Geometry
Coordinate Geometry Proofs

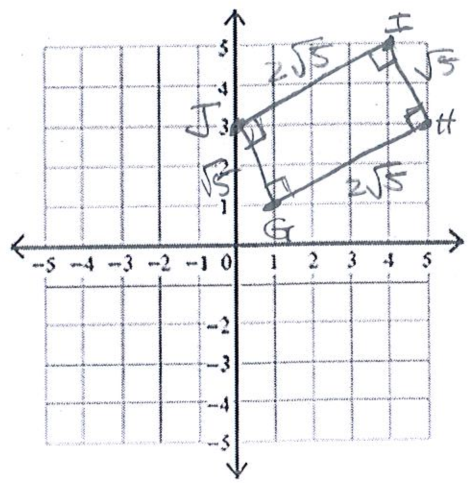
Name: Key
Date:

Formulas and 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: ➢ sides are congruent
• Slope Formula: $m = \frac{y_2 - y_1}{x_2 - x_1}$	To determine whether: ➢ opposite sides are parallel ➢ consecutive sides are perpendicular

Proving that a Quadrilateral is a Rectangle

Prove that G(1, 1), H(5, 3), I(4, 5), and J(0, 3) is a Rectangle



- Key Word: Rectangle
- Step 1: Calculate distances of all four sides to show that opposite sides are congruent.

$GH = \sqrt{(5-1)^2+(3-1)^2} = \sqrt{4^2+2^2} = \sqrt{16+4} = \sqrt{20} = 2\sqrt{5}$

$HI = \sqrt{(4-5)^2+(5-3)^2} = \sqrt{(-1)^2+(2)^2} = \sqrt{1+4} = \sqrt{5}$

$IJ = \sqrt{(0-4)^2+(3-5)^2} = \sqrt{(-4)^2+(-2)^2} = \sqrt{16+4} = \sqrt{20} = 2\sqrt{5}$

$JG = \sqrt{(0-1)^2+(3-1)^2} = \sqrt{(-1)^2+(2)^2} = \sqrt{1+4} = \sqrt{5}$

- Step 2: Calculate the slopes of all four sides to show that consecutive sides are perpendicular.

$m_{GH} = \frac{3-1}{5-1} = \frac{2}{4} = \frac{1}{2}$ $\quad m_{IJ} = \frac{3-5}{0-4} = \frac{-2}{-4} = \frac{1}{2}$

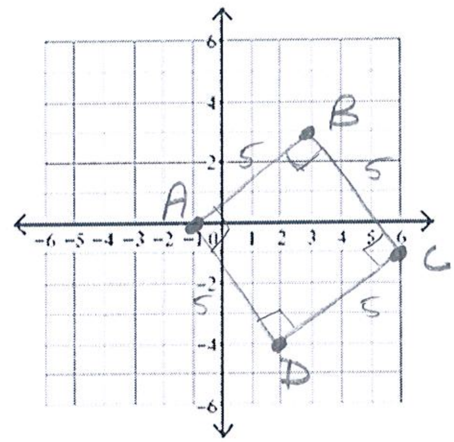
$m_{HI} = \frac{5-3}{4-5} = \frac{2}{-1} = -2$ $\quad m_{GJ} = \frac{3-1}{0-1} = \frac{2}{-1} = -2$

- Statement:

GHIJ is a rectangle because $\overline{JI} \cong \overline{GH}$, $\overline{JG} \cong \overline{IH}$, $\overline{GH} \perp \overline{HI}$, $\overline{IJ} \perp \overline{GJ}$, $\overline{HI} \perp \overline{IJ}$, $\overline{HG} \perp \overline{JG}$

Proving that a Quadrilateral is a Square

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



- Key Word: Square

- Step 1: Calculate distances of all four sides to show that all sides are congruent.

$AB = \sqrt{(3-{-1})^2+(3-0)^2} = \sqrt{4^2+3^2} = \sqrt{16+9} = \sqrt{25} = 5$

$BC = \sqrt{(6-3)^2+(-1-3)^2} = \sqrt{3^2+(-4)^2} = \sqrt{9+16} = \sqrt{25} = 5$

$CD = \sqrt{(2-6)^2+(-4-{-1})^2} = \sqrt{(-4)^2+(-3)^2} = \sqrt{16+9} = \sqrt{25} = 5$

$DA = \sqrt{(2-{-1})^2+(-4-0)^2} = \sqrt{3^2+(-4)^2} = \sqrt{9+16} = \sqrt{25} = 5$

- Step 2: Calculate the slopes of all four sides to show that consecutive sides are perpendicular

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

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

$m_{BC} = \frac{-1-3}{6-3} = \frac{-4}{3}$

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

- Statement:

ABCD is a square because $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{DA}$
$\overline{AB} \perp \overline{BC}$, $\overline{CD} \perp \overline{DA}$, $\overline{AB} \perp \overline{DA}$, $\overline{BC} \perp \overline{CD}$