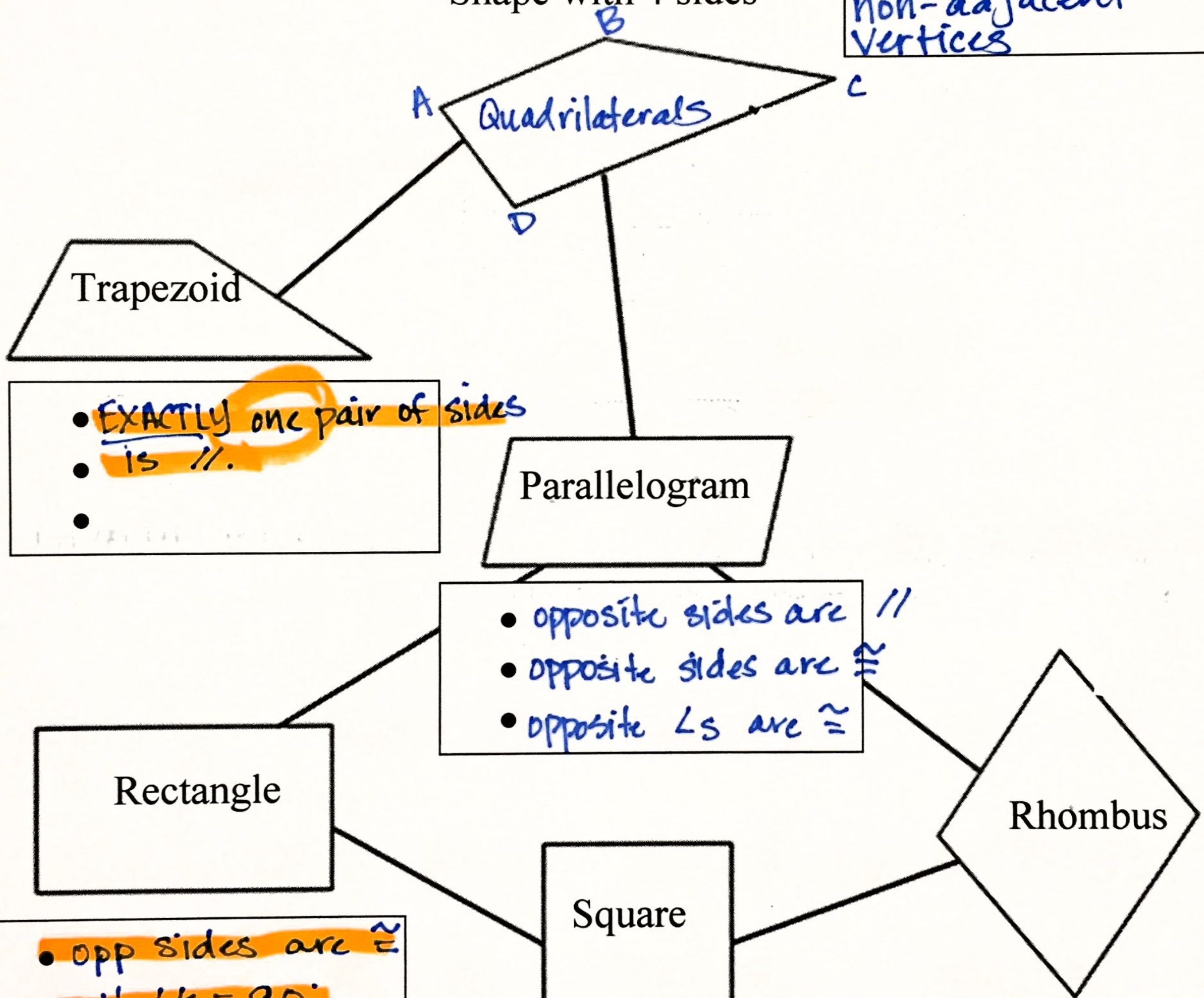
Classify Quadrilaterals

Classification Chart

Diagonal: a segment that connects non-adjacent vertices

Shape with 4 sides



Trapezoid
- EXACTLY one pair of sides
- is //.
-

Parallelogram
- opposite sides are //
- opposite sides are ≅
- opposite ∠s are ≅

Rectangle
- opp sides are ≅
- all ∠'s = 90°
- diagonals are ≅

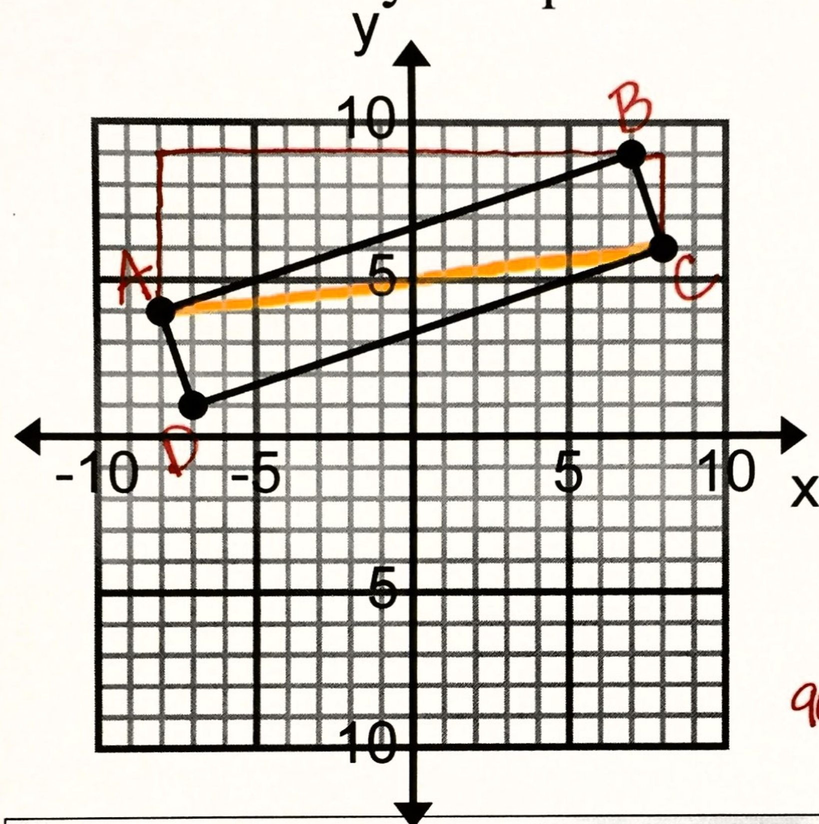
Square
- all sides are ≅
- all ∠s = 90°
- diagonals are ≅ & ⊥

Rhombus
- all sides are ≅
- ∠s ≠ 90°
- diagonals are ⊥ (90°)

Go back to the 1st six graphs and list what you would have to show in order to prove your prediction is true.

Notes 5-5
Classify Quadrilaterals

Ex. 1: Classify the quadrilateral.



$A(-8,4)$
$B(7,9)$
$C(8,6)$
$D(-7,1)$

$\frac{9-4}{7--8} = \frac{5}{15}$
$\frac{1}{3}$

$5^2 + 15^2 = c^2$
$25 + 225 = c^2$
$250 = c^2$

