MAT-222-840

Activities for Chapter 6

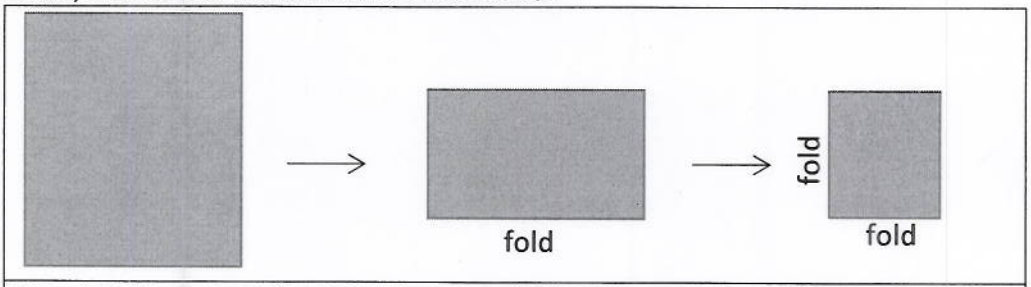
Name: Solutions

Summer 2016

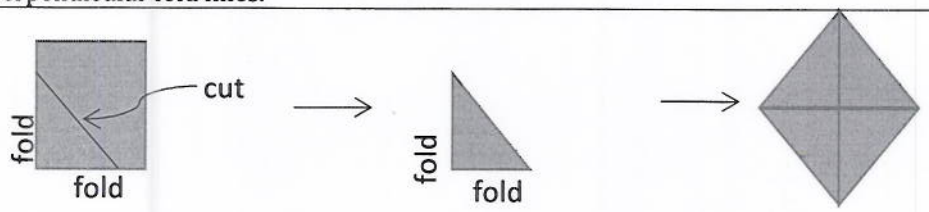
Date: _____

Activity 1: Folding Rhombuses

To create a rhombus, follow the next set of instructions:



Step 1: Fold a rectangular piece of paper in half and then in half again, creating perpendicular fold lines.



Step 2: Draw a line from anywhere on one fold to anywhere on the perpendicular fold. Cut along the line you drew. When you unfold, you will have a rhombus.

1. By referring to the definition of a rhombus, explain *why* the method described must always create a rhombus.

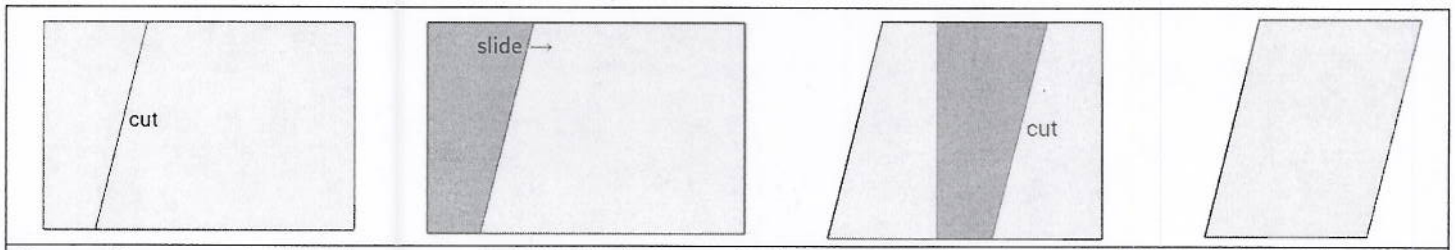
   Each of the four sides was created by the same cut. This means they are all the same length.

2. What properties does your rhombus have? Find as many as you can.

   - sides are the same length
   - diagonals bisect each other
   - diagonals are perpendicular
   - opposite angles are congruent
   - consecutive angles are supplementary
   - opposite sides are parallel

Activity 2: Folding Parallelograms

To create a parallelogram, start with a rectangular piece of paper of any size. Follow the next set of steps.



