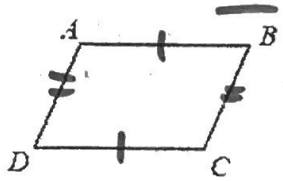
5.2 Notes

Proving Parallelograms (Coordinate Plane)

METHOD 1

Prove both pairs of opposite sides are congruent.



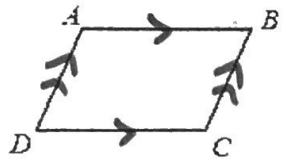
If $\overline{AB} \cong \overline{DC}$ and $\overline{AD} \cong \overline{BC}$, then $ABCD$ is a parallelogram.

Use Distance Form:

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

METHOD 2

Prove both pairs of opposite sides are parallel



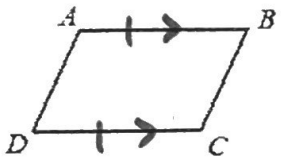
If $\overline{AB} \parallel \overline{DC}$ and $\overline{AD} \parallel \overline{BC}$, then $ABCD$ is a parallelogram.

Use Slope Form:

$$\frac{y_2-y_1}{x_2-x_1} \quad \frac{(\text{rise})}{(\text{run})}$$

METHOD 3

Prove one pair of opposite sides are congruent and parallel

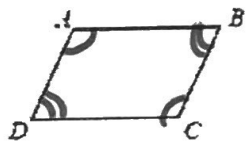


If $\overline{AB} \cong \overline{DC}$ and $\overline{AB} \parallel \overline{DC}$, then $ABCD$ is a parallelogram.

Use Distance Form & Slope Form. for 1 pair of opp. sides.

METHOD 4

Prove **both pairs of opposite angles** are **congruent**.

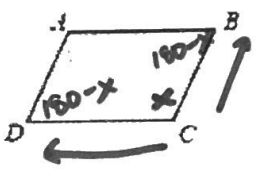


If $\angle A \cong \angle C$ and $\angle D \cong \angle B$, then ABCD is a parallelogram.

Use...

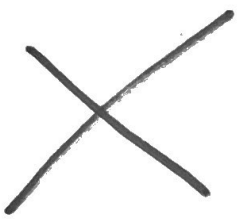
METHOD 5

Prove **two sets of consecutive angles** are **supplementary**.



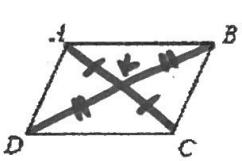
If $\angle C + \angle B = 180°$ and $\angle C + \angle D = 180°$, then ABCD is a parallelogram.

Use...



METHOD 6

Prove that **both diagonals** are **bisected**.



If $\overline{AK} \cong \overline{KC}$ and $\overline{DK} \cong \overline{KB}$, then ABCD is a parallelogram.

Use...

* midpoint Formula:

$$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

$$\downarrow \quad \downarrow$$

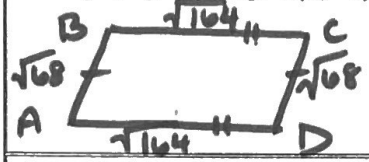
$$(x, y)$$

Find the midpoint of $\overline{AC}$ & find the midpoint of $\overline{DB}$. If they have the same midpoint, then they bisect each other.

Sides are $\cong$?

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

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



$\overline{AB}$: $\sqrt{(1+7)^2+(2-4)^2} \Rightarrow \sqrt{64+4} = \sqrt{68}$

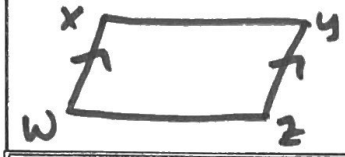
$\overline{CD}$: $\sqrt{(1-9)^2+(-6+8)^2} \Rightarrow \sqrt{64+4} = \sqrt{68}$

$\overline{BC}$: $\sqrt{(9-1)^2+(-8-2)^2} \Rightarrow \sqrt{64+100} = \sqrt{164}$

$\overline{AD}$: $\sqrt{(1+7)^2+(-6-4)^2} \Rightarrow \sqrt{64+100} = \sqrt{164}$

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

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



$\overline{WX}$: $\frac{-6+4}{1+7} = \frac{-2}{8} = \frac{-1}{4}$

$\overline{YZ}$: $\frac{-12+13}{1-5} = \frac{1}{-4} = \frac{-1}{4}$

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

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

Slope:

$JK = \frac{3}{4}$

$mK = \frac{3}{4}$

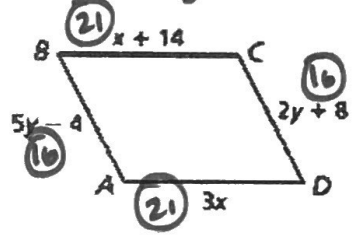
Distance:

$JK = 5$

$mL = 5$

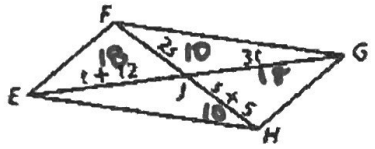
Show that *ABCD* is a parallelogram for $x = 7$ and $y = 4$.

plug in x & y



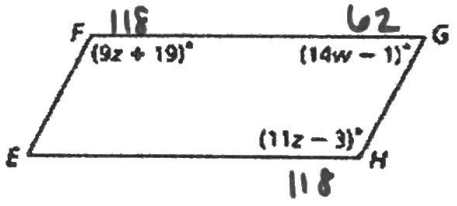
yes, opp. sides $\cong$.

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



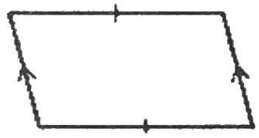
yes, diagonals bisect each other.

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

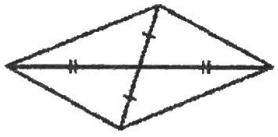


yes consecutive $\angle$'s are Supp.

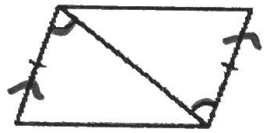
Determine if the following quadrilaterals must be parallelograms. Justify your answer.



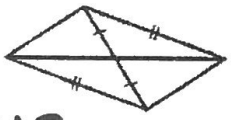
NO



yes, diagonals bisect each other

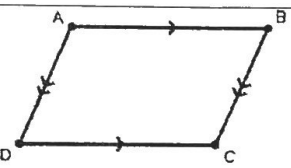


yes, 1 pair of opp. sides is $\cong$ & $\parallel$.



NO

yes, opp $\angle$'s are $\cong$.



yes, opp. sides $\parallel$.