

# **(M 133) Geometry and Measurement for Elementary School Teachers**

R.A. Darnell

## Contact

Office: Math 004A

Email: richard.darnell@mso.umt.edu

## Office Hours

T: 8:30-10:30

Th: 8:30-11:30

and by appointment

## **1 Overview**

This course is for prospective elementary school teachers. The purpose of this course is to prepare students to be competent in teaching the major concepts and practical skills related to Euclidean geometry and measurement. Strategies and instructional activities are used and discussed to provide a linkage between what the prospective teachers study and what they will teach. It provides the opportunity to discuss appropriate activities, strategies and programs in teaching areas related to problem solving, and to the visualization, construction, and manipulation of basic and complex geometric shapes.

**Catalog:** Offered autumn and spring. The study of geometry and geometric measurement for prospective elementary and middle school teachers, including synthetic, transformational, and coordinate geometry, constructions, congruence and similarity, 2-dimensional and 3-dimensional measurement, and problem solving.

**Credits:** 3

**Prerequisites:** M 132

## **2 Textbook and materials**

### **2.1 Required textbook**

The required text for this course is:

- Beckman, S., et.al., *Mathematics for Elementary Teachers (with activities)*, 4th edition. (Pearson, 2014). ISBN 9780321825728

It is good to bring the book to class for each session, although it may not be used in every class.

## 2.2 Additional readings

Additional readings will be available via handouts, pdf files, or through a selection on hold at the Mansfield Library.

## 2.3 Materials

- A basic scientific calculator is strongly encouraged. A TI-83 or equivalent may also be used.
- Graph paper
- Compass and straight edge/ruler

## 3 Course Requirements

mathematician: someone who studies, teaches, or is an expert in mathematics. (Cambridge Dictionaries Online)

A mathematician, like a painter or poet, is a maker of patterns. If his patterns are more permanent than theirs, it is because they are made with ideas. (G. H. Hardy, *A Mathematician's Apology*)

By virtue of being in this class, we are mathematicians. Compared to others we know in the field, we may not feel we are experts, but to our current and future students, we are viewed as such. As a future elementary mathematics expert, it is expected you will be a student of mathematics: learning the intricacies, patterns, and connections of elementary mathematics. As a future teacher of mathematics, it is not enough to know what your students need to know. You *need* to know:

- where this knowledge derives from
- how this knowledge is used in their future.
- how your students build this knowledge internally.
- what mistakes students make, and what thinking or content errors these mistakes represent.

To help meet this need for effective teaching knowledge, students successfully completing this course will begin their personal development of a profound understanding of fundamental mathematics by:

1. Identifying and solving problems in elementary geometry
2. Modeling the logic of arguments involving parallelism, congruence, and similarity
3. Using basic measurement to approach problems involving length, area, and volume.
4. Developing conjectures and proving mathematical ideas and theorems involving geometry.
5. Performing classical compass-straightedge constructions
6. Developing a facility with geometric theorems and proofs through hands-on and computer explorations.

### 3.1 Course Grade

Your grade in this class will be weighted according to your ability to document evidence of proficient knowledge, understanding, and practice among the following categories:

#### Requirement

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1. Elementary geometry problem-solving, including constructions, congruence and similarity
2. 2-dimensional and 3-dimensional measurement
3. Mathematical thinking as exhibited through proofs, logical arguments, and conjectures.
4. Participation with a mathematical cohort

I will give periodic feedback on your grade status. If you feel your current grade in a particular area is not reflective of your knowledge, understanding, and practice, it is your responsibility to let me know so we can come up with an appropriate method for you to provide evidence. Students are **strongly encouraged** to maintain a “journal of learning” after each class to keep a record of learning and progress. While this is not an item I will “grade,” you may find it an indispensable resource when documenting evidence of your knowledge and understanding.

You must earn a C- or better in this course to pass the requirement in the School of Education. You may change to Credit/No Credit up the last day of the class. Credit will be awarded to students earning a D- or better. However, if you choose this option the grade cannot be counted towards the School of Education requirement nor the UM graduation requirement.

#### Exams

We will have three exams in this course (scheduled and announced in class one week prior) that will cover geometric shapes, manipulations and transformations of those shapes, and measurement. Due to the interconnected nature of mathematics, all exams will have a comprehensive nature.

#### Homework

Homework may be assigned as an extension or preparation for topics covered in class, as a method to engage students with interesting material that is not covered in class, and as preparation for exams. Homework will not be collected or graded, but should instead serve as a catalyst for student thinking outside of class, and questioning and engagement in class. I will answer questions and provide solutions to homework as requested, and your homework may be used for documentation of your knowledge, understanding, and mathematical practice.

**Documentation and Evidence of Learning** Students are required to build a portfolio of learning over the course of the semester, which will be evaluated periodically in conference with the instructor. Suggested items include an outline summary of the content covered so far, student-produced summaries of notes and activities, completed homework problems, corrected exams, and any other material that shows student knowledge of the material. Creativity in constructing the portfolio is allowed, but the form of the portfolio should not interfere with the content. Documentation and evidence of learning will also occur through classroom observations and one-on-one interviews.

