

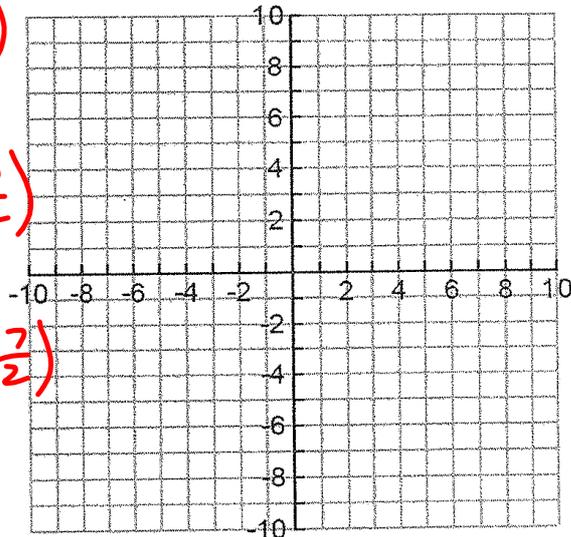
2) Prove that the quadrilateral with the coordinates P(1,1), Q(2, 4), R(5,6), and S(4, 3) is a parallelogram.

PROVE IT IS A PARALLELOGRAM BY DIAGONALS BISECT EACH OTHER

$$\text{midpoint} = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$\text{mp}(PR) = \left( \frac{1+5}{2}, \frac{1+6}{2} \right) = \left( 3, \frac{7}{2} \right)$$

$$\text{mp}(QS) = \left( \frac{2+4}{2}, \frac{4+3}{2} \right) = \left( 3, \frac{7}{2} \right)$$



diagonals PR and QS have the same midpoint

meaning PR and QS bisect each other

$\therefore$  PQRS is a parallelogram

3) The vertices of quadrilateral  $JOHN$  are  $J(-3, 1)$ ,  $O(3, 3)$ ,  $H(5, 7)$ , and  $N(-1, 5)$ .

Prove  $JOHN$  is a parallelogram by opposite sides are congruent

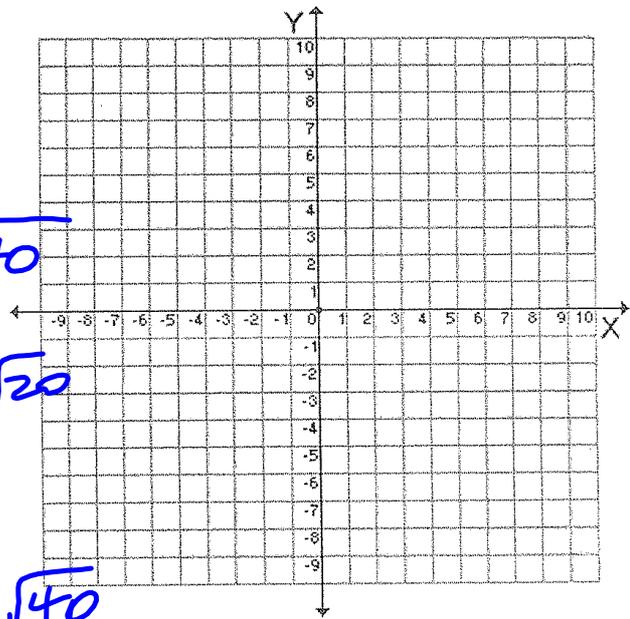
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$JO = \sqrt{(3 - (-3))^2 + (3 - 1)^2} = \sqrt{40}$$

$$OH = \sqrt{(5 - 3)^2 + (7 - 3)^2} = \sqrt{20}$$

$$HN = \sqrt{(-1 - 5)^2 + (5 - 7)^2} = \sqrt{40}$$

$$NJ = \sqrt{(-1 - 3)^2 + (5 - 1)^2} = \sqrt{20}$$



$$\overline{JO} \cong \overline{HN} \text{ and } \overline{OH} \cong \overline{NJ}$$

opposite sides  $\cong$

$\therefore JOHN$  is  $\square$

- 4) Prove that quadrilateral LEAP with vertices L(-3, 1), E(2, 6), A(9, 5), and P(4, 0) is a parallelogram.

Prove it is parallelogram by opposite sides are parallel

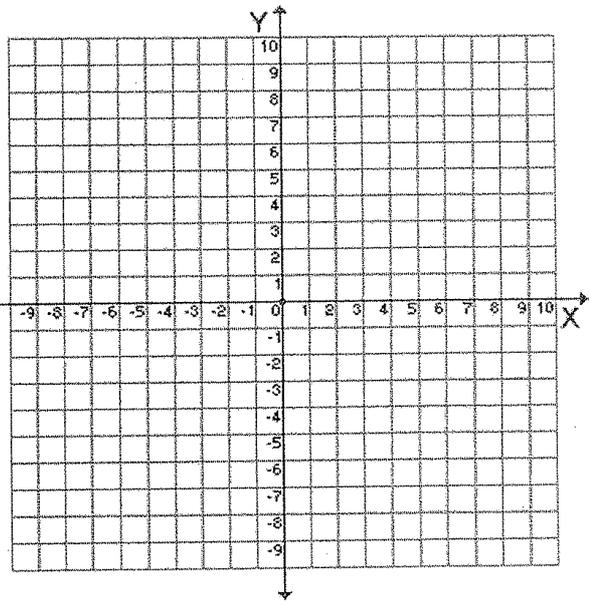
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m(LE) = \frac{6 - 1}{2 - (-3)} = \frac{5}{5} = 1$$

