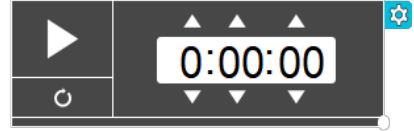
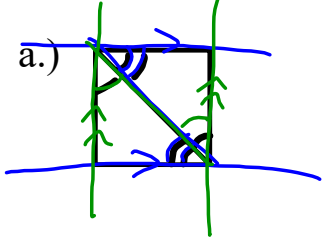


5- 7.4 - Proving Rhombus, Rectangle, Square Notes

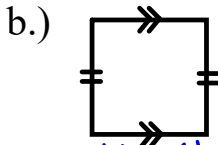
Mental Floss: Fri, Jan 24th



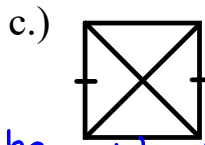
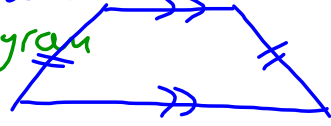
Determine whether the following quadrilaterals are parallelograms. State your reason.



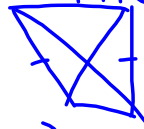
Yes it is a Parallelogram
 b/c both pairs of
 opposite sides are parallel
 Since alternate interior
 angles \cong .



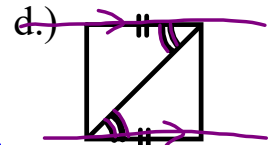
No, it could be a trapezoid



No, Not enough info



Quadrilateral



Yes it is
 b/c one pair
 of sides are
 both parallel
 and congruent
 Since alt.
 int. angles
 \cong .

Fi
 Tr
 G
 Pr

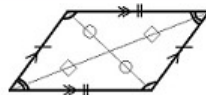
Properties of Quadrilaterals

Quadrilateral
 1.) 4 Sided Polygon
 2.) Sum of the Angles is 360 degrees

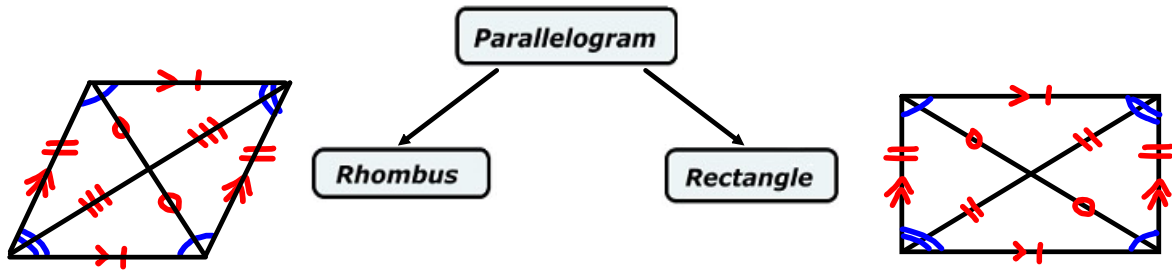


Parallelogram
 1.) Both Pairs of Opposite Sides Parallel
 2.) Both Pairs of Opposite Sides Congruent
 3.) Opposite Angles Congruent
 4.) Consecutive Angles Supplementary
 5.) Diagonals Bisect Each Other