Draw a line segment connecting two opposite sides of a rectangle. Cut along the line segment. Put the piece back (shown shaded) and slide it over as shown. Mark and cut at the leading edge of the slid-over piece.

What properties does your parallelogram have?

- opposite sides are congruent
- opposite angles are congruent
- opposite sides are parallel
- diagonals bisect each other
- consecutive angles are supplementary

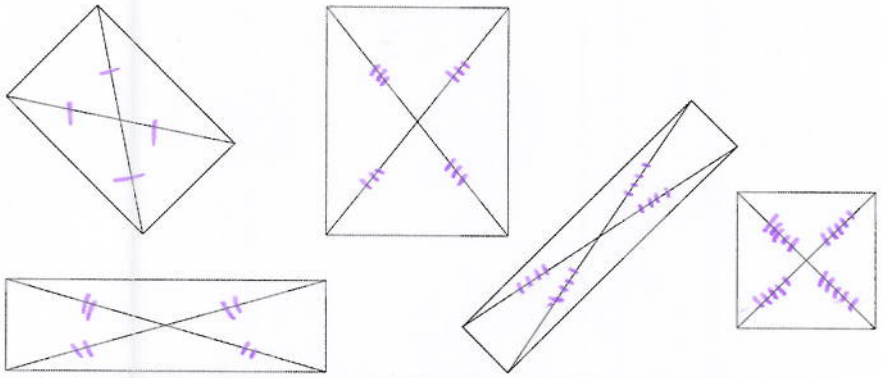
Activity 3: Investigating Diagonals of Quadrilaterals

On this page there are many examples of different kinds of quadrilaterals and their diagonals. Look carefully at the diagonals and do the following:

- Observe and measure the angles that the diagonals make with each other.
- Observe where the diagonals meet: where is this point located on the diagonals?
- Compare the length of the two diagonals.

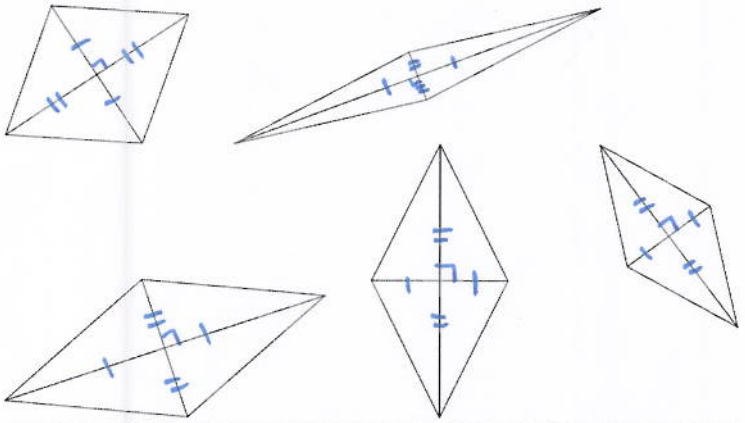
What do the diagonals of rectangles all have in common? What do the diagonals of rhombuses all have in common? What about diagonals of general quadrilaterals?

Rectangles:



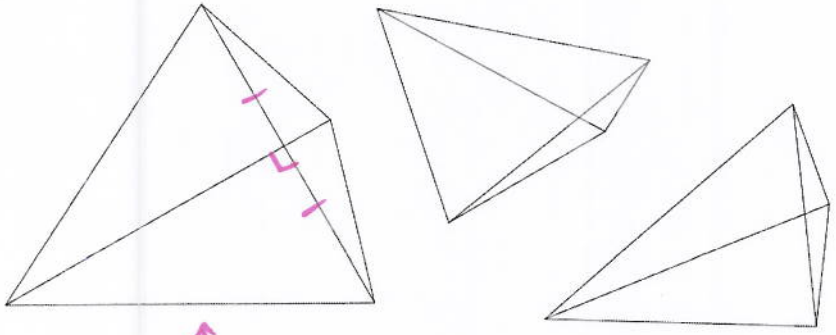
diagonals are congruent & bisect each other

Rhombuses:



diagonals bisect each other & meet at right angles.

