Unit 5.5 - Proving Rhombus, Rectangle, Square
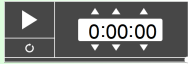
Determine whether the following quadrilaterals are parallelograms. State your reason.

a.)   YES!   b.)   NO!   c.)   NO!   d.)   YES!

1. OPP. SIDES ||
2. OPP. SIDEZ ≅
3. OPP. ∠S ≅
4. CONSEC. ∠S SUPP
5. DIAG DIS.

1 PAIR OPP. SIDES ≅ & ||

Properties of Quadrilaterals

Quadrilateral
1.) 4 Sided Polygon
2.) Sum of the Angles is 360 degress

Parallelogram
1.) Both Pairs of Opposite Sides Parallel
2.) Both Pairs of Opposite Sides Congruent
3.) Opposite Angles Congruent
4.) Consecutive Angles Supplementary
5.) Diagonals Bisect Each Other

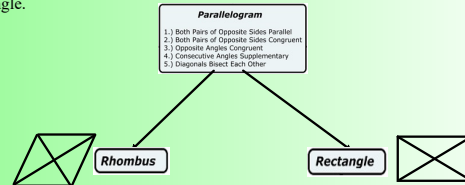**Parallelogram** → **Rhombus**, **Rectangle**
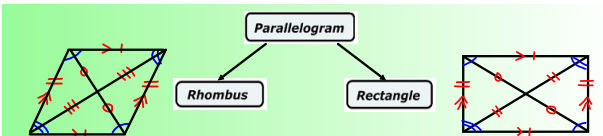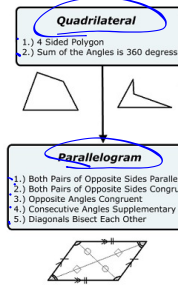
Rhombus and Rectangle

- A rhombus and rectangle are two specific types of parallelograms.

- Both shapes possess all 5 properties of a parallelogram, plus a few more!

How many of the properties of a rhombus and a rectangle can you come up with? Some are brand new, while some are extensions of those from a parallelogram. See what you can find!

Group Exploration
1.) Using a ruler and protractor, measure all segments and angles in each polygon.

2.) Using this information, come up with possible properties for a rhombus and a rectangle.
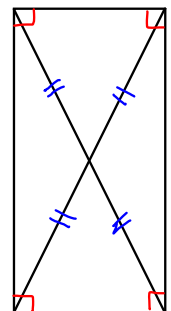
Parallelogram
1.) Both Pairs of Opposite Sides Parallel
2.) Both Pairs of Opposite Sides Congruent
3.) Opposite Angles Congruent
4.) Consecutive Angles Supplementary
5.) Diagonals Bisect Each Other

Rhombus   **Rectangle**

Properties of a Rhombus

1. All sides congruent

2. Diagonals are perpendicular bisectors of each other

3. Diagonals bisect outer angles
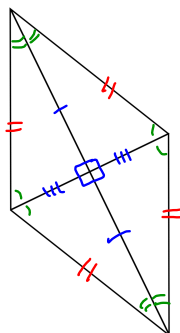
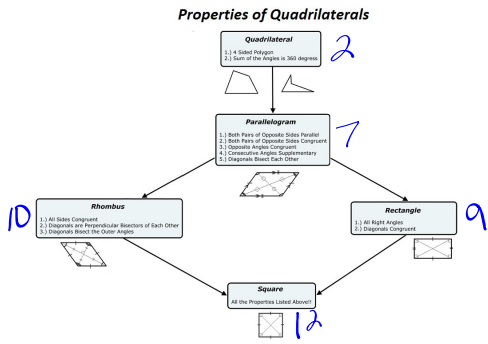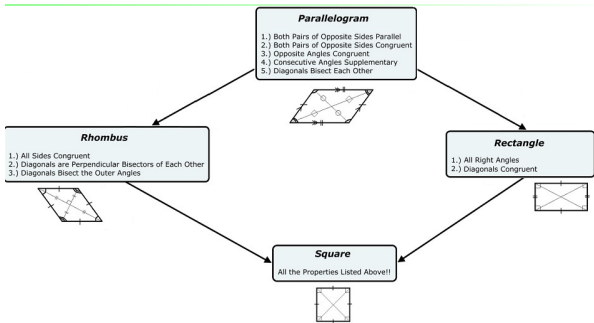### Properties of a Rectangle

1. All right angles

2. Diagonals congruent

Unit 5.5 - Proving Rhombus, Rectangle, Square

Properties of Quadrilaterals

Quadrilateral
1.) 4 Sided Polygon
2.) Sum of the Angles is 360 degrees

2

Parallelogram
1.) Both Pairs of Opposite Sides Parallel
2.) Both Pairs of Opposite Sides Congruent
3.) Opposite Angles Congruent
4.) Consecutive Angles Supplementary
5.) Diagonals Bisect Each Other

7

Rhombus
1.) All Sides Congruent
2.) Diagonals are Perpendicular Bisectors of Each Other
3.) Diagonals Bisect the Outer Angles

10

Rectangle
1.) All Right Angles
2.) Diagonals Congruent

9

Square
All the Properties Listed Above!!

