Name _____ Class _____ Date _____

# Practice 11-1

Square Roots and Irrational Numbers

**Estimate to the nearest integer.**

1. $\sqrt{18}$ _____
2. $\sqrt{24}$ _____
3. $\sqrt{50}$ _____
4. $\sqrt{8}$ _____
5. $\sqrt{62}$ _____
6. $\sqrt{78}$ _____
7. $\sqrt{98}$ _____
8. $\sqrt{46}$ _____
9. $\sqrt{38}$ _____

**Simplify each square root.**

10. $\sqrt{144}$ _____
11. $\sqrt{9 + 16}$ _____
12. $\sqrt{900}$ _____
13. $\sqrt{169}$ _____
14. $-\sqrt{100}$ _____
15. $\sqrt{0.16}$ _____
16. $\sqrt{\frac{16}{81}}$ _____
17. $\sqrt{\frac{4}{25}}$ _____
18. $\sqrt{\frac{121}{144}}$ _____

**Identify each number as rational or irrational.**

19. $\sqrt{289}$ _____
20. 5.7777... _____
21. $\sqrt{41}$ _____
22. 0.62662... _____
23. $\sqrt{49}$ _____
24. $\sqrt{52}$ _____

**Find two integers that make each equation true.**

25. $x^2 = 16$ _____
26. $3m^2 = 147$ _____

**Use the formula $d = \sqrt{1.5h}$ to estimate the distance to the horizon $d$ in miles for each viewer's eye height $h$, in feet.**

27. $h = 12$ ft _____
28. $h = 216$ ft _____
29. $h = 412$ ft _____

30. The Moon has a surface area of approximately 14,650,000 $mi^2$. Estimate its radius to the nearest mile.

_____

Name _____ Class _____ Date _____

# Practice 11-2

The Pythagorean Theorem

**Can you form a right triangle with the three lengths given? Show your work.**

1. 20, 21, 29 _____

2. 7, 11, 12 _____

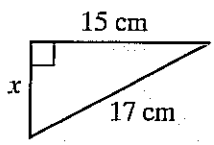
3. $10, 2\sqrt{11}, 12$ _____

4. 28, 45, 53 _____

5. $9, \sqrt{10}, 10$ _____

6. 10, 15, 20 _____

**Find each missing length to the nearest tenth of a unit.**

7. 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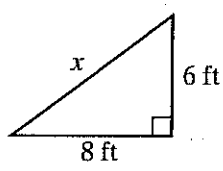
8. 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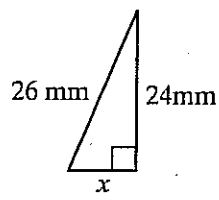
9. 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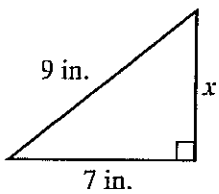
10. 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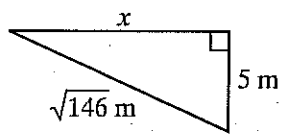
11. 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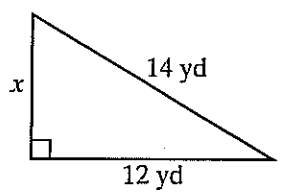
12. 


_____

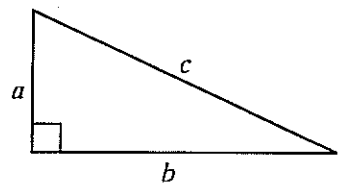
**Use the triangle at the right. Find the missing length to the nearest tenth of a unit.**

13. $a = 6$ m, $b = 9$ m
    $c \approx$ _____

14. $a = 19$ in., $c = 35$ in.
    $b \approx$ _____

15. $b = 24$ cm, $c = 32$ cm
    $a \approx$ _____

16. $a = 14$ ft, $c = 41$ ft
    $b \approx$ _____




17. A rectangular park measures 300 ft by 400 ft. A sidewalk runs diagonally from one corner to the opposite corner. Find the length of the sidewalk.

