrt{4x} - 7 = 1$
5. $\sqrt{x} = \sqrt{4x - 12}$
6. $x = \sqrt{11x - 28}$
7. $\sqrt{x} = 12$
8. $x = \sqrt{12x - 32}$
9. $x = \sqrt{13x - 40}$
10. $\sqrt{3x + 5} = \sqrt{x + 1}$
11. $\sqrt{x + 3} = 5$
12. $\sqrt{6x - 4} = \sqrt{4x + 6}$
13. $2 = \sqrt{x + 6}$
14. $x = \sqrt{2 - x}$
15. $\sqrt{4x + 2} = \sqrt{x + 14}$
16. $\sqrt{x} + 8 = 9$
17. $x = \sqrt{7x + 8}$
18. $\sqrt{3x + 8} = \sqrt{2x + 12}$
19. $\sqrt{2x + 3} = 5$
20. $\sqrt{3x + 13} = \sqrt{7x - 3}$
21. $x = \sqrt{6 + 5x}$
22. $\sqrt{3x} - 5 = 4$
23. $\sqrt{3x + 4} = \sqrt{5x}$
24. $x = \sqrt{x - 12}$
25. $\sqrt{x - 4} + 3 = 9$
26. $x = \sqrt{8x + 20}$
27. $12 = \sqrt{6x}$
28. $x = \sqrt{60 - 7x}$
29. $\sqrt{x + 14} = \sqrt{6x - 1}$
30. $\sqrt{5x - 7} = \sqrt{6x + 11}$
31. $7 + \sqrt{2x} = 3$
32. $\sqrt{x + 56} = x$
33. $5 + \sqrt{x + 4} = 12$

34. The equation $d = \frac{1}{2}at^2$ gives the distance d in ft that an object travels from rest while accelerating, where a is the acceleration and t is the time.
    a. How far has an object traveled in 4 s when the acceleration is 5 ft/s^2?
    b. How long does it take an object to travel 100 ft when the acceleration is 8 ft/s^2?

35. The equation $v = 20\sqrt{t + 273}$ relates the speed v, in m/s, to the air temperature t in Celsius degrees.
    a. Find the temperature when the speed of sound is 340 m/s.
    b. Find the temperature when the speed of sound is 320 m/s.

36. The equation $V = \sqrt{\frac{Fr}{m}}$ gives the speed V in m/s of an object moving in a horizontal circle, where F is centripetal force, r is radius, and m is mass of the object.
    a. Find r when $F = 6$ N, $m = 2$ kg, and $V = 3$ m/s.
    b. Find F when $r = 1$ m, $m = 3$ kg, and $V = 2$ m/s.

Name _____ Class _____ Date _____

Practice 11-6

Graphing Square Root Functions

Find the domain of each function.

1. $f(x) = \sqrt{x - 7}$
2. $f(x) = \sqrt{3x - 12}$
3. $y = \sqrt{4x + 11}$
4. $y = \sqrt{x - 12}$
5. $f(x) = \sqrt{x + 14}$
6. $y = \sqrt{x + 8}$
7. $y = \sqrt{5x + 13}$
8. $y = \sqrt{2x}$
9. $y = \sqrt{6x}$

Use a table of values to graph each function.

10. $y = \sqrt{x} - 12$
11. $y = 3\sqrt{x}$
12. $y = \sqrt{x + 8}$
13. $y = \sqrt{x + 7} - 6$
14. $y = \sqrt{x - 6} - 8$
15. $y = \sqrt{x - 10}$
16. $y = 2\sqrt{x - 2}$
17. $y = \sqrt{x - 8} + 6$
18. $y = \sqrt{x} + 7$

Using expressions such as "shift up," "shift down," "shift left," and "shift right," describe how each of the graphs compare to the graph of $y = \sqrt{x}$.

19. $y = \sqrt{x} - 9$
20. $y = \sqrt{x} - 8$
21. $y = \sqrt{x + 20}$
22. $y = \sqrt{x - 19}$
23. $y = \sqrt{x + 18}$
24. $y = \sqrt{x - 32}$
25. $y = \sqrt{x} + 11$
26. $y = \sqrt{x + 14}$
27. $y = \sqrt{x - 4} - 7$

28. The number of people involved in recycling in a community is modeled by the function $n = 90\sqrt{3t} + 400$, where t is the number of months the recycling plant has been open.
    a. Graph the function.
    b. Find the number of people recycling when the plant has been open for 6 mo.
    c. Find the month when about 670 people were recycling.

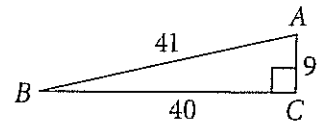
29. The time t, in seconds, that it takes for an object to drop a distance d, in feet, is modeled by the function $t = \sqrt{\frac{d}{16}}$. Assume no air resistance.
    a. Graph the function.
    b. Find the time it takes for an object to fall 1000 ft.
    c. How far does an object fall in 10 s?

Name _____ Class _____ Date _____

Practice 11-7

Trigonometric Ratios

Use $\triangle ABC$ to evaluate each expression.

