

NOTES: Proving Parallelograms and Rectangles 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:

MIDPOINT FORMULA:

SLOPE FORMULA:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad (x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

FORMULAS & THE COORDINATE PLANE	
FORMULA	WHEN TO USE IT
Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$	To determine whether... <ul style="list-style-type: none"> • Sides are congruent • Diagonals are congruent
Midpoint Formula: $(x_m, y_m) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$	To determine... <ul style="list-style-type: none"> • The coordinates of a midpoint of a side • Whether diagonals bisect each other
Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$	To determine whether... <ul style="list-style-type: none"> • Opposite sides are parallel • Diagonals are perpendicular • Sides are perpendicular

QUADRILATERAL	PROVE:
PARALLELOGRAM	<ul style="list-style-type: none"> • Both pairs of opposite sides are parallel • Both pairs of opposite sides are congruent • One pair of opposite sides are parallel and congruent • Diagonals bisect each other
RECTANGLE	First prove it's a parallelogram, and then prove... <ul style="list-style-type: none"> • The diagonals are congruent • Two consecutive sides of the parallelogram are perpendicular

Proving a Quadrilateral is a Parallelogram

Method: Show both pairs of opposite sides are equal by calculating the distances of all four sides.

1) Plot and label each point. A(2, 4), B(7, 9), C(6, 3), and D(1, -2)

Prove it!

Find the **length** of each side to the nearest tenth.

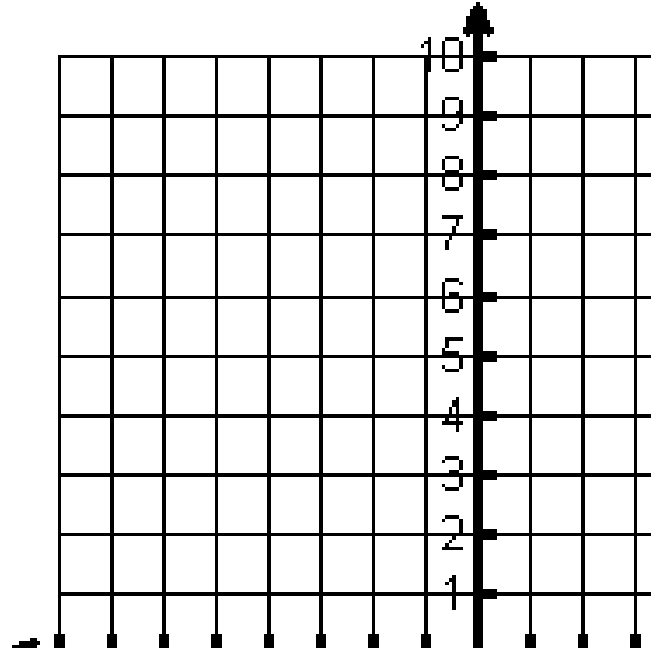
AB = _____

BC = _____

DC = _____

DA = _____

- What conclusions can you make?
(Hint: are any sides the same length)



Find the **slope** of each side.

Slope of AB = _____

Slope of DC = _____

Slope of BC = _____

Slope of AD = _____

- What conclusions can you make? (Hint: are any sides parallel? Perpendicular ?)

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

Proving a Quadrilateral is a Rectangle

Method: First, prove the quadrilateral is a parallelogram, then that the diagonals are congruent.

2) Plot and label each point. $A(-3, 0)$, $B(-2, 3)$, $C(4, 1)$, and $D(3, -2)$

Prove it!

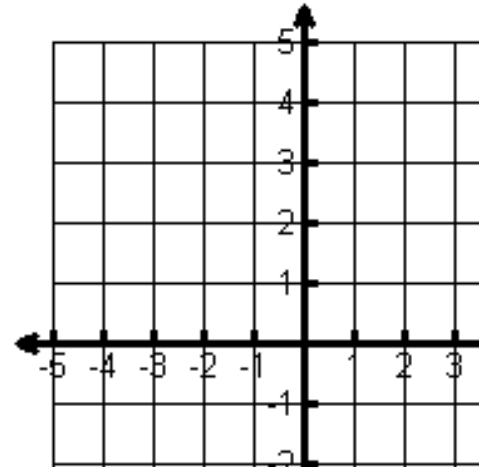
Find the **length** of each side to the nearest tenth.

$$AB = \underline{\hspace{2cm}}$$

$$BC = \underline{\hspace{2cm}}$$

$$DC = \underline{\hspace{2cm}}$$

$$DA = \underline{\hspace{2cm}}$$



- What conclusions can you make? (Hint: are any sides the same length)

Calculate the Distance of the Diagonals.

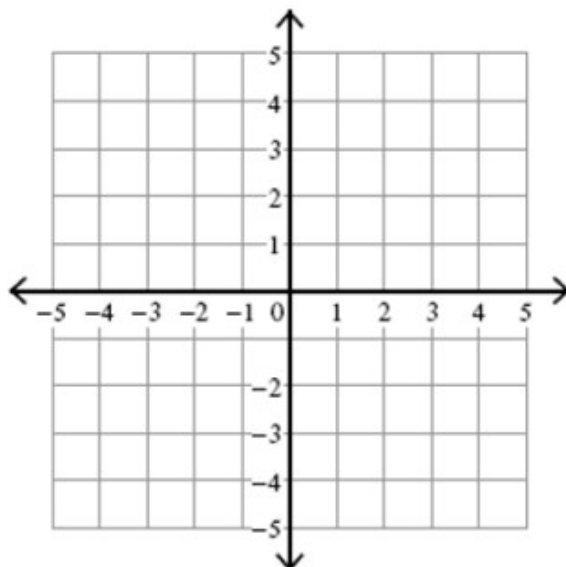
$$AC = \underline{\hspace{2cm}}$$

$$BD = \underline{\hspace{2cm}}$$

- What conclusions can you make? (Hint: are any sides parallel? Perpendicular?)

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

Prove that the quadrilateral with the coordinates $L(-2,3)$, $M(4,3)$, $N(2,-2)$ and $O(-4,-2)$ is a parallelogram.



Prove a quadrilateral with vertices $G(1,1)$, $H(5,3)$, $I(4,5)$ and $J(0,3)$ is a rectangle.

