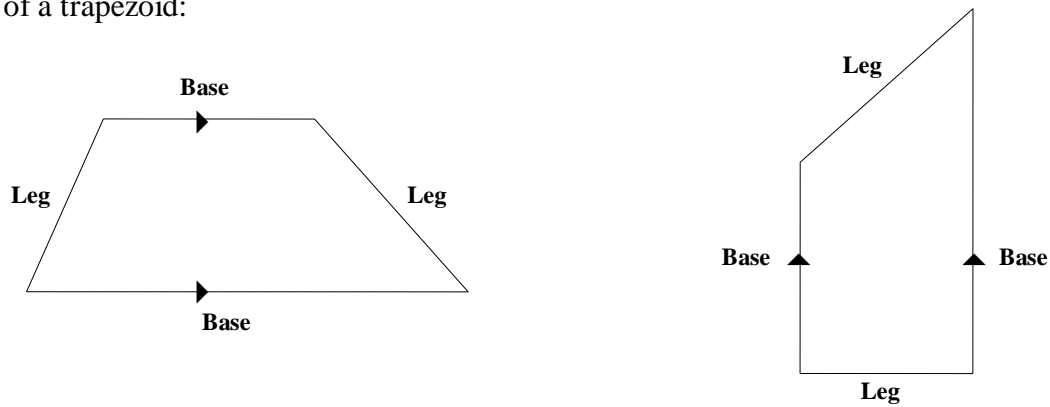


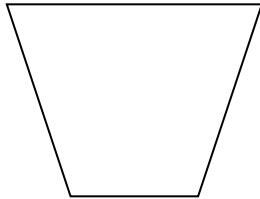
Trapezoids

Definition: A trapezoid is a quadrilateral with exactly two parallel sides.

Parts of a trapezoid:



Isosceles Trapezoid:

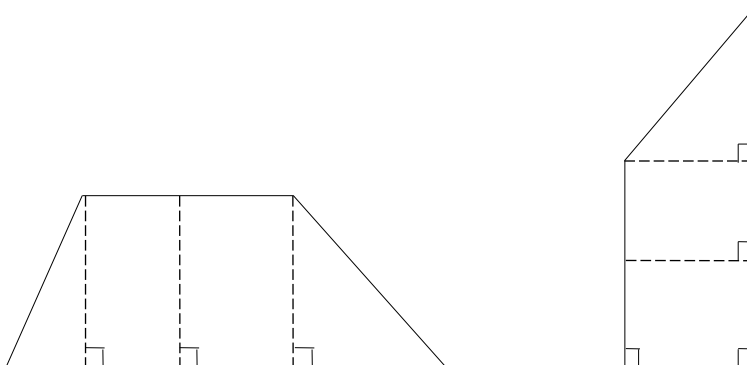


Every trapezoid contains two pairs of consecutive angles that are supplementary.

Definition:

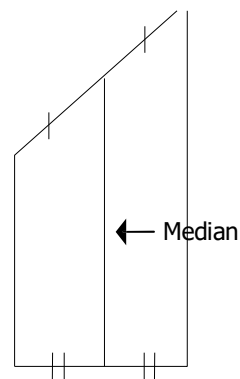
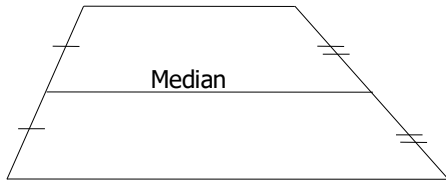
An **altitude** of a trapezoid is a segment drawn from any point on one of the parallel sides (base) perpendicular to the opposite side (the other base).

An infinite number of altitudes may be drawn in a trapezoid.

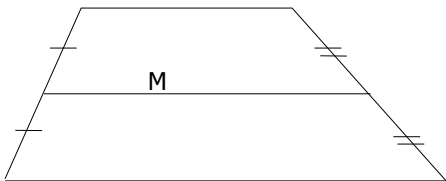


Definition:

A **median** of a trapezoid is the segment that joins the midpoints of the nonparallel sides (legs).



Theorem: The median of a trapezoid is parallel to each base and the length of the median equals one-half the sum of the lengths of the two bases.

**Definition:**

An **isosceles** trapezoid is a trapezoid in which the legs (nonparallel sides) are congruent.

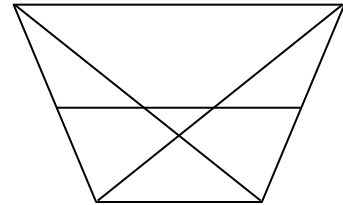
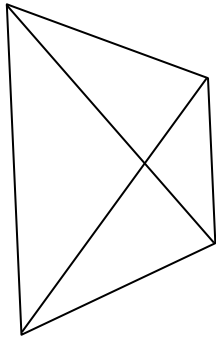
An isosceles trapezoid features some special properties not found in all trapezoids.

Theorem 4.4.1: The base angles of an isosceles trapezoid are congruent.

Theorem 4.4.2: The diagonals of an isosceles trapezoid are congruent.

