

Math 460: Mathematics for Secondary Teachers

Spring 2015

3 credits

Instructor: Dr. Dibbs

Instructor: Rebecca Dibbs, PhD

E-Mail: Rebecca.Dibbs@tamuc.edu

Office: 303 Binnion

Office Hours: M 2-3 & 6:20-7:20; T 10-11; W 2-3; R 10-11

Class Meets: MW 5:30-6:15

Texts: There will be no textbook for this class, but there is a coursepack for the handouts. Weekly readings will be made available to the class via Dropbox.

Course Materials: You will need a folder or binder in which to keep your written work and a flash drive on which to keep your work done on the computers. You will also want to have a sphere of some kind to look at when we study spherical geometry. Tennis balls work well, as do the plastic spheres often available at craft shops.

Course Description: Exploration of problems in algebra, trigonometry, analytic geometry, calculus, Euclidean geometry, probability, statistics and discrete mathematics using technology. The course is intended as a capstone study for prospective secondary teachers of mathematics. Graphing calculators and computers will be employed to illustrate and encourage conjecturing and problem solving with an emphasis on applications. In addition, a brief survey will be made of major documents and resources pertinent to secondary mathematics teachers, such as the NCTM Standards.

Prerequisite: Math 331 or consent of instructor.

Grades: Your final grade will be computed using the following weights:

Assignment	Weight
Labs	30%
Action Research Project or Proposal	50%
Journal	10%
Practice Test	5%
Portfolio	5%

A: 90-100%

F: 0-59%

B: 80-89%

Note: your grade will be rounded to the nearest whole percent before grades are assigned

C: 70-79%

D: 60-69%

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Labs: Over the course of the semester, I will be assigning a series of problems for you to write about. Some of these will be informal writing assignments that will be graded only on how complete they are; others will be formal writing assignments, for which you will be expected to turn in a typewritten paper that will be graded not only on the completeness and correctness of your answer, but also on the clarity of your explanations. All of these problems will go through a process of revision: I will make comments on them, and then you will have an opportunity to revise them. You should explore each question and write out your thinking in a way that can be shared with others. Focus on your own ideas and understandings, and turn in whatever your thinking is on a question, even if only to say, "I do not understand such and such" or "I am stuck here." Be as specific as possible. Conjecture. Use pictures. Respond to my comments and questions.

Action Research Project/Proposal: As part of your continued professional development as a teacher, you will find areas of your practice that you will wish to experiment with—this process is called action research. In this class you will develop an Action Research topic of interest. If you are currently in the classroom, I encourage you to actually try a full Action Research Project – especially if your Cooperating Teacher could be a potential source of support. If you do not wish to/are not able to carry out an intervention this semester, you may write a proposal for an Action Research Project. There are two reasons why we are doing this project: (1) Action Research is the most effective way to implement new professional development ideas in the classroom (even if you don't formally write a paper while teaching and (2) when you begin your Master's degree, you will almost certainly have to write a thesis. The two most common forms for an education thesis are Action Research or the type of literature found in the alternative project. Ideally, this project can serve as a jumping off point for your future thesis.

Journal: One of the hardest things to do as teachers is teaching our students problem solving skills. Research suggests that "think aloud teaching", explicitly mentioning every decision a teacher makes when solving a problem in class. However, since we as teachers were the unusually successful mathematics students, it is difficult to be aware of the problem solving steps we have internalized over the years. Each week in this class you will write a one page reflection about reflecting on the week. Some questions to consider in your reflection:

- How did your group approach the mathematical tasks?
- What decisions did you make?

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- How did you decide on a strategy?
- How does the reading and discussion this week inform future practice in this area of mathematics?

Your journal will be collected twice during the semester (see calendar for due dates). The grading rubric for your journal may be found in the rubric section of the coursepack.

Practice Certification Test: They have to get approval from the department (either Dr. Webster or Dr. Wang). Then go to the One Stop Shop and take it from the Assessment Office. I usually tell them to make an appointment and they can call 903-886-5122. We'll get their results normally within 24-48 hours and let them know if they can take the real state exam. You need to get at least a 60% on the practice exam by March 31 to receive full credit. From prior experience, a 60% on the practice exam is generally a sign that you are ready to take the certification exam. If you have already taken the practice or (even better) the certification exam, show me documentation to receive full credit.

Portfolio: At the end of the semester, I will ask you to turn in your portfolio containing all the work that you have done for this class, including all drafts of all papers, so please save everything. On average, you should expect to spend at least nine hours per week outside of class on this course. If you are concerned about the time that you are spending on this class, come see me.

Professionalism: It is my expectation that you attend every class and participate fully in group activities and classroom discussions.

Due dates: Labs can be revised as many times as you like; however, they should be substantially done within sixteen days of the original due date. Progress made after this date will count half as much as progress made before this date, unless the problem is at least 3/4 complete by then.

