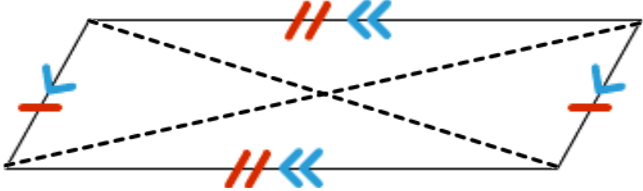
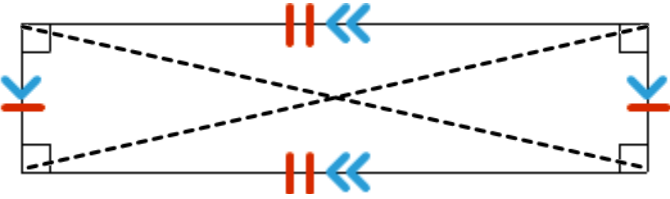
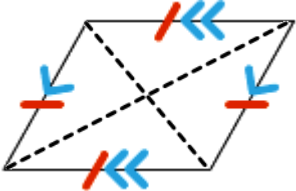
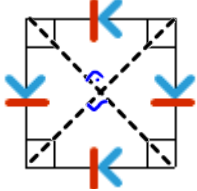


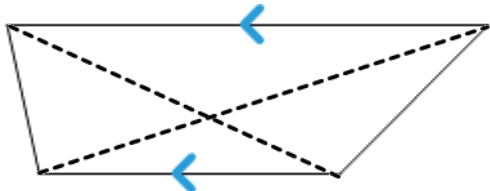
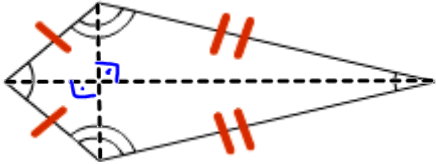
Meet the Quadrilateral Family



Go to <http://bit.ly/classifyingquadrilaterals>

- Complete the activity online. Once it is finished, it loops back to the beginning again - so you can stop once it repeats.
- Fill in the blanks as you complete the activity.

	<p>This is a <u>PARALLELOGRAM</u></p> <p>Opposite sides are <u>parallel</u> and <u>equal</u></p>
	<p>This is a <u>rectangle</u></p> <p>It is also a <u>parallelogram</u> with <u>2 different pairs of equal sides</u> and <u>4 right angles</u></p>
	<p>This is a <u>rhombus</u></p> <p>It is also a <u>parallelogram</u> with <u>4 equal sides</u> and <u>2 pairs of parallel sides</u></p>
	<p>This is a <u>square</u></p> <p>It is also a <u>parallelogram and a rhombus</u> with <u>4 equal sides</u>, <u>4 right angles</u>, and <u>2 pairs of parallel sides</u></p>

	<p>This is a <u>trapezoid</u></p> <p>It has one pair of <u>parallel sides</u></p>
	<p>This is a <u>kite</u></p> <p>It has two pairs of <u>equal sides</u> and <u>2 pairs of equal adjacent sides</u></p>

Examine the relationship in the diagonals of the quadrilaterals.

- Which ones are equal in length? square rectangle
- Which ones are perpendicular? kite square, rhombus
- Which ones bisect each other? square rhombus
kite parallelogram

What am I?



My opposite sides are parallel and equal in length:

parallelogram

My opposite sides are parallel and equal in length, and my sides are perpendicular:

rectangle

My opposite sides are parallel and all sides are equal in length:

rhombus

My opposite sides are parallel, all sides are equal in length, and my sides are perpendicular:

square

Two of my sides are parallel, but not equal in length. The other two sides are equal in length but not parallel:

isosceles trapezoid

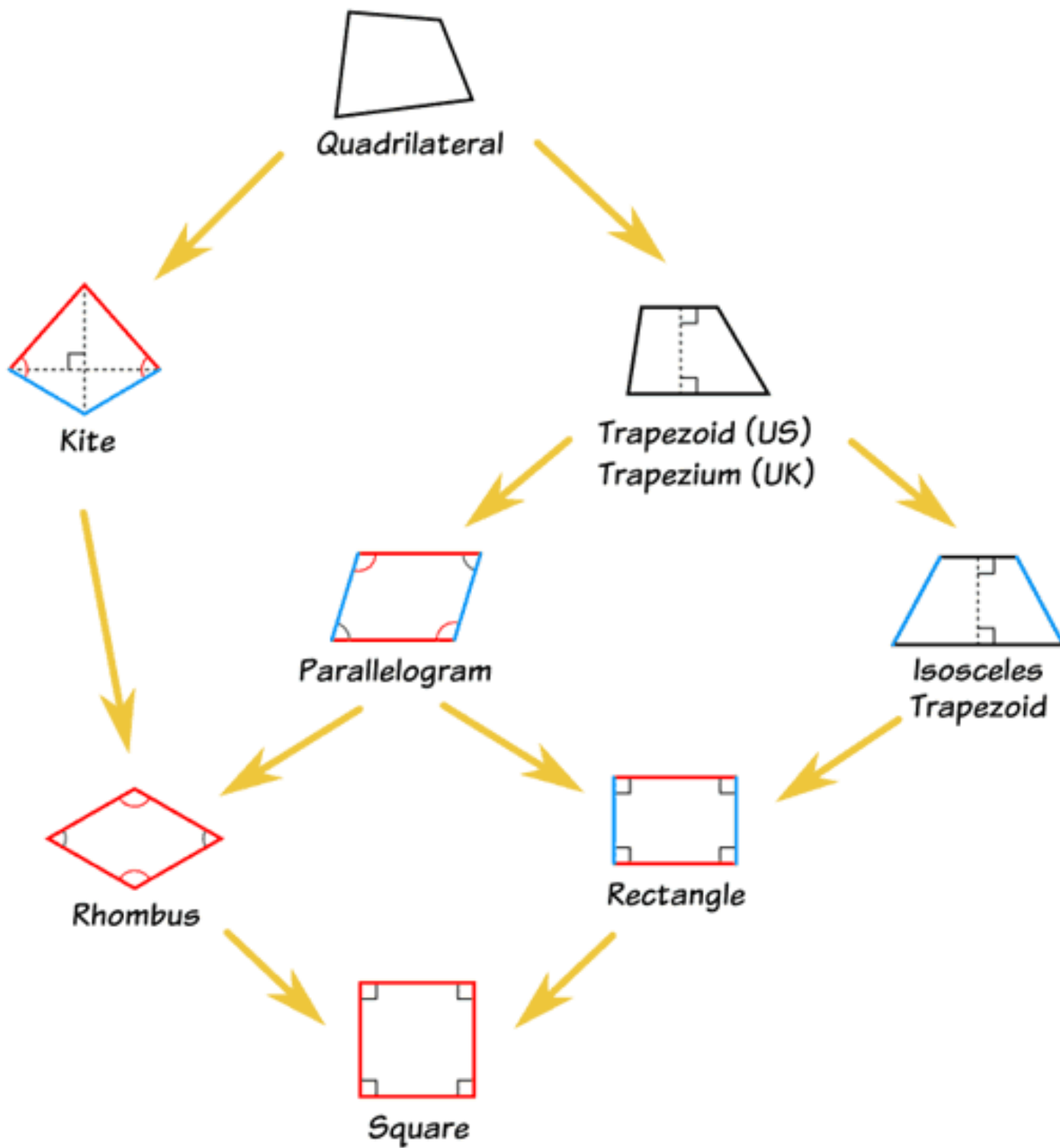
My diagonals are perpendicular and equal:

square

My diagonals are equal but not perpendicular:

parallelogram

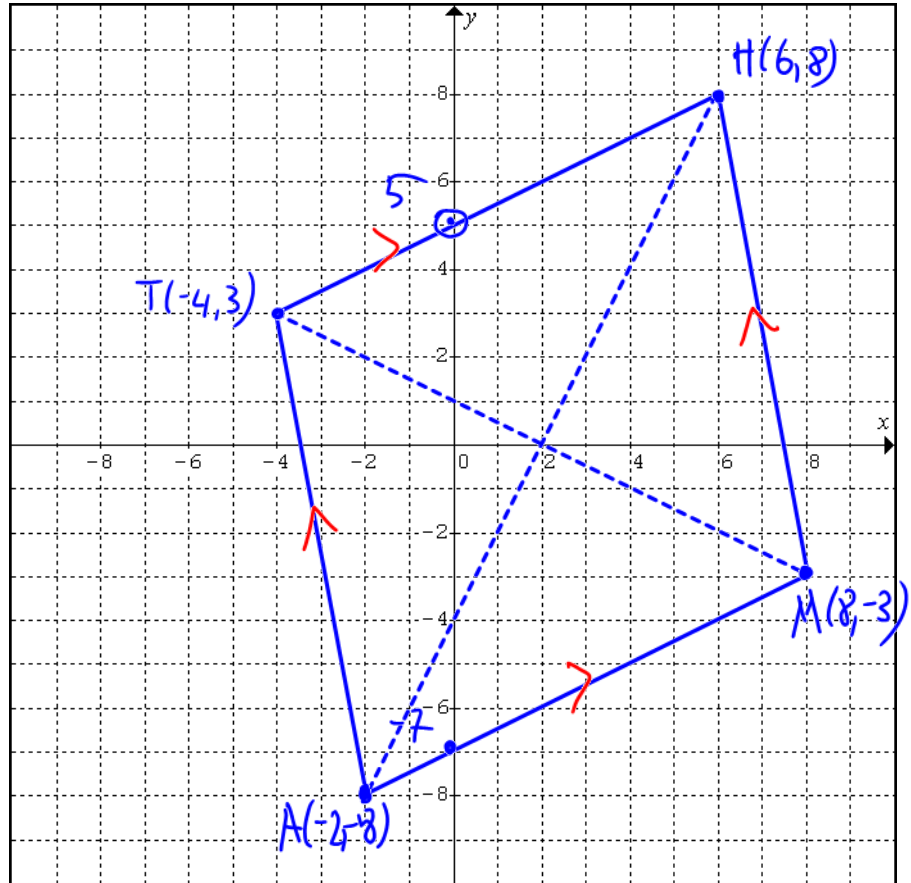
The Quadrilateral Family



Classifying Quadrilaterals

Problem A:

A quadrilateral has these coordinates: M(8, -3), A(-2, -8), T(-4, 3), and H(6, 8). Graph this quadrilateral and complete the following questions.



1. Determine the length of each side.

MA	AT	TH	HM
$d = \sqrt{(-2-8)^2 + (-8+3)^2}$ $= \sqrt{100 + 25}$ $= \sqrt{125}$ $=$	$d = \sqrt{(-4+2)^2 + (3+8)^2}$ $= \sqrt{4 + 121}$ $= \sqrt{125}$	$d = \sqrt{(-4-6)^2 + (3-8)^2}$ $= \sqrt{100 + 25}$ $= \sqrt{125}$	$d = \sqrt{(6-8)^2 + (8+3)^2}$ $= \sqrt{4 + 121}$ $= \sqrt{125}$

2. Determine the slope of each side.

MA	AT	TH	HM
$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3+8}{8+2}$ $m = \frac{5}{10} = \frac{1}{2}$ $m = 0.5$	$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3+8}{-4+2}$ $m = \frac{11}{-2}$ $m = -5.5$	$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8-3}{6+4}$ $m = \frac{5}{10} = \frac{1}{2}$ $m = 0.5$	$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8+3}{6-8}$ $m = \frac{11}{-2}$ $m = -5.5$

3. Is MATH a parallelogram? Justify your answer with proper calculations (IE: how do you know).

It's because opposite sides are parallel because they have the same slope and different y-int.

