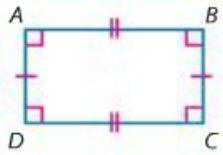
1 Properties of Rectangles A **rectangle** is a parallelogram with four right angles. By definition, a rectangle has the following properties.

- All four angles are right angles.
- Opposite sides are parallel and congruent.
- Opposite angles are congruent.
- Consecutive angles are supplementary.
- Diagonals bisect each other.

In addition, the diagonals of a rectangle are congruent.



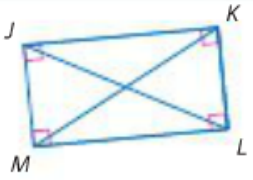
Rectangle *ABCD*

Theorem 6.13 Diagonals of a Rectangle

If a parallelogram is a rectangle, then its diagonals are congruent.

Abbreviation *If a ▱ is a rectangle, diag. are ≅.*

Example If ▱*JKLM* is a rectangle, then $\overline{JL} \cong \overline{MK}$.



Rectangle has ALL the properties of a parallelogram (7) PLUS 4 right angles and ≅ diagonals (2). → 9 total.

ALL rectangles are parallelograms, but not all parallelograms are rectangles.

2 Prove that Parallelograms are Rectangles The converse of Theorem 6.13 is also true.

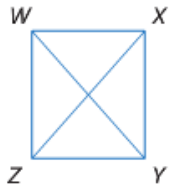
Converse: switches order of hypothesis/conclusion.

Theorem 6.14 Diagonals of a Rectangle Test for Rectangle.

If the diagonals of a parallelogram are congruent, then the parallelogram is a rectangle.

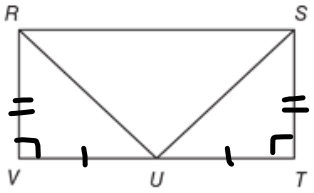
Abbreviation *If diag. of a ▱ are ≅, then ▱ is a rectangle.*

Example If $\overline{WY} \cong \overline{XZ}$ in ▱$WXYZ$, then ▱$WXYZ$ is a rectangle.



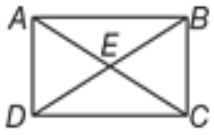
Example 1: Write a two-column proof.

PROOF: Write a two-column proof.
Given: $RSTV$ is a rectangle and U is the midpoint of $\overline{VT}$.
Prove: $\triangle RUV \cong \triangle SUT$



STATEMENTS	REASONS
1. RSTV is a rectangle and U is the midpt. of $\overline{VT}$.	1. Given
2. $\overline{UV} \cong \overline{UT}$	2. Def. of midpoint.
3. $\overline{RV} \cong \overline{ST}$	3. Opp. sides of $\square$ are $\cong$.
4. $\angle V$ and $\angle T$ are Right $\angle$s	4. Rectangle has 4 right $\angle$s.
5. $\angle V \cong \angle T$	5. All right $\angle$s are $\cong$.
6. $\triangle RUV \cong \triangle SUT$	6. SAS.

ALGEBRA Quadrilateral *ABCD* is a rectangle.



diagonals of rectangle are $\cong$.

2. If $AC = 2x + 13$ and $DB = 4x - 1$, find DB.

$AC = DB$

$2x + 13 = 4x - 1$

$-2x + 1 \quad -2x + 1$

$14 = 2x$

$\frac{14}{2} = \frac{2x}{2}$

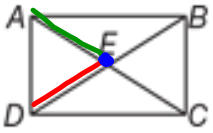
$7 = x$

$DB = 4(7) - 1$

28

$DB = 27$

ALGEBRA Quadrilateral *ABCD* is a rectangle.



3. If $DE = 6x - 7$ and $AE = 4x + 9$, find DB.

$DE = AE$

$6x - 7 = 4x + 9$

$-4x + 7 \quad -4x + 7$

$\frac{2x}{2} = \frac{16}{2}$

$x = 8$

$DB = 2DE$

$DB = 2(6 \cdot 8 - 7)$

$DB = 2(48 - 7)$

$DB = 2(41)$

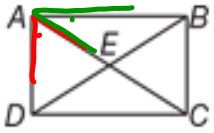
$DB = 82$

① Diagonals of rectangles are $\cong$

② Diagonals bisect each other

E = midpoint

ALGEBRA Quadrilateral *ABCD* is a rectangle.



4. If $m\angle DAC = 2x + 4$ and $m\angle BAC = 3x + 1$, find $m\angle BAC$.

Rect. has 4 right angles

$m\angle DAC + m\angle BAC = 90$

$2x + 4 + 3x + 1 = 90$

$5x + 5 = 90$

$-5 \quad -5$

$5x = 85$

$\frac{5x}{5} = \frac{85}{5}$

$x = 17$

$m\angle BAC = 3(17) + 1$

$51 + 1$

52

ALGEBRA Quadrilateral *ABCD* is a rectangle.

5. If $m\angle ABD = 7x - 31$ and $m\angle CDB = 4x + 5$, find $m\angle ABD$.

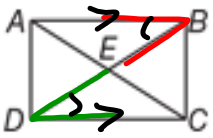
$m\angle ABD = m\angle CDB$

$7x - 31 = 4x + 5$

$-4x + 31 \quad -4x + 31$

$\frac{3x}{3} = \frac{36}{3}$

$x = 12$



alternate interior angles are $\cong$

$m\angle ABD = 7(12) - 31$

$84 - 31$

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