Name: ______________________________________ Date: __________________

PROVING TRAPEZOIDS AND PARALLELOGRAMS
COMMON CORE GEOMETRY

***Exercise* #1:** State the definition of a parallelogram below and then list its properties.

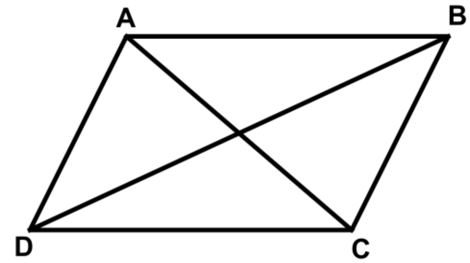
Definition: ____

Properties: 1. ____

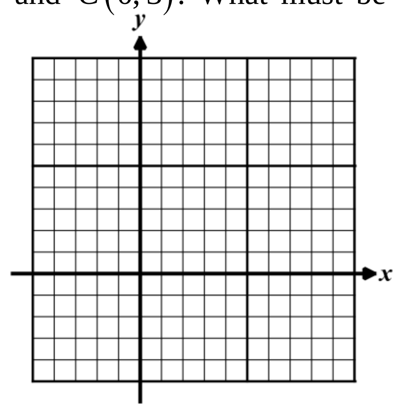
2. ____

3. ____

4. ____



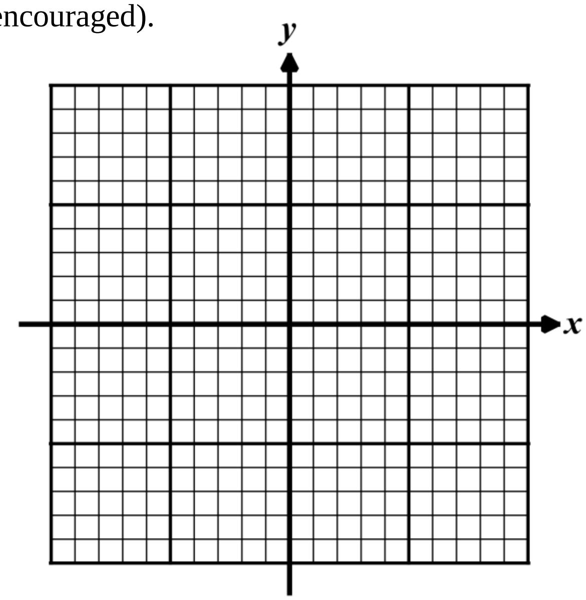
***Exercise* #2:** Parallelogram *ABCD* has coordinates of $A(7,1)$, $B(-2,-3)$, and $C(0,3)$. What must be the coordinates of point *D*? Explain how you found your answer.



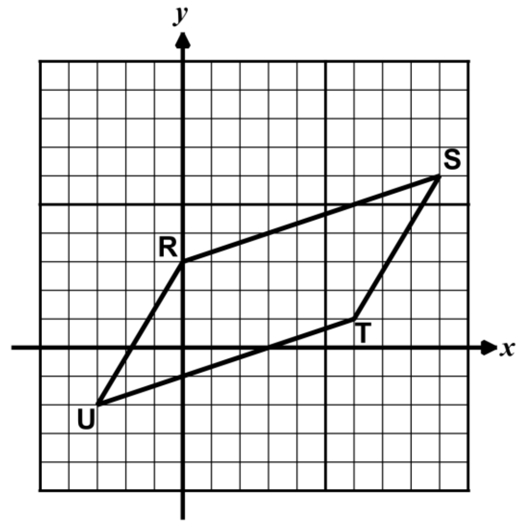
TRAPEZOID

Any **quadrilateral** with **<u>at least</u> one pair of parallel sides**. This means it could have either one pair of parallel sides or two pairs of parallel sides.

***Exercise* #3:** Quadrilateral *RSTU* has vertices at $R(-4,4)$, $S(2,7)$, $T(5,2)$ and $U(-7,-4)$. Show that *RSTU* is a trapezoid but *not* a parallelogram. Use of the grid is optional (but encouraged).



Exercise #4: On the diagram, quadrilateral $RSTU$ is shown with vertices $R(0,3)$, $S(9,6)$, $T(6,1)$ and $U(-3,-2)$.



