Geometry Name_____

Notes Section 7-4

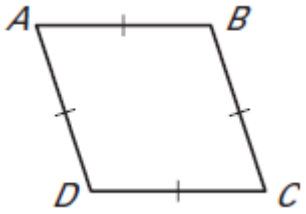
Hour _____ Date _____

GOAL: Use properties of rhombuses, rectangles, and squares.

Vocabulary

Rhombus

A **parallelogram** with four congruent Sides.

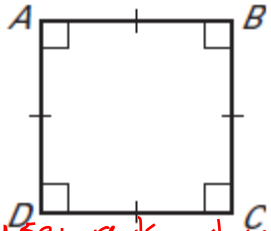


Rectangle

A **parallelogram** with four right angles.

Square

A **parallelogram** with four congruent Sides and four right angles.



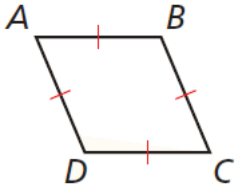
every square is a rhombus

every square is a rectangle

Corollaries

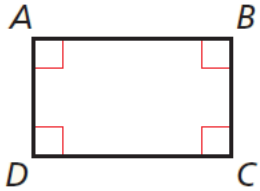
Rhombus Corollary

A quadrilateral is a rhombus if and only if it has four congruent Sides.



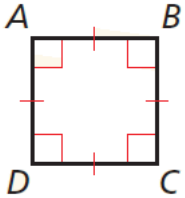
Rectangle Corollary

A quadrilateral is a rectangle if and only if it has four right angles.



Square Corollary

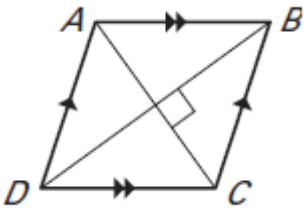
A quadrilateral is a square if and only if it is a rhombus and a rectangle.



Theorems

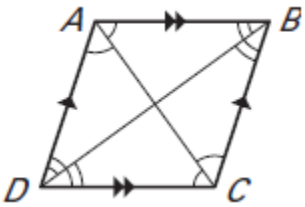
Rhombus Diagonals Theorem

A parallelogram is a rhombus if and only if its diagonals are perpendicular.



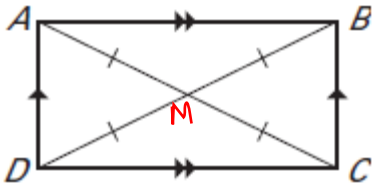
Rhombus Opposite Angles Theorem

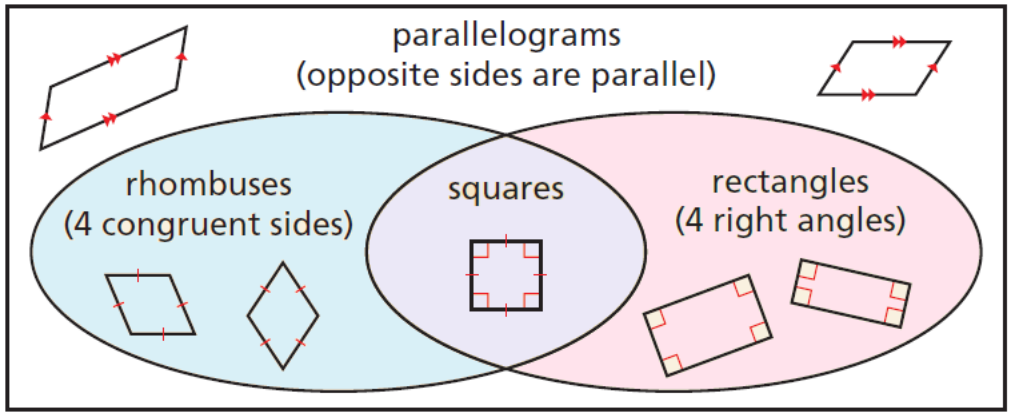
A parallelogram is a rhombus if and only if each diagonal bisects a pair of opposite angles.

