Study Guide and Review

State whether each sentence is *true* or *false*. If *false*, replace the underlined term to make a true sentence.

1. The center of a trapezoid is the perpendicular distance between the bases.

   SOLUTION:
   false; height

   ANSWER:
   false; height

2. A slice of pizza is a sector of a circle.

   SOLUTION:
   true

   ANSWER:
   true

3. The center of a regular polygon is the distance from the middle to the circle circumscribed around the polygon.

   SOLUTION:
   false; radius

   ANSWER:
   false; radius

4. The segment from the center of a square to the corner can be called the radius of the square.

   SOLUTION:
   true

   ANSWER:
   true

5. A segment drawn perpendicular to a side of a regular polygon is called an apothem of the polygon.

   SOLUTION:
   true

   ANSWER:
   true

6. The measure of each radial angle of a regular n-gon is $\frac{360}{n}$.

   SOLUTION:
   false; central

   ANSWER:
   false; central

7. The apothem of a polygon is the perpendicular distance between any two parallel bases.

   SOLUTION:
   false; height of a parallelogram

   ANSWER:
   false; height of a parallelogram

8. The height of a triangle is the length of an altitude drawn to a given base.

   SOLUTION:
   true

   ANSWER:
   true

9. Any side of a parallelogram can be called the height of a parallelogram.

   SOLUTION:
   false; base

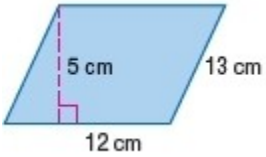
   ANSWER:
   false; base

10. The center of a regular polygon is also the center of its circumscribed circle.

    SOLUTION:
    true

    ANSWER:
    true

Find the perimeter and area of each parallelogram or triangle. Round to the nearest tenth if necessary.

11. 

    SOLUTION:

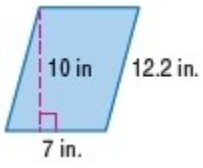
$$\begin{aligned} A &= bh \\ &= 12(5) \\ &= 60 \end{aligned}$$

$$\begin{aligned} P &= 2(12 + 13) \\ &= 2(25) \\ &= 50 \end{aligned}$$

    ANSWER:

    $P = 50$ cm; $A = 60$ cm^2

Study Guide and Review

12. 

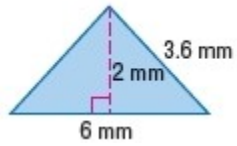
SOLUTION:

$$\begin{aligned} A &= bh \\ &= 7(10) \\ &= 70 \end{aligned}$$

$$\begin{aligned} P &= 2(7 + 12.2) \\ &= 2(19.2) \\ &= 38.4 \end{aligned}$$

ANSWER:

P = 38.4 in.; A = 70 in^2

13. 

SOLUTION:

$$\begin{aligned} A &= \tfrac{1}{2}bh \\ &= \tfrac{1}{2}(6)(2) \\ &= 6 \end{aligned}$$

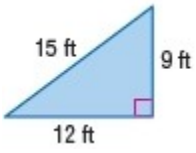
Use the Pythagorean Theorem to find the length of the third side of the triangle.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 3^2 + 2^2 &= c^2 \\ 9 + 4 &= c^2 \\ \sqrt{13} &= c \\ 3.6 &\approx c \end{aligned}$$

The perimeter is about 3.6 + 3 + 3.6 = 13.2 mm.

ANSWER:

P = 13.2 mm; A = 6 mm^2

14. 

SOLUTION:

$$A = \frac{1}{2}bh$$
$$= \frac{1}{2}(12)(9)$$
$$= 54$$

The perimeter is 12 + 9 + 15 = 36 ft.

ANSWER:

P = 36 ft; A = 54 ft^2

15. **PAINTING** Two of the walls of an attic in an A-frame house are triangular, each with a height of 12 feet and a width of 22 feet. How much paint is needed to paint one end of the attic?

SOLUTION:

$$A = \frac{1}{2}bh$$
$$= \frac{1}{2}(22)(12)$$
$$= 132$$

ANSWER:

132 sq. ft

Find the area of each trapezoid, rhombus, or kite.

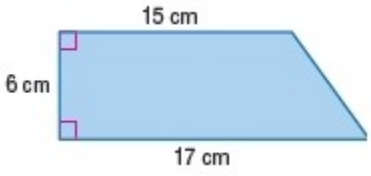
16. 

