1. Plot points A(-3, -1), B(-1, 2), C(4, 2), and D(2, -1).

a. Find the length of all four sides.

$$BC = 5$$

$$AD = 5$$
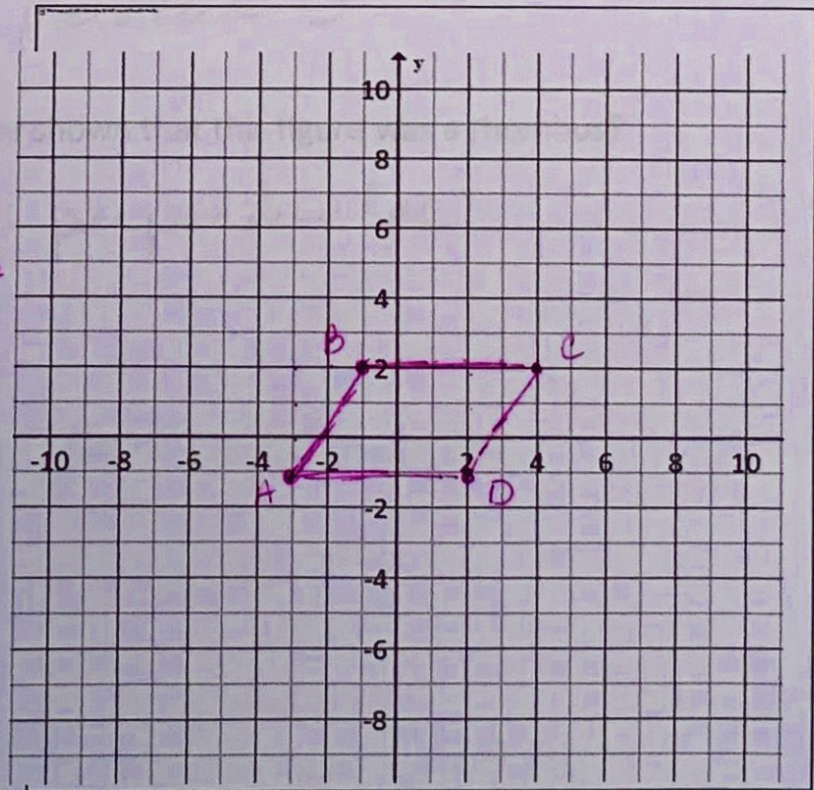
$$AB = \sqrt{(-1++3)^2 + (2++1)^2} = \sqrt{(2)^2 + (3)^2}$$
$$\sqrt{4+9} = \sqrt{13}$$

$$DC = \sqrt{(2-4)^2 + (-1-2)^2} = \sqrt{(-2)^2 + (-3)^2}$$
$$\sqrt{4+9} = \sqrt{13}$$

b. Find the slope of all four sides.

$$m \overline{BC} = 0 \qquad m \overline{AB} = \frac{3}{2}$$
$$m \overline{AD} = 0 \qquad m \overline{CD} = \frac{3}{2}$$

c. What specialized geometric figure is quadrilateral ABCD? How do you know?

- opposite sides are parallel and Congruent

Parallelogram

Name _____

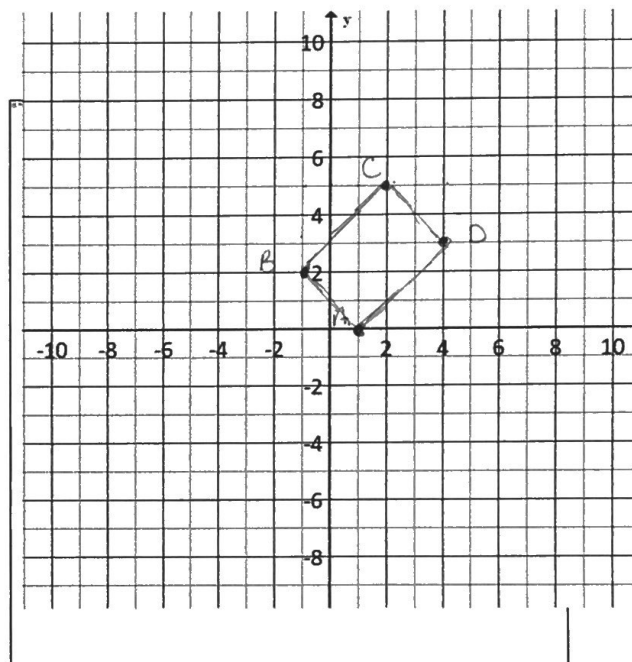3. Plot points A(1, 0), B(-1, 2), C(2, 5), and D(4,3).

