Class Notes
Section 4.1
Parallelograms

Defn – a parallelogram is a quadrilateral in which both pairs of opposite sides are parallel.

Thm – A diagonal of a parallelogram separates it into two congruent triangles.

Proof:

Corollary – The opposite angles of a parallelogram are congruent.

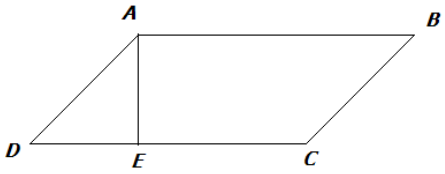
Corollary – The opposite sides of a parallelogram are congruent.

Corollary – The diagonals of a parallelogram bisect each other.

Corollary – Two consecutive angles of a parallelogram are supplementary.

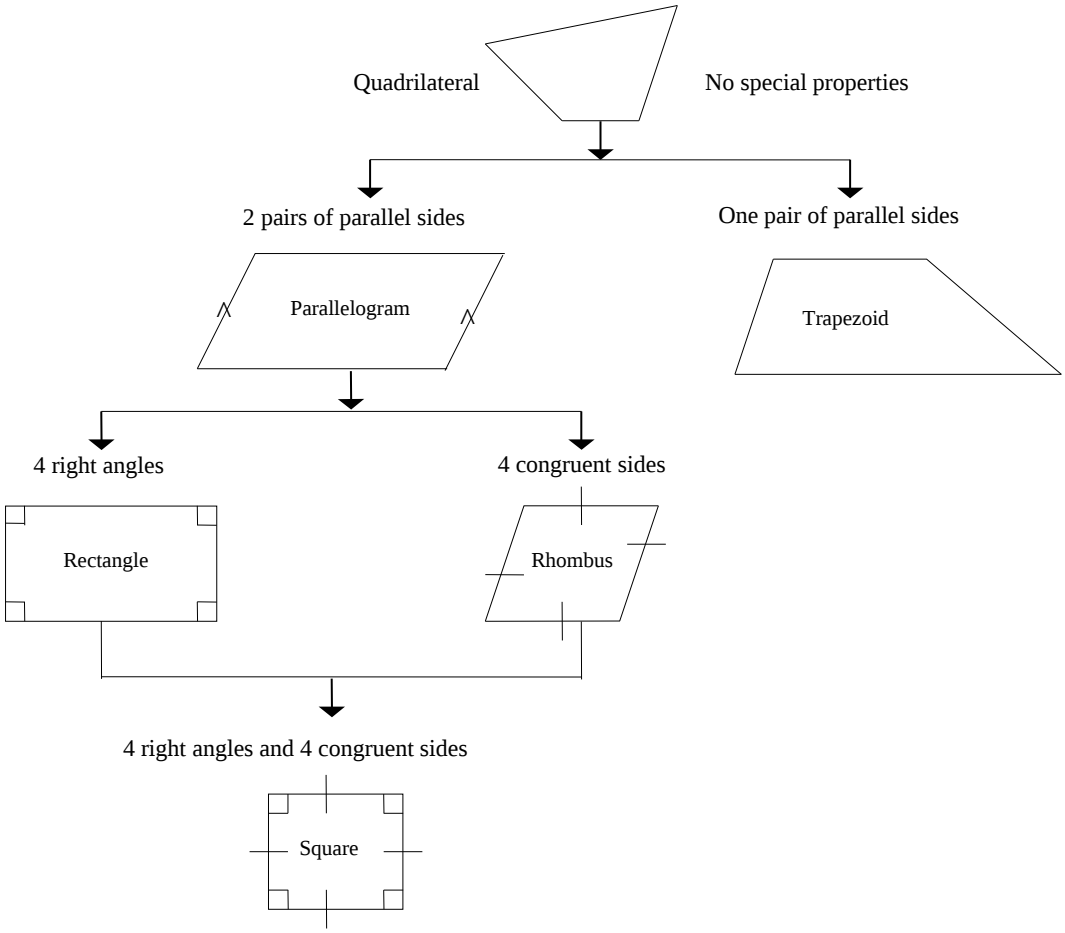
Thm – Two parallel lines are everywhere equidistant.

Defn – An **altitude** of a parallelogram is a line segment from one vertex that is perpendicular to a non adjacent side (or an extension of that side).



Thm – in a parallelogram with unequal pairs of consecutive angles, the longer diagonal lies opposite the obtuse angle.

As seen in the flow chart below, a rectangle, a rhombus, and a square are all parallelograms.

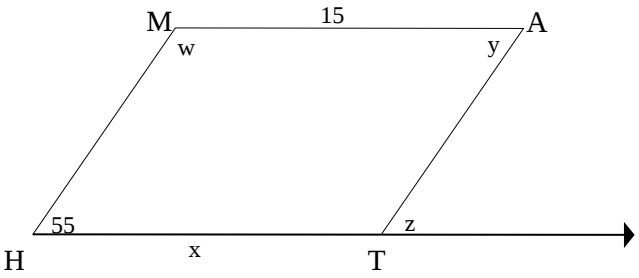


"RULES" of parallelograms:

1) Opposite sides of a parallelogram are congruent.
2) Opposite angles of a parallelogram are congruent.
3) Consecutive angles in a parallelogram are supplementary.
4) The diagonals of a parallelogram bisect each other.

