

Elementary Number Theory

MATH 4573

Instructor Info

Claire Merriman

Office Hours: TBD

Link available on Carmen

carmen.osu.edu

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Course Info

Prereq: C- or better in 3345 or 4181H; or credit for 345 or 264H.

Mon, Wed, Fri 11:30a-12:25p

Link available on Carmen

Grading

Participation	10%
Reading assignments	10%
Quizzes	10%
Homework	50%
Projects	20%

Grading scale

A	90-100
B	80-89
C	70-79
D	60-69
E	0-59

Projects

Project 1	February 5
Project 2	March 5
Project 3	April 2
Project 4	April 23

Overview

This course will cover all of Chapters 1-5 and 7, and most of Chapters 6, 8 and 10 in *Elementary Number Theory* by Gareth A. Jones and J. Mary Jones. We will also cover basic cryptology, using notes uploaded to Carmen. The main goals of the course are to:

- understand primes and factorization
- understand modular arithmetic and some methods for solving systems of congruences
- understand connections between modular arithmetic and groups, rings, and fields
- connect modular arithmetic to integer valued functions
- solve problems using quadratic reciprocity
- understand several techniques for solving Diophantine (integer solution) equations

Assignments, quizzes, and grades will be posted on Carmen.

If you are sick or otherwise have to miss class, contact me as soon as possible about making up missed work and turning in assignments.

Material

The main text is *Elementary Number Theory* by Gareth A. Jones and J. Mary Jones, ISBN: 978-3-540-76197-6. Digital copy available through the OSU library.

We will also use several sections of *Number Theory Revealed: A Masterclass* by Andrew Granville, ISBN: 978-1-470-45424-1. Digital copy available through the OSU library.

Additional notes uploaded to Carmen, mostly from *Elementary Number Theory* by James K. Strayer and *Number Theory: A Lively Introduction with Proofs, Applications, and Stories* by James E. Pommersheim, Tim K. Marks, and Erica L. Flapan.

Technology

You will need a webcam, microphone, and way to participate in Zoom chat MWF 11:30-12:25. Participation in the breakout room discussions are a significant portion of your grade.

All regular course meeting Zoom main meeting rooms will be recorded, captioned, and uploaded to Carmen after class. Breakout rooms are not recorded.

You will also need a way to submit assignments as PDFs on Gradescope. This may be photos/scans of handwritten work or PDFs of typed work. A list of options is available on Carmen.

Inclusively Statement

I expect this course to be a place where you will be treated with respect. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class. No student should be marginalized in any form for questions or contributions made in class, during office hours, or on Carmen discussion boards. Students should cooperate to help each other's understanding of the mathematical concepts discussed in lecture regardless of their background. Creating or contributing to a hostile environment during class or through the discussion boards/email will result in lost participation points.

Remember that everyone comes to the class with different personal and mathematical backgrounds. If someone has seen some of the course material before, that does not mean everyone has seen it before or that I expect you to already know it.

Discrimination against any individual based on age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status will not be tolerated.

Participation

This class will involve more in-class participation than you might be used to in a math class. Each class you will be assigned a group to work with. There will be a few problems throughout each lecture for the groups to solve. Participation will mostly be based on working on these group problems during class.

In addition to sharing these solutions in class, you will write up the solutions as part of your homework assignments.

You can earn up to 3 points per class session for active participation. You must arrive on time and stay for the whole session. Absence or tardiness will result in a lower participation score for the day. However, I acknowledge the online format will make it harder to arrive on time, especially if you have an in-person class at 10:20.

- 10 to 15 minutes late or leave 5 to 10 minutes early: 2 points maximum
- 15 to 20 minutes late or leave 10 to 15 minutes early: 1 point maximum.
- More than 20 minutes late, leave more than 15 minutes early, or unexcused absence: 0 points.

The instructor reserves the right to deduct additional points for distracting behavior, creating a hostile group environment, or lack of active participation.

The best way to interact with your group in breakout rooms is with your microphone, and to use a shared work space such as a virtual whiteboard. Zoom chat is a good backup for audio, although it takes longer and does not show when someone is typing.

If you are unable to attend on a certain day due to illness or technological difficulties, we will work together to determine a plan for making up the work.

The lowest 3 scores will be dropped.

Reading assignments

There will be mini homework assignments for each class. These will be one or two short calculations or proofs. The goal of these assignments is to familiarize yourself with the material before coming to class. They will be graded on a mix of completion and accuracy.

The lowest 2 grades will be dropped. Reading assignments will be due at the beginning of class.

Quizzes

There will be 1-3 question quizzes on Carmen each Friday, mostly focused on true/false questions. These quizzes are open notes, but have a short time frame from when you open the quiz. If you have testing related SLDS accommodations, it is important that you let me know so that I can make the changes in Carmen.

The lowest 2 quiz grades will be dropped.

Homework

Weekly homework assignments will cover the material from the past week's lecture and reading assignments. You are encouraged to work together on the problems; however, you must write up your own solutions and submit them individually.

Each homework assignment will have four sections: problems from class, calculations and applying algorithms, short proofs, and specific case/generalization. The specific case problems are ones where we prove a theorem in class, then you are asked to recreate the proof for a specific case (such as $n = 5$). The general case problems are the opposite, where we do a specific case in class and you prove it in general.

All problems will be graded on accuracy of the mathematical argument and clarity of the explanation. Homework will be submitted to and graded on Gradescope. However Gradescope will only show the score for each problem. Ignore Gradescope's overall assignment score.

