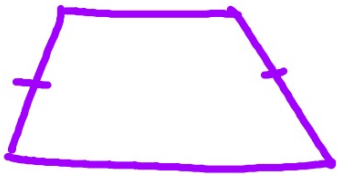
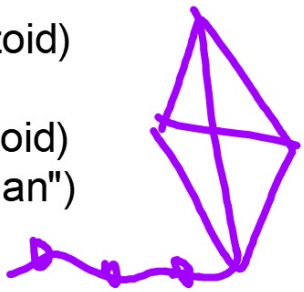
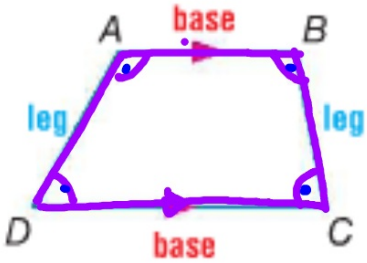
Geometry 6.6
Apply properties of trapezoids
Apply properties of kites

median (of a triangle)
trapezoid
base(s)
leg(s)
base angles (of a trapezoid)
isosceles trapezoid
midsegment (of a trapezoid)
(sometimes called "median")
kite





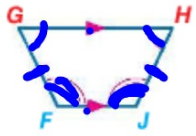


Little book: add trapezoid & kite

Theorems Isosceles Trapezoids

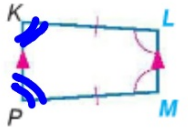
6.21 If a trapezoid is isosceles, then each pair of base angles is congruent.

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



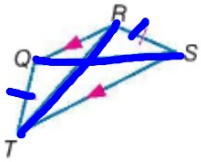
6.22 If a trapezoid has one pair of congruent base angles, then it is an isosceles trapezoid.

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.



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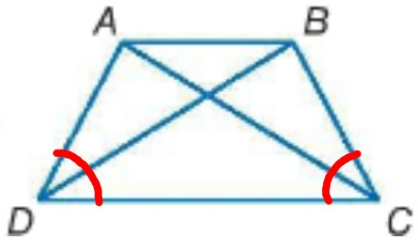
Proof Part of Theorem 6.23

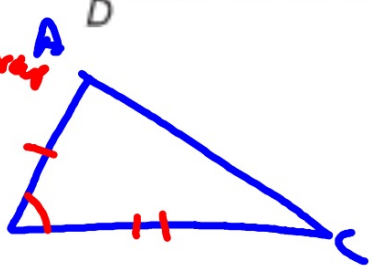
Given: $ABCD$ is an isosceles trapezoid.

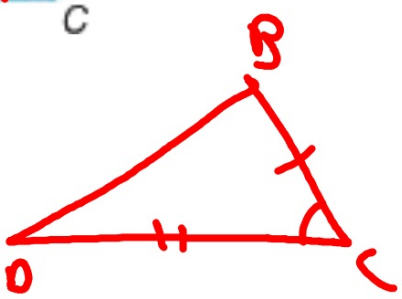
Prove: $\overline{AC} \cong \overline{BD}$

1. $ABCD$ isos. trap — 1. given
2. $\overline{AD} \cong \overline{BC}$ — 2. def isos. trap
3. $\angle D \cong \angle C$ — 3. def
4. $\overline{DC} \cong \overline{DC}$ — 4. refl
5. $\triangle ADC \cong \triangle BCD$ — 5. SAS
6. $\overline{AC} \cong \overline{BD}$ — 6. CPCTC

