Quadrilateral Explorations – Grade Nine

Ohio Standards Connection:

Geometry and Spatial Sense

Benchmark D
Use coordinate geometry to represent and examine properties of geometric figures.

Benchmark G
Prove or disprove conjectures and solve problems involving two- and three- dimensional objects represented within a coordinate system.

Indicator 3
Analyze two-dimensional figures in a coordinate plane; e.g., use slope and distance formulas to show that a quadrilateral is a parallelogram.

Mathematical Processes Benchmarks:

D. Apply reasoning processes and skills to construct logical verification or counter-examples to test conjectures and to justify and defend algorithms and solutions.

F. Use precise mathematical language and notations to represent problem situations and mathematical ideas.

Lesson Summary:
In this two-part lesson, ninth-grade students use coordinate geometry to identify and analyze quadrilaterals. The students work cooperatively in small groups to review the properties of quadrilaterals. They examine and classify given quadrilaterals using slope, midpoint and distance formulas. Students create various quadrilaterals using three given points and finding a fourth point that will satisfy the properties. In small groups, students create Quadrilateral Explorations for other groups in the class. A final post-assessment provides evidence of student learning.

Estimated Duration: *One hour 30 minutes*

Commentary:
Present this lesson after students have studied the distance and midpoint formulas, as well as the formula for finding slope. If an extended period of time has elapsed since instruction pre-assess students on the concepts and use of the formulas. Use tasks of finding measurements of congruent line segments and identifying parallel and perpendicular line segments as contexts for applying the formulas.

Pre-Assessment:

- Divide class into groups of three or four.
- Distribute *Characteristics of Quadrilaterals*, Attachment A, and a small stack of self-adhesive notes to each group. Have students work together to match the characteristics with the appropriate names of each quadrilateral. Once the group agrees, have students write appropriate characteristics on self-adhesive notes and place them next to the name of the quadrilateral on a poster board or chalkboard.
- Reassemble the class and examine each list of characteristics as presented on the self-adhesive notes.
- Discuss how previous lessons on slope, midpoint and distance formulas might be used in each grouping (e.g., characteristics involving lengths of sides, parallel sides, etc.). Make a list of possible connections for using the formulas to support geometric conjectures.