

## Chapter 6: Things To Know

### Section 6.1 Polygons

<p><b>Objectives</b></p> <ol style="list-style-type: none"> <li>1. Define and Name Polygons.</li> <li>2. Find the Sum of the Measures of the Interior Angles of a Quadrilateral.</li> </ol>	<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• polygon</li> <li>• vertex</li> <li>• n-gon</li> <li>• concave polygon</li> <li>• convex polygon</li> <li>• quadrilateral</li> <li>• regular polygon</li> <li>• diagonal</li> <li>• equilateral polygon</li> <li>• equiangular polygon</li> </ul>
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**Polygon Definition**

A figure is a polygon if it meets the following three conditions:

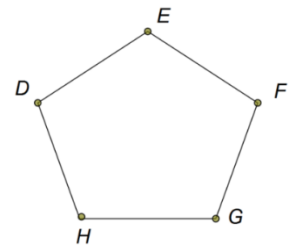
- 1.
- 2.
- 3.

The endpoints of the sides of a polygon are called the \_\_\_\_\_ (Singular form: \_\_\_\_\_).

Polygons must be named by listing all of the vertices *in order*.

Write two different ways of naming the polygon to the right below:

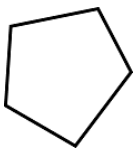
\_\_\_\_\_ , \_\_\_\_\_



**Example Identifying Polygons**

Identify the polygons. If not a polygon, state why.

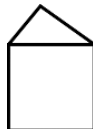
a.



b.



c.



d.



e.

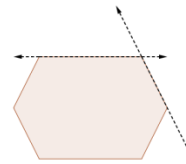


Number of Sides	Name of Polygon
3	
4	
5	
6	
7	
8	
9	
10	
12	
$n$	

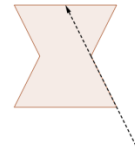
**Definitions**

In general, a polygon with  $n$  sides is called an \_\_\_\_\_.

A polygon is \_\_\_\_\_ if no line containing a side contains a point within the interior of the polygon.

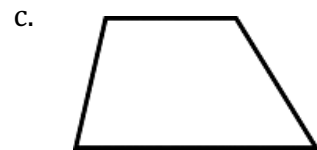
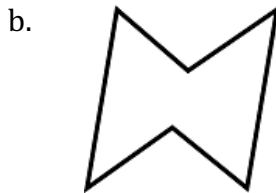
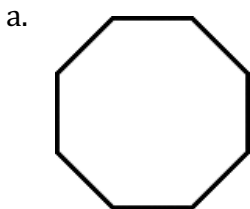


Otherwise, a polygon is \_\_\_\_\_.



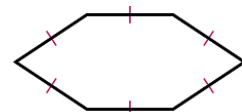
**Example** Identifying Convex and Concave Polygons.

Identify the polygons. If not a polygon, state why.

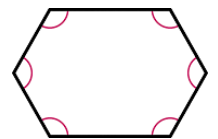


**Definition**

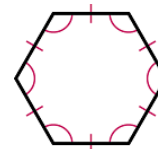
An \_\_\_\_\_ is a polygon with all sides congruent.



An \_\_\_\_\_ is a polygon with all angles congruent.

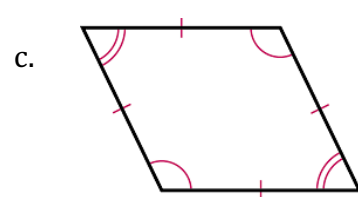
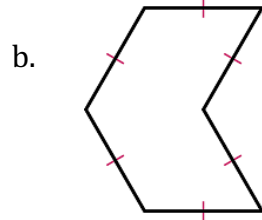
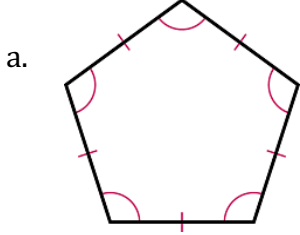


A \_\_\_\_\_ is a polygon that is both equilateral and equiangular.