_____

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# Practice 11-3

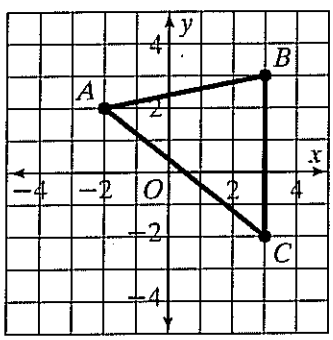
Distance and Midpoint Formulas

**The table has sets of endpoints of several segments. Find the distance between each pair of points and the midpoint of each segment. Round to the nearest tenth when necessary.**

| | Endpoints | Distance Between (Length of Segment) | Midpoint |
|---|---|---|---|
| 1. | $A(2, 6)$ and $B(4, 10)$ | | |
| 2. | $C(5, -3)$ and $D(7, 2)$ | | |
| 3. | $E(0, 12)$ and $F(5, 0)$ | | |
| 4. | $G(4, 7)$ and $H(-2, -3)$ | | |
| 5. | $J(-1, 5)$ and $K(2, 1)$ | | |
| 6. | $L(-3, 8)$ and $M(-7, -1)$ | | |

**Find the perimeter of each figure. Round to the nearest tenth when necessary.**

7.

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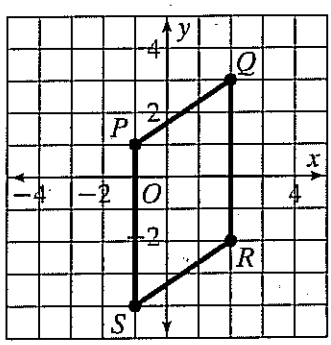
8.

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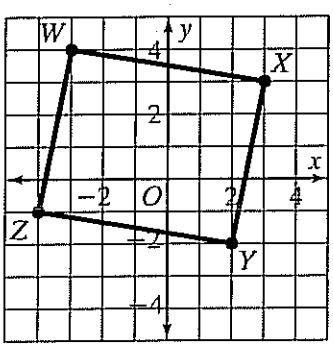
9.

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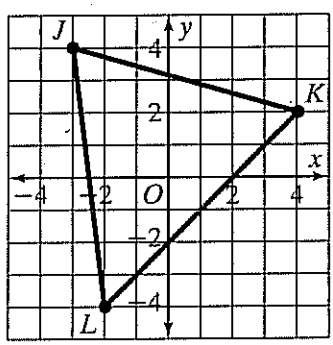
10.

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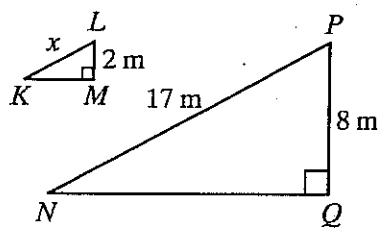
Name _____ Class _____ Date _____

# Practice 11-4

Write a Proportion

**Write a proportion and find the value of each $x$.**

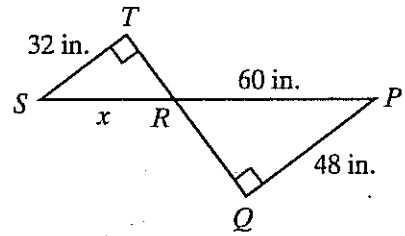
**1.** $\triangle KLM \sim \triangle NPQ$




Proportion: _____

$x =$ _____

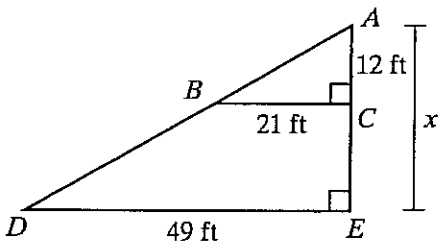
**2.** $\triangle RST \sim \triangle RPQ$




Proportion: _____

$x =$ _____

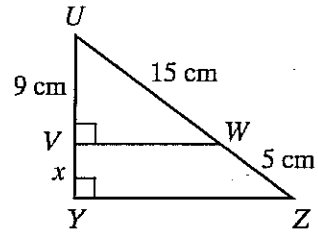
**3.** $\triangle ABC \sim \triangle ADE$




Proportion: _____

$x =$ _____

**4.** $\triangle UVW \sim \triangle UYZ$

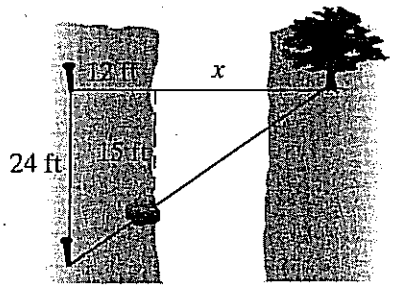



Proportion: _____

$x =$ _____

**Solve. Show the proportion you use.**

**5.** A surveyor needs to find the distance across a canyon. She finds a tree on the edge of the canyon and a large rock on the other edge. The surveyor uses stakes to set up the similar right triangles shown. Find the distance from the tree to the other side of the canyon, $x$.




