

**MATH 5003**  
**Algebra and Problem Solving**  
**for Elementary Teachers**  
**Spring 2008**

**ext:** *Mathematics for Elementary Teachers*, first edition, and the accompanying *Class Activities* manual by Sybilla Beckmann, published by Addison-Wesley. These can be purchased from the UGA bookstore and other bookstores. **Please bring the activity manual to class.**

**Course topics:** We will cover sections 7.4 - 7.6 and chapters 12 - 15 of the textbook (although not in that order). The specific topics are:

Basic descriptive statistics (chapter 14): Designing investigations and gathering data. Common ways to display data. The average and the median. Percentiles.

Algebra and functions (chapter 13): patterns, sequences, formulas, and equations. Solving algebra word problems with and without variables. Functions and their graphs. Relating qualitative descriptions of functions to their graphs.

Fractions, ratio and proportion (sections 7.4 - 7.6): Division of fractions: why the "invert and multiply" procedure is valid. Division of decimals. Understanding ratio and proportion in terms of fractions and in terms of multiplication and division.

Probability (chapter 15): Basic principles of probability. Using tree diagrams and using the meaning of fraction multiplication to understand simple probability calculations.

Solving, posing and modifying problems (especially within sections 7.4 - 7.6 and chapter 13). Because fractions, decimals, and percents are traditionally difficult topics to teach, part of the course will be devoted to solving, posing, and modifying problems involving fractions, decimals, and percents, especially problems that are relevant to and helpful for the teaching of these topics.

Number Theory (chapter 12): Factors and multiples, greatest common divisor and least common multiple. Prime numbers. Divisibility tests. Even and odd.

**Course objectives:** To strengthen and deepen knowledge and understanding of fractions, ratios, probability and statistics, elementary number theory and algebra, and how they are used to solve a wide variety of problems. In particular, to strengthen the understanding of and the ability to explain why various procedures and formulas in mathematics work. To strengthen the ability to communicate clearly about mathematics, both orally and in writing. To promote the exploration and explanation of mathematical phenomena. To solve problems in a variety of

ways, including informal methods, such as with pictures, as well as standard methods in mathematics. To learn to pose and modify mathematical problems.

Our focus in this class is on mathematics content, not methods of teaching. In order to be able to teach mathematics well, you must know not only the math you teach, but also how this math progresses and develops. In other words, you must know how the math you teach provides a foundation for your students' future mathematics learning. Therefore, for the topics we study, we will consider simple, concrete approaches and methods of solution as well as more advanced approaches and methods of solution, and we will relate different approaches.

**Class work:** This class is part of your preparation as a professional. As a professional, you should engage in collegial discussions about professional practice and you should constantly seek to enhance and refine your professional knowledge. To receive a full participation score, your work in class must consistently exhibit several or all of the following:

- interest in mathematical ideas
- interest in different ways of approaching mathematical ideas
- careful listening to different ways of solving a problem
- careful evaluation of proposed methods of solution
- attempts to connect the course material to your experiences with children and teachers at schools
- attempts to connect the course material to your future teaching
- attempts to connect the course material to the Georgia Performance Standards (GPS) and to NCTM's Standards and Focal Points
- interest in learning with and from others

### **Assignments:**

In addition to regular homework assignments, you will have a field assignment. In completing this field experience assignment, please refer to the detailed description on the web site.

There will be regular homework assignments. I encourage you to work on homework assignments with your classmates. Of course, you should always write your homework up on your own, using your own words to express the ideas you have discussed with others. Do not allow anyone to copy your work. When you discuss assignments with others, all partners should "give and take" ideas.

All academic work must meet the standards contained in "A Culture of Honesty." Students are responsible for informing themselves about those standards before performing any academic work. In particular, see UGA's Academic Honesty Policy.

Late homework will not be accepted. Please consult with me as soon as possible if you are unable to hand in an assignment due to an illness or emergency.

