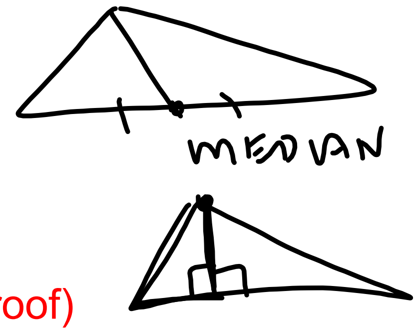
Lesson 6-2: Conditions for Parallelograms



Agenda:

- Check and review homework 6-1
- Guided Notes

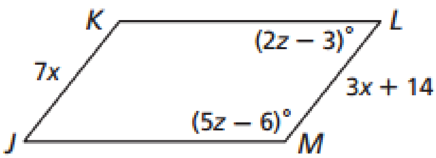
Homework:

- p402-404: #17-23,26 (write out proof)
- Remember: CR#5 due Friday
- Midterm 1/12

6-2 Homework: p395 #9, 11, 21, 22, 32-40 , 44

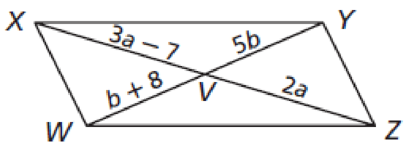
JKLM is a parallelogram. Find each measure.

9. *JK* 24.5
10. *LM* 24.5
11. m∠*L* 51°
12. m∠*M* 129°

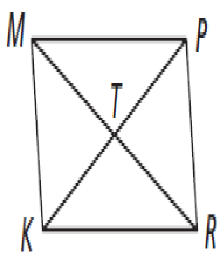


WXYZ is a parallelogram. Find each measure.

21. *WV* 10
22. *YW* 20



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



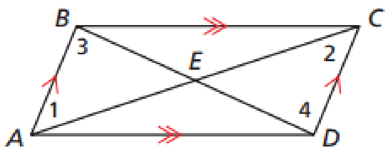
32. ∠*MPR* ≅ __?__
33. ∠*PRK* ≅ __?__
34. $\overline{MT}$ ≅ __?__
35. $\overline{PR}$ ≅ __?__
36. $\overline{MP}$ ∥ __?__
37. $\overline{MK}$ ∥ __?__
38. ∠*MPK* ≅ __?__
39. ∠*MTK* ≅ __?__
40. m∠*MKR* + m∠*PRK* = __?__

32. ∠*RKM* (▱ → opp. ∠s ≅)
33. ∠*KMP* (▱ → opp. ∠s ≅)
34. $\overline{RT}$ (▱ → diags. bisect each other)
35. $\overline{KM}$ (▱ → opp. sides ≅)
36. $\overline{RK}$ (Def. of ▱)
37. $\overline{RP}$ (Def. of ▱)
38. ∠*RKP* (Alt. Int. ∠s Thm.)
39. ∠*RTP* (Vert. ∠s Thm.)

180° (▱ → cons. ∠s supp.)

44d. opp. sides of a ▱ are ≅
e. ASA
f. CPCTC

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



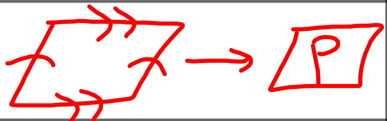
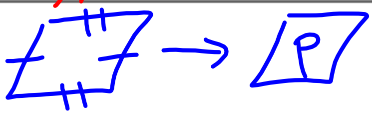
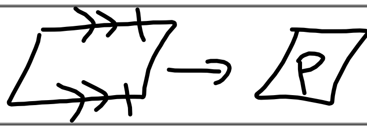
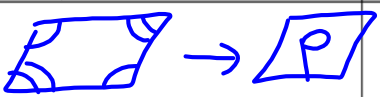
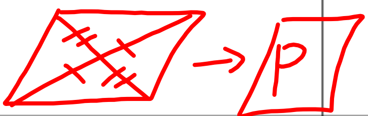
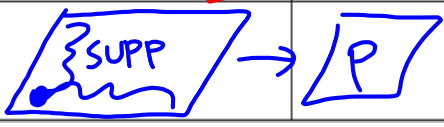
Given: *ABCD* is a parallelogram.
Prove: $\overline{AC}$ and $\overline{BD}$ bisect each other at *E*.

Proof: It is given that *ABCD* is a parallelogram. By the definition of a parallelogram, $\overline{AB} \parallel$ **a.** ___?___ $\overline{CD}$. By the Alternate Interior Angles Theorem, $\angle 1 \cong$ **b.** ___?___ $\angle 2$, and $\angle 3 \cong$ **c.** ___?___ $\angle 4$. $\overline{AB} \cong \overline{CD}$ 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.** ___?___ . bisect

To show that a quadrilateral is a parallelogram you only have to show that it satisfies one of these conditions:

- BOTH PAIRS of opposite sides are parallel (definition)
- One pair of opposite sides is both parallel AND congruent (6-3-1)
- BOTH PAIRS of opposite sides are congruent (6-3-2)
- BOTH PAIRS of opposite angles are congruent (6-3-3)
- One angle is supplementary to BOTH of its consecutive angles (6-3-4)
- The DIAGONALS bisect each other (6-3-5)

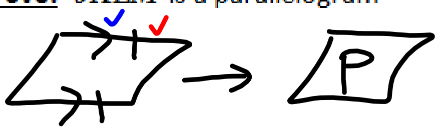
**Take out "Ways To Prove Quadrilaterals" from your Lesson Summaries or record below then transcribe:*

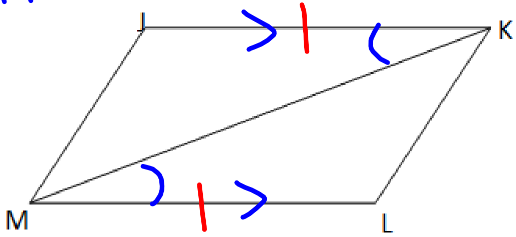
Ways to prove a quadrilateral is a parallelogram:		
Theorem/Condition	Diagram	Formula
Show 2 pairs of opposite sides PARALLEL		N/A
Show 2 pairs of opposite sides CONGRUENT		Will fill in o coordinate day
Show 1 pair of opposite sides BOTH ∥ & ≅		
Show 2 pairs of opposite angles CONGRUENT		
Show diagonals BISECT EACH OTHER		
Show an angle is supplementary to BOTH ITS CONSECUTIVE ANGLES		

≅ ALT INT → ∥

EX 1) **Given:** $\measuredangle JKM \cong \measuredangle LMK$, $\overline{JK} \cong \overline{LM}$

Prove: $JKLM$ is a parallelogram



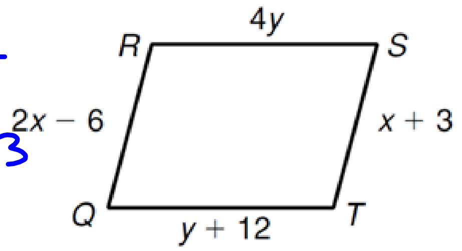


1. ∡JKM ≅ ∡LMK | 1. GIVEN
2. $\overline{JK}$ ∥ $\overline{ML}$ | 2. ≅ ALT INT ∡'S → ∥
3. $\overline{JK}$ ≅ $\overline{LM}$ | 3. GIVEN
4. ▱ JKLM | 4. A QUAD W/ 1 SET OPPOSITE SIDES ∥ & ≅ IS A ▱

For Examples 2 through 6 show that the given quadrilateral is a parallelogram by using the given definition or theorem. Explain your reasoning.

EX 2) What values of x and y guarantee that QRST is a parallelogram?

<u>Use BOTH sets of opposite sides congruent.</u>



$\overline{RS} \cong \overline{QT}$

$4y = y + 12$

$y = 4$

$4(4) \stackrel{?}{=} 4 + 12$

$16 = 16$ ✓

$\overline{QR} \cong \overline{ST}$

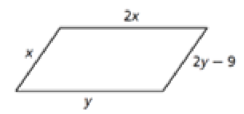
$2x - 6 = x + 3$

$x = 9$?

$2(9) - 6 = 9 + 3$

$12 = 12$ ✓

Note: You could see a system of equations here such as

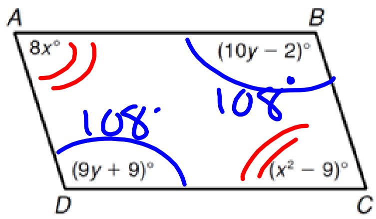


WHEN $x = 9$ AND $y = 4$, THEN BOTH PAIRS OF OPPOSITE SIDES ARE CONGRUENT SO ▱ QRST.

For Examples 2 through 6 show that the given quadrilateral is a parallelogram by using the given definition or theorem. Explain your reasoning.

EX 3) is ABCD a parallelogram? Explain.

<u>**Use BOTH sets of opposite angles are congruent.**</u>



$\angle D \cong \angle B$

$9y + 9 = 10y - 2$

$11 = y$

$9(11) + 9 = 10(11) - 2$

$99 + 9 = 110 - 2$

$108 = 108$ ✓

$\angle A \cong \angle C$

$8x = x^2 - 9$

$0 = x^2 - 8x - 9$

$0 = (x - 9)(x + 1)$

$x - 9 = 0$ | $x + 1 = 0$

$x = 9$ | $\cancel{x = -1}$

$8(9) \stackrel{?}{=} (9)^2 - 9$

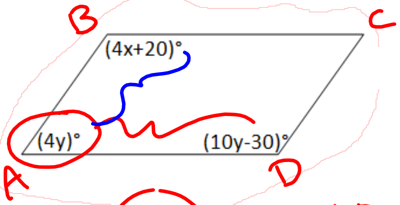
$72 = 72$ ✓

WHEN $x = 9$ AND $y = 11$, THEN BOTH PAIRS OF OPPOSITE $\angle$'S ARE $\cong$ SO ▱ ABCD.

For Examples 2 through 6 show that the given quadrilateral is a parallelogram by using the given definition or theorem. Explain your reasoning.

EX 4) what value of y guarantees that the following is a parallelogram?

Use one angle is supplementary to BOTH its consecutive angles.



$\angle A$ SUPP $\angle D$

$m\angle A + m\angle D = 180°$

$4y + (10y-30) = 180$

$14y = 210$

$y = 15$

$4(15) + (10 \cdot 15 - 30) \stackrel{?}{=} 180$

$180 = 180$ ✓

$\angle B$ SUPP $\angle A$

$(4x+20) + 4y = 180°$

$4x + 20 + 4(15) = 180°$

$4x + 80 = 180°$

$4x = 100$

$x = 25$

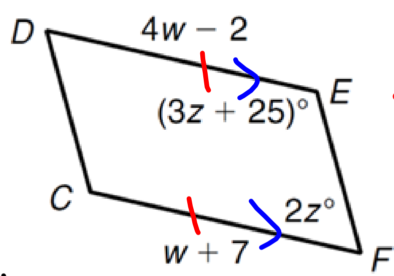
WHEN $x = 25$ AND $y = 15$, THEN $\angle A$ IS SUPPLEMENTARY TO BOTH ITS CONSECUTIVE ANGLES SO ▱ABCD.

For Examples 2 through 6 show that the given quadrilateral is a parallelogram by using the given definition or theorem. Explain your reasoning.

EX 5) What values of w and z guarantee that the following is a parallelogram?

Use one set of opposite sides BOTH congruent and parallel.

SUPP $\angle$'s



$\overline{DE} \cong \overline{CF}$

$4w - 2 = w + 7$

$3w = 9$

$w = 3$

$\overline{DE} \parallel \overline{CF}$

SS INT $\angle$'S SUPP

$m\angle E + m\angle F = 180°$

$3z + 25 + 2z = 180°$

$5z = 155$

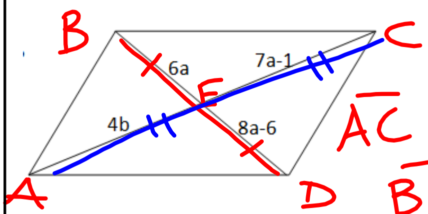
$z = 31$

WHEN $w = 3$ AND $z = 31$, THEN $\overline{DE}$ & $\overline{CF}$ ARE BOTH $\parallel$ AND $\cong$ SO ▱CDEF.

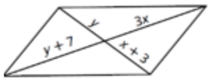
For Examples 2 through 6 show that the given quadrilateral is a parallelogram by using the given definition or theorem. Explain your reasoning.

EX 6) what value of a guarantees the following is a parallelogram?

Use the diagonals bisect each other.



Note: You could see a system of equations here such as



$3x = y + 7$
$y = x + 3$

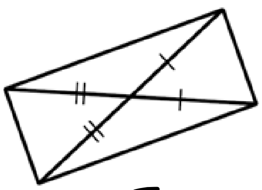
$\overline{AC}$ BISECT $\overline{BD}$
$\overline{BE} \cong \overline{DE}$
$6a = 8a - 6$
$6 = 2a \rightarrow a = 3$
$6(3) = 8(3) - 6$
$18 = 18$ ✓

$\overline{BD}$ BISECTS $\overline{AC}$
$\overline{AE} \cong \overline{CE}$
$4b = 7a - 1$
$4b = 7(3) - 1$
$4b = 20$
$b = 4$

WHEN $a = 3$ AND $b = 4$, THEN THE DIAGONALS BISECT EACH OTHER SO ▱ABCD.

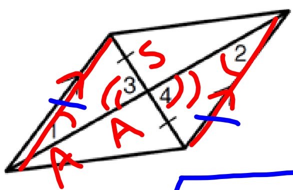
Determine whether the conditions for parallelograms are met for each of the following quadrilaterals and justify your response.

A)

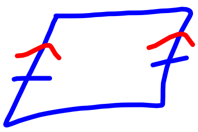


NONE

B)



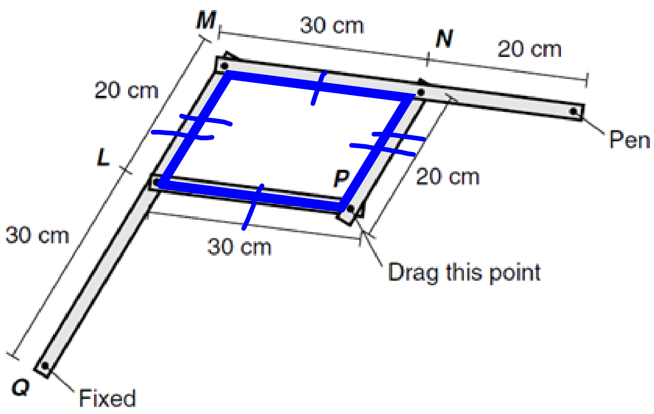
AAS $\cong$ →
$\cong \triangle$'s →
CPCTC



→ ▱

YES

If you drag the point at P so that the angle measures change, will $\square LMNP$ continue to be a parallelogram? Explain.



BOTH SETS OPP SIDES $\cong$

$\rightarrow$ ▱ P