$1^2 + 3^2 = c^2$
$1 + 9 = c^2$
$10 = c^2$

$90°\angle \rightarrow$ opp reciprocal slopes

Slope of the Sides:			
$m_{\overline{AB}} = \frac{1}{3}$	$m_{\overline{BC}} = -\frac{3}{1}$	$m_{\overline{CD}} = \frac{1}{3}$	$m_{\overline{AD}} = -\frac{3}{1}$
Length of the Sides:			
$AB = 5\sqrt{10} \approx 15.81$	$BC = \sqrt{10} \approx 3.16$	$CD = 5\sqrt{10} \approx 15.81$	$AD = \sqrt{10} \approx 3.16$
Angle Measures:			
$\overline{AB} \perp \overline{BC}$ $m\angle B = 90°$	$\overline{BC} \perp \overline{CD}$ $m\angle C = 90°$	$\overline{CD} \perp \overline{AD}$ $m\angle D = 90°$	$\overline{AD} \perp \overline{AB}$ $m\angle A = 90°$

Diagonals:		
Length: $AC = 2\sqrt{65} \approx 16.12$ $BD = 2\sqrt{65} \approx 16.12$	Slope: $m_{\overline{AC}} = \frac{1}{8}$ $m_{\overline{BD}} = \frac{4}{7}$	Relationship: $\overline{AC} \cong \overline{BD}$