**Writing Intensive Program:** This section of MATH 5003 is part of the Writing Intensive Program. The Writing Intensive Program is designed to help courses teach the writing process

within various disciplines. Although you have taken English courses on writing, and although these courses will help you with all your writing, mathematical writing has its own special features. In mathematics, we seek coherent, *logical* explanations, in which the desired conclusion is deduced from starting assumptions. Our graduate assistant, Jennifer Belton, has been trained by the Writing Intensive Program to help you learn to write good mathematical explanations. By participating in the Writing Intensive Program we have also learned about ways to use writing to deepen your understanding of the course concepts.

### **How your grade will be calculated:**

We will grade all your work on a 5 point scale, and we will assign points as follows:

<b># of points</b>	<b>description</b>	<b>characteristics</b>
5.25 points	exemplary	work that could serve as a model for other students
5 points	very good	correct work that is careful and thorough
4 points	competent	good, solid work that is largely correct
3 points	basic	work that has merit but also has significant shortcomings
2 points	emerging	work that shows effort but is seriously flawed
0 points	no credit	no work submitted, or no serious effort shown

**Grading criteria:** We will determine your score on assignments and tests by the extent to which your work meets the following criteria:

- The work is factually correct, or nearly so, with only minor, inconsequential flaws.
- The work addresses the specific question or problem that was posed. It is focused, detailed, and precise. Key points are emphasized. There are no irrelevant or distracting points.
- The work could be used to teach a student: either a child or another college student, whichever is most appropriate.
- The work is clear, convincing, and logical. An explanation should be convincing to a skeptic and should not require the reader to make a leap of faith.
- Clear, complete sentences are used. Mathematical terms and symbols are used correctly. If applicable, supporting pictures, diagrams, and/or equations are used appropriately and as needed.
- The work is coherent.

Your grade will be based on tests/quizzes, homework, the field assignment, class participation, and a *comprehensive* final exam. I expect to give 1 test and 2 announced quizzes during the semester. I will calculate your course score using the following percentages.

term test	22%
quizzes, 10% each	20%
class participation (please see criteria above under <b>class work</b> )	5%
homework	15%
field assignment	8%
final exam	30%

Makeup exams or quizzes will not be given. If an exam or quiz is missed due to an illness or emergency, I will calculate a grade for the exam or quiz using a relevant portion of the final exam.

I expect to assign letter grades as follows.

score	letter grade
4.6 - 5 or above	A
4.5	A-
4.4	B+
4.1, 4.2, 4.3	B
4.0	B-
3.9	C+
3.5, 3.6, 3.7, 3.8	C
3.4	C-
2.5 - 3.3	D
below 2.5	F

**Materials needed:** Please bring your activity manual to class. You might like to have a set of colored pencils since we will often draw simple pictures in the process of solving problems.

### Week 1:

**Monday, Jan 7** : first day of class

**Due Wednesday, Jan 9** : Read the course website, including all the course policies. Read sections 14.1 and 14.2 and do the practice problems (check your answers in the answer sections).

Notice that 3rd and 4th graders actually did a real capture/recapture experiment:  
<http://ascc.artsci.washington.edu/news/summer98/fishy.html>

### Week 2:

**Due Monday, January 14: MATH 7003 students only:** Extra assignment 1 is now posted. It is due on January 30. This is just a short assignment so expect another "extra assignment" before the field experience.

**Due Wednesday, January 16:** Read sections 14.3 and do (but don't hand in) the practice problems in that section. Also check your answers to the practice problems in the answer section. **Hand in** (please type, except you may fill in pictures, equations, etc. by hand): Page 651 problems 2, 6 With this modification for problem 6: Of the 30 marbles Carter picked, 5 were blue. Show 3 different ways that students could reason to solve this problem including at least 2 that students who haven't studied percentages or setting up proportions might be able to understand (draw on class work). Also hand in problem 7 a, b, c on pages 663, 664.

