Agenda- 6.7

Quadrilateral Proofs in the Coordinate Plane

- Check HW 6.6
- Guided Notes 6.7

HW - Worksheet 6.7

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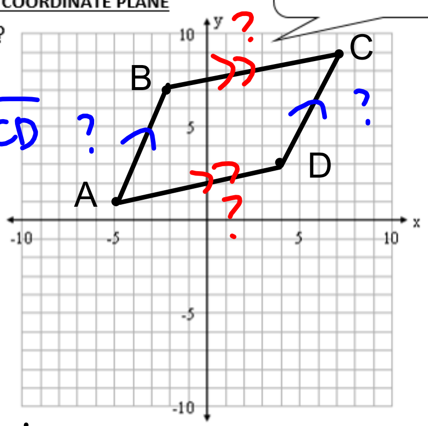
Geometry **Name:**__________________________________ **Date:**__________ **Section:**________

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?



$m\overline{AB} = \frac{6}{3} = \frac{2}{1}$ } $\overline{AB} \parallel \overline{CD}$?

$m\overline{CD} = \frac{2}{1}$

$m\overline{CB} = \frac{2}{9}$ } $\overline{CB} \parallel \overline{AD}$

$m\overline{AD} = \frac{2}{9}$

YES, ▱ABCD B/C BOTH PAIRS OF OPPOSITE SIDES ARE ∥.

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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.

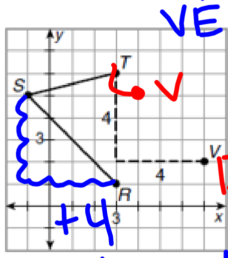
Three vertices of ▱*RSTV* are *R*(3, 1), *S*(−1, 5), and *T*(3, 6). Find the coordinates of *V*.

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 $\overline{ST} \parallel \overline{RV}$.

CONSECUTIVE ORDER OF VERTICES!



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

DON'T REDUCE SLOPE

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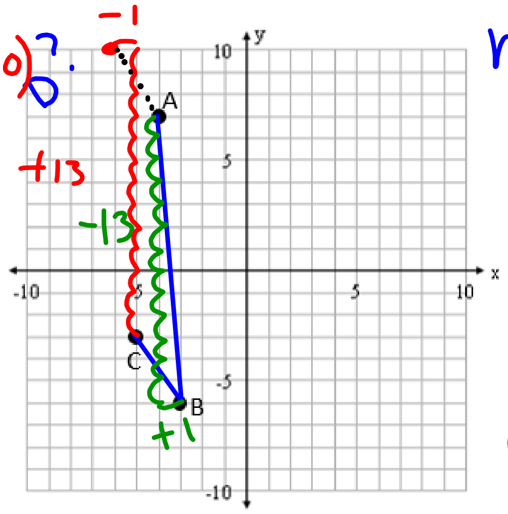
Example 1:

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

$\overline{CD} \parallel \overline{AB}$

D(-6,10)?



$m_{\overline{CD}} = m_{\overline{AB}}$

$= \frac{-13}{1}$

COUNT FROM C

↑13 ←1

CHECK $\overline{CB} \parallel \overline{DA}$

$-\frac{3}{2}$ SLOPES

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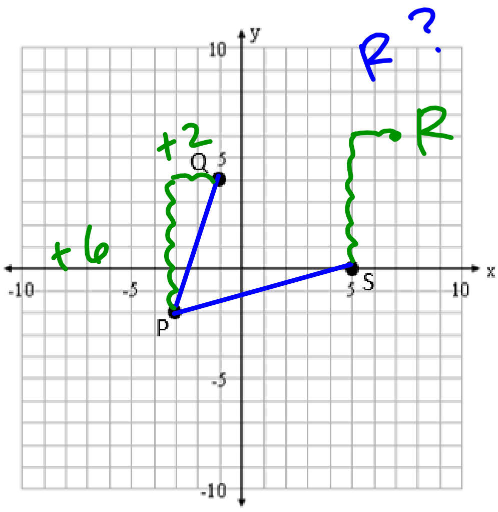
Example 2:

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



$\overline{PQ} \parallel \overline{SR}$

DON'T USE

3/1

R(6,3)

$m_{\overline{PQ}} = \frac{6}{2} = m\overline{SR}$

R(7,6)