4. Is MATH a rectangle? Justify your answer with proper calculations (IE: how do you know).

No because $m_{MA} \times m_{AT} \neq -1$
 $0.5 \times -5.5 = -2.75$

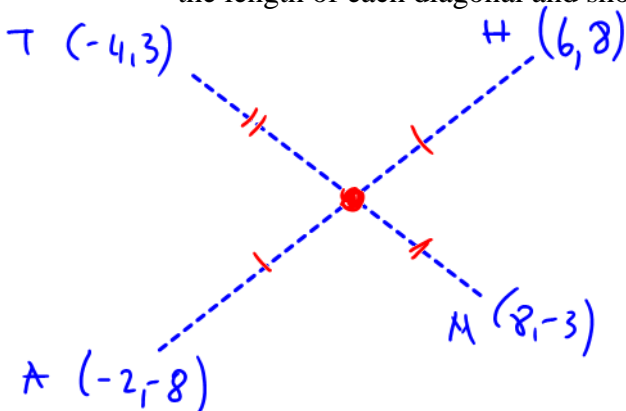
5. Is MATH a rhombus? Justify your answer with proper calculations (IE: how do you know).

YES, because each side are equal & parallel.

6. Is MATH a square? Justify your answer with proper calculations (IE: how do you know).

It's not a square because the angle between line segments are not right. For example $m_{MA} \times m_{AT} = -2.75$

7. Draw in the diagonals. Obviously, they are unequal in length. Verify this algebraically (IE: calculate the length of each diagonal and show they are unequal).