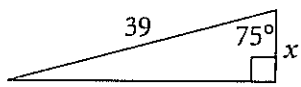


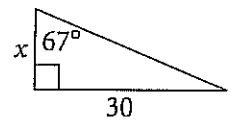
1. $\sin A$
2. $\cos A$
3. $\tan A$
4. $\sin B$
5. $\cos B$
6. $\tan B$

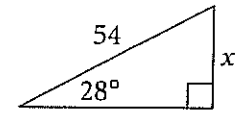
Evaluate each expression. Round to the nearest ten-thousandth.

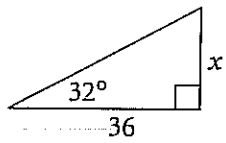
7. $\tan 59°$
8. $\sin 75°$
9. $\sin 8°$
10. $\cos 13°$
11. $\sin 32°$
12. $\tan 67°$
13. $\cos 17°$
14. $\cos 36°$
15. $\tan 19°$
16. $\cos 58°$

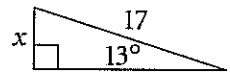
Find the value of x to the nearest tenth.

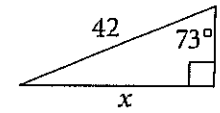
17. 

18. 

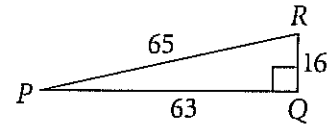
19. 

20. 

21. 

22. 

Use $\triangle PQR$ to evaluate each expression.



23. $\sin P$
24. $\cos P$
25. $\tan P$
26. $\sin R$
27. $\cos R$
28. $\tan R$

29. A tree casts a shadow that is 20 ft long. The angle of elevation of the sun is 29°. How tall is the tree?

30. Suppose your angle of elevation to the top of a water tower is 78°. If the water tower is 145 ft tall, how far are you standing from the water tower?

31. The angle of elevation from the control tower to an airplane is 49°. The airplane is flying at 5000 ft. How far away from the control tower is the plane?

32. A Boy Scout on top of a 1700-ft-tall mountain spots a campsite. If he measures the angle of depression at 35°, how far is the campsite from the foot of the mountain?

33. A 12-ft-long guy wire is attached to a telephone pole 10.5 ft from the top of the pole. If the wire forms a 52° angle with the ground, how high is the telephone pole?

Name _____ Class _____ Date _____

Reteaching 11-1

Simplifying Radicals

OBJECTIVE: Simplifying radicals involving products and quotients

MATERIALS: None

The following are three examples of simplifying radicals. Simplifying each radical makes it meet a condition that must be true to show that a radical expression is in its simplest form.

Example

Condition	Not in Simplest Form	How to Simplify	Simplest Form
The Multiplication Property of Square Roots is used to simplify the radical.			
The expression under the radical sign has no perfect square factors other than 1.	$\sqrt{20}$	Rewrite as a product of perfect squares and other factors. $= \sqrt{4} \cdot 5$ $= \sqrt{4} \cdot \sqrt{5}$	$2\sqrt{5}$
The Division Property of Square Roots is used to simplify the radical.			
The expression under the radical sign is a fraction.	$\sqrt{\frac{16}{25}}$	Separate into two radical expressions. Simplify each separately. $\frac{\sqrt{16}}{\sqrt{25}}$	$\frac{4}{5}$
The denominator contains a radical expression that is not a perfect square	$\frac{3}{\sqrt{2}}$	Rationalize the denominator by multiplying the fraction by a radical expression equal to 1. $= \frac{3}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$	$\frac{3\sqrt{2}}{2}$

Exercises

Simplify each radical expression.

1. $\sqrt{2} \cdot \sqrt{12}$
2. $3\sqrt{5} \cdot 2\sqrt{5}$
3. $4\sqrt{80}$
4. $\sqrt{3} \cdot \sqrt{36}$
5. $\sqrt{18}$
6. $\frac{5}{\sqrt{3}}$
7. $2\sqrt{28}$
8. $2\sqrt{\frac{4}{5}}$
9. $\sqrt{\frac{14}{25}}$
10. $\frac{\sqrt{5}}{\sqrt{64}}$
11. $2\sqrt{\frac{3}{8}}$
12. $\sqrt{\frac{16}{9}}$

Name _____ Class _____ Date _____

Reteaching 11-2

The Pythagorean Theorem

OBJECTIVE: Finding the lengths of the sides of a right triangle

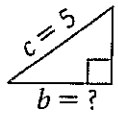
MATERIALS: None

As you solve problems using the Pythagorean Theorem, keep in mind these ideas.

- In the formula, a and b represent the *legs* of the right triangle.
- The *hypotenuse* is represented by c. This is the side *opposite* the right angle.
- Drawing a picture of the triangle each time is a good strategy for making sure you use the formula correctly.
- Writing a, b, and c on your picture with the values from your problem gives you a visual representation of your problem before you solve it.

Example

Find the length of the missing side: $a = 3, b = \blacksquare, c = 5$.



Draw a triangle and include the values from the problem for *a*, *b*, and *c*.

$a^2 + b^2 = c^2$ ← **Use the Pythagorean Theorem.**

$3^2 + b^2 = 5^2$ ← **Substitute 3 for *a* and 5 for *c*.**

$9 + b^2 = 25$ ← **Simplify.**

$b^2 = 16$ ← **Subtract 9 from each side.**

$\sqrt{b^2} = \sqrt{16}$ ← **Take the square root of each side.**

$b = 4$ ← **Use a calculator if necessary.**

Exercises

Draw and label a triangle. Find the length of the missing side to the nearest tenth.

