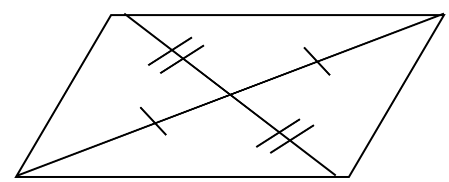
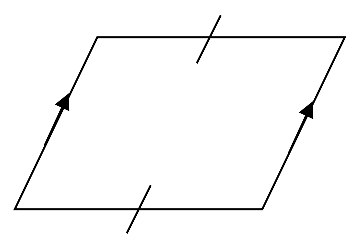
TOPIC 11-5: PROVING QUADRILATERALS

Conditions for Parallelograms
• Both pairs of opposite sides are parallel. • One pair of opposite sides are parallel and congruent. • Both pairs of opposite sides are congruent. • Both pairs of opposite angles are congruent. • One angle is supplementary to both of its consecutive angles. • The diagonals bisect each other.

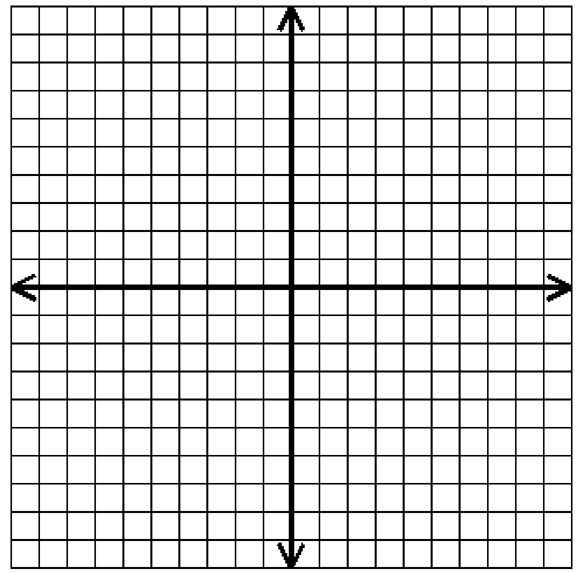
EXAMPLE 1: Determine if the quadrilateral must be a parallelogram. Justify your answer.



EXAMPLE 2: Determine if the quadrilateral must be a parallelogram. Justify your answer.



EXAMPLE 3: Show that quadrilateral ABCD is a parallelogram using one of the conditions above if A(-3, 2), B(-2, 7), C(2, 4), D(1, -1).



When you are given a parallelogram with certain properties, you can use the conditions below to determine whether the parallelogram is a rectangle, rhombus or square.

Conditions for Rectangles
• One angle is a right angle. • Diagonals are congruent.

Conditions for Rhombi
• One pair of consecutive sides are congruent. • The diagonals are perpendicular. • The diagonals bisect opposite angles.

To determine that a given quadrilateral is a <u>Square</u>, it is sufficient to show that a figure is both a rectangle and a rhombus.

EXAMPLE 4: Determine if the conclusion is valid. If not, tell what additional information is needed to make it valid.

<u>Given:</u> Quad ABCD where $\overline{AB} \cong \overline{CD}$, $\overline{BC} \cong \overline{AD}$, $\overline{AD} \perp \overline{DC}$, $\overline{AC} \perp \overline{BD}$

<u>Conclusion:</u> ABCD is a square.

EXAMPLE 5:

<u>Given:</u> *ABC* with vertices $A(-6,-2)$, $B(2,8)$, and $C(6,-2)$. $\overline{AB}$ has midpoint *D*, $\overline{BC}$ has midpoint *E*, and $\overline{AC}$ has midpoint *F.*

<u>Prove:</u> *ADEF* is a parallelogram and *ADEF* is *not* a rhombus