Lesson 6-6 LAB : Special Parallelograms in the Coordinate Plane

Agenda:

- Check & Review Homework 6-5
- Notes 6.6 - Finish
- Take Quiz Lessons 6.4-6.5

Homework:

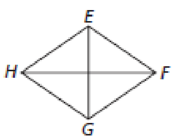
- "Worksheet 6.6B" - Complete Worksheet
- Prepare for quiz today

HW p. 422-423 7, 8, 11-16, 24-27

Determine if the conclusion is valid. If not, tell what additional information is needed to make it valid.

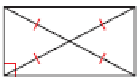
7. Given: $\overline{EG}$ and $\overline{FH}$ bisect each other. $\overline{EG} \perp \overline{FH}$
   Conclusion: *EFGH* is a rhombus. valid

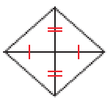
8. Given: $\overline{FH}$ bisects $\angle EFG$ and $\angle EHG$.
   Conclusion: *EFGH* is a rhombus.

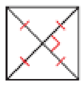


8. Not valid; by Thm. 6-5-5, if 1 diag. of a ▱ bisects a pair of opp. ∡s, then the ▱ is a rhombus. To apply this thm., you need to know that *EFGH* is a ▱.

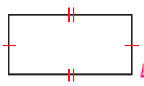
Tell whether each quadrilateral is a parallelogram, rectangle, rhombus, or square. Give all the names that apply.

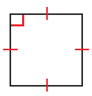
11.  ▱, rect.

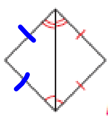
12.  ▱

13.  ▱, rect., rhombus, square

Tell whether each quadrilateral is a parallelogram, rectangle, rhombus, or square. Give all the names that apply.

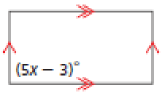
14.  ▱

15.  ▱, rect., rhombus, square

16.  ▱, rhombus

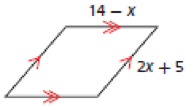
Find the value of x that makes each parallelogram the given type.

24. rectangle



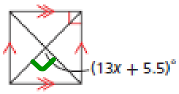
18.6

25. rhombus

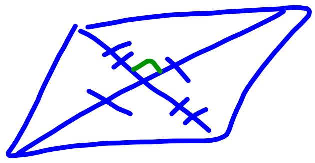


3

26. square



6.5



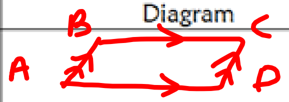
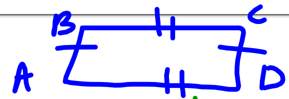
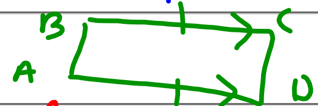
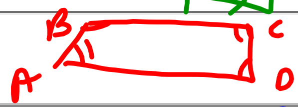
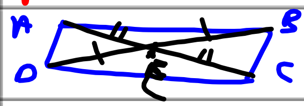
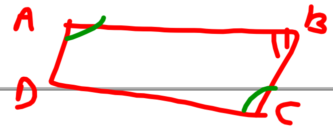
27. Critical Thinking The diagonals of a quadrilateral are perpendicular bisectors of each other. What is the best name for this quadrilateral? Explain your answer.

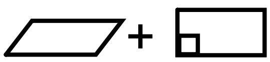
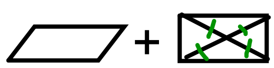
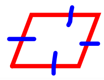
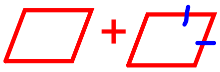
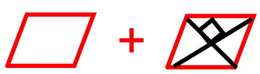
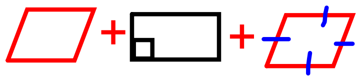
27. Rhombus; since the diags. bisect each other, the quad. is a ▱. Since the diags. of the ▱ are ⊥, the quad. is a rhombus.