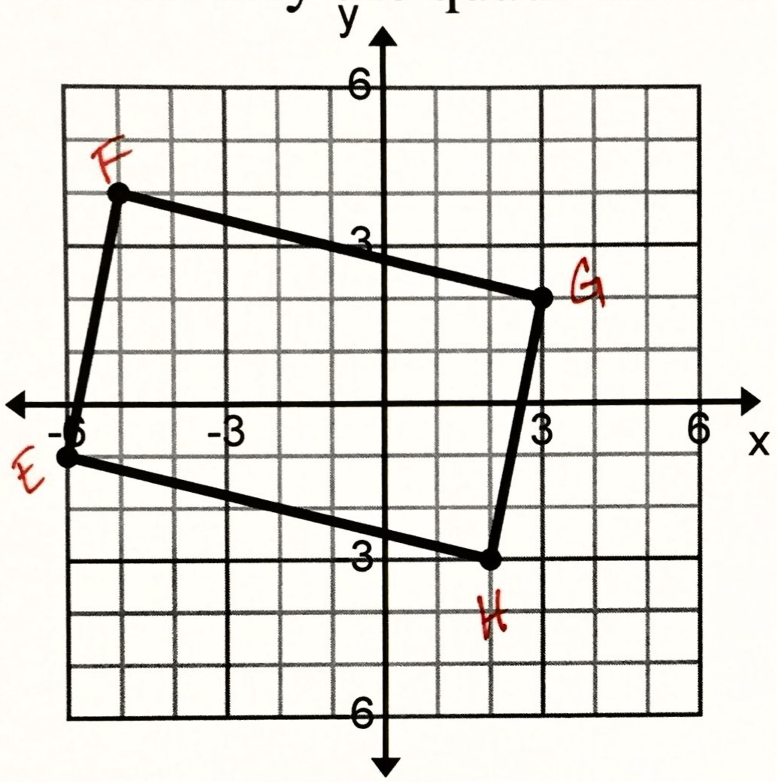
(-8,4)
(8,6)

$AC = \sqrt{(8--8)^2 + (6-9)^2}$
$16^2 + 2^2 = 256 + 4 = \sqrt{260}$

$BD = \sqrt{(7--7)^2 + (9-1)^2}$
$14^2 + 8^2$
$196 + 64 = \sqrt{260}$

Type of Quadrilateral Rectangle. Explain:
Because opp sides are $\cong$; $AB = CD = 15.81$ & $BC = AD = \sqrt{10}$
and all angles $\angle A = \angle B = \angle C = \angle D = 90°$

Ex. 2: Classify the quadrilateral.



$E(-6,-1)$
$F(-5,4)$
$G(3,2)$
$H(2,-3)$

$\frac{-1-2}{-6-3} = \frac{-3}{-9}$

$\frac{4--3}{-5-2} = \frac{7}{-7}$

EF
1^2+5^2
$1+25$
$\sqrt{26}$

FG
2^2+8^2
$4+64$
$\sqrt{70}$

Slope of the Sides:			
$m_{\overline{EF}} = \frac{5}{1}$	$m_{\overline{FG}} = -\frac{1}{4}$	$m_{\overline{GH}} = \frac{5}{1}$	$m_{\overline{EH}} = -\frac{1}{4}$
Length of the Sides:			
$EF = \sqrt{26} \approx 5.10$	$FG = \sqrt{70} \approx 8.37$	$GH = \sqrt{26} \approx 5.10$	$EH = \sqrt{70} \approx 8.37$
Angle Measures:			
$\overline{EF}$ not $\perp$ $\overline{EH}$ $m\angle E \neq 90°$	$\overline{FG}$ not $\perp$ $\overline{GH}$ $m\angle G \neq 90°$	$\overline{GH}$ not $\perp$ $\overline{EH}$ $m\angle H \neq 90°$	$\overline{EH}$ not $\perp$ $\overline{EF}$ $m\angle E \neq 90°$

Diagonals:

Length:	Slope:	Relationship:
$EG = 3\sqrt{10} \approx 9.49$ $FH = 7\sqrt{2} \approx 9.90$	$m_{\overline{EG}} = \frac{1}{3}$ $m_{\overline{FH}} = -1$	$\overline{EG} \not\cong \overline{FH}$ $\overline{EG}$ not $\perp$ $\overline{FH}$