CHECK $\overline{QR} \parallel \overline{PS}$ ✗

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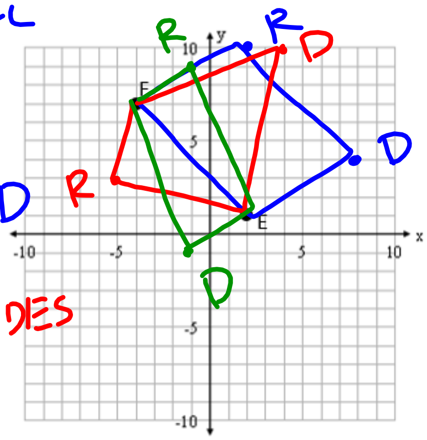
FINDING THE COORDINATES FOR TWO VERTICES

Example 3:

Two vertices of ▱$FRED$ 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.

$\overline{FE}$ DIAGONAL



A) R(2,10) D(8,4)

B) R(-5,3) D(4,10)

C) R(-1,9) D(-1,-1)

$\boxed{P}$ FRDE NOT FRED

TRAP FRED ONLY 1 PAIR OPP SIDES ∥

BOTH PAIRS OPP SIDES ∥

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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 $\square ABCD$?

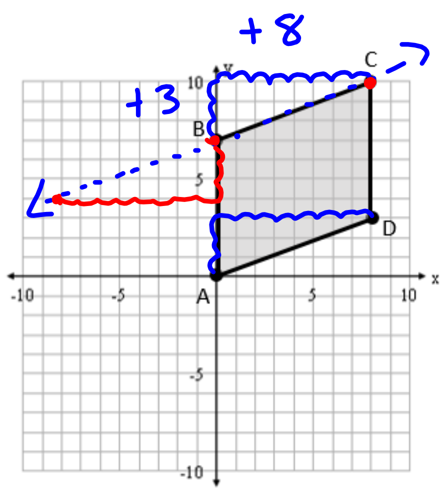
$m = \frac{3}{8}$

A) $y = \frac{3}{8}x + 6$ 7 THRU B ✓

B) $y - 10 = \frac{3}{8}(x - 8)$ C(8, 10) ✓

C) $y - 4 = \frac{3}{8}(x + 8)$ (−8, 4) ✓

~~D)~~ $y = -\frac{8}{3}x + 6$ WRONG SLOPE NOT ∥ TO $\overline{AD}$



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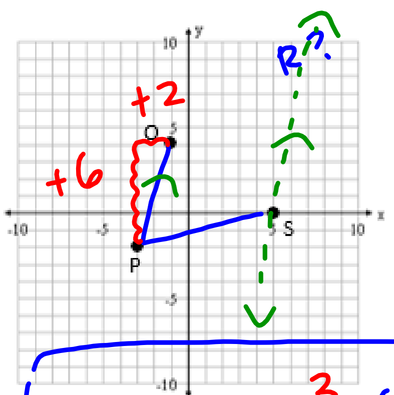
Example 5: Write an equation of the line containing the missing vertex of $\square PQRS$ given vertices P(-3,-2), Q(-1,4) and S(5,0).

EQ LINE ∥ TO GIVEN LINE THRU GIVEN POINT

$\overline{PQ} \parallel \overline{RS}$ THRU S(5, 0)

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

$m\overline{PQ} = \frac{6}{2} = m\overline{RS}$



$\boxed{y - 0 = \frac{3}{1}(x - 5)}$

OK TO REDUCE FOR EQ
$m = \frac{3}{1}$

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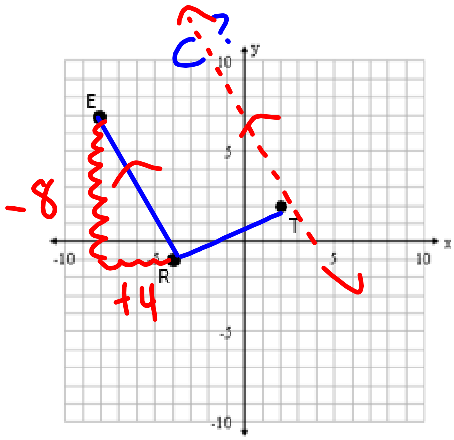
Example 6: Write an equation of the line containing the missing vertex of rectangle RECT given vertices R(-4,-1), E(-8,7) and T(2,2).



