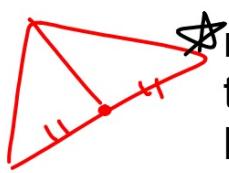


## Geometry 6.6

Apply properties of trapezoids

Apply properties of kites



★ median (of a triangle)

trapezoid

base(s)  $2 \parallel$  sides

leg(s)  $not \parallel$

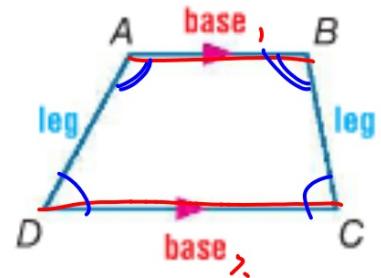
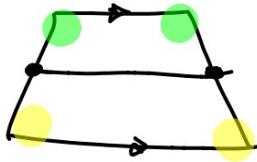
base angles (of a trapezoid)

isosceles trapezoid  $2 \cong$  legs

★ midsegment (of a trapezoid)

(sometimes called "median")

kite

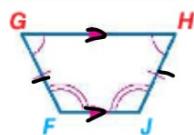


Little book: add trapezoid & kite

## Theorems Isosceles Trapezoids

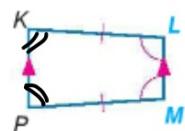
**6.21** If a trapezoid is isosceles, then each pair of base angles is congruent.

**Example** If trapezoid  $FGHJ$  is isosceles, then  $\angle G \cong \angle H$  and  $\angle F \cong \angle J$ .



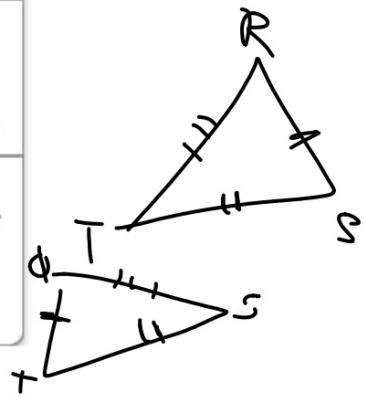
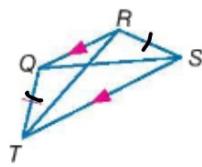
**6.22** If a trapezoid has one pair of congruent base angles, then it is an isosceles trapezoid.

**Example** If  $\angle L \cong \angle M$ , then trapezoid  $KLMP$  is isosceles.



**6.23** A trapezoid is isosceles if and only if its diagonals are congruent.

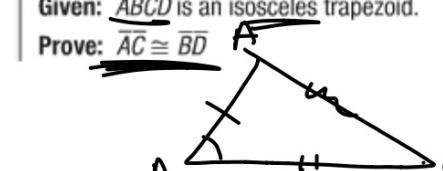
**Example** If trapezoid  $QRST$  is isosceles, then  $\overline{QS} \cong \overline{RT}$ . Likewise, if  $\overline{QS} \cong \overline{RT}$ , then trapezoid  $QRST$  is isosceles.



**Proof** Part of Theorem 6.23

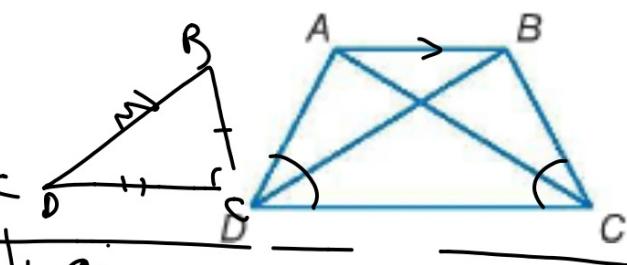
Given:  $ABCD$  is an isosceles trapezoid.

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



1.  $ABCD$  is isos. trap
2.  $\angle A D C \cong \angle B C D$
3.  $\triangle A D C \cong \triangle B C D$
4.  $\overline{AC} \cong \overline{BD}$

overlapping triangles



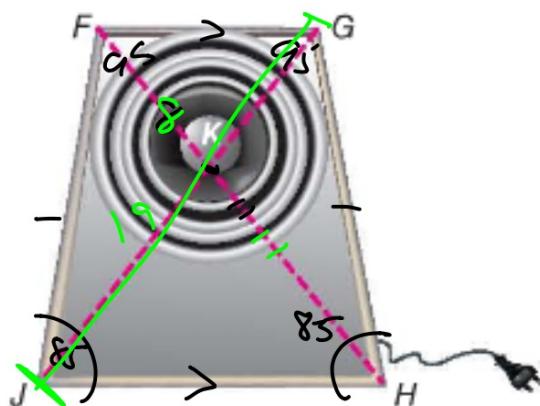
1. given
2. base  $\angle$ s isos trap  $\cong$
3.  $\triangle A S$
4. CPCTC

