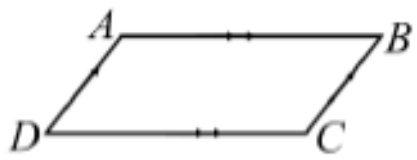
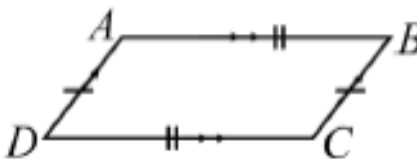
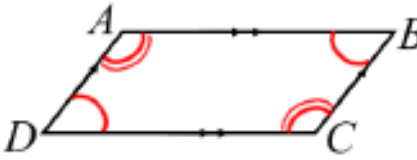
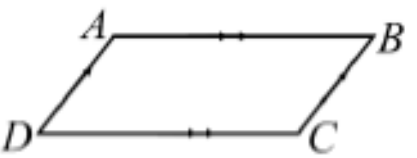
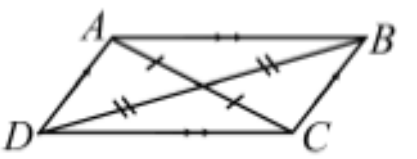


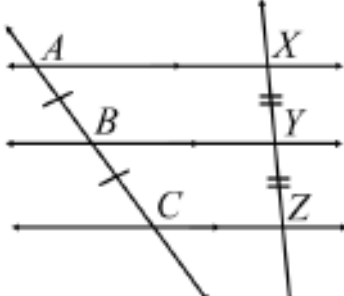
Properties of Parallelograms

SOL. G.9 (2016)

Practice

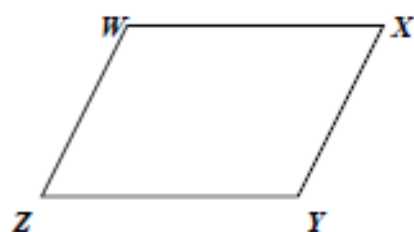
Definition of Parallelogram	
A quadrilateral with two pairs of opposite parallel sides. $\overline{AB} \parallel \overline{DC}$ $\overline{AD} \parallel \overline{BC}$	

Properties of Parallelograms	
If a quadrilateral is a parallelogram, then opposite sides are congruent. $\overline{AB} \cong \overline{DC}$ $\overline{AD} \cong \overline{BC}$	
If a quadrilateral is a parallelogram, then opposite angles are congruent. $\angle A \cong \angle C$ $\angle B \cong \angle D$	
If a quadrilateral is a parallelogram, then its consecutive angles are supplementary. $m\angle A + m\angle B = 180$ $m\angle B + m\angle C = 180$ $m\angle C + m\angle D = 180$ $m\angle D + m\angle A = 180$	
If a quadrilateral is a parallelogram, then the diagonals bisect each other. $\overline{IM} \cong \overline{MK}$ $\overline{LM} \cong \overline{MJ}$	

If three or more parallel lines cut off congruent segments on one transversal, then they cut off congruent segments on every transversal.	
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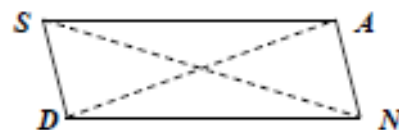
Complete the two-column proof.

1. Given:  WXYZ
Prove: $\overline{WX} \cong \overline{YZ}$



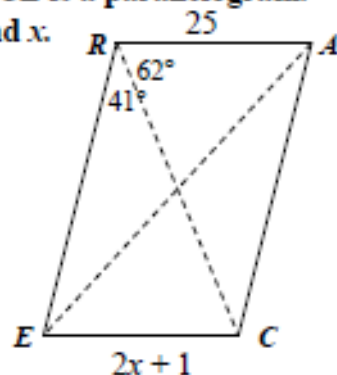
Statements	Reasons
1.  WXYZ	1.
2.	2. Def. of 
3. Draw $\overline{ZX}$.	3. Diagonal of WXYZ
4. $\angle ZXY \cong \angle WZX$ $\angle YZX \cong \angle WXZ$	4.
5.	5. Reflexive Property
6. $\triangle WZX \cong \triangle YXZ$	6.
7.	7.

Complete each statement about parallelogram SAND. Justify each answer.



2. $\overline{SD} \parallel$ _____
3. $\angle AND \cong$ _____
4. $\angle SND \cong$ _____

Example 1: Quadrilateral $RACE$ is a parallelogram. Find $m\angle ACE$, $m\angle RAC$, and x .



$$m\angle ERA = 41 + 62$$

$$m\angle ERA = 103^\circ$$

$$\angle ACE \cong \angle ERA$$

$$m\angle ACE = 103^\circ$$

$$m\angle ERA + m\angle RAC = 180$$

$$103 + m\angle RAC = 180$$

$$m\angle RAC = 77^\circ$$

$$\overline{RA} \cong \overline{EC}$$

$$25 = 2x + 1$$

$$24 = 2x$$

$$x = 12$$

Example 2: Find the coordinates of the intersection of the diagonals of parallelogram $LAKE$ with vertices $L(0, 5)$, $A(3, 3)$, $K(7, 4)$, and $E(4, 6)$.

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

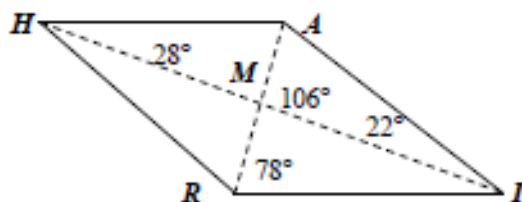
$$\left(\frac{0 + 7}{2}, \frac{5 + 4}{2} \right) = (3.5, 4.5)$$

$$\left(\frac{3 + 4}{2}, \frac{3 + 6}{2} \right) = (3.5, 4.5)$$

$$(3.5, 4.5)$$

1. Angle ERA is the sum of angles ARC and CRE .
2. Opposite angles of a parallelogram are congruent.
3. Consecutive sides of a parallelogram are supplementary.
4. Opposite sides of a parallelogram are congruent.
5. Substitute and solve.

Use parallelogram $HAIR$ to find each measure or value if $HA = 15$, $AM = 4.5$, $RI = 3x - 9$, and $RM = 10 - 11y$.



$$m\angle AIR$$

$$m\angle HRI$$

$$x$$

$$y$$

9. Find the coordinates of the intersection of the diagonals of parallelogram $TIME$ with vertices $T(-4, 8)$, $I(-2, 3)$, $M(3, 5)$, $E(1, 10)$.