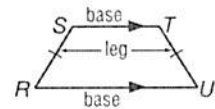


6-6 Study Guide and Intervention

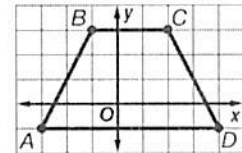
Trapezoids and Kites

Properties of Trapezoids A trapezoid is a quadrilateral with exactly one pair of parallel sides. The **midsegment** or **median** of a trapezoid is the segment that connects the midpoints of the legs of the trapezoid. Its measure is equal to one-half the sum of the lengths of the bases. If the legs are congruent, the trapezoid is an **isosceles trapezoid**. In an isosceles trapezoid both pairs of **base angles** are congruent and the diagonals are congruent.



$STUR$ is an isosceles trapezoid.
 $\overline{SR} \cong \overline{TU}$; $\angle R \cong \angle U$, $\angle S \cong \angle T$

Example The vertices of $ABCD$ are $A(-3, -1)$, $B(-1, 3)$, $C(2, 3)$, and $D(4, -1)$. Show that $ABCD$ is a trapezoid and determine whether it is an isosceles trapezoid.



$$\text{slope of } \overline{AB} = \frac{3 - (-1)}{-1 - (-3)} = \frac{4}{2} = 2$$

$$AB = \sqrt{(-3 - (-1))^2 + (-1 - 3)^2}$$

$$\text{slope of } \overline{AD} = \frac{-1 - (-1)}{4 - (-3)} = \frac{0}{7} = 0$$

$$= \sqrt{4 + 16} = \sqrt{20} = 2\sqrt{5}$$

$$\text{slope of } \overline{BC} = \frac{3 - 3}{2 - (-1)} = \frac{0}{3} = 0$$

$$CD = \sqrt{(2 - 4)^2 + (3 - (-1))^2}$$

$$\text{slope of } \overline{CD} = \frac{-1 - 3}{4 - 2} = \frac{-4}{2} = -2$$

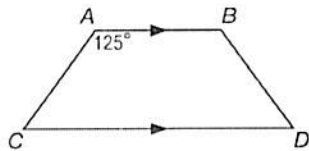
$$= \sqrt{4 + 16} = \sqrt{20} = 2\sqrt{5}$$

Exactly two sides are parallel, \overline{AD} and \overline{BC} , so $ABCD$ is a trapezoid. $AB = CD$, so $ABCD$ is an isosceles trapezoid.

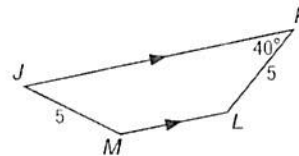
Exercises

Find each measure.

1. $m\angle D$



2. $m\angle L$



COORDINATE GEOMETRY For each quadrilateral with the given vertices, verify that the quadrilateral is a trapezoid and determine whether the figure is an isosceles trapezoid.

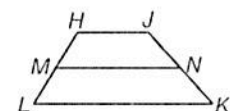
3. $A(-1, 1)$, $B(3, 2)$, $C(1, -2)$, $D(-2, -1)$

4. $J(1, 3)$, $K(3, 1)$, $L(3, -2)$, $M(-2, 3)$

For trapezoid $HJKL$, M and N are the midpoints of the legs.

5. If $HJ = 32$ and $LK = 60$, find MN .

6. If $HJ = 18$ and $MN = 28$, find LK .



6-6 Study Guide and Intervention *(continued)*

Trapezoids and Kites

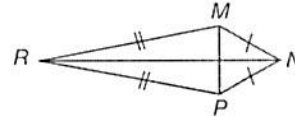
Properties of Kites A kite is a quadrilateral with exactly two pairs of consecutive congruent sides. Unlike a parallelogram, the opposite sides of a kite are not congruent or parallel.

The diagonals of a kite are perpendicular.

For kite $RMNP$, $\overline{MP} \perp \overline{RN}$.

In a kite, exactly one pair of opposite angles is congruent.

For kite $RMNP$, $\angle M \cong \angle P$.



Example 1 If $WXYZ$ is a kite, find $m\angle Z$.

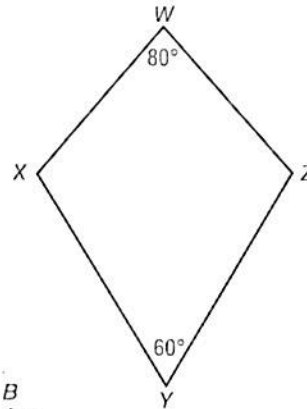
The measures of $\angle Y$ and $\angle W$ are not congruent, so $\angle X \cong \angle Z$.

$$m\angle X + m\angle Y + m\angle Z + m\angle W = 360$$

$$m\angle X + 60 + m\angle Z + 80 = 360$$

$$m\angle X + m\angle Z = 220$$

$$m\angle X = 110, m\angle Z = 110$$



Example 2 If $ABCD$ is a kite, find BC .