_____

**6.** Three cartons of juice cost \$4.77. Find the cost of 8 cartons.

_____

**7.** If a pizza with a diameter of 12 inches costs \$10.99, based on area, how much should a 15-inch pizza cost?

_____

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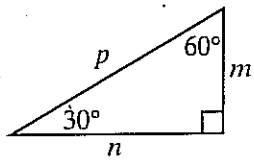
# Practice 11-5

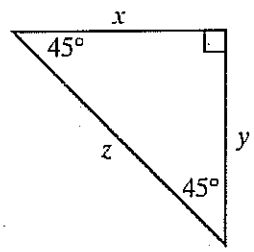
Special Right Triangles

**The length of one side of the triangle is given in each row of the table. Find the missing lengths for that triangle.**

| | m | n | p |
|---|---|---|---|
| 1. | 14 | | |
| 2. | | | 36 |
| 3. | | $9\sqrt{3}$ | |
| 4. | 5 | | |




| | x | y | z |
|---|---|---|---|
| 5. | 11 | | |
| 6. | | 8.7 | |
| 7. | | | $7\sqrt{2}$ |
| 8. | 17 | | |




**Tell whether a triangle with sides of the given lengths could be 45°-45°-90° or 30°-60°-90°. Explain.**

9. $3\sqrt{2}, 3\sqrt{2}, 6$

_____

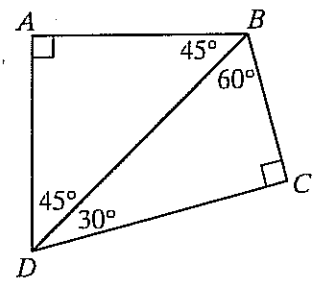
_____

10. 10, 24, 26

_____

_____

**In the figure, $BD = 6\sqrt{2}$. Find each value.**




11. $AB$ _____

12. $AD$ _____

13. $BC$ _____

14. $CD$ _____

15. One leg of a 45°-45°-90° right triangle measures 14 cm. Find the exact perimeter.

_____

Name _____ Class _____ Date _____

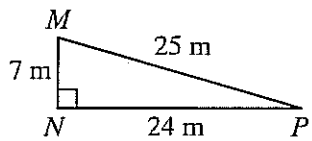
# Practice 11-6

Sine, Cosine, and Tangent Ratios

**Find each value. Round to four decimal places.**

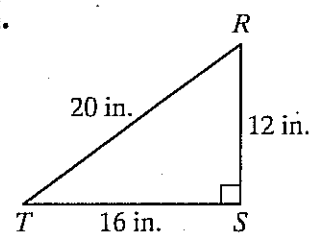
1. cos 20° _____
2. tan 64° _____
3. sin 41° _____
4. tan 8° _____
5. sin 88° _____
6. cos 53° _____

**Use $\triangle MNP$ for Exercises 7 to 12. Find each ratio.**




7. sine of $\angle P$ _____
8. cosine of $\angle P$ _____
9. tangent of $\angle P$ _____
10. sine of $\angle M$ _____
11. cosine of $\angle M$ _____
12. tangent of $\angle M$ _____

**Use $\triangle RST$ for Exercises 13 to 18. Find each ratio in simplest form.**



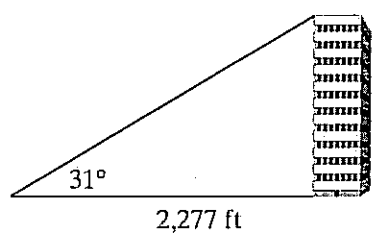

13. sine of $\angle T$ _____
14. cosine of $\angle T$ _____
15. tangent of $\angle T$ _____
16. sine of $\angle R$ _____
17. cosine of $\angle R$ _____
18. tangent of $\angle R$ _____

**Write each ratio using square root signs. Use your knowledge of 45°-45°-90° and 30°-60°-90° right triangles.**

19. tan 30° _____
20. cos 45° _____
21. sin 60° _____
22. cos 60° _____
23. tan 45° _____
24. sin 30° _____

25. A surveyor standing 2,277 ft from the base of a building measured a 31° angle to the topmost point. To the nearest ft, how tall is the building?

