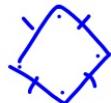


## Geometry 6.5



Recognize and apply the properties of rhombi and squares  
Determine whether a given quadrilateral is a rectangle,  
rhombus or square

parallel w 4  $\cong$  sides

rhombus (*diamond is not a geometry term!*)

square

diagonal

perpendicular

converse

little book--rhombus, square

activ: exploragons

Rectangle

Book

(name)

1. PolygoNS

Sides 3-10

2. Paralleogram

p.403

3. Rectangle

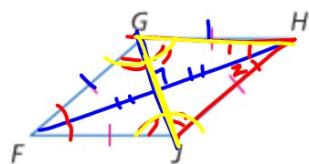
4. Rhombus

5. Square

~~Exploragons  
parallelogram  
rhombus~~

## 1 Properties of Rhombi and Squares

A **rhombus** is a parallelogram with all four sides congruent. A rhombus has all the properties of a parallelogram and the two additional characteristics described in the theorems below.



- ✓ 1. Diagonals of a rhombus are perpendicular.
- ✓ 2. Diagonals of a rhombus form congruent triangles.
- ✓ 3. Diagonals of a rhombus bisect opposite angles.

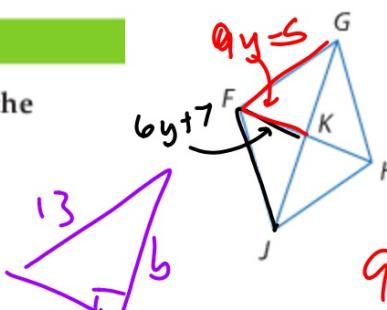
### Example 1 Use Properties of a Rhombus

The diagonals of rhombus  $FGHJ$  intersect at  $K$ . Use the given information to find each measure or value.

a. If  $m\angle FJH = 82$ , find  $m\angle KHJ$ .  $= 49^\circ$

$$\begin{aligned} x &= 2,75 \\ 5x - 2 &= x + 9 \\ -x + 2 &= -x + 2 \\ 4x &= 11 \end{aligned}$$

b. ALGEBRA If  $GH = x + 9$  and  $JH = 5x - 2$ , find  $x$ .


$$\begin{aligned} 9y - 5 &= 6y + 7 \\ -6y + 5 &= -6y + 5 \\ 3y &= 12 \\ y &= 4 \end{aligned}$$
$$\begin{aligned} 2s + b^2 &= 169 \\ -2s &= -2s \\ b^2 &= 144 \\ b &= 12 \end{aligned}$$

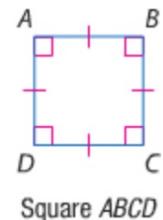
### Guided Practice

Refer to rhombus  $FGHJ$  above.

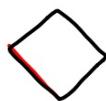
1A. If  $FK = 5$  and  $FG = 13$ , find  $KJ$ .  $= 12$

1B. ALGEBRA If  $m\angle JFK = 6y + 7$  and  $m\angle KFG = 9y - 5$ , find  $y$ .

A **square** is a parallelogram with four congruent sides and four right angles. Recall that a parallelogram with four right angles is a rectangle, and a parallelogram with four congruent sides is a rhombus. Therefore, a parallelogram that is both a rectangle and a rhombus is also a square.



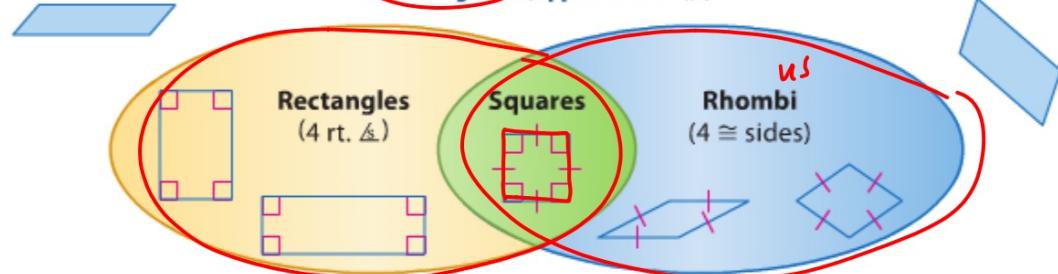
Square  $ABCD$



### ConceptSummary Parallelograms



Parallelograms (Opp. sides are  $\parallel$ .)

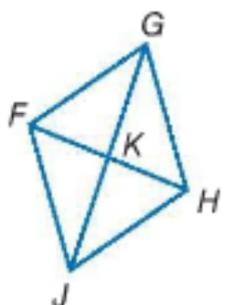


## Guided Practice

Refer to rhombus  $FGHJ$  above.

