11 CHAPTER SUMMARY

BIG IDEAS

For Your Notebook

Big Idea 1

Using Area Formulas for Polygons

Polygon	Formula	
Triangle	$A = \frac{1}{2}bh,$	with base b and height h
Parallelogram	$A = bh,$	with base b and height h
Trapezoid	$A = \frac{1}{2}h(b_1 + b_2),$	with bases b_1 and b_2 and height h
Rhombus	$A = \frac{1}{2}d_1d_2,$	with diagonals d_1 and d_2
Kite	$A = \frac{1}{2}d_1d_2,$	with diagonals d_1 and d_2
Regular polygon	$A = \frac{1}{2}a \cdot ns,$	with apothem a, n sides, and side length s

Sometimes you need to use the Pythagorean Theorem, special right triangles, or trigonometry to find a length in a polygon before you can find its area.

Big Idea 2

Relating Length, Perimeter, and Area Ratios in Similar Polygons

You can use ratios of corresponding measures to find other ratios of measures. You can solve proportions to find unknown lengths or areas.

If two figures are similar and . . .	then . . .
the ratio of side lengths is $a:b$	• the ratio of perimeters is also $a:b$. • the ratio of areas is $a^2:b^2$.
the ratio of perimeters is $c:d$	• the ratio of side lengths is also $c:d$. • the ratio of areas is $c^2:d^2$.
the ratio of areas is $e:f$	• the ratio of side lengths is $\sqrt{e}:\sqrt{f}$. • the ratio of perimeters is $\sqrt{e}:\sqrt{f}$.

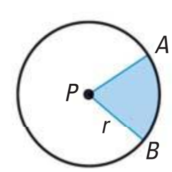
Big Idea 3

Comparing Measures for Parts of Circles and the Whole Circle

Given $\odot P$ with radius r, you can use proportional reasoning to find measures of parts of the circle.

Arc length $\dfrac{\text{Arc length of } \widehat{AB}}{2\pi r} = \dfrac{m\widehat{AB}}{360°}$ ← **Part** / ← **Whole**

Area of sector $\dfrac{\text{Area of sector } APB}{\pi r^2} = \dfrac{m\widehat{AB}}{360°}$ ← **Part** / ← **Whole**



11 CHAPTER REVIEW

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- Multi-Language Glossary
- Vocabulary practice

REVIEW KEY VOCABULARY

For a list of postulates and theorems, see pp. 926–931.

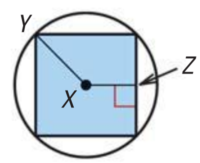
- bases of a parallelogram, *p. 720*
- height of a parallelogram, *p. 720*
- height of a trapezoid, *p. 730*
- circumference, *p. 746*
- arc length, *p. 747*
- sector of a circle, *p. 756*
- center of a polygon, *p. 762*
- radius of a polygon, *p. 762*
- apothem of a polygon, *p. 762*
- central angle of a regular polygon, *p. 762*
- probability, *p. 771*
- geometric probability, *p. 771*

VOCABULARY EXERCISES

1. Copy and complete: A *sector of a circle* is the region bounded by __?__.

2. **WRITING** *Explain* the relationship between the height of a parallelogram and the bases of a parallelogram.

The diagram shows a square inscribed in a circle. Name an example of the given segment.



3. An apothem of the square **4.** A radius of the square

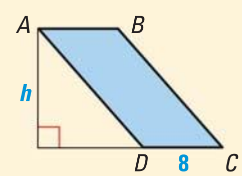
REVIEW EXAMPLES AND EXERCISES

Use the review examples and exercises below to check your understanding of the concepts you have learned in each lesson of Chapter 11.

11.1 Areas of Triangles and Parallelograms *pp. 720–726*

EXAMPLE

The area of $\square ABCD$ is 96 square units. Find its height h.



$A = bh$ Formula for area of a parallelogram

$96 = 8h$ Substitute 96 for A and 8 for b.

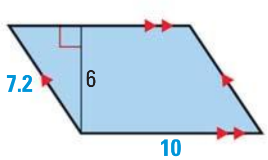
$h = 12$ Solve.

EXERCISES

EXAMPLES 1, 2, and 3 on pp. 721–722 for Exs. 5–8

Find the area of the polygon.

5.



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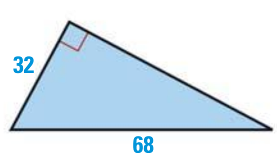

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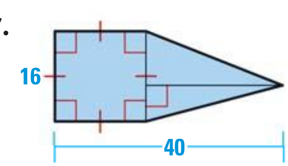

8. The area of a triangle is 147 square inches and its height is 1.5 times its base. Find the base and the height of the triangle.