 **Real-World Example 1** Use Properties of Isosceles Trapezoids

**MUSIC** The speaker shown is an isosceles trapezoid. If  $m\angle FJH = 85$ ,  $FK = 8$  inches, and  $JG = 19$  inches, find each measure.

a.  $m\angle FGH$   $95^\circ$

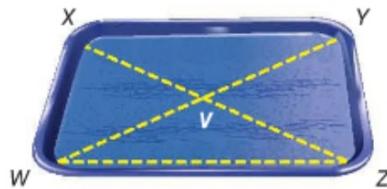
b.  $KH$   $11$



**Guided Practice**

1. **CAFETERIA TRAYS** To save space at a square table, cafeteria trays often incorporate trapezoids into their design. If  $WXYZ$  is an isosceles trapezoid and  $m\angle YZW = 45$ ,  $WV = 15$  centimeters, and  $VY = 10$  centimeters, find each measure.

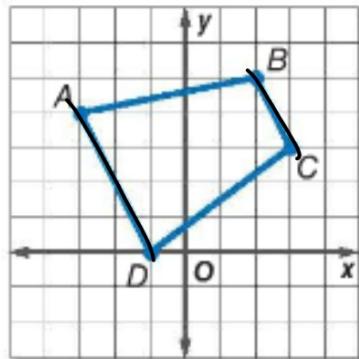
A.  $m\angle XWZ$       B.  $m\angle WXY$   
C.  $XZ$       D.  $XV$



### Example 2 Isosceles Trapezoids and Coordinate Geometry



**COORDINATE GEOMETRY** Quadrilateral  $ABCD$  has vertices  $A(-3, 4)$ ,  $B(2, 5)$ ,  $C(3, 3)$ , and  $D(-1, 0)$ . Show that  $ABCD$  is a trapezoid and determine whether it is an isosceles trapezoid.



reuel/Photographer's Choice/Getty Images

Arrange

What does it mean to be "1/2 the sum of..." ?

$$= \frac{1}{2} (a + b)$$

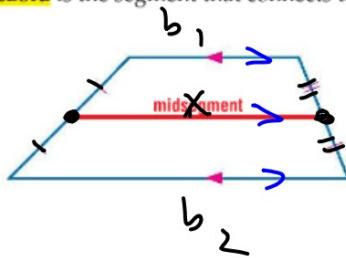
$$= \frac{a+b}{2}$$

**Reading Math**

**Midsegment** A midsegment of a trapezoid can also be called a *median*.

The **midsegment of a trapezoid** is the segment that connects the midpoints of the legs of the trapezoid.

$$= \frac{1}{2}(b_1 + b_2)$$



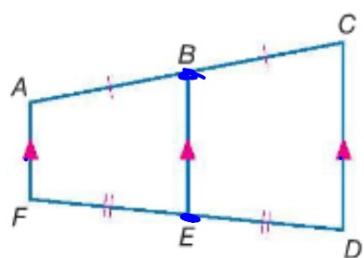
Doesn't have to be isosceles

P. 44)

### Theorem 6.24 Trapezoid Midsegment Theorem

The midsegment of a trapezoid is parallel to each base and its measure is one half the sum of the lengths of the bases.

**Example** If  $\overline{BE}$  is the midsegment of trapezoid  $ACDF$ , then  $\overline{AF} \parallel \overline{BE}$ ,  $\overline{CD} \parallel \overline{BE}$ , and  $BE = \frac{1}{2}(AF + CD)$ .



$$15 = \frac{1}{2}(x+18, 2)$$



### Standardized Test Example 3 Midsegment of a Trapezoid

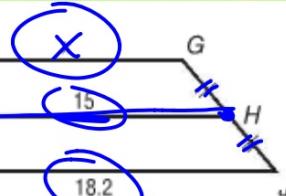
**GRIDDED RESPONSE** In the figure,  $\overline{LH}$  is the midsegment of trapezoid  $FGJK$ . What is the value of  $x$ ?

