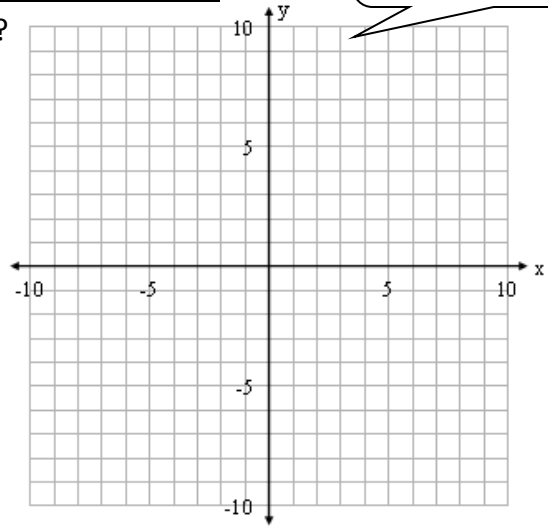


Unit 6 Day 7 Notes + HMWK: Parallelograms & Trapezoids in the Coordinate Plane

What is the **definition** of a parallelogram?

DETERMINING WHETHER A QUADRILATERAL IS A PARALLELOGRAM IN THE COORDINATE PLANE

Given  $A(-5,1)$ ,  $B(-2,7)$ ,  $C(7,9)$ ,  $D(4,3)$ , is  $ABCD$  a parallelogram?



FINDING A MISSING VERTEX:

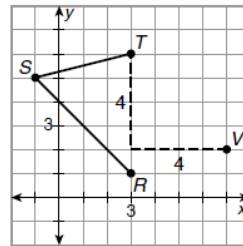
If you know the coordinates of three vertices of a parallelogram, you can use slope to find the coordinates of the fourth vertex.

Three vertices of  $\square RSTV$  are  $R(3, 1)$ ,  $S(-1, 5)$ , and  $T(3, 6)$ . Find the coordinates of  $V$ .

Since opposite sides must be parallel, the rise and the run from  $S$  to  $R$  must be the same as the rise and the run from  $T$  to  $V$ .

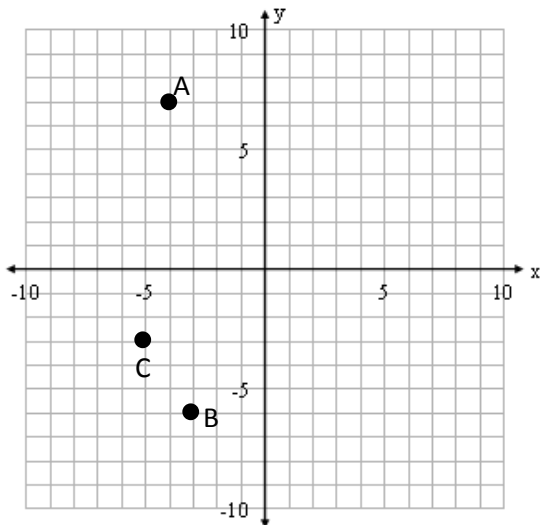
From  $S$  to  $R$ , you go down 4 units and right 4 units. So, from  $T$  to  $V$ , go down 4 units and right 4 units. Vertex  $V$  is at  $V(7, 2)$ .

You can use the slope formula to verify that  $\overline{ST} \parallel \overline{RV}$ .