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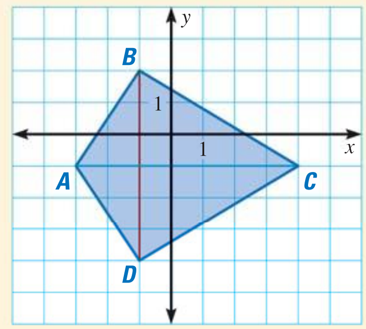
Chapter Review Practice

11.2 Areas of Trapezoids, Rhombuses, and Kites *pp. 730–736*

EXAMPLE

Find the area of the kite.



Find the lengths of the diagonals of the kite.

$d_1 = BD = |2 - (-4)| = 6$

$d_2 = AC = |4 - (-3)| = 7$

Find the area of $ABCD$.

$A = \frac{1}{2}d_1d_2$ **Formula for area of a kite**

$= \frac{1}{2}(6)(7) = 21$ **Substitute and simplify.**

▶ The area of the kite is 21 square units.

EXERCISES

EXAMPLE 4
on p. 732
for Exs. 9–11

Graph the polygon with the given vertices and find its area.

9. $L(2, 2)$, $M(6, 2)$, $N(8, 4)$, $P(4, 4)$

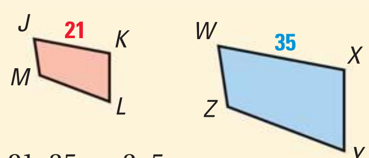
10. $Q(-3, 0)$, $R(-2, 3)$, $S(-1, 0)$, $T(-2, -2)$

11. $D(-1, 4)$, $E(5, 4)$, $F(3, -2)$, $G(1, -2)$

11.3 Perimeter and Area of Similar Figures *pp. 737–743*

EXAMPLE

Quadrilaterals *JKLM* and *WXYZ* are similar. Find the ratios (red to blue) of the perimeters and of the areas.



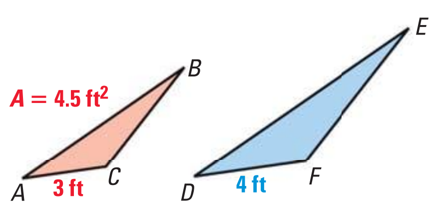
The ratio of the lengths of the corresponding sides is 21 : 35, or 3 : 5. Using Theorem 6.1, the ratio of the perimeters is 3 : 5. Using Theorem 11.7, the ratio of the areas is $3^2 : 5^2$, or 9 : 25.

EXERCISES

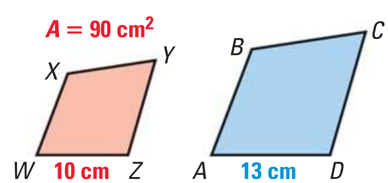
EXAMPLES 1, 2, and 3
on pp. 737–738
for Exs. 12–14

The polygons are similar. Find the ratio (red to blue) of the perimeters and of the areas. Then find the unknown area.

12. $\triangle ABC \sim \triangle DEF$



13. $WXYZ \sim ABCD$



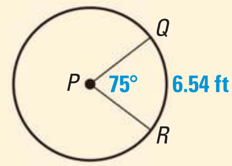
14. The ratio of the areas of two similar figures is 144 : 49. Write the ratio of the lengths of corresponding sides.

11 CHAPTER REVIEW

11.4 Circumference and Arc Length *pp. 746–752*

EXAMPLE

The arc length of $\overset{\frown}{QR}$ is 6.54 feet. Find the radius of $\odot P$.



$$\frac{\text{Arc length of } \overset{\frown}{QR}}{2\pi r} = \frac{m\overset{\frown}{QR}}{360°}$$ **Arc Length Corollary**

$$\frac{6.54}{2\pi r} = \frac{75°}{360°}$$ **Substitute.**

$$6.54(360°) = 75°(2\pi r)$$ **Cross Products Property**

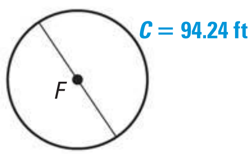
$$r \approx 5.00 \text{ ft}$$ **Solve.**

EXERCISES

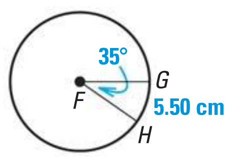
EXAMPLES 1, 3, and 4 on pp. 746, 748 for Exs. 15–17

Find the indicated measure.

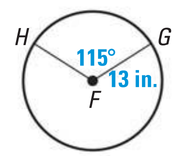
15. Diameter of $\odot F$



16. Circumference of $\odot F$



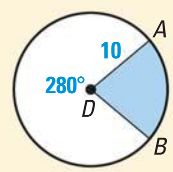
17. Length of $\overset{\frown}{GH}$



11.5 Areas of Circles and Sectors *pp. 755–761*

EXAMPLE

Find the area of sector *ADB*.



First find the measure of the minor arc.

$m\angle ADB = 360° - 280° = 80°$, so $m\overset{\frown}{AB} = 80°$.

$$\text{Area of sector } ADB = \frac{m\overset{\frown}{AB}}{360°} \cdot \pi r^2$$ **Formula for area of a sector**

$$= \frac{80°}{360°} \cdot \pi \cdot 10^2$$ **Substitute.**

$$\approx 69.81 \text{ units}^2$$ **Use a calculator.**

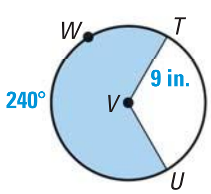
▶ The area of the small sector is about 69.81 square units.

EXERCISES

EXAMPLES 2, 3, and 4 on pp. 756–757 for Exs. 18–20

Find the area of the blue shaded region.

18.



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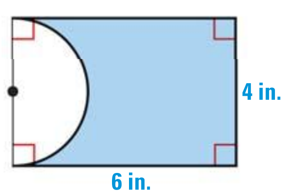

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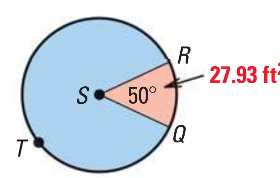

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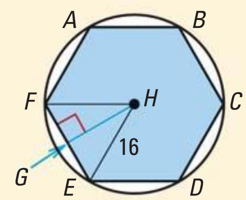
Chapter Review Practice

11.6 Areas of Regular Polygons *pp. 762–768*

EXAMPLE

A regular hexagon is inscribed in $\odot H$. Find (a) $m\angle EHG$, and (b) the area of the hexagon.



a. $\angle FHE$ is a central angle, so $m\angle FHE = \frac{360°}{6} = 60°$.
Apothem $\overline{GH}$ bisects $\angle FHE$. So, $m\angle EHG = 30°$.

b. Because $\triangle EHG$ is a 30°-60°-90° triangle, $GE = \frac{1}{2} \cdot HE = 8$ and
$GH = \sqrt{3} \cdot GE = 8\sqrt{3}$. So, $s = 16$ and $a = 8\sqrt{3}$. Then use the area formula.

$$A = \frac{1}{2}a \cdot ns = \frac{1}{2}(8\sqrt{3})(6)(16) \approx 665.1 \text{ square units}$$

EXERCISES

EXAMPLES 2 and 3 on pp. 763–764 for Exs. 21–22

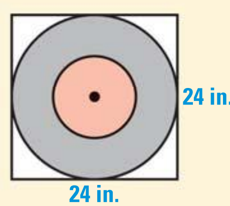
21. PLATTER A platter is in the shape of a regular octagon. Find the perimeter and area of the platter if its apothem is 6 inches.

22. PUZZLE A jigsaw puzzle is in the shape of a regular pentagon. Find its area if its radius is 17 centimeters and its side length is 20 centimeters.

11.7 Use Geometric Probability *pp. 771–777*

EXAMPLE

A dart is thrown and hits the square dartboard shown. The dart is equally likely to land on any point on the board. Find the probability that the dart lands in the white region outside the concentric circles.



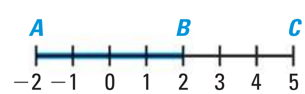
$$P(\text{dart lands in white region}) = \frac{\text{Area of white region}}{\text{Area of dart board}} = \frac{24^2 - \pi(12^2)}{24^2} \approx 0.215$$

▶ The probability that the dart lands in the white region is about 21.5%.

EXERCISES

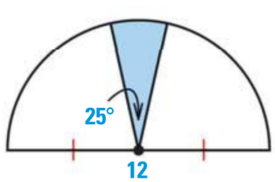
EXAMPLES 1 and 3 on pp. 771, 773 for Exs. 23–26

23. A point K is selected randomly on $\overline{AC}$ at the right. What is the probability that K is on $\overline{AB}$?



Find the probability that a randomly chosen point in the figure lies in the shaded region.

24.



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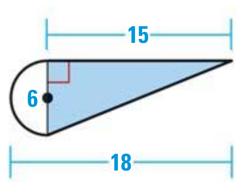

26.