Hints for Success: The best approach is to strive for a solid understanding of the course topics and to accept at the start that this necessarily entails some struggling with ideas and feelings of frustration. The course problems take time, especially time to explore and think about the ideas. Often you will need to walk away for a while or for a day, and return to a problem for a second or third look before writing up your response. Expect this. However, do not get behind on the problems. Try to cultivate an approach

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that is a nice balance between "just getting it done" and avoiding it altogether. Stay connected, and come see me if you are having difficulties.

Group Work: We will often work in groups in this course. Whenever a group hands in a written assignment, they are required to put on the paper the names of those who participated fully, and only those names. Each person must sign the final copy. Your signature certifies that you participated equally in the project. It is dishonest to turn in work that is not solely and equitably the creation of the team members. You are not required to include on the report the name of someone who started but did not finish, or who did not contribute their share. Also, as the instructor I reserve the right to assign group members different grades if it doesn't appear that every contributed equally.

Outside Sources: A central aim of this course is to help you learn to develop your own ideas about mathematical questions. You therefore should **NEVER** consult any reference materials outside of the course texts to complete labs. This includes materials found on the internet. *The ideas that you present should be your own.*

Office Hours: My office hours are listed above, and will be held in 303 Binnion Hall. Please come see me! The best way to make an appointment or to get in touch with me for any other reason is to send me an email.

Attendance: It is absolutely vital for an interactive class like this that you come to class and participate. Your attendance will count as part of your class participation grade, and excessive late arrivals will count as an absence.

Disability Support Services: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

Texas A&M University-Commerce

Gee Library- Room 132

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

StudentDisabilityServices@tamuc.edu

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Tentative Due Dates

All dates are subject to change!

**Labs need $\frac{3}{4}$ of a circle when submitted by the second due date in order to be able to get full credit

Week	Monday	Wednesday	Reading	For Next Week
1		<ul style="list-style-type: none"> • Introduction • Practice Test • Review of bases • What scares us? • Lab 1: My Math Ed Story • 	<ul style="list-style-type: none"> • "Benny" 	<ul style="list-style-type: none"> • Pass Practice Test • Problem Journal
2	<ul style="list-style-type: none"> • Finish Lab 1 • <i>TOPIC DUE</i> 	<ul style="list-style-type: none"> • Discuss "Benny" • What is Action Research? • Start Lab 2: Proportionality 	<ul style="list-style-type: none"> • Thorndike "Blueprint" 	<ul style="list-style-type: none"> • Write pre-proposal • Pass Practice Test • Problem Journal • Lab 1
3	<ul style="list-style-type: none"> • Finish Lab 2 • <i>LAB 1 DUE</i> 	<ul style="list-style-type: none"> • Discuss "Blueprints" • Introduce Lab 3: Cup & Chip Algebra • <i>PRE-PROPOSAL DUE</i> 	<ul style="list-style-type: none"> • Hall & Salmon (2003) 	<ul style="list-style-type: none"> • Begin revisions on pre-proposal • Pass Practice Test • Problem Journal • Lab 2 • Lab Revisions

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4	<ul style="list-style-type: none"> • Finish Lab 3 	<ul style="list-style-type: none"> • Discuss Hall & Salmon (2003) • Lab 5: "Blueprint/Rubric" • Introduce Lab 4: Algebra Tiles • LAB 2 DUE 	<ul style="list-style-type: none"> • Black & Wiliam (1998) • Black & Wiliam (2009) 	<ul style="list-style-type: none"> • Continue revisions on pre-proposal • Pass Practice Test • Problem Journal • Lab 3 • Lab 4 • Lab Revisions
5	<ul style="list-style-type: none"> • Lab 4: Algebra Tiles 	<ul style="list-style-type: none"> • Finish Lab 5 • Discuss formative assessment • How to find literature? • Introduce Lab 6: Formative Assessment • LAB 3 DUE • PRE-PROPOSAL REVISIONS DUE 	<ul style="list-style-type: none"> • "Lit Review" 	<ul style="list-style-type: none"> • Find at least one relevant article to your topic and bring it to class • Problem Journal • Pass Practice Test • Lab 4 • Lab 5 • Lab Revisions
6	<ul style="list-style-type: none"> • Lab 6: Formative Assessment • LAB 4 DUE • FIRST ARTICLE DUE 	<ul style="list-style-type: none"> • Finish Lab 6 • Discuss "Lit Review" • Introduce: Lab 7: Tie the Knot • LAB 5 DUE 	<ul style="list-style-type: none"> • "Vygotsky" 	<ul style="list-style-type: none"> • Find and code at least 5 articles. • Write Works Cited • Pass Practice Test • Problem Journal • Lab 6 • Lab Revisions
7	<ul style="list-style-type: none"> • Lab 7: Tie the Knot • LAB 6 DUE 	<ul style="list-style-type: none"> • Discuss "Vygotsky" • Lit Review Activity • Start Lab 8: Angry Birds • CODING & WORKS CITED DUE 	<ul style="list-style-type: none"> • Watch Shae Numbers Video¹ • Knuth, Choppin, & Bieda (2009) 	<ul style="list-style-type: none"> • Work on lit review • Pass Practice Test • Problem Journal • Lab 7 • Lab Revisions