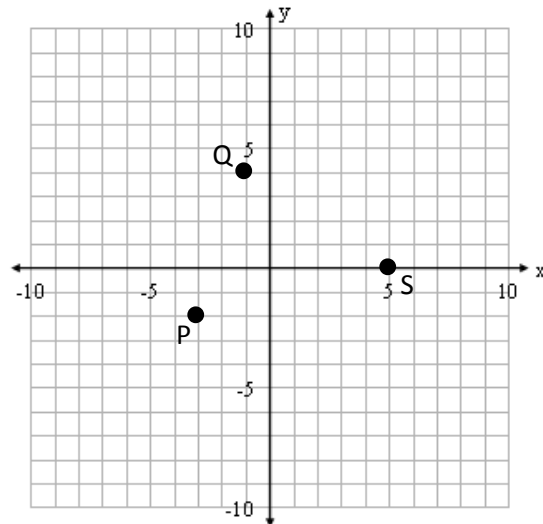
Example 1:

Three vertices of  $\square ABCD$  are  $A(-4,7)$ ,  $B(-3,-6)$  and  $C(-5,-3)$ . Find the coordinates of vertex  $D$ .



Example 2:

Three vertices of  $\square PQRS$  are  $P(-3,-2)$ ,  $Q(-1,4)$  and  $S(5,0)$ . Find the coordinates of vertex  $R$ .

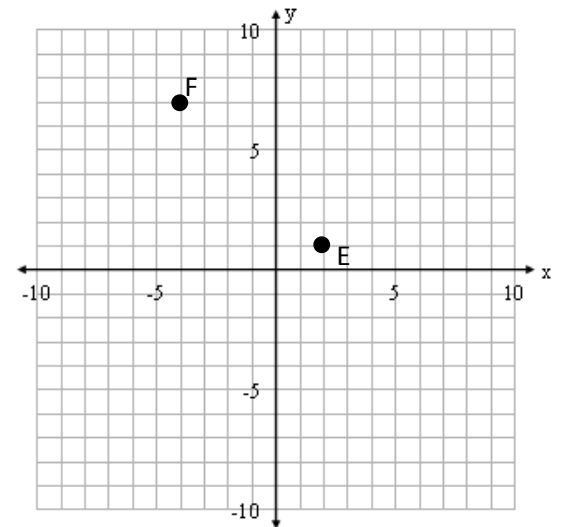


## FINDING THE COORDINATES FOR TWO VERTICES

### Example 3:

Two vertices of  $\square FRED$  are  $F(-4,7)$  and  $E(2,1)$ . Which could be the coordinates of the other two vertices? Explain why the other choices cannot be correct.

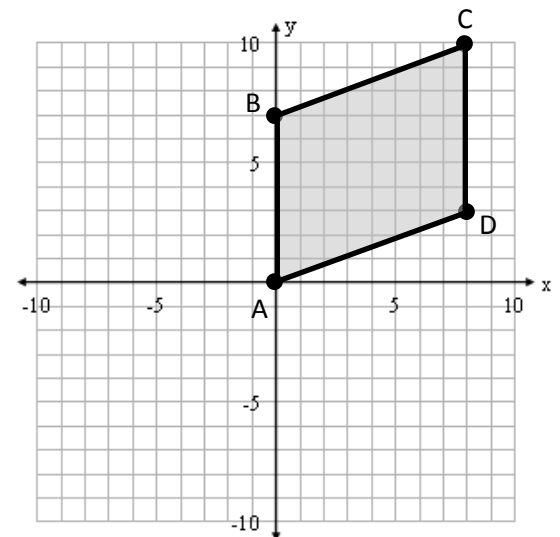
- A)  $R(2,10)$   $D(8,4)$
- B)  $R(-5,3)$   $D(4,10)$
- C)  $R(-1,9)$   $D(-1,-1)$



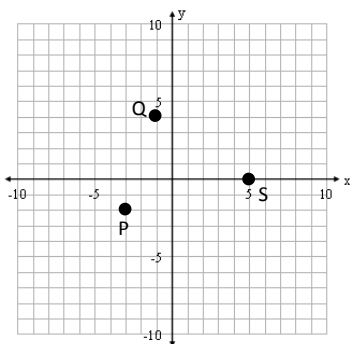
## WRITING THE EQUATION OF THE SIDE OF A PARALLELOGRAM:

Example 4: Which could NOT be an equation of the line containing the side  $\overline{BC}$  of  $\square ABCD$ ?