COMPLETE THE CHART BY PLACING A CHECK IF THE QUADRILATERAL HAS THAT PROPERTY.

PROPERTY	PARALLELOGRAM	RECTANGLE	RHOMBUS	SQUARE
Opposite Sides are Parallel	★	★	★	★
Opposite Sides are Congruent	★	★	★	★
Opposite Angles are Congruent	★	★	★	★
Consecutive Angles are Supplementary	★	★	★	★
Four Congruent Angles (4 Right ∠'s)		▬		▬
Four Congruent Sides			▰	▰
Diagonals Bisect each other	★	★	★	★
Diagonals are Congruent		▬		▬
Diagonals are Angle Bisectors			▰	▰
Diagonals are Perpendicular			▰	▰

***Take out "Ways To Prove Quadrilaterals" from your Lesson Summaries or record below then transcribe:*

Ways to prove a quadrilateral is a parallelogram:		
Theorem/Condition	Diagram	Formula
Show 2 pairs of opposite sides ∥		
Show 2 pairs of opposite sides ≅		
Show 1 pair of opposite sides ∥ and ≅		
Show 2 pairs of opposite angles ≅		∡A ≅ ∡C AND ∡B ≅ ∡D
Show diagonals bisect each other		
Show an angle is supplementary to Both of its consecutive ∠'s		$m\angle B + m\angle C = 180$ and $m\angle B + m\angle A = 180$

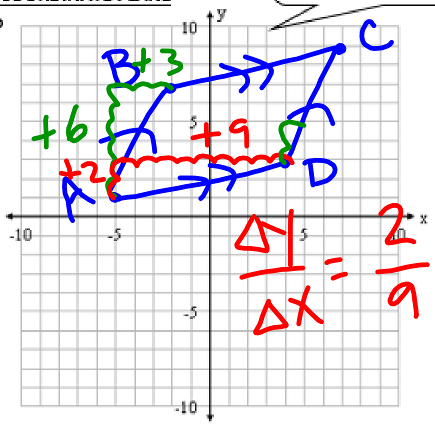
Coordinate Geometry Tools:		
Slope	Distance	Midpoint
$m = \frac{\Delta y}{\Delta x}$ To show = → ∥ $m_1 \cdot m_2 = -1$ → ⊥; Opp reciprocals → ⊥	$x = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ To show = → ≅	Midpoint = $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ To show same midpoint → diagonals bisect each other
Ways to prove a quadrilateral is a rectangle:		
Show it's a parallelogram w/ 1 rt. <		
Show it's a parallelogram w/ ≅ diagonals		
Ways to prove a quadrilateral is a rhombus:		
Show it has 4 ≅ sides	quad → 	
Show it's a parallelogram w/ 2 consecutive ≅ sides		
Show it's a parallelogram in which the diagonals are perpendicular		
Ways to prove a quadrilateral is a square:		
Show it is a parallelogram that is both rectangle + rhombus		

***Take out "Ways to Prove Quadrilaterals" in your Lesson Summaries as a resource*

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

DETERMINING WHETHER A QUADRILATERAL IS A PARALLELOGRAM IN THE COORDINATE PLANE

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



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

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

$\overline{BC} \parallel \overline{AD}$? ✓

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

▱ABCD B/C BOTH SETS OF OPPOSITE SIDES ARE ∥.

FINDING A MISSING VERTEX:

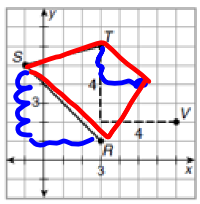
If you know the coordinates of three vertices of a parallelogram, you can use slope to find the coordinates of the fourth vertex.