SOLUTION:

$$\begin{aligned} A &= \tfrac{1}{2}(b_1 + b_2)h \\ &= \tfrac{1}{2}(8+4)(14) \\ &= 84 \end{aligned}$$

ANSWER:

84 ft^2

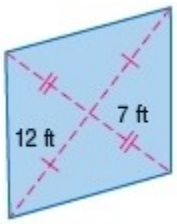
17. 

SOLUTION:

$$\begin{aligned} A &= \tfrac{1}{2}(b_1 + b_2)h \\ &= \tfrac{1}{2}(17+15)(6) \\ &= 96 \end{aligned}$$

ANSWER:

96 cm^2

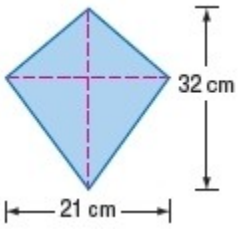
18. 

SOLUTION:

$$\begin{aligned} A &= \tfrac{1}{2}d_1d_2 \\ &= \tfrac{1}{2}(14)(24) \\ &= 168 \end{aligned}$$

ANSWER:

168 ft^2

19. 

SOLUTION:

$$\begin{aligned} A &= \tfrac{1}{2}d_1d_2 \\ &= \tfrac{1}{2}(32)(21) \\ &= 336 \end{aligned}$$

ANSWER:

336 cm^2

20. **KITES** Team Dragon's kite is 4 ft long and 3 ft across. How much fabric does it take to make their kite?

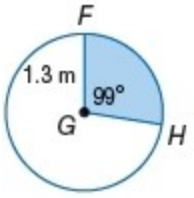
SOLUTION:

$$\begin{aligned} A &= \tfrac{1}{2}d_1d_2 \\ &= \tfrac{1}{2}(4)(3) \\ &= 6 \end{aligned}$$

ANSWER:

6 ft^2

Find the area of each shaded sector. Round to the nearest tenth.

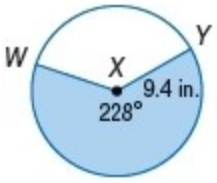
21. 

SOLUTION:

$$A = \frac{x}{360} \cdot \pi r^2$$
$$= \frac{99}{360}\pi(1.3)^2$$
$$= \frac{11}{40}\pi(1.69)$$
$$\approx 1.5$$

ANSWER:

1.5 m^2

22. 

SOLUTION:

$$A = \frac{x}{360} \cdot \pi r^2$$
$$= \frac{228}{360}\pi(9.4)^2$$
$$= \frac{57}{90}\pi(88.36)$$
$$\approx 175.8$$

ANSWER:

175.8 in^2

23. **BICYCLES** A bicycle tire decoration covers $\frac{1}{9}$ of the circle formed by the tire. If the tire has a diameter of 26 inches, what is the area of the decoration?

SOLUTION:

$$\begin{aligned} A &= \frac{x}{360} \cdot \pi r^2 \\ &= \frac{40}{360}\pi(13)^2 \\ &= \frac{1}{9}\pi(169) \\ &\approx 59.0 \end{aligned}$$

ANSWER:

59 in^2

24. **PIZZA** Charlie and Kris ordered a 16-inch pizza and cut the pizza into 12 slices.
    a. If Charlie ate 3 pieces, what area of the pizza did he eat?
    b. If Kris ate 2 pieces, what area of the pizza did she eat?
    c. What is the area of leftover pizza?

SOLUTION:

a.

$$\begin{aligned} A &= \frac{x}{360} \cdot \pi r^2 \\ &= \frac{90}{360}\pi(8)^2 \\ &= \frac{1}{4}\pi(64) \\ &\approx 50.27 \end{aligned}$$

b.

$$\begin{aligned} A &= \frac{x}{360} \cdot \pi r^2 \\ &= \frac{60}{360}\pi(8)^2 \\ &= \frac{1}{6}\pi(64) \\ &\approx 33.51 \end{aligned}$$

c.

$$\begin{aligned} A &= \frac{x}{360} \cdot \pi r^2 \\ &= \frac{210}{360}\pi(8)^2 \\ &= \frac{7}{12}\pi(64) \\ &\approx 117.29 \end{aligned}$$

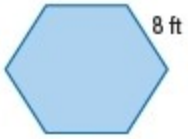
ANSWER:

a. 50.27 in^2

b. 33.51 in^2

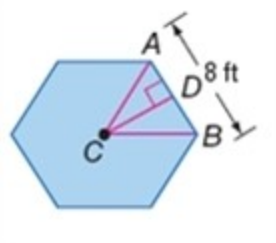
c. 117.29 in^2

Find the area of each figure. Round to the nearest tenth.