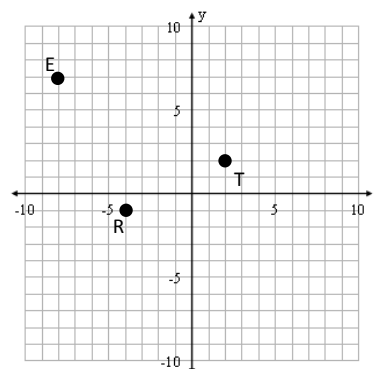
- A)  $y = \frac{3}{8}x + 6$
- B)  $y - 10 = \frac{3}{8}(x - 8)$
- C)  $y - 4 = \frac{3}{8}(x + 8)$
- D)  $y = -\frac{8}{3}x + 6$



Example 5: Write an equation of the line containing the missing vertex of  $\square PQRS$  given vertices  $P(-3,-2)$ ,  $Q(-1,4)$  and  $S(5,0)$ .

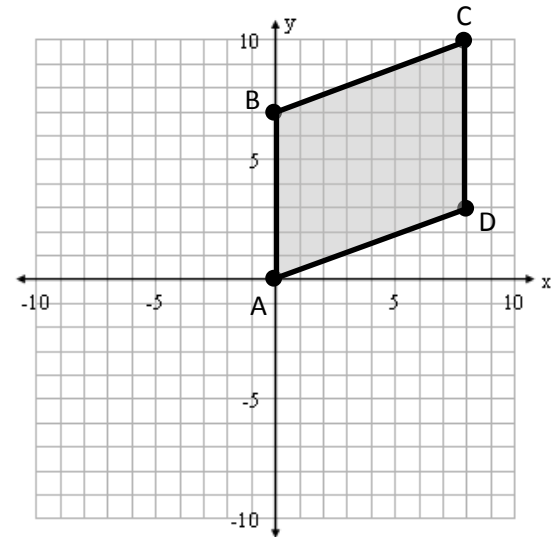


Example 6: Write an equation of the line containing the missing vertex of rectangle RECT given vertices  $R(-4,-1)$ ,  $E(-8,7)$  and  $T(2,2)$ .



## FINDING THE POINT OF INTERSECTION OF THE DIAGONALS OF A PARALLELOGRAM

Example 7: Find the point of intersection of the diagonals in parallelogram ABCD both algebraically and graphically. A(0,0) B(0,7) C(8,10) D(8,3)

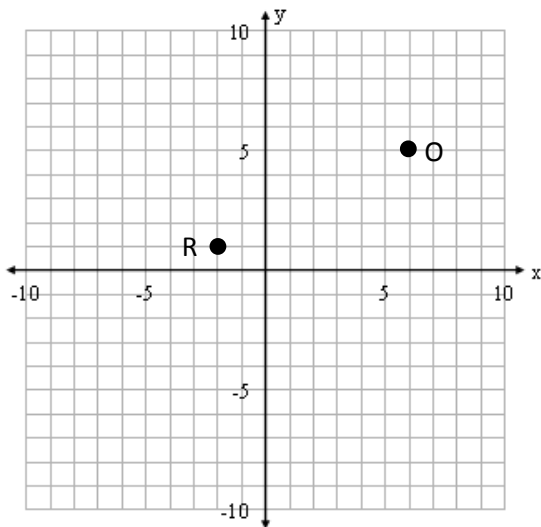


- Explain why you used the chosen coordinate plane formula:
- If ABCD was also a rhombus, what is the additional relationship of the diagonals? \_\_\_\_\_
- If ABCD was a rectangle, what is the additional relationship of the diagonals? \_\_\_\_\_

