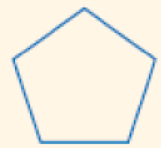
CHAPTER 6 QUADRILATERALS

Theorem 6.1 Interior Angle Sum Theorem

If a convex polygon has n sides and S is the sum of the measures of its interior angles, then $S = 180(n - 2)$.

Example:

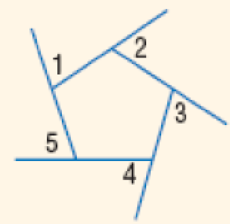


$n = 5$
$S = 180(n - 2)$
$= 180(5 - 2)$ or 540

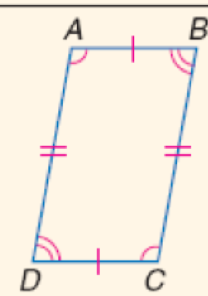
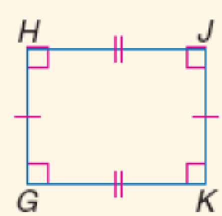
Theorem 6.2 Exterior Angle Sum Theorem

If a polygon is convex, then the sum of the measures of the exterior angles, one at each vertex, is 360.

Example: $m\angle 1 + m\angle 2 + m\angle 3 + m\angle 4 + m\angle 5 = 360$



Theorems 6.3 - 6.6

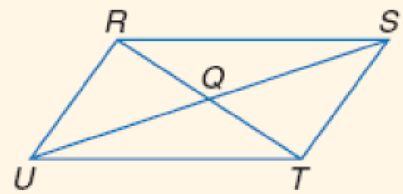
		Examples	
6.3	Opposite sides of a parallelogram are congruent. **Abbreviation:** *Opp. sides of ▱ are ≅.*	$\overline{AB} \cong \overline{DC}$ $\overline{AD} \cong \overline{BC}$	
6.4	Opposite angles in a parallelogram are congruent. **Abbreviation:** *Opp ∡ of ▱ are ≅.*	$\angle A \cong \angle C$ $\angle B \cong \angle D$	
6.5	Consecutive angles in a parallelogram are supplementary. **Abbreviation:** *Cons. ∡ in ▱ are suppl.*	$m\angle A + m\angle B = 180$ $m\angle B + m\angle C = 180$ $m\angle C + m\angle D = 180$ $m\angle D + m\angle A = 180$	
6.6	If a parallelogram has one right angle, it has four right angles. **Abbreviation:** *If ▱ has 1 rt. ∠, it has 4 rt. ∡.*	$m\angle G = 90$ $m\angle H = 90$ $m\angle J = 90$ $m\angle K = 90$	

Theorem 6.7

The diagonals of a parallelogram bisect each other.

Abbreviation: *Diag. of ▱ bisect each other.*

Example: $\overline{RQ} \cong \overline{QT}$ and $\overline{SQ} \cong \overline{QU}$

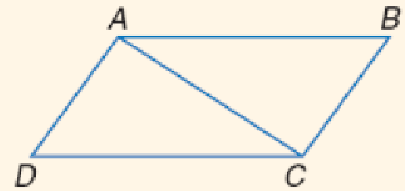


Theorem 6.8

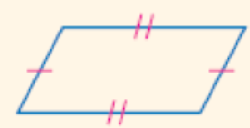
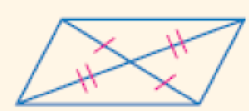
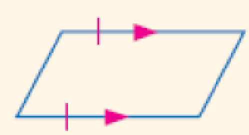
Each diagonal of a parallelogram separates the parallelogram into two congruent triangles.

Abbreviation: *Diag. separates ▱ into 2 $\cong$ $\triangle$s.*

Example: $\triangle ACD \cong \triangle CAB$



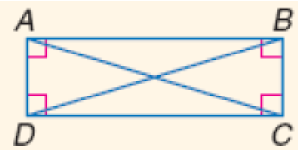
Theorems 6.9 – 6.12 Proving Parallelograms

6.9	If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram. **Abbreviation:** *If both pairs of opp. sides are $\cong$, then quad. is ▱.*	
6.10	If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram. **Abbreviation:** *If both pairs of opp. $\angle$s are $\cong$, then quad. is ▱.*	
6.11	If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram. **Abbreviation:** *If diag. bisect each other, then quad. is ▱.*	
6.12	If one pair of opposite sides of a quadrilateral is both parallel and congruent, then the quadrilateral is a parallelogram. **Abbreviation:** *If one pair of opp. sides is $\parallel$ and $\cong$, then the quad. is a ▱.*	

Theorem 6.13

If a parallelogram is a rectangle, then the diagonals are congruent.

Abbreviation: *If ▱ is rectangle, diag. are ≅.*

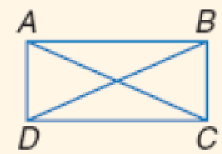


$\overline{AC} \cong \overline{BD}$

Theorem 6.14

If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.

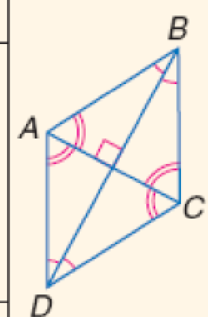
Abbreviation: *If diagonals of ▱ are ≅, ▱* is a rectangle.



$\overline{AC} \cong \overline{BD}$

Theorems 6.15 – 6.17 Rhombus

		Examples
6.15	The diagonals of a rhombus are perpendicular.	$\overline{AC} \perp \overline{BD}$
6.16	If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus. (Converse of Theorem 6.15)	If $\overline{BD} \perp \overline{AC}$ then ▱*ABCD* is a rhombus.
6.17	Each diagonal of a rhombus bisects a pair of opposite angles.	$\angle DAC \cong \angle BAC \cong \angle DCA \cong \angle BCA$ $\angle ABD \cong \angle CBD \cong \angle ADB \cong \angle CDB$



Theorem 6.18 and 6.19 Isosceles Trapezoid

6.18 Each pair of base angles of an isosceles trapezoid are congruent.

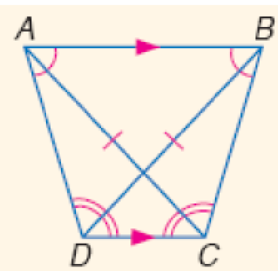
6.19 The diagonals of an isosceles trapezoid are congruent.

Example:

$\angle DAB \cong \angle CBA$

$\angle ADC \cong \angle BCD$

$\overline{AC} \cong \overline{BD}$



Theorem 6.20

The median of a trapezoid is parallel to the bases, and its measure is one-half the sum of the measures of the bases.

Example: $EF = \frac{1}{2}(AB + DC)$