

## MA351 MODELS AND PROBLEM SOLVING FOR THE ELEMENTARY TEACHER

Winter Semester, 2003

M-T-W-Th 4:00-4:50 WS 3808

Prerequisite: MA 150, MA 151, and MA 250 with a C or better

**NOTE:** If you do not have these prerequisites, see me before I drop you from the roster.

Instructor: Dr. Donald L. Zalewski, 1001 NSF  
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Office Hours: 10:00-10:45 MWR and 2:00- 3:45 MTWR Other times by appointment.  
Before making a special trip to see me on Tuesdays, please call. I am sometimes out supervising student teachers on Tuesdays.

### Required Materials

1. MORE THOUGHT PROVOKERS by Rohrer, Key Curriculum Press, 1994.
2. MIDDLE SCHOOL MATHEMATICS COMPETITION PROBLEMS, Michigan Council of Teachers of Mathematics, Monograph #22, 1990.
3. A graphing calculator or a laptop program that simulates one (ie. TI Interactive)
4. Extra notebook just for outside readings (Especially the NCTM's PRINCIPLES AND STANDARDS FOR SCHOOL MATHEMATICS ( [www.standards.nctm.org](http://www.standards.nctm.org) ), which has several sections on problem solving and reasoning, and the Michigan CURRICULUM FRAMEWORK ( <http://cdp.mde.state.mi.us>) standards, strands and benchmarks for mathematics. A clarification, good examples, and teaching vignettes for the FRAMEWORK can be found in the MI CLiMB ([www.miclimb.net](http://www.miclimb.net)) document.

### Course Goals

1. To strengthen your mathematics background and to develop the ability to apply your skills in mathematical modeling and problem solving. (This course assumes that, as a mathematics major or minor, you have an above average background to start with.)
2. To help you understand the problem solving process.
3. To help prepare you to take the state certification test in mathematics. (Elementary education majors and minors now take a different test than the secondary education students. But it is still quite challenging.)
4. This is a content course. But it will also involve the K-8 curriculum, teaching, and learning, with a strong focus on problem solving and reasoning. National and state curriculum recommendations will be studied.
5. To build up your supply of good problems, and problem solving materials and resources.

### Course Activities

1. Attend class regularly and participate in classroom activities and discussions. Part of your grade is determined by this.
2. Do assignments and projects.
3. Keep neat and organized notes from the assigned readings separate from your daily class notes. You will be able to use your notes on some quizzes/tests.
4. Take quizzes and tests.

### Disabilities

**If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Dean of Students Office at 1104 University Center (227-1737). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.**

**Objectives of the Course** The students will:

- A. Use a variety of strategies and models to solve problems.
- B. Verbalize the steps and solution to a problem.
- C. Write a coherent explanation to their solution to a problem.
- D. Investigate sources and problems appropriate for middle school and elementary school students.
- E. Examine teaching and learning theories, and their relationships to problem solving.
- F. Use calculators and computers to help solve problems.
- G. Find and create good problems for students in K-8.
- H. Interpret the national and state recommendations concerning problem solving and reasoning

**Course Outline**

- 1. Introduction to Problem Solving in Mathematics
  - a. Definitions
  - b. Polya's Model and Heuristics
  - c. Basic strategies, new tools, and advanced strategies
- 2. Applications of Problem Solving
  - a. Arithmetic and Number theory
  - b. Geometry and Measurement
  - c. Algebra and Analytic Geometry
  - d. Trigonometry
  - e. Logic and deductive reasoning
  - f. Games and puzzles
- 3. Problem Solving in the Classroom
  - a. Developing and measuring problem solving skills
  - b. Finding or creating good problems
  - c. Resources for problem solving ideas and materials
  - d. National and state curriculum recommendations

**Assignments**

Numerous problems representing the outline's content will be assigned for the purpose of further developing participants' general mathematical ability and of developing strong problem solving skills. Readings and projects will also be given. Tests will be given on problem solving concepts and skills, and on the outside readings.

**Course Grade**

The total points earned for class participation, projects, quizzes and tests will determine your semester grade, using this scale: A: 93-100%; A-: 90-92%; B+: 87-89%; B: 83-86%; C+: 77-79%; C: 73-76%; C-: 70-72%

Final Exam: Monday, April 28, 4:00-5:50

**POLICIES:**

- A. Quizzes and tests can be made up only if arrangements are made with the instructor IN ADVANCE. A valid, documented excuse is needed to make up a quiz or test.
- B. Any assignment turned in late without prior arrangements will lose credit: Same day: 10%  
Each day late; 25%;