Sides
 angles

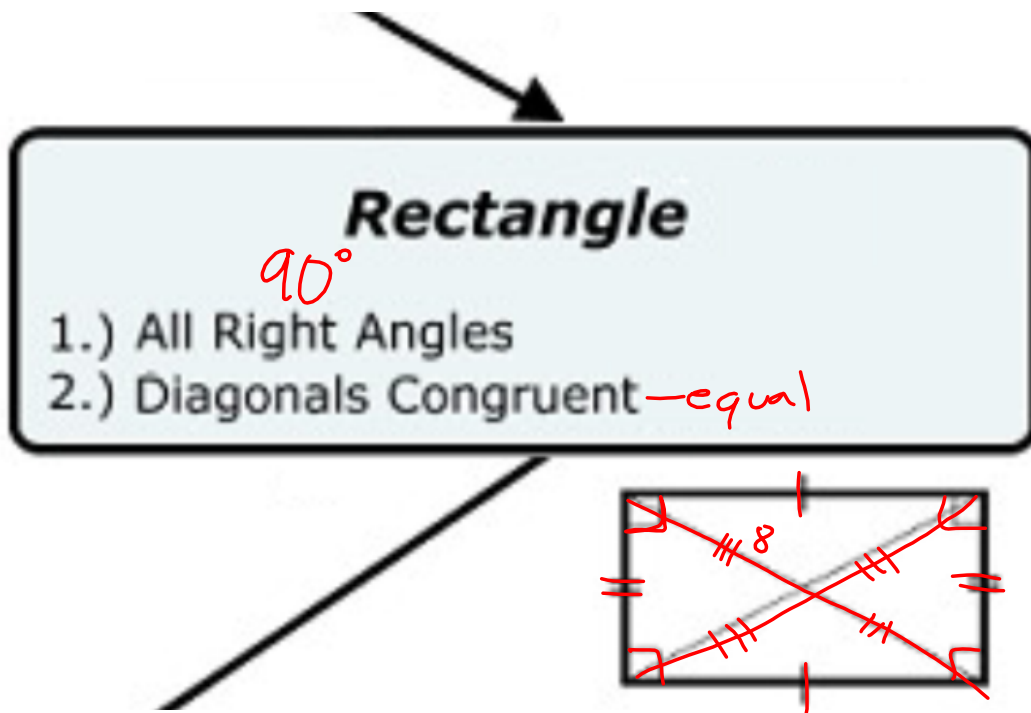


5- 7.4 - Proving Rhombus, Rectangle, Square Notes



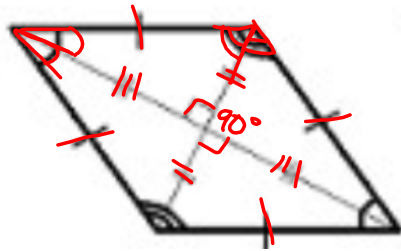
Rhombus and Rectangle

- A rhombus and rectangle are two specific types of parallelograms.
- Both shapes possess all 5 properties of a parallelogram, plus a few more!



Rhombus

- 1.) All Sides Congruent 90°
- 2.) Diagonals are Perpendicular Bisectors of Each Other
- 3.) Diagonals Bisect the Outer Angles

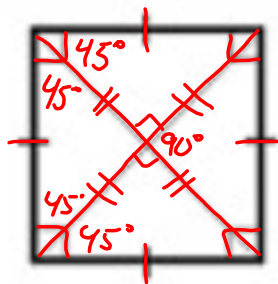


Rhombus

Square

All the Properties Listed Above!!

Rectangle



5- 7.4 - Proving Rhombus, Rectangle, Square Notes

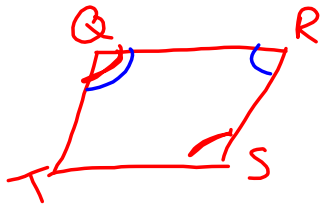
Example #1

Using Properties of Special Quadrilaterals

For any rhombus $QRST$, decide whether the statement is *always* or *sometimes* true. Draw a diagram and explain your reasoning.

a. $\angle Q \cong \angle S$

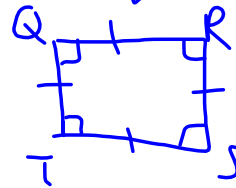
Always True



b/c opposite angles \cong in a parallelogram and a rhombus is always a parallelogram.

b. $\angle Q \cong \angle R$

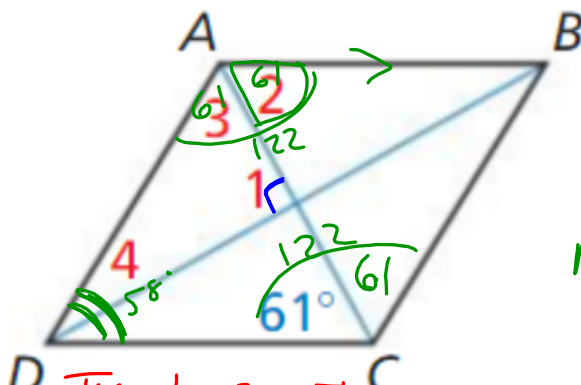
Sometimes true
Only if the rhombus is a square



Example #2

Finding Angle Measures in a Rhombus

Find the measures of the numbered angles in rhombus $ABCD$.



$m\angle 1 = 90^\circ$ b/c diagonals are perpendicular bisectors

$m\angle 2 = 61^\circ$ b/c alt. interior angles congruent in \parallel lines

$m\angle 3 = 61^\circ$ b/c diagonals bisect outer angles

Triangle sum th
 $90 + 61 + m\angle 4 = 180$

OR
Consecutive angles Supplementary
 $180 - 122 = 58^\circ$

$58 \div 2 = 29^\circ$ } $m\angle 4 = 29^\circ$

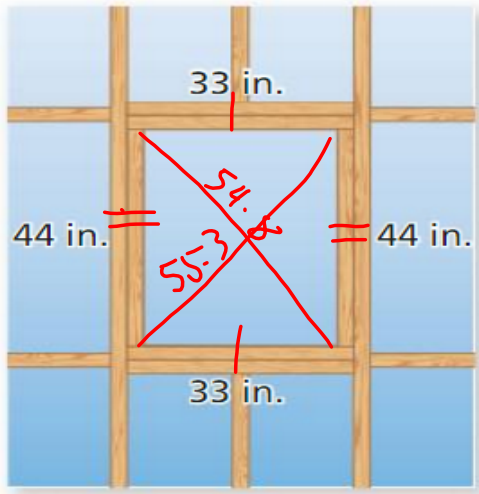
5- 7.4 - Proving Rhombus, Rectangle, Square Notes

Example #3

Identifying a Rectangle

You are building a frame for a window. The window will be installed in the opening shown in the diagram.

- The opening must be a rectangle. Given the measurements in the diagram, can you assume that it is? Explain. *No, we only have the requirements for a parallelogram shown*
- You measure the diagonals of the opening. The diagonals are 54.8 inches and 55.3 inches. What can you conclude about the shape of the opening?



*Not a rectangle
b/c diagonals are
not congruent*

Example #4

Finding Diagonal Lengths in a Rectangle

In rectangle $QRST$, $QS = 5x - 31$ and $RT = 2x + 11$.