(a) Prove that $RSTU$ is a parallelogram using coordinate geometry.

(b) Show that $\overline{RU} \cong \overline{ST}$ using coordinate geometry.

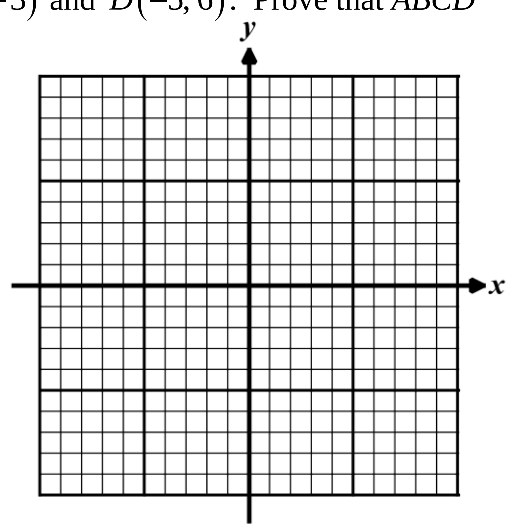
(c) Using the midpoint formula, find the midpoint of the diagonals $\overline{RT}$ and $\overline{SU}$. What observation can you make about these? What does it tell you about the diagonals? Draw them in to visualize.

Midpoint of $\overline{RT}$:

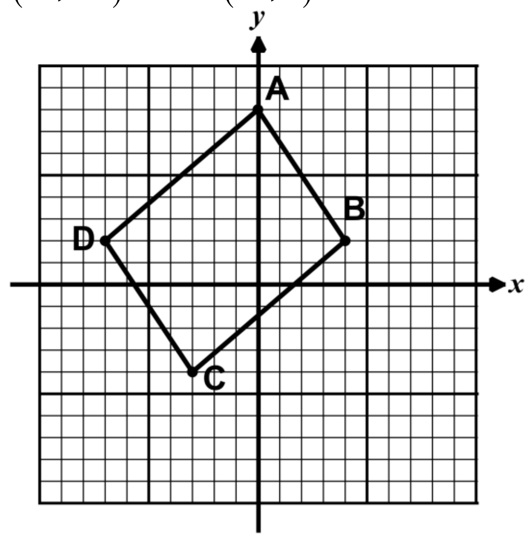
Midpoint of $\overline{SU}$:

Observation and conclusion:

Exercise #5: Quadrilateral $ABCD$ has vertices at $A(5,9)$, $B(9,0)$, $C(-1,-3)$ and $D(-5,6)$. Prove that $ABCD$ is a parallelogram using midpoints.



Below, quadrilateral *ABCD* is plotted with coordinates $A(0,8)$, $B(4,2)$, $C(-3,-4)$ and $D(-7,2)$.



(a) Calculate the slope of each line segment. Show your calculation and express your answers in simplest form.

$\overline{AB}$: $\overline{BC}$: $\overline{CD}$: $\overline{AD}$:

(b) What conclusions can you make about parallel sides based on these slope calculations?

(c) What conclusion can you make about quadrilateral *ABCD*? Why?

Rhombus *ABCD* has vertices $A(-1,-2), B(2,2), C(6,5),$ and $D(3,1)$. The perimeter of the rhombus is

(1) 5   (3) 20

(2) $5\sqrt{2}$ (4) $20\sqrt{2}$

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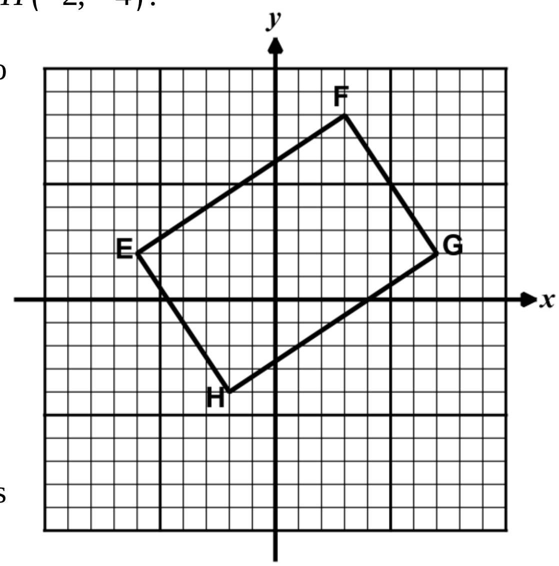
The diagonals of square *WXYZ* intersect at the point $(-4,2)$. If the line with equation $y=\frac{1}{2}x+4$ contains diagonal $\overline{WY}$, then which of the following equations is that of the line that contains diagonal $\overline{XZ}$?