Each homework will be graded out of 10. The rubric for each homework will be on the corresponding assignment page on Carmen.

Assignments should be legible—you should work out problems then write up a new, final version. Leave enough room for each problem and write them up in order. Problems or assignments that are messy may result in lower grades.

After the homework is graded, *you may revise your answers based on the feedback and resubmit for a new grade* due two weeks after the original due date.

Since you may resubmit any homework assignment for a new grade, no scores will be dropped. If you resubmit an assignment, the new grade replaces the old grade. For up to three homework assignments, you may submit a third time for a new grade, due four weeks after the original due date. In order to submit a third time, you must have already submitted a reasonable attempt at every problem on the assignment.

Projects

There will be four short projects during the semester. For two of these projects, you will pick from a list of longer homework-style problems to work on. The list will include generating conjectures, harder versions of homework problems, and short coding projects.

For the other two projects, you will explain a topic from our course to someone not in the course. Create a document, website, app, video, podcast, song, cartoon, dance, etc that explains the idea. The purpose of this assignment is to help you process definitions, but you are also invited to have fun with it.

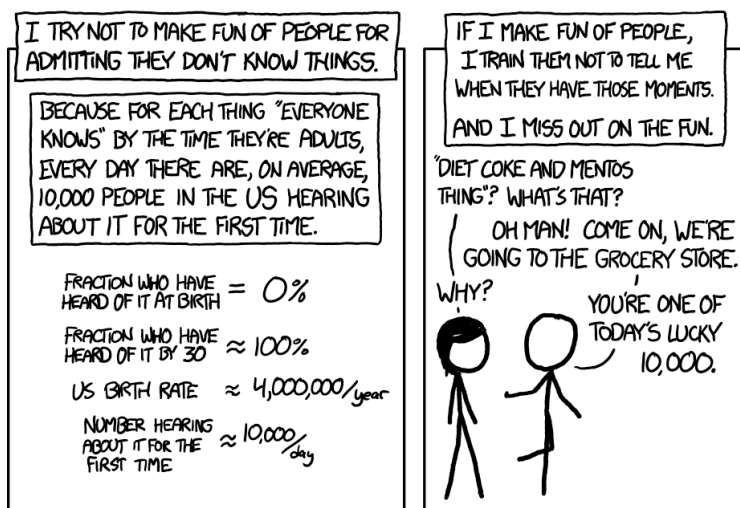
Course Notes

Course notes will be posted on Carmen under Modules. The files will be updated after each class, with one file per week.

Group Work

Much of your time in class will be spent working in groups. You are expected to be a helpful and active participant in all group work, as well as allowing the rest of your group to do the same. This means asking and answering questions, as well as working at the same pace as your group. You have not completed a problem until all of your group members understand the solution.

You are at a point in your education where everyone is taking courses in different orders. The topics in this course may also be more or less familiar depending on what other courses you have taken or if you have been involved in any math competitions. If you have already seen a concept that we cover in class, view this as an opportunity to learn about it from a different perspective and practice explaining math to others.



Office Hours and Carmen Discussion boards

You are highly encouraged to attend office hours and post in the Carmen discussion boards. The office hours link will be available on Carmen.

Office hours are a chance for you to ask questions and to get feedback on course assignments prior to submitting them. In the event you are unable to attend office hours, you may request an appointment.

Carmen discussion boards allow you to ask questions outside of class and office hours, as well as get feedback from your classmates.

I will respond to discussion board posts and emails within 24 hours on weekdays.

Technological Difficulties

I expect that all students will run into some sort of technological difficulties throughout the semester. All students get 3 late passes that allow them to turn in a homework up to 24 hours late for any reason.

Note that Gradescope does mark if your assignment is even a minute late, but I will generally be more flexible. Please do not make a habit of turning in assignments at 1 am.

If you know that you have an unreliable internet connection or laptop/tablet, we can make arrangements similar to SLDS deadline modifications. These arrangements need to be made ahead of time and do not exempt you from group work.

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- Self-Service and Chat support: <http://ocio.osu.edu/selfservice>
- Phone: 614-688-HELP (4357)
- Email: 8help@osu.edu
- TDD: 614-688-8743

Academic Integrity

Your homework and projects will be submitted individually. Though you may discuss your solutions with any of your classmates, you are expected to write your final submissions on your own. Any copying of work which is not your own is an academic integrity violation. In addition, allowing others to copy your work (in person or by making it available electronically) is an academic integrity violation. If you work on a problem with a classmate (in or out of class) you should acknowledge this collaboration by making a statement of the form “For this problem, I collaborated with . . .”.

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

Make-up Policy

If you know ahead of time that you need to miss a class, let me know as soon as possible. The plan for making up work will depend on the assignment and the reason you missed class. Late assignments will be handled on a case-by-case basis. You can make up participation for excused absences such as illness, family emergency, or technological difficulties. If you are unsure about whether an absence is excused, talk to me.

Even though this course is entirely online, you may not be able to focus on school work if you are sick. If you are dealing with longer term illnesses or other life events that are interfering with your ability to attend class, reach out to me about how to handle assignments and attendance.

Mental Health Statement

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life’s Counseling and Consultation Service (CCS) by visiting ccs.osu.edu or calling 614-292-5766.

CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.

Accommodations for Students with Disabilities

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion.

SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.