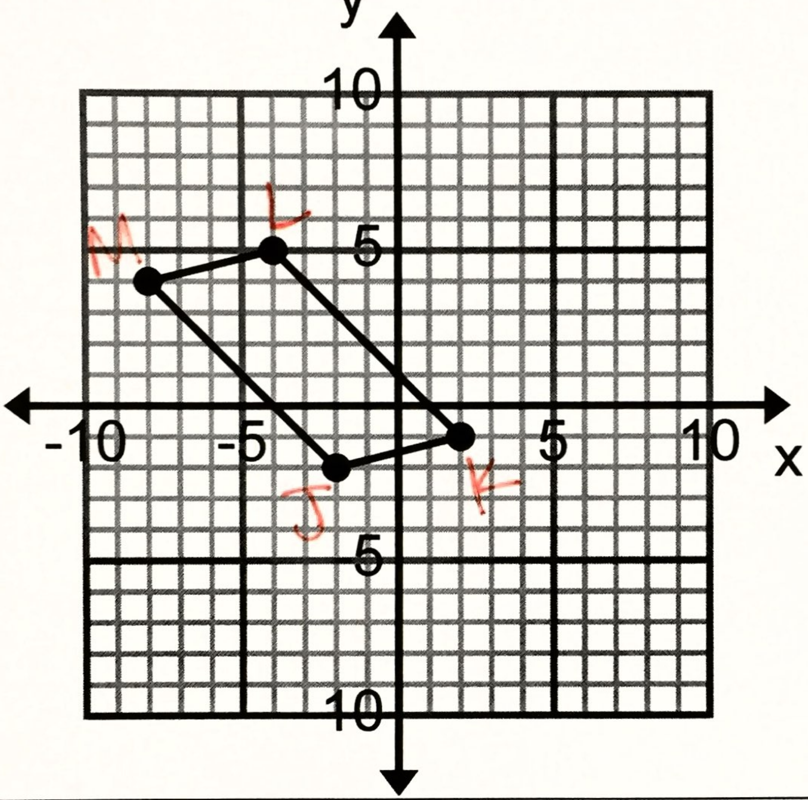
$EG = \sqrt{(-6-3)^2 + (-1-2)^2}$
$(-9)^2 + (-3)^2 = 81 + 9 = \sqrt{90}$

$FH = \sqrt{(-5-2)^2 + (4--3)^2}$
$(-7)^2 + (7)^2 = 49 + 49 = \sqrt{98}$

Type of Quadrilateral Parallelogram Explain: because opposite sides are //, $\overline{EF} \parallel \overline{GH}$ and $\overline{FG} \parallel \overline{EH}$; and opposite sides are $\cong$ $EF = GH = \sqrt{26}$ and $FG = EH = \sqrt{70}$; but $\angle \neq 90°$

Notes 5-5
Classify Quadrilaterals

Ex. 3: Classify the quadrilateral.



$J(-2,-2)$
$K(2,-1)$
$L(-4,5)$
$M(-8,4)$

$\frac{5--2}{-4--2} = \frac{7}{-2}$

$\frac{4--1}{-8-2} = \frac{5}{-10}$

$\overline{JK}$: 1^2+4^2, $1+16$, $\sqrt{17}$

$\overline{KL}$: 6^2+6^2, $36+36$, $\sqrt{72}$

Slope of the Sides:			
$m_{\overline{JK}} = \frac{1}{4}$	$m_{\overline{LK}} = -1$	$m_{\overline{ML}} = \frac{1}{4}$	$m_{\overline{MJ}} = -1$
Length of the Sides:			
$JK = \sqrt{17} \approx 4.12$	$KL = 6\sqrt{2} \approx 8.49$	$ML = \sqrt{17} \approx 4.12$	$MJ = 6\sqrt{2} \approx 8.49$
Angle Measures:			
$\overline{JK}$ not $\perp$ $\overline{LK}$ $m\angle K \neq 90°$	$\overline{LK}$ not $\perp$ $\overline{ML}$ $m\angle L \neq 90°$	$\overline{ML}$ not $\perp$ $\overline{MJ}$ $m\angle M \neq 90°$	$\overline{MJ}$ not $\perp$ $\overline{JK}$ $m\angle J \neq 90°$

