9.15 Coordinate Proofs: Parallelograms & Rectangles

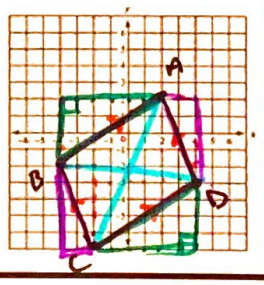
Name: _____

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 opposite sides.
3. Prove both pairs of opposite sides are congruent. Find the 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 $AB: \frac{4}{6} = \frac{2}{3}$ $BC: \frac{5}{-2}$

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

Both pairs of opp sides are ||.

② $AB: \frac{2}{3}$

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

$AB: 4^2+6^2=c^2$

$\sqrt{52}=\sqrt{c^2}$

$c=\sqrt{52}$

$CD: 4^2+6^2=c^2$

$c=\sqrt{52}$

③ $AB: \sqrt{52}$

$CD: \sqrt{52}$

$BC: 2^2+5^2=c^2$

$\sqrt{29}=\sqrt{c^2}$ $c=\sqrt{29}$

$AD: 2^2+5^2=c^2$

$\sqrt{29}=c2$ $c=\sqrt{29}$

④ $\overline{AC}: (2,2)(-2,-7)$ (A, C)

$\overline{BD}: (-4,-2)(4,-3)$ (B, D)

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

$\overline{AC}: \frac{2+-2}{2}, \frac{2+-7}{2} = (0, -\frac{5}{2})$

$\overline{BD}: \left(\frac{-4+4}{2}, \frac{-2+-3}{2}\right) = (0, -\frac{5}{2})$

To prove a quadrilateral is a rectangle...

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

- slopes are opposite reciprocals.

OR

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

distance Formula or Pythagorean Th

OR

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

consecutive sides are ⊥.

(1) I) Prove it's a parallelogram:

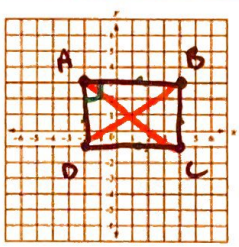
(3) Slopes of $\overline{AB}$: zero $\overline{AD}$: undefined

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

II) do we have at least 1 right ∠? 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



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(2) I) Slopes:

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

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

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

AC: (−2, 3)(4, −1) $\sqrt{(4+2)^2+(-1-3)^2} = \sqrt{52}$

BD: (4, 3)(−2, −1) $\sqrt{(-2-4)^2+(-1-3)^2} = \sqrt{52}$