**Week 3:**

**Monday, January 21:** MLK day, no class

**Due Wednesday, January 23:** Read sections 14.4 and section 13.1 and do (but don't hand in) the practice problems in those sections (and check your answers in the answer sections). **Hand in** (please type, except you may fill in pictures, equations, etc. by hand): Problems 1, 10 on pages 668, 669, problem 6 on page 675, and problem 7 on page 593 (be sure to explain how you got your expression and why that makes sense). Also hand in: Draw pictures to illustrate the following equations:  $7 \times 8 = 5 \times 8 + 2 \times 8$ ;  $9 \times 6 = 10 \times 6 - 6$ ;  $13 - 8 = 10 - 8 + 3$ . In each case explain how your picture illustrates that equation and discuss why the equation (or the idea of thinking about the total in two different ways) could be useful for elementary school children.

No office hours this Thursday since I will be in Tulsa, OK.

**Week 4:**

**Due Monday, January 28 :** QUIZ on sections 14.1, 14.2, 14.3. Quiz problems will be similar to homework problems that have been graded and returned or "don't hand in" practice homework problems (including ones that are not like ones we discussed in class!) or class activity problems we discussed. Read section 13.2 and do (but don't hand in) the practice problems (and check your answers).

**Due Wednesday, January 30 : MATH 7003 students only:** Extra assignment 1 is due. **Hand in** (please type, except you may fill in pictures, equations, etc. by hand): Problems 6, 11, 22 on pages 606 - 608. (This is the corrected version that was revised after class on Monday.)

**Week 5:**

**Due Monday, February 4 :** Read section 7.4 and do (but don't hand in) the practice problems (and check your answers).

**Due Wednesday, Feb 6** : Read section 7.5. **Hand in** (please type, except you may fill in pictures, equations, etc. by hand): Problems 8, 10, (problem 13 had been assigned for today but is now due on Feb 13 to ease your load a bit! :- ) , and problem 19 on pages 289, 290.

Office hours Thursday cancelled due to meeting with a job candidate. Please contact me for a time to meet.

Begin to plan for your field assignment

### **Week 6:**

**Due Monday, Feb 11** : Read section 7.6 to page 303 only. Do (but don't hand in) the practice problems of section 7.5 (and check your answers) and practice problem 2 of section 7.6.

**Due Wednesday, Feb 13** : Read pages 303, 304 of section 7.6 and do (but don't hand in) practice problems 3, 4, 5 of section 7.6. **Hand in** (please type, except you may fill in pictures, equations, etc. by hand): problem 13 on page 290, problem 5 a,b,c on page 298, and: explain how to use a ratio table or a double number line (or both, if you like!) to solve problem 4 on page 312 in two different ways.

### **Week 7:**

**Due Monday, Feb 18:** Read section 13.3 and do the practice problems. Study for the test on Wednesday and bring questions to class.

**Due Wednesday, Feb 20** : TEST on the material we have discussed so far this semester: Statistics (including the 4 steps of the statistical problem solving process) chapter 14; Expressions, equations, and solving equations (with and without standard algebra), sections 13.1, 13.2; Fraction and decimal division, section 7.4, 7.5; Ratio and proportion, section 7.6; we also discussed the connection between fractions and division in conjunction with unit rates, see practice problem 1 on page 275; Sequences, section 13.3.

### **Weeks 8 - 11 field experience:**

During your field experience, you should plan and teach at least one mathematics lesson. **Due April 7:** Please provide the following information about your teaching experience in the form of a list (not an essay).

1. State the grade level and topic you taught.
2. List the activities/problems that were done in class. You may photocopy worksheets or handouts you used.
3. What mathematics do you think the students learned from your lesson? How do you know? What actions on your part do you think contributed positively to the students' learning?

4. What did students have trouble learning? Why do you think they had trouble with that? If you were teaching another lesson, how might you help the students learn the material they had trouble with?
5. If you could do your lesson over again, what would you improve? What went well in your lesson?

