

Day 2 – Properties of Rhombi, Squares, Trapezoids and Kites

In the previous lesson, we explored properties of parallelograms. To reiterate, a **parallelogram** is a type of quadrilateral that has **two pairs of opposite sides that are parallel**.

There are 5 theorems associated with PARALLELOGRAMS:

- Opposite sides are congruent
- Diagonals bisect each other
- Opposite angles are congruent
- Diagonals form two congruent triangles
- Consecutive angles are supplementary


Parallelograms can be broken down into three more specific types of quadrilaterals (rectangles, rhombi, and squares) with the same properties as parallelograms. Today, we will specifically discuss Rhombi and Squares.

A **Rhombus** is a parallelogram with 4 congruent sides.

A **Square** is a parallelogram with 4 congruent sides and 4 right angles.

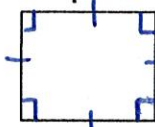
As we learned with rectangles, these specific types of parallelograms also have some properties of their own:

Rhombus



- All properties of parallelograms
- Diagonals are perpendicular
- Diagonals bisect each other *other opposite angles*
- Four sides are congruent

Square



- All properties of parallelograms
- Four right angles
- Four congruent sides
- Diagonals are congruent, perpendicular, and bisect each other

In addition to the quadrilaterals above, we will discuss three more: Kites, Trapezoids, and Isosceles Trapezoids. Let us define them.

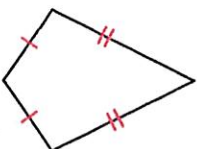
A **Kite** is a quadrilateral with **2 pairs of consecutive congruent sides**, but opposites sides are NOT parallel.

A **Trapezoid** is a quadrilateral with **1 pair of parallel sides called bases**.

A **Isosceles Trapezoid** is a quadrilateral with **1 pair of parallel sides called bases and non-parallel sides are congruent** (legs).

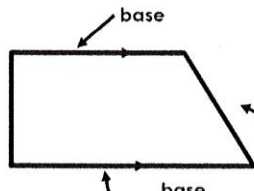
Special Properties:

Kite




- Diagonals are perpendicular
- *one diagonal is bisected by the other*

Trapezoid



- Have only one pair of opposite sides that are parallel

Isosceles Trapezoid



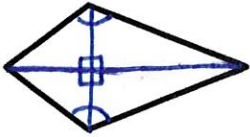
- Diagonals are congruent

Theorems of Quadrilaterals:

Kites:

If a quadrilateral is a kite, then its diagonals are perpendicular.

If a quadrilateral is a kite, then exactly one pair of opposite angles are congruent.



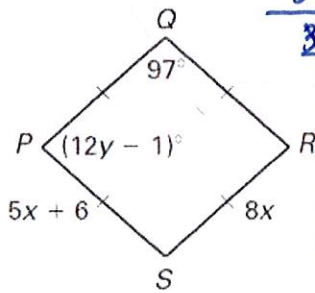
Trapezoids:

If a trapezoid is isosceles, then each pair of base angles is congruent.



Practice:

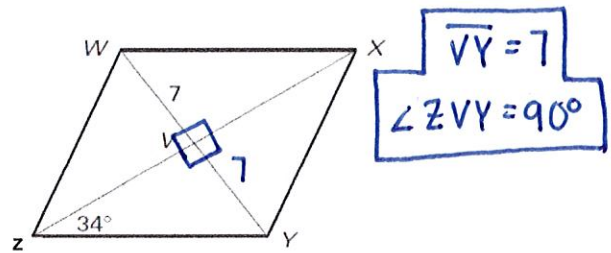
1. Solve for x and y.



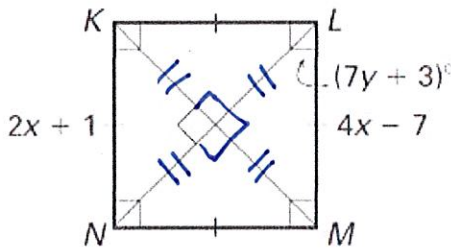
$$\begin{aligned} 8x &= 5x + 6 \\ -5x & \quad -5x \\ \hline 3x &= 6 \\ \frac{3x}{3} &= \frac{6}{3} \\ \boxed{x} &= \boxed{2} \end{aligned}$$

$$\begin{aligned} 12y - 1 + 97 &= 180 \\ 12y + 96 &= 180 \\ -96 & \quad -96 \\ \hline 12y &= 84 \\ \frac{12y}{12} &= \frac{84}{12} \\ \boxed{y} &= \boxed{7} \end{aligned}$$

2. Find the length of VY and the measure of $\angle ZVY$.



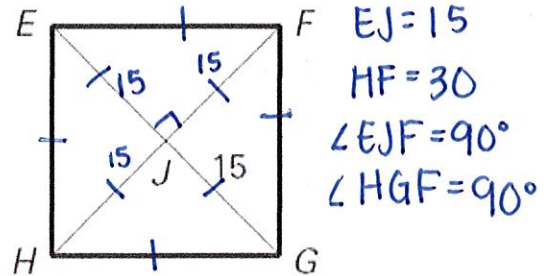
3. Solve for x and y.



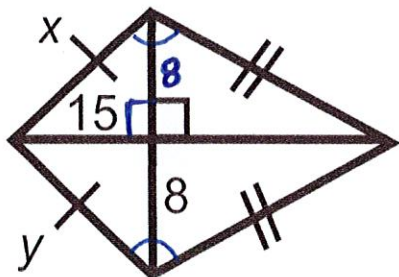
$$\begin{aligned} 2x + 1 &= 4x - 7 \\ -4x & \quad -4x \\ \hline -2x + 1 &= -7 \\ -1 & \quad -1 \\ \hline -2x &= -8 \\ -x & \quad -2 \\ \hline \boxed{x} &= \boxed{4} \end{aligned}$$

$$\begin{aligned} 7y + 3 &= 45 \\ -3 & \quad -3 \\ \hline 7y &= 42 \\ \frac{7y}{7} &= \frac{42}{7} \\ \boxed{y} &= \boxed{6} \end{aligned}$$

4. Find the length of EJ, HF, $m\angle EJF$, and $m\angle HGF$.



5. Solve for x.



Pythagorean Theorem:

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 8^2 + 15^2 &= c^2 \\ \sqrt{289} &= \sqrt{c^2} \\ 17 &= c \\ \boxed{c} &= \boxed{17} \end{aligned}$$

$$\begin{aligned} \boxed{x} &= \boxed{17} \\ \boxed{y} &= \boxed{17} \end{aligned}$$