$$m(EA) = \frac{5 - 6}{9 - 2} = \frac{-1}{7}$$

$$m(AP) = \frac{0 - 5}{4 - 9} = \frac{-5}{-5} = 1$$

$$m(PL) = \frac{0 - 1}{4 - (-3)} = \frac{-1}{7}$$



LE  $\parallel$  AP

EA  $\parallel$  PL

opposite sides  $\parallel$

$\therefore$  LEAP is a  $\square$

5) Prove that quadrilateral with vertices A(-2, 3), B(2, 6), C(7, 6), and D(3, 3) is a rhombus.

Prove it is a rhombus by all sides congruent

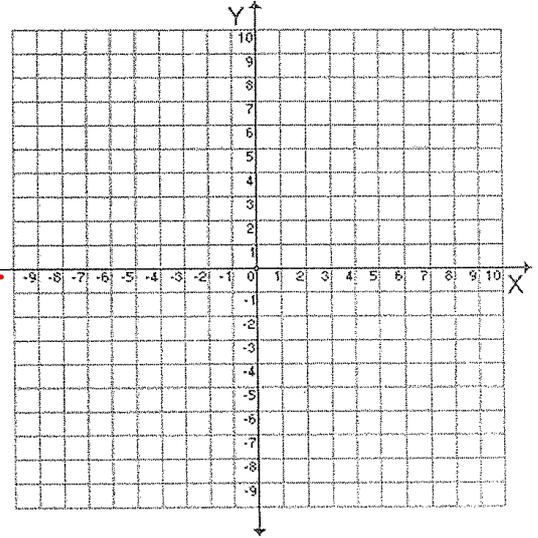
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$AB = \sqrt{(2 - (-2))^2 + (6 - 3)^2} = \sqrt{25}$$

$$BC = \sqrt{(7 - 2)^2 + (6 - 6)^2} = \sqrt{25}$$

$$CD = \sqrt{(3 - 7)^2 + (3 - 6)^2} = \sqrt{25}$$

$$DA = \sqrt{(3 - (-2))^2 + (3 - 3)^2} = \sqrt{25}$$



$$\overline{AB} \cong \overline{CD}, \overline{BC} \cong \overline{DA}$$

opp sides  $\cong \therefore ABCD$  is a  $\square$

all sides  $\cong$

$$\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{DA}$$

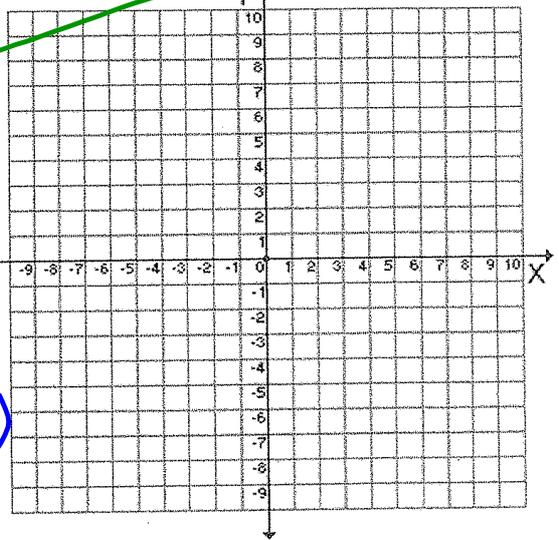
a  $\square$  with all sides  $\cong$  is a rhombus.

6) Prove the quadrilateral with vertices A(-1, 4), B(2, 6), C(5, 4), and D(2, 2) is a rhombus.

Prove it is a rhombus by diagonals bisect each other and are perpendicular

midpoint  
$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Slope  
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$



$$mp(AC) = \left( \frac{-1 + 5}{2}, \frac{4 + 4}{2} \right) = (2, 4)$$

$$mp(BD) = \left( \frac{2 + 2}{2}, \frac{6 + 2}{2} \right) = (2, 4)$$

diagonals have same midpt, making  
AC and BD bisect each other  
 $\therefore$  ABCD is a  $\square$

$$m(AC) = \frac{4 - 4}{5 - -1} = \frac{0}{6} = 0 \text{ slope}$$

$$m(BD) = \frac{2 - 6}{2 - 2} = \frac{-4}{0} = \text{undefined slope.}$$

slope 0  $\perp$  slope undefined  
(horizontal line) (vertical line)

AC  $\perp$  BD

making ABCD a rhombus.