$$|AH| = \sqrt{(-2-6)^2 + (-8-8)^2}$$

$$= \sqrt{64 + 256}$$

$$= \sqrt{320}$$

$$|MT| = \sqrt{(8+4)^2 + (-3-3)^2}$$

$$= \sqrt{144 + 36} = \sqrt{180}$$

8. Determine the midpoint of each diagonal. What do you notice? What does this mean?

$$M_{AT} = \left(\frac{8-4}{2}, \frac{-3+3}{2} \right)$$

$$M_{AH} = \left(\frac{6-2}{2}, \frac{8-8}{2} \right)$$

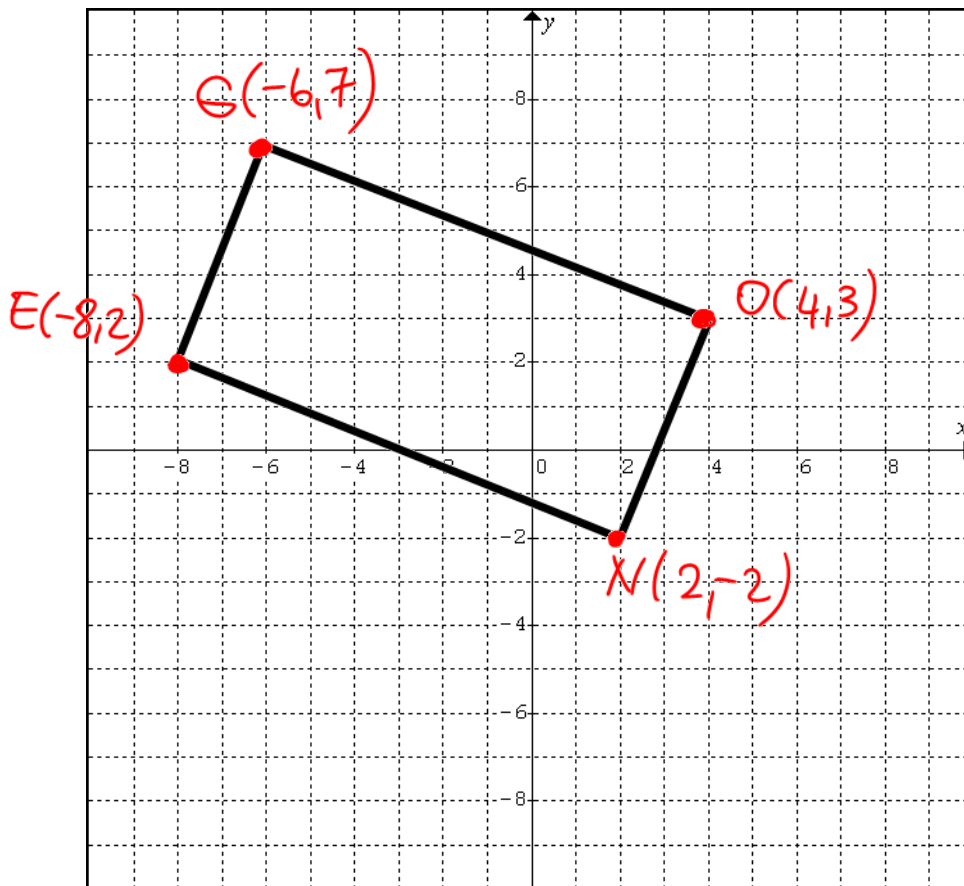
$$M_{AT} = (2, 0)$$

$$M_{AH} = (2, 0)$$

Midpoints of each diagonal are also POI
 Diagonals bisect each other equally

Problem B:

Points G(-6, 7), O(4, 3), N(2, -2), and E(-8, 2) form a quadrilateral.



1. Classify the quadrilateral.

What's your plan? IE: What do you need to calculate?

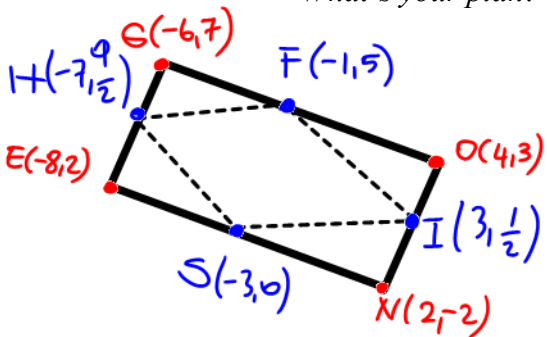
slope of each line, length of each side

LENGTH

<p style="text-align: center;"><i>GO</i></p> $d = \sqrt{(-6-4)^2 + (7-3)^2}$ $= \sqrt{100 + 16}$ $= \sqrt{116}$	<p style="text-align: center;"><i>ON</i></p> $d = \sqrt{(4-2)^2 + (3+2)^2}$ $= \sqrt{4 + 25}$ $= \sqrt{29}$	<p style="text-align: center;"><i>EN</i></p> $d = \sqrt{(-8-2)^2 + (2+2)^2}$ $= \sqrt{100 + 16}$ $= \sqrt{116}$	<p style="text-align: center;"><i>GE</i></p> $d = \sqrt{(-6+8)^2 + (7-2)^2}$ $= \sqrt{4 + 25}$ $= \sqrt{29}$
<p style="text-align: center;"><i>slope GO</i></p> $m = \frac{7-3}{-6-4} = \frac{4}{-10} = -\frac{2}{5}$ $m = -\frac{2}{5}$	<p style="text-align: center;"><i>slope ON</i></p> $m = \frac{3+2}{4-2} = \frac{5}{2}$ $m = \frac{5}{2}$	<p style="text-align: center;"><i>slope EN</i></p> $m = \frac{2+2}{-8-2} = \frac{4}{-10} = -\frac{2}{5}$ $m = -\frac{2}{5}$	<p style="text-align: center;"><i>slope GE</i></p> $m = \frac{7-2}{-6+8} = \frac{5}{2}$ $m = \frac{5}{2}$

2. Join the midpoints of each side to form another quadrilateral.

What's your plan? IE: What do you need to calculate?



$$F(x,y) = \left(\frac{-6+4}{2}, \frac{7+3}{2} \right)$$

$$F = (-1, 5)$$

$$I(x,y) = \left(\frac{4+2}{2}, \frac{3-2}{2} \right)$$

$$I = \left(3, \frac{1}{2} \right)$$

$$S(x,y) = \left(\frac{-8+2}{2}, \frac{2-2}{2} \right)$$

$$S = (-3, 0)$$

$$H(x,y) = \left(\frac{-6-8}{2}, \frac{7+2}{2} \right)$$

$$H = \left(-7, \frac{9}{2} \right)$$

3. Verify that this 'midpoint' quadrilateral is a parallelogram.

What's your plan? IE: What do you need to calculate?
