

Austin Peay State University
MATH 1410 Structure of Mathematical Systems
Spring 2010

Instructor: Dr. David Cochener Office: CX 327 Phone: (931) 221-7804 Email: cochenerdj@apsu.edu	Office Hours: MWF 8-10 TT 9:30-11, 2:15-2:45 other times by appointment
---	---

Description: Topics include the rational number system and number theory. Emphases are problem solving, number sense, and communicating mathematics concepts with language, symbols, and concrete and pictorial representations.

Content Outline:

- (1) number sense
- (2) fractions and percents
- (3) number theory

Prerequisites: Two years high school mathematics

University Goals:

The course objectives given below are consistent with the following university goals:

- (1) Skills of inquiry, abstract and logical thinking and critical analysis;
- (2) the ability to understand and use numbers and statistics

The objectives for this course are the following Standards recommended by NCTM:

Standard 1: Knowledge of Mathematical Problem Solving

Candidates know, understand, and apply the process of mathematical problem solving.

- 1.1 Apply and adapt a variety of appropriate strategies to solve problems.
- 1.2 Solve problems that arise in mathematics and those involving mathematics in other contexts.
- 1.3 Build new mathematical knowledge through problem solving.
- 1.4 Monitor and reflect on the process of mathematical problem solving.

Standard 2: Knowledge of Reasoning and Proof

Candidates reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry.

- 2.1 Recognize reasoning and proof as fundamental aspects of mathematics.
- 2.2 Make and investigate mathematical conjectures.
- 2.3 Develop and evaluate mathematical arguments and proofs.
- 2.4 Select and use various types of reasoning and methods of proof.

Standard 3: Knowledge of Mathematical Communication

Candidates communicate their mathematical thinking orally and in writing to peers, faculty, and others.

- 3.1 Communicate their mathematical thinking coherently and clearly to peers, faculty, and others.
- 3.2 Use the language of mathematics to express ideas precisely.
- 3.3 Organize mathematical thinking through communication.
- 3.4 Analyze and evaluate the mathematical thinking and strategies of others.

Standard 4: Knowledge of Mathematical Connections

Candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding.

- 4.1 Recognize and use connections among mathematical ideas.
- 4.2 Recognize and apply mathematics in contexts outside of mathematics.
- 4.3 Demonstrate how mathematical ideas interconnect and build on one another to produce a coherent whole.

Standard 5: Knowledge of Mathematical Representation

Candidates use varied representations of mathematical ideas to support and deepen students' mathematical understanding.

- 5.1 Use representations to model and interpret physical, social, and mathematical phenomena.
- 5.2 Create and use representations to organize, record, and communicate mathematical ideas.
- 5.3 Select, apply, and translate among mathematical representations to solve problems.

Standard 6: Knowledge of Technology

Candidates embrace technology as an essential tool for teaching and learning mathematics.

- 6.1 Use knowledge of mathematics to select and use appropriate technological tools, such as but not limited to, spreadsheets, dynamic graphing tools, computer algebra systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.

Standard 7: Dispositions

Candidates support a positive disposition toward mathematical processes and mathematical learning.

- 7.3 Commitment to learning with understanding
- 7.6 Use of various teaching tools including technology

Austin Peay State University
MATH 1410 Structure of Mathematical Systems
Spring 2010

<p>Standard 9: Knowledge of Number and Operation Candidates demonstrate computational proficiency, including a conceptual understanding of numbers, ways of representing number, relationships among number and number systems, and the meanings of operations.</p> <p>9.1 Develop the meaning of addition, subtraction, multiplication, and division and provide multiple models for whole number operations and their applications.</p> <p>9.2 Recognize the meaning and use of place value in representing whole numbers and finite decimals, comparing and ordering numbers, and understanding the relative magnitude of numbers.</p> <p>9.3 Demonstrate proficiency in multi-digit computation using algorithms, mental mathematics, and computational estimation.</p> <p>9.4 Analyze integers and rational numbers, their relative size, and how operations with whole numbers extend to integers and rational numbers.</p> <p>9.5 Demonstrate knowledge of the historical development of number and number systems including contributions from diverse cultures.</p>	<p>Standard 10: Knowledge of Different Perspectives on Algebra</p> <p>10.1 Explore and analyze patterns, relations, and functions.</p> <p>10.2 Recognize and analyze mathematical structures.</p> <p>10.3 Investigate equality and equations.</p> <p>10.4a Use mathematical models to represent quantitative relationships.</p> <p>10.5 Analyze change in various contexts.</p> <p>10.6 Demonstrate knowledge of the historical development of algebra including contributions from diverse cultures.</p>
---	--

Text: *Reconceptualizing Mathematics: Reasoning about Numbers and Quantities*

Nature of Instruction

As often as possible, concepts are approached from a problem solving viewpoint. Mathematical explorations involving materials (e.g. attribute blocks), calculators, and computers provide contexts for some of the concepts taught. Lecture and demonstrations are used when appropriate.

