

Math 4V91 **Foundations of Measurement and Informal
Butts Geometry**

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Fall 05 **Overview**
Butts

Time: Mondays, Wednesdays 5:30 p.m. – 6:45 p.m.

Office Hours: MW 3–5 pm; 7:15 pm–8:00 pm[in CB building], T. 3–6 pm and by appt.

Prerequisites: MATH 2V90 (Mathematics for Elem.Teachers) or equivalent: College Algebra
This course is aimed at students seeking teacher certification in 4-8 mathematics and cannot be used to satisfy requirements for a mathematics major, a mathematics minor, or secondary [8–12] teacher certification in mathematics.

Text: Mathematics for Elementary Teachers Volume II: Geometry and Other Topics, Preliminary Edition (with Activities Manual) Sybilla Beckmann, Addison Wesley Higher Education, 2003
ISBN: 0-321-14914-9

Supplies: ruler, compass, protractor, scissors, tape, pencil , geoboard [optional]

Topics: An analysis, from an advanced perspective, of the basic concepts and methods of geometry and measurement. Topics include visualization, geometric figures and their properties; transformations and symmetry; congruence and similarity; coordinate systems; measurement [especially length, area, and volume]; geometry as an axiomatic system. Emphasis on problem solving, logical reasoning, and communication of ideas consistent with the objectives of Standard III [Geometry and Measurement] of the Texas Educator Standards.

Units:

1. Overview of Key Concepts of 2-D geometry using a geoboard and other tools - handout
2. Chapter 7: Geometry - Visualization, Shapes, and Constructions/ handout
3. Chapter 8: Geometry of Motion and Change/ handout
4. Chapter 9: Measurement and Geometry/ handout
5. Axiomatic systems and proof in geometry - handout

Assessments:

Three tests [partial take-home] and a comprehensive final exam - 70%:

Probable Test Dates: Sept. 21, Oct. 19, Nov. 16 Final Exam Nov. 30 at 5:00 pm.

Written assignments, class attendance, and class participation - 30%

Technology:

WINGEOM : <http://math.exeter.edu/rparris/default.html> [freeware]

Geometer's Sketchpad - Student Edition: <http://www.keymath.com/STORE/software/gsp.html>

We will be using other tools and resources on the Internet

Drop Date Info: <http://www.utdallas.edu/calendar/index.php?search=withdraw>

Academic Honesty: In this course students will conform to the University rules for academic honesty. For more information see <http://www.utdallas.edu/judicialaffairs/index.html>

Students with disabilities: Information from this course can be provided to students with disabilities through University services. For more information see <http://www.utdallas.edu/student/sliffe/hcsvc.html>

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Standard III. Geometry and Measurement: The mathematics teacher understands and uses geometry, spatial reasoning, measurement concepts and principles, and technology appropriate to teach the statewide curriculum (Texas Essential Knowledge and Skills [TEKS]) in order to prepare students to use mathematics.

Teacher Knowledge: What Teachers Know

Teachers of Students in Grades 4–8

The beginning teacher of mathematics knows and understands:

- 3.1k how to use spatial reasoning to investigate concepts such as direction, orientation, perspective, shape, and structure;
- 3.2k the use of mathematical reasoning to develop, generalize, justify, and prove geometric relationships;
- 3.3k connections among geometric ideas and number concepts, measurement, probability and statistics, algebra, and analysis;
- 3.4k measurement as a process;
- 3.5k methods of approximation and estimation and the effects of error on measurement;
- 3.6k how to use measurement to collect data, to recognize relationships, and to develop generalizations, including formulas;
- 3.7k how to locate, develop, and solve real-world problems using measurement and geometry concepts;
- 3.8k how to explore geometry from synthetic, coordinate, and transformational approaches;
- 3.9k logical reasoning, justification, and proof in relation to the axiomatic structure of geometry;
- 3.10k how geometry, spatial reasoning, and measurement concepts and principles are developmental and connected across grade levels.

Application: What Teachers Can Do

Teachers of Students in Grades 4–8*

The beginning teacher of mathematics is able to:

- 3.1s extend the understanding of shape in terms of dimension, direction, orientation, perspective, and relationships among these concepts;
- 3.2s develop, explain, and use formulas to find length, perimeter, area, and volume of basic geometrical figures;
- 3.3s explain and illustrate the use of numbers and units of measurement for quantities such as temperature, money, percent, speed, and acceleration;
- 3.4s develop, justify, and use conversions within and between different measurement systems;
- 3.5s use translations, rotations, reflections, dilations, and contractions to illustrate similarities, congruencies, and symmetries of figures; and
- 3.6s identify attributes to be measured, quantify the attributes by selecting and using appropriate units, and communicate information about the attributes using the unit measure.
- 3.7s apply all skills specified for teachers in grades EC–4, using content and contexts appropriate for grades 4–8;
- 3.8s develop, justify, and perform geometric constructions using compass, straight-edge, reflection devices, and other appropriate technology;
- 3.9s investigate and prove geometric relationships within the axiomatic structure of Euclidean geometry;
- 3.10s analyze and solve problems involving one-, two-, and three-dimensional objects such as lines, angles, circles, triangles, polygons, cylinders, prisms, and spheres;
- 3.11s analyze the relationship among three-dimensional figures and related two-dimensional representations (e.g., projections, cross-sections, nets) and use these representations to solve problems;
- 3.12s apply measurement concepts and dimensional analysis to derive units and formulas for a variety of situations, including rates of change of one variable with respect to another;
- 3.13s use symmetry to describe tessellations and show how they can be used to illustrate concepts, properties, and relationships;
- 3.14s relate geometry to algebra and trigonometry by using the Cartesian coordinate system and use this relationship to solve problems; and
- 3.15s use calculus concepts to answer questions about rates of change, areas, volumes, and properties of functions and their graphs.