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

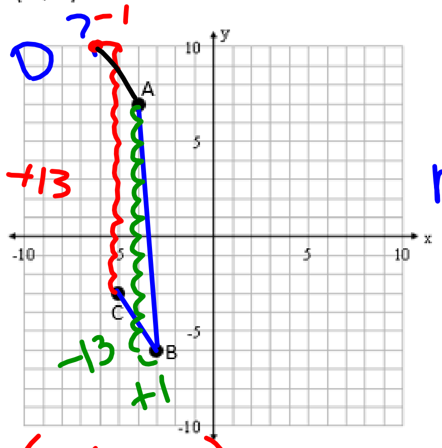


DON'T REDUCE SLOPE!

CONSECUTIVE ORDER W/VERTICES

Example 1:

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



D(-6,10)

CHECK: $m\overline{DA} = -\frac{3}{2} = m\overline{CB}$

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

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

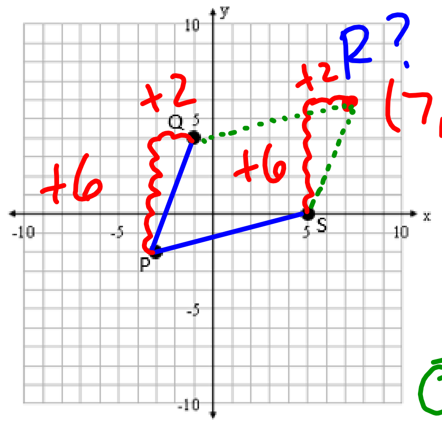
$m\overline{AB} = \frac{-13}{1} = m\overline{CD}$

FROM C COUNT SLOPE

↑13 ←1 $\frac{+13}{-1}$

Example 2:

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



(7,6)

$\overline{PQ} \parallel \overline{RS}$ DON'T REDUCE!

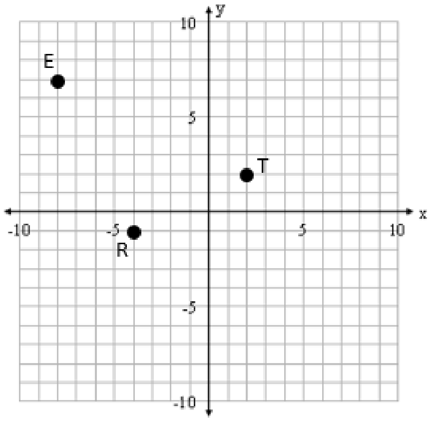
$m\overline{PQ} = \frac{6}{2} = m\overline{RS}$

COUNT $\frac{6}{2}$ FROM S

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

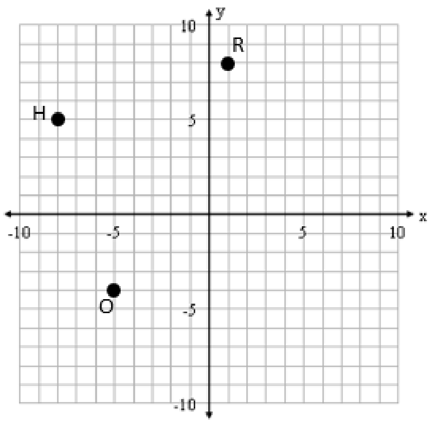
$m\overline{QR} = \frac{2}{8} = m\overline{PS}$ ✓

Example 3: Rectangle
Three vertices of rectangle RECT are R(-4,-1), E(-8,7) and T(2,2). Find the coordinates of vertex C.



Homework

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

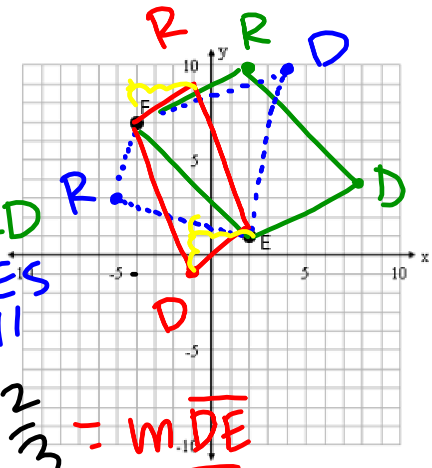


Homework

FINDING THE COORDINATES FOR TWO VERTICES

Example 5:

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.