Other Quadrilaterals:



kite

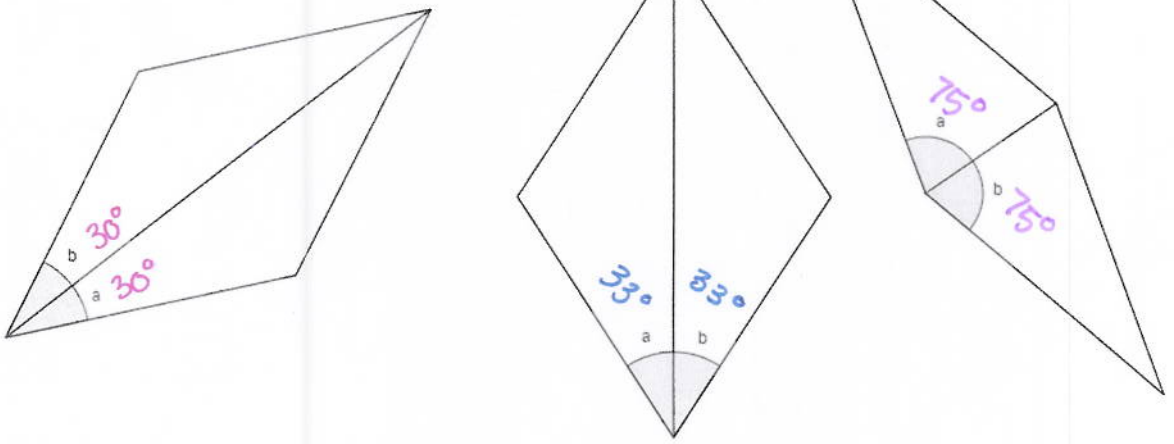
diagonals are not necessarily congruent, they do not bisect each other, and do not necessarily meet at right angles.

Activity 4: More Investigating Diagonals

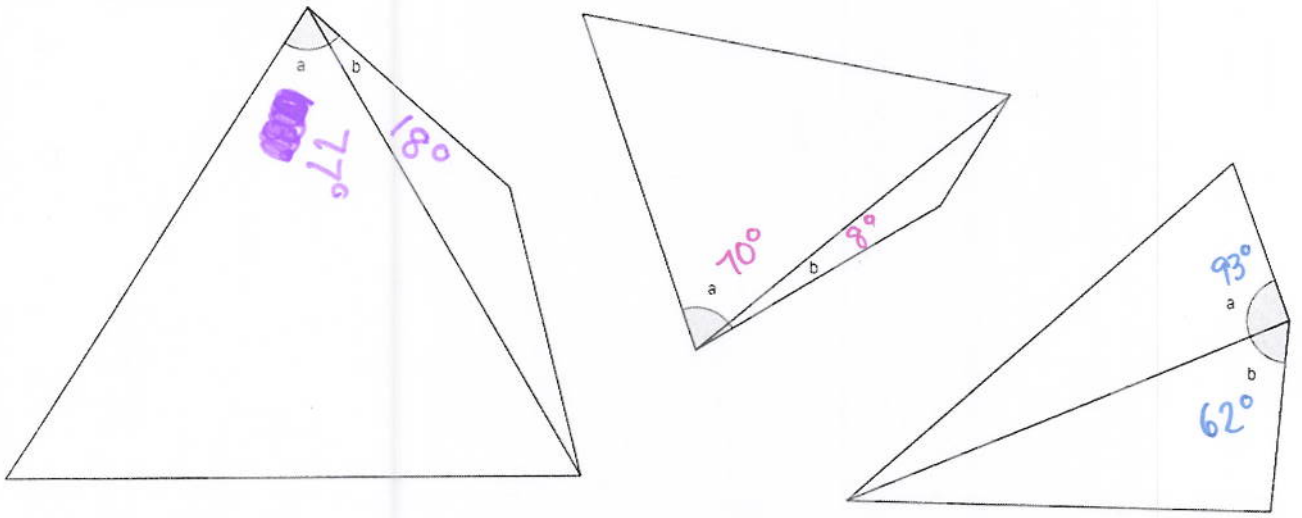
Below there are some rhombuses and other quadrilaterals with one of the two diagonals drawn in. The two angles created by the quadrilaterals are labeled a and b. In each case, compare angle a with angle b. Compare what you observed for quadrilaterals with what you observed for rhombuses.