1. $a = 6, b = \blacksquare, c = 10$
2. $a = \blacksquare, b = 4, c = 10$
3. $a = 5, b = 12, c = \blacksquare$

Find the length of the missing side to the nearest tenth.

4. $a = \blacksquare, b = 5, c = 7$
5. $a = 4, b = \blacksquare, c = 9$
6. $a = 7.5, b = 4, c = \blacksquare$
7. $a = 5, b = \blacksquare, c = 12$
8. $a = 8, b = \blacksquare, c = 17$
9. $a = 6, b = 8, c = \blacksquare$
10. $a = \blacksquare, b = 24, c = 25$
11. $a = 4, b = 3, c = \blacksquare$
12. $a = 9, b = \blacksquare, c = 15$

Name _____ Class _____ Date _____

Reteaching 11-3

The Distance and Midpoint Formulas

OBJECTIVE: Finding the distance between two points in a coordinate plane; finding the coordinates of the midpoint of two points

MATERIALS: None

The following strategies may be used to help you apply the distance formula or the midpoint formula correctly.

- Underline the x-coordinates.
- Circle the y-coordinates.

Example

Find the distance between $(2, 5)$ and $(-1, -3)$. Round your answer to the nearest tenth.

$(\underline{2},\textcircled{5}), (\underline{-1},\textcircled{-3})$ ← **Underline the x-coordinates and circle the y-coordinates.**

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ ← **Write the distance formula.**

$d = \sqrt{\big(2 - (-1)\big)^2 + \big(5 - (-3)\big)^2}$ ← **Substitute the underlined numbers for x-coordinates and the circled numbers for the y-coordinates, in corresponding order.**

$d = \sqrt{3^2 + 8^2}$ ← **Simplify.**

$d = \sqrt{9 + 64}$

$d = \sqrt{73}$

$d = 8.5$ ← **Use a calculator. Round to the nearest tenth.**

Exercises

Find the distance between each pair of points. Round your answers to the nearest tenth.

1. $(4, -2), (0, 4)$
2. $(2, 5), (-1, -3)$
3. $(4, -2), (-3, 5)$
4. $(-3, -2), (4, -1)$

The midpoint of a line segment with endpoints $A(x_1, y_1)$ and $B(x_2, y_2)$ is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$. Find the midpoint of $\overline{AB}$.

5. $A(2, 4)$ and $B(0, 6)$
6. $A(-6, -2)$ and $B(4, -1)$
7. $A(-2, 4)$ and $B(-6, 8)$
8. $A(-3, 6)$ and $B(-5, 0)$

Name _____ Class _____ Date _____

Reteaching 11-4

Operations with Radical Expressions

OBJECTIVE: Simplifying radical expressions **MATERIALS:** None

- Underline radicals not in simplest form.
- (Circle) like terms. They can be combined.

Example

Simplify $\sqrt{27} + 2\sqrt{3}$.

$\underline{\sqrt{27}} + 2\sqrt{3}$ ← **Underline radicals not in simplest form.**

$\sqrt{9 \cdot 3} + 2\sqrt{3}$ ← **Rewrite as a product of perfect squares and other factors. 9 is a perfect square and a factor of 27.**

$\sqrt{9} \cdot \sqrt{3} + 2\sqrt{3}$ ← **Use the Multiplication Property of Square Roots.**

$3\sqrt{3} + 2\sqrt{3}$ ← **Simplify $\sqrt{9}$.**

$(3\sqrt{3}) + (2\sqrt{3})$ ← **(Circle) like terms.**

$5\sqrt{3}$ ← **Combine like terms by adding the coefficients.**

Example

Simplify $\sqrt{5}(2 + \sqrt{10})$

$\sqrt{5}(2 + \sqrt{10}) = 2\sqrt{5} + \sqrt{50}$ ← **Use the Distributive Property.**

$= 2\sqrt{5} + \sqrt{25} \cdot \sqrt{2}$ ← **Use the Multiplication Property of Square Roots.**

$= 2\sqrt{5} + 5\sqrt{2}$ ← **Simplify.**

Exercises

Underline radicals not in simplest form and circle like terms. Simplify each expression.

1. $3\sqrt{24} - 2\sqrt{6}$
2. $6\sqrt{3} + 4\sqrt{3}$
3. $\sqrt{27} + \sqrt{3}$
4. $3\sqrt{12} - 2\sqrt{3}$
5. $10\sqrt{6} - 3\sqrt{6}$
6. $6\sqrt{7} - \sqrt{28}$

Simplify each expression.

7. $\sqrt{5}(\sqrt{5} + 2)$
8. $(\sqrt{2} + 1)(\sqrt{2} - 1)$
9. $\sqrt{2}(\sqrt{2} - \sqrt{3})$
10. $(2\sqrt{3} + \sqrt{5})^2$
11. $(3\sqrt{2} - \sqrt{5})(2\sqrt{5} + 4\sqrt{2})$
12. $(2\sqrt{3} + 1)(\sqrt{3})$

Name _____ Class _____ Date _____

Reteaching 11-5

Solving Radical Equations

OBJECTIVE: Solving equations that contain radicals

MATERIALS: Index cards or pieces of paper of a similar size

A radical equation has a *variable* under the radical sign. The radical expression must be alone on one side of the equal sign before squaring.