**1A.** If  $FK = 5$  and  $FG = 13$ , find  $KJ$ .

**1B. ALGEBRA** If  $m\angle JFK = 6y + 7$  and  $m\angle KFG = 9y - 5$ , find  $y$ .

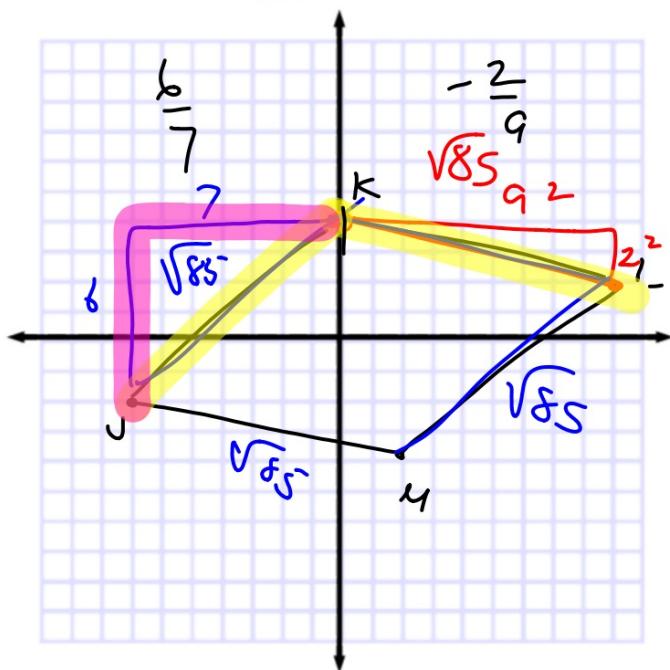




#### Example 4 Classify Quadrilaterals Using Coordinate Geometry

**COORDINATE GEOMETRY** Determine whether  $\square JKLM$  with vertices  $J(-7, -2)$ ,  $K(0, 4)$ ,  $L(9, 2)$ , and  $M(2, -4)$  is a *rhombus*, a *rectangle*, or a *square*. List all that apply. Explain.

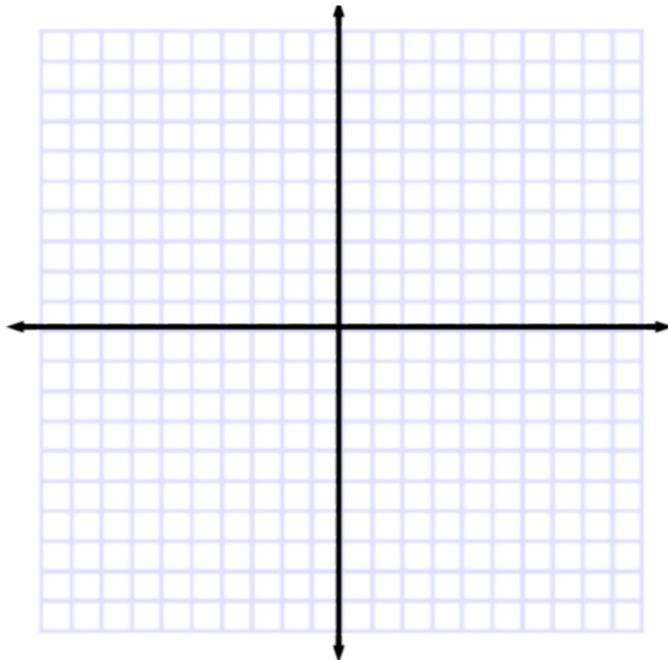
*Y/N* *Y/N* *Y/N*



Graph and make a preliminary decision.  
Do the math and prove it.  
(Can't go by eyeball)

### Guided Practice

4. Given  $J(5, 0)$ ,  $K(8, -11)$ ,  $L(-3, -14)$ ,  $M(-6, -3)$ , determine whether parallelogram  $JKLM$  is a *rhombus*, a *rectangle*, or a *square*. List all that apply. Explain.



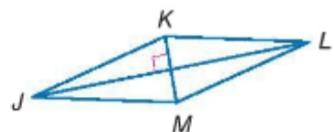
**StudyTip****Common Misconception**

Theorems 6.17, 6.18, and 6.19 apply only if you already know that a quadrilateral is a parallelogram.

**Theorems Conditions for Rhombi and Squares**

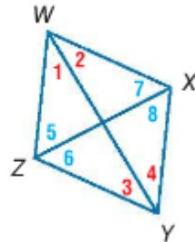
**6.17** If the diagonals of a parallelogram are perpendicular, then the parallelogram is a rhombus. (Converse of Theorem 6.15)

**Example** If  $\overline{JL} \perp \overline{KM}$ , then  $\square JKLM$  is a rhombus.



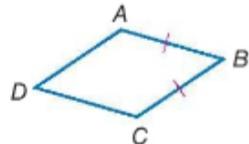
**6.18** If one diagonal of a parallelogram bisects a pair of opposite angles, then the parallelogram is a rhombus. (Converse of Theorem 6.16)

**Example** If  $\angle 1 \cong \angle 2$  and  $\angle 3 \cong \angle 4$ , or  $\angle 5 \cong \angle 6$  and  $\angle 7 \cong \angle 8$ , then  $\square WXYZ$  is a rhombus.



