

Geometry 1.2
Class-Notes
HSG.CO.C11

Name _____
Date _____ Period _____

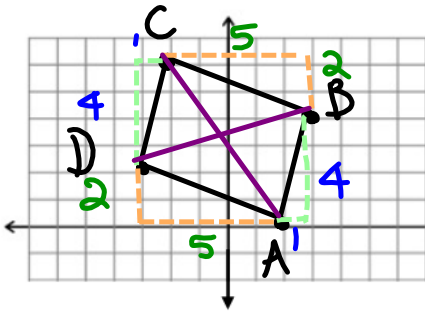
8.6 Identify Special Quadrilaterals (Day 1)

Goal: Identify special quadrilaterals

There are four ways to Prove Quadrilateral is a Parallelogram on the coordinate plane.

- Show that both pairs of opposite sides are parallel. Use slope $m = \frac{y_2 - y_1}{x_2 - x_1}$
- Show that both pairs of opposite sides are congruent. Use Pythagorean (dist) $a^2 + b^2 = c^2$
- Show that the diagonals bisect each other. Use midpoint $M = (\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$
- Show that one pair of opposite sides are congruent and parallel. Use slope and Pythagorean

Show that A(2, 0), B(3, 4), C(-2, 6), and D(-3, 2) are the vertices of a parallelogram. Then determine if the parallelogram is a rectangle, rhombus, or square.



Method 1: Show that opposite sides have the same slope, so they are parallel.

$$m_{CB} = \frac{6-4}{-2-3} = -\frac{2}{-5} = \frac{2}{5}$$

$$m_{CD} = \frac{2-6}{-3+2} = \frac{-4}{-1} = 4$$

$$m_{DA} = \frac{2-0}{-3-2} = -\frac{2}{-5} = \frac{2}{5}$$

$$m_{BA} = \frac{4-0}{3-2} = \frac{4}{1} = 4$$

Method 2: Show that the opposite sides have the same length.

$$CB^2 = DA^2 = 2^2 + 5^2 = 4 + 25 = 29$$

$$CB = DA = \sqrt{29}$$

$$CD^2 = AB^2 = 1^2 + 4^2 = 17$$

$$CD = AB = \sqrt{17}$$

Method 3: Show that one pair of opposite sides is congruent and parallel.

$$CB \parallel DA$$

$$m_{CB} = m_{DA}$$

$$CB = DA$$

Method 4: Show that the midpoint of each diagonal is the same (diagonals bisect each other).

$$M_{CA} = (\frac{-2+2}{2}, \frac{6+0}{2}) = (0, 3)$$

$$M_{BD} = (\frac{3-3}{2}, \frac{4+2}{2}) = (0, 3)$$

NO

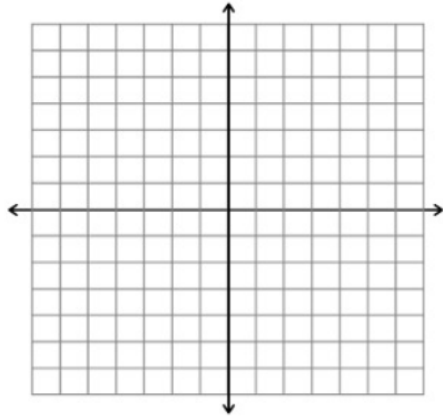
Rectangle – consecutive sides have opposite reciprocal slopes (\perp)

Rhombus – all 4 sides are \cong .

Square – if it is a rectangle and a rhombus, then it is a square.

The best name for the quadrilateral is a parallelogram because _____

Using slope, length, and midpoint to show that the quadrilateral with vertices T(6, 2), N(3, 4), G(4, -1), and L(1, 1) is a parallelogram. Then determine if the parallelogram is a rectangle, rhombus, or square.



Method 1: Show that opposite sides have the same slope, so they are parallel.

Method 2: Show that the opposite sides have the same length.

Method 3: Show that one pair of opposite sides is congruent and parallel.

Method 4: Show that the midpoint of each diagonal is the same (diagonals bisect each other).

Rectangle – consecutive sides have opposite reciprocal slopes (\perp).

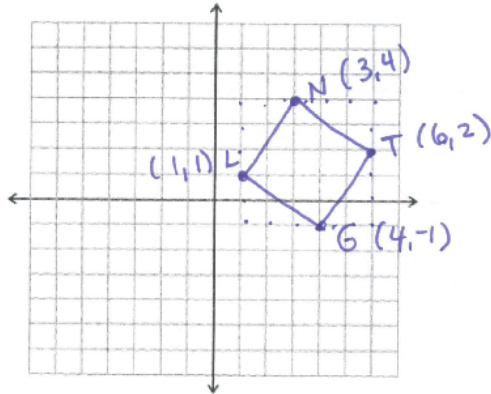
Rhombus – all 4 sides are \cong .

Square – if it is a rectangle and a rhombus, then it is a square.

The best name for the quadrilateral is a _____ because _____

 _____.

Using slope, length, and midpoint to show that the quadrilateral with vertices T(6, 2), N(3, 4), G(4, -1), and L(1, 1) is a parallelogram. Then determine if the parallelogram is a rectangle, rhombus, or square.



Method 1: Show that opposite sides have the same slope, so they are parallel.

LN, GT
 $\frac{3-1}{4-1} = \frac{2}{3}$
 $\frac{2-4}{6-3} = \frac{-2}{3}$
 \parallel

LG, NT
 $\frac{4-1}{4-1} = \frac{3}{3} = 1$
 $\frac{2-4}{6-3} = \frac{-2}{3}$
 \parallel
 opp sides $\parallel \rightarrow \square$

Method 2: Show that the opposite sides have the same length.

LN, GT
 $3^2 + 2^2 = c^2$
 $9 + 4$
 $\sqrt{13} = c$

LG, NT
 $2^2 + 3^2$
 $4 + 9$
 $\sqrt{13}$

both pairs opp sides \cong
 \rightarrow rhombus \checkmark

Method 3: Show that one pair of opposite sides is congruent and parallel.

LN, GT
 $\frac{3}{2} \rightarrow$ slope
 $\sqrt{13} \rightarrow$ length
 1 pair opp sides $\parallel + \cong$
 $\rightarrow \square$

Method 4: Show that the midpoint of each diagonal is the same (diagonals bisect each other).

Diagonals:
 LT (1,1)(6,2)
 $(\frac{1+6}{2}, \frac{1+2}{2})$
 $(3.5, 1.5)$

NG (3,4)(4,-1)
 $(\frac{3+4}{2}, \frac{4+(-1)}{2})$
 $(3.5, 1.5)$

diagonals each have the same midpoint \rightarrow
 diagonals bisect e/o \rightarrow
 yes \square .

Rectangle – show that consecutive sides have opp recip slopes (\perp).

Rhombus – show that all 4 sides are congruent. all 4 sides $\cong \sqrt{13}$

Square – if it is a rectangle and a rhombus, then it is a square.

slopes: LN $\frac{3}{2}$ NT $\frac{2}{-3}$ yes \perp

The best name for the quadrilateral is a square because _____

all 4 sides are \cong (all $\sqrt{13}$) so it's a rhombus, and consecutive sides have opp recip slopes $\frac{3}{2} \rightarrow \frac{2}{-3}$, so \perp .

if \square is a rectangle + rhombus, then it is a square \smile