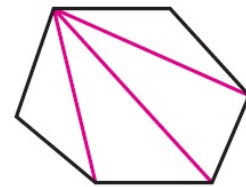
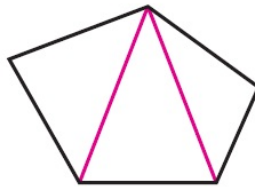
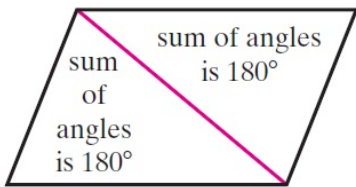
**Example** Identifying Regular Polygons

Determine if each polygon is regular or not. Explain your reasoning.



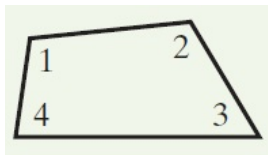
**Definition**

A segment joining to nonconsecutive vertices of a convex polygon is called a \_\_\_\_\_ of the polygon.



**Theorem** Interior Angle Sum of a Convex Quadrilateral

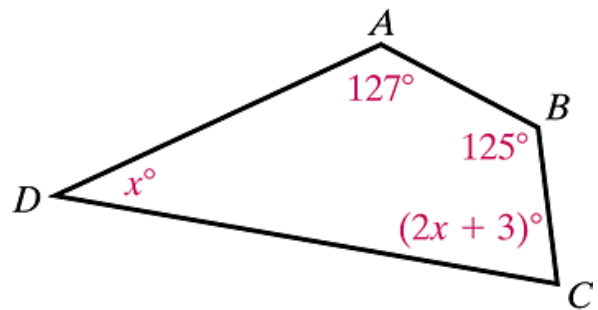
The sum of the measures of the interior angles of a convex quadrilateral is \_\_\_\_\_.



$$m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 = \underline{\hspace{2cm}}$$

**Example** Solve for x

Find x, and then the measures of angles C and D.



**Section 6.2 Parallelograms**

**Objectives**

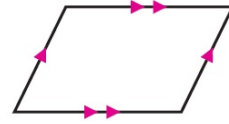
1. Use Relationships Among Sides and Angles of Parallelograms.
2. Use Relationships Among Consecutive Angles and Diagonals of Parallelograms.

**Vocabulary**

- parallelogram
- opposite sides
- opposite angles
- consecutive angles

**Definition**

A \_\_\_\_\_ is a quadrilateral with both pairs of opposite sides parallel.

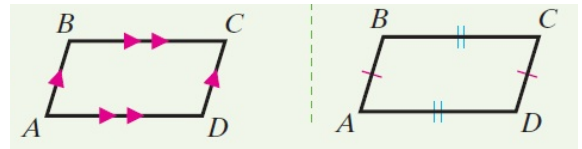


In a parallelogram \_\_\_\_\_ do not share a vertex, and \_\_\_\_\_ do not share a side.



**Theorem Opposite Sides of a Parallelogram**

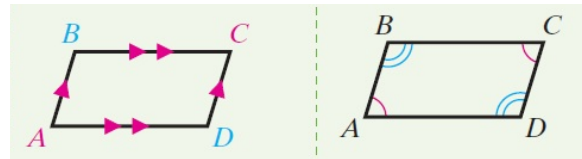
If...



Then...

**Theorem Opposite Angles of a Parallelogram**

If...

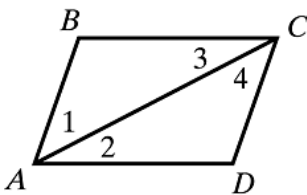


Then...

**Example Proof of the Opposite Sides Theorem**

**Given:**  $ABCD$

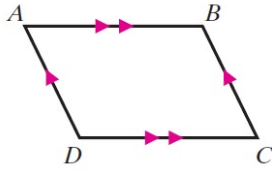
**Prove:**  $\overline{AB} \cong \overline{CD}$  and  $\overline{BC} \cong \overline{DA}$



Statements	Reasons
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.

**Definition**

Angles of a polygon that share a side are \_\_\_\_\_.



In the diagram,  $\angle A$  and  $\angle B$  are consecutive angles because they share side  $\overline{AB}$ .

