Teaching Portfolio

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Teaching Philosophy

One of the reasons I chose to come to the University of Tennessee as a graduate student was that I wanted to teach math. The reasoning may not seem obvious, but as a career goal it played a huge role in my deciding where to continue my graduate studies. Teaching mathematics has always been a lifetime passion for me, but I also found investigating problems in conservation and genetics intriguing. Thus, I chose a university that could train me as an educator in mathematics and as a researcher of biological questions. Tennessee boasts one of the few graduate programs that focuses on the interdisciplinary connection between these two areas and trains its students in the skills needed to be successful in this growing field. I have an excellent opportunity here to do fascinating research and coursework in theoretical ecology and evolutionary biology, and I have been encouraged to grow as a student, a researcher, and a teacher. This experience in teaching has been especially rewarding, and I would like to share it with you.

I arrived at the University of Tennessee with a Master's degree, so I was assigned to teach a lower level math class in the fall to fulfill my teaching associateship. At my prior university, I had taught a lower level algebra class, and, as I expected, it was very enjoyable and fulfilling to have taught math-challenged minds to solve algebraic equations with some occasional applications. I was an "old school" type of math teacher who believed that these mathematical manipulations were the essence of mathematics. Even though I had taken a college teaching class, and attended conference workshops on teaching mathematics, I resisted the new trends in mathematics education. I wasn't too excited about the prospects of group homework explorations and the absence of plug-and-chug formulas. So when I found out that at the University of Tennessee, I would be teaching the service course nicknamed "math appreciation," my first impulse was to try to get out of it. What made me persevere was the realization that I was being challenged as a mathematics educator and as a mathematics student by teaching this class.

My new motto became "If I can teach this course, I can teach anything." I had met one of the book's authors at a Mathematics Association of America meeting a few years earlier and heard him speak about his new approach to teaching mathematics. I was also fortunate enough to have taken a unique combination of pure and applied mathematics coursework while a student at the University of Maine. These factors together prepared me for the diversity of mathematical concepts presented in the book. With new confidence and motivation, I walked into the first class meeting. Several Platonic solid, Sierpinksy carpet, Möbius strip, and Klein bottle constructions later, I braced myself for student evaluations. The verdict was in; the written reviews were favorable, and I believe I am a better teacher because of this experience. I opted to teach the same course again that spring semester and enthusiastically modified the curriculum to include sections from the book on mathematical biology, chaos, and fractals.

I have always wanted to teach, and my only goal for teaching is to become a better teacher. By teaching at the college level, I have an excellent opportunity to address young minds interested in bettering themselves - or even to catch the attention of those who are just getting by. I aspire to teach them to appreciate the enormous usefulness of mathematics and to understand our dependence on ideas relying on mathematical foundations. By doing so, I can help students think constructively, analytically, and creatively about any situation they encounter, whether mathematical or practical.

As a professor of mathematics, with the unique training I will receive at Tennessee, I hope to apply what I have learned in teaching this class to future classes. The next generation of biological researchers will need the same skills to survive in a world that is becomingly increasingly dependent on computational and mathematical tools and ideas. I work everyday towards becoming a professor so that I can make this important impact, encouraging students to pursue these interdisciplinary directions and helping students adapt to a changing environment.

Teaching Strategies and Evaluation

I center the curriculum and classroom around the idea that mathematics is about a way of thinking. For courses that service a diversity of majors, my goal is to help students discover, understand, and demonstrate critical thinking, logical arguments, and quantitative reasoning. Even for courses that service primarily science and mathematics majors, the foundation of the classroom is still the same: to discover, understand, and demonstrate mathematical concepts and principles.

The first challenge is discovery, and it begins in the classroom. The road that leads to discovery is paved with questions: "How do you solve problems?," "Are there different kinds of infinities?," "What is slope?," and "Where have you seen this idea before?" Some call this the Socratic Method; I call it classroom motivation and exploration. There is a stereotype concerning mathematics that propagates the public feeling of sterile clear-cut answers and inapplicability to "real-life." The process of discovery, however, is intrinsic to all sciences and a natural product of human curiosity. It is not only about motivating students to learn but about helping students to become independent thinkers.

Students, mostly of the liberal arts and humanities, who took my Mathematical Reasoning course were asked if my class was intellectually stimulating and stretched their thinking. Below are a few demonstrative responses taken from the evaluations:

- Yes, Mrs. Eaton made an undesirable subject, for myself, very bearable. She made the topic of math a much more interesting and useable subject to learn
- Yes – This class was actually very interesting at times, which is very unusual for a math class.
- Yes, it made me realize math goes beyond equations.
- Yes – I had to think outside the box.
- Yes – it helped me to see more depth of the math language.
- Yes it made me think of geometry from another, deeper perspective…
- Yes…by teaching ways to logically figure out problems.
- Yes – This class required more thinking than any math class I've ever had. Ms. Eaton forced us to stretch our thinking the whole semester.
- Yes – The class introduced new ideas and ways of thinking…I often came out of class excited about having learned something new.
- Yes – abstract concepts were enjoyable.
- Yes, there were many things I didn't know that will be able to apply now. Some of this stuff is pretty cool!

I believe that this success can be attributed to my approach, building the mathematical ideas intuitively through exploration instead of by strict lecturing. Students become involved in the mathematics, and I believe their attitudes about math change because of their investment in the process.