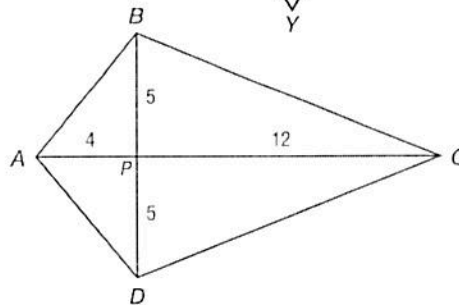
The diagonals of a kite are perpendicular. Use the Pythagorean Theorem to find the missing length.

$$BP^2 + PC^2 = BC^2$$

$$5^2 + 12^2 = BC^2$$

$$169 = BC^2$$

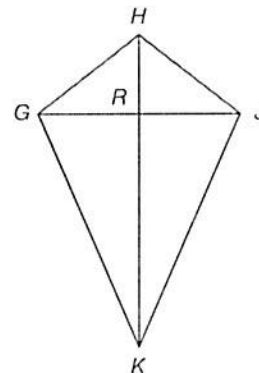
$$13 = BC$$



Exercises

If $GHJK$ is a kite, find each measure.

- Find $m\angle JRK$.
- If $RJ = 3$ and $RK = 10$, find JK .
- If $m\angle GHJ = 90$ and $m\angle GKJ = 110$, find $m\angle HGK$.
- If $HJ = 7$, find HG .
- If $HG = 7$ and $GR = 5$, find HR .
- If $m\angle GHJ = 52$ and $m\angle GKJ = 95$, find $m\angle HGK$.

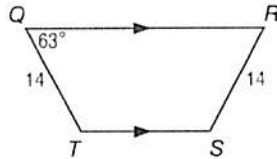


6-6 Skills Practice

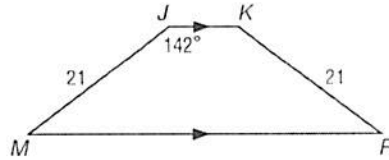
Trapezoids and Kites

ALGEBRA Find each measure.

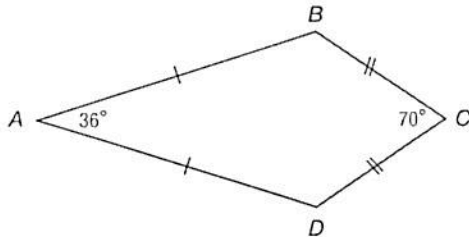
1. $m\angle S$



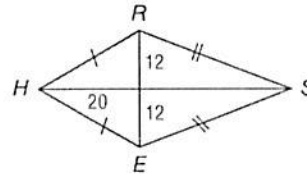
2. $m\angle M$



3. $m\angle D$

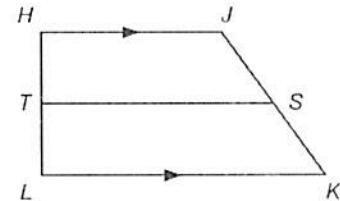


4. RH



ALGEBRA For trapezoid $HJKL$, T and S are midpoints of the legs.

- If $HJ = 14$ and $LK = 42$, find TS .
- If $LK = 19$ and $TS = 15$, find HJ .
- If $HJ = 7$ and $TS = 10$, find LK .
- If $KL = 17$ and $JH = 9$, find ST .



COORDINATE GEOMETRY $EFGH$ is a quadrilateral with vertices $E(1, 3)$, $F(5, 0)$, $G(8, -5)$, $H(-4, 4)$.

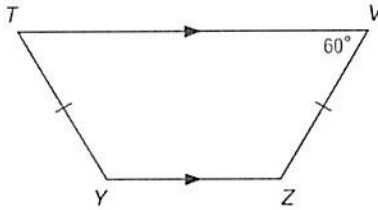
- Verify that $EFGH$ is a trapezoid.
- Determine whether $EFGH$ is an isosceles trapezoid. Explain.

6-6 Practice

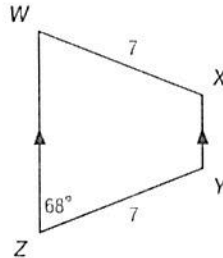
Trapezoids and Kites

Find each measure.

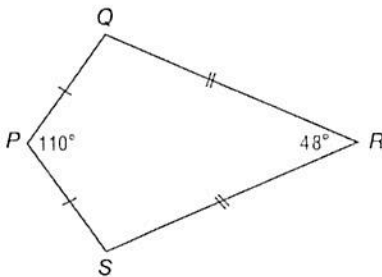
1. $m\angle T$



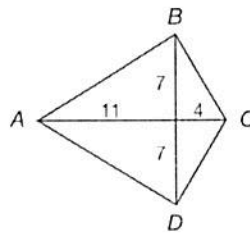
2. $m\angle Y$



3. $m\angle Q$

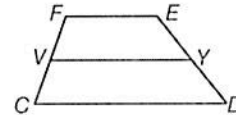


4. BC



ALGEBRA For trapezoid $FEDC$, V and Y are midpoints of the legs.

5. If $FE = 18$ and $VY = 28$, find CD .
6. If $m\angle F = 140$ and $m\angle E = 125$, find $m\angle D$.



COORDINATE GEOMETRY $RSTU$ is a quadrilateral with vertices $R(-3, -3)$, $S(5, 1)$, $T(10, -2)$, $U(-4, -9)$.

7. Verify that $RSTU$ is a trapezoid.
8. Determine whether $RSTU$ is an isosceles trapezoid. Explain.
9. **CONSTRUCTION** A set of stairs leading to the entrance of a building is designed in the shape of an isosceles trapezoid with the longer base at the bottom of the stairs and the shorter base at the top. If the bottom of the stairs is 21 feet wide and the top is 14 feet wide, find the width of the stairs halfway to the top.
10. **DESK TOPS** A carpenter needs to replace several trapezoid-shaped desktops in a classroom. The carpenter knows the lengths of both bases of the desktop. What other measurements, if any, does the carpenter need?