12

Parallelogram
1.) Both Pairs of Opposite Sides Parallel
2.) Both Pairs of Opposite Sides Congruent
3.) Opposite Angles Congruent
4.) Consecutive Angles Supplementary
5.) Diagonals Bisect Each Other

Rhombus
1.) All Sides Congruent
2.) Diagonals are Perpendicular Bisectors of Each Other
3.) Diagonals Bisect the Outer Angles

Rectangle
1.) All Right Angles
2.) Diagonals Congruent

Square
All the Properties Listed Above!!

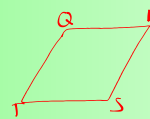**Example #1** — **Using Properties of Special Quadrilaterals**

For any rhombus $QRST$, decide whether the statement is *always* or *sometimes* true. Draw a diagram and explain your reasoning.

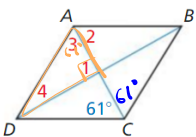**a.** $\angle Q \cong \angle S$ (A)

b. $\angle Q \cong \angle R$ (S)?

RHOM → SQUARE
· $\angle$s ADD $= 360°$
· OPP. $\angle$s $\cong$
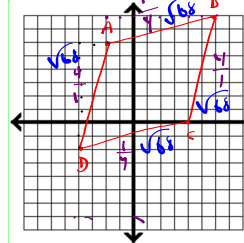· CONSEC. $\angle$s SUPP.

Example #2 — **Finding Angle Measures in a Rhombus**

Find the measures of the numbered angles in rhombus $ABCD$.

$\angle 1 = 90°$
$\angle 2 = 61°$
$\angle 3 = 61°$
$\angle 4 = 29°$

Example #5 — **Identifying a Parallelogram in the Coordinate Plane**   6th Period

Decide whether $\square ABCD$ with vertices $A(-2, 6)$, $B(6, 8)$, $C(4, 0)$, and $D(-4, -2)$ is a *rectangle*, a *rhombus*, or a *square*.
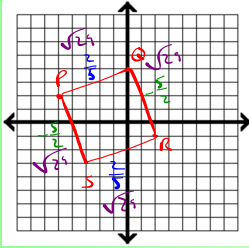
$\square \Rightarrow$ OPP. SIDES ||
RHOM → ALL SIDES $\cong$ ($\sqrt{68}$)
NOT RECT → NO OPP. PERP. SLOPES
NOT SQU

RHOMBUS

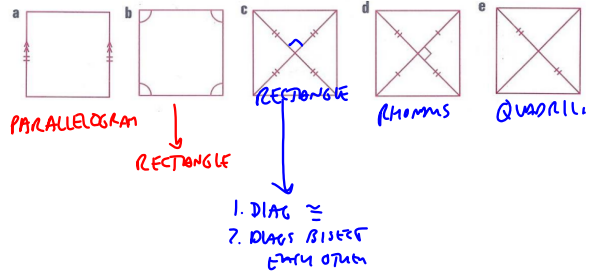# Unit 5.5 - Proving Rhombus, Rectangle, Square

Example #6	Identifying a Parallelogram in the Coordinate Plane

Decide whether □PQRS with vertices $P(-5, 2)$, $Q(0, 4)$, $R(2, -1)$, and $S(-3, -3)$ is a *rectangle*, a *rhombus*, or a *square*.

⟹ OPP. SIDES ‖

RHOM ⟹ ALL SIDES ≅

RECT ⟹ OPP. RECP. SLOPES

SQUARE ⟹ RECT + RHOM

SQUARE

13 What is the most descriptive name for each quadrilateral below? 2ND PERIOD

a b c d e

PARALLELOGRAM

RECTANGLE

RECTANGLE

RHOMBUS

QUADRILL.

1. DIAG ≅
2. DIAGS BISECT EACH OTHER

In Exercises 29–34, name each quadrilateral—
parallelogram, rectangle, rhombus, or square—for
which the statement is always true.

29. It is equiangular.   Rectangle   Square

30. It is equiangular and equilateral.   Square

31. The diagonals are perpendicular.   Rhombus   Square

32. Opposite sides are congruent.   Parallelogram   Rectangle   Rhombus   Square

33. The diagonals bisect each other.   Parallelogram   Rectangle   Rhombus   Square

34. The diagonals bisect opposite angles.   Rhombus   Square

Parallelogram

Rhombus

Rectangle

Square