The second challenge is to help students understand mathematical ideas. If, as a class, we can discover ideas together, we are only half-way there; we still need to understand how they are used and their applications. In class, we do not just accept results; we ask why. Sometimes that means that we go so far as to construct Möbius bands and Klein bottles in class to understand the relationships. I typically assign homework that takes the student beyond the basics. My goal is to challenge what it means to "understand" a mathematical concept. My door is always open, and I never expect that students must take their journey alone. I encourage students to talk out ideas during class, online, at home and in my office. Below are a few student responses from students taken from the evaluations about what aspects of class contributed the most:

- Her enthusiasm and desire for the class to learn the subject contributed the most.
- Lectures – good at explaining things. Good enthusiasm!
- Class lectures and homework. Reading the book, in class explanations.
- Getting personal help from you and reading the chapter.
- …being able to ask questions in class as well as have some sort of relationship with the teacher.
- Making things to use in our learning for class.
- Hands-on stuff, like building the icosahedron.

- Group Work.
- The in-class group work.
- Critical thinking.
- The homework was helpful.
- The homework

Lastly, the challenge is to help them articulate their mathematical ideas. I spend an entire class on argument formation at the beginning of the semester and give students feedback on a mock-assignment so that they get into the habit of making strong arguments. I encourage them to constantly ask themselves how each step is justified and what the goal of their approach is. This emerged from the realization that I needed to identify what I wanted students to take from the class. More than theorems and formulas, I wanted my students to be able to form, construct, and analyze arguments. In the handout for the homework grading scale, I stress the major components for mathematical writing so that students learn how to structure their arguments (See Syllabus in Appendix A). I also construct my examinations to include questions that address both the content and the reasoning techniques (See Final Exam, Appendix B). Here is a response to these techniques from one former student:

> "I really have enjoyed your class. You have taught me a great deal about how to think in a more logical manner and how to appreciate new and innovative approaches to problem-solving. I thank you so much."

I continue to learn from my experiences and from my students. I routinely gather anonymous evaluations from my students besides those administered by my department to see how certain lectures have been assimilated and to learn whether students are unhappy with any aspect of the class. The first semester I taught Mathematical Reasoning, I did have trouble merging my goals for the class with the course coordinator's syllabus. Students picked up on this very quickly:

- I often felt that the homework wasn't relevant to the exams.
- Making the homework questions more like the actually test questions.
- I was happy when you decided to collect work more. Helped my grade a lot!
- In the future, the assignments should be provided both online and on the syllabus.
- I would suggest a lighter load, better preparation by the teacher – this is supposed to be an introductory course, most of us haven't taken a math class in 3 or 4 years so it is significantly harder for us.

I addressed their dissatisfactions by modifying, with permission, the coordinator's homework problems list to match more closely my goals for the class and by creating a list of more basic recommended homework problems that I would borrow for the exams. I attached this comprehensive list of homework and due dates to the syllabus given out the first day along with explanations on the syllabus for how to manage time on out-of-class work (See Syllabus in Appendix A).

Most of the student feedback I have cited above reflect on my teaching in the Mathematical Reasoning course that I taught for three semesters at the University of Tennessee. This does not mean, however, that my techniques can only apply to this type of course. As a volunteer workshop instructor for Math4ME, a camp sponsored by the

University of Maine Women's Resource Center for high school girls to explore mathematics, I was voted Most Creative Instructor by the campers. Also while at the University of Maine, I was able to negotiate my research assistantship to include an opportunity to teach my own class in College Algebra. This course satisfies part of the General Education Requirement and prepares its students to take Pre-Calculus. I received very favorable reviews, even from this more traditional mathematics class, and I have compiled the evaluation results in Appendix D. Several students, in addition, elected to write open-ended responses. Below are some of the comments I received.

- Mrs. Eaton was great. She always made sure people understood the info. Always made herself available.
- Carrie was very enthusiastic about the material and was very concerned with her students' grades and if she was presenting the material clearly enough. Overall I enjoyed this class and learned a lot from it.
- Carrie Eaton was an enthusiastic professor. Although I did not do very well in this course, she recognized my efforts and was willing to help whenever possible.
- Carrie was extremely enthusiastic during the length of the course. Her ability to explain concepts and procedures made the class much easier. As well, she was always available for students much more so than other instructors outside of class.

I was very surprised how much students appreciated my accessibility. Perhaps because this was my very first feedback while teaching college students, I learned a lot about what students value in their instructors, and I have kept this in mind every time I prepare to teach.

Representative Course Syllabus and Student Learning Assessments

Appendix A – Syllabus

This syllabus represents 3 semesters of teaching Mathematical Reasoning. The syllabus is carefully worded to give the student a sense of earning his or her grade and not just getting assigned a grade. I feel it is very important for students to take ownership of their learning. The core feature is a description of each course component in terms of its role in assessing student learning. Major modifications to the original as a result of incorporating student feedback include adding a course calendar, adding a customized homework grading rubric, and stressing the important components of mathematical writing.

Appendix B – Final Exam

The final exam attached here is a two-hour exam for Mathematical Reasoning, designed to assess whether students understood the main concepts presented in the class and realized connections between the various topics presented. It is extremely comprehensive content-wise, but several questions also require the students to demonstrate their level of critical thinking. There are several checks and balances incorporated into the exam. For example, I ask what Cantor's Diagonalization shows, but in a separate question, I also ask if we can always make a 1-1 correspondence between two infinite sets. Likewise I ask them to draw the Sierpinksi Carpet and convert .3 repeating into a fraction, and later on in the exam I ask them about the theme of repetitive patterns in the course. This is a method I learned during a Math and Science Teaching conference I attended in Orono, Maine. This is also a common method in psychology for developing survey questions.

