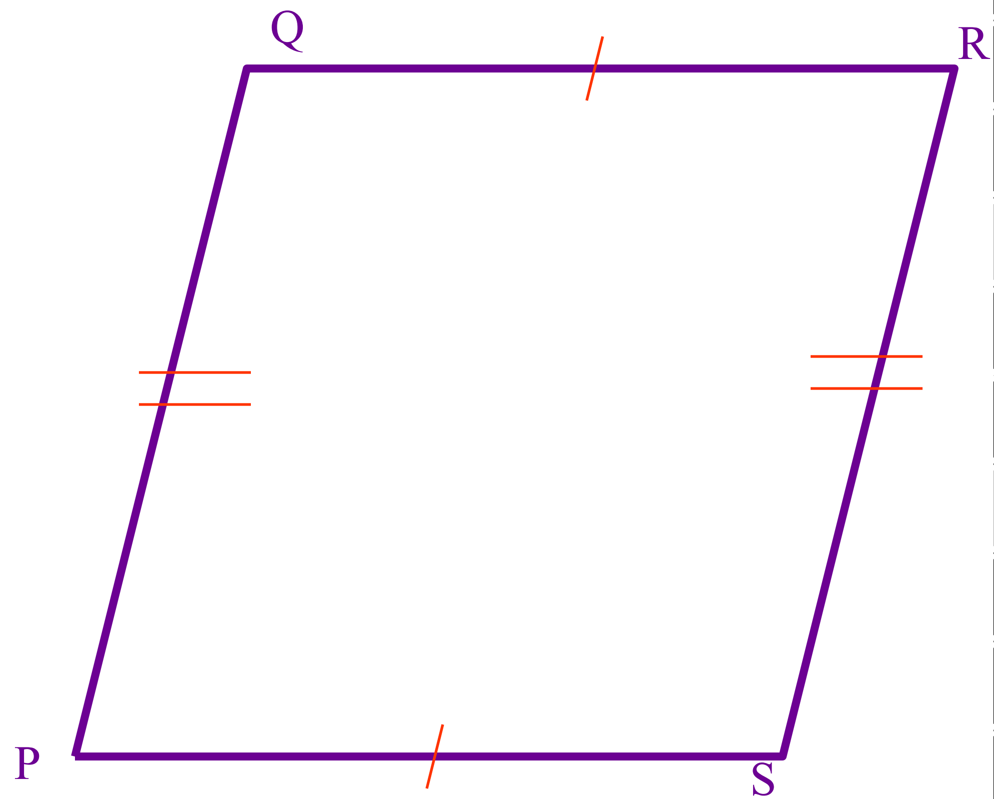
Theorems about parallelograms

- If a quadrilateral is a parallelogram, then its *opposite sides* are congruent.
- ▶ PQ≅RS and SP≅QR

