

MAT 138 – Mathematics for Elementary Teachers II

Spring 2008 Syllabus

General Information

Class meets: Tuesdays 5:45 – 9:45 p.m. on April 8, April 15, April 22, April 29, May 6, May 13, May 20, May 27, June 3, June 10, June 17 and June 24. The Final Exam is Tuesday, June 24, from 5:45 to 9:45 p.m. Additional evening classes have been scheduled so we have extra time to cover the material and master the concepts.

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Please send me YOUR email address. That way I can **get in touch with you** about any addition or change in the syllabus.

Course Prerequisites: MPG 3 and MAT137 or MPG 4 or by consent of the professor. This course is designed for students who are planning to major in Elementary Education. Students seeking Middle School licensure in mathematics have different requirements. Please consult an advisor in the Mathematics or Education Department.

Required Text: *Mathematics for Elementary Teachers: An Activity Approach, 7th edition* by Bennett, Burton, and Nelson, McGraw Hill, 2007.

Other Required Material: Manipulative Packet, Scientific calculator, 3-ring binder (strongly recommended)

Recommended Text: *Mathematics for Elementary Teachers: A Conceptual Approach, 7th edition* by Bennett, Burton, and Nelson, McGraw Hill, 2007.

Catalog Description

Mathematics for Elementary Teachers I & II

Concepts of number, operations, algebra, geometry, measurement, data analysis and probability with an emphasis on the processes of problem solving, reasoning, connections, communication, and representation. These courses are designed for prospective K-6 elementary school teachers. Prereq.: MPG3 for MAT 137; MAT 137 or MPG4 for MAT 138.

Goals

The goals for you while taking MAT 138:

- To improve your quantitative reasoning skills including
 - To recognize, represent, and analyze patterns and use mathematical models to represent and understand quantitative relationships in daily life.
 - To understand the meaning of numbers, number systems, operations and their relationships.
 - To improve your spatial reasoning and develop mathematical arguments about geometric relationships.
 - To understand the measurable attributes of objects and apply appropriate techniques to measure.
 - To understand and apply the basic concepts of probability and statistics.
- To improve your oral and written communication skills of mathematically supported arguments.
- To apply and adapt problem solving to build new mathematical knowledge.
- To make and investigate mathematical conjectures.
- To acquire deeper understanding of mathematical concepts in the K-6 classroom, and understand the relationship between depth of knowledge of mathematics and mathematical teaching and learning.
- To see connections between mathematics and your life, work, and interests.
- ***To have fun with mathematics and the construction of mathematical knowledge!***

Augsburg College has an **Academic Honesty Policy**. Please refer to your Student Guide for the complete policy.

Attendance and timely arrival to class is expected.

Evaluation is based on what you demonstrate that you have learned through homework, projects, participation in class activities, reading reflection, and examinations, with the following weights:

15%	Homework
10%	QR Project
5%	Attendance/Participation
5%	Reading Reflections
50%	5 Exams
15%	Final Examination

Homework will be due prior to examinations. Required assignments will be graded for completeness on a $\sqrt{+}$, $\sqrt{}$, $\sqrt{-}$ basis, where $\sqrt{+}=5$ points, $\sqrt{=}4$, and $\sqrt{-}=3$. A $\sqrt{+}$ will be given for work that is completed at a high level, a $\sqrt{}$ will be given to work that is acceptably complete, and a $\sqrt{-}$ will be given to work that fails to be acceptably complete in some way. All homework assignments must be accompanied by a completed self-evaluation check-list.

Students who attend all classes and remain engaged and productively working throughout each class period will get full points for **Attendance/Participation**.

The **QR Project** in this course will take the form of an extended written assignment. You will be graded on the quality of both the mathematical reflection and written presentation used in this paper.