   a. Find the length of all four sides.

$$AB = \sqrt{(-1-1)^2 + (2-0)^2} = \sqrt{(-2)^2 + (2)^2} = \sqrt{8}$$

$$BC = \sqrt{(2--1)^2 + (5-2)^2} = \sqrt{(3)^2 + (3)^2} = \sqrt{18}$$

$$CD = \sqrt{(4-2)^2 + (3-5)^2} = \sqrt{(2)^2 + (-2)^2} = \sqrt{8}$$

$$DA = \sqrt{(4-1)^2 + (3-0)^2} = \sqrt{(3)^2 + (3)^2} = \sqrt{18}$$

   b. Find the slope of all four sides.

$$m\,AB = \frac{2}{-2} = 1 \qquad m\,CD = \frac{2}{-2} = -1$$

$$m\,BC = \frac{3}{3} = 1 \qquad m\,DA = \frac{3}{3} = 1$$

   c. What specialized geometric figure is quadrilateral ABCD? How do you know?

- opposite sides are ≅.
- opposite sides are parallel
- sides are perpendicular $(1 \cdot -1) = -1$
  — all angles are Right ∠'s

      } Rectangle

   d. Describe another way that we could have shown that this figure was a rectangle?
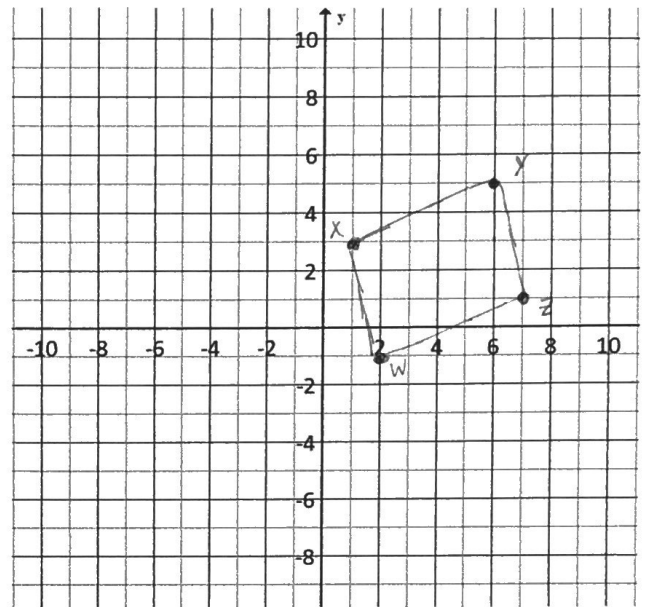
Diagonals are congruent
$$\overline{AC} \cong \overline{BD}$$

1. Plot the points W(2, -1), X(1, 3), Y(6, 5), and Z(7, 1).

   a. What properties do you need to prove WXYZ is a parallelogram?

   - opposite sides are parallel
     $\overline{WX} \parallel \overline{YZ}$, $\overline{XY} \parallel \overline{WZ}$
   - opposite sides are $\cong$.
     $\overline{WX} \cong \overline{YZ}$, $\overline{XY} \cong \overline{WZ}$

   slope of sides

   b. Show that WXYZ is a parallelogram.

   $m\overline{WX} = \frac{4}{-1} = -4$ $m\overline{XY} = \frac{2}{5}$ $m\overline{YZ} = \frac{-4}{-1} = -4$

   $m\overline{ZW} = \frac{-2}{-5} = \frac{2}{5}$

   $WX = \sqrt{(1-2)^2 + (3+1)^2} = \sqrt{(-1)^2 + (4)^2} = \sqrt{17}$

   $XY = \sqrt{(6-1)^2 + (5-3)^2} = \sqrt{(5)^2 + (2)^2} = \sqrt{29}$

   $YZ = \sqrt{(7-6)^2 + (1-5)^2} = \sqrt{(1)^2 + (-4)^2} = \sqrt{17}$ $WZ = \sqrt{(7-2)^2 + (1+1)^2} = \sqrt{25+4} = \sqrt{29}$