Rhombuses:

diagonals bisect the vertex angles.



Other Quadrilaterals:



diagonals do not bisect vertex angles

Activity 5: Mysterious Midpoints

You will need a piece of graph paper with four sets of axes on it for this activity.

1. Plot and label the following sets of points on separate coordinate axes. Connect the points in each set in order to form the following special quadrilaterals: a parallelogram, a rhombus, a rectangle, and a square.
   a. $D(4,8), U(1,3), C(10,6), K(13,11)$
   b. $B(2,-2), I(9,1), K(2,4), E(-5,1)$
   c. $R(2,3), O(-3,3), S(-3,-4), E(2,-4)$
   d. $P(-2,-5), O(-7,0), L(-2,5), Y(3,0)$

2. Identify each of the quadrilaterals and explain how you determined your answer.

   DUCK is a parallelogram
   BIKE is a rhombus
   ROSE is a rectangle (A rectangle by any other name would have as many right angles...)
   POLY is a square.

3. Locate the midpoints of the sides and label them consecutively M, O, N, and T. Connect the points in order to form quadrilaterals.
   a. Are any of the quadrilaterals *MONT* that were formed special quadrilaterals? Explain how you determined your answer.

      a. For DUCK, MONT is a parallelogram (parallel sides)
      b. For BIKE, MONT is a rectangle (4 right angles)
      c. For ROSE, MONT is a rhombus (4 congruent/same length sides)
      d. For POLY, MONT is a square (4 right angles & 4 same length sides)

