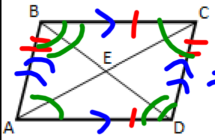
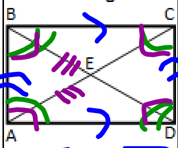
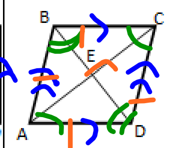
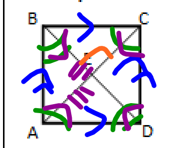
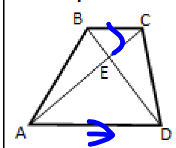
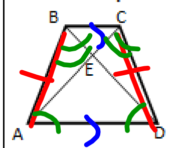
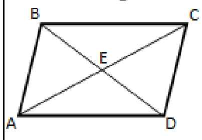
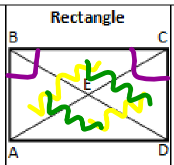
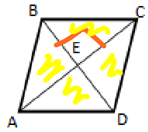
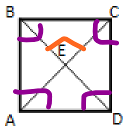
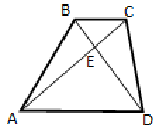
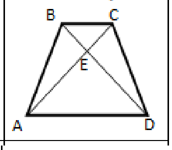
Lesson 6-1: Properties of Parallelograms

AGENDA
- Check in & Go over Bridge
- Look at unit outline
- Notes 6.1

Homework
6.1 p. 395-397 : #9,11,21,22,32-40,44

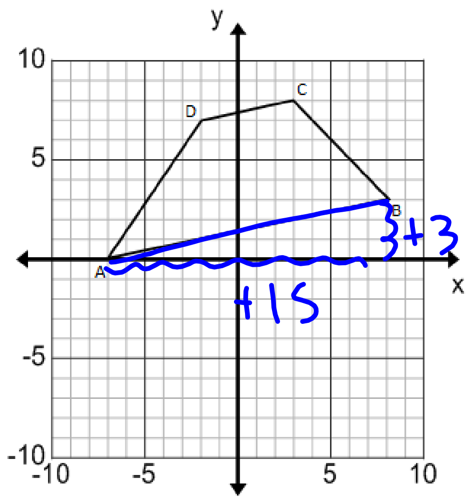
Using your background knowledge on quadrilaterals, the textbook for unit 6, and your universal angle maker and compass, complete the following chart. The drawings of quadrilateral ABCD with diagonals intersecting at E are to scale.

	Parallelogram	Rectangle	Rhombus	Square	Trapezoid	Isosceles Trapezoid
State all of the following, if applicable						
The pairs of parallel quad sides	$\overline{AB} \parallel \overline{CD}$ $\overline{BC} \parallel \overline{AD}$	$\overline{AB} \parallel \overline{CD}$ $\overline{BC} \parallel \overline{AD}$	→	→	$\overline{BC} \parallel \overline{AD}$	→
The pairs of congruent quad sides	$\overline{AB} \cong \overline{CD}$ $\overline{BC} \cong \overline{AD}$	→	ALL	ALL	NONE	$\overline{AB} \cong \overline{CD}$
The pairs of congruent quad angles	$\angle BAD \cong \angle BCD$ $\angle ABC \cong \angle APC$	ALL	→	ALL	NONE	$\angle BAD \cong \angle CDA$ $\angle ABC \cong \angle BCD$
The pairs of perpendicular quad sides	N/A	$\overline{AB} \perp \overline{BC}$ 4 SETS CONSEC SIDES	N/A	4 SETS CONSEC SIDES $\perp$	NONE	NONE
Are diagonals congruent?	N/A	YES	NO	$\overline{BD} \cong \overline{AC}$	NONE	YES
Are diagonals perpendicular?	NO	NO	YES	YES	NO	NO

	Parallelogram	Rectangle	Rhombus	Square	Trapezoid	Isosceles Trapezoid
						
Name all right triangles, if applicable	NONE	ΔABC ΔADC ΔBCD ΔBAD	ΔBEC ΔBEA ΔDEC ΔDEA	8	NONE	

* MAY HAVE SPECIAL CASE ⊥

Given the quadrilateral in the coordinate plane,



1) Calculate the slope of $\overline{AB}$ using the slope formula or by counting.

$+\frac{1}{5}$

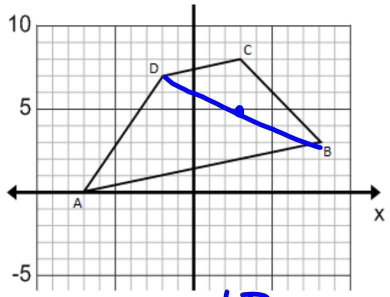
➔ The slope of any parallel segment would be $\frac{1}{5}$

➔ The slope of any perpendicular segment would be $-\frac{5}{1}$

2) Calculate the length of $\overline{AB}$ using the distance formula or Pythagorean Theorem.

$\sqrt{234}$

3) Were your answers to part 1 and 2 the same? NO



3) Were your answers to part 1 and 2 the same? NO

- Slope can be used to show segments are $\perp$ or $\parallel$.
- Distance formula/Pythagorean Theorem can be used to show segments are $\cong$.

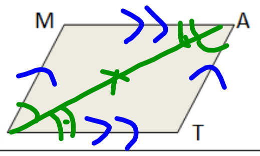
4) Calculate the midpoint of $\overline{DB}$ using the midpoint formula or counting. (3, 5)

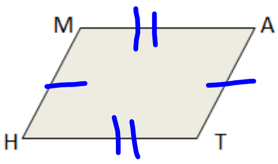
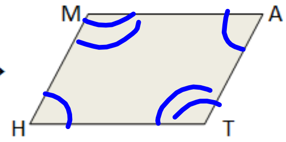
- A midpoint BISECTS a segment into two congruent halves.

Geometry+LAB Name:__________ Date:__________ Section:__________

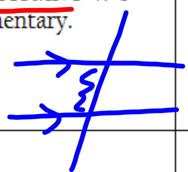
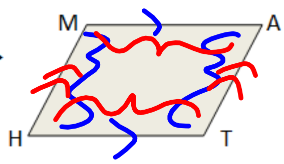
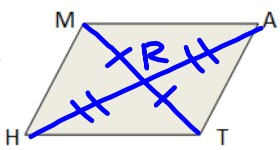
Unit 6 Day 1 Notes: Properties of Parallelograms

How is a parallelogram named? CONSECUTIVE ORDER OF VERTICES

Definition	Example
A quadrilateral with two pairs of parallel opposite sides is a parallelogram.	$\square MATH \rightarrow$  $\overline{MA} \parallel \overline{TH}$ $\overline{MH} \parallel \overline{AT}$

Theorem	Example
If a quadrilateral is a ▱ then its opposite sides are ≅.	▱*MATH* →  $\overline{MA} \cong \overline{TH}$ $\overline{MH} \cong \overline{AT}$
If a quadrilateral is a ▱ then its opposite ∡'s are ≅.	▱*MATH* →  $\angle H \cong \angle A$ $\angle M \cong \angle T$

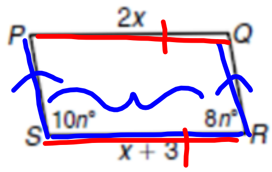
|| → SS INT ∡'S SUPP

If a quadrilateral is a ▱ then its consecutive ∡'s are supplementary. 	▱*MATH* →  ∡A SUPP ∡T ∡M SUPP ∡H ∡H SUPP ∡T ∡M SUPP ∡A
If a quadrilateral is a ▱ then its diagonals bisect each other.	▱*MATH* →  $\overline{AH}$ BISECTS $\overline{MT}$ $\overline{MT}$ BISECTS $\overline{AH}$

→ $\overline{MR} \cong \overline{TR}$

$\overline{AR} \cong \overline{HR}$

Example 1: Given parallelogram PQRS, find the values of x and n.



n: ▱ → CONSECUTIVE ∡'S SUPP

$m\angle S + m\angle R = 180°$

$10n + 8n = 180$

$n = 10$

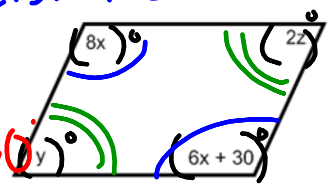
x: ▱ → OPPOSITE SIDES ≅ $\overline{PQ} \cong \overline{SR}$

$2x = x + 3$

$x = 3$

Example 2: Given the parallelogram, find x, y, and z.

$8(15) = 120°$



x: ▱ → OPP ∡'S ≅

$8x = 6x + 30$

$x = 15$

$60 = 2z$

$z = 30$

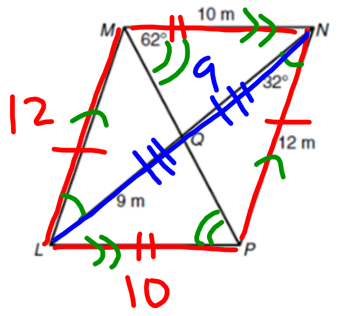
$120°$

y: ▱ → CONSECUTIVE ∡'S SUPP

$y + 120° = 180°$ $y = 60$

Example 3:

Find each measure in ▱*LMNP*.



3. *ML* 12 m

▱ → OPP SIDES ≅

4. *LP* 10 m

5. m∠*LPM* 62°

▱ → ∥ OPP SIDES → ALT INT ∠'S ≅

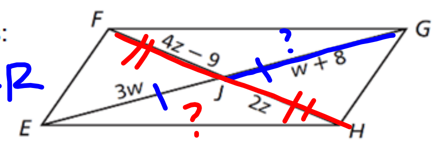
6. *LN* 18 m SEG ADD POST

7. m∠*MLN* 32°

8. *QN* 9m ▱ → DIAG BIS EACH OTHER

$\overline{EJ} \cong \overline{GJ}$

Example 4: EFGH is a parallelogram. Find each of the following measures:



A. JG

▱ → DIAG BIS EACH OTHER

$3w = w + 8$

$w = 4$

$JG = 4 + 8 = \boxed{12 = JG}$

B. FH

$\overline{FJ} \cong \overline{JH}$

$4z - 9 = 2z$

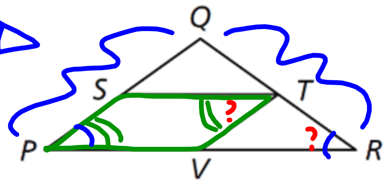
$z = \frac{9}{2}$

$JH = 2\left(\frac{9}{2}\right) = 9$

$FH = FJ + JH$

$9 + 9 = 18$

ISOS → △



Example 5: **Given:** *PSTV* is a parallelogram. $\overline{PQ} \cong \overline{RQ}$
Prove: $\angle STV \cong \angle R$

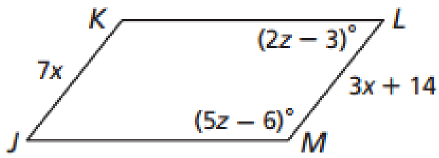
Statements	Reasons
1. $\overline{PQ} \cong \overline{RQ}$	1. GIVEN
2. △PQR ISOS	2. DEFN ISOS △
3. $\angle P \cong \angle R$	3. ISOS △ ⟷ BASE ∠'s ≅
4. ▱PSTV	4. GIVEN
5. $\angle P \cong \angle STV$	5. ▱ → OPP ∠'s ≅
6. $\angle STV \cong \angle R$	6. SUBSTITUTION (STEP 5 INTO 3)

HW
6.1 - p. 395-397 : #9,11,21,22,32-40,44

***JKLM* is a parallelogram. Find each measure.**

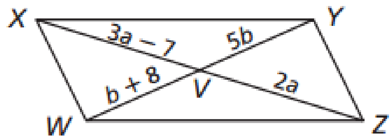
9. *JK*

11. m∠*L*

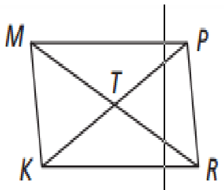


***WXYZ* is a parallelogram. Find each measure.**

21. *WV* **22.** *YW*



Complete each statement about ▱$KMPR$. Justify your answer.

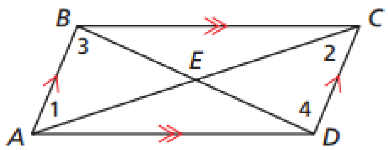


32. $\angle MPR \cong$ ___?___ **33.** $\angle PRK \cong$ ___?___ **34.** $\overline{MT} \cong$ ___?___

35. $\overline{PR} \cong$ ___?___ **36.** $\overline{MP} \parallel$ ___?___ **37.** $\overline{MK} \parallel$ ___?___

38. $\angle MPK \cong$? **39.** $\angle MTK \cong$? **40.** $m\angle MKR + m\angle PRK =$?

44. Complete the paragraph proof of Theorem 6-2-4 by filling in the blanks.



Given: $ABCD$ is a parallelogram.

Prove: $\overline{AC}$ and $\overline{BD}$ bisect each other at E.

Proof: It is given that $ABCD$ is a parallelogram. By the definition of a parallelogram, $\overline{AB} \parallel$ **a.** _____ By the Alternate Interior Angles Theorem, $\angle 1 \cong$ **b.** _____ , and $\angle 3 \cong$ **c.** __ $\overline{AB} \cong \overline{CD}$ because **d.** ___?___ . This means that $\triangle ABE \cong \triangle CDE$ by **e.** ___?___ . So by **f.** ___?___ , $\overline{AE} \cong \overline{CE}$, and $\overline{BE} \cong \overline{DE}$. Therefore $\overline{AC}$ and $\overline{BD}$ bisect each other at E by the definition of **g.** ___?___