## WRITING THE EQUATION OF A DIAGONAL OF A PARALLELOGRAM

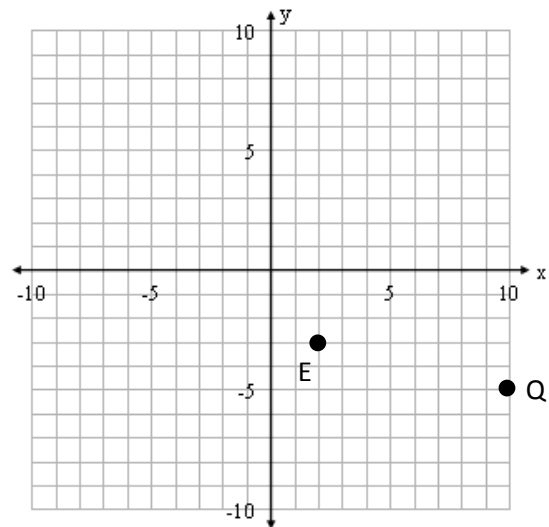
### Example 8: RHOMBUS

Write an equation of the line that contains the diagonal  $\overline{HM}$  of rhombus RHOM given vertices R(-2,1) and O(6,5).



### Example 9: SQUARE

Write an equation of the line that contains the diagonal  $\overline{SR}$  of square SQRE given vertices Q(10,-5) and E(2,-3).

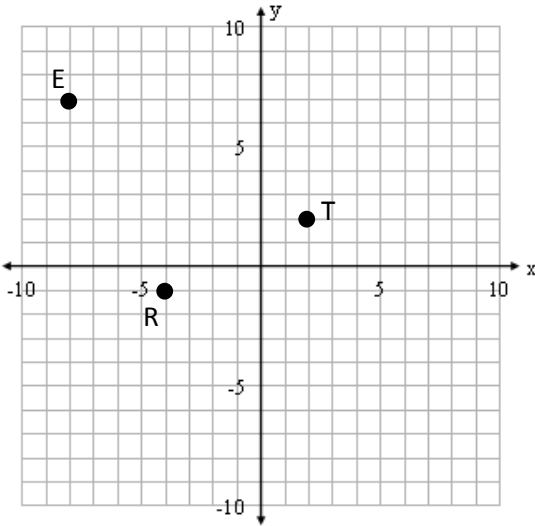


**PROBLEM SET 6-7**

NAME: \_\_\_\_\_ Section: \_\_\_\_\_

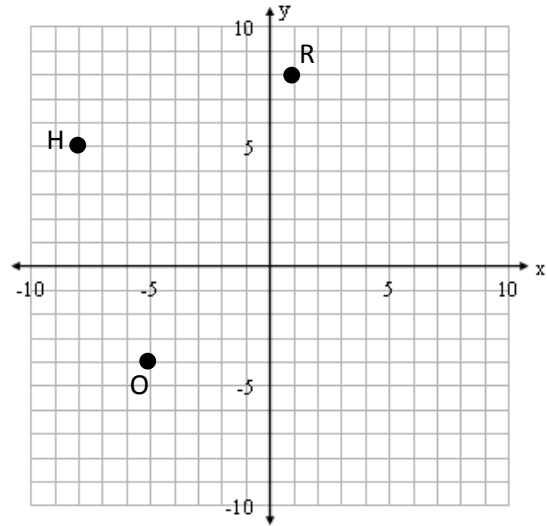
Problem 1: Rectangle

Three vertices of rectangle RECT are  $R(-4,-1)$ ,  $E(-8,7)$  and  $T(2,2)$ . Find the coordinates of vertex C.