Find the lengths of the diagonals of $QRST$.

$$QS = 5(14) - 31 = 39$$

$$RT = 2(14) + 11 = 39$$

Diagonals \cong in a rectangle

$$5x - 31 = 2x + 11$$

$$\begin{array}{r} -2x \\ -2x \end{array}$$

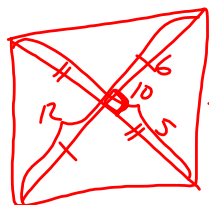
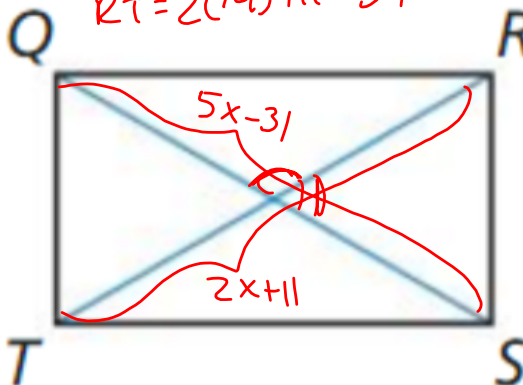
$$3x - 31 = 11$$

$$\begin{array}{r} +31 \\ +31 \end{array}$$

$$\hline 3x = 42$$

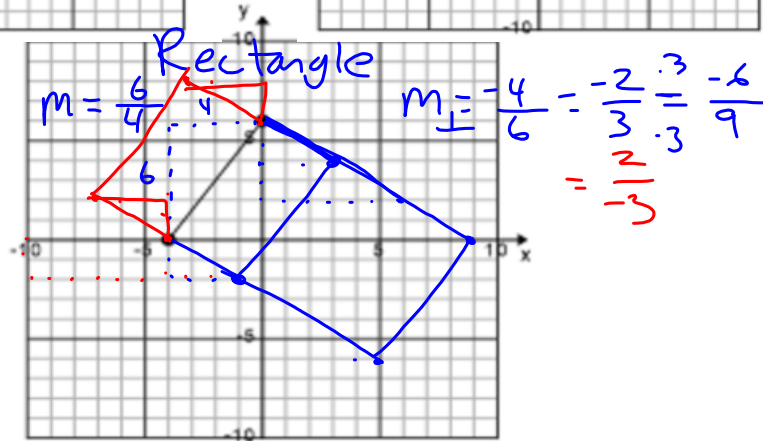
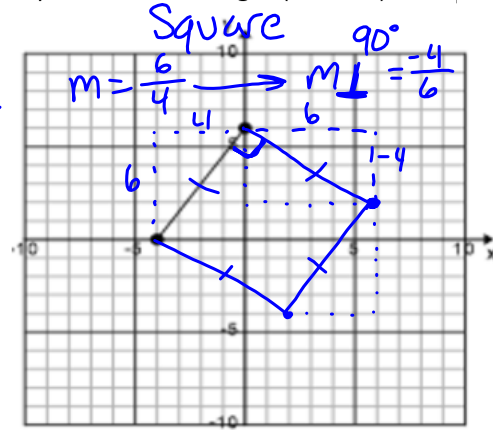
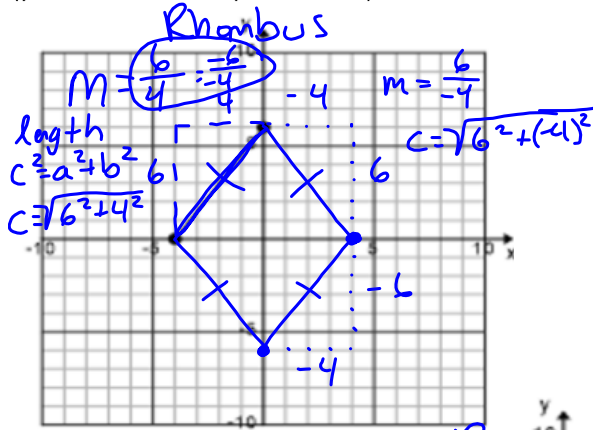
$$\begin{array}{r} \underline{3} \\ \underline{3} \end{array}$$

$$x = 14$$

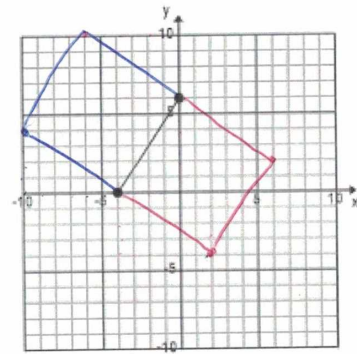
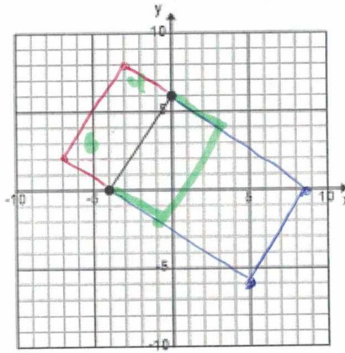
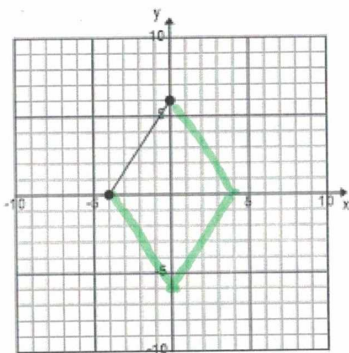