(1) $y = 2x + 10$ (3) $y = \frac{1}{2}x + 2$

(2) $y = -2x - 6$ (4) $y = -\frac{1}{2}x$ ____________

Quadrilateral *EFGH* has vertices at $E(-6, 2)$, $F(3, 8)$, $G(7, 2)$, and $H(-2, -4)$.

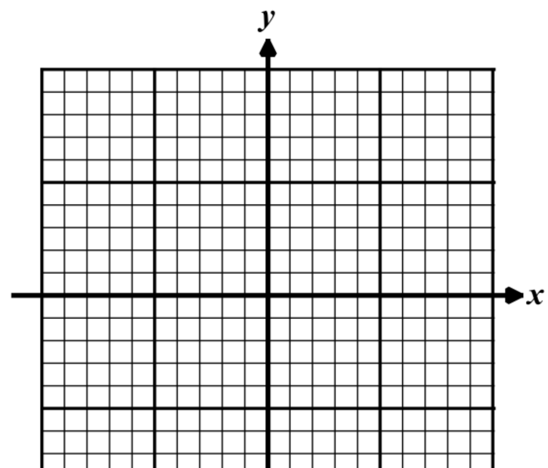


(a) Calculate the slopes of all four sides of *EFGH*. Use these slopes to prove that *EFGH* is a rectangle.

(b) Calculate the midpoints of the diagonals of *EFGH*. Why does this show that *EFGH* is parallelogram?

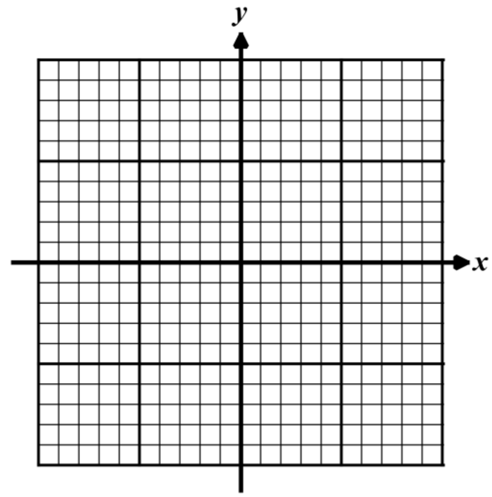
(c) Calculate the lengths of the diagonals of *EFGH*. Why along **with (b)** does this show that *EFGH* is a rectangle?

Given quadrilateral *EFGH* with vertices at $E(-4, 8)$, $F(8, 4)$, $G(5, -5)$ and $H(-7, -1)$, prove using coordinate geometry that *EFGH* is a rectangle. Note that there are a few different methods that work.



Quadrilateral *ABCD* has vertices at $A(0,6)$, $B(4,-1)$, $C(-4,0)$ and $D(-8,7)$. Prove that:

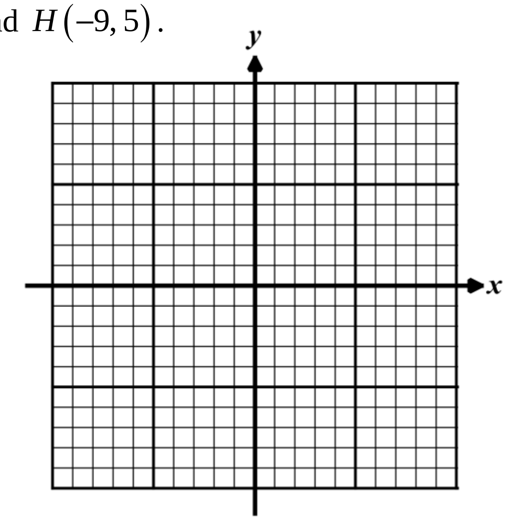
(a) *ABCD* is a rhombus using the distance formula