_____

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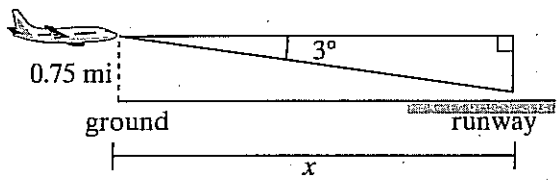
# Practice 11-7

## Angles of Elevation and Depression

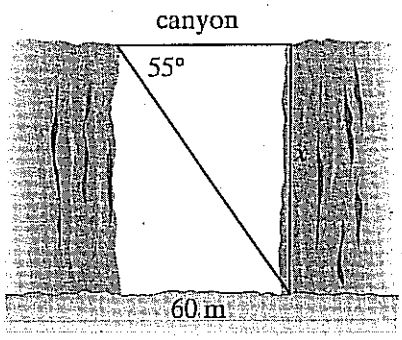
**Find $x$ to the nearest tenth.**

**1.**



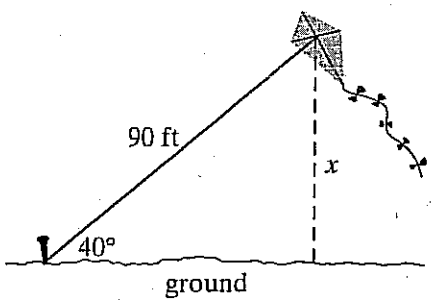

$x \approx$ _____

**2.**



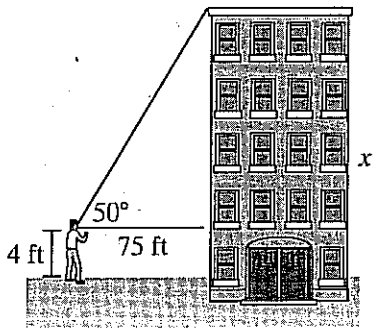

$x \approx$ _____

**3.**




$x \approx$ _____

**4.**




$x \approx$ _____

**Solve each problem. Round to the nearest unit.**

**5.** A helicopter is rescuing a would-be mountain climber. The helicopter is hovering, so there is an angle of depression of 35° from the helicopter to the climber. The bottom of the helicopter's 12-meter ladder is hanging even with the climber. How far does the helicopter need to move horizontally to be directly above the climber?

_____

**6.** Kara's kite is flying at the end of 35 yards of string. Her end of the string is 1 yard off the ground. The angle of elevation of the kite is 50°. What is the height of the kite from the ground?

_____

**7.** Karl is standing 80 ft from the base of a tree. He sees the top of the tree from an angle of elevation of 42°. His eye is 4.5 feet off the ground. How tall is the tree?

_____

Name _____ Class _____ Date _____

# Reteaching 11-1

## Square Roots and Irrational Numbers

Estimate $\sqrt{27}$ to the nearest integer.

To estimate square roots, it is helpful to know the perfect squares in the following table.

| $n$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $n^2$ | 1 | 4 | 9 | 16 | 25 | 36 | 49 | 64 | 81 | 100 | 121 | 144 |

Look at the $n^2$ row. These numbers are called perfect squares. Between which two perfect squares is 27?

$25 < 27 < 36$

so, $\sqrt{25} < \sqrt{27} < \sqrt{36}$

and $5 < \sqrt{27} < 6$

Since 27 is closer to 25 than to 36, $\sqrt{27}$ is closer to 5 than to 6.

Thus, $\sqrt{27}$ to the nearest integer is 5.

---

**Each square root is between what two integers? Circle the integer to which it is closer.**

1. $\sqrt{18}$ _____, _____
2. $\sqrt{60}$ _____, _____
3. $-\sqrt{8}$ _____, _____
4. $\sqrt{90}$ _____, _____
5. $\sqrt{29 + 8}$ _____, _____
6. $-\sqrt{21}$ _____, _____
7. $\sqrt{133}$ _____, _____
8. $-\sqrt{118}$ _____, _____

**Estimate to the nearest integer.**

9. $\sqrt{48}$ _____
10. $\sqrt{80}$ _____
11. $\sqrt{119}$ _____
12. $\sqrt{141}$ _____
13. $\sqrt{67}$ _____
14. $\sqrt{95}$ _____
15. $\sqrt{6}$ _____
16. $\sqrt{20}$ _____
17. $\sqrt{12}$ _____
18. $-\sqrt{3}$ _____
19. $\sqrt{42}$ _____
20. $-\sqrt{22}$ _____
21. $-\sqrt{110}$ _____
22. $-\sqrt{31}$ _____
23. $\sqrt{45}$ _____

