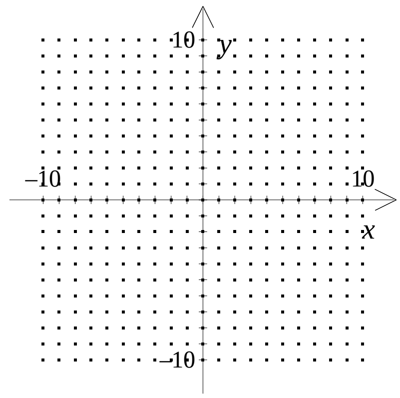
NAME:______________________________

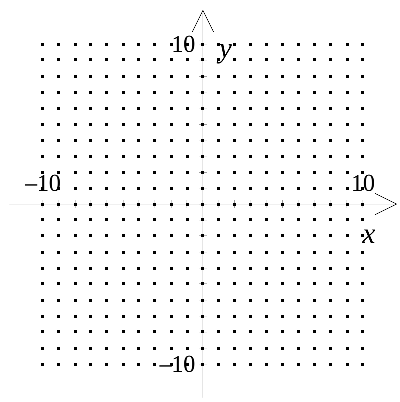
P.I. G.G.69: Investigate, justify, and apply the properties of triangles and quadrilaterals in the coordinate plane, using the distance, midpoint, and slope formulas

1. Draw a figure in the coordinate plane and write a two-column coordinate proof.
   Given: Quadrilateral *ABCD* with *A*(– 5, 0), *B*(1, –4), *C*(5, 2), *D*(–1, 6).
   Prove: *ABCD* is a rectangle.



[1] ______________________________

2. Draw a figure in the coordinate plane and write a two-column coordinate proof.
   Given: Quadrilateral *ABCD* with *A*(– 5, 0), *B*(–1, –8), *C*(7, –4), *D*(3, 4).
   Prove: *ABCD* is a rectangle.



[2] ______________________________

3. Write four possible coordinates for the vertices of a rectangle. Use slopes to show that your figure is a rectangle.

[3] ______________________________

NAME:________________________________

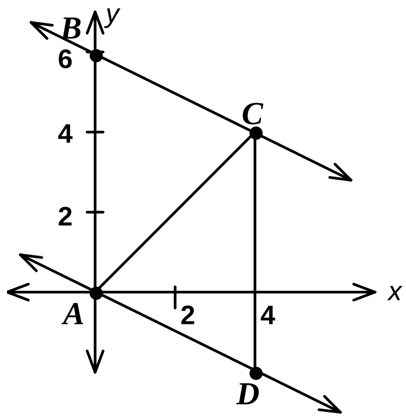
4. Given $A(1, 1)$, $B(0, 5)$, $C(4, 4)$, and $D(5, 0)$. Use the fact that if the diagonals of a parallelogram are perpendicular, then it is a rhombus to prove $ABCD$ is a rhombus.

[4] ________________________________

5. Prove using coordinate geometry: The midpoints of the sides of a rhombus determine a rectangle.

[5] ________________________________

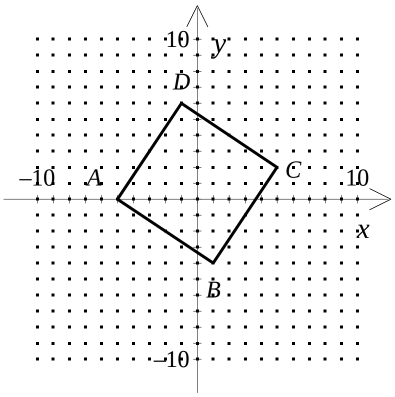
6. Prove that $\Delta ABC \cong \Delta CDA$.