$\overline{ER} \parallel \overline{CT}$ THRU T

$m_{\overline{ER}} = \frac{-8}{4} = m_{\overline{CT}}$

OR $-\frac{2}{1}$

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

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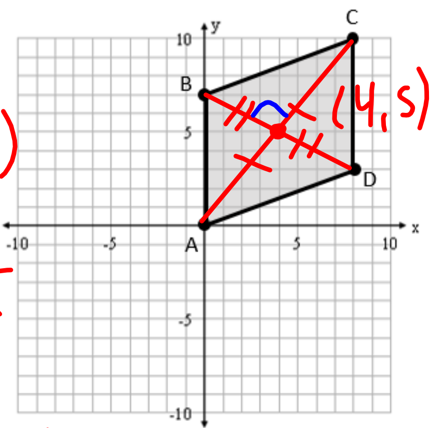
FINDING THE POINT OF INTERSECTION OF THE DIAGONALS OF A PARALLELOGRAM

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)



$\overline{BD} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = (4, 5)$

$\overline{AC} = (4, 5)$ COMMON MIDPOINT

- Explain why you used the chosen coordinate plane formula:
  MIDPOINT – DIAGONALS BISECT EACH OTHER
- If ABCD was also a rhombus, what is the additional relationship of the diagonals? $\perp$
- If ABCD was a rectangle, what is the additional relationship of the diagonals? $\cong$

SQ: DIAGONALS ARE $\cong$ $\perp$ BISECTORS OF EACH OTHER

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WRITING THE EQUATION OF A DIAGONAL OF A PARALLELO

Example 8: RHOMBUS

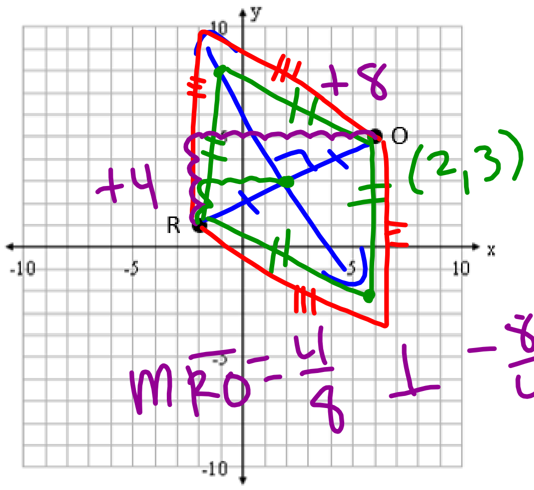
Write an equation of the line that contains the diagonal $\overline{HM}$ of rhombus RHOM given vertices R(-2,1) and O(6,5).

⊥ BIS OF $\overline{RO}$

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

MIDPT OPP REC MIDPOINT

MIDPOINT OF $\overline{RO}$



$m\overline{RO} = \frac{4}{8}$ ⊥ $-\frac{8}{4} = m\overline{HM}$

$-\frac{2}{1}$

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

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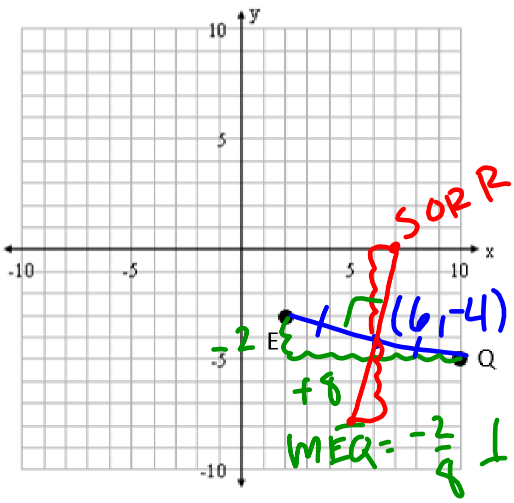
Example 9: SQUARE

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

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



$mEQ = -\frac{2}{8}$ ⊥ $+\frac{8}{2} = m\overline{SR}$

IF WANT S & R COORDINATES, COUNT ⊥ SLOPE HALF OF IT FROM MIDPOINT

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