Out-of-Class Requirements

Assignments are given nearly every day. Students are expected to check the class web site between class periods for updates, information, corrections, etc... Students are expected to read and interpret mathematical exposition.

Withdrawal

January 27, 2010 is the last day for withdrawing from the class without record. February 25, 2010 is the last day to drop the course with an automatic "W." March 26, 2010, is the last day to drop prior to the mandatory F period.

Philosophy

The philosophy of mathematics education that underlies the choice of content and instructional methods is consonant with the vision of mathematics education depicted in the 2000 NCTM document Principles and Standards for School Mathematics. We assume that students learn by constructing meaning for the concepts and symbolism they encounter as they actively engage in problem solving. Thus, as instructors we strive to create an environment in which preservice teachers can explore mathematics. We also assume that not only are we teaching mathematics explicitly through our instruction but we are also implicitly providing a model for how one might approach teaching mathematics. Thus, we reflect on the pedagogy at two levels:

- 1) how well does the instruction help students, who are preservice teachers, to learn mathematics;
- 2) how well does the instruction prepare preservice teachers, who are our students, to think about teaching mathematics.

Class Attendance and Decorum

Regular and prompt class attendance is expected. If you have no unexcused absences, a bonus of 2 points will be added to your final average. A bonus of 1 point will be added for only one unexcused absence. Five days of unexcused absence will constitute a mandatory failure or withdrawal, whichever is appropriate. Arriving late or leaving early may count as an unexcused absence at the instructor's discretion. All cell phones, pagers, etc. should be turned off during class. Each cell phone interruption will result in a 5-point deduction. Students will be expected to work together in cooperative groups.

Austin Peay State University
MATH 1410 Structure of Mathematical Systems
Spring 2010

Conduct

Students are expected to conduct themselves appropriately at all times. Academic and classroom misconduct will not be tolerated. Students must read the "Code of Student Conduct" in the new Student Handbook for an understanding of what will be expected of them within the academic setting.

Mid-Term Grades

A mid-term grade will be awarded for all students in this course. The grade awarded may not necessarily be based on 50% of the course requirements and may or may not differ from the final grade. Your mid-term grade will be posted on *AP Web*.

Disabilities

Any student who has a disability that may affect his/her academic performance is encouraged to make an appointment with me to discuss this matter, or you may contact Disability Services; telephone 221-6230; voice 221-6278; voice tty.

Minors on Campus: Minors (any non-student under the age of 18) accompanying staff, faculty, students, or visitors on campus are not permitted in the classroom. For additional information on minors on campus, contact the Office of Student Affairs in the Morgan University Center.

ASSESSMENT

- Homework: On ten or more days, homework will be collected at the BEGINNING of the period. No late homework will be accepted for any reason. The homework will be checked for EFFORT. Each student will receive from zero to five points. I expect to see something recorded for every question. If you have no idea how to work a problem, at least record the important information or write what you think you know. Only 8 homework scores will be included in your final grade.
- Homework Presentations: Every student will be expected to present at least two homework problems, which will be worth up to 10 points (3 points for a correct answer; 2 points for correct notation and language; 5 points for a thorough and reasonable solution and explanation of your thinking.)
- **Feedback:** Before each test, there will be a Feedback assignment with problems that address the major ideas covered since the previous test. The purpose of these assignments is to provide feedback on solutions. These assignments are worth up to 30 points each. Each Feedback assignment will be taken up at the BEGINNING of the period in which it is due. Late work will receive NO CREDIT. These take-home assignments CANNOT be made up. Fifteen of the 30 points will come from individual work. On the day feedback is taken up, students will work in groups on the feedback. The group's score will account for the other 15 points of the feedback score. The lowest feedback score will be dropped. Students who do not turn in the individual work will not receive credit for the group work.
- Extra Credit: A student can earn up to 25 extra credit points. Each additional homework presentation will be worth 2 extra credit points. There will probably be other extra credit opportunities as well.
- Tests: There will be 3 major tests and one final examination. There will be no make-up tests given. Failure to test as scheduled will result in a 0. During tests, all digital media except calculators (cell phones, pagers, etc.) must be turned off and placed on your desk.

Assessment	Homework (8)	Presentation (2)	Feedback (2)	Tests (3)	Final (1)	Total Points
Points Each	5	10	30	100	150	
Total	40	20	60	300	150	570

A, [90%, 100%]; B, [80%, 90%]; C, [70%, 80%]; D [60%, 70%); F [0%, 60%)

The above schedule and procedures are subject to change in the event of extenuating circumstances.