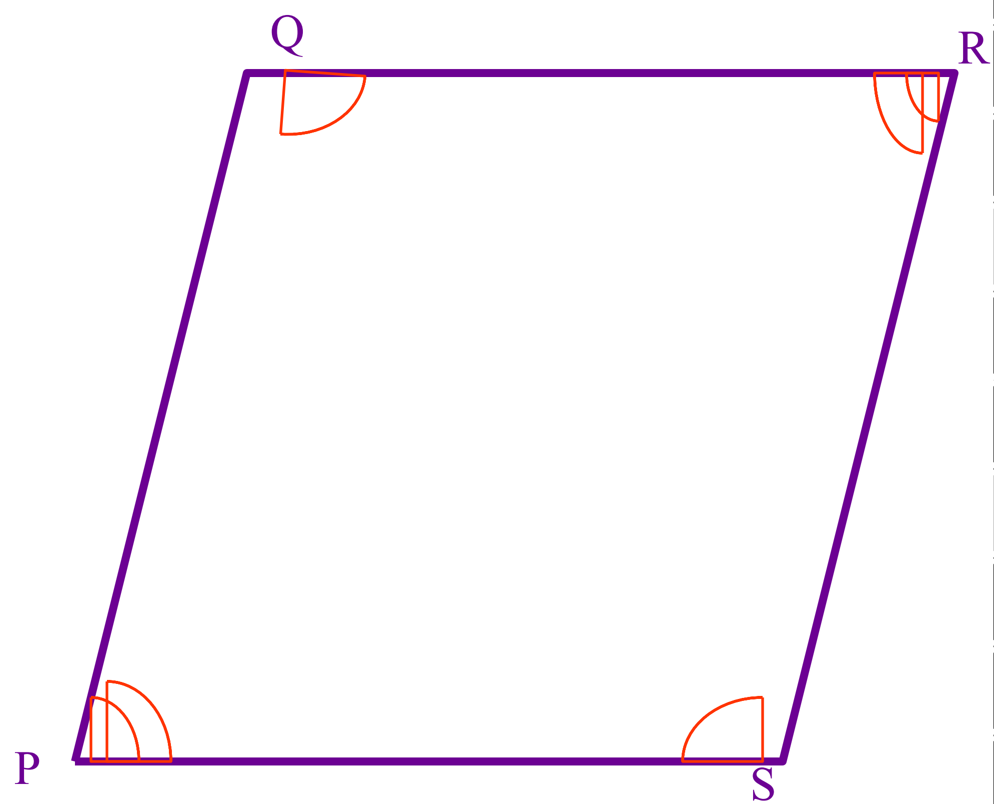


Theorems about parallelograms

- If a quadrilateral is a parallelogram, then its *opposite angles* are congruent.

$\angle P \cong \angle R$ and

$\angle Q \cong \angle S$



Theorems about parallelograms

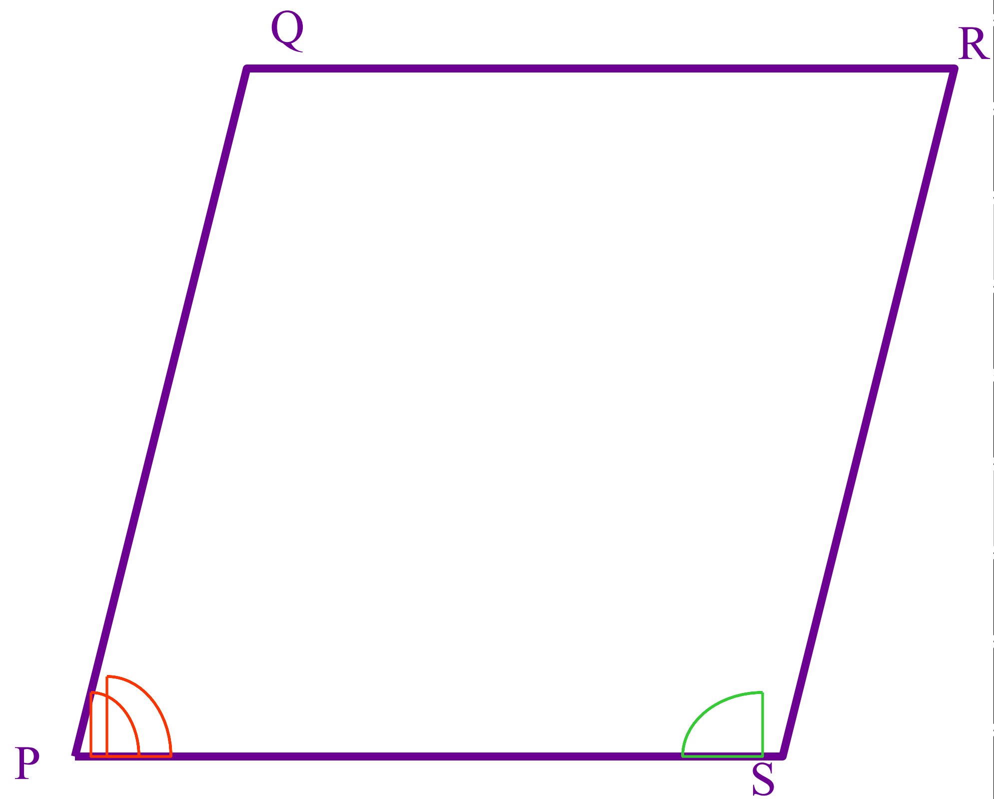
- If a quadrilateral is a parallelogram, then its *consecutive angles* are *supplementary* (add up to 180°).

