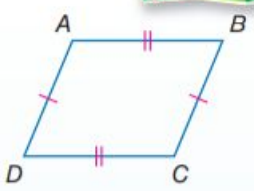
Theorems — Conditions for Parallelograms

For Your FOLDABLE

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

Abbreviation *If both pairs of opp. sides are ≅, then quad. is a ▱.*

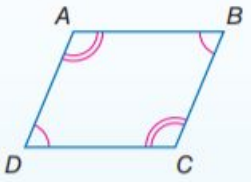
Example If $\overline{AB} \cong \overline{DC}$ and $\overline{AD} \cong \overline{BC}$, then *ABCD* is a parallelogram.



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

Abbreviation *If both pairs of opp. ∠s are ≅, then quad. is a ▱.*

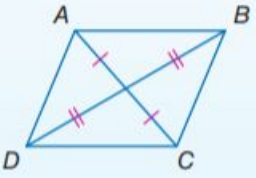
Example If $\angle A \cong \angle C$ and $\angle B \cong \angle D$, then *ABCD* is a parallelogram.



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

Abbreviation *If diag. bisect each other, then quad. is a ▱.*

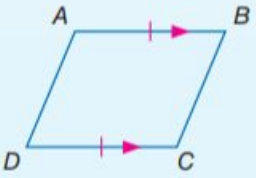
Example If $\overline{AC}$ and $\overline{DB}$ bisect each other, then *ABCD* is a parallelogram.



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

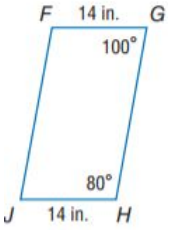
Abbreviation *If one pair of opp. sides is ≅ and ||, then the quad. is a ▱.*

Example If $\overline{AB} \parallel \overline{DC}$ and $\overline{AB} \cong \overline{DC}$, then *ABCD* is a parallelogram.

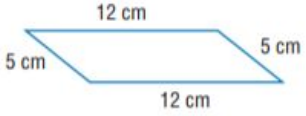


1. Determine whether the quadrilateral is a parallelogram. Justify your answer.

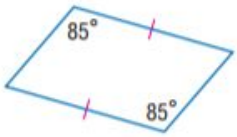
a.



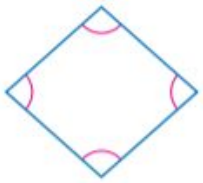
b.



c.

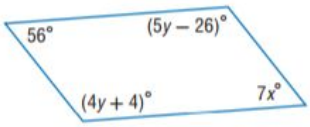


d.

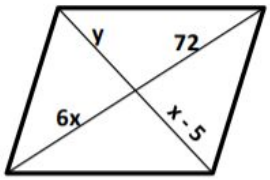


2. Find the variables in the diagrams below so that each quadrilateral is a parallelogram.

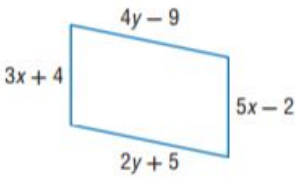
a.



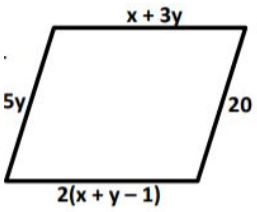
c.



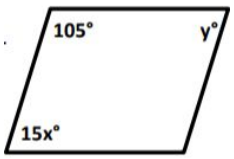
b.



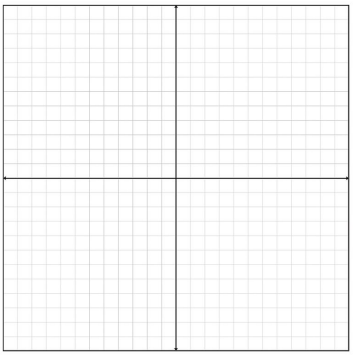
d.



e.



3. Show that $A(2,-1)$, $B(1,3)$, $C(6,5)$, and $D(7,1)$ are the vertices of a parallelogram.



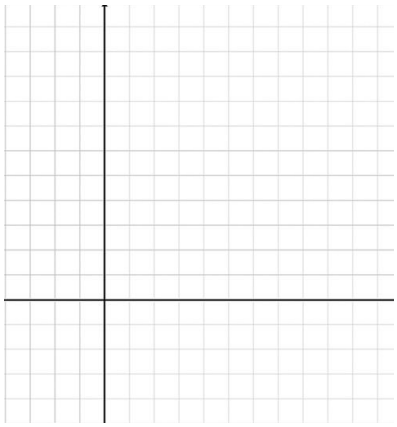
Method 1: Show that the opposite sides have the same

_____

Method 2: Show that the opposite sides have the same _____

Method 3: Show that one pair of opposite sides is _____and _____

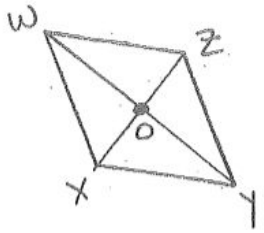
4. Graph quadrilateral KLMN with vertices $K(2,3)$, $L(8,4)$, $M(7,-2)$, and $N(1,-3)$. Determine whether the quadrilateral is a parallelogram.



5.

Given: $\square$ WXYZ

Prove: $\Delta WOX \cong \Delta YOZ$

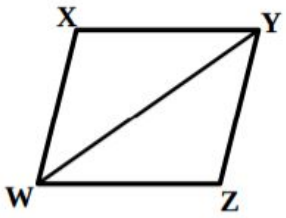


Statements	Justifications
1. $\square$ WXYZ	1.
2. $\angle WOX \cong \angle ZOY$	2.
3. $\overline{XW} \parallel \overline{YZ}$	3.
4. $\angle WXO \cong \angle YZO$	4.
5. $\overline{WX} \cong \overline{YZ}$	5.
6. $\Delta WOX \cong \Delta YOZ$	6.

4.

Given: $\Delta XYW \cong \Delta ZWY$

Prove: XYZW is a parallelogram.

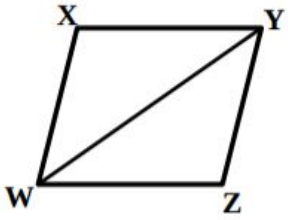


Statements	Justifications
1. $\Delta XYW \cong \Delta ZWY$	1. Given
2. $\overline{XY} \cong \overline{WZ}$	2. _____
3. $\overline{XW} \cong \overline{YZ}$	3. _____
4. XYZW is a parallelogram	4. _____

5.

Given: $\Delta XYW \cong \Delta ZWY$

Prove: XYZW is a parallelogram.



Statements	Justifications
1. $\Delta XYW \cong \Delta ZWY$	1. Given
2. $\measuredangle XYW \cong \measuredangle YWZ$	2. _____
3. $\overline{XY} \parallel \overline{WZ}$	3. _____
4. $\overline{XY} \cong \overline{WZ}$	4. _____
5. XYZW is a parallelogram	5. _____