Appendix C – Final Exam Supplement
This final exam supplement is a writing assignment designed to assess student learning at the end of the Mathematical Reasoning course. Students are asked to discuss their exploration of mathematics through this course which includes not only concepts presented but also student perception of what mathematics is.

Appendix D – Aggregate Student Evaluation Data
I have summarized the end-of-the-year anonymous teacher evaluations and included those evaluation responses that best address my teaching philosophies.

Teaching Projects and Evidence of Student Learning

The Spring 2006 course design of Mathematical Reasoning is the product of collaborative work with the Instructional Technology Center, thanks to grant funding provided by GTA@ITC! After teaching Mathematical Reasoning for two semesters, I wanted to take this course to the next level intended by the textbook authors. I was at a MAA conference when Dr. Burger, one of the co-authors of the textbook for the course, *Heart of Mathematics*, lectured on his teaching methodology and philosophy. One thing he wanted to do was to incorporate online technologies so that students were coming to the classroom prepared to discuss the topics for the day. With this in mind, I wrote a proposal for a GTA@ITC! grant to use Blackboard (a web-based virtual classroom) to facilitate out-of-class student learning.

There are two major ways in which I address out-of-class student learning. The first is to get students to familiarize themselves with concepts before they walk into the classroom, and the second way is to get students to explore the concepts even further once they step out of class. For this first component, students in this Mathematical Reasoning course typically either do not have the mathematical study skills or do not prioritize their time in such a way that they prepare for class in advance. I found that incorporating pop extra-credit quizzes before class encouraged students to read the book before coming to class, but this can take a lot of time to do before every class or even once a week. I therefore developed quizzes that students could take online before they came to class to encourage them to prepare for class in advance. For the second component, to help students continue to talk about the concepts once they leave the classroom, I developed an online discussion forum and participation grade.

This forum I count as a success. Students share approaches to problems, ask each other questions, and share thoughts on lectures and reading. Below I give a few quotes from this semester's discussion board:

- In this problem you have a 10 oz. glass and a 6 oz. glass and you have to use those to glasses to get 8 oz. of the mango juice. I was having trouble with this problem until I remembered that the same problem was presented in "Die Hard With a Vengeance". If you are having trouble with this one you might think back to that movie because it helped me at least to explain and understand this seemingly impossible problem.

- OK.. I am the world's worst at confusing myself with alot of information. Especially when you are brainstorming and trying to think about a different possibilities for different problems. A way that I found that works is this: (It may sound silly but it works for me) I think of one possibility at a time and try to "teach" myself why this possibility will work.. I write down my steps and its just not as scattered and confusing
- Dialogue between three students on the concept of denseness:
    - I was wondering if the idea that there is an infinite amount of numbers in between each number on the number line is mind boggling. I mean, that's a lot of numbers, but at the same time it makes sense to me that you can always find another number in between another two. Does anybody else find this at least semi-interesting?
    - Yeah, it's pretty cool because even if you pick two numbers that you might think are close together, those numbers, in fact, are infinitely far away.
    - I'm pretty sure that's about the coolest thing I've ever heard in a math class up to now. It makes total sense I guess the concept just isn't something that I've ever really thought about... I love it though. I want to ask someone what numbers comes after one just to be able to say, No, it isn't actually 2.... listen to this... :P
- Dialogue on the Pythagorean Thoerem:
    - I like problems that include the pythagorean theorem because I'm very familar with it. It makes a lot more sense to me than anything else that we have discussed in class so far. The PT is really important in mathematics in general. It can help you solve not only for right triangles, but you can use it with other types of problems. for example, the problem that we did in class with the circles and the radius of each circle, the PT was used to find the area. It's a really crucial formula.
    - I thought it was really cool and useful how the PT could be used to solve a problem like that as well. Often times you don't think about things like that but when you broaden your thought it's easy to see. I guess it just shows how it is important to be open minded when approaching problems such as this.
    - I think the pythagorean theorem is the most easily understood subject we have discussed yet in class. The circle problem also was very interesting, and the best thing about it, I thought, was that I was able to understand it.
    - It blows my mind to think that something as simple as the Pythagorean Theorem, which we learned in 8th grade or something, can be used to solve such complex, seemingly impossible problems. This just confirms my opinion of this class, which seems to rely on simplistic concepts that, when applied to extremely complex problems, will give you an answer that makes sense if you think about it in the right way.
- Student comment to the idea of a spatial 4th dimension:
    - Man, the 4d cube really befuddles me....as does the word "befuddle"...but that picture that Dali painted is really neat, I wonder if he ever did

> anything with the other dimensions in his work. The whole idea of the dimensions and the string theory is really cool stuff. It reminds me of that movie Event Horizon, where the ship can bend space and go through the wormholes and it ends up going to hell...really cool stuff for really nerdy kids like me.

It is really fantastic to see students thinking about what is going on and responding to the material and to each other.

Several other components including the gradebook, handouts, and supplementary online resources are integrated into Blackboard and into the syllabus and curricula. The class is conducted in a technology enabled room so that online JAVA manipulatives available on the textbook website can be used in class to demonstrate concepts presented. The end of term writing assessment that will evaluate student learning and the effect of incorporating Blackboard into the curriculum is presented in Appendix C.