5- 7.4 - Proving Rhombus, Rectangle, Square Notes

Build a rhombus, a rectangle, and a square out of the given line segments. You must build 3 different figures (you cannot use the square for all 3) and the vertices must stay on the coordinate grid (-10 to 10). **



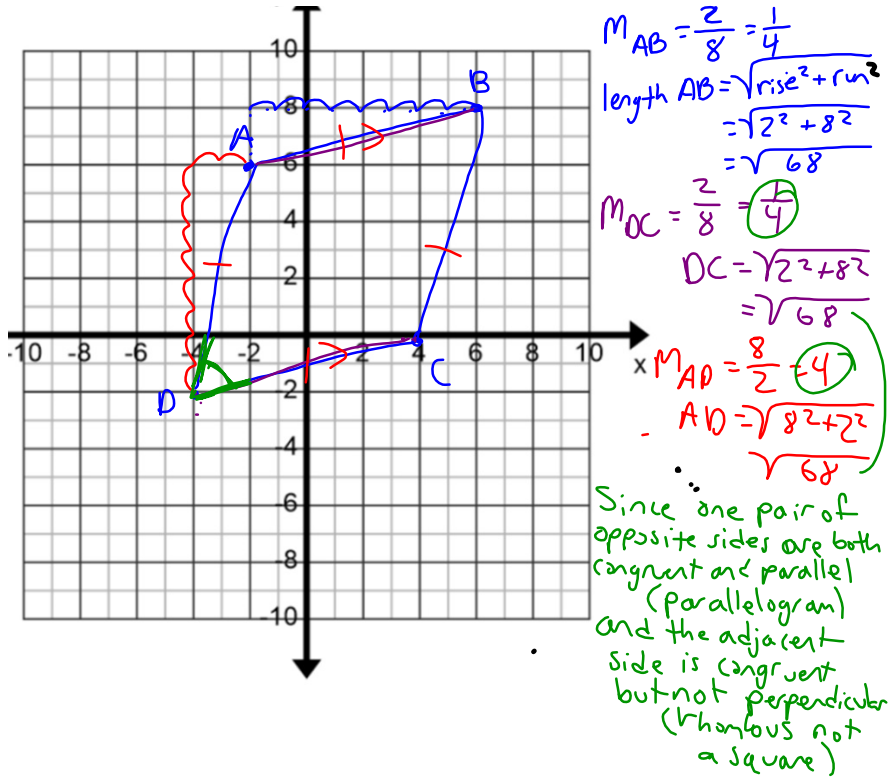
Build a rhombus, a rectangle, and a square out of the given line segments. You must build 3 different figures (you cannot use the square for all 3) and the vertices must stay on the coordinate grid (-10 to 10).



5- 7.4 - Proving Rhombus, Rectangle, Square Notes

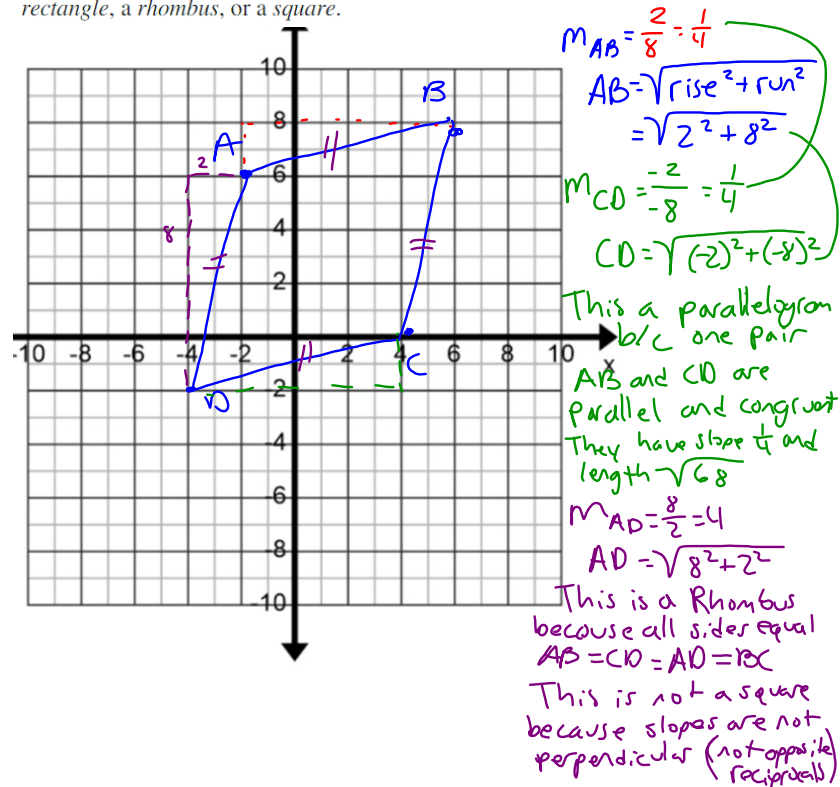
Identifying a Parallelogram in the Coordinate Plane

Decide whether $\square ABCD$ with vertices $A(-2, 6)$, $B(6, 8)$, $C(4, 0)$, and $D(-4, -2)$ is a rectangle, a rhombus, or a square.



