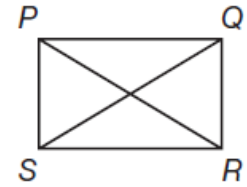


Geometry Lesson 52

Objective: TSW use properties of rectangles, rhombuses, and squares.

The diagonals of parallelograms have special properties. Recall that a rhombus is a parallelogram with four congruent sides, a rectangle is a parallelogram with four right angles, and a square shares the properties of both a rectangle and a rhombus. One property of the diagonals of a parallelogram has already been introduced: they bisect each other. Three more are introduced in this lesson.

Properties of a Rectangle: Congruent Diagonals - The diagonals of a rectangle are congruent. _____



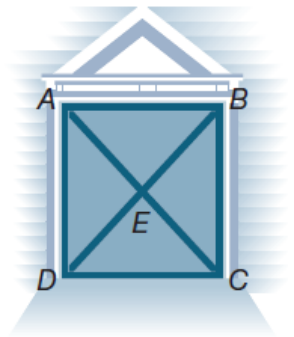
If a quadrilateral is a parallelogram, it is a rectangle if and only if the above property is true.

Example 1 Using Diagonals of a Rectangle

A rectangular barn door has diagonal braces.

If AE is 6 feet, what is the length of \overline{BD} ?

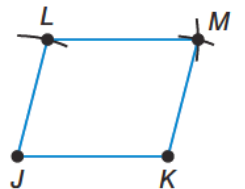
SOLUTION



Exploration: Using Construction Techniques to Draw a Rhombus

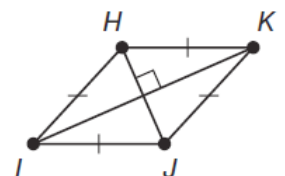
In this exploration, you will use simple construction techniques to construct a quadrilateral, then classify it. You may wish to review Construction Lab 1 before this exploration.

1. Draw \overline{JK} . Set your compass to \overline{JK} . Place the compass point at J and draw an arc above \overline{JK} . Choose and label a point L on the arc. What is the relationship between \overline{JK} and \overline{JL} ?
2. Place the compass point at L and draw an arc to the right of L .
3. Place the compass point at K and draw an arc that intersects the arc you drew in step 2. Label the point of intersection M . How are \overline{JK} , \overline{KM} , \overline{ML} , and \overline{LJ} related?
4. How do you know that the quadrilateral you have drawn is a rhombus?
5. Draw the diagonals \overline{JM} and \overline{LK} and label their point of intersection P . Measure $\angle LPM$. What can you determine about the diagonals?
6. By measuring angles, determine the relationship between the diagonals and the angles of the rhombus.



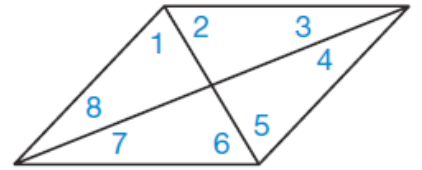
Properties of a Rhombus: Perpendicular Diagonals - The diagonals of a rhombus are perpendicular. _____

If a quadrilateral is a parallelogram, it is a rhombus if and only if the above property is true. Since a square is both a rhombus and a rectangle, its diagonals are both perpendicular and congruent.



Properties of a Rhombus: Diagonals as Angle Bisectors - Each diagonal of a rhombus bisects opposite angles. Because opposite angles of a rhombus are equal, when they are bisected by a diagonal, four congruent angles result.

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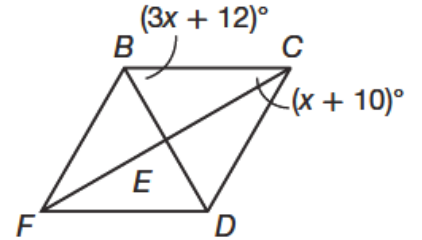
If a quadrilateral is a parallelogram, it is a rhombus if and only if the above property is true.

Example 2 Using Properties of Diagonals of a Rhombus

$BCDF$ is a rhombus. Find the measure of each angle.

a. $m\angle EBC$

SOLUTION



b. $m\angle ECD$

SOLUTION

Hint

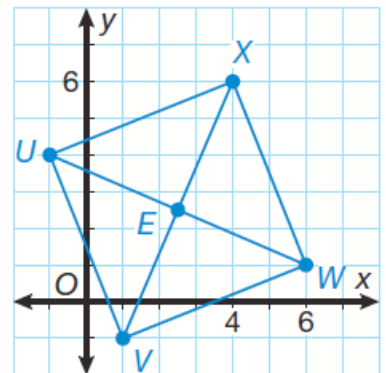
It may be possible to classify a parallelogram using more than one of the properties in this lesson.

Example 3 Using Properties of Parallelograms

$UVWX$ is a parallelogram. Decide what type of parallelogram it is by using the properties of rectangles and rhombuses.

a. Determine whether the diagonals are congruent and classify the parallelogram.

SOLUTION



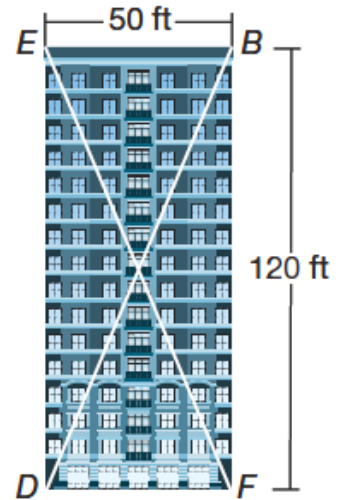
b. Determine whether the diagonals are perpendicular and classify the parallelogram.

SOLUTION

Example 4 Application: Architecture

A rectangular building is designed with steel support braces placed diagonally in the interior. Determine the length of the steel brace that will be used for diagonal \overline{BD} .

SOLUTION

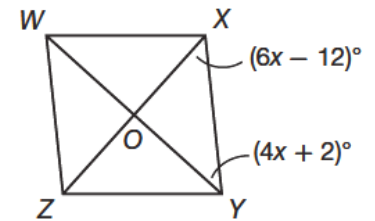


You Try!!!!

a. In rectangle $MNOP$, $MO = 5.4$ inches. What is the length of NP ?

$WXYZ$ is a rhombus. Using the diagram, answer the questions that follow.

b. Find $m\angle OXY$.



c. Find $m\angle OYZ$.

d. Quadrilateral $RSTU$ has a center point, V . If $\overline{RT} \cong \overline{SU}$, and $\overline{RT} \perp \overline{SU}$, classify the quadrilateral.

e. Architecture A building is made with a rhombus-shaped courtyard. If the longer diagonal walkway is 50 feet and the shorter one is 40 feet, what is the perimeter of the courtyard to the nearest foot?

