

MATH 251. Elements of Geometry (4 credits)

Course Description. Content knowledge for teaching elementary school mathematics. Geometric vocabulary, relationships, concepts and skills, including properties and classification of two- and three-dimensional shapes; transformations and symmetry; and measurement. Appropriate geometric tools and technology* are integrated throughout.

Required Textbook. There is no required textbook for the course.

Required Technology. While technology is required for the course, it is the instructor's discretion to use either Geometer's Sketchpad or Geogebra.

Course Outline. Students will be able to...

- Unit 1. Geometric Attributes** 1 Week
- Recognize defining attributes of different figures
 - Categorize figures based on their attributes
 - Identify shared attributes among different figures
 - Determine whether or not a figure is a polygon using its attributes
- Unit 2. Introduction to Dynamic Geometry Software** 0.5 Week
- Use basic dynamic geometry software tools (e.g., Sketchpad, Geogebra)
 - Distinguish between drawn and constructed figures
- Unit 3. Angles** 1 Week
- Identify angles by type (i.e., acute, right, obtuse, straight, reflex)
 - Describe and justify angle relationships using symmetries (e.g., paper folding, patty paper)
 - Supplementary and complementary
 - Vertical Angles
 - Parallel lines cut by a transversal
- Unit 4. Triangles** 1.5 Weeks
- Identify types of triangles by side length and angle measure
 - Explain why the sum of the interior angles of a triangle is 180°
 - Determine whether or not a triangle can be formed given a set of side lengths
 - Use rearrangement of area to verify and prove the Pythagorean Theorem
 - Use the Pythagorean theorem to determine a missing side length of a right triangle
- Unit 5. Interior Angles of Polygons** 0.5 Week
- Explain how to determine the sum of the interior angles of a polygon with n sides using triangles
 - Determine the measure of *one* interior angle of a regular polygon with n sides
- Unit 6. Quadrilaterals** 1.5 Weeks
- Identify the defining properties of special types of quadrilaterals:
 - Categorize quadrilaterals based on their defining properties
 - Identify shared attributes among different quadrilaterals
- Unit 7. Geometric Solids** 2 Weeks
- Construct various solids using their two-dimensional nets
 - Identify special types of polyhedra (i.e., regular, prisms, pyramids) and solids (i.e., cones, cylinders)
 - Determine whether or not a solid is a polyhedra using its attributes
 - Explain the relationship between the number of faces, edges, and vertices of a polyhedra
- Unit 8. Transformations, Symmetries, and Tessellations** 2 Weeks
- Determine which transformation(s) (i.e., reflection, rotation, translation, dilation) were performed
 - Perform various transformations either by hand or using geometry software
 - Identify different symmetries (i.e., reflection, rotation, translation) of a given figure
 - Determine whether or not various polygons will tessellate using what is known about their interior angles
- Unit 9. Measurement** 1.5 Weeks
- Determine the perimeter and area of two-dimensional figures
 - Determine the surface area and volume of three-dimensional figures
 - Relate the area of a circle to the area of a parallelogram