25. 

SOLUTION:

A regular hexagon has 6 congruent triangles and 6 congruent central angles, so the measure of each central angle is $\frac{360}{6} = 60$.



Apothem $\overline{DC}$ is the height of equilateral triangle ABC and splits the triangle into two congruent triangles.

$\angle ADC = \angle BDC = 30$

Use the Trigonometric ratios to find the apothem of the polygon.

$$\tan\theta = \frac{opposite}{adjacent}$$

$$\tan 30° = \frac{AD}{DC}$$

$$\tan 30° = \frac{4}{DC}$$

$$DC = \frac{4}{\tan 30°}$$

$$\text{Area of the polygon} = \frac{1}{2}aP$$

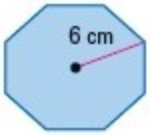
$$= \frac{1}{2}\left(\frac{4}{\tan 30°}\right)(6 \times 8)$$

$$\approx 166.3 \text{ ft}^2$$

ANSWER:

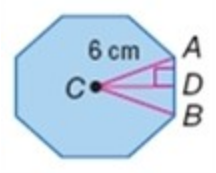
166.3 ft^2

Study Guide and Review

26. 

SOLUTION:

A regular octagon has 8 congruent triangles with 8 congruent central angles, so the measure of each central angle is $360 \div 8 = 45$.



Apothem $\overline{DC}$ is the height of the isosceles triangle ABC and it splits the triangle into two congruent triangles.

$$\angle ADC = \angle BDC = 22.5$$

Use the trigonometric ratios to find the side length and apothem of the polygon.

$$\sin\theta = \frac{opposite}{hypotenuse}$$

$$\sin 22.5° = \frac{AD}{AC}$$

$$AD = 6\sin 22.5°$$

$$\cos\theta = \frac{adjacent}{hypotenuse}$$

$$\cos 22.5° = \frac{CD}{AC}$$

$$CD = 6\cos 22.5°$$

$AB = 2(AD) = 12 \sin 22.5$

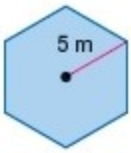
$$\text{Area of the polygon} = \frac{1}{2}aP$$

$$= \frac{1}{2}(6\cos 22.5°)(8 \times 12\sin 22.5°)$$

$$\approx 101.8 \text{ cm}^2$$

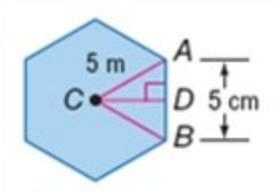
ANSWER:

101.8 cm^2

27. 

SOLUTION:

A regular hexagon has 6 congruent triangles with 6 congruent central angles, so the measure of each central angle is $360 \div 6 = 60$.



Apothem $\overline{DC}$ is the height of an equilateral triangle ABC and it splits the triangle into 2 congruent triangles.

$\angle ADC = \angle BDC = 30$

Use the trigonometric ratios to find the side length and apothem of the polygon.

$$\cos\theta = \frac{adjacent}{hypotenuse}$$

$$\cos 30 = \frac{CD}{AC}$$

$$\cos 30 = \frac{CD}{5}$$

$$CD = 5\cos 30°$$

$$\text{Area of the polygon} = \frac{1}{2}aP$$

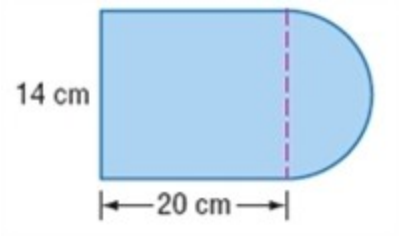
$$= \frac{1}{2}(5\cos 30°)(6 \times 5)$$

$$\approx 65\,\text{m}^2$$

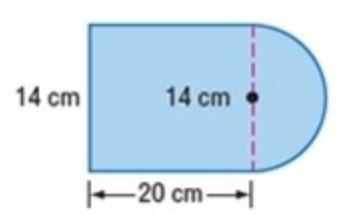
ANSWER:

65.0 m^2

Study Guide and Review

28. 