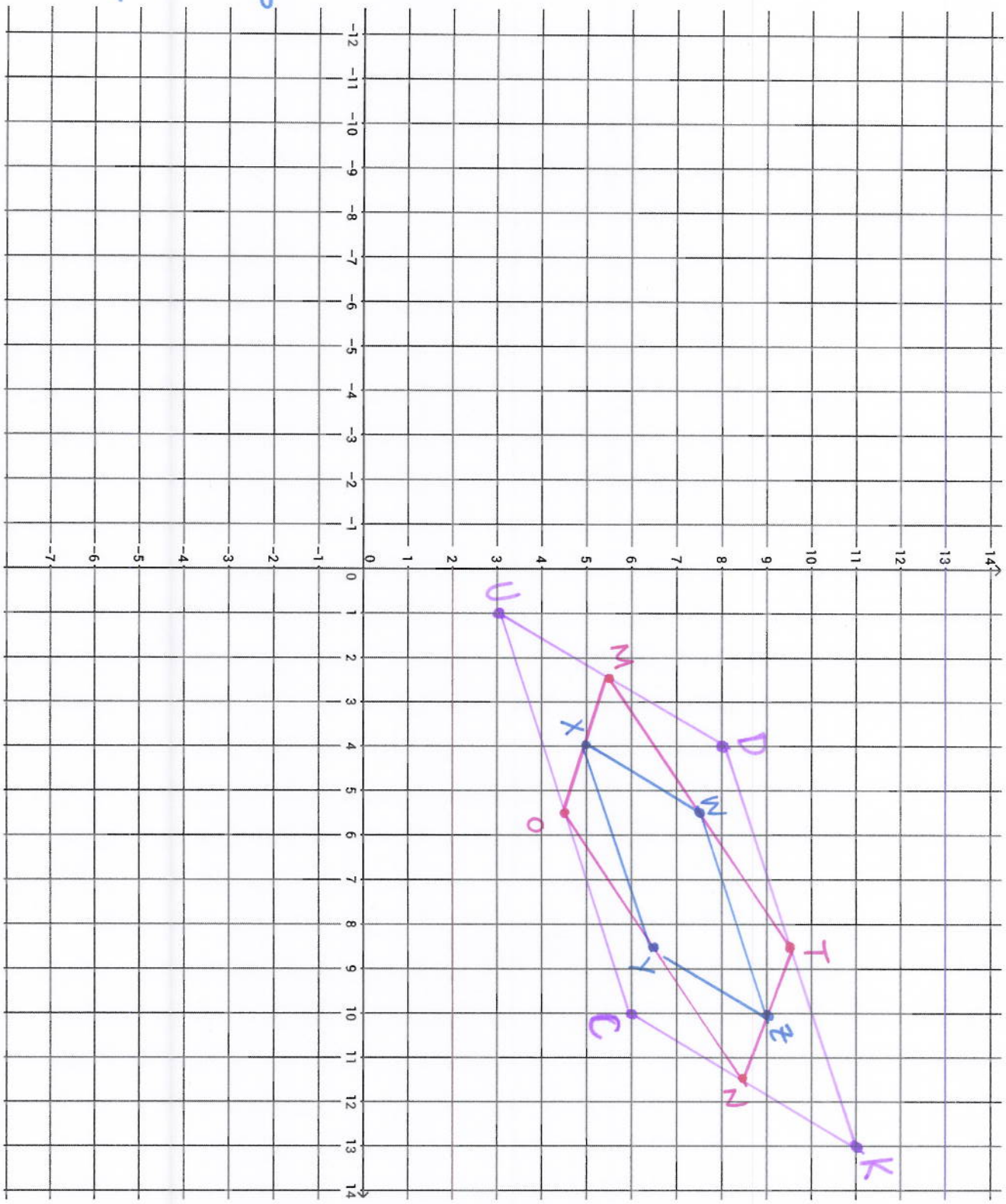
   b. Are any of the quadrilaterals *MONT* the same type of quadrilateral as the original figure? Explain how you determined your answer.

      yes, for DUCK and POLY. (See above for explanations)