Identifying a Parallelogram in the Coordinate Plane

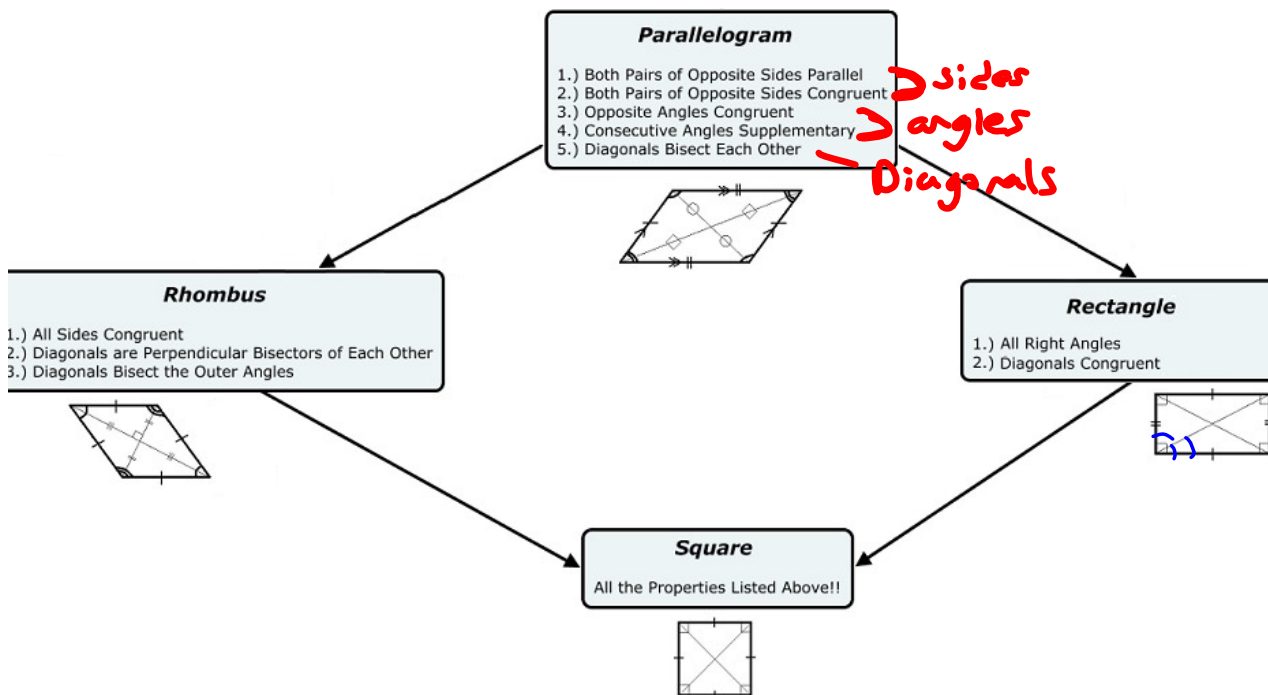
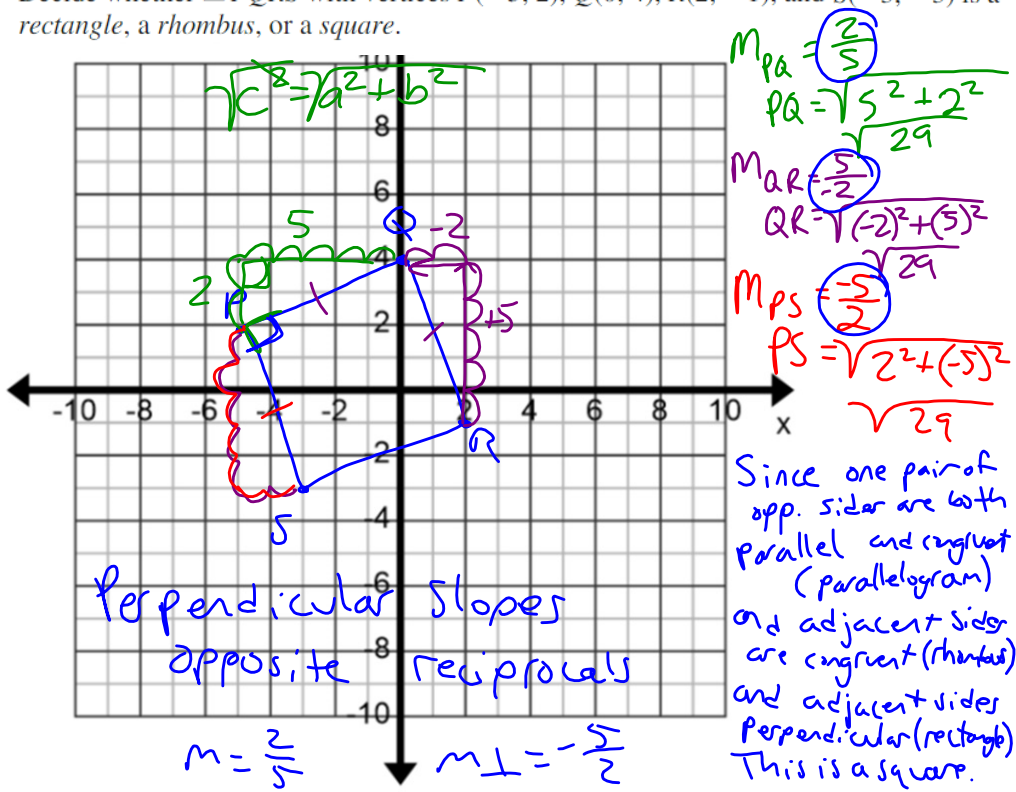
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5- 7.4 - Proving Rhombus, Rectangle, Square Notes

Identifying a Parallelogram in the Coordinate Plane

Decide whether $\square PQRS$ with vertices $P(-5, 2)$, $Q(0, 4)$, $R(2, -1)$, and $S(-3, -3)$ is a rectangle, a rhombus, or a square.