SOLUTION:



Area of the polygon = Area of the rectangle + Area of the semicircle

$$\text{Area of the polygon} = (20 \times 14) + \frac{1}{2}\left(\pi(7)^2\right)$$
$$\approx 357.0 \text{ cm}^2$$

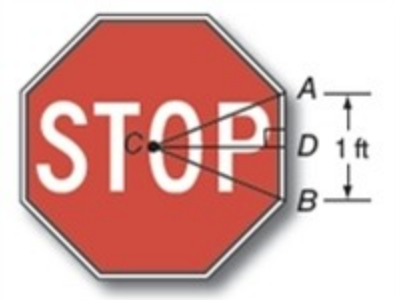
ANSWER:

357.0 cm^2

29. **SIGNS** Find the area of the stop sign below in square inches.

SOLUTION:

A regular octagon has 8 congruent triangles with 8 congruent central angles, so the measure of each central angle is $360 \div 8 = 45$.



Apothem $\overline{DC}$ is the height of the isosceles triangle ABC and it splits the triangle into 2 congruent triangles.

$\angle ADC = \angle BDC = 22.5$

Use the trigonometric ratios to find the side length and apothem of the polygon. Note that 1 foot = 12 inches.

$$\tan\theta = \frac{opposite}{adjacent}$$

$$\tan 22.5 = \frac{AD}{DC}$$

$$DC = \frac{AD}{\tan 22.5}$$

$$= \frac{6}{\tan 22.5}$$

$$\text{Area of the polygon} = \frac{1}{2}aP$$

$$= \frac{1}{2}\left(\frac{6}{\tan 22.5}\right)(8 \times 12)$$

$$\approx 695.3 \text{ in}^2$$

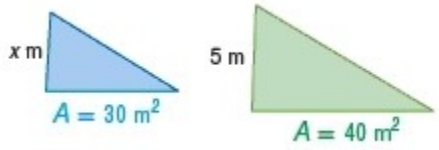
ANSWER:

$\approx 695 \text{ in}^2$

Study Guide and Review

For each pair of similar figures, use the given areas to find the scale factor from the blue to the green figure. Then find *x*.

30.



SOLUTION:

The scale factor between the blue triangle and the green triangle is $\frac{x}{5}$, so the ratio of their areas is $\left(\frac{x}{5}\right)^2$.

$$\frac{\text{Area of the blue triangle}}{\text{Area of the green triangle}} = \left(\frac{x}{5}\right)^2$$

$$\frac{30}{40} = \frac{x^2}{25}$$

$$40x^2 = 30 \cdot 25$$

$$x^2 = \frac{30 \cdot 25}{40}$$

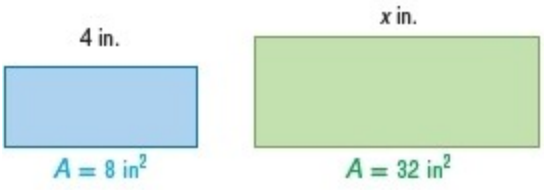
$$x^2 = \frac{3 \cdot 25}{4}$$

$$x = \frac{5\sqrt{3}}{2}$$

The scale factor is $\frac{\left(\frac{5\sqrt{3}}{2}\right)}{5}$ or $\frac{\sqrt{3}}{2}$.

ANSWER:

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

31. 

SOLUTION:

The scale factor between the blue triangle and the green triangle is $\frac{4}{x}$, so the ratio of their areas is $\left(\frac{4}{x}\right)^2$.

$$\frac{\text{Area of the blue triangle}}{\text{Area of the green triangle}} = \left(\frac{4}{x}\right)^2$$

$$\frac{8}{32} = \frac{16}{x^2}$$

$$8x^2 = 16 \cdot 32$$

$$x^2 = \frac{16 \cdot 32}{8}$$

$$x^2 = 64$$

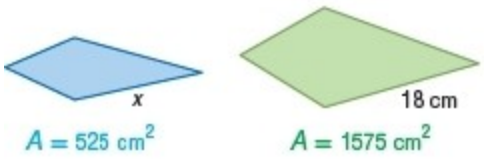
$$x = 8$$

The scale factor is $\frac{4}{8}$ or $\frac{1}{2}$.

ANSWER:

$\frac{1}{2}$;8

32.