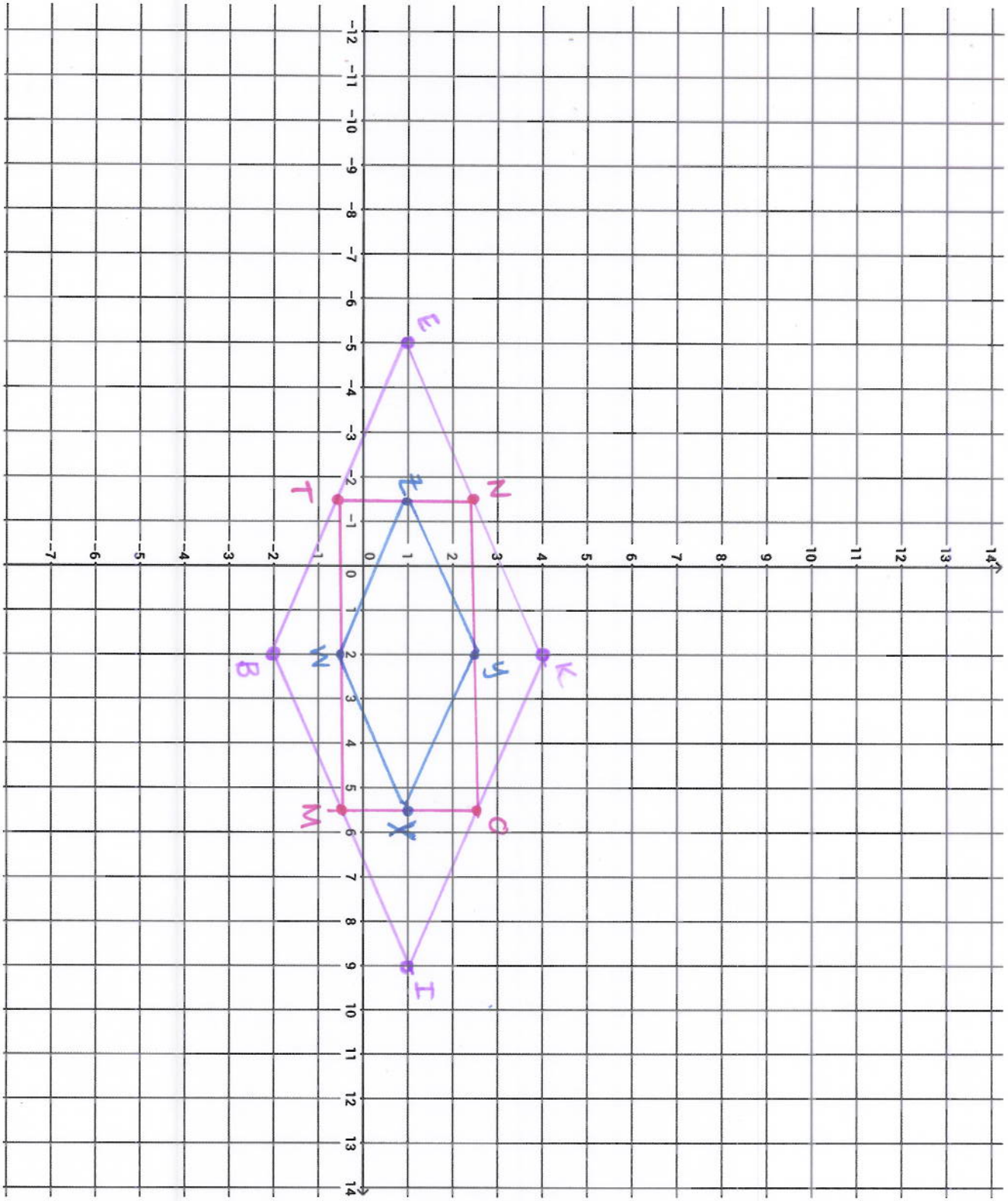
4. In each of the quadrilaterals *MONT* in Exercise 3, locate the midpoints of the sides, label them consecutively W, X, Y, and Z, and connect them in order to form new quadrilaterals. How are the new quadrilaterals related to the original figures drawn in Exercise 1?

   In all cases, WXYZ is similar to the original quadrilateral (same shape, smaller size)

