

Understanding Geometry
MATH 6242
Fall 2009

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Required Materials

Freitag, M. (In Progress). Mathematics for Elementary Teachers: a Process Approach. Chapters 10 and 12. Copyright Houghton Mifflin. All Rights Reserved.

A calculator. scissors, ruler, compass, and protractor...

Catalog Description

A study of geometric concepts and measurement using nonstandard, English, and metric units. Topics include coordinate geometry, inductive and deductive reasoning, and concepts related to two- and three dimensional objects including similarity, congruence, and transformations. Prerequisite(s): Admission to Teacher Education and Permission of Instructor.

Rationale for the Course

Recent trends in the elementary curriculum have moved towards including more geometry. There are many reasons to do so. For one, geometry is closely connected to our everyday lives as most of our interactions with the physical world are some how related to geometry. Two, geometry plays an integral part in the study of other areas of mathematics and other disciplines. Three, incorporating geometry in the early grades allows students to develop their ability to solve problems, reason logically, and communicate mathematically. The fourth, and perhaps most important reason to include more geometry in the early grades, is that it helps students develop their spatial thinking. Spatial thinking is an important part of learning mathematics as research indicates that not only do our perceptions of visual images influence our responses to events in our daily lives, but it is also correlates to problem solving and success in mathematics and science (Gardner, 1983, Tillotson, 1985).

Traditionally, when geometric topics have been taught in the early grades, the focus has been on naming shapes and memorizing terms rather than on developing geometrical thinking by building relationships between geometric objects, understanding properties of geometrical figures, and developing spatial reasoning. (Martin & Strutchens, 2000). A more contemporary approach is to teach geometry informally, which allows students to experience, explore, observe, justify, and come to intuitively understand geometric concepts. Thus, the focus of geometry in the early grades, is not just on the names, but also on the experiences students have in learning elementary geometry. The purpose of this course is to help preservice elementary teachers fully

understand the concepts of geometry and measurement so that they can teach them to their students.

Course Objectives

After completing this course students will be able to

- Use the NCTM Process standards to learn and understand geometry;
- Understand Euclidean geometry as a prime example of an axiomatic system;
- Know and use definitions and properties of two- and three-dimensional shapes;
- Use constructions as a way of understanding geometrical relationships and solving geometric problems;
- Understand and apply the ideas of congruence and similarity to geometric shapes;
- Use coordinate geometry as a way of understanding, learning, and measuring various two-dimensional shapes;
- Apply transformations such as rotations, translations, and reflections to geometric figures using coordinate geometry;
- Use transformational geometry to study patterns and tessellations;
- Describe the measurement process;
- Understand the need for standard units and make conversions between USCS and metric units;
- Use non-standard, USCS and metric systems to measure geometrical attributes including but not limited to perimeter, area, surface area and volume;
- Understand and apply measurement formulas related to different geometric attributes; and
- Demonstrate a working knowledge of geometrical manipulatives and software, particularly Geometer's sketchpad

Course Requirements

Students are expected to

1. Complete all homework assignments. All assignments are due at the beginning of the period on the date assigned. Any assignment that is submitted late, but in the same day of class, will automatically be reduced by 10 points. Late assignments that are submitted after the due date but within one week of the due date will be automatically reduced by 25 points. **NO ASSIGNMENT WILL BE ACCEPTED LATER THAN ONE WEEK AFTER THE GIVEN DUE DATE.** Due dates will typically coincide with test dates.
2. Complete in-class lab activities. It is expected that when labs are not completed in class, they will be finished as homework and turned in during the next class period.
3. Complete all reading assignments.
4. Complete all tests.

5. Complete a final review activity part of which includes a comprehensive exam.
6. Participate in class by working trial problems, answering questions asked by the instructor, and asking questions about the material.
7. Attend class on a regular basis. Although attendance will not be taken, there is a direct correlation between attendance and grades. Poor attendance often leads to poor grades. Due dates for assignments and test dates will be given in class at least one full week before an assignment is due or a test is given. **NO MAKE-UP TESTS WILL BE GIVEN!!!** If you miss class, getting due dates is your responsibility. If you know you will have to miss a test, please see me to make other arrangements.
8. Not engage in academic dishonesty. Students caught cheating will have charges brought against them in the ASU judicial system. Cheating includes using a “cheat sheet” of any kind, using another student’s work on assignments where such conduct is not allowed, using resources which are specifically disallowed by the professor, and any other conduct deemed inappropriate by the instructor. I reserve the right to examine all materials used by students during test taking situations. **NOTE:** Working on homework together at the idea level is acceptable and encouraged. However, it is expected that all students will write up assignments separately. If assignments are written in an identical format, the points awarded to the assignment will be split between the students.

BY ENROLLING IN THIS COURSE, YOU ACCEPT ALL CONDITIONS STATED ON THIS SYLLABUS.

Standards of Performance

Grading will consist of four types of assignments: homework assignments, in-class laboratories, tests, and a final. A point total for each type of assignment will be kept, and then point totals will be weighted a certain percentage for determining the final grade. Grades will be determined in the following manner

Reading Assignments	5%	100 – 90	A
In-class laboratories	15%	89 – 80	B
Homework Assignments	25%	79 – 70	C
Tests	40%	69 – 60	D
Final Exam	15%	59 ↓	F