Teaching Improvement Activities

Best Practices in Teaching Program, 2005 – 2006

- Seminar certificate program presented by the University of Tennessee Graduate School designed to stimulate pedagogical discussion between faculty, post-doctoral students, and graduate students.
- I also participated in the Dean's Colloquy, a roundtable discussion of a chosen book on pedagogy with university deans, faculty, postdoctoral students, and graduate students.

Institute on Mentoring and Teaching, Arlington, VA, October 2005

- Conference sponsored by several organizations such as NSF, Southern Regional Education Board, and McNabb Scholars designed to increase minority employment in academic institutions. Seminars addressed both research and teaching aspects of university professorship.

First Year Teaching Seminars and Teaching Orientation, Department of Mathematics, University of Tennessee, 2004 – 2005

- Program designed for first-year graduate teaching associates and assistants in the mathematics department. Addressed several issues ranging from department and university policies to methods in teaching mathematics. I also participated in a videotaping of my instruction and review with peers and faculty.

Issues in College Teaching, University of Maine, 2002

- In this 3-credit course I read current journal articles and book excerpts on learning and pedagogy, and discussed the readings in general and in terms of application to my teaching mathematics. The class explored how student learning takes place, methods of student assessment, case studies on various teaching methods, and social issues confronted when teaching at the higher education level.

Integrating Science and Mathematics Education Research into Teaching, Orono, ME June 2002

- This conference at the University of Maine brought together educators at both the high school and college level from around the nation to discuss case-studies in teaching and learning and methodologies for teaching in mathematics and science.

Mathematical Association of America/American Mathematical Society Joint Meeting, Mathfest 2002, Burlington, VT, August 2002

- During this conference, I attended a day-long workshop specifically for new graduate students on teaching. The workshop addressed creating student assessment and grading student assessment as well as syllabus creation and other issues for new mathematics instructors.

Mathematical Association of America Northeastern Regional Meetings

- Wellesley, MA, November 2003
- Framingham, MA, November 2002
- Providence, RI, November 2000

CRLA Advanced Tutor Certification, 2001

- As an undergraduate Peer Tutor for the University of Maine, tutoring Calculus III (1999-2001), I earned the Peer Tutoring Advanced Tutor Certification from the College Reading and Learning Association

I also participate in several collaborative activities with other instructors to improve our teaching. For example, we sit in on each others' classes to give teaching advice to each other. We also take other teachers' exams to help each other spot errors or work on test length and timing. This collaborative spirit has helped me improve my instruction as well as the instruction of others.

Conclusion

I have invested a great deal of time learning about and observing various teaching methods. I draw from my experiences as a learner and from my knowledge of current literature in higher education to make the course experience one of lifetime learning for all of my students. Teaching is an enjoyable challenge with infinitely rewarding outcomes. The key to this challenge is to find the passions that drive us to study and understand mathematics and that will lead us to discover what drives our students.

In this process, the most fundamental question I ask is "what do I want my students to get from this course more than theorems and formulas?" Once I identify this component, I build my course around that ultimate goal, and student learning comes as a natural by-product of the course design. Students respond well to this approach as demonstrated by evaluation comments and online discussion excerpts. Student learning of core concepts is enhanced as is their ability to think independently. Most importantly, for the service courses, student perception of what mathematics is fundamentally changes. I look forward to applying this approach to upper level mathematics courses, exploring with my students such topics as Differential Equations, Dynamical Systems, Applied Mathematics, and Models in Biology.

MAT 113: Mathematical Reasoning with
Carrie Eaton
TR 3:40 - 4:55 pm, Ayres 314
eaton@math.utk.edu

Office Hours:
Ayres 109
Tues., Thurs. 2:30 – 3:30 PM
or e-mail for appointment

Course Description

Classical and modern topics in number theory, logic, geometry, and probability with emphasis on problem solving. Consumer mathematics and other real-world applications. ***(QR)***

Goals and Objectives

Mathematical reasoning (Math 113) satisfies the university's general education requirement for quantitative reasoning. The quantitative reasoning requirement as stated by the undergraduate catalog is as follows:

> In today's world, arguments and claims often rely for support on scientific studies and statistical evidence. Students should possess the mathematical and quantitative skills both to recognize the quantitative dimension of problems and to use mathematical reasoning to formulate and solve the problems. Finally, students need strong quantitative skills because they are indispensable in managing everyday-life situations.

This course should introduce and exercise the skills outlined above in a creative and hands-on manner.

Course Materials:

Course Book: Edward B. Burger and Michael Starbird, *The Heart of Mathematics: An invitation to effective thinking,* Key College Publishing, 2004, Second Edition
Calculator: A scientific calculator able to perform exponent calculations (^ key) is required for the course. You may not use the calculator on your cell phone.

Format of the Course:

I am invested in your educational success. I work hard to make this a positive experience for everyone here. The last page is an approximate timeline for the sections that will be covered each class. Classes will consist of lectures, group explorations and recitation. In-class work will be supplemented by homework, quizzes, exams, and the use of the Online@UT Blackboard system. If you have any suggestions to improve the course, please e-mail me or come see me.

Blackboard:

I will be using a course management tool called Blackboard to supplement the class. Check the site frequently and update your contact information as you are responsible for all announcements, quizzes, and resources posted on this site. You can access the Blackboard site by going to the Online@UT website at http://online.utk.edu/ and logging in with your NetID and password. The Online@UT site also has an online tutorial for students new to the system. Contact the Office of Information Technologies if you have difficulty with the system or with logging in.

