Math 467: Introduction to Number Theory, Lecture 001, Fall 2023

Course Information

Course Description: An introduction to proof writing techniques through a study of classical topics in elementary number theory. Topics include the divisibility, basic properties of primes, congruences, Fermat's theorem.

Credits: 3.

Course Designations and Attributes:
Breadth – Natural Science
Level – Advanced
L&S Credit – Counts as Liberal Arts and Science credit in L&S

Requisites: MATH 234, 375, (222 and MATH/COMP SCI 240), (222 and 320), or (222 and 340).

Meeting Time and Location: MWF: 09:55am–10:45am in Sewell Social Sciences Hall, room 6102.

Instructional Modality: Classroom Instruction.

Instructor: Mikhail Ivanov, Teaching Faculty, *Email:* mivanov@wisc.edu

Instructor Office hours: MW: 1pm–2pm in Van Vleck Hall, room B224, or by Appointment.

Grader: Jiahao Wan jwan23@wisc.edu.

Course Assistant: Tianze Huang thuang255@wisc.edu. W: 6pm–8pm, Th: 5pm–6pm in Van Vleck Hall, room B227.

Course Learning Outcomes

By the conclusion of this course, students are expected to be able to:

- Understand and use the standard methods and tools of mathematical argument (e.g. direct and indirect methods, the construction of examples and counterexamples, induction arguments).
- State and describe the formal definitions of the mathematical objects and their properties used in elementary number theory (e.g., divisibility, prime numbers, congruences, etc.).
- State and apply the main theorems in elementary number theory (e.g. theorems related to modular arithmetic, divisibility, prime numbers, Fermat's Little Theorem).

- Prove or disprove statements and evaluate the validity of arguments related to the definitions, properties, and theorems elementary number theory.

How Credit Hours are Met by the Course

This class meets for three 50-minute class periods each week over the fall semester and carries the expectation that students will work on course learning activities (e.g. reading, problem sets, papers, and studying) for about two hours outside of classroom for every class period. The syllabus includes more information about meeting times and expectations for student work.

Course Overview

The course provides a systematic study of elementary number theory with the use of abstraction and logical reasoning. We will cover roughly Chapters 1–7 and 12 in the text.

Course Website and Digital Instructional Tools

- Our Learning Management System is Canvas. All important course information will be relayed through Canvas. It is your responsibility to read any Canvas announcements.
- We will use Piazza. This page is a forum for you to discuss the material of this class with other students and your TAs and/or instructor. Posts to this page should be confined to questions regarding the material and logistical questions about the class (e.g., exam dates and locations). Any posts containing comments (either positive or negative) about the instructors, the class, the students, or anything else, will be deleted. Unprofessional conduct may result in disciplinary action. Please do not use email for math questions.
  You can use private question in Piazza to communicate with Instructor about personal circumstances.
- We will use Gradescope to grade exams. Instructions will be shared later.

Required Textbook, Software and Other Course Materials

- David Burton's "Elementary Number Theory". Editions 5, 6 and 7 are ok.

Exams, Quizzes, Papers, Homework and Other Assignments

Homework. Weekly homework assignments can be accessed through the Canvas website. Written assignments will be several questions long and will be assigned weekly usually due on Fridays. The way assignments will be submitted (online or in-person) is to be determined by grader.

Collaborating with other students on the homework is encouraged, but you must write up all reasoning and solutions on your own (in other words, no copying). Failure to abide by this guideline could be construed as a form of academic dishonesty.

Each problem should be completed with neat, understandable, detailed solutions and explanations. Your explanations and proofs must be sound and rigorous, paying attention to detail and clarity.

Late homework will generally not be accepted. Since it is quite likely that during the semester you will either experience a technical difficulty (e.g., missed the deadline, your

computer shut down as you were submitting it, internet outage, etc) or a personal emergency (being sick, attending a funeral, etc), the two lowest HW scores will be dropped. You do not need to contact your instructor if such a situation does come up.

Exams. The course will have five exams. The exams will be in-class exams. No notes, books, cell phones, or other devices will be permitted during the exams.

Exam I, II, III, IV will cover corresponding materials, Exam V will be cummulative.

- Exam I: Friday, September 22, 9:55am–10:40am.
- Exam II: Friday, October 13, 9:55am–10:40am.
- Exam III: Friday, November 10, 9:55am–10:40am.
- Exam IV: Wednesday, December 13, 9:55am–10:40am.
- Exam V: Thursday, December 21, 14:45pm–16:15pm.

One lowest exam will be dropped at the end of the semester.

Participation. This course depends on students' active participation in class discussions and group works. You are expected to engage your fellow classmates in relevant discussions, work on the assigned problems, ask questions, share your approach to problems, keep on task by contributing ideas and analyze material of lectures after class. Your attendance and attention are important to your success in this course. Please remove any distractions while attending this course. If you experience long-term absence due to a serious illness with verification or accommodations from the McBurney Center, then contact your instructor.

Grading

In this course, you will be evaluated based on components described above with their corresponding percentages:

Homework	10%
Exams	90%

Grading Scale. Final grades will be curved.

Calculator Policy. During an exam no books, notes, calculators, cell phones, pagers, or any electronic devices will be allowed.

Academic Policies and Statements

- Academic Calendar and Religious Observances
- Academic Integrity Statement
- Accommodations for Students with Disabilities
- Course Evaluations
- Diversity and Inclusion Statement
- Mental Health and Well-Being Statement
- Privacy of Student Records and the Use of Audio Recorded Lectures Statement
- Students' Rules, Rights and Responsibilities
- Teaching and Learning Data Transparency Statement

Mathematica

Mathematica and Wolfram—Alpha Pro are available at no charge to UW Madison students. They are useful for: (a) solving problems, (b) obtaining step-by-step solutions, and (c) writing programs with the assistance of Artificial Intelligence. (AI chat is built in.) To get access, go to www.wolfram.com/siteinfo and enter your University of Wisconsin email. (Here are click-by-click steps if you need them: wolfr.am/UWMadison) Learn how to use Mathematica at www.wolfram.com/wolfram-u/