

Course Goals: Math 103 Geometric Structures

Catalog description: This course focuses on the geometric and measurement content of Pre-K–8 mathematics and appropriate teaching methods and is designed specifically to address requirements for teachers and pre-service teachers seeking MC-EA licensure. Instruction will be guided by the Common Core State Standards for Mathematics and the NCTM Principles and Standards for School Mathematics. Emphasis is on problem solving, critical thinking, and communication. This course does NOT satisfy the college General Education requirement in math. Prerequisite: MATH 102 with a grade of C or above.

Student will demonstrate each of the following abilities.

Regarding professional standards:

- State each of the six NCTM Principles and the ten Process Standards.
- Identify, with justification, principles and standards addressed within specific examples of lesson plans.
- Identify, with justification, the grade band (corresponding with NCTM *Principles and Standards for School Mathematics* and the *Common Core State Standards for Mathematics*.) in which a given problem occur.
- Analyze a unit from a mathematics curriculum that is currently in use in area school districts.

Regarding formal pedagogy:

- Articulate basic structure of a lesson plan and explore a specific type (Review-Teach-Practice, Investigate/Problem-Based, or Direct Instruction)
- Articulate learning objectives using the language of Bloom’s taxonomy.
- Articulate the van Hiele level of understanding supported by a given learning activity and recommend subsequent activities designed to move the learner to the next level.
- Construct (original or based on materials explored within the course) classroom activities around a variety of different types of goals: concept introduction, exploration, reinforcement and generalization.
- Design problems that assess a given geometric concept.
- Identify topics that exhibit the interconnectedness of algebra and geometry.

Within geometric concepts:

- Describe two- and three-dimensional geometric objects by: naming them; comparing, sorting and classifying; drawing and constructing physical models to specifications; identifying properties (such as isosceles, parallel sides, or rotational symmetry).
- Identify three-dimensional shapes from two-dimensional perspectives and draw two dimensional sketches of three-dimensional objects that suggest depth perspective accurately.
- Compare objects and components of objects for qualities such as adjacent, interior, parallel, and perpendicular; and, in the case of two-dimensional objects only, region of intersection.
- Identify symmetry, congruence, and similarity through use of physical materials and motion geometry (slides, flips, and turns). Use appropriate tools to perform common transformations on two-dimensional figures and describe and analyze the effects of such transformations. Use transformations to develop patterns.
- Solve problems using geometric objects and spatial reasoning to visualize, represent, and solve. This may include use of transformations.

- Locate and represent objects on a rectangular coordinate system.
- Evaluate others reasoning and solutions for correctness.
- Recommend ways that teachers may anticipate and work to prevent common geometric misconceptions. Recommend ways that teachers may address such misconceptions, once they have occurred.

Within measurement concepts:

- Describe measurable attributes such as length, liquid capacity, time, weight, temperature, volume, angle size; and use appropriate tools and units to measure them.
- Use arbitrary and standard units (metric and US Customary) to describe quantities; convert units within a system (*e.g.*, miles to inches); convert units between systems (*e.g.*, meters to inches). Demonstrate understanding that direct measurement produces approximate, not exact results and use smaller units to determine more precise results.
- Identify and describe attributes in situations where they are not easily measurable; such as distance or area of an irregular figure.
- Determine measurements indirectly using each of the following: estimation, conversion of units, ratio and proportion (*e.g.*, similarity and scaling), geometric relationships and properties for angle size (*e.g.*, sum of angles in a triangle), Pythagorean relationship.
- Evaluate the reasonableness of an obtained measurement.
- Recommend ways that teachers may anticipate and work to prevent common misconceptions regarding measurement. Recommend ways that teachers may address such misconceptions, once they have occurred.

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