overlapping triangles





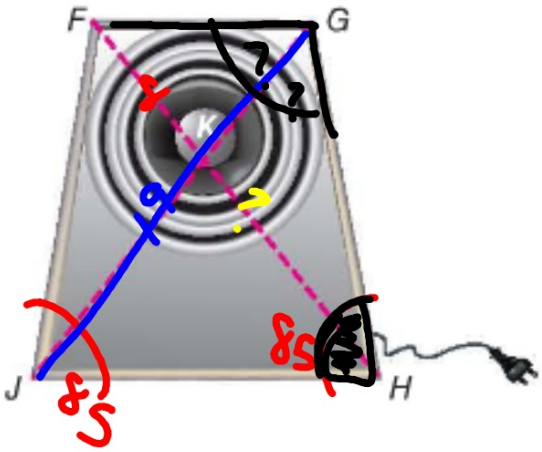


Real-World Example 1 Use Properties of Isos

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

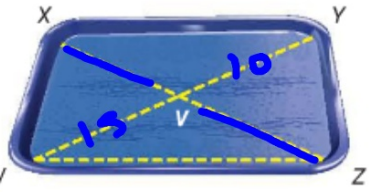
a. $m\angle FGH$

b. KH



GuidedPractice

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. $m\angle XWZ$ 45

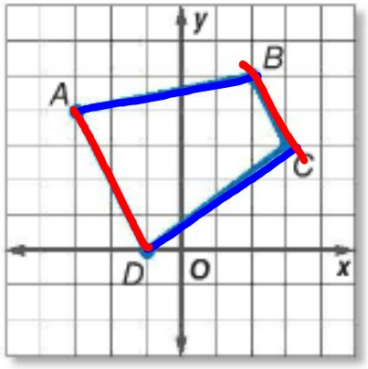
B. $m\angle WXY$ 135

C. XZ 25

D. XV 10

Example 2 Isosceles Trapezoids and Coordinate Geomerty

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

average

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

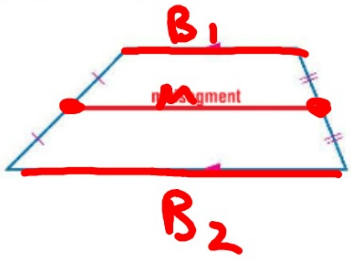
$\frac{1}{2}(22 + 18)$

$\frac{(\quad + \quad)}{2}$

ReadingMath

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.



// to bases

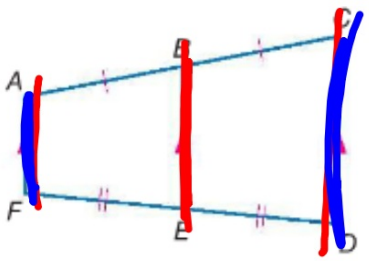
$M = \frac{1}{2}(B_1 + B_2)$

Doesn't have to be isosceles

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 $BE = \frac{1}{2}(AF + CD)$.



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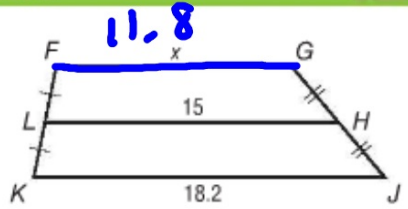
Standardized Test Example 3 Midsegment of a Trapezoid

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



Note: The figure is not drawn to scale.

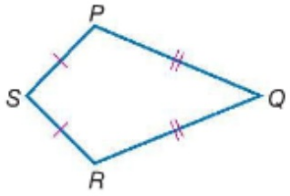
11.8

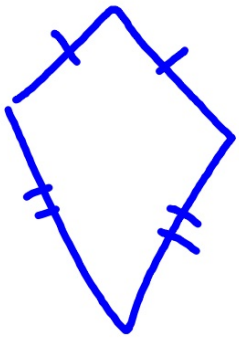
$15 = \frac{1}{2}(18.2 + x)$

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

$2 \cdot 5.9 = \frac{1}{2}x \cdot 2$

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.





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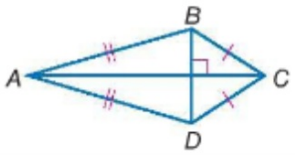
StudyTip

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

Theorems Kites

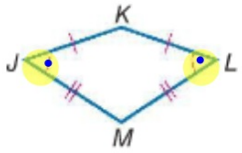
6.25 If a quadrilateral is a kite, then its diagonals are perpendicular.

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.

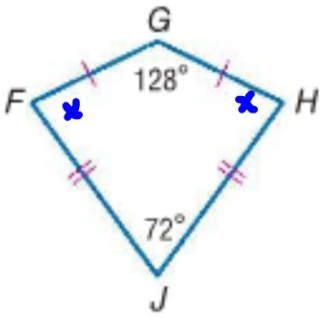
Example If quadrilateral *JKLM* is a kite, $\overline{JK} \cong \overline{KL}$, and $\overline{JM} \cong \overline{LM}$, then $\angle J \cong \angle L$ and $\angle K \ncong \angle M$.



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 $m\angle GFJ$. $= 80°$



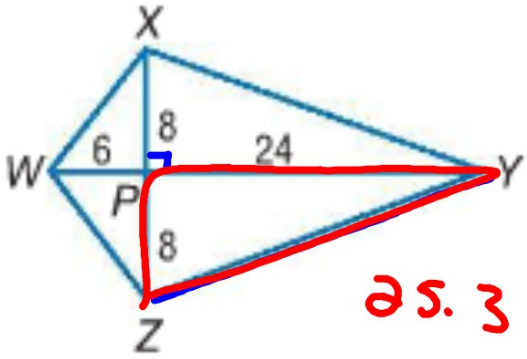
$128 + 72 + 2x = 360$

$2x = 160$

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

$8^2+24^2=c^2$

$640=$

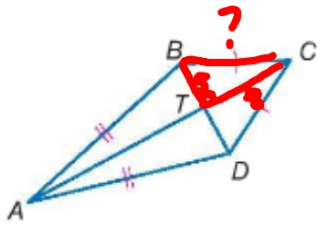


25.3

GuidedPractice

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

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



Finish Little book: "Quadrilaterals"
parallelogram
rectangle
rhombus
square
trapezoid
kite

6.6
9-27 0
35-49 0