$$15 = \frac{1}{2}(x+18, 2)$$

$$15 = \frac{1}{2}x + 9.1$$

$$-9.1 \quad -9.1$$

$$\frac{2(5.9)}{11.8} = \left(\frac{1}{2}x\right) \cdot 2$$

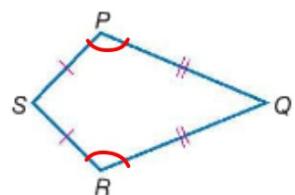
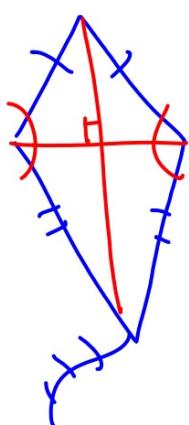


Note: The figure is not drawn to scale.

$$\frac{15 + 18 - 2}{2}$$

$$2(5.9) = \left(\frac{1}{2}x\right) \cdot 2$$

**2 Properties of Kites** A **kite** is a quadrilateral with exactly two pairs of consecutive congruent sides. Unlike a parallelogram, the opposite sides of a kite are not congruent or parallel.



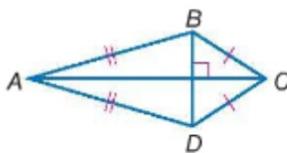
**StudyTip**

**Kites** The congruent angles of a kite are included by the non-congruent adjacent sides.

**Theorems** Kites

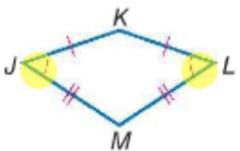
**6.25** If a quadrilateral is a kite, then its diagonals are perpendicular.

**Example** If quadrilateral  $ABCD$  is a kite, then  $\overline{AC} \perp \overline{BD}$ .



**6.26** If a quadrilateral is a kite, then exactly one pair of opposite angles is congruent.

**Example** If quadrilateral  $JKLM$  is a kite,  $\overline{JK} \cong \overline{KL}$ , and  $\overline{JM} \cong \overline{LM}$ , then  $\angle J \cong \angle L$  and  $\angle K \not\cong \angle M$ .

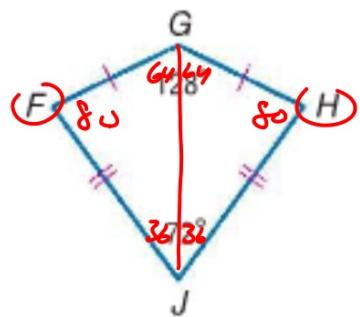


You will prove Theorems 6.25 and 6.26 in Exercises 31 and 32, respectively.

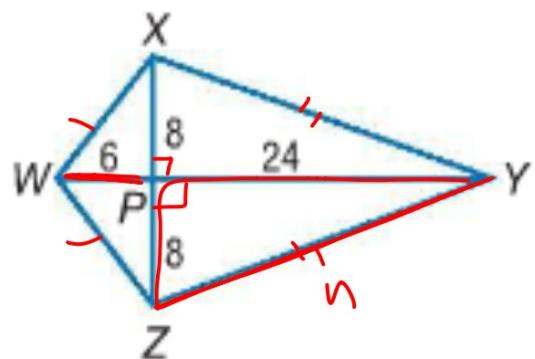
**Example 4** Use Properties of Kites

a. If  $FGHJ$  is a kite, find  $m\angle GFJ$ .

$$80^\circ \quad \frac{160}{2}$$



b. If  $WXYZ$  is a kite, find  $ZY$ .



$$\begin{aligned}8^2 + 24^2 &= n^2 \\64 + 576 &= n^2 \\640 &= n^2 \\25.3 &= n\end{aligned}$$

$$\frac{272}{2}$$

**Guided Practice**

4A. If  $m\angle BAD = 38$  and  $m\angle BCD = 50$ , find  $m\angle ADC$ .

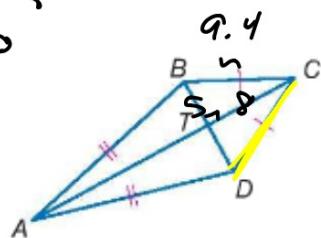
4B. If  $BT = 5$  and  $TC = 8$ , find  $CD$ .  $\approx 9.4$

$$5^2 + 8^2 = n^2$$

$$25 + 64 = n^2$$

$$89 = n^2$$

136°



Finish Little book: "Quadrilaterals"

{ parallelogram  
rectangle  
rhombus  
square  
Add:

6.6 p. 444

→ trapezoid  
→ kite

9-27 odd  
35-49 odd

74-77