X A) R(2,10) D(8,4)   ▱FRDE ≠ ▱FRED

X B) R(-5,3) D(4,10)   BOTH SETS OPP SIDES HAVE TO BE ∥

C) R(-1,9) D(~~5,3~~) D(-1,-1)

$\overline{FR} \parallel \overline{ED}$? $m\overline{FR} = \frac{2}{3} = m\overline{DE}$

$\overline{FD} \parallel \overline{RE}$? $m\overline{FD} = -\frac{8}{3}\ m\overline{RE}$

Example 6:

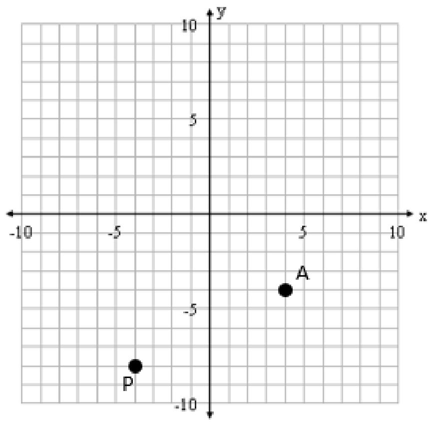
Two vertices of square PLAY are P(-4,-8) and A(4,-4). Which could be the other two vertices? Explain why the other choices cannot be correct.

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

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

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

Homework



WRITING THE EQUATION OF THE SIDE OF A PARALLELOGRAM:

Example 7: 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) $y=-\frac{8}{3}x+6$

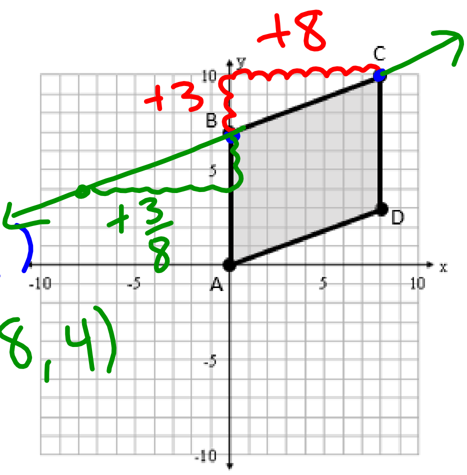
NOT RIGHT SLOPE

$(0,6)$

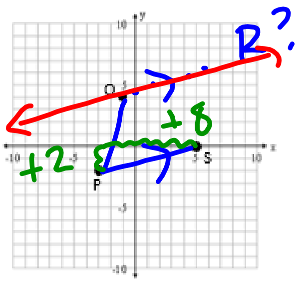
$y=mx+b$

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

$(8,10)$ $(-8,4)$



Example 8: 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).



$m\overline{PS} = \frac{2}{8} = m\overline{QR}$

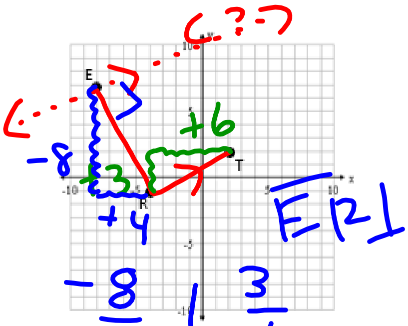
THROUGH Q(-1,8)

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

$y-8=\frac{2}{8}(x-(-1))$

$\boxed{y-8=\frac{1}{4}(x+1)}$

Example 9: 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).



