

# Day 1 – Parallelograms

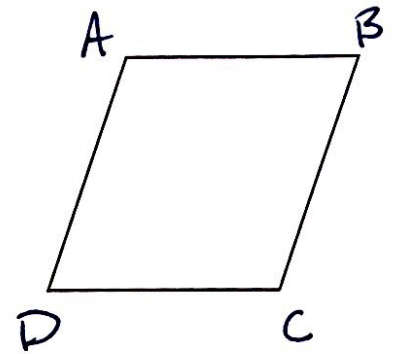
## Warm – Up

Two consecutive angles of a parallelogram measure  $3x + 42$  and  $9x - 18$ . What are the measures of the angles?

- A 13, 167
- B 58.5, 31.5
- C 39, 141
- D 81, 99**

$$3x + 42 + 9x - 18 = 180$$

$$x = 13$$

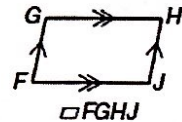


## Properties of the Parallelogram



### \*Parallelogram\*

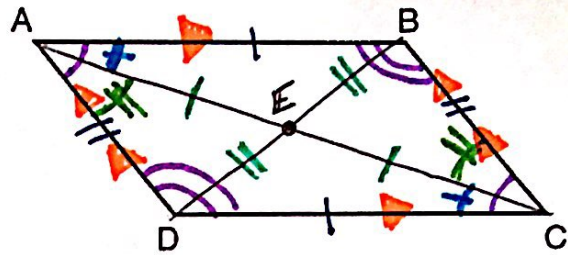
A parallelogram is a quadrilateral with two pairs of parallel sides. All parallelograms, such as  $\square FG H J$ , have the following properties.



Properties of Parallelograms	
<p>Opposite sides are congruent.</p>	$\overline{FG} \cong \overline{HJ}$ $\overline{GH} \cong \overline{JF}$
<p>Opposite angles are congruent.</p>	$\angle F \cong \angle H$ $\angle G \cong \angle J$
<p>Consecutive angles are supplementary.</p>	$m\angle F + m\angle G = 180^\circ$ $m\angle G + m\angle H = 180^\circ$ $m\angle H + m\angle J = 180^\circ$ $m\angle J + m\angle F = 180^\circ$
<p>The diagonals bisect each other.</p>	$\overline{FP} \cong \overline{HP}$ $\overline{GP} \cong \overline{JP}$

Complete the statement and give the reason that justifies the statement.

Given: ABCD is a parallelogram



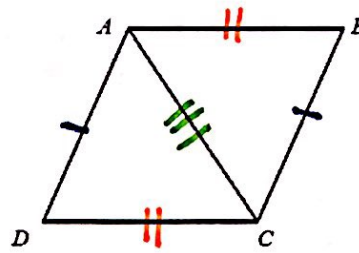
Statements	Reasons
a. $\overline{AB} \cong \overline{DC}$ and $\overline{AD} \cong \overline{BC}$	a. Opp. sides $\cong$ Prop.
b. $\angle A \cong \angle C$ and $\angle D \cong \angle B$	b. Opp. $\angle$ 's $\cong$ Prop.
c. $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$	c. Opp. sides $\parallel$ Prop.
d. $\angle A$ suppl. $\angle B$ and $\angle D$ $\angle C$ suppl. $\angle B$ and $\angle D$	d. Consecutive $\angle$ 's are suppl. Prop.
e. Draw $\overline{AC}$ and $\overline{BD}$ . (The lines intersect at E.)	e. Two Points Make a Line.
f. $\angle BAC \cong \angle ACD$ and $\angle DAC \cong \angle BCA$	f. Def. Alt Int $\angle$ 's
g. $\overline{AE} \cong \overline{CE}$ and $\overline{DE} \cong \overline{BE}$	g. Diagonals bisect Prop.

# You Try It!

Given:  $\square ABCD$

Prove:  $\triangle DAC \cong \triangle BCA$

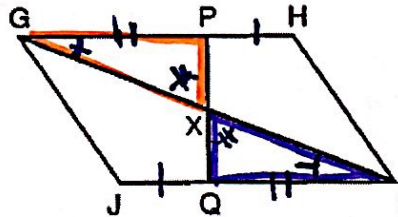
(At most 6 steps! You may not need all 6!!!)