SOLUTION:

The scale factor between the blue triangle and the green triangle is $\frac{x}{18}$, so the ratio of their areas is $\left(\frac{x}{18}\right)^2$.

$$\frac{\text{Area of the blue triangle}}{\text{Area of the green triangle}} = \left(\frac{x}{18}\right)^2$$

$$\frac{525}{1575} = \frac{x^2}{324}$$

$$1575x^2 = 324 \cdot 525$$

$$x^2 = \frac{324 \cdot 525}{1575}$$

$$x^2 = 108$$

$$x = 6\sqrt{3}$$

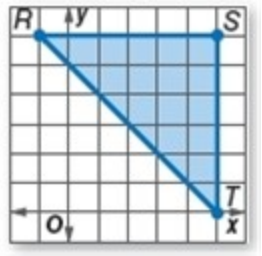
The scale factor is $\frac{6\sqrt{3}}{18}$ or $\frac{\sqrt{3}}{3}$.

ANSWER:

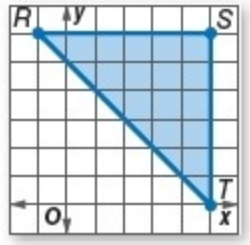
$\frac{\sqrt{3}}{3}; 6\sqrt{3}$

COORDINATE GEOMETRY Find the area of each figure. Use the segment length given to find the area of a similar polygon.

33. $R'S' = 3$



SOLUTION:



Area of a triangle $= \frac{1}{2}bh$

Area of triangle $RST = \frac{1}{2}(6)(6) = 18$

The scale factor between ΔRST and $\Delta R'S'T'$ is $\frac{RS}{R'S'}$ or $\frac{6}{3}$, so the ratio of their areas is $\left(\frac{6}{3}\right)^2$.

$$\frac{\text{Area of } \Delta RST}{\text{Area of } \Delta R'S'T'} = \left(\frac{6}{3}\right)^2$$

$$\frac{18}{\text{Area of } \Delta R'S'T'} = \frac{36}{9}$$

$$36 \cdot \text{Area of } \Delta R'S'T' = 18 \cdot 9$$

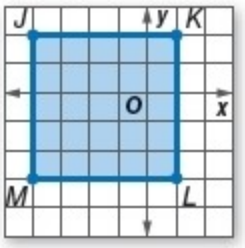
$$\text{Area of } \Delta R'S'T' = \frac{18 \cdot 9}{36}$$

$$\text{Area of } \Delta R'S'T' = 4.5 \text{ units}^2$$

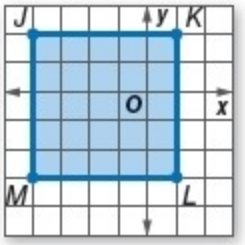
ANSWER:

area of $\Delta RST = 18$ square units; area of $\Delta R'S'T' = 4.5$ square units

34. $K'L' = 15$



SOLUTION:



$JM = ML = LK = KJ = 5$.
Area of the square $JKLM = 5(5) = 25$

$K'L' = 15$

The scale factor between $JKLM$ and $J'K'L'M'$ is $\frac{KL}{K'L'} = \frac{1}{3}$, so the ratio of their areas is $\left(\frac{1}{3}\right)^2$.

$$\frac{\text{Area of } JKLM}{\text{Area of } J'K'L'M'} = \left(\frac{1}{3}\right)^2$$

$$\frac{25}{\text{Area of } J'K'L'M'} = \frac{1}{9}$$

$$\text{Area of } J'K'L'M' = 25 \cdot 9$$

$$\text{Area of } J'K'L'M' = 225 \text{ units}^2$$

ANSWER:

area of rJKL = 25square units; area of r$J'K'L'$ ≈ 225 square units

35. **LAND OWNERSHIP** Joshua's land is 600 square miles. A map of his land is 5 square feet. If one side of the map is 1.5 feet, how long is the corresponding side of the land?

SOLUTION:

Let x be the length of the corresponding side of the land. The scale factor is $\frac{x}{1.5}$, so the ratio of their areas is $\left(\frac{x}{1.5}\right)^2$.

$$\frac{\text{Area of Joshua's land}}{\text{Area of the map of his land}} = \left(\frac{x}{1.5}\right)^2$$

$$\frac{600}{5} = \frac{x^2}{2.25}$$

$$5x^2 = 1350$$

$$x^2 = 270$$

$$x \approx 16.4 \text{ mi}$$

ANSWER:

16.4 mi