$m\angle P + m\angle Q = 180°$,

$m\angle Q + m\angle R = 180°$,

$m\angle R + m\angle S = 180°$,

$m\angle S + m\angle P = 180°$

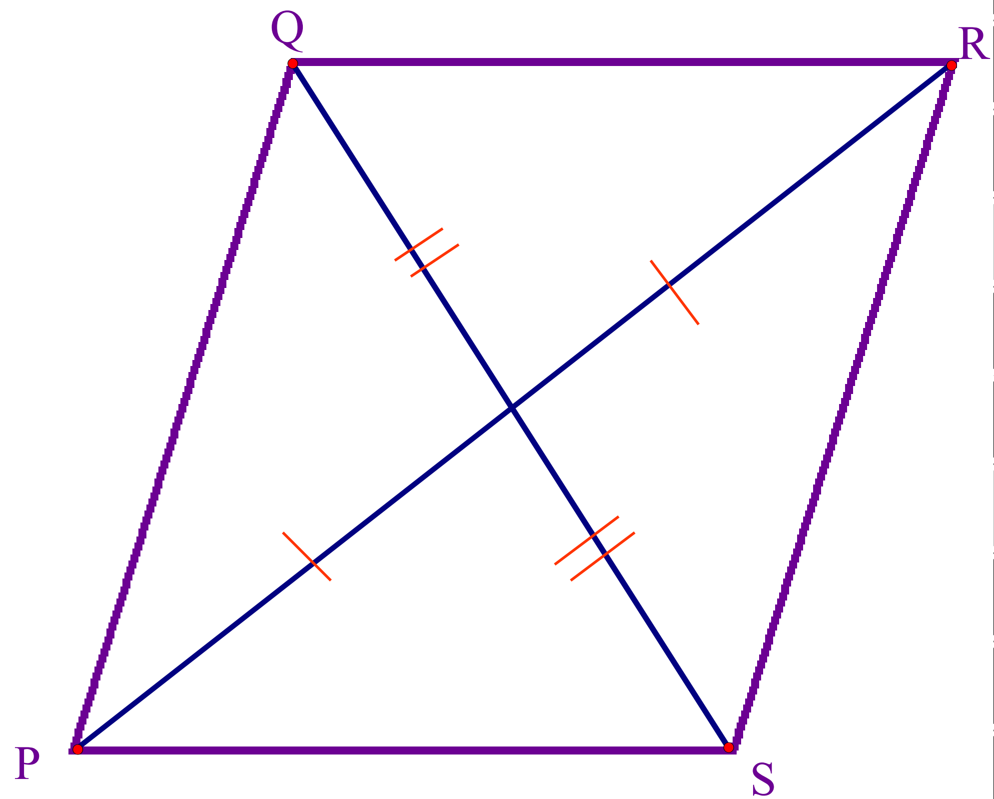


Theorems about parallelograms

- If a quadrilateral is a parallelogram, then its diagonals bisect each other.

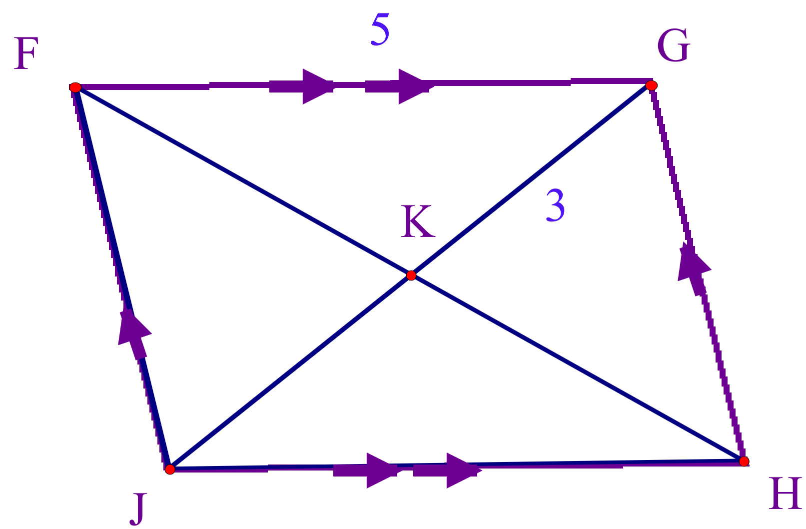
QM ≅ SM and

PM ≅ RM



Ex. 1: Using properties of Parallelograms

- FGHJ is a parallelogram. Find the unknown length. Explain your reasoning.
  a. JH
  b. JK