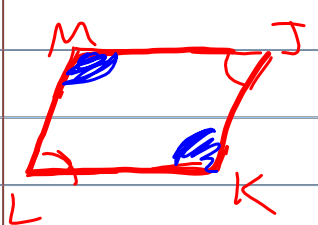
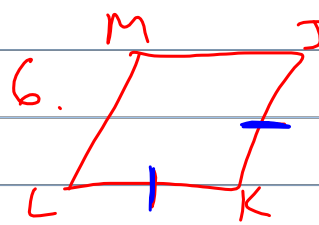


Homework

7.4 p.393

#4-8 Even, 14-22 odd, #27-35 all (Tuesday 2/8)

7.4 #57-60, 65-70 (Friday 2/11)

		Your Name
		Mrs. Theo
		2/8/22
		Homework
	Rhombus, Rectangle, Square	
	7.4 p.393 #4-8 Even, 14-22 Odd, #27-35 all	
4)		
	$\angle K \cong \angle M$	
	Always true, a	
	Rhombus is a	
	Parallelogram with	
	opposite angles congruent	
6.		
	$\overline{JK} \cong \overline{KL}$	
	Always true	
	Rhombus; have all	
	sides congruent	

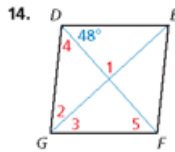
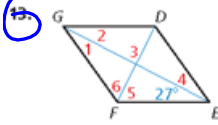
5- 7.4 - Proving Rhombus, Rectangle, Square Notes

Monitoring Progress and Modeling with Mathematics

In Exercises 3–8, for any rhombus $JKLM$, decide whether the statement is *always* or *sometimes* true. Draw a diagram and explain your reasoning. (See Example 1.)

3. $\angle L \cong \angle M$
4. $\angle K \cong \angle M$
5. $\overline{JM} \cong \overline{KL}$
6. $\overline{JK} \cong \overline{KL}$
7. $\overline{JL} \cong \overline{KM}$
8. $\angle JKM \cong \angle LKM$

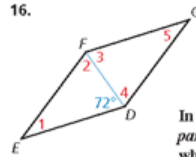
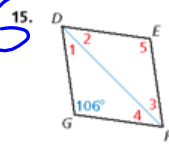
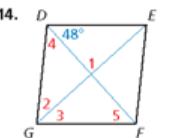
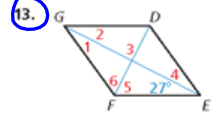
In Exercises 13–16, find the measures of the numbered angles in rhombus $DEFG$. (See Example 3.)



In Exercises 25–28, find the lengths of the diagonals of rectangle $WXYZ$. (See Example 5.)

25. $WY = 6x - 7$
 $XZ = 3x + 2$
26. $WY = 14x + 10$
 $XZ = 11x + 22$
27. $WY = 24x - 8$
 $XZ = -18x + 13$
28. $WY = 16x + 2$
 $XZ = 36x - 6$

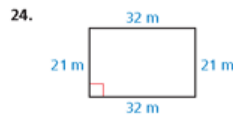
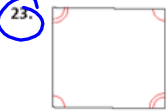
In Exercises 13–16, find the measures of the numbered angles in rhombus $DEFG$. (See Example 3.)



In Exercises 17–22, for any rectangle $WXYZ$, decide whether the statement is *always* or *sometimes* true. Draw a diagram and explain your reasoning.

17. $\angle W \cong \angle X$
18. $\overline{WX} \cong \overline{YZ}$
19. $\overline{WX} \cong \overline{XY}$
20. $\overline{WY} \cong \overline{XZ}$
21. $\overline{WY} \perp \overline{XZ}$
22. $\angle WXZ \cong \angle YXZ$

In Exercises 23 and 24, determine whether the quadrilateral is a rectangle. (See Example 4.)

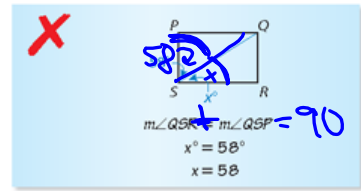


In Exercises 25–28, find the lengths of the diagonals of rectangle $WXYZ$. (See Example 5.)

25. $WY = 6x - 7$
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26. $WY = 14x + 10$
 $XZ = 11x + 22$
27. $WY = 24x - 8$
 $XZ = -18x + 13$
28. $WY = 16x + 2$
 $XZ = 36x - 6$

In Exercises 29–34, name each quadrilateral—*parallelogram, rectangle, rhombus, or square*—for which the statement is always true.