Homework:

Collected assignments are indicated on the timeline beside the day they are due in the Collected HW Due column, usually Thursdays. I will not accept late homework! All collected assignments should be done professionally, all sheets stapled, in clear handwriting and with full explanations in order to receive full credit. You may work with other students, but each student must write up separate solutions in his/her own words, and collaborators must be acknowledged. Each problem will be graded on a scale of 0 to 3 for a total of 72 points. A score of 4 may be earned if the work done is exceptional. No credit will be given for solutions without explanations or work.

Quizzes:
There will be a quiz posted on Blackboard every Thursday after class unless otherwise noted. It must be taken before the next class on Tuesday; no make-ups will be given. The quiz will cover material and suggested problems from that Thursday's class and the readings assigned for that Tuesday's class. The quizzes are timed on Blackboard; for each minute you go over 10 minutes, you will be fined 1 pt. You may use your book and notes, but you may not collaborate with other students. Each quiz will have 2 questions worth 2 points apiece for a total of 48 points.

Exams:
There will be three in-class Exams and a cumulative Final. You must notify me in advance if you are unable to attend an exam; otherwise a make-up will not be arranged and given.

Participation:
20 points worth of participation points can be earned during the semester. You can earn each point in one of two ways, online or in-class.
Online (15 points): Once a week, you will be required to post a thoughtful response to the week's material on the Discussion Board on Blackboard. Each posting is worth 1 point.
In-class (5 points): During class you can earn points by reading ahead and participating in class discussions. I will also provide days on which everyone in the class can earn a participation point by working on group explorations.

Attendance and Make-up Policy:
Class attendance is essential to your success in this course. The topics covered are non-traditional, so do not expect to rely on your previous knowledge of high-school mathematics. During class time, I often provide alternative explanations and additional examples for the results shown in the book. I will also provide days on which everyone in class has the opportunity to earn participation points. Late homework and quizzes will not be accepted, and advance documented notice must be given for any missed exam; otherwise a make-up will not be arranged. If you have extenuating circumstances such as a death in the family or a serious illness or accident, it is your responsibility to contact me as soon as possible so we can talk.

Grading Procedure:

Assessment	% of grade	points worth
Homework	15 %	72
Quiz Grade Average	10 %	48
Exam 1	12.5 %	60
Exam 2	16.75 %	90
Exam 3	16.75 %	90
Participation	4.2%	20
Final Exam	20.8 %	100
Total	100 %	480

Final letter grades are determined as follows:

A	432 – 480 points		
B+	408 – 431 points	C	336 – 359 points
B	384 – 407 points	D	312 – 335 points
C+	360 – 383 points	F	0 – 311 points

How to Succeed in this Course:
Come to class prepared, and manage your time for this class effectively. Bring your notebook, homework, and book to every class. In advance of the class meeting, I expect you to do all of the reading and urge you to try the "Developing Ideas" problems at the end of each section.

Reviewing the terminology in the books before you come to class will help you understand lecture better. After class, try the more in-depth problems to self-test your understanding of the concepts presented during class. I will always open the class with a time for questions on these problems, and there will be either homework and/or a quiz due at the beginning of most classes. Each student is expected to spend an average of 9 hours out of class each week on coursework and studying. Please be prepared to make that time commitment. There is a handout available on Blackboard to help schedule and manage your time commitments.
Help each other learn. During group collaborations, you should never be bored. If you know what's going on, help others in your group learn. Explaining concepts to someone else increases your understanding tenfold. If you are having trouble, ask your teammates, and engage the group in conversation. The more effort you put into the course, the more you will get out of it.
Be responsible for your actions. Follow classroom etiquette and the suggestions for success in this class. Attend class regularly, and seek help with any difficulty with the material before it is a problem (refer to the list of resources at the end). I don't give you a grade; you earn your grade.

Classroom Etiquette:
Respect your peers around you, and please respect me. Do not walk into class late, and do not pack your bags before class is over. Turn off all cell phones and beepers, and pay attention. These interruptions can take away from class time. If there is group work assigned, participate to the best of your ability. If I had everyone's attention and participation 100% of the time, class would get out early everyday.

Academic Honesty:
All students are expected to abide by the University **Honor Statement**. In mathematics, violations of these policies include copying another person's work on any graded assignment or test, collaborating on a graded assignment without the instructor's approval, and using unauthorized "cheat sheets" or technical devices such as calculators, cell phones, or computers for graded tests and assignments, as well as the other infractions listed in ***Hilltopics***. These violations are serious offenses, subject to disciplinary action that may include failure in a course and/or dismissal from the University. The instructor has full authority to suspend a student from his/her class, to assign an "F" in an exercise or examination, or to assign an "F" in the course. See ***Hilltopics*** for more complete information. A report of all offenses will be sent to appropriate deans and the Office of Student Judicial Affairs for possible further action. Cheating yourself out of coursework only cheats you out of an education.

Additional Resources:
If you need additional help with the course material, explore the following **free** options:

- The Math Tutorial Center, located in Aryes 322: http://www.math.utk.edu/MTC/
- The BSC Academic Support Unit: http://web.utk.edu/~omsa/tutorialprog.html
- The Educational Advancement Program (EAP): http://web.utk.edu/~mcnair/eap/

And, of course, feel free to consult with me during **office hours** or e-mail me for an appointment! In addition, I or the math office (Aryes 121) can recommend a private fee tutor.

If you need course adaptations or accommodations because of a documented disability, please contact the Office of Disability Services in Dunford Hall at 974-6087. This will ensure that you are properly registered for services.