Ex. 1: Using properties of Parallelograms

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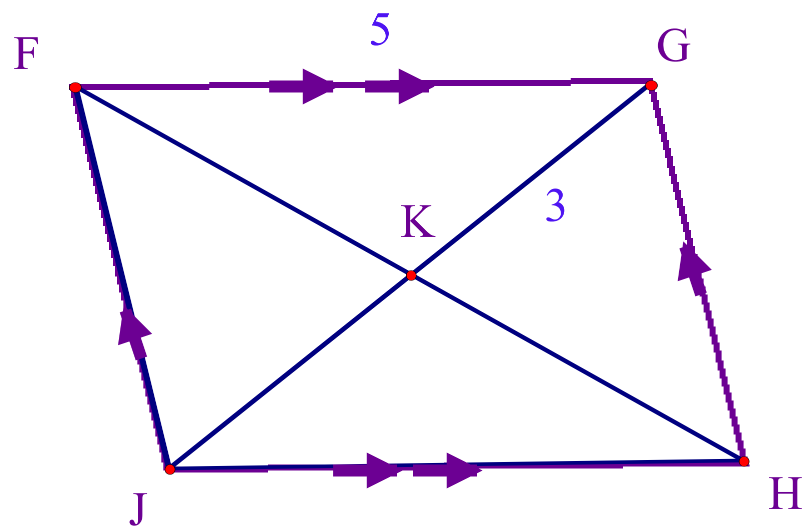

SOLUTION:

a. JH = FG Opposite sides of a ▱ are ≅.

JH = 5 Substitute 5 for FG.

Ex. 1: Using properties of Parallelograms

- FGHJ is a parallelogram. Find the unknown length. Explain your reasoning.
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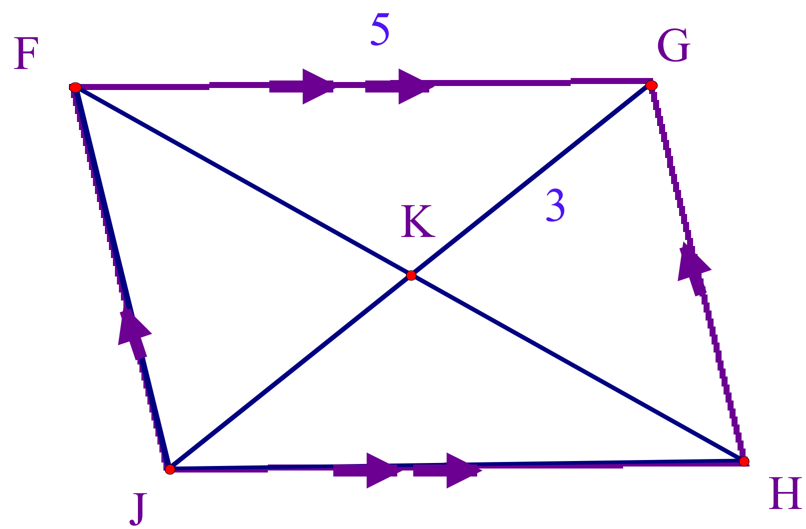


SOLUTION:

a. JH = FG Opposite sides of a ▱ are ≅.

JH = 5 Substitute 5 for FG.

b. JK = GK Diagonals of a ▱ bisect each other.

