

MATH 5035/7035

Algebra for Middle Grades Teachers

Fall 2009

Tuesdays and Thursdays, 12:30 – 1:45 pm in room 322 Boyd Graduate Studies

Instructor:

[Dr. Sybilla Beckmann](#), Professor of Mathematics

501 Boyd Graduate Studies Building

706-542-2548

[sybilla at uga dot edu](mailto:sybilla@uga.edu)

Office hours: Tuesdays and Thursdays 11:50 am – 12:20 pm and Wednesdays 1 – 1:45 pm. You are always welcome to make an appointment to see me at other times or to e-mail me or call me with questions. Please contact me as soon as possible if an illness or emergency prevents you from attending class.

Writing Intensive Program (WIP) Teaching Assitant:

[Laura Nunley](#)

427F Boyd Graduate Studies

706-542-2619

[lnunley at math dot uga dot edu](mailto:lnunley@math.uga.edu)

Office hours: Mondays 12:15-1:15 and Tuesdays 3:15-4:15

You are always welcome to make an appointment to see Laura at other times or to e-mail or call with questions.

Text: *Mathematics for Elementary Teachers*, **second** edition, (purple with zebras) and the accompanying *Class Activities* manual by Sybilla Beckmann, published by Addison-Wesley. These can be purchased from the UGA bookstore and other bookstores.

Supplementary materials will be posted on E-Learning Commons. **Please bring the activity manual to class.**

Course topics: Fraction division, ratio and proportion (section 7.6); mathematical expressions and equations, sequences, series, functions, especially linear functions, solving linear and quadratic equations (chapter 13 and supplements); number theory, including prime numbers, factors and multiples, divisibility tests, and rational and irrational numbers (chapter 12). Other topics may be added.

Course objectives: To strengthen and deepen knowledge and understanding of algebra and number theory, how it is used to solve a wide variety of problems, and how it is connected to arithmetic. In particular, to strengthen the understanding of and the ability to explain why various procedures from algebra and number theory 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 show that many problems can be solved in a variety of ways.

Preparation for your teaching: This course is part of your preparation to become a middle grades teacher (grades 4 – 8) who will teach math. The importance of understanding the math you will teach well cannot be overstated. Teacher quality is known to be a major factor in student achievement. And students who build a good foundational understanding of math will be empowered and will have all options open to them. You can make a difference in your students' lives!

Our focus in this course is on the mathematics content itself and not the methods by which you will help your students learn math. Even so, a number of the activities we will do in class can readily be modified for use in the middle grades. However, we will often go beyond what is feasible with typical middle grades students. This is to help you understand the material more deeply and to prepare you to guide your students toward "where the math goes next." There is a Chinese proverb that says: "To teach a drop, you must know a gallon." So sometimes you may be surprised to find the material much deeper and more intricate than you ever knew it was. But don't let this scare you – you don't have to be perfect! Instead, strive to have a positive attitude about learning. Be willing to engage in thinking about mathematical ideas in new ways. Keep trying to understand an idea even when you don't "get it" right away.

Teaching is a path of lifelong learning! Good teachers are always striving to learn more about the subjects they teach and about how students think and learn. Good teachers have a "[growth mindset](#)" – they know that intelligence is not fixed, but is something that they and their students can improve. In fact, "[A] proven intervention is to tell junior-high-school students that I.Q. is expandable, and that their intelligence is something they can help shape. Students exposed to that idea work harder and get better grades. That's particularly true of girls and math, apparently because some girls assume that they are genetically disadvantaged at numbers; deprived of an excuse for failure, they excel." (From the NY Times 4/16/2009 article *How to Raise our I.Q.* by Nicholas Kristof.) And: "People who believe in the power of talent tend not to fulfill their potential because they're so concerned with looking smart and not making mistakes. But people who believe that talent can be developed are the ones who really push, stretch, confront their own mistakes and learn from them." (Dr. Carol Dweck, as quoted in the NY Times

7/6/2008, If [You're Open to Growth You Tend to Grow](#)) Good teachers know that persistence and commitment to continued learning are critically important to success in the long run, much more so than being talented or “quick.”

We hope you will find the course interesting and engaging and that you will seek to develop an enthusiasm for math that you will pass on to your students. We will work hard in this course, but we are also going to have a lot of fun doing it!

Class work: As a teacher, you will have the important responsibility of helping your students understand mathematical ideas and ways to solve math problems. To help prepare you, we will often ask you to explain a mathematical idea, a line of reasoning, or why a solution method is valid to a classmate or to the whole class. As a teacher you will also need to determine how your students are thinking about mathematical ideas so that you can address misconceptions and build on what your students know. This means you will need to listen carefully to your students' mathematical ideas. So in class, we will ask you to listen carefully to other students' methods of solution, and we will sometimes ask you to restate or ask a question about another student's idea, or whether you agree or disagree with a statement. Class time is a time for us to think ideas through and to evaluate the ideas. Even answers that ultimately prove to be incorrect can provide invaluable learning opportunities when we determine where the flaws lie. In order to make productive use of our class time, and as part of your preparation to teach mathematics to children, all students (and the instructor and teaching assistants too!) are asked to do the following in class:

- Show interest in mathematical ideas
- Show interest in different ways of approaching mathematical ideas
- Listen carefully to different ways of solving a problem
- Carefully evaluate a proposed method of solution
- State whether you agree or disagree with a statement (you may feel more comfortable saying you “respectfully disagree”)
- Show interest in learning with and from others

Because our interactive work in class is an important component of this course, **class attendance is required**. In the event of an illness or emergency, please contact Dr. Beckmann as soon as possible. Students with four or more unexcused absences may be dropped from the course.