$\overline{RT} \parallel \overline{EC}$

$m\overline{RT} = \frac{3}{6} = m\overline{EC}$

THROUGH PT E(-8,7)

$\overline{ER} \perp \overline{RT}$

$\frac{-8}{4} \perp \frac{3}{6}$

$\frac{-2}{1} \perp +\frac{1}{2}$ ✓

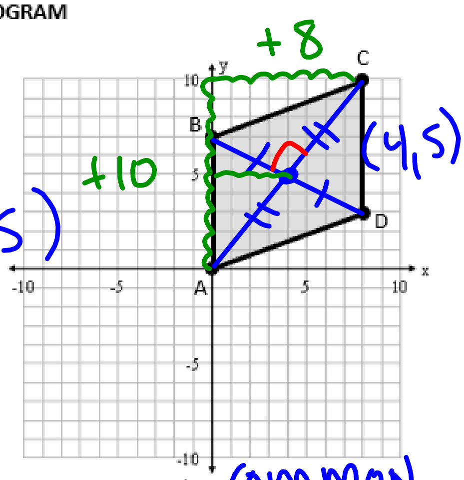
$y - y_1 = m(x - x_1)$

$y - 7 = \frac{3}{6}(x - (-8))$

$$\boxed{y - 7 = \frac{1}{2}(x + 8)}$$

FINDING THE POINT OF INTERSECTION OF THE DIAGONALS OF A PARALLELOGRAM

Example 10: 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)

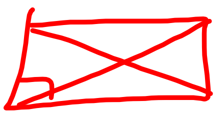


C(8,10)
MID $= \left(\frac{8+0}{2}, \frac{10+0}{2}\right) = (4,5)$
A(0,0)

- Explain why you used the chosen coordinate plane formula:

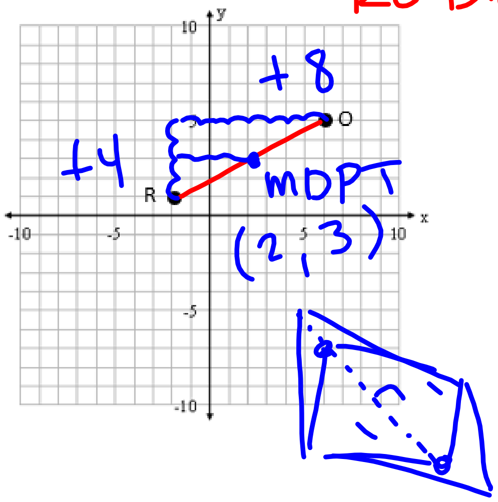
▱ → DIAG BIS EACH OTHER → COMMON MIDPOINT

- 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? $\cong$



WRITING THE EQUATION OF A DIAGONAL OF A PARALLELOGRA

Example 11: RHOMBUS
Write the equation of the line that contains the diagonal $\overline{HM}$ of rhombus RHOM given vertices R(-2,1) and O(6,5).



⊥BIS EQ

RO DIAGONAL $\frac{4}{8}$

⊥ TO $\overline{RO}$ THRU MIDPOINT $-\frac{8}{4}$

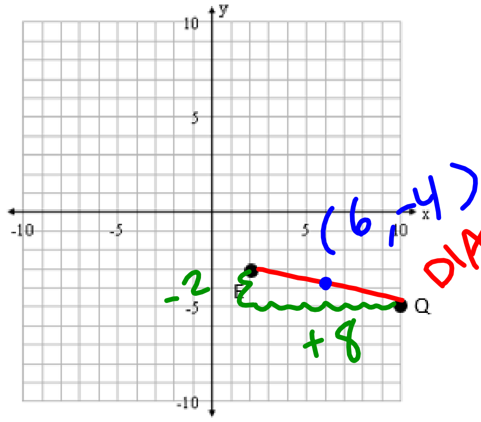
(2, 3)

$y-3=-\frac{8}{4}(x-2)$

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

$\overline{RS}$

Example 12: SQUARE
Write the equation of the line that contains the diagonal $\overline{HM}$ of square SQRE given vertices Q(10,-5) and E(2,-3).



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

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

$m\overline{RS}$

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