JK = 3 Substitute 3 for GK

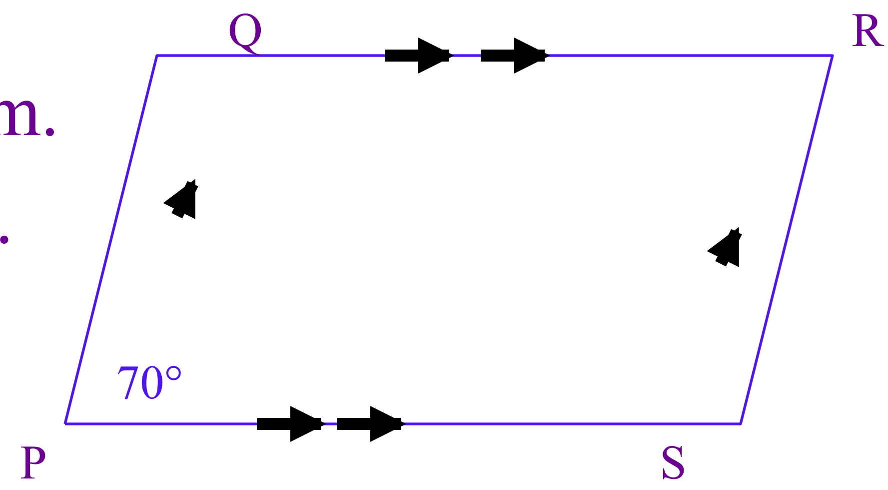
TRY YOURSELF : 9/29/15

PQRS is a parallelogram.

Find the angle measure.

a. $m\angle R$

b. $m\angle Q$

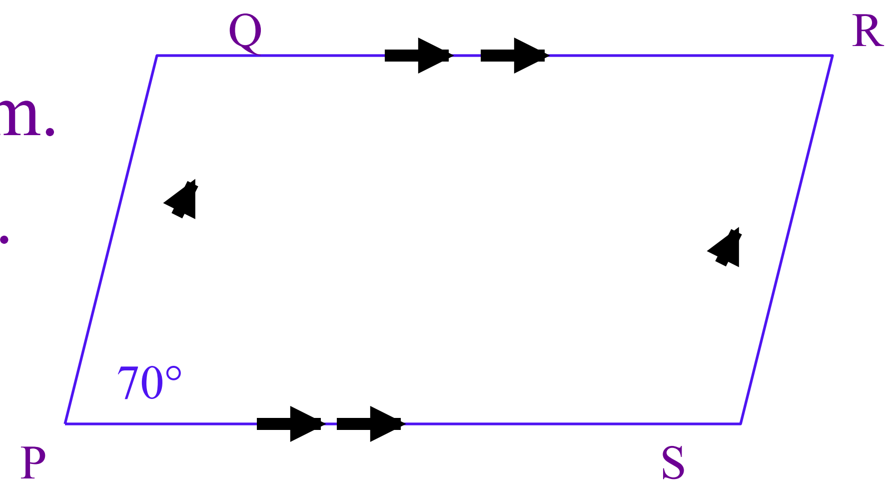


PQRS is a parallelogram.

Find the angle measure.

a. $m\angle R$

b. $m\angle Q$



a. $m\angle R = m\angle P$ Opposite angles of a are $\cong$ ▱

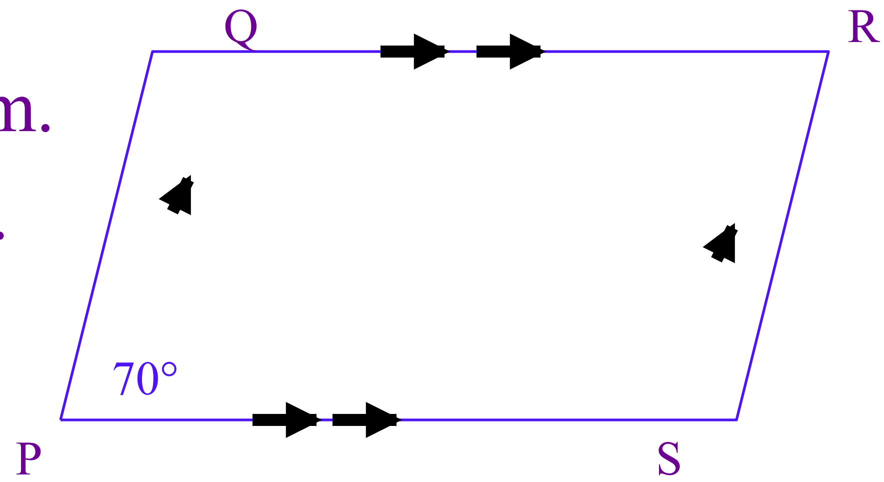
$m\angle R = 70°$ Substitute 70° for $m\angle P$.

PQRS is a parallelogram.

