# 8 CHAPTER SUMMARY

## BIG IDEAS

For Your Notebook

Big Idea 1

### Using Angle Relationships in Polygons

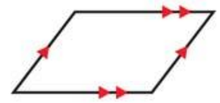
You can use theorems about the interior and exterior angles of convex polygons to solve problems.

| Polygon Interior Angles Theorem | Polygon Exterior Angles Theorem |
| --- | --- |
| The sum of the interior angle measures of a convex $n$-gon is $(n - 2) \cdot 180°$. | The sum of the exterior angle measures of a convex $n$-gon is $360°$. |

Big Idea 2

### Using Properties of Parallelograms

By definition, a parallelogram is a quadrilateral with both pairs of opposite sides parallel. Other properties of parallelograms:



- Opposite sides are congruent.
- Diagonals bisect each other.
- Opposite angles are congruent.
- Consecutive angles are supplementary.

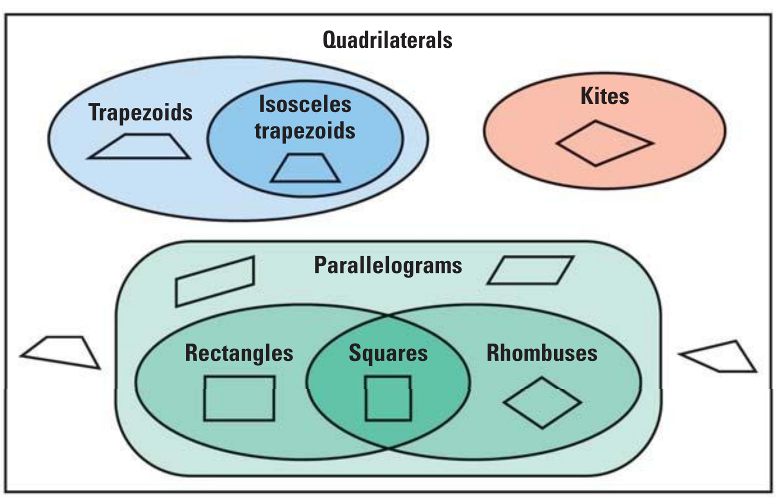
**Ways to show that a quadrilateral is a parallelogram:**

- Show both pairs of opposite sides are parallel.
- Show both pairs of opposite sides or opposite angles are congruent.
- Show one pair of opposite sides are congruent and parallel.
- Show the diagonals bisect each other.

Big Idea 3

### Classifying Quadrilaterals by Their Properties

Special quadrilaterals can be classified by their properties. In a parallelogram, both pairs of opposite sides are parallel. In a trapezoid, only one pair of sides are parallel. A kite has two pairs of consecutive congruent sides, but opposite sides are not congruent.



# 8 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.

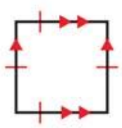
- diagonal, *p. 507*
- parallelogram, *p. 515*
- rhombus, *p. 533*
- rectangle, *p. 533*
- square, *p. 533*
- trapezoid, *p. 542*
- bases of a trapezoid, *p. 542*
- base angles of a trapezoid, *p. 542*
- legs of a trapezoid, *p. 542*
- isosceles trapezoid, *p. 543*
- midsegment of a trapezoid, *p. 544*
- kite, *p. 545*

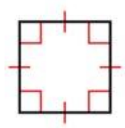
### VOCABULARY EXERCISES

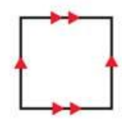
**In Exercises 1 and 2, copy and complete the statement.**

1. The _?_ of a trapezoid is parallel to the bases.
2. A(n) _?_ of a polygon is a segment whose endpoints are nonconsecutive vertices.
3. **WRITING** *Describe* the different ways you can show that a trapezoid is an isosceles trapezoid.

**In Exercises 4–6, match the figure with the most specific name.**

**4.** 

**5.** 

**6.** 

**A.** Square **B.** Parallelogram **C.** Rhombus

## 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 8.

### 8.1 Find Angle Measures in Polygons *pp. 507–513*

**EXAMPLE**

**The sum of the measures of the interior angles of a convex regular polygon is 1080°. Classify the polygon by the number of sides. What is the measure of each interior angle?**

Write and solve an equation for the number of sides $n$.

$(n - 2) \cdot 180° = 1080°$ **Polygon Interior Angles Theorem**

$n = 8$ **Solve for *n*.**

The polygon has 8 sides, so it is an octagon.

A regular octagon has 8 congruent interior angles, so divide to find the measure of each angle: $1080° \div 8 = 135°$. The measure of each interior angle is 135°.

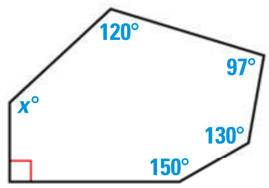
## EXERCISES

**EXAMPLES 2, 3, 4, and 5** on pp. 508–510 for Exs. 7–11

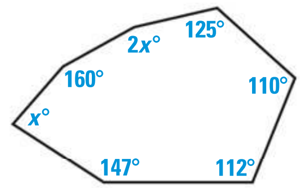
**7.** The sum of the measures of the interior angles of a convex regular polygon is 3960°. Classify the polygon by the number of sides. What is the measure of each interior angle?

**In Exercises 8–10, find the value of *x*.**

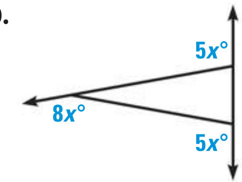
**8.**




**9.**




**10.**



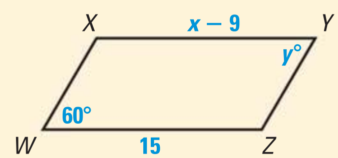

**11.** In a regular nonagon, the exterior angles are all congruent. What is the measure of one of the exterior angles? *Explain.*

## 8.2 Use Properties of Parallelograms

*pp. 515–521*

### EXAMPLE

**Quadrilateral *WXYZ* is a parallelogram. Find the values of *x* and *y*.**




To find the value of *x*, apply Theorem 8.3.

| | |
|---|---|
| $XY = WZ$ | **Opposite sides of a ▱ are ≅.** |
| $x - 9 = 15$ | **Substitute.** |
| $x = 24$ | **Add 9 to each side.** |

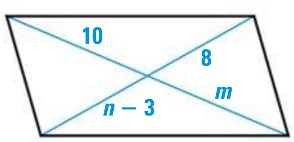
By Theorem 8.4, $\angle W \cong \angle Y$, or $m\angle W = m\angle Y$. So, $y = 60$.

## EXERCISES

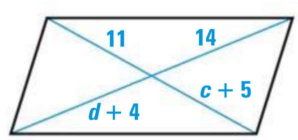
**EXAMPLES 1, 2, and 3** on pp. 515, 517 for Exs. 12–17

**Find the value of each variable in the parallelogram.**

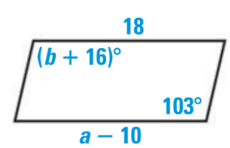
**12.**




**13.**




**14.**




**15.** In ▱*PQRS*, $PQ = 5$ centimeters, $QR = 10$ centimeters, and $m\angle PQR = 36°$. Sketch *PQRS*. Find and label all of its side lengths and interior angle measures.

**16.** The perimeter of ▱*EFGH* is 16 inches. If *EF* is 5 inches, find the lengths of all the other sides of *EFGH*. *Explain* your reasoning.

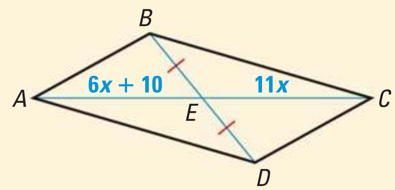
**17.** In ▱*JKLM*, the ratio of the measure of $\angle J$ to the measure of $\angle M$ is 5 : 4. Find $m\angle J$ and $m\angle M$. *Explain* your reasoning.

# 8 CHAPTER REVIEW

## 8.3 Show that a Quadrilateral is a Parallelogram *pp. 522–529*

**EXAMPLE**

**For what value of $x$ is quadrilateral *ABCD* a parallelogram?**




If the diagonals bisect each other, then *ABCD* is a parallelogram. The diagram shows that $\overline{BE} \cong \overline{DE}$. You need to find the value of $x$ that makes $\overline{AE} \cong \overline{CE}$.

$AE = CE$ **Set the segment lengths equal.**

$6x + 10 = 11x$ **Substitute expressions for the lengths.**

$x = 2$ **Solve for $x$.**

When $x = 2$, $AE = 6(2) + 10 = 22$ and $CE = 11(2) = 22$. So, $\overline{AE} \cong \overline{CE}$.

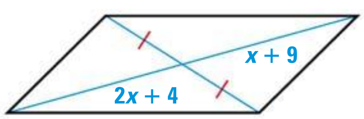
Quadrilateral *ABCD* is a parallelogram when $x = 2$.

### EXERCISES

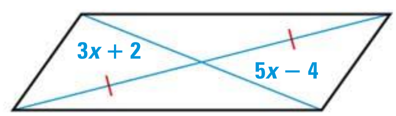
**EXAMPLE 3** on p. 524 for Exs. 18–19

**For what value of $x$ is the quadrilateral a parallelogram?**

**18.**



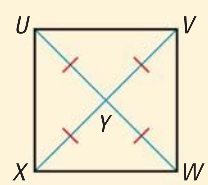

**19.**




## 8.4 Properties of Rhombuses, Rectangles, and Squares *pp. 533–540*

**EXAMPLE**

**Classify the special quadrilateral.**



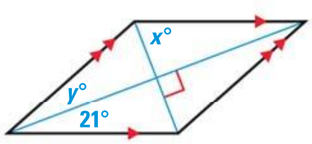

In quadrilateral *UVWX*, the diagonals bisect each other. So, *UVWX* is a parallelogram. Also, $\overline{UY} \cong \overline{VY} \cong \overline{WY} \cong \overline{XY}$. So, $UY + YW = VY + XY$. Because $UY + YW = UW$, and $VY + XY = VX$, you can conclude that $\overline{UW} \cong \overline{VX}$. By Theorem 8.13, *UVWX* is a rectangle.

### EXERCISES

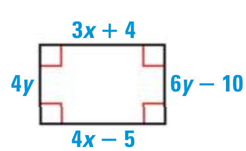
**EXAMPLES 2 and 3** on pp. 534–535 for Exs. 20–22

**Classify the special quadrilateral. Then find the values of $x$ and $y$.**

**20.**




**21.**




**22.** The diagonals of a rhombus are 10 centimeters and 24 centimeters. Find the length of a side. *Explain.*

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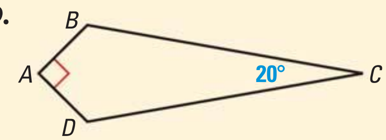
Chapter Review Practice

## 8.5 Use Properties of Trapezoids and Kites *pp. 542–549*

**EXAMPLE**

**Quadrilateral *ABCD* is a kite. Find $m\angle B$ and $m\angle D$.**




A kite has exactly one pair of congruent opposite angles. Because $\angle A \ncong \angle C$, $\angle B$ and $\angle D$ must be congruent. Write and solve an equation.

$90° + 20° + m\angle B + m\angle D = 360°$ **Corollary to Theorem 8.1**

$110° + m\angle B° + m\angle D = 360°$ **Combine like terms.**

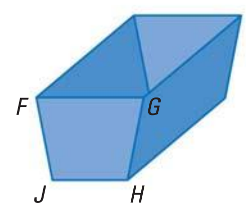
$m\angle B + m\angle D = 250°$ **Subtract 110° from each side.**

Because $\angle B \cong \angle D$, you can substitute $m\angle B$ for $m\angle D$ in the last equation. Then $m\angle B + m\angle B = 250°$, and $m\angle B = m\angle D = 125°$.

### EXERCISES


**EXAMPLES 2 and 3** on pp. 543–544 for Exs. 20–22


**In Exercises 23 and 24, use the diagram of a recycling container. One end of the container is an isosceles trapezoid with $\overline{FG} \parallel \overline{JH}$ and $m\angle F = 79°$.**



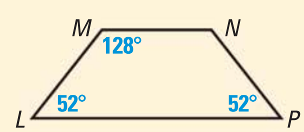

**23.** Find $m\angle G$, $m\angle H$, and $m\angle J$.

**24.** Copy trapezoid *FGHJ* and sketch its midsegment. If the midsegment is 16.5 inches long and $\overline{FG}$ is 19 inches long, find *JH*.

## 8.6 Identify Special Quadrilaterals *pp. 552–557*

**EXAMPLE**

**Give the most specific name for quadrilateral *LMNP*.**




In *LMNP*, $\angle L$ and $\angle M$ are supplementary, but $\angle L$ and $\angle P$ are not. So, $\overline{MN} \parallel \overline{LP}$, but $\overline{LM}$ is not parallel to $\overline{NP}$. By definition, *LMNP* is a trapezoid.

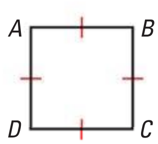
Also, $\angle L$ and $\angle P$ are a pair of base angles and $\angle L \cong \angle P$. So, *LMNP* is an isosceles trapezoid by Theorem 8.15.

### EXERCISES

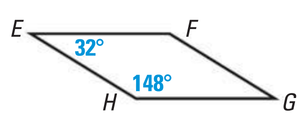

**EXAMPLE 2** on p. 553 for Exs. 25–28


**Give the most specific name for the quadrilateral. *Explain* your reasoning.**

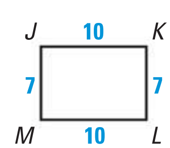
**25.**




**26.**




**27.**




**28.** In quadrilateral *RSTU*, $\angle R$, $\angle T$, and $\angle U$ are right angles, and $RS = ST$. What is the most specific name for quadrilateral *RSTU*? *Explain.*