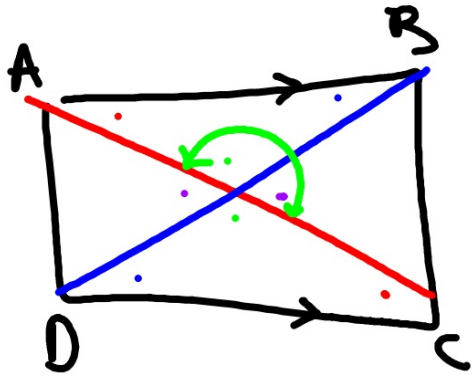
Geometry 6.4
Recognize and apply properties of rectangles
Determine whether parallelograms are rectangles

parallelogram w. 4 rt ∠'s
rectangle
activity: measure rectangles

Activity:
Label the rectangle that you have been given rect. ABCD.
Use a straight edge to draw the diagonals of the rectangle.
Label the intersection point X.

Measure and label ALL segments ~~and angles.~~
Write down 4 facts that you observe.

1. opp. sides ≅
2. diagonals int. at X
3. X is a mp
4. diag. ≅
5. diag segments ≅

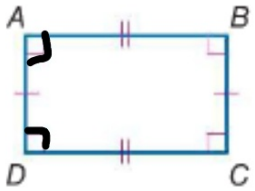


Find somebody else that had the same rectangle as yours.
Compare your findings.

## 1 Properties of Rectangles

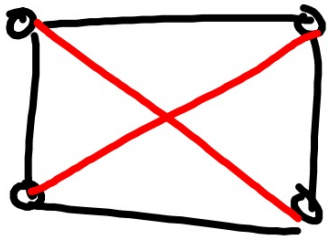
A **rectangle** is a parallelogram with four right angles. By definition, a rectangle has the following properties.

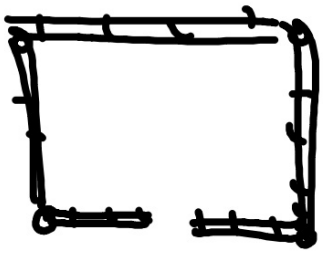
- All four angles are right angles.
- Opposite sides are parallel and congruent.
- Opposite angles are congruent.
- Consecutive angles are supplementary.
- Diagonals bisect each other.



Rectangle *ABCD*

In addition, the diagonals of a rectangle are congruent.



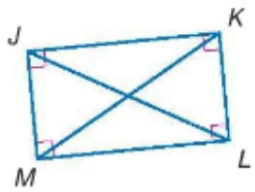


## Theorem 6.13 Diagonals of a Rectangle

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

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

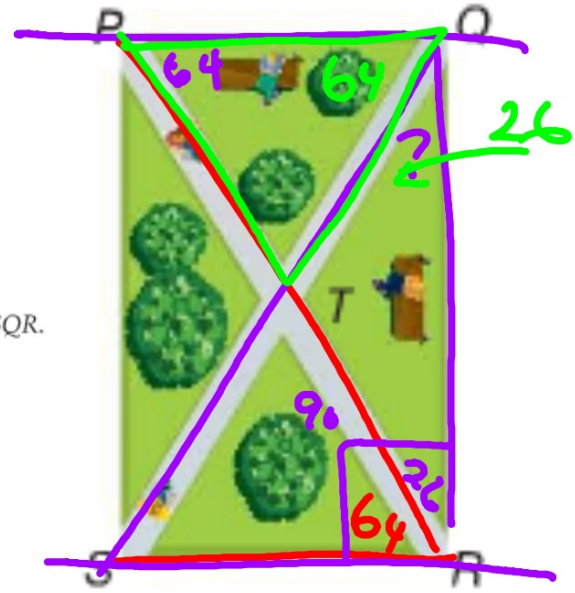
**Example** If ▱*JKLM* is a rectangle, then $\overline{JL} \cong \overline{MK}$.




You will prove Theorem 6.13 in Exercise 33.