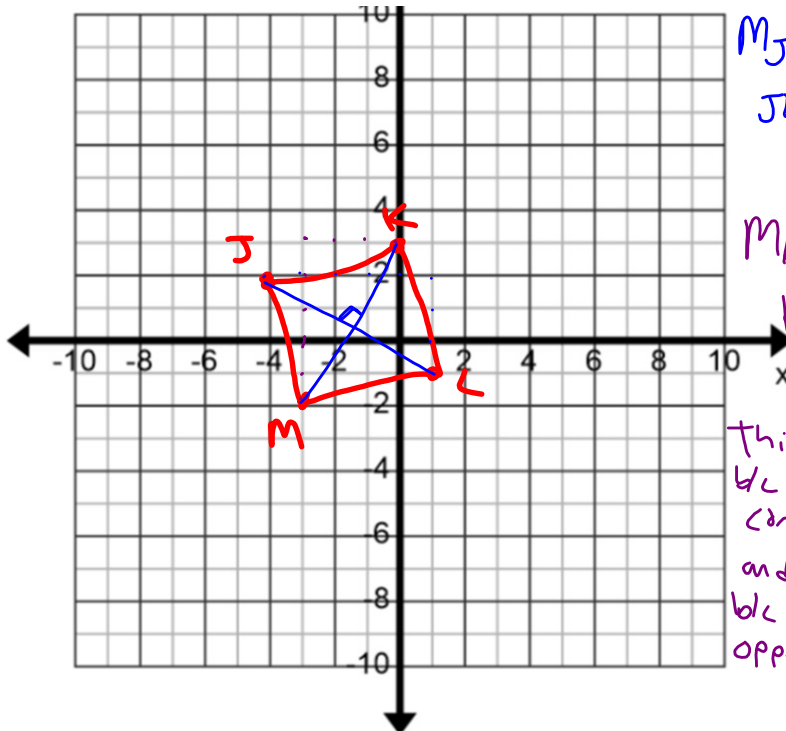
29. It is equiangular. **Rectangle, Square**
30. It is equiangular and equilateral. **Square**
31. The diagonals are perpendicular. **Rhombus and Square**
32. Opposite sides are congruent. **Parallelogram, Rectangle, Rhombus, Square**
33. The diagonals bisect each other. **Parallelogram, Rectangle, Rhombus, Square**
34. The diagonals bisect opposite angles. **Rhombus, Square**
35. **ERROR ANALYSIS** Quadrilateral $PQRS$ is a rectangle. Describe and correct the error in finding the value of x .



Identifying a Parallelogram in the Coordinate Plane

$J(-4, 2)$ $K(0, 3)$ $L(1, -1)$ $M(3, -4)$

Decide whether $\square PQRS$ with vertices $P(-4, 2)$, $Q(0, 3)$, $R(1, -1)$, and $S(3, -4)$ is a rectangle, a rhombus, or a square.



$$m_{JL} = \frac{3 - 2}{1 - (-4)} = \frac{1}{5}$$

$$m_{KM} = \frac{-4 - 3}{3 - 0} = \frac{-7}{3}$$

$$m_{JL} \cdot m_{KM} = \frac{1}{5} \cdot \frac{-7}{3} = \frac{-7}{15} \neq -1$$

$$JK = \sqrt{(0 - (-4))^2 + (3 - 2)^2} = \sqrt{16 + 1} = \sqrt{17}$$

$$KL = \sqrt{(1 - 0)^2 + (-1 - 3)^2} = \sqrt{1 + 16} = \sqrt{17}$$

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

$$MJ = \sqrt{(-4 - 3)^2 + (2 - (-4))^2} = \sqrt{49 + 36} = \sqrt{85}$$

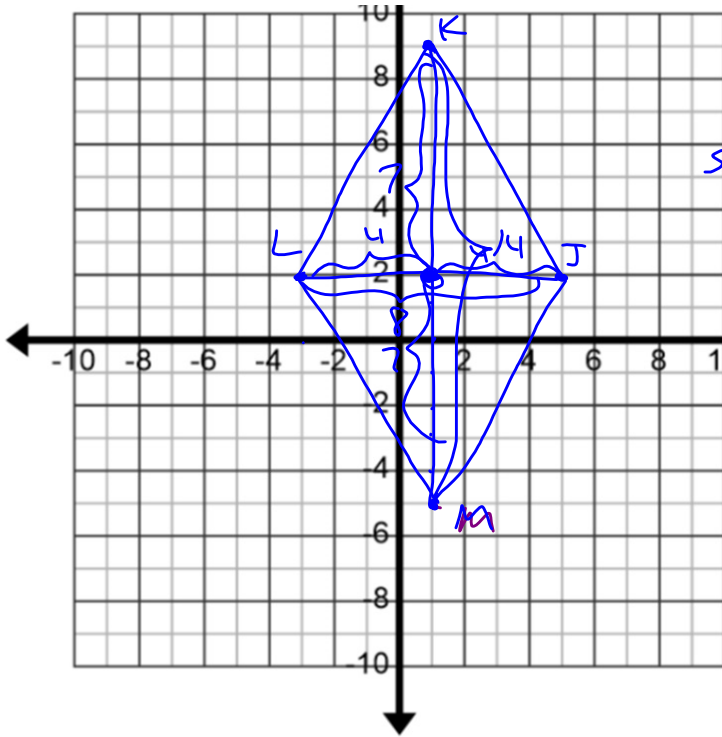
This is a square b/c diagonals are congruent $= \sqrt{34}$ and perpendicular b/c slopes are opposite reciprocals

5- 7.4 - Proving Rhombus, Rectangle, Square Notes

59.