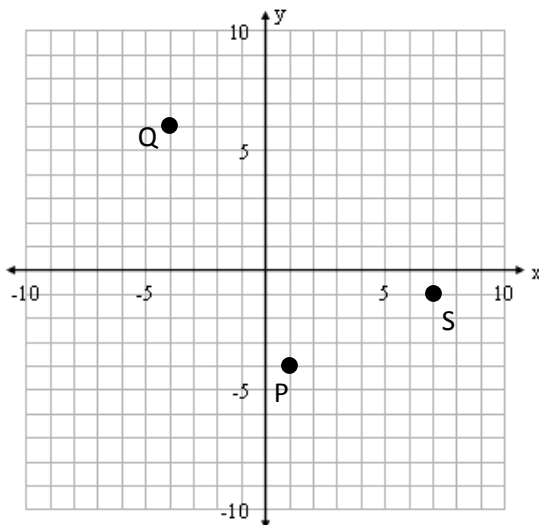
Problem 2: Rhombus

Three vertices of rhombus RHOM are  $R(1,8)$ ,  $H(-8,5)$  and  $O(-5,-4)$ . Find the coordinates of vertex M.



Problem 3: Three vertices of rectangle PQRS are  $P(1,-4)$ ,  $Q(-4,6)$  and  $S(7,-1)$ .

- Explain why R cannot be located at  $(-10,3)$ :
- Explain why R cannot be located at  $(0,8)$ :
- What type of quadrilateral will be formed if R is located at  $(0,8)$ ? \_\_\_\_\_
- What are the coordinate for R? \_\_\_\_\_ Explain why these *are* the correct coordinates:



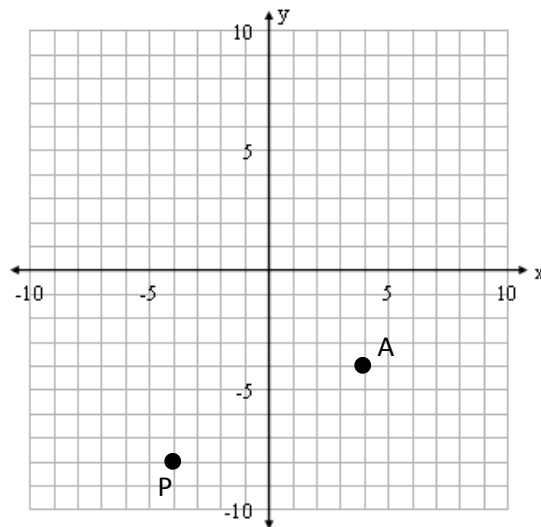
**Problem 4:**

Two vertices of square PLAY are  $P(-4,-8)$  and  $A(4,-4)$ . Which could be the other two vertices? Explain why the other choices cannot be correct.

A)  $L(2,-10)$  and  $Y(-2,-2)$

B)  $L(-4,-4)$  and  $Y(4,-8)$

C)  $L(-1,-4)$  and  $Y(1,-8)$



**Problem 5:** Two vertices of a quadrilateral are  $(-5,5)$  and  $(5,5)$ .

Which specific quadrilateral (parallelogram, rectangle, rhombus, or square, trapezoid, isosceles trapezoid) would be formed by locating the other two vertices at:

A)  $(0,8)$  and  $(0,2)$  \_\_\_\_\_

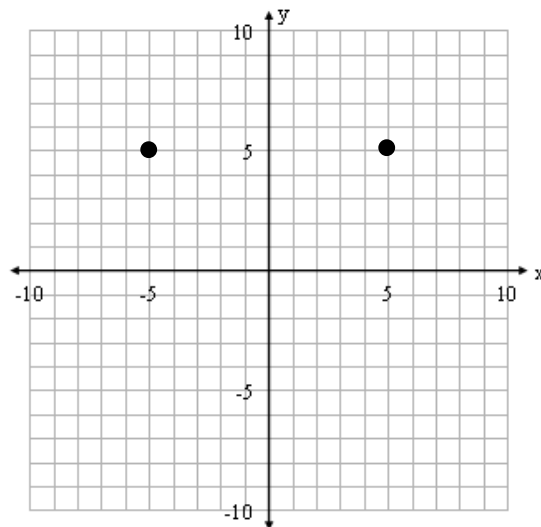
B)  $(0,0)$  and  $(0,10)$  \_\_\_\_\_

C)  $(-5,-5)$  and  $(5,-5)$  \_\_\_\_\_

D)  $(-5,1)$  and  $(5,1)$  \_\_\_\_\_

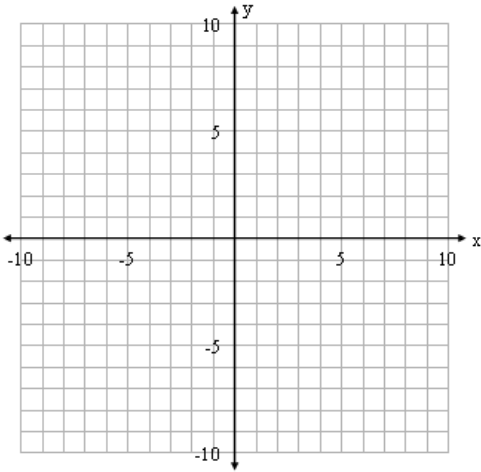
E)  $(-3,8)$  and  $(3,2)$  \_\_\_\_\_

F)  $(-8,0)$  and  $(8,0)$  \_\_\_\_\_

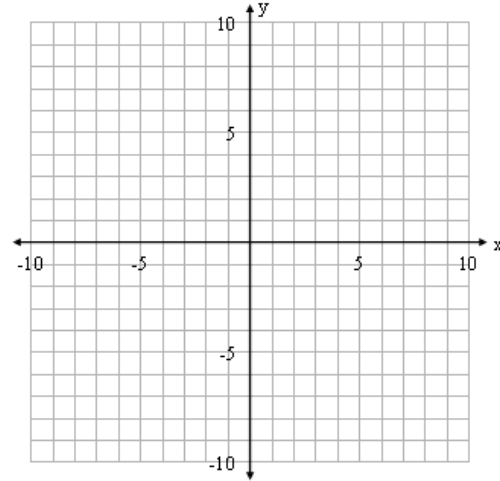


**Recall**  $y - y_1 = m(x - x_1)$

- 6) Write an equation of the line containing the missing vertex of parallelogram FTBL given vertices F(-4,0), T(-2,-6) and L(7,4).

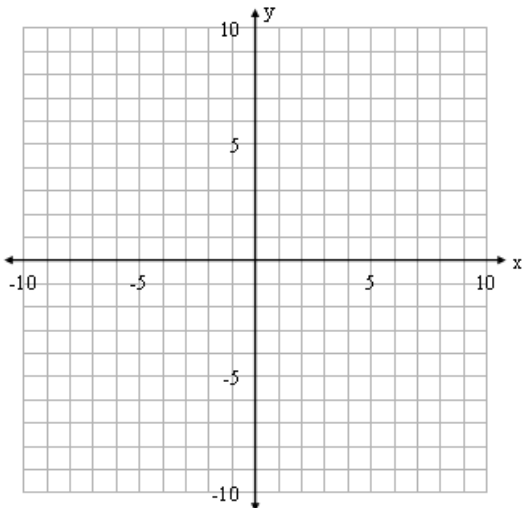


- 7) Write an equation of the line that contains the diagonal  $\overline{AH}$  of square MATH given vertices M(-3,2) and T(5,8).



- 8) Given T(-4,5) and R(8,-1) are two vertices of trapezoid TRAP, which of the following equations could contain the base  $\overline{AP}$ ? Explain why the others cannot.

- a.  $y = -\frac{1}{2}x + 3$
- b.  $y - 1 = -\frac{1}{2}(x - 4)$
- c.  $y + 1 = \frac{2}{1}(x - 8)$
- d.  $y = -\frac{1}{2}x + 8$



- 9) Given R(-2,1), locate the vertex O of rhombus SOCR if the line containing diagonal  $\overline{SC}$  has the equation:

- A)  $y = -\frac{3}{1}x + 5$
- B)  $y - 0 = \frac{4}{5}(x - 7)$