   Sides are $\cong$

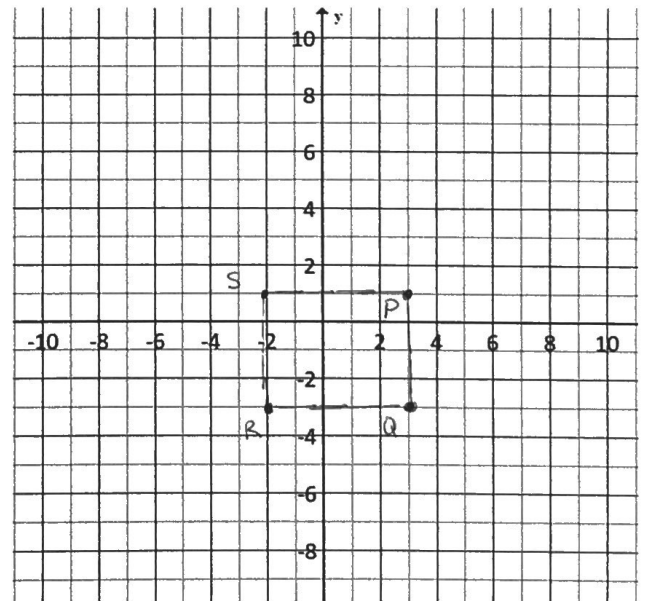2. Plot the points P(3, 1), Q(3, -3), R(-2, -3), and S(-2, 1).

   a. What properties do you need to prove PQRS is a rectangle.?

   - opposite sides are parallel
     $\overline{SR} \parallel \overline{PQ}$, $\overline{SP} \parallel \overline{RQ}$

   - Diagonals are $\cong$.
     $\overline{RP} \cong \overline{SQ}$

   b. Show that PQRS is a rectangle.

   $m\overline{SP} = 0$ $m\overline{SR} = $ undefined
   $m\overline{RQ} = 0$ $m\overline{PQ} = $ undefined

   Slope of sides

   diagonals are $\cong$

   $\overline{RP} = \sqrt{(-2-3)^2 + (-3-1)^2} = \sqrt{(-5)^2 + (-4)^2} = \sqrt{41}$

   $\overline{SQ} = \sqrt{(-2-3)^2 + (1--3)^2} = \sqrt{(-5)^2 + (4)^2} = \sqrt{41}$

Determine whether the given points represent the vertices of a parallelogram, rectangle, rhombus, or square. Justify your answer mathematically.

1. A(-2, 8), B(5, 8), C(2, 0), D(-5, 0)

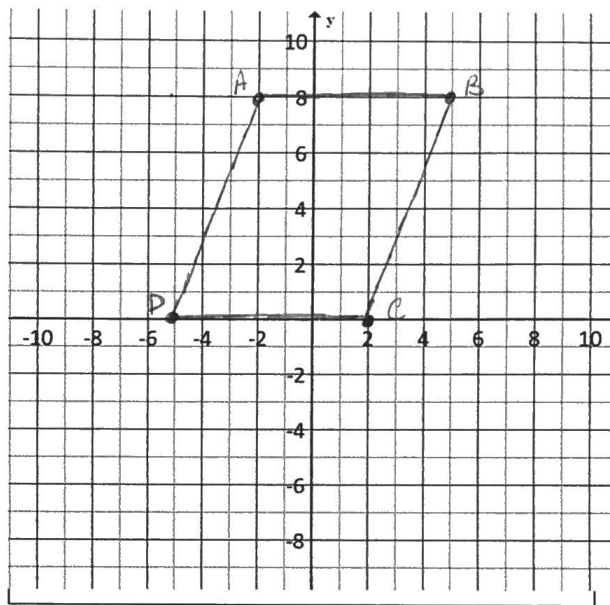Sides || $\quad mAD = \frac{8}{3} \qquad mAB = \frac{0}{7} = 0$