¹ <http://deepblue.lib.umich.edu/handle/2027.42/65013>

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8	<ul style="list-style-type: none"> • Lab 8: Angry Birds 	<ul style="list-style-type: none"> • Finish Lab 8 • Midterm Problem Journal Due • Discuss Shae #'s • Discuss Knuth, Choppin & Bieda (2009) • LAB 7 DUE 	<ul style="list-style-type: none"> • Heinze & Reiss (2009) 	<ul style="list-style-type: none"> • Work on lit review • Pass Practice test • Problem Journal • Lab Revisions
9	<p>SPRING BREAK</p>	<p>SPRING BREAK</p>	<ul style="list-style-type: none"> • Heinze & Ross (2009) 	<ul style="list-style-type: none"> • Work on lit review • Lab Revisions
10	<ul style="list-style-type: none"> • Lab 9: What is 'straight'? • LAB 8 DUE 	<ul style="list-style-type: none"> • Finish Lab 9 • Discuss Practice Test • Discuss Heinze & Ross (2009) • LIT REVIEW DUE 	<ul style="list-style-type: none"> • Gonzalez et al. (2009) 	<ul style="list-style-type: none"> • Pass Practice Test • Problem Journal • Lab Revisions
11	<ul style="list-style-type: none"> • Lab 10: The Vertical Angle Theorem 	<ul style="list-style-type: none"> • Finish Lab 10 • Discuss Gonzalez et al. (2009) • Discuss "What is a good intervention?" • LAB 9 DUE • PRACTICE TEST DUE 	<ul style="list-style-type: none"> • MAA Notes: Chapter 13 	<ul style="list-style-type: none"> • Revise lit review • Write intervention draft • Problem Journal • Lab 10 • Lab Revisions
12	<ul style="list-style-type: none"> • Lab 11: Folding a Parallel Line 	<ul style="list-style-type: none"> • Lab 11 • Discuss MAA Notes Chapter 13 • LAB 10 DUE • INTERVENTION DRAFT DUE 	<ul style="list-style-type: none"> • MAA Notes: Chapter 14 	<ul style="list-style-type: none"> • Revisions (intro/lit) • Problem Journal • Lab 11 • Lab Revisions
13	<ul style="list-style-type: none"> • Lab 12: Complex Numbers 	<ul style="list-style-type: none"> • Finish Lab 12 • Trig Tricks • Intervention Discussion • Discuss MAA Notes Chapter 14 • LAB 11 DUE 	<ul style="list-style-type: none"> • MAA Notes Chapter 15 • MAA Notes Chapter 32 	<ul style="list-style-type: none"> • Revisions (intro, lit, & intervention) • Problem Journal • Lab 12 • Start Intervention • Lab Revisions

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14	<ul style="list-style-type: none"> • Lab 13: Forest Fires 	<ul style="list-style-type: none"> • Finish Lab 13 • Intervention Discussion • "What is a good reflection?" • Discuss MAA Notes Chapters 15 & 32 • LAB 12 DUE 	<ul style="list-style-type: none"> • Oehrtman (2009) 	<ul style="list-style-type: none"> • Revisions (intro, lit, intervention) • Write Reflection • Problem Journal • Lab 13 • Lab Revisions
15	<ul style="list-style-type: none"> • Lab 14: Locate the Hole 	<ul style="list-style-type: none"> • Finish Lab 14 • Reflection Discussion • "What is a good poster?" • Discuss Oehrtman (2009) • LAB 13 DUE • PAPER DRAFT DUE 	<ul style="list-style-type: none"> • New Teacher Survival-SKIM 	<ul style="list-style-type: none"> • Start Poster • Problem Journal • Lab 14 • Lab Revisions
16	<ul style="list-style-type: none"> • Lab 15: Cubic Splines • LAB 14 DUE • POSTER DRAFT DUE (Optional) 	<ul style="list-style-type: none"> • Evaluate class • Information about undergraduate research info • Discuss New Teacher Survival • Presentation/Paper work time and consultations if time allows • LAB 15 DUE • JOURNAL DUE • PORTFOLIO DUE • ALL LAB REVISIONS DUE 		<ul style="list-style-type: none"> • Final Paper Revisions • Finish Poster
17	<p>FINALS WEEK</p>	<ul style="list-style-type: none"> • Poster Session • Portfolios Returned 	<p>FINALS WEEK</p>	