Example

Jubal solved a radical equation, showing all the steps. He wrote each step on a separate index card. Then he dropped the pack of cards! Number each of his cards to show the correct order of his steps.

The number in the lower left corner shows the correct order for the steps.

$\sqrt{y} = 4$ **3.**	$3 + \sqrt{y} - 3 = 7 - 3$ **2.**	$y = 16$ **5.**
The solution of $3 + \sqrt{y} = 7$ is 16. **8.**	$(\sqrt{y})^2 = (4)^2$ **4.**	$3 + \sqrt{16} \stackrel{?}{=} 7$ **6.**
$3 + 4 = 7$ ✔ **7.**	$3 + \sqrt{y} = 7$ **1.**	

Exercises

Solve each radical equation.

1. $\sqrt{3a} - 9 = 0$
2. $\sqrt{n - 2} = 3$
3. $c = \sqrt{3c - 8}$
4. $\sqrt{b} - 6 = -2\sqrt{b}$
5. $s = \sqrt{24 - 10s}$
6. $\sqrt{5x - 1} = \sqrt{3x + 9}$
7. $\sqrt{3y + 1} = 6$
8. $\sqrt{5x} - 3 = 2$
9. $\sqrt{2x + 1} = 5$

Name _____ Class _____ Date _____

Reteaching 11-6

Graphing Square Root Functions

OBJECTIVE: Graphing and exploring square root functions

MATERIALS: Graph paper

Make a table of the values for x and y. These values can be plotted as ordered pairs.

Example

Make a table and then graph the function $y = \sqrt{6 + x}$.

Step 1 Select a domain that makes the expression under the radical greater than or equal to zero.

$$6 + x \geq 0$$

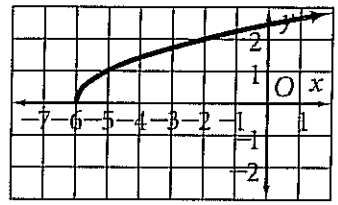
$$x \geq -6$$

Domain $= -6, -5, -2, 3, \ldots$

Step 2 Make a table like the one below. Replace x with each member of the domain to find y.

Domain	Replace x to find y.	Range
x	$\sqrt{6 + x}$	y
-6	$\sqrt{6 + (-6)} = \sqrt{0}$	0
-5	$\sqrt{6 + (-5)} = \sqrt{1}$	1
-2	$\sqrt{6 + (-2)} = \sqrt{4}$	2
3	$\sqrt{6 + 3} = \sqrt{9}$	3

Step 3 Use the values for x and y from the table to graph the function.



What do all of the y-values have in common? They are all positive.

Exercises

Graph each function using Steps 1–3.

1. $y = \sqrt{4 + x}$
2. $f(x) = \sqrt{x - 2}$
3. $y = \sqrt{x - 3}$

Graph each function.

4. $y = \sqrt{x - 1} + 2$
5. $f(x) = \sqrt{x} - 4$
6. $f(x) = \sqrt{5 - x} + 1$
7. $f(x) = \sqrt{x - 1} - 2$
8. $f(x) = \sqrt{x} + 3$
9. $f(x) = \sqrt{1 - x} + 3$
10. $f(x) = \sqrt{x + 5} - 1$
11. $f(x) = \sqrt{3x + 1} + 2$
12. $f(x) = \sqrt{3 - 2x} + 2$

Name _____ Class _____ Date _____

Reteaching 11-7

Trigonometric Ratios

OBJECTIVE: Exploring and calculating trigonometric ratios

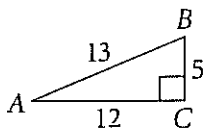
MATERIALS: None

To make sure you are applying a trigonometric formula correctly, you should label the triangle's adjacent leg, opposite leg, and hypotenuse before you get started. Remember these key points:

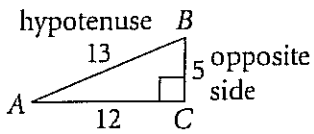
- The *hypotenuse* is *opposite* the right angle.
- *Adjacent* means *next to.*
- Use a pencil when labeling sides so that your marks can be erased when the problem is for a different angle.

Example

For $\triangle ABC$ find the sine, cosine, and tangent of $\angle A$ and $\angle B$.

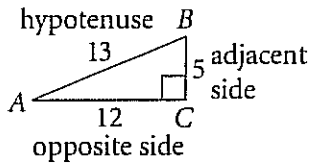


For $\angle A$



Redraw and label the sides of $\triangle ABC$ for sine, cosine, and tangent of $\angle A$ and $\angle B$.

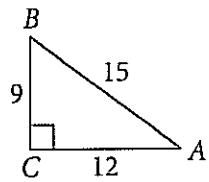
For $\angle B$



For $\angle A$	Trigonometric Ratios	For $\angle B$
$\sin A = \frac{5}{13}$	sine $= \frac{\text{length of opposite leg}}{\text{length of hypotenuse}}$	$\sin B = \frac{12}{13}$
$\cos A = \frac{12}{13}$	cosine $= \frac{\text{length of adjacent leg}}{\text{length of hypotenuse}}$	$\cos B = \frac{5}{13}$
$\tan A = \frac{5}{12}$	tangent $= \frac{\text{length of opposite leg}}{\text{length of hypotenuse}}$	$\tan B = \frac{12}{5}$

Exercises

Use $\triangle ABC$ to evaluate each expression.