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# Chapter 11 Answers

## Practice 11-1

**1.** 4 **2.** 5 **3.** 7 **4.** 3 **5.** 8 **6.** 9 **7.** 10 **8.** 7 **9.** 6 **10.** 12 **11.** 5 **12.** 30 **13.** 13 **14.** $-10$ **15.** 0.4 **16.** $\frac{4}{9}$ **17.** $\frac{2}{5}$ **18.** $\frac{11}{12}$ **19.** Rational **20.** Rational **21.** Irrational **22.** Irrational **23.** Rational **24.** Irrational **25.** $4, -4$ **26.** $7, -7$ **27.** about 4 mi **28.** 18 mi **29.** about 25 mi **30.** 1,080 mi

## Practice 11-2

**1.** yes, $20^2 + 21^2 \stackrel{?}{=} 29^2, 400 + 441 \stackrel{?}{=} 841, 841 = 841$ **2.** no, $7^2 + 11^2 \stackrel{?}{=} 12^2, 49 + 121 \stackrel{?}{=} 144, 170 \neq 144$ **3.** yes, $10^2 + (2\sqrt{11})^2 \stackrel{?}{=} 12^2, 100 + 44 \stackrel{?}{=} 144, 144 = 144$ **4.** yes, $28^2 + 45^2 \stackrel{?}{=} 53^2, 784 + 2{,}025 \stackrel{?}{=} 2{,}809, 2{,}809 = 2{,}809$ **5.** no, $9^2 + (\sqrt{10})^2 \stackrel{?}{=} 10^2, 81 + 10 \stackrel{?}{=} 100, 91 \neq 100$ **6.** no, $10^2 + 15^2 \stackrel{?}{=} 20^2, 100 + 225 \stackrel{?}{=} 400, 325 \neq 400$ **7.** $x = 8$ cm **8.** $x = 10$ ft **9.** $x = 10$ mm **10.** $x \approx 5.7$ in. **11.** $x = 11$ m **12.** $x \approx 7.2$ yd **13.** 10.8 m **14.** 29.4 in. **15.** 21.2 cm **16.** 38.5 ft **17.** 500 ft

## Practice 11-3

**1.** $4.5, (3, 8)$ **2.** $5.4, \left(6, -\frac{1}{2}\right)$ **3.** $13, \left(2\frac{1}{2}, 6\right)$ **4.** $11.7, (1, 2)$ **5.** $5, \left(\frac{1}{2}, 3\right)$ **6.** $9.8, \left(-5, 3\frac{1}{2}\right)$ **7.** 16.5 **8.** 17.2 **9.** 22.4 **10.** 23.8

## Practice 11-4

Sample proportions are shown. **1.** $\frac{x}{17} = \frac{2}{8}$, 4.25 m **2.** $\frac{x}{60} = \frac{32}{48}$, 40 in. **3.** $\frac{x}{12} = \frac{49}{21}$, 28 ft **4.** $\frac{x+9}{9} = \frac{20}{15}$, 3 cm **5.** $\frac{15}{24} = \frac{x}{x+12}$; 20 ft **6.** $\frac{3}{4.77} = \frac{8}{x}$; \$12.72 **7.** $\frac{10.99}{113.04} = \frac{x}{176.625}$; about \$17.17

## Practice 11-5

**1.** $14\sqrt{3}, 28$ **2.** $18, 18\sqrt{3}$ **3.** $9, 18$ **4.** $5\sqrt{3}, 10$ **5.** $11, 11\sqrt{2}$ **6.** $8.7, 8.7\sqrt{2}$ **7.** $7, 7$ **8.** $17, 17\sqrt{2}$ **9.** 45°-45°-90°; Two sides are equal, and $(3\sqrt{2})\sqrt{2} = 6$, so the hypotenuse = leg $\cdot \sqrt{2}$. **10.** Neither; The length of the longest side is neither 2 times nor $\sqrt{2}$ times the length of the shortest side. **11.** 6 **12.** 6 **13.** $3\sqrt{2}$ **14.** $3\sqrt{6}$ **15.** $28 + 14\sqrt{2}$ cm

## Practice 11-6

**1.** 0.9397 **2.** 2.0503 **3.** 0.6561 **4.** 0.1405 **5.** 0.9994 **6.** 0.6018 **7.** $\frac{7}{25}$ **8.** $\frac{24}{25}$ **9.** $\frac{7}{24}$ **10.** $\frac{24}{25}$ **11.** $\frac{7}{25}$ **12.** $\frac{24}{7}$ **13.** $\frac{3}{5}$ **14.** $\frac{4}{5}$ **15.** $\frac{3}{4}$ **16.** $\frac{4}{5}$ **17.** $\frac{3}{5}$ **18.** $\frac{4}{3}$ **19.** $\frac{1}{\sqrt{3}}$ **20.** $\frac{1}{\sqrt{2}}$ **21.** $\frac{\sqrt{3}}{2}$ **22.** $\frac{1}{2}$ **23.** 1 **24.** $\frac{1}{2}$ **25.** 1,368 ft

