

# 6-6

## Trapezoids and Kites

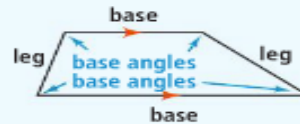


### Content Standard

**G.SRT.5** Use congruence . . . criteria to solve problems and prove relationships in geometric figures.

**Objective** To verify and use properties of trapezoids and kites

A **trapezoid** is a quadrilateral with exactly one pair of parallel sides. The parallel sides of a trapezoid are called **bases**. The nonparallel sides are called **legs**. The two angles that share a base of a trapezoid are called **base angles**. A trapezoid has two pairs of base angles.



An **isosceles trapezoid** is a trapezoid with legs that are congruent.  $ABCD$  at the right is an isosceles trapezoid. The angles of an isosceles trapezoid have some unique properties.



Take note

### Theorem 6-19

#### Theorem

If a quadrilateral is an **isosceles trapezoid**, then each pair of base angles is congruent.

#### If . . .

$TRAP$  is an isosceles trapezoid with bases  $\overline{RA}$  and  $\overline{TP}$

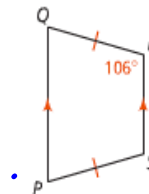


#### Then . . .

$\angle T \cong \angle P$ ,  $\angle R \cong \angle A$

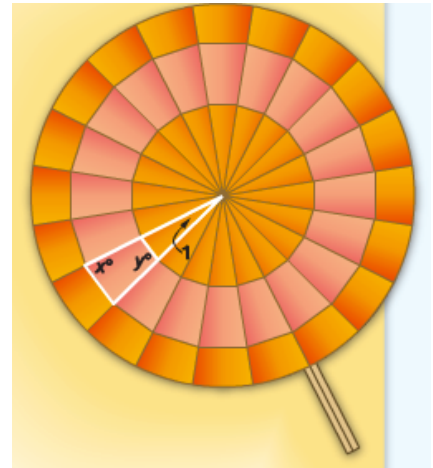


**Got It?** 1. a. In the diagram,  $PQRS$  is an isosceles trapezoid and  $m\angle R = 106$ . What are  $m\angle P$ ,  $m\angle Q$ , and  $m\angle S$ ?





**Got It?** 2. A fan like the one in Problem 2 has 15 angles meeting at the center. What are the measures of the base angles of the trapezoids in its second ring?



*fake note*

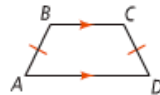
**Theorem 6-20**

**Theorem**

If a quadrilateral is an isosceles trapezoid, then its diagonals are congruent.

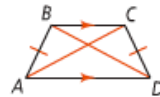
**If . . .**

$ABCD$  is an isosceles trapezoid



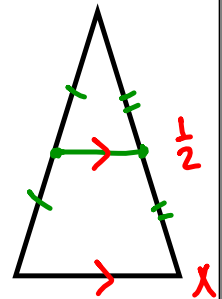
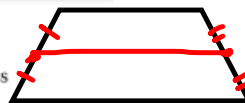
**Then . . .**

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



You will prove Theorem 6-20 in Exercise 54.

In Lesson 5-1, you learned about midsegments of triangles. Trapezoids also have midsegments. The **midsegment of a trapezoid** is the segment that joins the midpoints of its legs. The midsegment has two unique properties.



*fake note*

**Theorem 6-21 Trapezoid Midsegment Theorem**

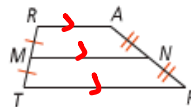
**Theorem**

If a quadrilateral is a trapezoid, then

- (1) the midsegment is parallel to the bases, and
- (2) the length of the midsegment is half the sum of the lengths of the bases.

**If . . .**

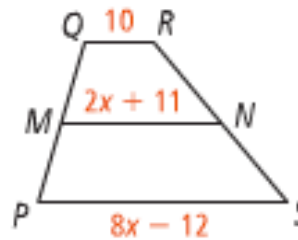
$TRAP$  is a trapezoid with midsegment  $\overline{MN}$



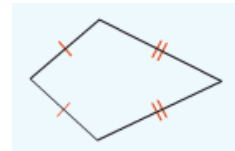
**Then . . .**

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

**Got It?** 3. a. Algebra  $\overline{MN}$  is the midsegment of trapezoid  $PQRS$ . What is  $x$ ? What is  $MN$ ?



A **kite** is a quadrilateral with two pairs of consecutive sides congruent and no opposite sides congruent.



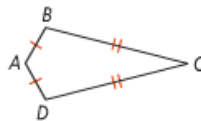
Take note

**Theorem 6-22**

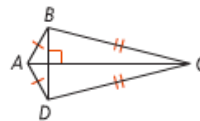
**Theorem**

If a quadrilateral is a kite, then its diagonals are perpendicular.

If ...  
 $ABCD$  is a kite



Then ...  
 $\overline{AC} \perp \overline{BD}$



**Got It?** 4. Quadrilateral  $KLMN$  is a kite. What are  $m\angle 1$ ,  $m\angle 2$ , and  $m\angle 3$ ?