1. $\sin A$
2. $\cos A$
3. $\tan A$
4. $\sin B$
5. $\tan B$
6. $\cos A$

Chapter 11 Answers

Practice 11-1

1. $4\sqrt{2}$ **2.** $4\sqrt{11}$ **3.** $7\sqrt{3}$ **4.** $\frac{\sqrt{17}}{12}$ **5.** $ab^2\sqrt{b}$ **6.** $\frac{\sqrt{6}}{3}$
7. $4\sqrt{5}$ **8.** $3\sqrt{3}$ **9.** $2\sqrt{2}$ **10.** $\frac{8\sqrt{7}}{7}$ **11.** $2x^2\sqrt{3}$ **12.** $2\sqrt{2}$
13. $10\sqrt{2}$ **14.** $\frac{2\sqrt{3}}{15}$ **15.** $3\sqrt{10}$ **16.** $2\sqrt{30}$ **17.** $\frac{2\sqrt{2a}}{a}$
18. $54\sqrt{2}$ **19.** $5\sqrt{10}$ **20.** $\sqrt{5}$ **21.** $2\sqrt{21}$ **22.** $\frac{\sqrt{2}}{5}$
23. $4s\sqrt{3s}$ **24.** $6\sqrt{6}$ **25.** $5\sqrt{21}$ **26.** $4\sqrt{10}$ **27.** $2\sqrt{3}$
28. $2n\sqrt{2n}$ **29.** $2\sqrt{34}$ **30.** $\frac{3x\sqrt{3}}{16}$ **31.** $mn\sqrt{m}$ **32.** $2\sqrt{5}$
33. 12 **34.** 300 **35.** $\frac{\sqrt{17}}{8}$ **36.** $5\sqrt{2}$ **37.** $4\sqrt{3}$ **38.** $2\sqrt{5}$
39. $2\sqrt{2}$ **40.** $5x$ **41.** $\frac{\sqrt{7}}{3}$ **42.** $\frac{\sqrt{17}}{8}$ **43.** $\sqrt{6}$ **44.** $2\sqrt{3}$
45. $\frac{5\sqrt{2}}{2}$ **46.** $5\sqrt{3}$ **47.** $10\sqrt{3}$ **48.** $7a\sqrt{a}$ **49.** $5\sqrt{5}$
50. $2x^2\sqrt{7}$ **51.** $\frac{7\sqrt{3}}{3}$ **52.** $\frac{\sqrt{15}}{7}$ **53.** $\sqrt{5}$ **54.** $\sqrt{3}$
55. $\sqrt{2}$ **56.** $6x\sqrt{2x}$ **57.** $5y\sqrt{2y}$ **58.** $3xy\sqrt{5y}$
59. $\frac{2x\sqrt{11}}{3}$ **60.** $\frac{2\sqrt{3x}}{3x}$ **61.** $12\sqrt{5}$ **62.** $b\sqrt{ab}$
63. $a^2b^3\sqrt{a}$ **64.** $24x\sqrt{15}$ **65.** 12 **66.** 18 **67.** 245
68. $4\sqrt{7}$ **69.** 125 **70.** $2x^3y^3\sqrt{2y}$ **71.** $4a^2\sqrt{5a}$
72. $2\sqrt{14}$ **73.** $x\sqrt{15}$ **74.** 20 **75.** $8\sqrt{6}$ **76.** $84\sqrt{6}$
77. $\frac{10\sqrt{x}}{x}$ **78.** $\frac{3\sqrt{2x}}{2x}$ **79.** $\frac{2\sqrt{5}}{5}$ **80.** $\frac{2}{3}$ **81.** $\frac{3\sqrt{35x}}{10x}$
82. $\frac{\sqrt{10y}}{y}$

Practice 11-2

1. 37 **2.** 24 **3.** 60 **4.** 39 **5.** 17 **6.** 32 **7.** 30.0 **8.** 46.0
9. 56.0 **10.** 41.2 **11.** 11.3 **12.** 17.7 **13.** 19.0 **14.** 20.2
15. 9.4 **16.** 48.8 **17.** 30.7 **18.** 19.8
19. yes; $20^2 + 21^2 = 29^2$ **20.** yes; $16^2 + 30^2 = 34^2$
21. no; $24^2 + 60^2 \neq 66^2$ **22.** no; $14^2 + 18^2 \neq 23^2$
23. no; $10^2 + 24^2 \neq 28^2$ **24.** yes; $45^2 + 28^2 = 53^2$
25. yes; $\left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2 = 1^2$ **26.** no; $\left(\frac{2}{3}\right)^2 + \left(\frac{1}{3}\right)^2 \neq \left(\frac{4}{3}\right)^2$
27. no; $3.5^2 + 4.4^2 \neq 5.5^2$ **28.** no; $10.5^2 + 11.3^2 \neq 13.8^2$
29. yes; $3.3^2 + 5.6^2 = 6.5^2$ **30.** yes; $24^2 + 70^2 = 74^2$
31. yes; $4.2^2 + 5.6^2 = 7.0^2$ **32.** yes; $5.2^2 + 3.9^2 = 6.5^2$
33. yes; $2.1^2 + 2.8^2 = 3.5^2$ **34.** no; $4.8^2 + 5.4^2 \neq 7.5^2$
35. no; $6.7^2 + 4.3^2 \neq 7.5^2$
36. no; $\left(\frac{1}{18}\right)^2 + \left(\frac{1}{15}\right)^2 \neq \left(\frac{1}{9}\right)^2$
37. yes; $\left(\frac{1}{2}\right)^2 + \left(\frac{6}{5}\right)^2 = \left(\frac{13}{10}\right)^2$
38. no; $\left(\frac{1}{5}\right)^2 + \left(\frac{1}{4}\right)^2 \neq \left(\frac{1}{3}\right)^2$ **39.** 7 ft **40.** 16 ft
41. 13.3 mi **42.** 43.6 ft **43.** 13.2 ft

