NOTES-Proving Rhombus and Squares on a Coordinate Plane

PARALLELOGRAMS ON THE COORDINATE PLANE

Objectives:

- Show that a quadrilateral is a parallelogram on the coordinate plane
- Identify and verify parallelograms

DISTANCE FORMULA: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

MIDPOINT FORMULA: $(x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

SLOPE FORMULA: $m = \frac{y_2 - y_1}{x_2 - x_1}$

FORMULAS & THE COORDINATE PLANE	
FORMULA	WHEN TO USE IT
Distance Formula: $\boldsymbol{d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}}$	To determine whether... • Sides are congruent • Diagonals are congruent
Midpoint Formula: $\boldsymbol{(x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)}$	To determine... • The coordinates of a midpoint of a side • Whether diagonals bisect each other
Slope Formula: $\boldsymbol{m = \frac{y_2 - y_1}{x_2 - x_1}}$	To determine whether... • Opposite sides are parallel • Diagonals are perpendicular • Sides are perpendicular

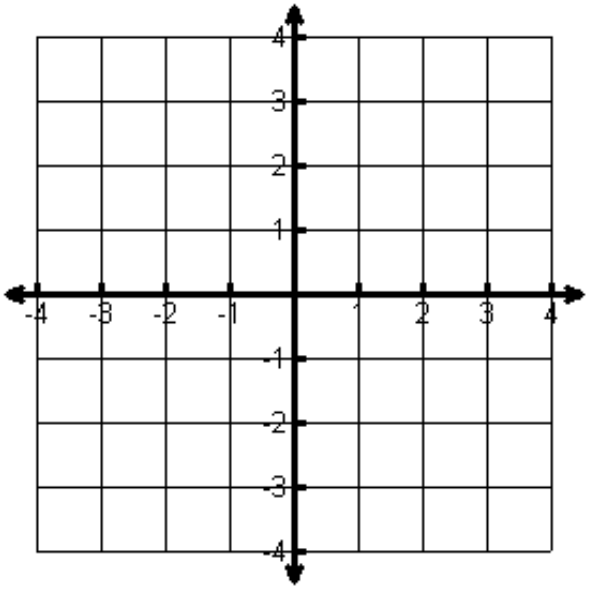
QUADRILATERAL	PROVE:
RHOMBUS	First prove it's a parallelogram, and then prove... • Two consecutive sides are congruent • The diagonals are perpendicular OR... • All four sides are congruent
SQUARE	• It's a rectangle and a rhombus (see above)

Proving a Quadrilateral is a Rhombus

Method: Prove that all four sides are congruent.

Example 1: Plot and label each point. A(1, 3), B(4, 1), C(1, -1), and D(-2, 1)

Prove it!



Find the **length** of each side.

AB = _____

BC = _____

DC = _____

DA = _____

- What conclusions can you make from the side lengths?

Find the **slope** of each side.

Slope of AB = _____

Slope of DC = _____

Slope of BC = _____

Slope of AD = _____

- What conclusions can you make concerning the relationship of the slopes of the sides?

Based on my answers above, I have proven this shape to be a _____

because…

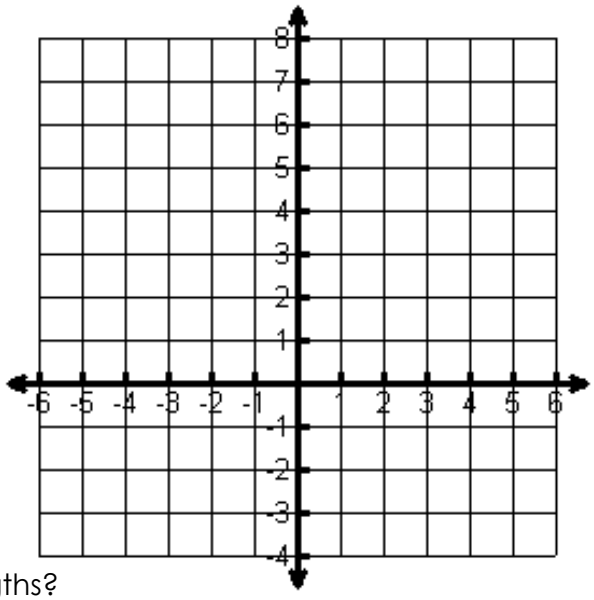
Proving that a Quadrilateral is a Square

Method: First, prove the quadrilateral is a rhombus by showing all four sides is congruent; then prove the quadrilateral is a rectangle by showing the diagonals is congruent.

Example 2: Plot and label each point. A(-5, 6), B(3, 7), C(4, -1), and D(-4, -2)

Prove it!

Find the **length (distance)** of each side.



AB = _____

BC = _____

DC = _____

DA = _____

- What conclusions can you make from the side lengths?

Find the **slope** of each side.

Slope of AB = _____

Slope of DC = _____

Slope of BC = _____

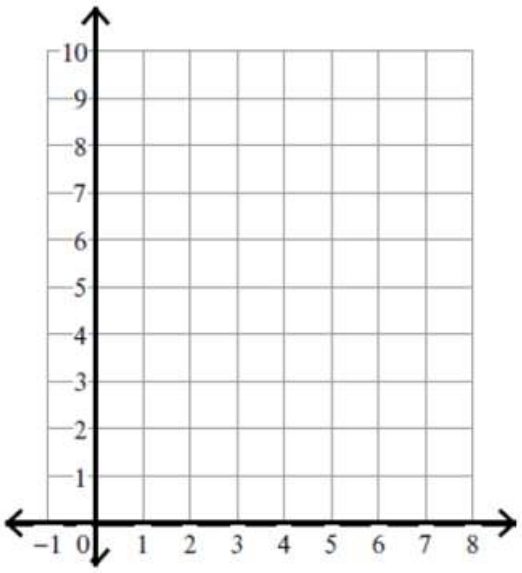
Slope of AD = _____

- What conclusions can you make concerning the relationship of the slopes of the sides?

Based on my answers above, I have proven this shape to be a _____ because…

GUIDED PRACTICE

1.) Prove that a quadrilateral with the vertices A(-1,3), B(3,6), C(8,6) and D(4,3) is a rhombus.



2.) Prove that the quadrilateral with vertices A(-1,0), B(3,3), C(6,-1) and D(2,-4) is a square.