### **Weeks 8 - 11 field experience:**

During your field experience, you should plan and teach at least one mathematics lesson. **Due April 7:** Please provide the following information about your teaching experience in the form of a list (not an essay).

1. State the grade level and topic you taught.
2. List the activities/problems that were done in class. You may photocopy worksheets or handouts you used.
3. What mathematics do you think the students learned from your lesson? How do you know? What actions on your part do you think contributed positively to the students' learning?
4. What did students have trouble learning? Why do you think they had trouble with that? If you were teaching another lesson, how might you help the students learn the material they had trouble with?
5. If you could do your lesson over again, what would you improve? What went well in your lesson?

### **Week 12:**

**Due Monday, March 31** : Welcome back!!

**Due Wednesday, April 2** : Read sections 12.1 and 12.2 and do the practice problems in those sections.

No office hours on Thursday since I will be in Massachusetts. I will be back on Friday and will be glad to meet with you. Please make an appointment to see me.

### **Week 13:**

**Due Monday, April 7** : Field assignment due.

Take a look at this report, which is important for all of us who teach! [Students' view of intelligence can help grades](#)

**Due Wednesday, April 9** : Read section 12.3 and do the practice problems in that section.

No office hours this Thursday since I will be in Salt Lake City. I'll be glad to meet with you another time, please make an appointment.

### **Week 14:**

**Due Monday, April 14** : Read section 12.4 and 12.5 and do the practice problems in those sections. **Hand in** (please type, except you may fill in pictures, equations, etc. by hand): problem 4 on page 565. Make sure your explanation for problem 4 (p. 565) really explains why the answer is *\*always\** true. (Note that the other problems that were due this day have been moved to next week due to your major paper.)

**Due Wednesday, April 16** : Review the learning trajectories on [www.ubtriad.org](http://www.ubtriad.org) that we discussed in class. Login using the username and password given in class. To get to the descriptions of the learning trajectories (and the videos of children) click on "BBLT's". Then on the new page that pops up, click on "Development." If necessary, click on "number" to see the learning trajectories on number (there are also geometry learning trajectories). Click on the name of a level to see the description of it and then click on "more info" to see videos (if available).

### **Week 15:**

**Due Monday, April 21** : We will meet again in the computer lab, room 227/228 Aderhold. The quiz was moved to Wednesday.

**Due Wednesday, April 23** : **Hand in** (please type, except you may fill in pictures, equations, etc. by hand): problems 8, 9, 12 on page 555 and problem 9a on page 569. Be sure to word your story problems in problems 8 and 9 (p. 555) very carefully! QUIZ on sections 12.1 - 12.5 plus the following material that we discussed in class but is not in the text: 1) the "slide method" for determining GCFs and LCMs and 2) determining GCFs and LCMs using prime factorizations.

### **Week 16:**

**Due Monday, April 28**: Last day of class. Bring questions and things you would like us to go over to class.

**Tuesday, April 29** : reading day

**Comprehensive final exam: Wednesday, April 30, 8 - 11 am in our usual classroom.** The final exam will cover all the material we have studied this semester: Statistics (including the 4 steps of the statistical problem solving process) chapter 14; Expressions, equations, and solving equations (with and without standard algebra), sections 13.1, 13.2; Fraction and decimal division, section 7.4, 7.5; Ratio and proportion, section 7.6; we also discussed the connection between fractions and division in conjunction with unit rates, see practice problem 1 on page 275; Sequences, section 13.3; Factors and multiples, greatest common factor and least common multiples, prime numbers, even and odd, and divisibility tests, sections 7.1 - 7.5 and also material that we discussed in class but is not in the text: 1) the "slide method" for determining GCFs and LCMs and 2) determining GCFs and LCMs using prime factorizations; early childhood mathematics concerning counting, subitizing,

composing, adding and subtracting, patterning, composing shapes, and suitable activities to help young children develop these competencies from the TRIAD website, expect one or more questions from the handout Monday April 21 on the final.