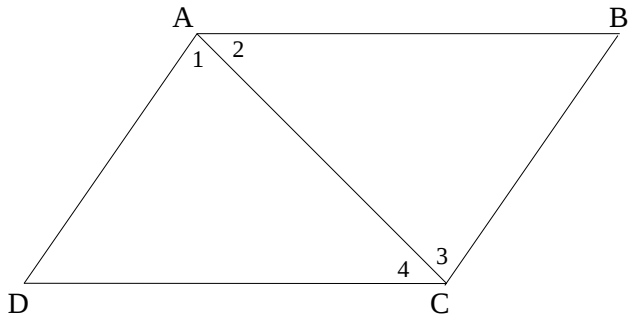
Example 1:

MATH is a parallelogram. Find the values of w, x, y, and z.



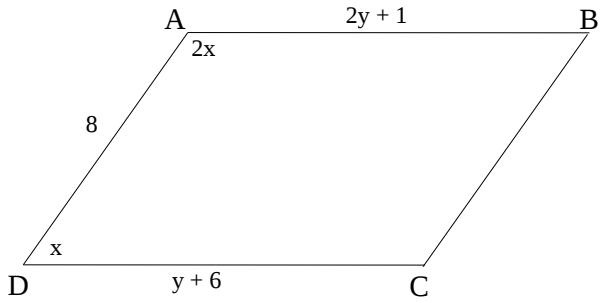
Example 2:

If $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$, is quadrilateral ABCD a parallelogram?

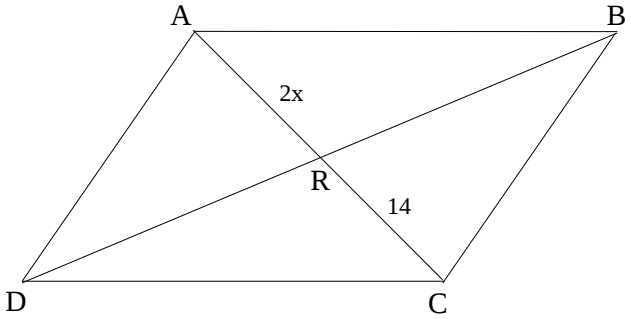


Example 3:

Find the measure of each angle and side in parallelogram ABCD below.



Example 4 :

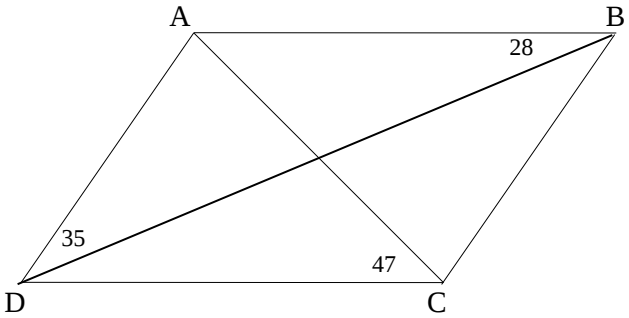


Diagonals and intersect at R. Find the measure of:

=

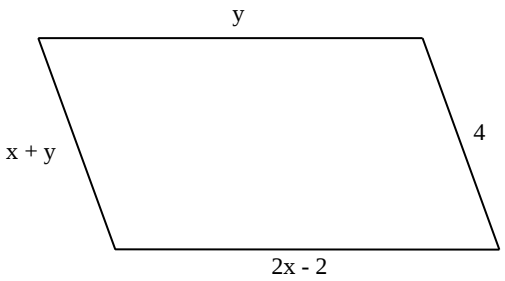
Example 5:

Find the measure of each angle in parallelogram ABCD below.



Example 6: Find x = _____

y = _____



Methods might be used to prove that a quadrilateral is a parallelogram.

1. If both pairs of opposite sides of a quadrilateral are parallel, then the quadrilateral is a parallelogram.

2. If both pairs of opposite sides of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

3. If one pair of opposite sides of a quadrilateral are both parallel and congruent, then the quadrilateral is a parallelogram.

4. If the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram.

5. If both pairs of opposite angles of a quadrilateral are congruent, then the quadrilateral is a parallelogram.

Example 7: State whether or not you can conclude that the figure is a parallelogram, based on the given information.

a. $AB \cong CD$ and $AD \cong BC$

b. $AB \parallel CD$ and $AD \parallel BC$

c. $AB \cong CD$ and $AB \parallel CD$

d. $AD \cong BC$ and $AB \parallel CD$

e. $AE = AC$ and $BE = BD$

f. $AB = BC = CD = AD$

g. $m\angle ADC = m\angle ABC$ and $m\angle BAD = m\angle BCD$