Reading Reflections will be due at the beginning of each Wednesday class period. Reading reflections will be graded on completeness on a $\sqrt{+}$, $\sqrt{}$, $\sqrt{-}$ basis, where $\sqrt{+}=5$ points, $\sqrt{=}4$, and $\sqrt{-}=3$. A $\sqrt{+}$ will be given for evidence of exceptionally thoughtful reflection, a $\sqrt{}$ will be given to acceptably complete reflections, and a $\sqrt{-}$ will be given to work that fails to be acceptably complete in some way.

You are expected to take all **Exams**, including the final exam, at the times and dates scheduled. The final exam will be cumulative one-hour exam. There will be an opportunity to make up one midterm topic exam to reach a maximum of 2.0 on that particular midterm exam. Extenuating circumstances for missed exams and/or late work will be considered only in very unusual cases.

At the end of the course, your average will convert into grades according to this scheme:

93 and above:	4.0	88 - 92:	3.5	83 - 87:	3.0
78 - 82:	2.5	73 - 77:	2.0	68 - 73:	1.5
63 - 67:	1.0	58 - 62:	0.5	57 and below:	0.0

Notes:

- I may consider improved and/or continued development of understanding and/or completion of a substantial number of recommended problems as positive factors when assigning final grades.
- A grade of at least 2.0 is needed for this course to fulfill the Quantitative Reasoning skill requirement and to fulfill K-6 teaching licensure requirements. Note that you must achieve a grade of 2.0 on the QR skill components of the course in order to achieve a 2.0 for the overall grade in the course.
- If you elect to take this course P/N, you must earn at least a 2.0 to get grade P. Please talk with me if you are considering the P/N option.

Topics

In this course you'll see a variety of mathematics based on the K-6 licensure requirements including topics as:

- Problem Solving Techniques: number sense development, conjecture construction, alternate representations, iterative processes, and axiomatic systems.
- Numeration Systems: introduction and comparison of Egyptian, Babylonian, Roman, and Hindu-Arabic numeration systems.
- Number Theory and Operations: modular arithmetic, applications, operations in other bases, defining and investigating new operations, introduction to algebra using alternate number systems, imaginary numbers.
- Statistical Reasoning: collecting data, experimental bias, descriptive statistics, visual displays, averages, variance, inferential statistics, normal distribution, confidence intervals, margin of error, and correlation.
- Probability: counting, elementary probability theory, odds, expected value, independence, and conditional probability.
- Geometry and Measurement: various dimensional objects, units of measurement, analytic and transformational geometry, fractals, tessellations, and the golden ratio.
- Graph Theory: routing problems and networks.
- Historical Background: information on the development of numbers and number systems, geometry, number theory, algebra, probability and statistics and the place of mathematics in our society and other cultures.

Course Structure

Classes will be a mixture of interactive lecture, activities and small group problem solving sessions. Your attendance and participation in class is crucial and required in this course as we will regularly explore new ideas during class and it will be difficult to make this work up on your own. Please be sure to seek assistance from the professor, tutors, or peers when needed!

Gateway Exams

Gateway exams will be given throughout the term evaluating basic mathematical knowledge required for K-6 teacher certification. The gateway exams will be designed to test your knowledge of the fundamental concepts, mastery of basic skills, and ability to successfully communicate knowledge. The gateway exams will also prepare you for the Praxis exams required for licensure. The first time a gateway may be taken during the semester will be during class time. If you do not pass the first time the exam is offered, you must take another version of the gateway to demonstrate mastery of the material. A schedule of when gateways can be taken after the initial offering will be provided.

Additionally, it is strongly suggested that you keep a **reflective journal** in your three-ring binder. This could be a notebook or loose leaf paper. The most successful teachers are those who take the profession of teaching seriously and take time and make effort to reflect on lessons and look back on their reflections. **Reflection is a cornerstone to growth.** Since we are creatures of habit, we urge you to start the habit of reflective journaling now. It is more difficult to begin when you are in the throes of teaching. However, a graded reflection changes the nature and purpose of serious reflection and thus, the reflective journal is not part of your grade. As when you are part of the teaching profession, it is your responsibility to take the initiative and continue to develop your teaching skills.