Writing Intensive Program: This section of MATH 5035 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 teaching assistant, Laura Nunley, has been trained by the Writing Intensive Program to help you learn to write good mathematical explanations. Laura will give you feedback to help you improve your explanations over the course of the semester.

Why are we emphasizing writing in this course? To be an effective teacher of mathematics, you need to understand the mathematical ideas you will teach well and beyond the level at which you will discuss them with your students. By writing your initial thoughts and then revising your writing to produce clear, thorough, well thought out explanations, you will have a chance to develop and refine your understanding of the ideas you will teach. Because of the benefits of writing, we think that the writing intensive format is a perfect fit for this course.

Types of assignments: All assignments will be posted on the links on the main course page. Some assignments may require that you access E-Learning Commons. You should expect to spend at least 2 to 3 hours outside of class for each hour in class.

Written homework assignments to turn in: Expect to have a written assignment due at nearly every class. These **assignments must be typed**. You may write by hand any equations, pictures, diagrams, or the like. Pictures and diagrams can be inserted either within the body of the text or they can be labeled and placed at the end of the document (and in this case you should refer to them by their label within the text). Your written assignments will generally be fairly short, but we expect your work to be highly polished. Turn in only well thought out second or third (or fourth ...) drafts. Mathematics requires precise language, so attend closely to the way you express your ideas. When you teach, you will also need to take care to use correct and precise language, but we will hold you to an even higher standard of expression than would be realistic all the time in a classroom with children. In grading your work we will be looking for the extent to which it 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.

Explain all your solutions unless there are explicit instructions not to.

You are encouraged to form study groups and to work on homework assignments with your classmates. (Perhaps some of you might like to form facebook groups.) Of course, you must adhere to [UGA's Academic Honesty Policy](#). Therefore, always write your homework up on your own, using your own words to express the ideas you have *discussed* with others. It is not academically honest to simply read someone else's work and then put it in your own words. Instead, when you work with others, you must participate in the development and refinement of the ideas by discussing them. All partners should "give and take" in the discussion. It is not academically honest to allow others to copy your work.

Homework is due at the beginning of class and **homework must be turned in on time**. Please contact Dr. Beckmann as soon as possible if you are unable to hand in an assignment due to an illness or emergency.

Please save returned homework since we expect to allow you to revise and resubmit a few selected assignments.

Reading and "don't hand in" assignments: Expect to have a reading assignment due after every class. The reading is designed to help you shore up the ideas discussed in class and be ready for the topic to be discussed in the next class. The "don't hand in" assignments will consist mainly of problems whose solutions are given in the book. You should work the problems first without looking at the solutions and then read the solutions and compare them with your own. It's a good idea to discuss the "don't hand in" problems with a study group. Expect quizzes on the "don't hand in" problems and the reading.

Minute papers: Occasional "minute papers" will be assigned to do either at the end of class or to post on E Learning Commons before the next class. These minute papers are an opportunity to think through the day's material by writing freely and quickly about it, capturing any insights you had or questions and stumbling blocks you hope to follow up on. Minute papers will be graded only for completion, not for accuracy.

How your grade will be calculated:

We will grade all your work on a 10 point scale, and we will assign points as follows:

# of points	description	characteristics
10.5 points	exemplary	work that could serve as a model for other students
10 points	very good	correct work that is thorough and carefully done
9 points		Work that contains only a minor flaw
8 points	competent	good, solid work that is largely correct

7 points		Work that has merit but also has some shortcomings
6 points	basic	work that has merit but also has significant shortcomings
4 points	emerging	work that shows effort but is seriously flawed
0 points	no credit	no work submitted, or no serious effort shown

Your course grade will be based on 2 hour tests, quizzes, homework assignments, and a **comprehensive final exam**. The tests and final exam will emphasize problems that require you to write clear, complete, logical explanations.

hour tests, 2 at 18% each	36%
quizzes, total	20%
minute papers	4%
homework	15%
final exam	25%

Letter grades are expected to be assigned as follows.

for scores from	up to	letter grade
9.2	10 or above	A
9.0	9.1	A-
8.8	8.9	B+
8.2	8.7	B
8.0	8.1	B-
7.8	7.9	C+
7.2	7.7	C
7.0	7.1	C-
5.0	6.9	D
below 5.0		F

Materials needed: Please bring your activity manual to class.

Observers: You may notice that some students never turn in any work and never take any tests! How do they get away with it? These students are graduate students who are observing MATH 5035 in preparation for eventually teaching courses for prospective elementary or middle grades teachers.

MATH 7035 students only: To get graduate credit you will need to do extra assignments in addition to completing all the MATH 5035 coursework. Please see me to arrange these additional assignments.

Your course score will be calculated as follows:

Hour tests, 2 at 18% each	36%
Quizzes	20%
Minute papers	2%
Math 5035 homework	13%
Math 7035 additional assignments	4%
Final exam	25%