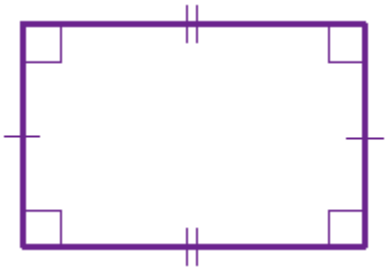
Sections 4.3-4.4 Special Parallelograms

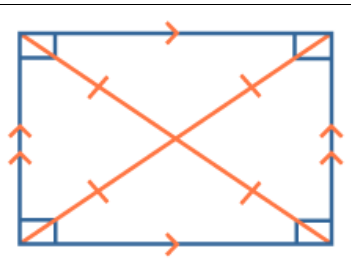
http://www.mathsisfun.com/geometry/rectangle.html

DEFINITION

A **rectangle** is a parallelogram that has a right angle.



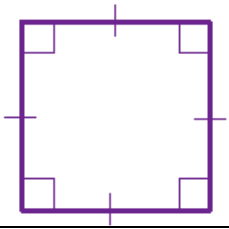
Since it is a parallelogram, opposite angles are congruent, and adjacent angles are supplementary, so it follows that ALL the angles of a rectangle are right angles.

Rectangle Diagonals Theorem The diagonals of a rectangle are congruent and bisect each other.	

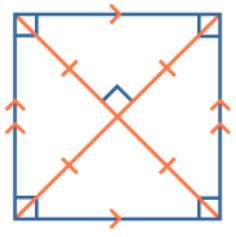
http://www.mathsisfun.com/geometry/square.html

DEFINITION

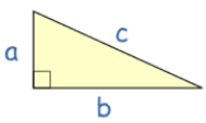
A **square** is a rectangle that has two congruent adjacent sides.



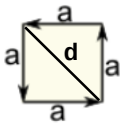
Since a square is a rectangle, it has 4 right angles, and since it is a parallelogram, opposite sides are congruent, so if adjacent sides are also congruent, that means all 4 sides are congruent.

Square Diagonals Corollary The diagonals of a rectangle are congruent, bisect each other, and are perpendicular.	

The length of the diagonals of a rectangle or square can be found by the Pythagorean Theorem.



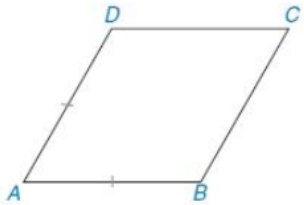
$$c = \sqrt{a^2 + b^2}$$



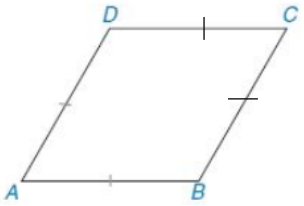
$$d = \sqrt{a^2 + a^2}$$
$$= \sqrt{2a^2}$$
$$= a\sqrt{2}$$

DEFINITION

A **rhombus** is a parallelogram with two congruent adjacent sides.



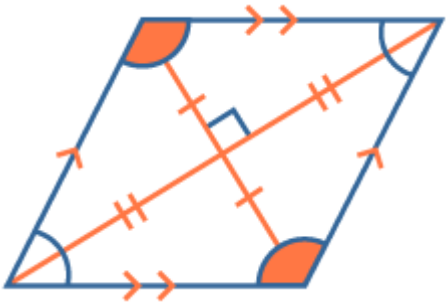
Since it's a parallelogram, opposite sides are congruent.



Rhombus Diagonals Theorem The diagonals of a rhombus are perpendicular, and they bisect each other.

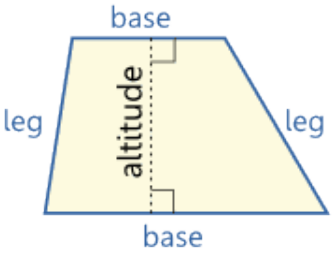
Double-Edged Straightedge Corollary If two parallel lines are intersected by a second pair of parallel lines that are the same distance apart as the first pair, then the parallelogram formed is a **rhombus**.

Rhombus Angles Corrollary The diagonals of a rhombus bisect the angles of the rhombus.

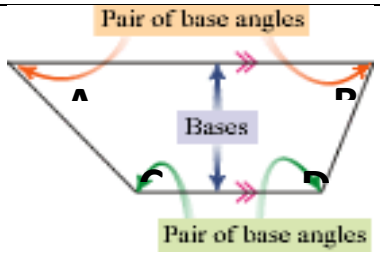
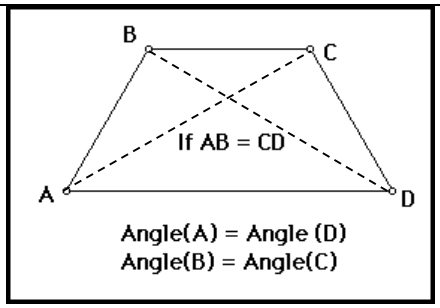


DEFINITION

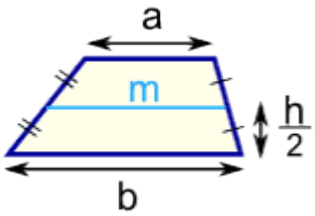
A **trapezoid** is a quadrilateral with exactly two parallel sides.



The parallel sides are the "bases"
The other two sides are the "legs"
The distance (at right angles) from one base to the other is called the "altitude"

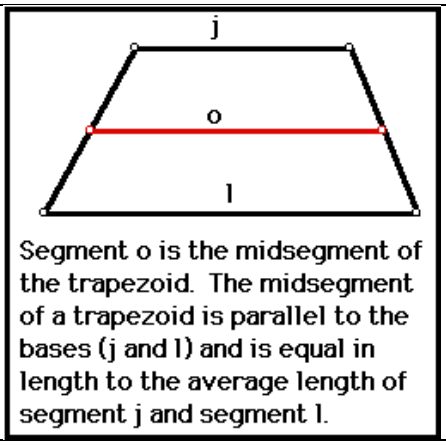
Trapezoid Consecutive Angles Corollary The consecutive angles between the bases of a trapezoid are supplementary.	 A + B=180°, C+D = 180°
Isosceles Trapezoid Theorem The base angles of an isosceles trapezoid are congruent. (Lesson 5.3)	 Also, AC = BD

Median of a Trapezoid



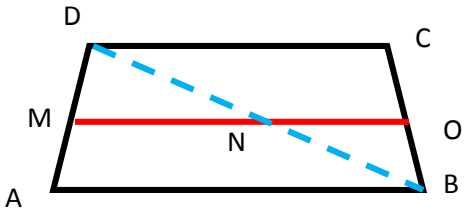
The **median** (also called a midline or midsegment) is a line segment half-way between the two bases.

The median's length is the average of the two base lengths: $m = \frac{a+b}{2}$

Trapezoid Midsegment Corollary The midsegment of a trapezoid is parallel to the bases and is equal in length to the average of the lengths of the bases.	

Now you can apply this theorem in the following way:

M, N and O midpoints of AD, DB and BC.



By the midsegment theorem, MN is paralell to MN and half its length, while NO is parallel to DC and half its length.

Since DC and AB are parallel MNO are on one line.