Practice 11-3

1. (5, 10) **2.** (7, 13) **3.** (2, 2) **4.** (2, 3) **5.** (−6, 2)
6. $\left(5, 11\frac{1}{2}\right)$ **7.** $\left(2\frac{1}{2}, 7\right)$ **8.** $\left(10\frac{1}{2}, \frac{1}{2}\right)$ **9.** $\left(4\frac{1}{2}, -15\right)$
10. $\left(8\frac{1}{2}, 6\right)$ **11.** $\left(7\frac{1}{2}, -1\frac{1}{2}\right)$ **12.** $\left(4\frac{1}{2}, -10\right)$
13. $\left(-5, 5\frac{1}{2}\right)$ **14.** $\left(2, -6\frac{1}{2}\right)$ **15.** $\left(8\frac{1}{2}, 7\frac{1}{2}\right)$
16. $\left(-1, -10\frac{1}{2}\right)$ **17.** $\left(2, -5\frac{1}{2}\right)$ **18.** $\left(3\frac{1}{2}, 4\right)$ **19.** 5
20. 15 **21.** 10 **22.** 6.4 **23.** 12.1 **24.** 15.8 **25.** 12.5 **26.** 8.9
27. 25.5 **28.** 18.4 **29.** 5 **30.** 19.4 **31.** 29.1 **32.** 27.1
33. 5.7 **34.** 9.2 **35.** 21.6 **36.** 24.4 **37.** 22.1 **38.** 7.2
39. (−3, 6) **40.** (−7, −4) **41.** yes; (0, 5) same midpoint
42. 4.2 mi **43.** 12.0 km **44.** 7.8 km

Practice 11-4

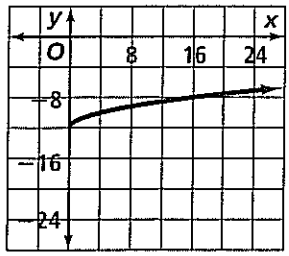
1. $8\sqrt{7}$ **2.** 18 **3.** $8\sqrt{2} + 8\sqrt{6}$ **4.** $5\sqrt{5}$ **5.** $19\sqrt{11}$
6. $2\sqrt{6} - 8$ **7.** $5\sqrt{7}$ **8.** $-5\sqrt{6}$ **9.** $3\sqrt{2} - 6$
10. $-2\sqrt{2}$ **11.** $8\sqrt{2}$ **12.** $2\sqrt{15}$ **13.** $24\sqrt{3} - 21$
14. $16\sqrt{5} + 40\sqrt{2}$ **15.** $5\sqrt{21}$ **16.** $7\sqrt{6} + 9\sqrt{2}$
17. $32 - 24\sqrt{2}$ **18.** $22\sqrt{3}$ **19.** $21\sqrt{3}$ **20.** $18\sqrt{26}$
21. $3\sqrt{10} - 4\sqrt{15}$ **22.** $4\sqrt{2}$ **23.** $3\sqrt{13}$ **24.** $4\sqrt{6}$
25. $7\sqrt{7}$ **26.** $-4\sqrt{13}$ **27.** $32\sqrt{10}$ **28.** $-9\sqrt{2} - 9$
29. $-3\sqrt{29}$ **30.** $8\sqrt{6}$ **31.** $3\sqrt{3}$ **32.** $18\sqrt{2} + 18$
33. $19\sqrt{35}$ **34.** $5\sqrt{19}$ **35.** 24 **36.** $4 - 14\sqrt{2}$
37. $-\sqrt{3} - \sqrt{2}$ **38.** $\frac{5\sqrt{7} + 5\sqrt{3}}{4}$
39. $\frac{-3\sqrt{5} + 15}{20}$ or $\frac{-3\left(\sqrt{5} - 5\right)}{20}$ **40.** $15 - 6\sqrt{6}$ **41.** 80
42. $\frac{-7\sqrt{2} - 7\sqrt{7}}{5}$ **43.** $3 + \sqrt{6}$ **44.** $4\left(\sqrt{6} + 3\right)$
45. $\frac{14 - 9\sqrt{2}}{17}$ **46.** $18 + 18\sqrt{5}$; 58 in.
47. $7 + 7\sqrt{5}$; 23 ft **48.** $20 + 20\sqrt{5}$; 65 ft