**Theorem** Consecutive Angles of a Parallelogram

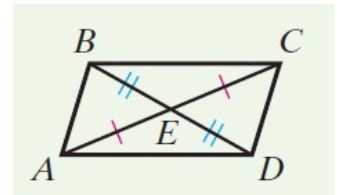
If...

Then...

**Theorem** Diagonals of a Parallelogram

If...

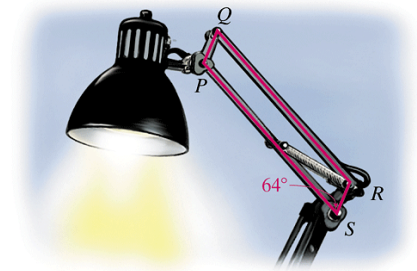
Then...



**Example** Using Consecutive Angles

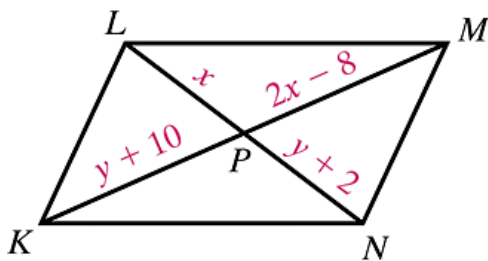
Multiple Choice: What is  $m\angle P$  in  $\square PQRS$ ?

- a.  $26^\circ$
- b.  $64^\circ$
- c.  $116^\circ$
- d.  $126^\circ$



**Example** Using Algebra to Find Lengths

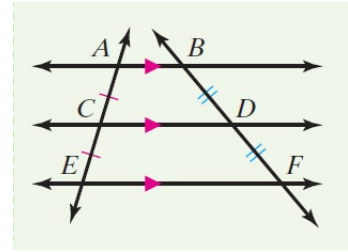
Solve a system of linear equations to find the values of  $x$  and  $y$  in  $\square KLMN$ . What are  $KM$  and  $LN$ ?



**Theorem** Multiple Parallel Lines and Transversals

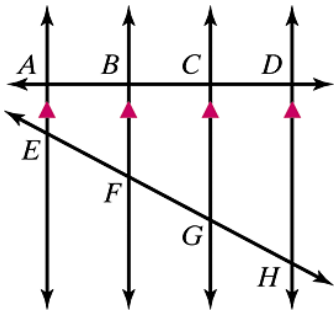
If...

Then...



**Example** Using Parallel Lines and Transversals

In the figure,  $AE \parallel BF \parallel CG \parallel DH$ ,  $AB = BC = CD = 2$  and  $EF = 25$ . What is  $EH$ ?



**Section 6.3 Proving that a Quadrilateral is a Parallelogram**

**Objectives**

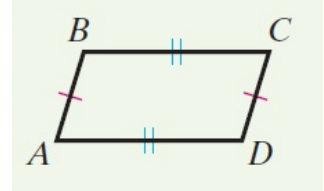
1. Determine Whether a Quadrilateral is a Parallelogram.
2. Use Coordinate Geometry with Parallelograms.

**Vocabulary**

- No new vocabulary

**Theorem** Converse of Opposite Sides Theorem

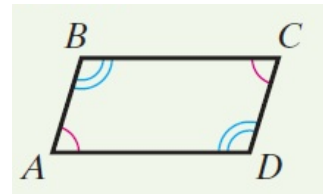
If...



Then...

**Theorem** Converse of Opposite Angles Theorem

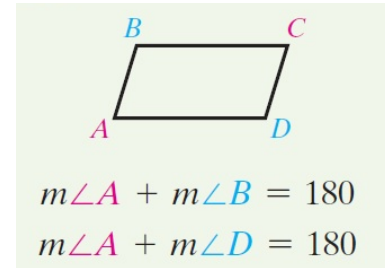
If...



Then...