Properties of Isosceles Trapezoid

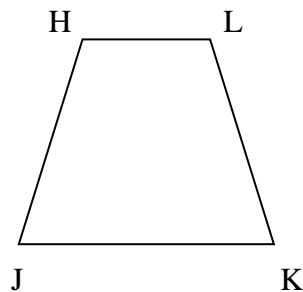
1. The legs are congruent.
2. The bases are parallel.
3. The lower base angles of an isosceles trapezoid are congruent.
4. The upper base angles of an isosceles trapezoid are congruent.
5. The lower base angle is supplementary to any upper base angle.
6. The diagonals of an isosceles trapezoid are congruent.
7. The median is parallel to the base.
8. The length of the median equals one-half the sum of the lengths of the two bases.



Proving that Trapezoid is isosceles

1. If legs of a trapezoid are congruent then it is an isosceles trapezoid.
2. If two base angles of a trapezoid are congruent, then it is an isosceles trapezoid.
3. If the diagonals of a trapezoid are congruent, then it is an isosceles trapezoid.

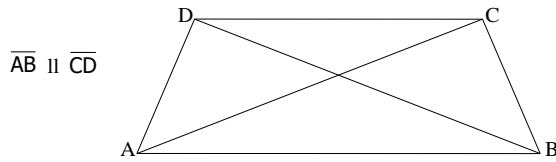
Example 1: Given the trapezoid HLJK



If the $m\angle J = 65^\circ$ and the $m\angle K = 95^\circ$, the measure of angles H and L .

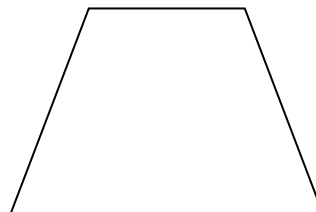
Example 2:

Use Isosceles Trapezoid ABCD with length of $AD = BC$.



- $m\angle DAB = 75^\circ$. Find the $m\angle ADC$.
- $\overline{AC} = 40$. Find \overline{BD} .
- If $m\angle A = 6x + 25$ and $m\angle B = 8x + 15$, find the measures of angle C and D.

Definition: An altitude is a line segment from one vertex of one base of the trapezoid and perpendicular to the opposite base.



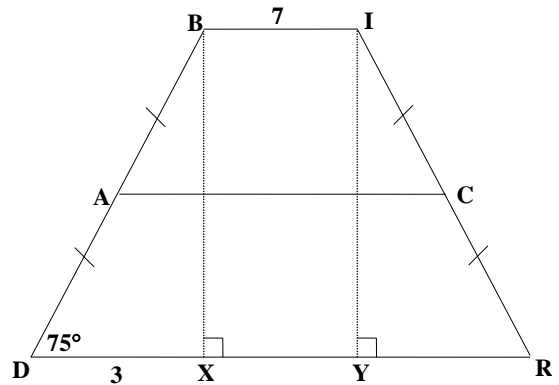
Theorem 4.4.3: The length of the median of a trapezoid equals one-half the sum of the bases.

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

Example 3:

Find the missing measures of the given trapezoid.

- $m\angle IRD$
- YR
- DR
- AC

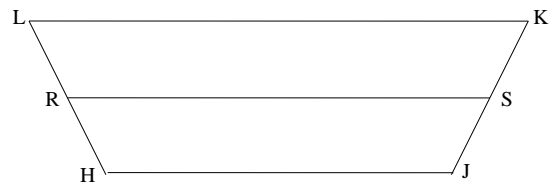
**Example 4:**

HJKL is an isosceles trapezoid with bases \overline{HJ} and \overline{LK} , and median \overline{RS} . Use the given information to solve each problem.

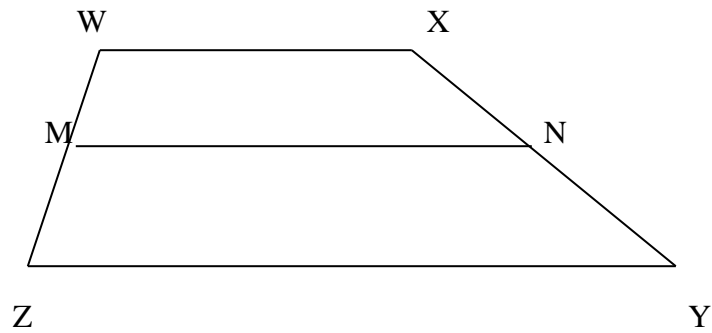
- $\overline{LK} = 30$
 $\overline{HJ} = 42$
 find \overline{RS}

- $\overline{RS} = 17$
 $\overline{HJ} = 14$
 find \overline{LK}

- $\overline{RS} = x + 5$
 $\overline{HJ} + \overline{LK} = 4x + 6$
 find \overline{RS}



Example 5: Given $WXYZ$ is a trapezoid with $\overline{WX} \parallel \overline{ZY}$, \overline{MN} is the median



- a. If $WX = 19$ and $ZY = 31$, find MN
- b. If $WX = 4x - 7$, $MN = 2x + 10$ and $ZY = 2x + 1$, find x and the lengths of WX , MN and ZY .

SUMMARY CHARTS:

Special Quadrilateral	Diagonals Are Always		Diagonals Always Bisect	
	Congruent	Perpendicular	Each Other	Angles
Parallelogram	No	No	Yes	No
Rectangle	Yes	No	Yes	No
Rhombus	No	Yes	Yes	Yes
Square	Yes	Yes	Yes	Yes
Trapezoid	No	No	No	No
Isosceles Trapezoid	Yes	No	No	No

There is an excellent chart in your book on page 205.