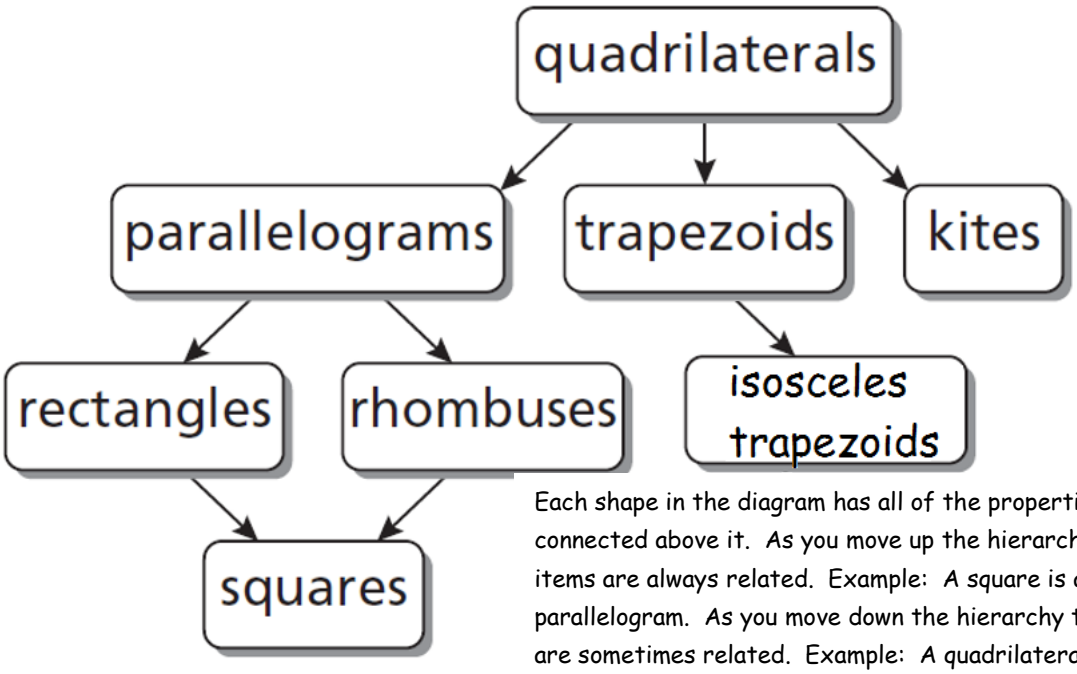


Rectangle Diagonals Theorem

A parallelogram is a rectangle if and only if its diagonals are Congruent.



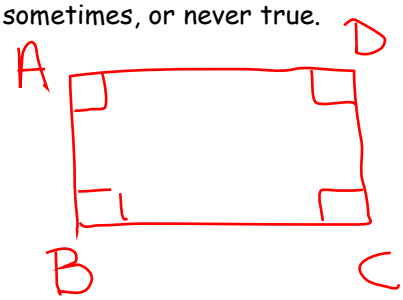




Each shape in the diagram has all of the properties of the shapes connected above it. As you move up the hierarchy the connected items are always related. Example: A square is always a parallelogram. As you move down the hierarchy the connected items are sometimes related. Example: A quadrilateral is sometimes a rectangle.

Example 1:

Given rectangle ABCD decide whether each ~~state~~ Statement is always, sometimes, or never true.



a. $\overline{AB} \cong \overline{CD}$ always

b. $\overline{AB} \cong \overline{BC}$ Sometimes

Example 2:

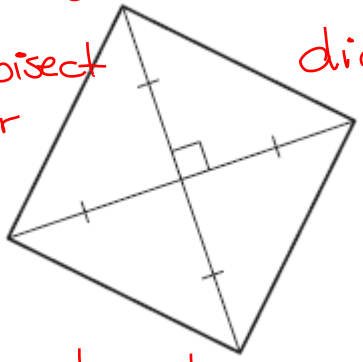
What is the BEST name for the quadrilateral shown below? Explain.

a. Square

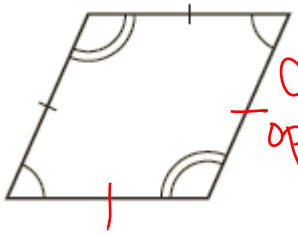
diagonals bisect each other

diagonals are $\cong$

diagonals are $\perp$



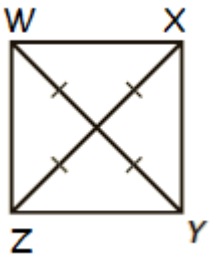
b. rhombus



2 pair of Congruent opposite $\angle$'s

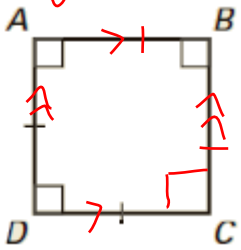
c. rectangle

diagonals bisect each other



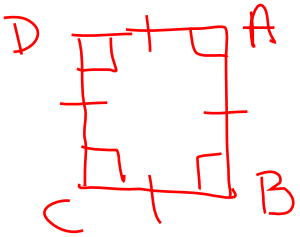
diagonals are congruent

d. Square



Example 3:

Sketch square ABCD. List 5 properties of the square.