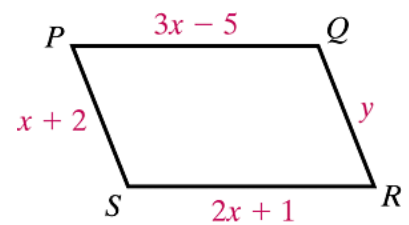
**Theorem** Converse of Consecutive Angles Theorem

If...



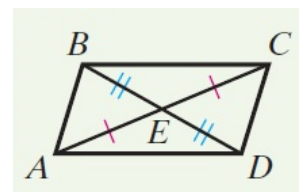
Then...

**Example** Finding Values of Variables in Parallelogram  
For what value of  $y$  must  $PQRS$  be a parallelogram?



**Theorem** Converse of the Diagonals Theorem

If...

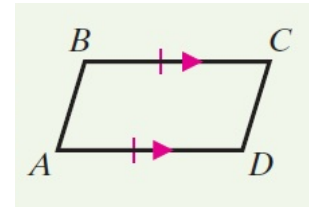


Then...

**Theorem** Quadrilateral as a Parallelogram

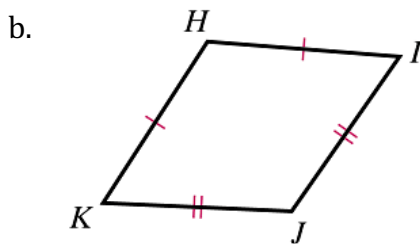
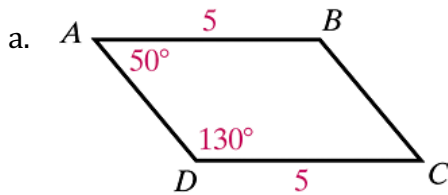
If...

Then...



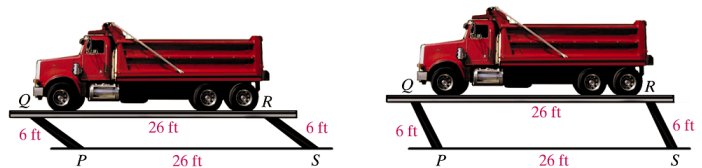
**Example** Deciding Whether a Quadrilateral is a Parallelogram

Can you prove that the quadrilateral is a parallelogram based on the given information? Explain why or why not.



**Example** Identifying Parallelograms

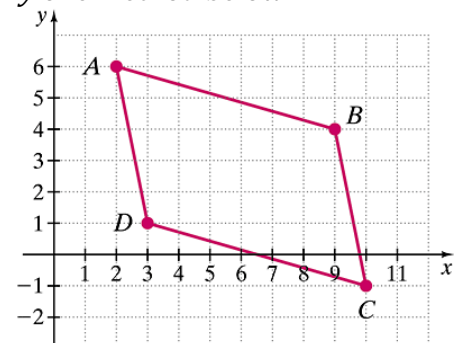
A truck sits on the platform of a vehicle lift. Two moving arms raise the platform until a mechanic can fit underneath. Why will the truck always remain parallel to the ground as it is lifted?



**Example** Showing that a Quadrilateral is a Parallelogram

Show that a quadrilateral with vertices  $A(2,6)$ ,  $B(9,4)$ ,  $C(10,-1)$ , and  $D(3,1)$  is a parallelogram.

Read all three solution methods and choose your favorite. Take notes on only one method below.



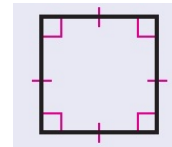
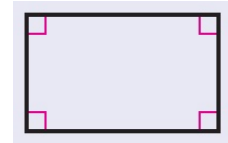
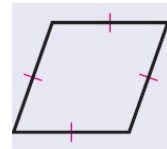


**Section 6.4 Rhombuses, Rectangles, and Squares**

<p><b>Objectives</b></p> <ol style="list-style-type: none"> <li>1. Define and Classify Special Types of Parallelograms.</li> <li>2. Use Properties of Diagonals of Rhombuses, Rectangles, and Squares.</li> <li>3. Use Properties of Diagonals to Form Rhombuses, Rectangles, and Squares.</li> </ol>	<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• rhombus</li> <li>• rectangle</li> <li>• square</li> </ul>
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**Special Parallelograms**