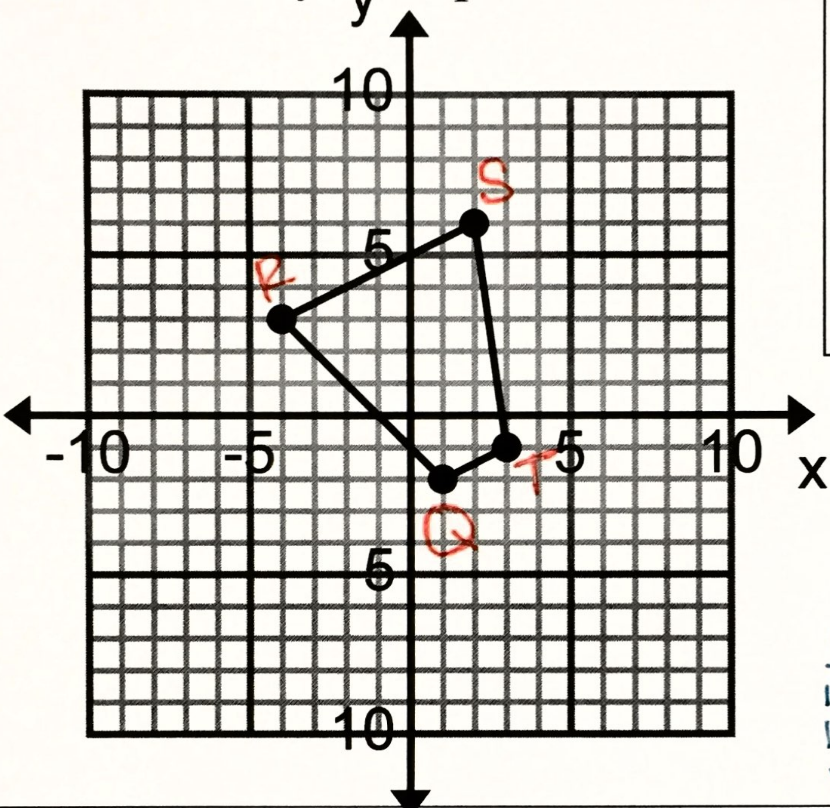
Diagonals:		
Length: $JL = \sqrt{53} \approx 7.28$ $MK = \sqrt{281} \approx 16.76$	Slope: $m_{\overline{JL}} = -7/2$ $m_{\overline{MK}} = -1/2$	Relationship: $\overline{JL} \not\cong \overline{MK}$ $\overline{JL}$ not $\perp$ $\overline{MK}$

$JL = \sqrt{(-2--4)^2 + (-2-5)^2}$
$2^2 + (-7)^2 = 4 + 49 = \sqrt{53}$

$MK\ \sqrt{(-8-2)^2 + (4--1)^2}$
$(-16)^2 + (5)^2 = 256 + 25 = \sqrt{281}$

Type of Quadrilateral Parallelogram Explain: because opposite sides are $\parallel$ $\overline{JK} \parallel \overline{ML}$ & $\overline{LK} \parallel \overline{MJ}$; opposite sides are $\cong$, $JK = ML = \sqrt{17}$ & $KL = MJ = 6\sqrt{2}$; angles are $\neq 90°$

Ex. 4: Classify the quadrilateral.



$Q(1,-2)$
$R(-4,3)$
$S(2,6)$
$T(3,-1)$

$\frac{3 - -1}{-4-3} = \frac{4}{-7}$

$\frac{-2-6}{1-2} = \frac{-8}{-1}$

$\overline{RS}$: 3^2+6^2, $9+36$, $\sqrt{45}$

$\overline{ST}$: 7^2+1^2, $49+1$, $\sqrt{50}$

$\overline{QT}$: 1^2+2^2, $1+4$, $\sqrt{5}$

$\overline{RQ}$: 5^2+5^2, $25+25$, $\sqrt{50}$

Slope of the Sides:			
$m_{\overline{RS}} = \frac{1}{2}$	$m_{\overline{ST}} = -\frac{7}{1}$	$m_{\overline{QT}} = \frac{1}{2}$	$m_{\overline{QR}} = -1$
Length of the Sides:			
$RS = 3\sqrt{5} \approx 6.71$	$ST = 5\sqrt{2} \approx 7.07$	$QT = \sqrt{5} \approx 2.24$	$RQ = 5\sqrt{2} \approx 7.07$
Angle Measures:			
$\overline{RS}$ not $\perp$ $\overline{ST}$ $m\angle S \neq 90^\circ$	$\overline{ST}$ not $\perp$ $\overline{QT}$ $m\angle T \neq 90^\circ$	$\overline{QT}$ not $\perp$ $\overline{QR}$ $m\angle Q \neq 90^\circ$	$\overline{QR}$ not $\perp$ $\overline{RS}$ $m\angle R \neq 90^\circ$

Diagonals:		
Length: $RT = \sqrt{65} \approx 8.06$ $QS = \sqrt{65} \approx 8.06$	Slope: $m_{\overline{RT}} = \frac{-4}{7}$ $m_{\overline{SQ}} = 8$	Relationship: $\overline{RT} \cong \overline{QS}$ $\overline{RT}$ not $\perp$ $\overline{QS}$