## Real-World Example 1 Use Properties of Rectangles

**EXERCISE** A rectangular park has two walking paths as shown. If $PS = 180$ meters and $PR = 200$ meters, find $QT$.




**GuidedPractice** **Refer to the figure in Example 1.**

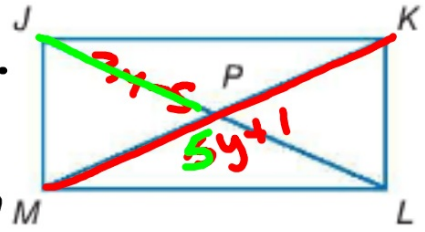
**1A.** If $TS = 120$ meters, find $PR$.

**1B.** If $m\angle PRS = 64$, find $m\angle SQR$.

**Example 2** Use Properties of Rectangles and Algebra

**ALGEBRA** Quadrilateral $JKLM$ is a rectangle. If $m\angle KJL = 2x + 4$ and $m\angle JLK = 7x + 5$, find $x$.

x=·




$2x + 4 + 7x + 5 + 90 = 180$

$9x + 99 = 180$

$\frac{9x}{9} = \frac{81}{9}$

**GuidedPractice**

**2.** Refer to the figure in Example 2. If $JP = 3y - 5$ and $MK = 5y + 1$, find $y$.

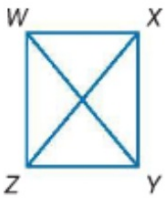
$6y - 10 = 5y + 1$

$-5y + 10 \quad -5y + 10$

$y = 11$

**Theorem 6.14** Diagonals of a 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.*

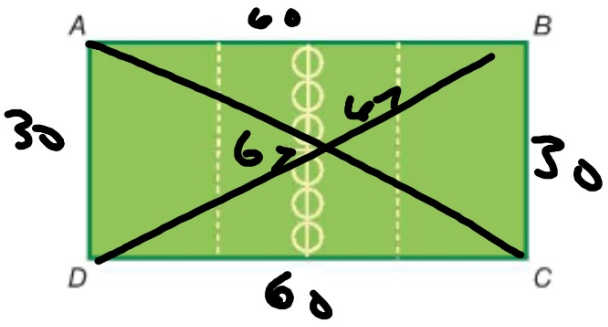
**Example** If $\overline{WY} \cong \overline{XZ}$ in ▱*WXYZ*, then ▱*WXYZ* is a rectangle.

You will prove Theorem 6.14 in Exercise 34.

Ex. you can win arguments with your spouse :)

## Real-World Example 3 Providing Rectangle Relationships

**DODGEBALL** A community recreation center has created an outdoor dodgeball playing field. To be sure that it meets the ideal playing field requirements, they measure the sides of the field and its diagonals. If $AB = 60$ feet, $BC = 30$ feet, $CD = 60$ feet, $AD = 30$ feet, $AC = 67$ feet, and $BD = 67$ feet, explain how the recreation center can be sure that the playing field is rectangular.



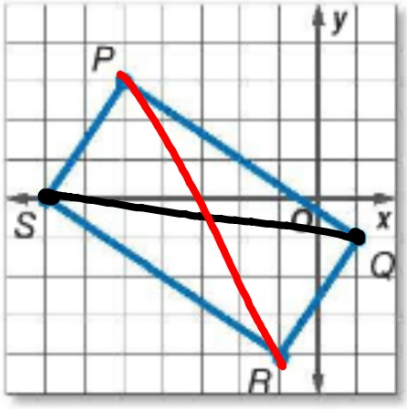
Which distance(s) would it be helpful to know?

**Example 4** Rectangles and Coordinate Geometry

**COORDINATE GEOMETRY** Quadrilateral $PQRS$ has vertices $P(-5, 3)$, $Q(1, -1)$, $R(-1, -4)$, and $S(-7, 0)$. Determine whether $PQRS$ is a rectangle by using the Distance Formula.

SQ =

PR =



6.4

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