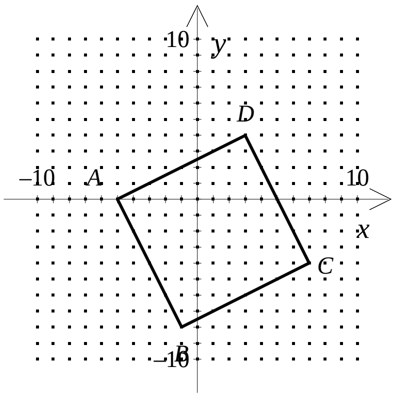
[6] ________________________________

7. ΔABC has vertices $A(2,\ 1)$, $B(7,\ 4)$, and $C(4,\ -1)$. ΔDEF has vertices $D(-3,\ 1)$, $E(0,\ -4)$, and $F(-5,\ -1)$. Use the distance formula to prove that $\Delta ABC \cong \Delta DEF$.

[7] ________________________________



1. Quadrilateral $ABCD$ with $A(-5, 0)$, $B(1, -4)$, $C(5, 2)$, $D(-1, 6)$	1. Given
2. slope of $\overline{AB} = \dfrac{-4 - 0}{1 - (-5)} = -\dfrac{2}{3}$ slope of $\overline{BC} = \dfrac{2 - (-4)}{5 - 1} = \dfrac{3}{2}$ slope of $\overline{CD} = \dfrac{6 - 2}{-1 - 5} = -\dfrac{2}{3}$ slope of $\overline{AD} = \dfrac{0 - 6}{-5 - (-1)} = \dfrac{3}{2}$	2. Definition of slope
3. $AB \perp BC$, $BC \perp CD$, $CD \perp AD$, $AD \perp AB$	3. Any two lines whose slopes are negative reciprocals are $\perp$.
4. $\angle ABC$, $\angle BCD$, $\angle CDA$, and $\angle DAC$ are right angles.	4. Definition of $\perp$
[1] 5. $ABCD$ is a rectangle	5. Definition of a rectangle



1. Quadrilateral $ABCD$ with $A(-5, 0)$, $B(-1, -8)$, $C(7, -4)$, $D(3, 4)$	1. Given
2. slope of $\overline{AB} = \dfrac{-8 - 0}{-1 - (-5)} = -2$ slope of $\overline{BC} = \dfrac{-4 - (-8)}{7 - (-1)} = \dfrac{1}{2}$ slope of $\overline{CD} = \dfrac{4 - (-4)}{3 - 7} = -2$ slope of $\overline{AD} = \dfrac{0 - 4}{-5 - 3} = \dfrac{1}{2}$	2. Definition of slope
3. $AB \perp BC$, $BC \perp CD$, $CD \perp AD$, $AD \perp AB$	3. Any two lines whose slopes are negative reciprocals are $\perp$.
4. $\angle ABC$, $\angle BCD$, $\angle CDA$, and $\angle DAC$ are right angles.	4. Definition of $\perp$
5. $ABCD$ is a rectangle	5. Definition of a rectangle

[2]

Answers may vary. Sample: $A(1, 1)$, $B(7, -1)$, $C(8, 2)$, $D(2, 4)$; slope of $AB = -\frac{1}{3}$, slope of $BC = 3$, slope of $CD = -\frac{1}{3}$, slope of $DA = 3$; AB and CD are parallel, BC and DA are parallel, AB and BC are perpendicular, BC and CD are perpendicular, CD and DA are perpendicular, DA and AB are perpendicular

[3]

First show that $ABCD$ is a parallelogram by using slopes to show that opposite sides are parallel. The slopes of $\overline{BD}$ and $\overline{AC}$ are -1 and 1, respectively, so they are perpendicular. Hence $ABCD$ is a rhombus.

[4]

Check students' work. They should show that opposite sides are the same length and are parallel and that there is one right angle.

[5]

$\overline{BC} \parallel \overline{AD}$ since they have the same slope. So, $\angle BCA \cong \angle DAC$ by the Alt. Int. Angles Post. Similarly, $\overline{AB} \parallel \overline{DC}$ since they have the same slope. So, $\angle BAC \cong \angle DCA$. $\overline{AC} \cong \overline{CA}$, so the triangles are congruent by ASA. Other congruence strategies would also work.

[6]

[7] $AB=\sqrt{34}=DE$, $BC=\sqrt{34}=EF$, and $AC=\sqrt{8}=DF$, so the triangles are congruent by SSS.