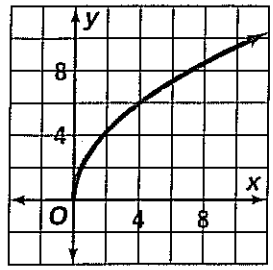
Practice 11-5

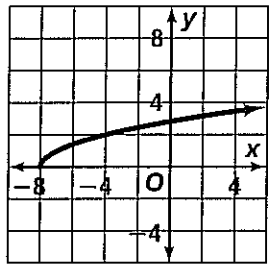
1. 64 **2.** 4 **3.** 2 **4.** 16 **5.** 4 **6.** 4, 7 **7.** 144 **8.** 4, 8 **9.** 5, 8
10. no solution **11.** 22 **12.** 5 **13.** −2 **14.** 1 **15.** 4 **16.** 1
17. 8 **18.** 4 **19.** 11 **20.** 4 **21.** 6 **22.** 27 **23.** 2
24. no solution **25.** 40 **26.** 10 **27.** 24 **28.** 5 **29.** 3
30. no solution **31.** no solution **32.** 8 **33.** 45 **34a.** 40 ft
34b. 5 s **35a.** 16°C **35b.** −17°C **36a.** 3 m **36b.** 12 N

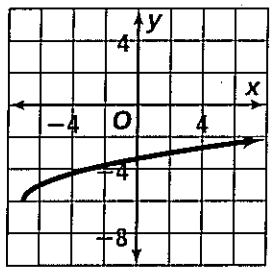
Practice 11-6

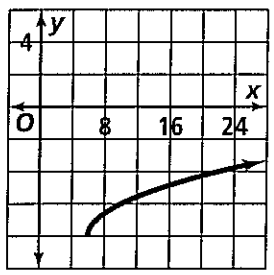
1. $x \geq 7$ **2.** $x \geq 4$ **3.** $x \geq -\frac{11}{4}$ **4.** $x \geq 12$ **5.** $x \geq -14$
6. $x \geq -8$ **7.** $x \geq -\frac{13}{5}$ **8.** $x \geq 0$ **9.** $x \geq 0$

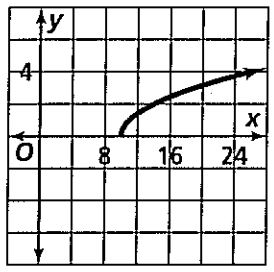
10. 

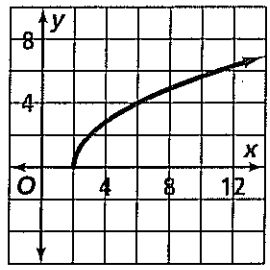
11. 

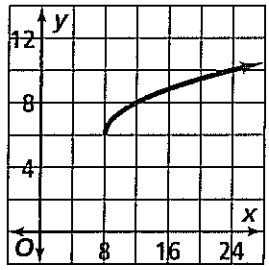
12. 

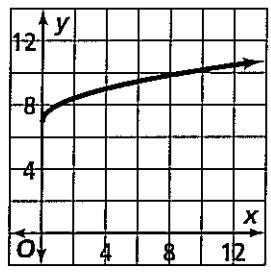
13. 

14. 

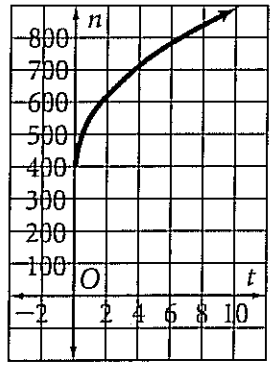
15. 

16. 

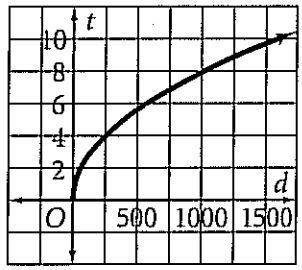
17. 

18. 

19. shift down 9 **20.** shift down 8 **21.** shift left 20
22. shift right 19 **23.** shift left 18 **24.** shift right 32
25. shift up 11 **26.** shift left 14
27. shift right 4 and shift down 7

28a. 

28b. 782 people **28c.** 3 mo

29a. 

29b. 7.9 s **29c.** 1600 ft

Practice 11-7

1. $\frac{40}{41}$ **2.** $\frac{9}{41}$ **3.** $\frac{40}{9}$ **4.** $\frac{9}{41}$ **5.** $\frac{40}{41}$ **6.** $\frac{9}{40}$ **7.** 1.6643
8. 0.9659 **9.** 0.1392 **10.** 0.9744 **11.** 0.5299 **12.** 2.3559
13. 0.9563 **14.** 0.8090 **15.** 0.3443 **16.** 0.5299 **17.** 10.1
18. 12.7 **19.** 25.4 **20.** 22.5 **21.** 3.8 **22.** 40.2 **23.** $\frac{16}{65}$
24. $\frac{63}{65}$ **25.** $\frac{16}{63}$ **26.** $\frac{63}{65}$ **27.** $\frac{16}{65}$ **28.** $\frac{63}{16}$ **29.** 11.1 ft
30. 30.8 ft **31.** 4346.4 ft **32.** 2428 ft **33.** 20 ft

Reteaching 11-1

1. $2\sqrt{6}$ **2.** 30 **3.** $16\sqrt{5}$ **4.** $6\sqrt{3}$ **5.** $3\sqrt{2}$ **6.** $\frac{5\sqrt{3}}{3}$
7. $4\sqrt{7}$ **8.** $\frac{4\sqrt{5}}{5}$ **9.** $\frac{\sqrt{14}}{5}$ **10.** $\frac{\sqrt{5}}{8}$ **11.** $\frac{\sqrt{6}}{2}$ **12.** $\frac{4}{3}$