Find the angle measure.

a. $m\angle R$

b. $m\angle Q$



a. $m\angle R = m\angle P$ Opposite angles of a are ≅ ▱

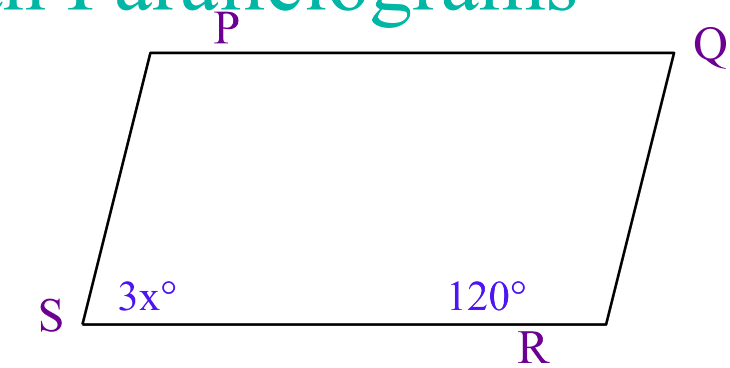
$m\angle R = 70°$ Substitute 70° for $m\angle P$.

b. $m\angle Q + m\angle P = 180°$ Consecutive ∠s of a ▱ are supplementary.

$m\angle Q + 70° = 180°$ Substitute 70° for $m\angle P$.

$m\angle Q = 110°$ Subtract 70° from each side.

Ex. 3: Using Algebra with Parallelograms

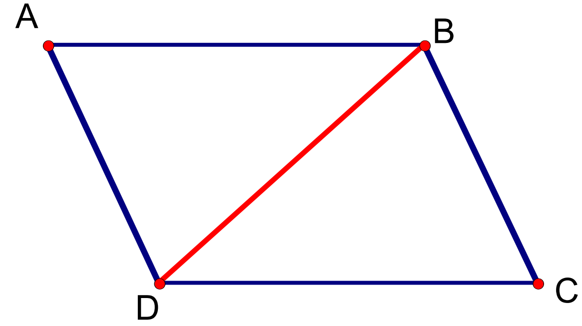


PQRS is a parallelogram. Find the value of *x*.

$m\angle S + m\angle R = 180°$	Consecutive ∠s of a □ are supplementary.
$3x + 120 = 180$	Substitute 3x for $m\angle S$ and 120 for $m\angle R$.
$3x = 60$	Subtract 120 from each side.
$x = 20$	Divide each side by 3.

TOTD

Ex. 5: Proving Theorem 6.2

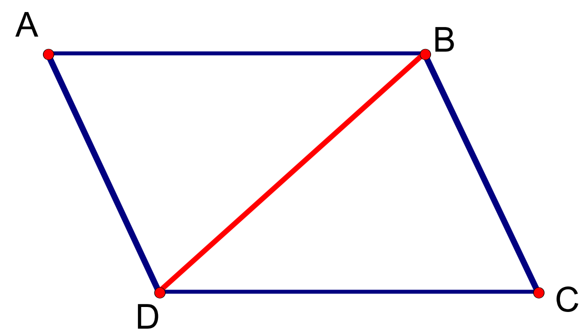


Given: ABCD is a parallelogram.

Prove $AB \cong CD$, $AD \cong CB$.

1. *ABCD is a ▱.*	1. Given
2. *Draw BD.*	
3. $AB \parallel CD$, $AD \parallel CB$.	
4. $\angle ABD \cong \angle CDB$, $\angle ADB \cong \angle CBD$	
5. $DB \cong DB$	
6. $\Delta ADB \cong \Delta CBD$	
7. $AB \cong CD$, $AD \cong CB$	

Ex. 5: Proving Theorem 6.2



Given: ABCD is a parallelogram.

Prove AB ≅ CD, AD ≅ CB.

1. *ABCD is a ▱.*	1. Given
2. *Draw BD.*	2. Through any two points, there exists exactly one line.
3. $AB \parallel CD,\ AD \parallel CB.$	
4. $\angle ABD \cong \angle CDB,\ \angle ADB \cong \angle CBD$	
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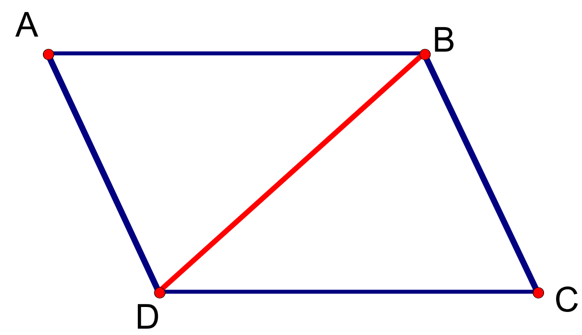

Given: ABCD is a parallelogram.