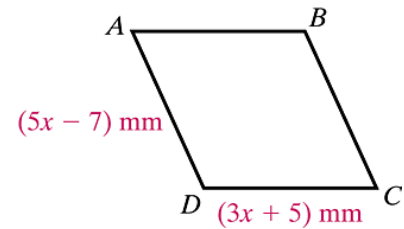
- A \_\_\_\_\_ is a parallelogram with four congruent sides.
- A \_\_\_\_\_ is a parallelogram with four right angles.
- A \_\_\_\_\_ is a parallelogram with four congruent sides and four right angles.



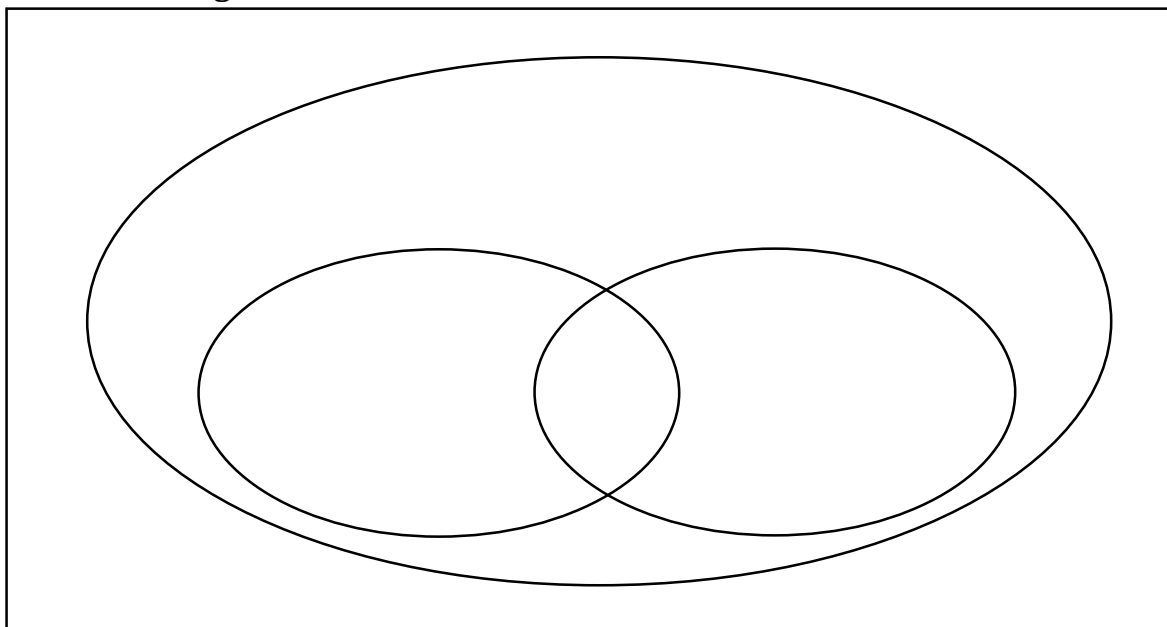
**Example Using Properties of Special Parallelograms**

The figure shown is a rhombus.

- a. Find the value of  $x$ .
- b. Find the measure of each side.



**Quadrilaterals Venn Diagram**



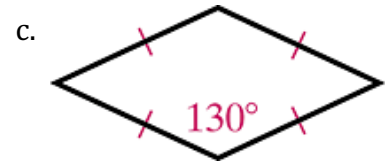
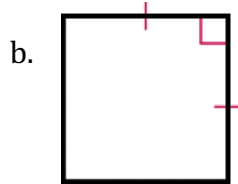
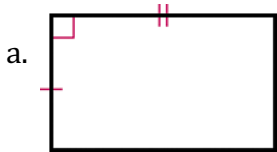
**Theorem** Quadrilaterals Biconditionals

A quadrilateral is a parallelogram if and only if...

