

Justifying with Coordinate Geometry

#3

Name: Key
Date: _____ Period: _____

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

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

Given coordinate points for quadrilateral ABCD, calculate side lengths and slopes and use them to justify what type of quadrilateral it is.

Coordinates: **A (0, 0) B (3, -2) C (1, -5) D (-2, -3)**

Side Coords.	Side Length Work (d):	Side Slope Work (m):
AB (0, 0) (3, -2)	$d = \sqrt{(3-0)^2 + (-2-0)^2}$ $= \sqrt{3^2 + (-2)^2}$ $= \sqrt{9+4}$ $= \sqrt{13} \approx 3.61 \text{ units}$	$m = \frac{-2-0}{3-0} = \frac{-2}{3}$ $\boxed{-\frac{2}{3}}$
BC (3, -2) (1, -5)	$d = \sqrt{(3-1)^2 + (-2-(-5))^2}$ $d = \sqrt{2^2 + 3^2}$ $d = \sqrt{4+9}$ $= \sqrt{13} \approx 3.61 \text{ units}$	$m = \frac{-5-(-2)}{1-3} = \frac{-3}{-2} = \frac{3}{2}$ $\boxed{\frac{3}{2}}$
CD (1, -5) (-2, -3)	$d = \sqrt{(1-(-2))^2 + (-5-(-3))^2}$ $d = \sqrt{3^2 + (-2)^2}$ $d = \sqrt{9+4}$ $= \sqrt{13} \approx 3.61 \text{ units}$	$m = \frac{-3-(-5)}{-2-1} = \frac{2}{-3} = -\frac{2}{3}$ $\boxed{-\frac{2}{3}}$
AD (0, 0) (-2, -3)	$d = \sqrt{(0-(-2))^2 + (0-(-3))^2}$ $d = \sqrt{2^2 + 3^2}$ $d = \sqrt{4+9}$ $= \sqrt{13} \approx 3.61 \text{ units}$	$m = \frac{-3-0}{-2-0} = \frac{-3}{-2} = \frac{3}{2}$ $\boxed{\frac{3}{2}}$

Diagonal Coords.	Diagonal Lengths	Diagonal Slopes	Diagonal Midpoints
AC (0, 0) (1, -5)	$d = \sqrt{(0-1)^2 + (0-(-5))^2}$ $d = \sqrt{(-1)^2 + (5)^2}$ $d = \sqrt{1+25}$ $= \sqrt{26} \approx 5.1 \text{ units}$	$m = \frac{-5-0}{1-0} = \frac{-5}{1}$ $\boxed{-5}$	$(\frac{0+1}{2}, \frac{0+(-5)}{2})$ $\boxed{(\frac{1}{2}, -\frac{5}{2})}$
BD (3, -2) (-2, -3)	$d = \sqrt{(3-(-2))^2 + (-2-(-3))^2}$ $d = \sqrt{5^2 + 1^2}$ $d = \sqrt{25+1}$ $= \sqrt{26} \approx 5.1 \text{ units}$	$m = \frac{-3-(-2)}{-2-3} = \frac{-1}{-5}$ $\boxed{\frac{1}{5}}$	$(\frac{3+(-2)}{2}, \frac{-2+(-3)}{2})$ $\boxed{(\frac{1}{2}, -\frac{5}{2})}$

Summarize your calculations (from the front) in the table below. Then, use the table to help you brainstorm and write your justification.

Sides	Side Length	Side Slope
AB	$\approx 3.61 \text{ un}$	$-\frac{2}{3}$
BC	$\approx 3.61 \text{ un}$	$\frac{3}{2}$
CD	$\approx 3.61 \text{ un}$	$-\frac{2}{3}$
AD	$\approx 3.61 \text{ un}$	$\frac{3}{2}$

Diagonals	Diagonal Lengths	Diagonal Slopes	Diagonal Midpoints
AC	$\approx 5.1 \text{ un}$	-5	$(\frac{1}{2}, -\frac{5}{2})$
BD	$\approx 5.1 \text{ un}$	$\frac{1}{5}$	$(\frac{1}{2}, -\frac{5}{2})$

Type of quadrilateral: Square

JUSTIFICATION #1 (Side Information ONLY):

- 2 pairs of parallel sides (parallelogram family)
- All (4) congruent sides (square or rhombus)
- Consecutive sides are \perp - opposite reciprocal slopes

square

JUSTIFICATION #2 (Diagonal Information ONLY):

- Diagonals \cong (rec, sq, isos trap, plain quad)
- Diagonal slopes are \perp - opposite reciprocals (not a rec or isos trap)
- Diagonals bisect each other - share a mid point (not a plain quad)

Square