**6.19** If one pair of consecutive sides of a parallelogram are congruent, the parallelogram is a rhombus.

**Example** If  $\overline{AB} \cong \overline{BC}$ , then  $\square ABCD$  is a rhombus.

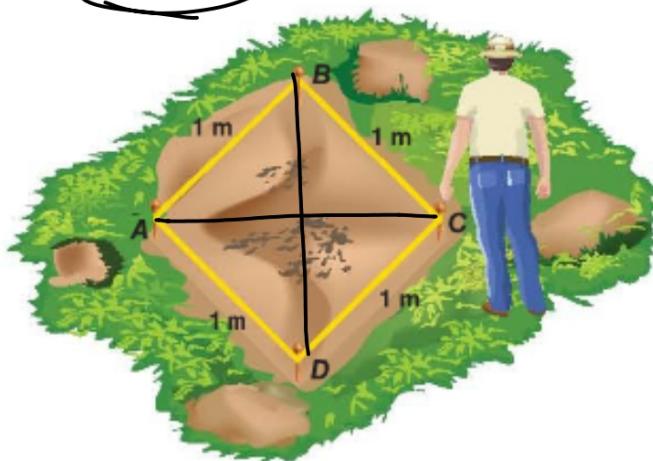


**6.20** If a quadrilateral is both a rectangle and a rhombus, then it is a square.



### Real-World Example 3 Use Conditions for Rhombi and Squares

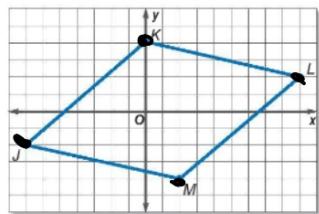
**ARCHAEOLOGY** The key to the successful excavation of an archaeological site is accurate mapping. How can archaeologists be sure that the region they have marked off is a 1-meter by 1-meter square?





#### Example 4 Classify Quadrilaterals Using Coordinate Geometry

**COORDINATE GEOMETRY** Determine whether  $\square JKLM$  with vertices  $J(-7, -2)$ ,  $K(0, 4)$ ,  $L(9, 2)$ , and  $M(2, -4)$  is a *rhombus*, a *rectangle*, or a *square*. List all that apply. Explain.



**StudyTip**

**Square and Rhombus**

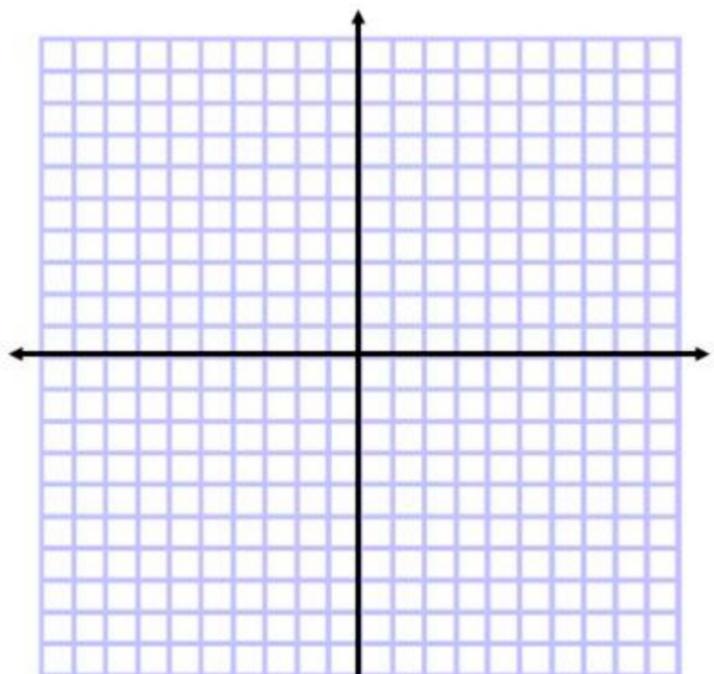
A square is a rhombus, but a rhombus is not necessarily a square.

*Every square is a rhombus.*

*Not every rhombus is a square.*

**Guided Practice**

4. Given  $J(5, 0)$ ,  $K(8, -11)$ ,  $L(-3, -14)$ ,  $M(-6, -3)$ , determine whether parallelogram  $JKLM$  is a *rhombus*, a *rectangle*, or a *square*. List all that apply. Explain.



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6. S p 435  
7-33 odd  
55-65 odd