9.15 Coordinate Proofs: Parallelograms & Rectangles

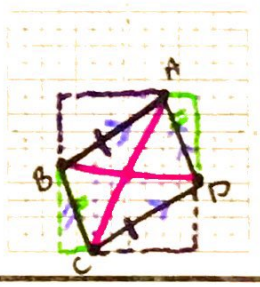
Name: _____

Ways to Prove a Parallelogram:

1. Prove both pairs of opposite sides are parallel. Find slopes of all 4 sides.
2. Prove one pair of opposite sides are parallel and congruent. Find the length/distance & slope for 1 pair of opp. sides.
3. Prove both pairs of opposite sides are congruent. Find length/distance for all 4 sides.
4. Prove both pairs of opposite angles are congruent. CAN'T DO ON Graph
5. Prove one angle is supplementary to both of its consecutive angles. CAN'T DO ON Graph
6. Prove the diagonals bisect each other. Find the midpoint of both diagonals.

Given: A(2, 2), B(−4, −2), C(−2, −7), & D(4, −3)

Prove: ABCD is a parallelogram in 4 different ways



① Slopes of

$\overline{AB}: \frac{4}{6}=\frac{2}{3}$ $\overline{BC}: \frac{5}{-2}$

$\overline{CD}: \frac{4}{6}=\frac{2}{3}$ $\overline{AD}: \frac{5}{-2}$

Both pairs of opp. sides are ||.

② Slopes of

$\overline{AB}: \frac{2}{3}$

$\overline{CD}: \frac{2}{3}$

Are they ≅?

$\overline{AB} = 4^2+6^2=x^2$

$\sqrt{52}$

$\overline{CD} = 4^2+6^2=x^2$

$\sqrt{52}$

③ $\overline{AB} \cong \overline{CD}$

both have lengths of $\sqrt{52}$

$\overline{BC} = 2^2+5^2=x^2$

$\sqrt{29}$

$\overline{AD} = 2^2+5^2=x^2$ $\overline{BC} \cong \overline{AD}$

$\sqrt{29}$

④ Find midpoint of both diagonals.

$\overline{AC}$: $(2,2)(-2,-7)$ $\left(\frac{2+-2}{2}, \frac{2+-7}{2}\right)$

$\left(0, -\frac{5}{2}\right)$

$\overline{BD}$: $(-4,-2)(4,-3)$ $\left(\frac{-4+4}{2}, \frac{-2+-3}{2}\right)$

$\left(0, -\frac{5}{2}\right)$

To prove a quadrilateral is a rectangle...

1) **First prove it is a parallelogram.** Then prove parallelogram contains at least one right angle.

OR

2) **First prove it is a parallelogram.** Then, the diagonals of a parallelogram are congruent.

OR

3) You could prove that all four angles are right angles.

① I: Slopes of

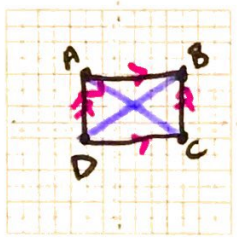
$\overline{AB}$: zero $\overline{AD}$: undefined

$\overline{DC}$: zero $\overline{BC}$: undefined

II: Do we have a rt ∠? yes, slopes are opp. rec.

Given: A(−2, 3), B(4, 3), C(4, −1), & D(−2, −1)

Prove: ABCD is a rectangle in 2 different ways



② I

Slope:

$\overline{AB}$: zero

$\overline{DC}$: zero

$\overline{AD}$: undef.

$\overline{BC}$: undef.

> parallelogram

II: Are diagonals ≅? yes

$\overline{AC} = (-2,3)(4,-1) \rightarrow \sqrt{(4+2)^2 + (-1-3)^2} = \boxed{\sqrt{52}}$

$\overline{BD} = (4,3)(-2,-1) \rightarrow \sqrt{(-2-4)^2 + (-1-3)^2} = \boxed{\sqrt{52}}$