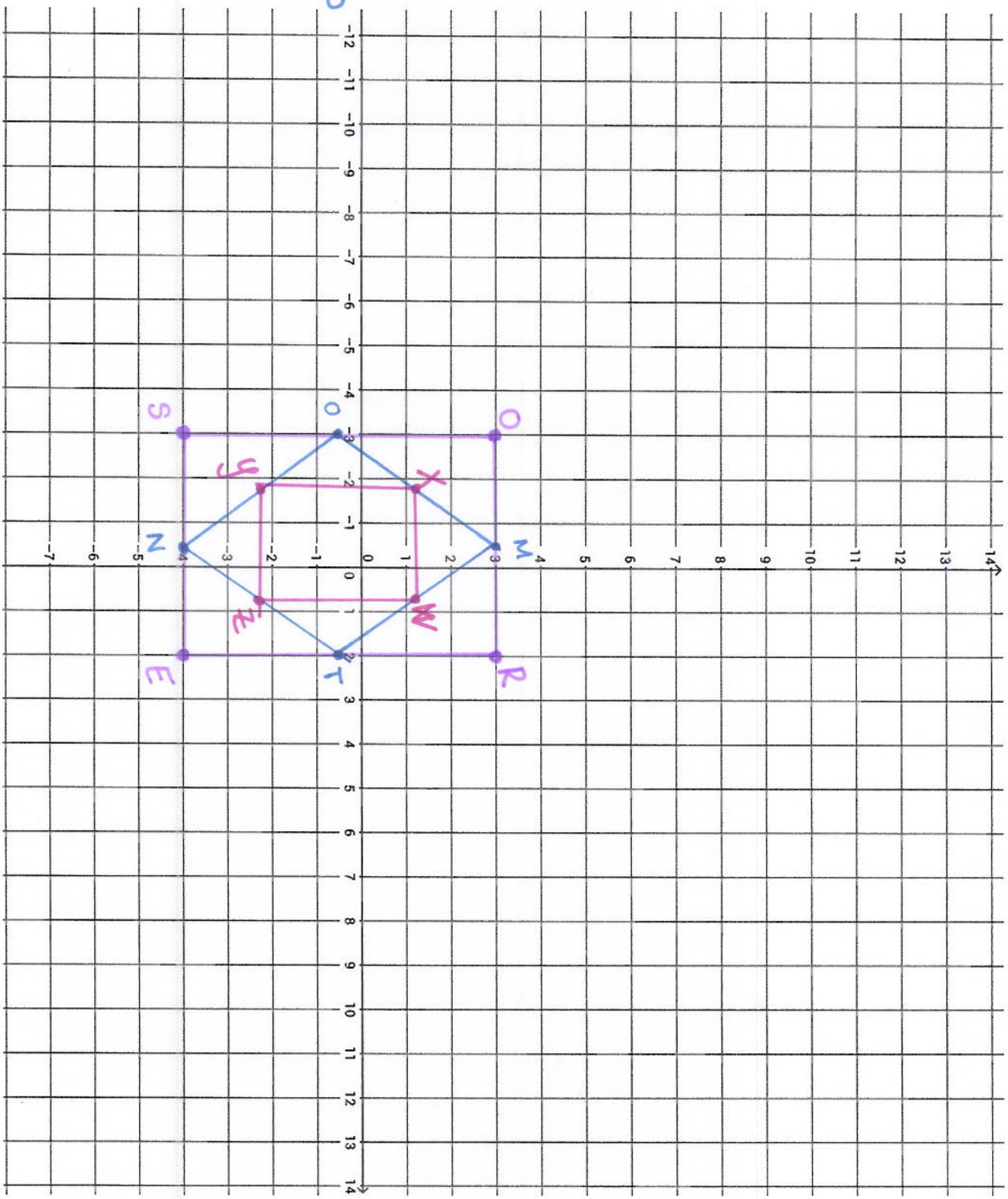
DUCK — parallelogram



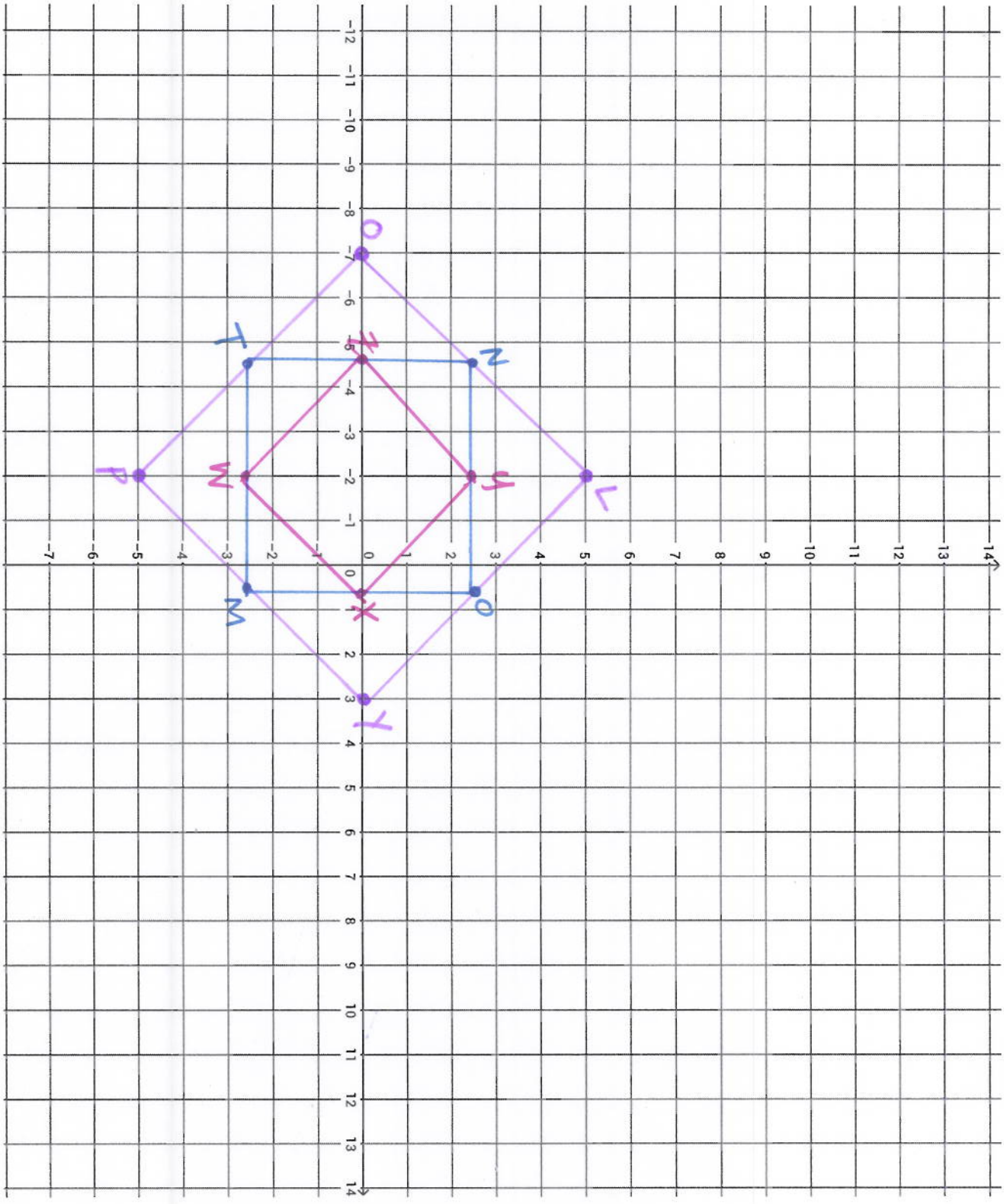
BIKE – rhombus



ROSE - rectangle



POLY - square



Activity 6: Quadrilateral Classifications

Complete the following charts about special quadrilaterals.

In this first table, if it is not true that ALL adjacent sides/angles are congruent, but certain PAIRS of adjacent sides/angles are congruent, write "Pairs." Otherwise, write "Yes" if the statement is always true and "No" if the statement is sometimes or never true.

	Opposite Sides Congruent?	(Pairs of) Adjacent Sides Congruent?	Opposite Angles Congruent?	(Pairs of) Adjacent Angles Congruent?
Quadrilateral	No	No	No	No
Parallelogram	Yes	No	Yes	No
Rhombus	Yes	Yes	Yes	No
Rectangle	Yes	Yes	Yes	Yes
Square	Yes	Yes	Yes	Yes
Trapezoid	No	No	No	No
Isosceles Trapezoid	No	One Pair	No	Yes, Pairs
Kite	No	Pairs	One Pair	No

Write "Yes" if the statement is true and "No" if the statement is sometimes or never true.

	Diagonals Bisect Each Other?	Diagonals Congruent?	Diagonals Perpendicular?	Diagonals Bisect Opposite Angles?
Quadrilateral	No	No	No	No
Parallelogram	Yes	No	No	No
Rhombus	Yes	No	Yes	Yes
Rectangle	Yes	Yes	No	No
Square	Yes	Yes	Yes	Yes
Trapezoid	No	No	No	No
Isosceles Trapezoid	No	Yes	No	No
Kite	No	No	Yes	One Pair