Contract:
This syllabus serves as a contract between student and instructor. I reserve the right to change the syllabus schedule as needed due to class cancellations, adjustments in course pace, etc. If you have any concerns about its content, please talk to me as soon as possible.

Guidelines for graded assignments
Mat 113 Mathematical Reasoning with Carrie Eaton

Homework Guidelines:

The goal of the homework assignments is to practice your mathematical reasoning skills through challenging exercises. Each homework problem will be graded on a scale of 0 – 3. The following criteria are important in grading the assignment: effort, presentation, neatness, clarity of explanation, logical thought, justification of process and solution, correct solution. This usually breaks down into the following:

1 point Effort: includes presentation and ability to follow the approach to the problem presented
1 point Logic: includes the justification and explanation of the approach
1 point Solution: includes the explanation of the solution and the correctness of the answer
Note: NO points will be given to answers without explanations!

Some examples of reasons to assign a particular grade:
0: No homework handed in, or no effort put into problem
1: Problem statement written, problem has been started; however, the approach is lacking logic and not followed through to completion or is ill-presented
2: Problem statement written, an attempt has been made to solve the problem, and a partially correct solution has been attained; however, explanations are lacking and/or the work is ill-presented.
OR
2: Problem statement written, approach has been outlined and discussed so that I can follow the logic; however, the approach has not been followed through to completion or it results in the wrong answer
3: Problem statement written, logic behind approach is presented clearly, the problem has correctly been solved (or at least mostly correctly solved).

I may award a **4** to a homework solution that stands out. The forth point is like extra credit and will be the only opportunity for extra credit offered during the semester, so I recommend you start trying to attain these extra points early. There are 24 problems assigned this semester, so this could result in up to 24 points extra credit on your grade. An example of a solution that would garner a **4**:
4: The solution is professionally prepared, and all explanations are thorough and logic. Steps leading to the solution can be followed, and the solution is presented and discussed in context of the chapter.

If you complete your homework early, I would be more than happy to "mock grade" it for you with suggestions on how to improve your score.

Quiz and Exam guidelines:

Quizzes are designed to test your understanding of the basic concepts and ideas presented. Assigned and suggested problems allow you to explore these concepts at a more in depth level. Tests take the material a little further than the quizzes, and in addition to requiring that you demonstrate comprehension of the basic topics, one must also demonstrate the techniques learned throughout the chapter. Each question on quizzes and exams will be graded on a scale of 0-2 based on correctness and explanation of solution.

C. D. Eaton Teaching Portfolio – Appendix A

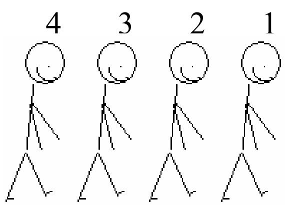
Course Schedule: **Points Attained:**

Date	**Ch.Section**	**Suggested Problems**	**Collected Homework Due**	**HW/Test**	**Part.**	**Quiz**
12-Jan	Introduction	Syllabus				
17-Jan	Section 1.1 Section 1.2	 Handout				
19-Jan	Section 1.3 Section 1.4	 1-5, 7, 8, 15				
20-Jan	*Last Day to Late Register, Add, Change Grading Options, Drop w/out a "W"*					
24-Jan	Section 2.1 Section 2.2	1-8, 11, 13-15 2, 3, 6-9, 16, 17, 30, 34-37	Ch 1: 9,10,11,13 (pick two)			
26-Jan	Section 2.3	1, 3-5, 7, 11-15, 22, 28, 29, 32, 35-37	2.1.19, 2.2.28			
31-Jan	Section 2.6 Section 2.7	1-5, 8-12, 15, 30-32, 36 2, 3, 5-24, 29, 33, 36, 42				
2-Feb	Review		2.3.2, 2.6.29, 2.7.22			
7-Feb	**Exam 1**	**Covers Ch 1 & 2**				N/A
9-Feb	Section 3.1 Section 3.2	1-10, 13-15, 17-22 1-7, 9, 10, 12-18, 20, 26, 31, 33-37				
14-Feb	Section 3.3	1-9, 11-14, 16-19				
16-Feb	Section 4.1	1-10, 15, 17, 18, 21	3.1.16, 3.2.27, 3.3.12			
21-Feb	Section 4.3	1-9, 13, 15, 16				
21-Feb	*Last Day to Drop with a "W"*					
23-Feb	Section 4.5	1-6, 9-11, 16	4.1.19, 4.3.12			
28-Feb	Section 4.7	1-10				
2-Mar	Review		4.5.13, 4.7.16			
7-Mar	**Exam 2**	**Covers Ch 3 & 4**				N/A
9-Mar	Section 6.1 Section 6.3	1, 2, 4, 9, 10 1-6, 12, 14, 18, 21, 34				
14-Mar	Section 5.1	1-7, 9-12, 17, 23, 31, 38				
16-Mar	Section 5.2	1-12, 23-27, 32, 33, 35	6.3.25, 5.1.25			
21 & 23-Mar		March Break			N/A	
28-Mar	Section 7.1 Section 7.2	1-10, 13-15 1-8, 10-14, 16-21, 24-28, 33, 34				
30-Mar	Section 7.3	1-5, 22, 24, 30, 32	5.2.28, 7.1.16, 7.2.15			
4-Apr	Review					
4-Apr	*Last Day to Drop with a "WP/WF" grade*					
6-Apr	**Exam 3**	**Covers Ch 5, 6, & 7**				
11-Apr	Section 8.1	1-8, 12-16, 18-21, 32, 33, 40				
13-Apr	Section 8.2	1-8, 10, 11, 13, 16, 17, 19-22	7.3.20, 8.1.22			
18-Apr	Section 6.2	1-5, 8-15, 30, 38				
20-Apr	Section 8.3	1-4, 6-12, 13, 19	8.2.18, 6.2.39			
25-Apr	Section 8.3 cont.					
27-Apr	Review Day		8.3.16			
4-May	**Final Exam**	**Cumulative Final Exam (Thursday)**	**5:00 - 7:00 PM, Room A314**		N/A	N/A