(b) The diagonals of *ABCD* are perpendicular

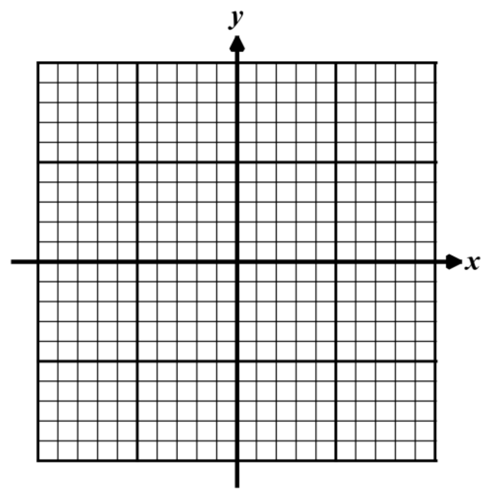
7. Quadrilateral *EFGH* has vertices at $E(1,8)$, $F(6,-1)$, $G(-4,-4)$ and $H(-9,5)$.

(a) Prove that *EFGH* is a parallelogram.

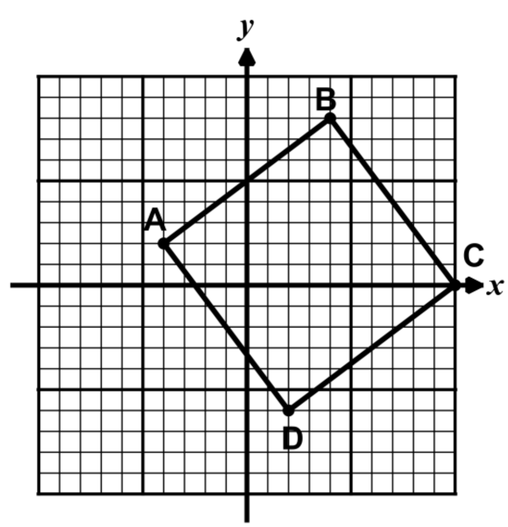


(b) Prove that *EFGH* is *not* a rhombus. (Many methods)

Square *ABCD* has vertices at $A(-8,1)$, $B(3,6)$, and $D(-3,-10)$. What are the coordinates of point *C*?

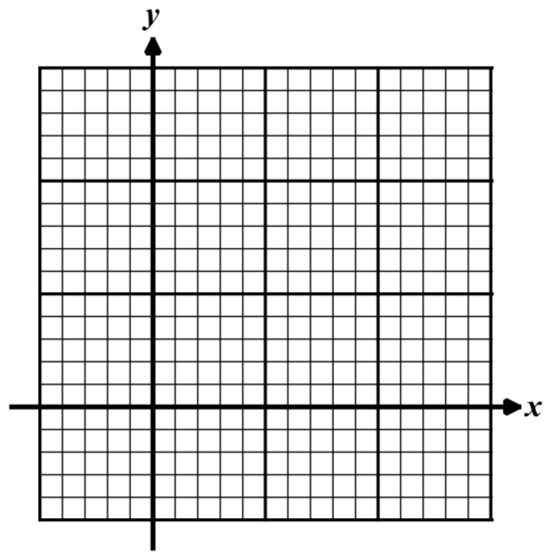


Quadrilateral *ABCD* has coordinates of $A(-4,2)$, $B(4,8)$, $C(10,0)$ and $D(2,-6)$. Using coordinate geometry, prove *ABCD* is a square by showing it has four sides of equal length and four pairs of perpendicular sides.



Quadrilateral *ABCD* has vertices at:

$A(0,7)$, $B(10,9)$, $C(12,-1)$, and $D(2,-3)$



(a) Find the midpoint of each diagonal of *ABCD*. Based on this result, what special type of quadrilateral is *ABCD*?

Diagonal $\overline{AC}$: Diagonal $\overline{BD}$:

(b) Calculate the slope of each diagonal of *ABCD*. Based on this result and (a), what special type of quadrilateral is *ABCD*? Explain.

Diagonal $\overline{AC}$: Diagonal $\overline{BD}$:

(c) Calculate the length of each diagonal of *ABCD*. Based on this result along with (a) and (b), what type of special quadrilateral is *ABCD*? Explain.

Diagonal $\overline{AC}$: Diagonal $\overline{BD}$: