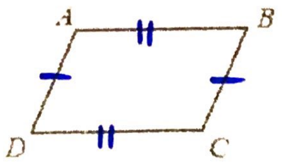
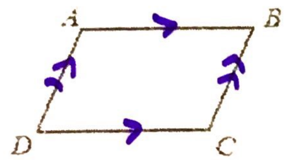
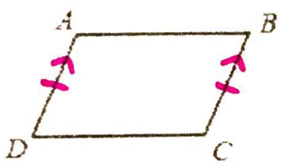
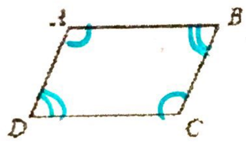
5.2 Notes

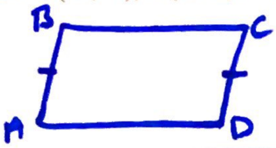
Proving Parallelograms

METHOD 1	Prove **both pairs of opposite sides** are **congruent.**  If $\overline{AB} \cong \overline{DC}$ and $\overline{AD} \cong \overline{BC}$, then *ABCD* is a parallelogram.	Use Distance Form: $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ OR Pythagorean Th.
METHOD 2	Prove **both pairs of opposite sides** are **parallel**  If $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$, then *ABCD* is a parallelogram.	Use Same slope means parallel! $\frac{y_2-y_1}{x_2-x_1}$ $\frac{\text{(rise)}}{\text{(run)}}$
METHOD 3	Prove **one pair of opposite sides** are **congruent and parallel**  If $\overline{AD} \cong \overline{BC}$ and $\overline{AD} \parallel \overline{BC}$, then *ABCD* is a parallelogram.	Use... Distance & slope Formula.
METHOD 4	Prove **both pairs of opposite angles** are **congruent**.  If $\angle A \cong \angle C$ and $\angle D \cong \angle B$, then ABCD is a parallelogram.	**Use...** need $\cong$ $\angle$ measures to determine.
METHOD 5	Prove **two sets of consecutive angles** are **supplementary**.  If $\angle A + \angle D = 180$ and $\angle D + \angle C = 180$, then ABCD is a parallelogram.	**Use...** need $\angle$ measures to determine.
METHOD 6	Prove that **both diagonals** are **bisected**.  If $\overline{AE} \cong \overline{EC}$ and $\overline{DE} \cong \overline{EB}$, then ABCD is a parallelogram.	**Use...** midpoint Form: $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ *If both diagonals have same midpoint, they bisect each other.

$\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ Sides ≅ ?

DIRECTIONS: Determine whether the figure is a parallelogram using the distance formula.

1. $A(-7, 4)$, $B(1, 2)$, $C(9, -8)$, $D(1, -6)$



AB: $(-7,4)\,(1,2)$ — $x_1\ y_1\ x_2\ y_2$

$\sqrt{(1+7)^2+(2-4)^2}$ $\boxed{\sqrt{68}}$

CD: $(9,-8)(1,-6)$ — $x_1\ y_1\ x_2\ y_2$

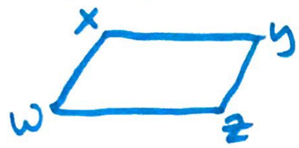
$\sqrt{(1-9)^2+(-6+8)^2}$ $\sqrt{68}$

BC: $(1,2)(9,-8)$ — $x_1\ y_1\ x_2\ y_2$

AD: $(-7,4)(1,-6)$ — $x_1\ y_1\ x_2\ y_2$

DIRECTIONS: Determine whether the figure is a parallelogram using the slope formula.

3. $W(-7, -4)$, $X(1, -6)$, $Y(5, -13)$, $Z(1, -12)$



$\dfrac{y_2-y_1}{x_2-x_1}$

XY: $(1,-6)(5,-13)$ — $x_1\ y_1\ x_2\ y_2$

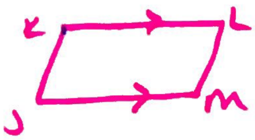
$\dfrac{-13+6}{5-1} = \boxed{\dfrac{-7}{4}}$ $\boxed{\text{NO}}$

WZ: $(-7,-4)(1,-12)$ — $x_1\ y_1\ x_2\ y_2$

$\dfrac{-12+4}{1+7} = \dfrac{-8}{8} = \boxed{-1}$

DIRECTIONS: Determine whether the figure is a parallelogram using the distance and slope formulas.

5. $J(-9, -2)$, $K(-5, 1)$, $L(1, -4)$, $M(-3, -7)$



1 pair is ≅ & ∥.

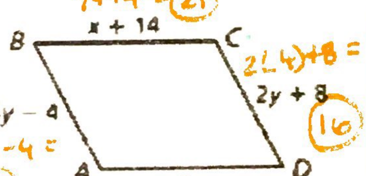
part I:

KL: $(-5,1)(1,-4)$ — $x_1\ y_1\ x_2\ y_2$ $\dfrac{-4-1}{1+5} = \boxed{\dfrac{-5}{6}}$

JM: $(-9,-2)(-3,-7)$ — $x_1\ y_1\ x_1\ y_1$ $\dfrac{-7+2}{-3+9} = \boxed{\dfrac{-5}{6}}$

part II: distance Form.

Show that *ABCD* is a parallelogram for $x = 7$ and $y = 4$. plug in



$7+14 = 21$

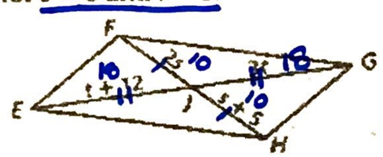
$2(4)+8 = 16$

$5(4)-4 = 16$

$3(7) = 21$

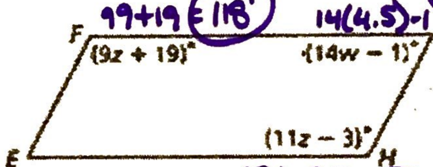
yes, both pairs of opp sides ≅.

Show that *EFGH* is a parallelogram for $s = 5$ and $t = 6$.



yes, bc diagonals bisect each other

Show that *EFGH* is a parallelogram for $z = 11$ and $w = 4.5$.



$99+19 = 118°$

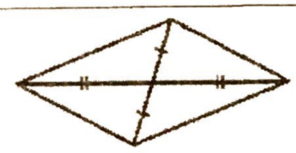
$14(4.5)-1$ 62

$121-3 = 118°$

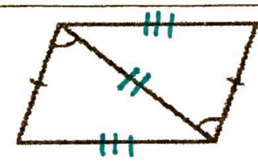
opp. ∠'s ≅ & consecutive ∠'s are supp.

Determine if the following quadrilaterals must be parallelograms. Justify your answer.

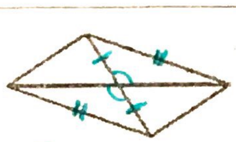
NO



yes, bc diag. bisect

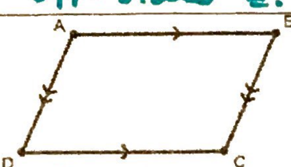


yes, both pairs of opp. sides ≅.



NO

yes, bc. opp ∠'s ≅.



yes, bc both pairs of opp. sides are ∥.