Identifying a Parallelogram in the Coordinate Plane

Decide whether $\square JKLM$ with vertices $J(5,2)$, $K(1,9)$, $L(-3,2)$, $M(1,-5)$ is a rectangle, a rhombus, or a square.



Slope JL $\frac{0}{8} = 0$
 Slope KM $\frac{14}{0} = \text{undefined}$
 Since perpendicular slopes (Rhombus)
 length JL 8 length KM 14
 not a rectangle
 (so not a square)
 Midpoint (1,2)
 bisects JM and KM
 so diagonals bisect each other
 (parallelogram)
 not a kite
 This is a rhombus
 not equal.

Geometry Chapter 7 Rhombus, Rectangle or Square Coordinate Proofs (7.4 #55-60) Name: _____ Period: _____

55. $J(-4,2)$, $K(0,3)$, $L(1,-1)$, $M(-3,-2)$

Is it a Rectangle, Rhombus, or Square? Determine and Prove.

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

Slope of JL: $m = \frac{3}{-5}$ Slope of KM: $m = \frac{5}{3}$

distance = $\sqrt{\text{rise}^2 + \text{run}^2}$

Length of JL = $\sqrt{3^2 + (-5)^2} = \sqrt{34}$
 Length of KM = $\sqrt{5^2 + 3^2} = \sqrt{34}$

Reasoning as a sentence:
 Square, bc Diagonals are equal means rectangle and Diagonals are perpendicular means Rhombus

59. $J(5,2)$, $K(1,9)$, $L(-3,2)$, $M(-1,-5)$

Is it a Rectangle, Rhombus, or Square? Determine and Prove.

Slope of ~~KL~~ $\frac{2}{4}$ Slope of ~~JM~~ $\frac{7}{6}$

Length of JL _____ Length of KM _____

Reasoning as a sentence:
 Quadrilateral, not even a parallelogram, opposite sides are not parallel.

if M(1,-5) it would be a rhombus bc Diagonals perpendicular but not congruent

57. $J(3,1)$, $K(3,-3)$, $L(-2,-3)$, $M(-2,1)$

Is it a Rectangle, Rhombus, or Square? Determine and Prove.

Slope of JK: $\frac{4}{0}$ undefined Slope of LM: $\frac{4}{0}$ undefined
 Slope of KL: $\frac{0}{5} = 0$ Slope of JM: $\frac{0}{5} = 0$
 Length of JK: 4 Length of LM: 4
 Length of KL: 5 Length of JM: 5

Reasoning as a sentence:
 Rectangle, bc both pairs of opposite sides are parallel and congruent, and adjacent sides are perpendicular, creates all 90° angles.

56. $J(-2,7)$, $K(7,2)$, $L(-2,-3)$, $M(-11,2)$

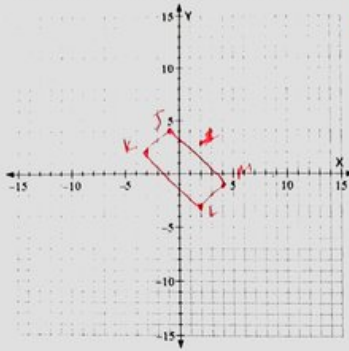
Is it a Rectangle, Rhombus, or Square? Determine and Prove.

$M_{JL} = \frac{10}{0} = 0$ $M_{KM} = \frac{0}{18}$ undefined
 $JL = 10$ $KM = 18$
 ~~$M_{JK} = \frac{9}{9}$~~ ~~$M_{LM} = \frac{7}{9}$~~

Reasoning as a sentence:
 Since diagonals are perpendicular but not equal it can't be a square but can be a rhombus it's not a kite because $m_{JK} \neq m_{LM}$
 it is a parallelogram and diagonals bisect each other 5 and 5 and 9 and 9.

5- 7.4 - Proving Rhombus, Rectangle, Square Notes

58. J(-1,4), K(-3,2), L(2,-3), M(4,-1)



Is it a Rectangle, Rhombus, or Square?
Determine and Prove.

$$m_{JK} = \frac{2}{-2} = -1 \quad m_{ML} = \frac{2}{-2} = -1$$

$$m_{JM} = \frac{-5}{-5} = 1 \quad m_{LK} = \frac{-5}{-5} = 1$$

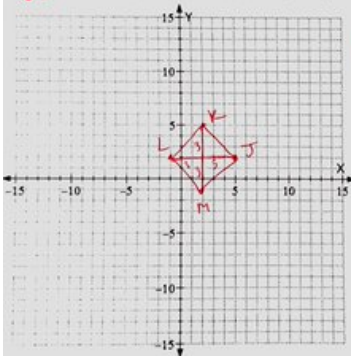
$$JK = \sqrt{2^2 + 2^2} = ML$$

$$JM = \sqrt{5^2 + (-5)^2} = LK$$

Reasoning as a sentence:

Rectangle because opposite sides are parallel and adjacent sides are perpendicular and not the same length.

59. J(5,2), K(2,5), L(-1,2), M(2,-1)



Is it a Rectangle, Rhombus, or Square?
Determine and Prove.

$$m_{KM} = \text{undefined}$$

$$m_{LJ} = 0$$

$$KL = 6 = KM$$

Midpoint for both KM and JL is (2,2)

Reasoning as a sentence:

Square because diagonals bisect each other (parallelogram), diagonals are perpendicular (rhombus), diagonals are congruent (rectangle)