



SDSU Math 413: Mathematics for Middle Grade Teachers

Spring, 2010

Instructor

Dr. Janet Bowers

Email: (JBowers@math.sdsu.edu)

Phone: 619-594-6361

Office Hours: T/W 10-11 AM (or by appointment, please email me)

OFFICE: GMCS-570

Description of the course

This course is specifically targeted to prospective teachers who want to specialize in mathematics in order to teach at the middle school level.

Course Objectives

Students will learn to:

1. Develop algebraic “Habits of Mind” by solving unique open-ended problems *and* creating follow-up questions and revisions. When solving and extending these problems, students will reflect on their thinking strategies in order to recognize that the goal is not to solve the immediate problem, but instead to develop metacognitive skills for solving entire classes of algebraic problems.
2. Develop a deep understanding of the process by which students learn about proportionality, and the links between proportional reasoning and other branches of mathematics including geometry, graphing of linear equations, similarity, and various algorithms such as cross multiplication and the division of fractions.
3. Learn advanced topics that are included on the CSET Exam 1. Topics that may be covered include: operations with matrices, the Euclidean Algorithm, roots of functions, graphing of functions with degree 2 or higher, trigonometric functions, and logarithmic functions.

Required Textbook & Software

<i>Fostering Algebraic Thinking</i> by Mark Driscoll. ISBN 0-325-00154-5
--

Other assorted handouts that will be supplied by instructor.
--

Weekly assignments

Each week, students will be expected to engage in several types of activities:

- ***Whole class discussions***

Each week, I will introduce some of the concepts involved in the weekly unit. Students are encouraged to work together as a class to debate ideas for proving the various conjectures. Students are expected to participate in whole class and small group discussions.

- **Homework**
Homework will involve constructions, proofs, and explanations assigned from the textbook. Constructions will be performed using the Geometer's Sketchpad and submitted via Blackboard. Some of these will be graded by instructor; others may be critiqued by classmates in the peer review process.
- **Peer Review**
The peer review process will involve working in groups and evaluating each others' arguments, explanations, and willingness to participate in group work.
- **Final Project**
Students will each prepare a final project that involves interviewing a middle schooler (someone in grades 6-10) solving a novel problem. The project will focus on the problem posed and the ways in which the interviewer either increased or decreased the level of difficulty based on an assessment of the middle schooler's solution strategy.
NOTE: if a student has *no* access to a middle schooler, an alternative plan will be devised. DUE: May 3, 2010.

Homework

- Each student will turn in his or her own work, but collaboration is encouraged (unless otherwise noted, such as take-home exams).
- Students are encouraged to ask for help from the instructor (during office hours, or by appointment via email)
- Homework will be graded on a sliding scale, depending on number of problems assigned.
- Late homework will be downgraded by 10% of total score for every day late (unless dire circumstances intervene. Such cases will be discussed on a personal basis).

Assessment

Homework	25%
Test 1 (<i>Tentatively scheduled for Wed, March 10</i>).....	20%
Test 2 (<i>Tentatively scheduled for Mon, April 12</i>)	20%
Final Project (<i>Due May 3, 2010</i>).....	10%
Final Exam (Scheduled Monday, May 17, 1300-1500)	25%

Grading Scale

93% – 100%	A	74% – 76%	C
90% – 92%	A-	70% – 73%	C-
87% – 89%	B+	67% – 69%	D+
84% – 86%	B	64% – 66%	D
80% – 83%	B-	60% – 63%	D-
77% – 79%	C+	59% or lower	F

Tentative Schedule of Topics:

Part I: Fostering Algebraic Thinking

Chapter 1: Developing Algebraic Habits of Mind (solving and extending problems)

Chapter 2: Thinking about Algorithms (sums of consecutive integers, Euclidean Algorithm)

Chapter 3: Number Theory (factors, patterns, modular arithmetic)

Chapter 4: Generalizations (systems of equations, differences and sums, linear algebra and matrices)

Part II: Proportional Reasoning

Chapter 1: Fractions and Ratios (algorithms for percent \leftrightarrow fractions \leftrightarrow dec, division of fractions)

Chapter 2: Proportional reasoning (students' difficulties, meaning of cross-multiplication, composite units versus unit fraction comparison methods)

Chapter 3: Relation of proportional reasoning to other topics (geometry-Pyth Theorem, similarity, slope, constant of variation, slope)

Part III: Follow-up ideas for CSET Preparation

Chapter 1: Operations with Vectors and Matrices

Chapter 2: Graphing various functions (logarithms, trigonometric functions)

Expectations

For Instructor:

- Tests will be designed to fit in allotted time
- Tests will reflect the homework problems assigned
- Grading rubrics will be made public, substantiations for all grades will be given
- Assignments will be graded in a timely manner
- Grades will be calculated mathematically; no change of grades or extra credit will be given
- Course costs will be kept at a minimum; only one (relatively small) textbook is required, and cell phones (which are desirable, but not required) will be used instead of clickers for whole-class polling activities
-
-

For students:

- Students will respect one another and the instructor. Angry, resentful, or disrespectful comments spoken in class diminish class morale and weaken the enjoyment of the class. Students wishing to express dissatisfaction with the teacher or class are welcome to do so in person, in private conversation.
- No cheating of any kind will be tolerated
- Mass emailing of any kind is ***not*** be permitted; if such a practice occurs, the sender will be subject to University sanctions
-
-