Statements	Reasons
1 Parallelogram ABCD	1 Given
2 $\overline{AD} \cong \overline{BC}$	2 Opp. sides $\cong$ Prop.
3 $\overline{AB} \cong \overline{CD}$	3 Opp. sides $\cong$ Prop.
4 $\overline{AC} \cong \overline{CA}$	4 Reflexive Prop.
5 $\triangle DAC \cong \triangle BCA$	5 SSS
6	6

Given:  $\square GHIJ$   
 $\overline{HP} \cong \overline{JQ}$

Prove:  $\overline{PX} \cong \overline{QX}$



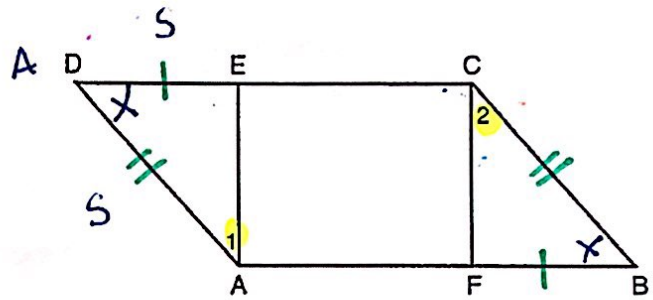
Statements	Reasons
1 Parallelogram GHIJ	1 Given
2 $\overline{HP} \cong \overline{JQ}$	2 Given
3 $\overline{GH} \cong \overline{JI}$	3 Opp. sides $\cong$ Prop.
4 $\overline{HP} + \overline{GP} \cong \overline{TQ} + \overline{JQ}$	4 Segment Add. Th.
5 $\overline{GP} \cong \overline{TQ}$	5 Def. $\cong$
6 $\angle PGX \cong \angle QIX$	6 Def Alt Int $\angle$ 's
7 $\angle GXP \cong \angle IXQ$	7 Def. Vert $\angle$ 's
8 $\triangle GPX \cong \triangle IQX$	8 AAS
9. $\overline{PX} \cong \overline{QX}$	9. CPCTC



# Proofs

Given:  $\square ABCD$   
 $\overline{DE} \cong \overline{FB}$

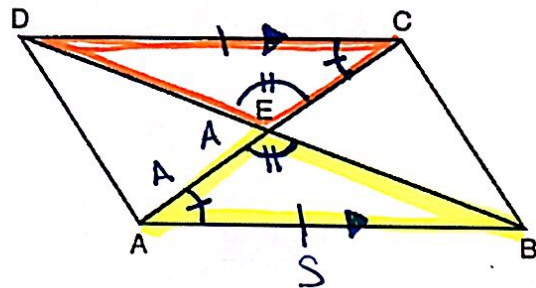
Prove: a)  $\triangle DEA \cong \triangle BFC$   
 b)  $\angle 1 \cong \angle 2$



STATEMENT	REASONS
1. Parallelogram ABCD	1. Given
2. $\overline{AD} \cong \overline{CB}$	2. Opp. sides $\cong$ Prop.
3. $\angle D \cong \angle B$	3. opp. $\angle$ 's $\cong$ Prop.
4. $\overline{DE} \cong \overline{FB}$	4. Given
5. $\triangle DEA \cong \triangle BFC$	5. SAS
6. $\angle 1 \cong \angle 2$	6. CPCTC - congruent parts of congruent triangles are congruent.

Given:  $\square ABCD$

Prove:  $\triangle AEB \cong \triangle CED$



STATEMENT	REASONS
1. Parallelogram ABCD	1. Given
2. $\overline{AB} \cong \overline{CD}$	2. Opp sides $\cong$ prop.
3. $\overline{AB} \parallel \overline{CD}$	3. opp sides $\parallel$ prop.
4. $\angle CAB \cong \angle DCA$	4. Def. Alt Int $\angle$ 's
5. $\angle AEB \cong \angle CED$	5. Def. Vertical $\angle$ 's
6. $\triangle AEB \cong \triangle CED$	6. AAS