Final Exam Test B Name________________________
MAT 110 TR 12:40-1:55 Grade: / 78 + 2 Ex. Cr ( )

<u>Show all work clearly to get credit. State the name of theorems used, if any.</u> This exam has 8 pgs and 27 questions. Each question part is worth 2 pts.

1) (2 pts) The Locker Problem: Imagine an infinite hallway, with infinitely many lockers on it, starting with Locker Number 1. There is an infinite line of students lined up behind Locker Number 1. The first student walks by all of the lockers and opens each one. The second student walks by and closes every other one starting with the second one. The third student goes by and changes the position of every third locker (so if it's closed he opens it, and if it's open he closes it) starting with the 3rd locker. The fourth student goes by and changes the position of every fourth locker, and so on. <u>Which lockers will be left open, and which will be left closed? Why?</u>



1	2	3	4	5	6	7	8	9	10	11	12	13

2) (2 pts) In the Let's Make A Deal scenario, you have to guess which out of three doors has the big prize. Then you must chose whether to switch your door or stay with your door after one wrong door is revealed. Are the chances of winning better (or the same) to switch or stay? Why? (Hint: What is the probability you initially guessed wrong?)

3) (2 pts each) In Chapter 1, we introduced Sir Pinsky and his purple and gold carpet. He needed to calculate how much Gold fabric to buy for his carpet if he started with a purple square 1 yard by 1 yard.
   a) What did his carpet look like (Draw the next 2 stages)?

   Stage 1,
   all purple

   b) Explain the paradox in the carpet he created.

4) (2 pts) We saw φ (the golden ratio) appear in the Fibonnacci numbers and in the Golden Rectangle where it took on two different, but equivalent, meanings. φ is the ratio of what in each of these 2 scenarios?

5) (2 pts each) A few numbers are given below. For each number tell whether it is a prime, a perfect square, a natural number, an integer, a rational number, an irrational number and/or a real number.
   a) $\sqrt{5}$

   b) -6

   c) $0.\overline{3}$

   d) 9

   e) $\frac{4}{5}$

6) (2 pts) What can we use prime factorization for? Create your own example, and use prime factorization to help solve the problem.

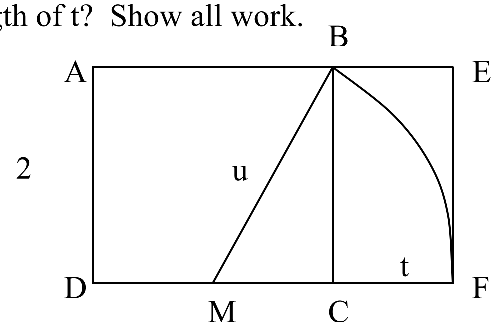
7) (2 pts) In the proof that $\sqrt{2}$ is irrational, we show that $a^2 = 2b^2$. We then argue that i) a is divisible by 2 and ii) b is divisible by 2. Explain how to argue steps i) and ii).

8) (2 pts) Can we always make a 1-1 correspondence between 2 infinite sets? Why or why not? Give examples.

9) (2 pts) Cantor's proof is often referred to as "Cantor's diagonalization argument." Explain what it is and why this is a reasonable name.

10) (2 pts) Explain the key idea in the pictoral proof for the Pythagorean Theorem?

11) (2 pts) Below is the golden rectangle construction. What is the length of u? What is the length of t? Show all work.



12) (2 pts) What is a platonic solid? Give an example.

13) (2 pts) Describe the fourth dimension. Give examples.

14) (2 pts) Why is a coffee cup topologically equivalent to a donut?

15) (2 pts) Use the edge identification of the Möbius strip to show that it has only one edge and only one side.

16) (2 pts) Suppose you flip a penny 30 times, with 18 tosses landing heads up, and 12 landing tails up. Give two possible explanations as to why you did not get 15 heads and 15 tails.

17) (2 pts) What is the probability that at least 2 people in a room of 5 have the same birthday? (I don't need a decimal – you can just set it up). What happens to the probability as the number of the people in the room increases?

18) (2 pts) Which has higher probability, throwing one fair die two times and getting a 6 and then a 3 or throwing two fair dice at once and getting a 6 and a 3 (or are they equal)? Why?

19) (2 pts) How do you calculate expectation? What does it tell you?

20) (2 pts) Should you play this casino game? You roll one fair die. If you roll a 1, then the house pays you $25. If you roll 2, then the house pays you $5. If you roll 3, you win nothing. If you roll a 4 or a 5, you must pay the house $10, and if you roll a 6, you must pay the house $15. What is the expected value of this game?