- 2 pair of congruent opposite Sides
- 2 pair of opposite Sides parallel
- 4 right angles
- 4 Congruent Sides
- Diagonals are $\perp$ to each other

Example 4:

Name each quadrilateral-parallelogram, rectangle, rhombus, or square-for which the property is true:

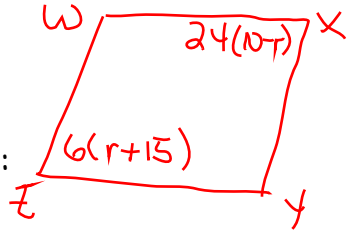
a. The diagonals bisect opposite angles. Square, rhombus

b. The diagonals are congruent. Square, rectangle

c. Opposite sides are congruent. Parallelogram, rectangle, rhombus, square

Example 5:

Given WXYZ is a rhombus. If m∠ X = 24(10 – r)° and m∠Z = 6(r + 15)°, find m∠ Y.



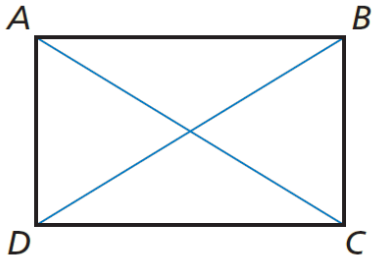
$24(10-r) = 6(r+15)$
$240-24r = 6r+90$
$240 = 30r+90$
$150 = 30r \quad r = 5$

$m\angle Z = 6(20)$
$= 120$

$m\angle Y = 180-120$
$= 60$

Example 6:

In rectangle ABCD, AC = $7x - 15$ and BD = $2x + 25$. Find the lengths of the diagonals of ABCD.



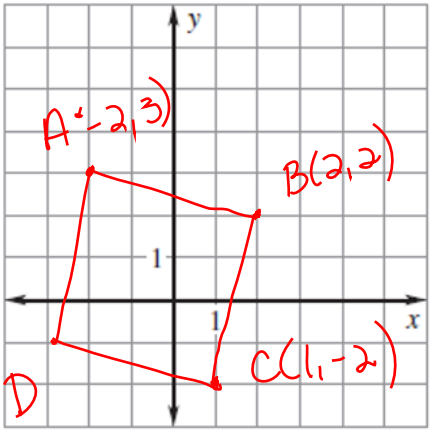
$AC = BD$
$7x-15 = 2x+25$
$5x-15 = 25$
$5x = 40 \quad x = 8$

$AC = 7(8)-15$
$= 56-15$
$= 41$

$BD = 2(8)+25$
$= 16+25 = 41$

Example 7:

Determine whether ▱ ABCD with vertices A(- 2, 3), B(2, 2), C(1, - 2), and D(- 3, - 1) is a rectangle, a rhombus, or a square. Give all names that apply.



The slope of $\overline{AB}$: $\frac{3-2}{-2-2} = \frac{1}{-4}$

The slope of $\overline{BC}$: $\frac{2-(-2)}{2-1} = 4$

The slope of $\overline{CD}$: $-\frac{2-(-1)}{1-(-3)} = -\frac{1}{4}$

The slope of $\overline{AD}$: $\frac{3-(-1)}{-2-(-3)} = 4$

$\overline{AB} \perp \overline{BC}$, $\overline{BC} \perp \overline{CD}$, $\overline{CD} \perp \overline{AD}$, $\overline{AB} \perp \overline{AD}$

ABCD has 4 right ∠'s

ABCD is a rectangle

Homework: Day 1 p. 393 # 1 - 39 Odd

Day 2 p. 394 # 41 - 77 Odd, 85, 87

$AB = \sqrt{(-2-2)^2 + (3-2)^2} = \sqrt{(-4)^2 + 1^2} = \sqrt{16+1} = \sqrt{17}$

$BC = \sqrt{(2-1)^2 + (2-(-3))^2} = \sqrt{1^2 + 4^2} = \sqrt{17}$

$DC = \sqrt{17}$
$AD = \sqrt{17}$
} ABCD is a parallelogram, opposite sides are congruent

ABCD has 4 congruent sides

ABCD is a rhombus and a square.