$\qquad mBC = \frac{-8}{-3} = \frac{8}{3} \qquad mCD = \frac{0}{7} = 0$

Distance of sides $\quad AB = 7 \qquad CD = 7$

$DA = \sqrt{(-5+2)^2 + (0-8)^2} = \sqrt{(-3)^2 + (-8)^2} = \sqrt{73}$

$BC = \sqrt{(2-5)^2 + (0-8)^2} = \sqrt{(-3)^2 + (-8)^2} = \sqrt{73}$

[Parallelogram] opposite sides $\cong$ and parallel
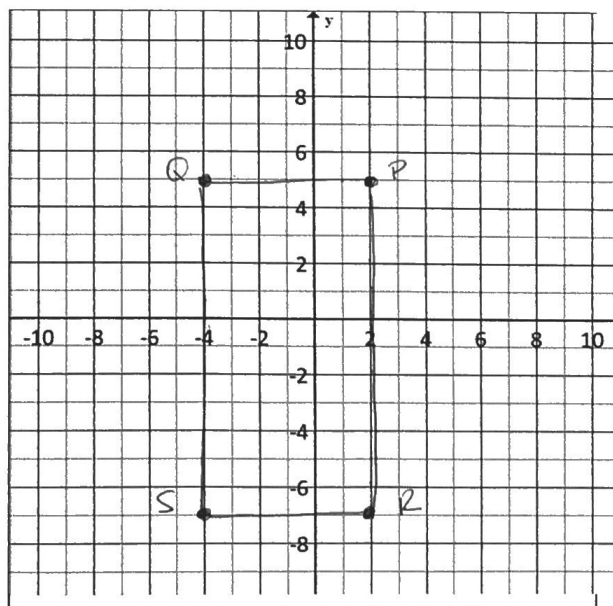

2. P(2, 5), Q(-4, 5), R(2, -7), S(-4, -7)

Sides || $\quad mQP = \frac{0}{6} = 0 \quad mPR = \frac{12}{0} = und.$

$\qquad mSR = \frac{0}{6} = 0 \quad mSQ = \frac{12}{0} = und.$

all 4 right $\angle$'s

$\overline{QP} \perp \overline{PR}$
$\overline{PR} \perp \overline{SR}$
$\overline{SR} \perp \overline{SQ}$
$\overline{SQ} \perp \overline{QP}$

$\left. \right\}$ horizontal + Vertical lines are perpendicular

[OR]

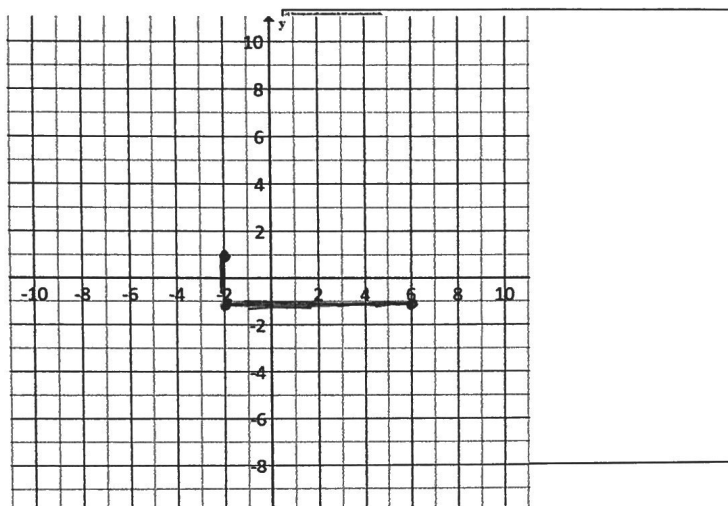$QR = \sqrt{(2+4)^2 + (-7-5)^2} = \sqrt{(6)^2 + (-12)^2} = \sqrt{180}$

$SP = \sqrt{(-4-2)^2 + (-7-5)^2} = \sqrt{(-6)^2 + (-12)^2} = \sqrt{180}$

$\left. \right\}$ Diagonals are congruent

[Rectangle]

Directions: Question 5 is multiple choice. Choose the correct answer.

5. Three vertices of a rectangle on the coordinate plane are (-2, -1), (6, -1), and (-2, 1).

Which of the following is the coordinate of the fourth vertex?

A. (6,1)   B. (6, -1)   C. (-7, 1)   D. (2, 1)

opposite sides ≅
⊥ sides for right angles