- 
- 
- 
- 

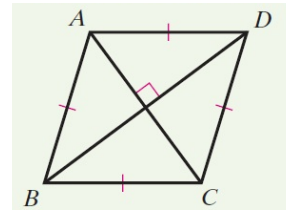
**Example** Identifying Special Parallelograms

Identify each parallelogram as a rhombus, a rectangle, or a square. Be as precise as possible.



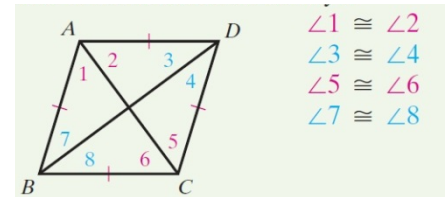
**Theorem** Rhombus Diagonal/Perpendicular Theorem

A parallelogram is a rhombus if and only if...



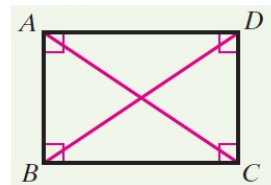
**Theorem** Rhombus Diagonals

A parallelogram is a rhombus if and only if...



**Theorem** Rectangle Diagonals

A parallelogram is a rhombus if and only if...

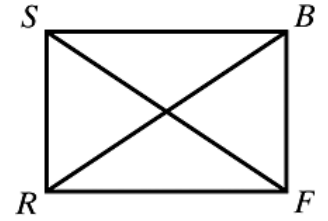


**Example** Finding Diagonal Length

Multiple Choice: In rectangle  $RSBF$ ,  $SF = 2x + 15$  and  $RB = 5x - 12$ .

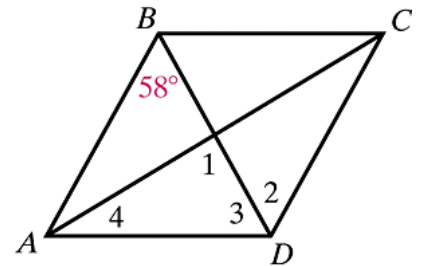
What is the length of the diagonal?

- a. 1
- b. 9
- c. 18
- d. 33



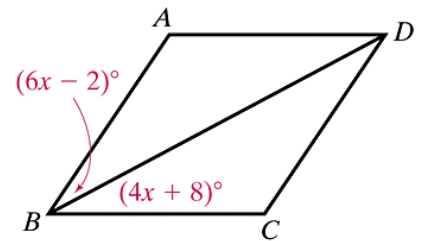
**Example** Finding Angle Measures

What are the measures of the numbered angles in rhombus  $ABCD$ ?



**Example** Using Properties of Special Parallelograms

For what value of  $x$  is  $\square ABCD$  a rhombus?



**Section 6.5 Trapezoids and Kites**

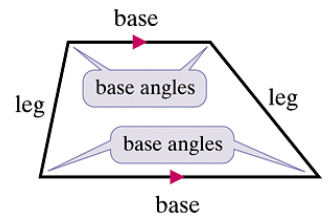
<p><b>Objectives</b></p> <ol style="list-style-type: none"> <li>1. Use Properties of Trapezoids.</li> <li>2. Use Properties of Kites.</li> </ol>	<p><b>Vocabulary</b></p> <ul style="list-style-type: none"> <li>• trapezoid</li> <li>• base</li> <li>• leg</li> <li>• base angle</li> <li>• isosceles trapezoid</li> <li>• midsegment of a trapezoid</li> <li>• kite</li> </ul>
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**Special Quadrilaterals**

A \_\_\_\_\_ is a quadrilateral with exactly one pair of parallel sides.

The parallel sides of a trapezoid are called \_\_\_\_\_.

The nonparallel sides are called \_\_\_\_\_.



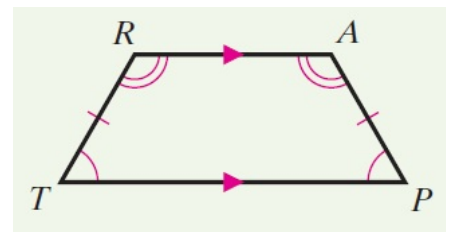
The two angles that share a base of a trapezoid are called \_\_\_\_\_.  
 A trapezoid has two pairs of base angles.

An \_\_\_\_\_ is a trapezoid with legs that are congruent.

**Theorem Base Angles of an Isosceles Trapezoid**

If...

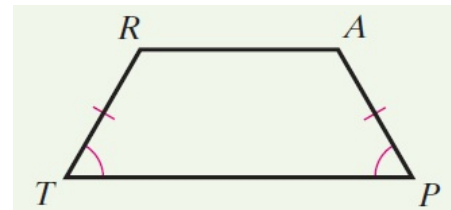
Then...



**Theorem Isosceles Trapezoid**

If...

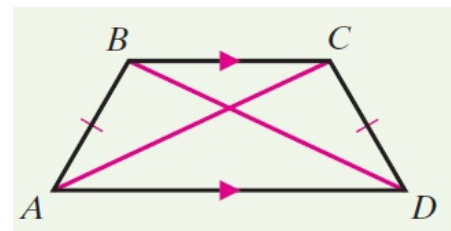
Then...



**Theorem Diagonals of an Isosceles Trapezoid**

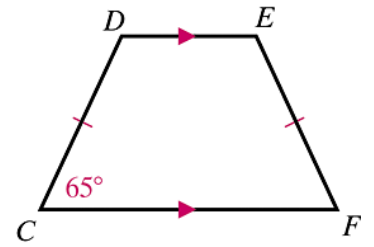
A trapezoid is isosceles if and only if...

\_\_\_\_\_



**Example** Finding Angle Measures in Trapezoids

$CDEF$  is an isosceles trapezoid. Calculate  $m\angle D$ ,  $m\angle E$ , and  $m\angle F$ .



**Theorem** Trapezoid Midsegments

The midsegment of a trapezoid is \_\_\_\_\_.

If a quadrilateral is a trapezoid, then...

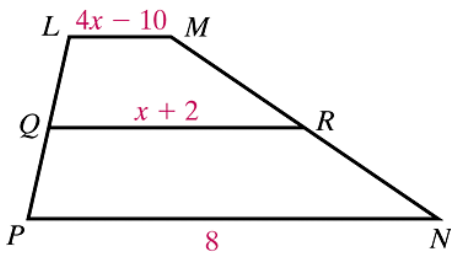
(1)

(2)

(1)  $\overline{MN} \parallel \overline{TP}$ ,  $\overline{MN} \parallel \overline{RA}$ , and  
 (2)  $MN = \frac{1}{2}(TP + RA)$

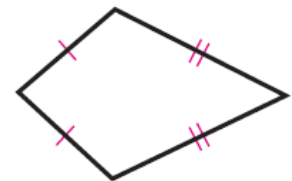
**Example** Using the Midsegment of a Trapezoid

Segment  $QR$  is the midsegment of trapezoid  $LMNP$ . What is  $x$ ?



**Special Quadrilaterals**

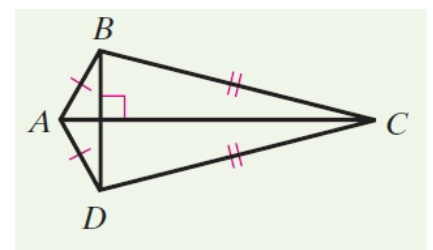
A \_\_\_\_\_ is a quadrilateral with two pairs of consecutive sides congruent and no opposite sides congruent.



**Theorem** Diagonals of a Kite

If...

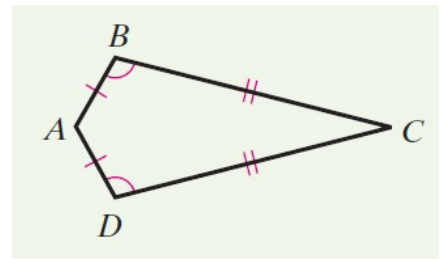
Then...



**Theorem** Opposite Angles of a Kite

If...

Then...



**Example** Finding Angle Measures in Kites

Quadrilateral  $DEFG$  is a kite. What are  $m\angle 1$ ,  $m\angle 2$ , and  $m\angle 3$ ?