Reteaching 11-2

1. 8 **2.** 9.2 **3.** 13 **4.** 4.9 **5.** 8.1 **6.** 8.5 **7.** 10.9 **8.** 15 **9.** 10
10. 7 **11.** 5 **12.** 12

Reteaching 11-3

1. 7.2 **2.** 8.5 **3.** 9.9 **4.** 7.1 **5.** (1, 5) **6.** $\left(-1, -1\frac{1}{2}\right)$
7. (−4, 6) **8.** (−4, 3)

Reteaching 11-4

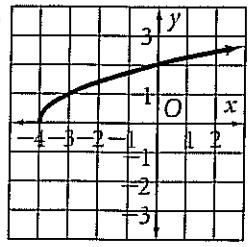
1. $4\sqrt{6}$ **2.** $10\sqrt{3}$ **3.** $4\sqrt{3}$ **4.** $4\sqrt{3}$ **5.** $7\sqrt{6}$ **6.** $4\sqrt{7}$
7. $5 + 2\sqrt{5}$ **8.** 1 **9.** $2 - \sqrt{6}$ **10.** $17 + 4\sqrt{15}$
11. $14 + 2\sqrt{10}$ **12.** $6 + \sqrt{3}$

Reteaching 11-5

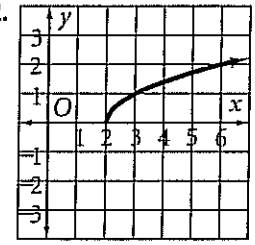
1. 27 **2.** 11 **3.** no solution **4.** 4 **5.** 2 **6.** 5 **7.** $\frac{35}{3}$ **8.** 5
9. 12

Reteaching 11-6

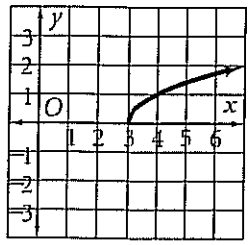
1.



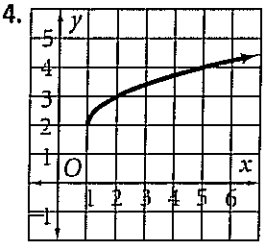
2.



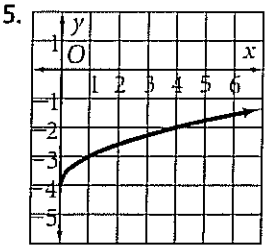
3.



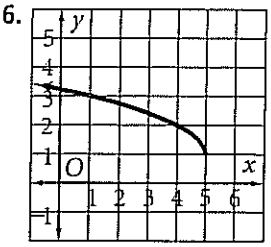
4.



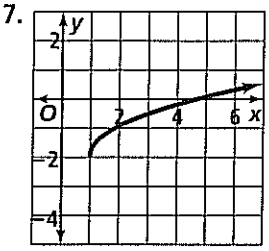
5.



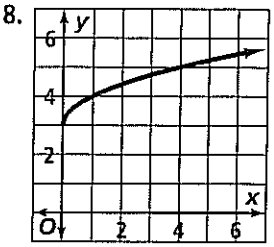
6.



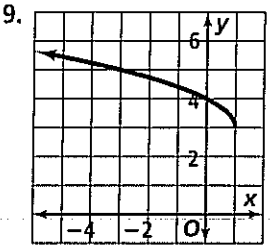
7.



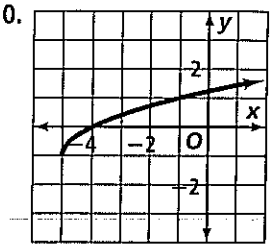
8.



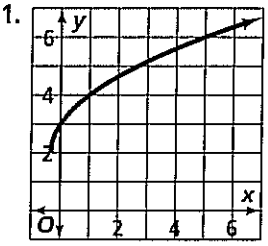
9.



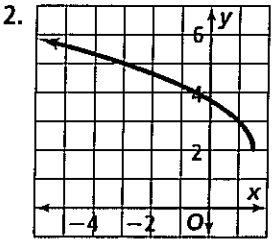
10.



11.



12.



Reteaching 11-7

1. $\frac{3}{5}$ **2.** $\frac{4}{5}$ **3.** $\frac{3}{4}$ **4.** $\frac{4}{5}$ **5.** $\frac{4}{3}$ **6.** $\frac{4}{5}$

Enrichment 11-1

1. 1, 16, 81, 256, 625 **2.** 4096 **3.** 10,000 **4.** 14,641 **5.** 20,736
6. 50,625 **7.** 160,000 **8.** $16 = 2^4$ **9.** $1296 = 6^4$
10. $256 = 4^4$ **11.** $2401 = 7^4$ **12.** $6561 = 9^4$
13. 10,000 and 100,000,000
14. The power of 10 and the number of zeros must be a multiple of 4. **15.** $10^{12} = 1{,}000{,}000{,}000{,}000$

Enrichment 11-2

1. 5, 12, 13 **2.** 8, 15, 17 **3.** 15, 20, 25 **4.** 10, 24, 26 **5.** 6, 8, 10
6. 9, 12, 15