## Practice 11-7

**1.** 14.3 mi **2.** 85.7 m **3.** 57.9 ft **4.** 93.4 ft **5.** about 17 m **6.** about 28 yd **7.** about 77 ft

## Reteaching 11-1

**1.** 4, 5 **2.** 7, 8 **3.** $-3, -2$ **4.** 9, 10 **5.** 6, 7 **6.** $-5, -4$ **7.** 11, 12 **8.** $-11, -10$ **9.** 7 **10.** 9 **11.** 11 **12.** 12 **13.** 8 **14.** 10 **15.** 2 **16.** 4 **17.** 3 **18.** $-2$ **19.** 6 **20.** $-5$ **21.** $-10$ **22.** $-6$ **23.** 7

## Reteaching 11-2

**1.** $x = 61.0$ mm **2.** $x = 9.0$ in. **3.** $x \approx 9.7$ ft **4.** $x = 12.0$ m **5.** $x \approx 13.6$ cm **6.** $x \approx 6.2$ in. **7.** 12.6 in. **8.** 11.9 mm **9.** 63.1 ft **10.** 23.0 cm

## Reteaching 11-3

**1.** $5\sqrt{2}, \sqrt{13}, 5, 15.7$ **2.** $4\sqrt{2}, \sqrt{53}, 3\sqrt{5}, 19.6$

## Reteaching 11-4

Sample proportions are shown. **1.** $\frac{3}{5} = \frac{9}{x+9}$, 6 ft **2.** $\frac{6}{x+5} = \frac{5}{6}$, 2.2 m

## Reteaching 11-5

**1.** 15.0 cm **2.** 21.2 cm **3.** 30.0 cm **4.** 26.0 cm **5.** 36.0 mm **6.** 50.9 mm **7.** 18.0 mm **8.** 31.2 mm **9.** 14 ft **10.** 12.1 ft **11.** 7 ft **12.** 9.9 ft **13.** 11 ft **14.** 22 ft **15.** 11 ft **16.** 15.6 ft

## Reteaching 11-6

**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.** $\frac{5}{13}$ **8.** $\frac{12}{13}$ **9.** $\frac{5}{12}$ **10.** $\frac{12}{13}$ **11.** $\frac{5}{13}$ **12.** $\frac{12}{5}$ **13.** $\frac{24}{25}$ **14.** $\frac{7}{25}$ **15.** $\frac{24}{7}$ **16.** $\frac{7}{25}$ **17.** $\frac{24}{25}$ **18.** $\frac{7}{24}$

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Name _____ Class _____ Date _____

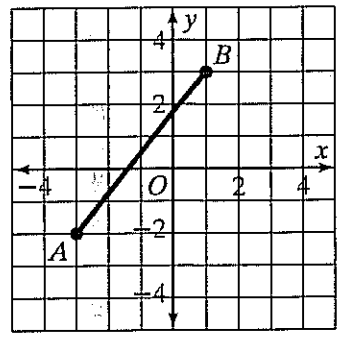
# Cumulative Review (continued)

*Chapter 11*

**13.** Which estimate is closest to the distance between $A$ and $B$?

**A.** 4 units **B.** 5 units

**C.** 6 units **D.** 7 units



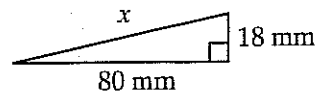

**14.** Find the midpoint of $\overline{AB}$.

_____

**15.** Find the slope of the line containing points $A$ and $B$.

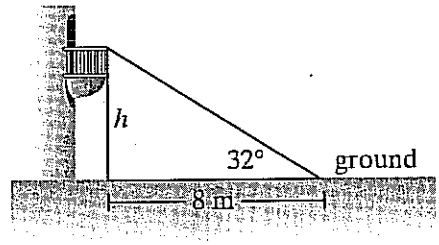
_____

**16.** Find $x$. _____




**17.** In the diagram, the angle of elevation from the ground to the balcony is 32°. Find the height $h$ of the balcony.

_____




**18.** Give an example of an irrational number and explain why it is irrational.

_____

_____

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