$RT = \sqrt{(-4-3)^2 + (3 - -1)^2}$
$(-7)^2 + (4)^2 = 49 + 16 = \sqrt{65}$

$QS = \sqrt{(1-2)^2 + (-2-6)^2}$
$(-1)^2 + (-8)^2 = 1 + 64 = \sqrt{65}$

Type of Quadrilateral Trapezoid. Explain: because there is only one pair of // sides. $\overline{RS}$ // $\overline{QT}$ and $\overline{ST}$ not // $\overline{QR}$

Notes 5-5
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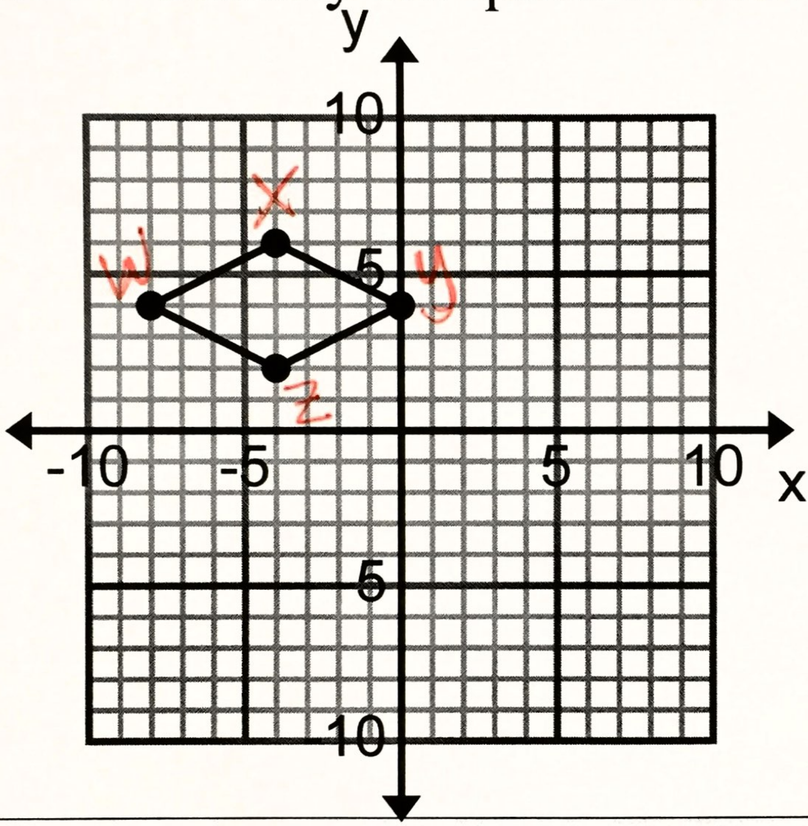
Ex. 5: Classify the quadrilateral.

$W(-8,4)$
$X(-4,6)$
$Y(0,4)$
$Z(-4,2)$



$\overline{WX}$
2^2+4^2
$4+16$
$\sqrt{20}$

Slope of the Sides:			
$m_{\overline{WX}} = \frac{1}{2}$	$m_{\overline{XY}} = -\frac{1}{2}$	$m_{\overline{YZ}} = \frac{1}{2}$	$m_{\overline{WZ}} = -\frac{1}{2}$
Length of the Sides:			
$WX = 2\sqrt{5} \approx 4.47$	$XY = 2\sqrt{5} \approx 4.47$	$YZ = 2\sqrt{5} \approx 4.47$	$WZ = 2\sqrt{5} \approx 4.47$
Angle Measures:			
$\overline{WX}$ not $\perp$ $\overline{XY}$ $m\angle X \neq 90°$	$\overline{XY}$ not $\perp$ $\overline{YZ}$ $m\angle Y \neq 90°$	$\overline{YZ}$ not $\perp$ $\overline{WZ}$ $m\angle Z \neq 90°$	$\overline{WZ}$ not $\perp$ WX $m\angle W \neq 90°$
Diagonals:			
Length: $WY = 8$ $XZ = 4$	Slope: $m_{WY} = 0$ $m_{XZ} =$ undefined	Relationship: $\overline{WY} \ncong \overline{XZ}$ $\overline{WY} \perp \overline{XZ}$	

$WY = \sqrt{(-8-0)^2 + (4-4)^2}$

Type of Quadrilateral Rhombus. Explain: because all four sides are $\cong$, $WX = XY = YZ = WZ = 2\sqrt{5}$ and all $\angle s \neq 90°$