C2.0 Geometry Unit 4 Instructional Focus: Connecting Algebra and Geometry through Coordinates

Topic	Instructional Foci
Topic 1: Conic Sections	Students connect what they have learned about cross-sections of three-dimensional shapes to cross-sections of double cones (i.e., conic sections). Students continue their study of quadratics by connecting the geometric and algebraic definitions of parabolas. In the Cartesian coordinate system, students use the distance formula to write the equation of a circle when given the radius and the coordinates of its center. Given an equation of a circle, they draw the graph in the coordinate plane. Students may explore the definitions, equations, and graphs of ellipses and hyperbolas as well (required for Honors). **Concepts optional for Geometry, required for Honors Geometry* ***Concepts:*** Identify conic sections as the cross-sections of a double cone. Identify the locus of points that defines a circle and graph circles using the center and the radius. Use the Pythagorean Theorem to derive the equation of a circle, given the center and the radius. Write an equation for a circle given the endpoints of the diameter. Convert an equation of a circle in quadratic form, by completing the square, to standard form; identify the center and radius of a circle. Define an ellipse in terms of the distance from its foci to any fixed point on the curve; derive the equation of an ellipse in standard form.* Graph ellipses and write the equations of ellipses in standard form.* Define a hyperbola in terms of the distance from its foci to any fixed point on the curve.* Graph hyperbolas and write the equations of hyperbolas in standard form.* Graph ellipses and hyperbolas and write their equations in standard form.* Define a parabola. Graph and write equations of parabolas given a focus and directrix. Determine the vertex, focus, directrix, line of symmetry, and equation given the graph of a parabola. Identify and describe characteristics of conic sections based upon a given equation or graph.
Topic 2: Coordinate Geometry	Building on their work with the Pythagorean Theorem to find distances, students use a rectangular coordinate system to verify geometric relationships, including properties of special triangles and quadrilaterals and slopes of parallel and perpendicular lines. ***Concepts:*** Use ratios to determine a point that divides a given line segment proportionally. Prove the slope criteria for parallel and perpendicular lines. Use the slope formula to prove lines are parallel or perpendicular. Determine the equation of a line that is parallel or perpendicular to a given line and passes through a given point. Apply the distance formula to determine the perimeter and area of polygons in the coordinate plane. Use coordinate geometry to classify triangles. Use coordinate geometry to classify quadrilaterals. Use coordinate geometry to prove theorems algebraically.