Study Tips and Additional Support

- First make sure that you have *structured time to study* outside of class. It takes time spent exploring the material for it to sink in. Many students have found it helpful to set aside specific study times for specific courses and make it a high priority to keep those study times for their intended purpose.
- If you need help after spending quality time on the material, talk with me. After struggling with the material, you are likely to gain much more from explanations given during class or one-on-one instruction.
- Some students find it beneficial to form study groups that meet at regular times each week. This is a great way to make sure you spend time with the material and gain deeper understanding of the material. In addition, you become acclimated to conversing about mathematics – after all, as a teacher you will be talking about mathematics, so getting practice now with your peers is ideal.

Graduation and Licensure Standards Met

MAT 138 contains **Graduation Skill in Quantitative Reasoning** (grade of 2.0 or higher required).

MAT 138 counts as a Science/Mathematics Liberal Arts Foundations course under the General Education guidelines.

MAT 138 meets the Minnesota Board of Teaching Standards for K-6 Licensure MN BOT 8710.3200 Subpart 3 Part C Items listed below. (grade of 2.0 or higher required).

C. A teacher of children in kindergarten through grade 6 must demonstrate knowledge of fundamental concepts of mathematics and the connections between them. The teacher must know and apply:

- (1) concepts of mathematical patterns, relations, and functions, including the importance of number and geometric patterns in mathematics and the importance of the educational link between primary school activities with patterns and the later conceptual development of important ideas related to functions and be able to:
 - (a) identify and justify observed patterns;
 - (b) generate patterns to demonstrate a variety of relationships; and
 - (c) relate patterns in one strand of mathematics to patterns across the discipline;
- (2) concepts and techniques of discrete mathematics and how to use them to solve problems from areas including graph theory, combinatorics, and recursion and know how to:
 - (a) help students investigate situations that involve counting finite sets, calculating probabilities, tracing paths in network graphs, and analyzing iterative procedures; and
 - (b) apply these ideas and methods in settings as diverse as the mathematics of finance, population dynamics, and optimal planning;
- (3) concepts of numerical literacy:
 - (a) possess number sense and be able to use numbers to quantify concepts in the students' world;
 - (b) understand a variety of computational procedures and how to use them in examining the reasonableness of the students' answers;
 - (c) understand the concepts of number theory including divisibility, factors, multiples, and prime numbers, and know how to provide a basis for exploring number relationships; and
 - (d) understand the relationships of integers and their properties that can be explored and generalized to other mathematical domains;
- (4) concepts of space and shape:
 - (a) understand the properties and relationships of geometric figures;
 - (b) understand geometry and measurement from both abstract and concrete perspectives and identify real world applications; and
 - (c) know how to use geometric learning tools such as geoboards, compass and straight edge, ruler and protractor, patty paper, reflection tools, spheres, and platonic solids;
- (5) data investigations:
 - (a) use a variety of conceptual and procedural tools for collecting, organizing, and reasoning about data;
 - (b) apply numerical and graphical techniques for representing and summarizing data;
 - (c) interpret and draw inferences from data and make decisions in a wide range of applied problem situations;
 - (d) help students understand quantitative and qualitative approaches to answering questions and develop students' abilities to communicate mathematically;
- (6) concepts of randomness and uncertainty:
 - (a) probability as a way of describing chance in simple and compound events; and
 - (b) the role of randomness and sampling in experimental studies;
- (7) mathematical processes:
 - (a) know how to reason mathematically, solve problems, and communicate mathematics effectively at different levels of formality;
 - (b) understand the connections among mathematical concepts and procedures, as well as their application to the real world;
 - (c) understand the relationship between mathematics and other fields; and
 - (d) understand and apply problem solving, reasoning, communication, and connections; and
- (8) mathematical perspectives:
 - (a) understand the history of mathematics and the interaction between different cultures and mathematics;
 - (b) know how to integrate technological and nontechnological tools with mathematics.