Prove AB ≅ CD, AD ≅ CB.

Statements	Reasons
1. *ABCD is a ▱.*	1. Given
2. *Draw BD.*	2. Through any two points, there exists exactly one line.
3. $AB \parallel CD$, $AD \parallel CB$.	3. Definition of a parallelogram
4. $\angle ABD \cong \angle CDB$, $\angle ADB \cong \angle CBD$	
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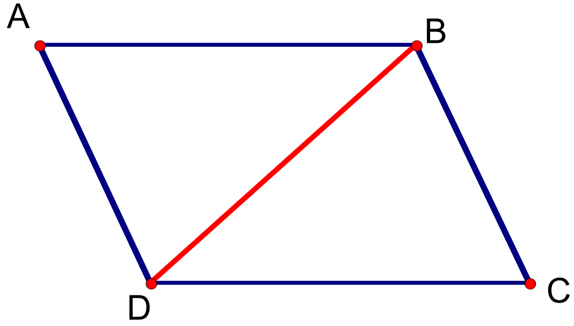

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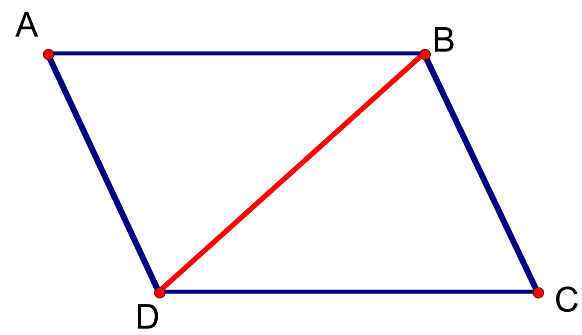

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4. $\angle ABD \cong \angle CDB$, $\angle ADB \cong \angle CBD$	4. Alternate Interior ∠s Thm.
5. $DB \cong DB$	5. Reflexive property of congruence
6. $\Delta ADB \cong \Delta CBD$	
7. $AB \cong CD$, $AD \cong CB$	

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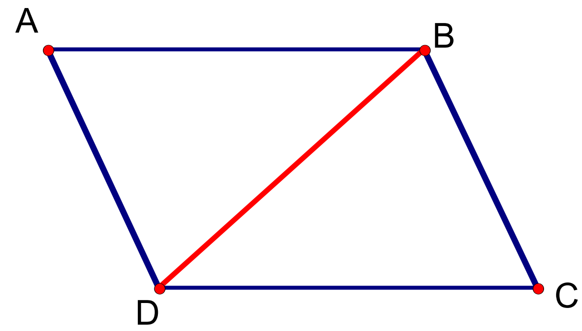
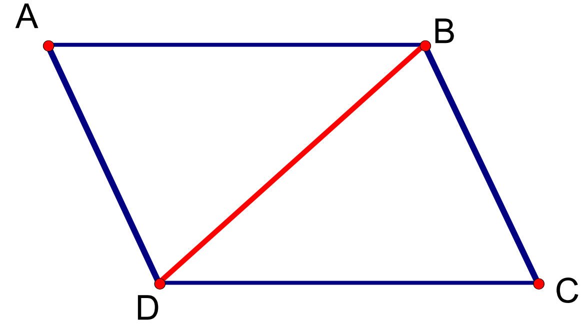


Given: ABCD is a parallelogram.

Prove AB ≅ CD, AD ≅ CB.

1. *ABCD is a ▱.*	1. Given
2. *Draw BD.*	2. Through any two points, there exists exactly one line.
3. *AB ∥ CD, AD ∥ CB.*	3. Definition of a parallelogram
4. *∠ABD ≅ ∠CDB, ∠ADB ≅ ∠CBD*	4. Alternate Interior ∠s Thm.
5. *DB ≅ DB*	5. Reflexive property of congruence
6. *ΔADB ≅ ΔCBD*	6. ASA Congruence Postulate
7. *AB ≅ CD, AD ≅ CB*	

Ex. 5: Proving Theorem 6.2



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7. $AB \cong CD$, $AD \cong CB$	7. CPCTC