**Book Report**

You are required to report on a children's book (below age 12/grade 6) book covering a mathematical idea from this class. The Mansfield Library and the Missoula Public Library both contain a selection of children's literature with a mathematics focus.

By the Friday before spring break, please get approval for the book you are going to review. The report is due on the Monday of the full week before finals week. You will present your book report to the class in the week before finals.

The report It should include the following items:

1. A scan of the cover of the book.
2. Summary of the book's content, age level, and perceived intent.
3. Key mathematical ideas covered. Describe how the illustrations relate to or emphasize the mathematical ideas addressed. List what CCSM standards are covered.
4. Critique/review of the mathematical content. Typical questions to answer include:
  - Does it achieve what it set out to do?
  - Are there any errors in its mathematical thinking?
  - What assumptions does it make about the reader's prior knowledge?
  - Would you recommend it to others, or use it in your classroom? Why?
  - How would you envision using this book in a classroom lesson?

**Class Participation**

Mathematics is a community activity. This class will have in-class individual and group activities. You are expected to participate fully. Attendance will be kept to monitor presence, level, and quality of activity. You are responsible for all assignments and tasks in class, whether you are in attendance or not.

**Classroom behavior** All students in this course are expected to be respectful of other participants, the instructor, and of the learning environment. In the support of free and open academic inquiry, civil behavior is required. This includes but is not limited to:

- restricting comments to current topics in the course
- refraining from disparaging or insulting remarks directed at or about others (present or not)
- silencing cell phones and other extraneous electronic devices
- limiting comments and conversations with classmates to a very quiet minimum

As a general rule, if the behavior will add to the learning environment, it is acceptable. If it disrupts the learning environment, it is not. Students are expected to be well-motivated and constructive in their pursuit of learning in the instructional situation. Expected student conduct is outlined in the Student Code of Conduct.

## **4 Class Communication**

Outside of regular class time, all communication with students as a group or individually will be through email or the UM LMS. Be sure and check this account regularly.

## **5 Notices and Disclaimers**

### **5.1 Passing credit**

You must earn a C- or better in this course to pass the requirement in the School of Education. You may change to Credit/No Credit up the last day of the class. Credit will be awarded to students earning a D- or better. However, if you choose this option the grade cannot be counted towards the School of Education requirement nor the UM graduation requirement.

### **5.2 Access and Accommodation**

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors and Disability Services for Students (DSS). If you think that you may have a disability adversely affecting your academic performance, and you have not already registered with DSS, please contact DSS in Lommassen 154. I will work with you and DSS to provide an appropriate accommodation.

### **5.3 Copyright and Fair-Use**

Materials used in connection with this course may be subject to copyright protection under Title 17 of the United States Code. Under certain Fair Use circumstances specified by law, copies may be made for private study, scholarship, or research. Electronic copies should not be shared with unauthorized users. If a user fails to comply with Fair Use restrictions, that user may be liable for copyright infringement.

### **5.4 Academic Dishonesty**

Dishonesty includes plagiarism, cheating and any conscious act by a student that gives him or her undue advantage over fellow students. Plagiarism is copying or using the ideas of another without giving proper credit through the use of quotation marks, footnotes, or other forms of reference. Cheating involves making unauthorized use of answers to examinations, tests, quizzes, in-class work, or homework assignments, as well as copying from fellow students or submitting work that has been done by someone else. Taking photos of tests and/or texting information from the test is also considered cheating.

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at [http://life.umt.edu/vpsa/student\\_conduct.php](http://life.umt.edu/vpsa/student_conduct.php)

### **5.5 Safety**

Please note the evacuation plan posted in this college classroom in the event of fire, tornado, or other disaster. If you see other hazards, please let us know. Additional information regarding UM's safety

policies can be found in the university catalog.

## 5.6 Disclaimer

Information contained in this syllabus was, to the best knowledge of the instructor, considered correct and complete when distributed for use at the beginning of the class. However, this syllabus should not be considered a contract between University of Montana and the student. The instructor reserves the right, acting within the policies and procedures of UM, to make changes in courses content or instructional technique without notice or obligation. If extenuating circumstances exist in a particular student's situation the instructor reserves the right to make modifications based on the needs of individual students, in accordance with university policy.

## 6 Schedule

The rough schedule presented is subject to change as needed to meet the needs of the class and its objectives. It may change upon announcement in class.

**Week 1-5** Building a Basic Geometry (with constructions) (Chapters 10, 14)

**Week 6-8** Measurements and Units (Chapter 11)

**Week 9-11** Measurements and Units: Area (Chapter 11, 12)

**Week 11-13** Measurements and Units: Area (Chapter 11, 13)

**Week 14-15** Transformations, Symmetry, and Congruence (Chapter 14)

### 6.1 Important dates

- February 12 is the last day to drop or add the course using Cyberbear.
- March 28 is the last day to drop with instructor and advisor signatures.
- May 6 is the last day to drop the course or change grading option using a late drop form. Acceptable reasons for a late drop are listed in the university catalog and include reasons such as accident, illness, family emergency or a change in work schedule. The following examples are not considered sufficient for a late drop: protecting GPA, forgetting to turn in the change slip, losing financial aid, losing eligibility to engage in sports.