

# MTH 213 : FUNDAMENTALS OF ELEMENTARY MATHEMATICS III

## Transcript title

Fund of Elementary Math III

## Credits

4

## Grading mode

Standard letter grades

## Total contact hours

40

## Lecture hours

40

## Recommended preparation

MTH 211.

## Course Description

Covers geometric shapes, measurement, congruence and similarity, and coordinate and transformational geometry. Third term of a sequence for students planning to become elementary teachers but open to any student wanting to study the foundations of mathematics.

## Course learning outcomes

1. Use appropriate mathematical language to describe two- and three-dimensional shapes and their properties.
2. Use a variety of problem-solving techniques to analyze and solve two- and three-dimensional geometric problems.
3. Use algebraic techniques to analyze geometric problems.
4. Use a geometry software package to construct geometric models involving properties of lines, angles, polygons, circles and transformations.
5. Use straight-edge and compass, and Mira (where appropriate) to perform classic Euclidean constructions.
6. Explain how formulas for areas of polygons and volumes of corresponding prisms and pyramids can be generated.
7. Explain and demonstrate how shape affects area for a given perimeter and perimeter for a given area.
8. Use the language and practices described in the Standards of Mathematical Practices (Common Core State Standards).

## Content outline

1. Problem Solving
  - a. Students will use a variety of problem-solving techniques to analyze and solve two- and three-dimensional geometric problems.
    - i. Techniques will include exploring patterns, developing mathematical models, working backwards, creating tables of data, drawing graphs, using equations, estimating the reasonableness of an answer using a calculator or other appropriate technology.
2. Geometric Language and Concepts
  - a. Students will use appropriate mathematical language to describe two- and three-dimensional shapes and their properties.
    - i. Identify and name polygons (triangle, quadrilateral, square, rectangle, parallelogram, trapezoid, rhombus, pentagon, hexagon, heptagon, octagon, nonagon, and decagon).
    - ii. Identify and name polyhedron (prisms and pyramids related to polygons above).
    - iii. Identify and name circle, sphere, and cone.
    - iv. Use geometric terms appropriately (regular, translation, reflection, rotation, vertices, edge, face, angle, line, line segment, ray).
3. Geometric Problems
  - a. Students will use algebraic techniques to analyze geometric problems.
    - i. Compute relationships between inscribed and circumscribed polygons and polyhedrons.
    - ii. Use the Pythagorean Theorem to solve geometric problems.
    - iii. Solve problems involving areas of polygons and circles and problem involving volumes of polyhedrons and spheres and cones.
4. Geometric Constructions and Measurement
  - a. Students will use a geometry software package to construct geometric models involving properties of lines, angles, polygons, circles, and transformations.
    - i. Use GeoGebra or The Geometer's Sketchpad or other similar program to explore relationships and transformations and solve problems involving properties of lines, angles, polygons, and circles.
  - b. Students will use straight-edge, compass, and Mira (where appropriate) to perform classic Euclidean constructions.
    - i. Use a straightedge and compass to recreate classical Euclidean constructions including, but not necessarily limited to, copying and bisecting angles, copying triangles, bisecting lines, inscribing (regular triangles, squares, regular hexagons) polygons in circles.
    - ii. Use a straightedge and compass to construct various geometric figures.
    - iii. Use a Mira to explore limitations and strengths of various construction tools.
  - c. Students will explain how formulas for areas of polygons and volumes of corresponding prisms and pyramids can be generated.
    - i. Generate formulas for triangles, rectangles, parallelograms, trapezoids, and regular hexagons.
    - ii. Generalize volumes of prisms and pyramids.
  - d. Students will explain and demonstrate how shape affects area for a given perimeter and perimeter for a given area.
    - i. Understand the effect the shape of an object has on perimeter and area.
    - ii. Use the understanding of the effect the shape of an object has on the perimeter and are of the object to calculate the maximum area for a given perimeter and the minimum perimeter for a given area.

5. Standard of Mathematical Practice

- a. Students will use the language and practices described in the Standards of Mathematical Practices (Common Core State Standards).
  - i. Make sense of problems and persevere in solving them.
  - ii. Reason abstractly and quantitatively.
  - iii. Construct viable arguments and critique the reasoning of others.
  - iv. Model with mathematics.
  - v. Use appropriate tools strategically.
  - vi. Attend to precision.
  - vii. Look for and make use of structure.
  - viii. Look for and express regularity in repeated reasoning.

## Required materials

This course may require a textbook.

## General education/Related instruction lists

- Science not Lab
- Mathematics