21) (2 pts) Play out the next two stages of the game of life, given this starting board (A signifies the square is alive):

	A	A		
		A		

22) (2 pts) A island population of 1,000,000 have recently discovered that HIV has been introduced into the population, and 1 out of every 1000 people have it. A government initiative declares that each person must be tested for the virus. The HIV test is 98% accurate.

a) How many people on the island have HIV? How many people do not have it?

b) Fill in the following box using the information given above:

	Have HIV	Don't have HIV
Test (+)		
Test (-)		

c) From the information derived in part b), calculate the probability that an individual has HIV, given he or she receives a (+) test result.

d) Recently in the news, a third-grader in Pennsylvannia brought her mother's insulin syringe to school with her and stuck 19 classmates with its needle. Each of the students was screened for transmittable diseases including HIV, and one student received a positive test result for HIV. Suppose you are in the PTA meeting listening to the angry parents; what can you tell them about the chances that this child has received a false positive result? (Incidentally, the child was retested with a different HIV test, and received negative results the second time).

23) (2 pts) Suppose a new vaccine that prevents SARS virus is discovered. Each injection costs $10. The government estimates it will save 1 in 10,000. If the government pays for everyone to get the shot, what would the cost per life saved be?

24) (2 pts each)

a) Describe 2 examples of infinitely repeating visual patterns we have talked about this semester.

b) Describe 2 examples of infinitely repeating numerical patterns we have talked about this semester.

c) What method did we implement for solving for one of these infinitely repeating numerical patterns? Use an example to illustrate.

25) (2 pts each) The following problems involve accruing interest on a lump sum.

a) Write the formula for calculating the final amount when investing a principle amount in a bank. Explain all variables used.

b) If you invest $5000 in a bank savings account at 4% per year compounded **annually**, what will your final amount be after 2 years?

c) If you invest $5000 in a bank savings account at 4% per year compounded **monthly**, what will your final amount be after 2 years?

d) Compare your answers in parts b) and c). Why do you expect that your answers should be the same/different?

26) You have just accepted a job after graduation in a new town. You know you will be there for a few years, so you are trying to decide weather you should rent or buy. Houses in the area you would like to live are about $80,000 after your down payment, and the going mortgage rate is 6% for a 30 year loan, compounded monthly. Use the following formula to come up with an expression to calculate your monthly payment (you do not need to simplify):

$$PMT = \frac{P \cdot \frac{r}{n}}{\left[1 - \left(1 + \frac{r}{n}\right)^{-nY}\right]}$$

27) (2 pts Extra Credit) In number 4), I mentioned we saw the golden ratio appear in the section on Fibonacci numbers and the section on Golden Rectangles. Where does it appear in the section on platonic solids?

Final Exam Writing Assignment
MAT 113: Mathematical Reasoning with Carrie Eaton
TR 3:40 - 4:55 pm, Ayres 314

4-May	**Thursday**	**Cumulative Final Exam**	**5:00 - 7:00 PM A314**

The final exam grade is the opportunity to earn 100 points. This Final Exam Writing Assignment gives you the opportunity to earn 25 points of those points at home, to be turned in at or before the final exam. The remaining exam points can be earned at the exam itself, given May 4th.

Final Exam Writing Assignment (Due at the final exam):

Write a 3-4 page essay, typed, about your exploration of mathematics through this course. Think carefully about the following questions and address each question in your essay. Write honestly and critically about your experiences.

What were your feelings about mathematics before this course?
What was your definition of mathematics?
What in general did you learn in this course?
What were the themes of mathematics introduced in this course?
If you were going to describe this class to a prospective enrollee, how would you describe it?
What components of the course most contributed to your understanding of the material?
How did using Blackboard contribute to your understanding of the course material?
What would you change about the course, including assessment and topics covered?
Has your attitude about the field of mathematics changed? If so, how?

Don't just answer the questions or write verbatim from the book; write the paper on the course as a whole in your own words. Cite references, like course book, where appropriate.

Grading of assignment (out of 25 points):

Continuous, easy-to-read, easy-to-understand flow of thought	5 points
Grammar, spelling	5 points
Correct discussion of concepts presented	5 points
Well thought out, constructive reflection on your exploration of mathematics and logical thought throughout this course, and completes assignment goal	10 points

Helpful Hints and Suggestions:

If you e-mail me a draft of your paper by the last day of classes, I would be more than happy to look it over and give it back by Monday with suggestions.

Study for your exam early. Reading through your notes, exams, homework, books and old Blackboard postings will help you recall your discovery of mathematics through this course.

Aggregate Evaluation Data

MAT 111, College Algebra, University of Maine, Fall 2002, (n = 20)

Question and Scale	Median	Mean
How prepared was the instructor for class? 1 = well-prepared; 5 = often unprepared	1.21	1.30
How clearly were the objectives of the course presented? 1 = very clear; 5 = unclear	1.75	1.80
How enthusiastic was the instructor about the subject? 1 = very much; 5 = very little	1.33	1.45
How clearly did the instructor present ideas and theories? 1 = very clear; 5 = often unclear	1.94	2.15
How much were students encouraged to think for themselves? 1 = very much; 5 = very little	1.75	1.95
How concerned was the instructor for the quality of her teaching? 1 = very concerned; 5 = unconcerned	1.41	1.80
How orderly and logical were the instructor's presentations of the material? 1 = very much; 5 = not at all	1.68	1.65
Did the instructor show respect for the questions and opinions of students? 1 = always; 5 = rarely	1.21	1.50
How often were examples used in class? 1 = very often; 5 = rarely	1.13	1.20
Overall, how would you rate this instructor? 1 = excellent; 5 = below average	1.79	1.95
Were students required to apply concepts to demonstrate understanding? 1 = very much; 5 = very little	1.41	1.65