**Activity 2.4.2 Kites in the Coordinate Plane**

A **kite** is a quadrilateral with two pairs of adjacent sides congruent . You can use the coordinates of the vertices of a quadrilateral and the *distance formula* to determine whether or not a quadrilateral is a kite.

If you come to the conclusion that a figure is a kite, then you can test the slopes of the diagonals of the kite to see what relationship is formed. In the questions below you will use the distance formula to determine whether or not the figure is a kite.

**Here are some formulas you may want to recall:**

Distance formula = $\sqrt{\left(x\_{2}-x\_{1}\right)^{2}+\left(y\_{2}-y\_{1}\right)^{2}}$ Slope formula = $\frac{\left(x\_{2}-x\_{1}\right)}{\left(y\_{2-}y\_{1}\right)}$

Slopes of parallel lines are equal.

Slopes of perpendicular lines are the opposite reciprocals of each other. For example lines with slopes -5 and $\frac{1}{5}$ are perpendicular; therefore two lines with these slopes create a right angle.

1. Plot the vertices of quadrilateral *OBCD* and find the lengths of each side using the distance formula.

**For all problems below:**

a. Leave answers exact in square root form if necessary. (For example: $\sqrt{37}$ )

$O\left(0,0\right), B\left(2,4\right), C\left(4,4\right), D(4,2)$ *OB* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 *OD* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 *BC* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

  *DC* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_



b. Which pairs of sides are congruent?

c. Are these pairs of sides adjacent?

d. Is OBCD a kite? Explain.

e. Does OBCD have any lines of symmetry?

 If so, draw them on the figure.

e. Find the slopes of $\overbar{OC}and \overbar{BD.}$

Slope of OC = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Slope of BD = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

f. What is the relationship between $\overbar{OC}and \overbar{BD}$? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Draw quadrilateral *QUAD* with the given vertices. Then classify the quadrilateral by finding the length of the sides using the distance formula.

$Q\left(0,0\right), U\left(4,0\right), A\left(3,6\right), D(-1,6)$ *QU* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 *AU* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 *DA* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 *DQ* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

B Which pairs of sides are congruent?



c. Are these pairs of sides adjacent?

d. Is OBCD a kite? Explain.

e. Find the slopes of the four sides.

f. Classify *QUAD*. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain your reasoning.

g. Are there any lines of symmetry?\_\_\_\_\_\_

If so, draw them on the figure.

h. Find the slopes of $\overbar{DU}and \overbar{AQ.}$

Slope of $\overbar{DU}$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Slope of $\overbar{AQ}$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

i. What is the relationship between $\overbar{DU}and \overbar{AQ}$? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Draw quadrilateral *POLY* with the given vertices. Then classify the quadrilateral by finding the length of the sides using the distance formula.

$P\left(-3,0\right), O\left(0,3\right), L\left(3,0\right), Y(0,-3)$ *PO* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

  *LO* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

 *PY* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

  *LY* = \_\_\_\_\_\_\_\_\_\_\_\_\_\_



b. Classify *POLY* Explain your reasoning.

c. Are there other ways to classify *POLY?* Explain.

d. Are there any lines of symmetry?\_\_\_\_\_\_

If so, draw them on the figure.

e. Find the slopes of $\overbar{OY}and \overbar{PL.}$

Slope of $\overbar{OY}$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Slope of$ \overbar{PL}$ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

f. What is the relationship between $\overbar{OY}and \overbar{PL}$? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Conclusions:**

a. After completing the activity, we can see that in kites, the diagonals are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

b. In a kite, we can also see that the line of symmetry is also a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

c. We also saw that a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a type of kite.

d. Two pairs of adjacent sides of a kite are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.