Elementary Number Theory

MATH 4573

Instructor Info —

Claire Merriman

Office Hours: TBD

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Course Info ———

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

Mon, Wed, Fri 11:30am-12:25pm

Smith Lab 1064

Textbook ————

Elementary Number Theory by Gareth A. Jones and J. Mary Jones. Digital copy available through the OSU library.

Additional readings uploaded to Carmen.

Grading ————

A	93-100	A-	90-92		
B+	87-89	B	83-86	B-	80-82
C+	77-79	C	73-76	C-	70-72
D+	67-69	D	60-66		
E	0-59				

Rounding grades will be based on semester long attendance and utilization of the resubmission process.

Projects and Papers

Break-it Down Project	February 11
Draft Paper 1	March 11
Paper 1	March 25
Draft Paper 2	April 15
Paper 2	April 29

Course Goals

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

The goals of this course format and homework grading are to:

- Increase student confidence in their ability to solve difficult math problems by using previous results, trying different methods, asking questions, and working with others
- Increase student confidence in their ability to judge when a solution is "done."
- Improve student's mathematical communication skills
- Improve student's mathematical writing

Course Notes

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

Solutions to reading assignments and some in-class problems will be included in the notes. Other in-class assignments will be submitted as homework problems.

Poll Everywhere Questions

There will be two Poll Everywhere polls for this course at: `https://pollev.com/nmath735`.
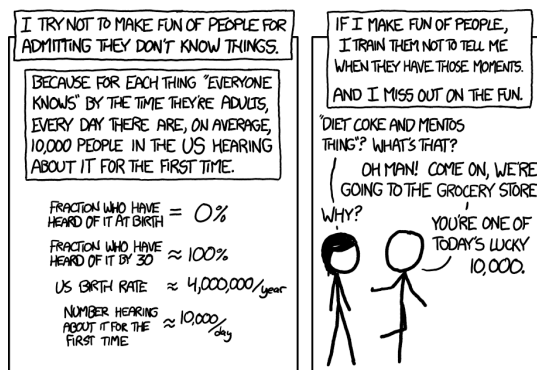
The "Questions about the reading" poll will be available until 10 am the day of class. I will incorporate these questions into the lecture for the day.

The "What questions do you have?" poll will be available during class. This poll should be used for questions you don't want to forget to ask, not a replacement for raising your hand to ask questions in class.

Classroom Expectations

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.

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. 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.

I TRY NOT TO MAKE FUN OF PEOPLE FOR ADMITTING THEY DON'T KNOW THINGS.

BECAUSE FOR EACH THING "EVERYONE KNOWS" BY THE TIME THEY'RE ADULTS, EVERY DAY THERE ARE, ON AVERAGE, 10,000 PEOPLE IN THE US HEARING ABOUT IT FOR THE FIRST TIME.

$$\text{FRACTION WHO HAVE HEARD OF IT AT BIRTH} = 0\%$$
$$\text{FRACTION WHO HAVE HEARD OF IT BY 30} \approx 100\%$$
$$\text{US BIRTH RATE} \approx 4{,}000{,}000/\text{year}$$
$$\text{NUMBER HEARING ABOUT IT FOR THE FIRST TIME} \approx 10{,}000/\text{day}$$

IF I MAKE FUN OF PEOPLE, I TRAIN THEM NOT TO TELL ME WHEN THEY HAVE THOSE MOMENTS.

AND I MISS OUT ON THE FUN.

"DIET COKE AND MENTOS THING"? WHAT'S THAT?

OH MAN! COME ON, WE'RE GOING TO THE GROCERY STORE.

WHY?

YOU'RE ONE OF TODAY'S LUCKY 10,000.

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.

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. Reading assignments are available for the entire week starting on Saturday.

The lowest 2 grades will be dropped. Reading assignments are due at 10 am the day of class and will not be accepted more than 5 minutes after the start of class.

You may also submit questions about the readings at `https://pollev.com/nmath735` by 10 am before class. These questions will be incorporated into the lecture for the day.

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 two sections: "Proofs and Writing" and "Calculations and Algorithms". The rubrics for the "Proofs and Writing" questions will be on the corresponding assignment page on Carmen before the assignment is due. "Proofs and Writing" questions are always worth 4 points. The point values for all problems will be available on Gradescope.

Assignments should be legible–you should work out problems then write up a new, final version. Homework should be on a separate page or in a separate file from you course notes. Problems or assignments that are messy may result in lower grades.

After the homework is graded, **you may revise your answers to the Proofs and Writing question based on the feedback and resubmit for a new grade** due one week after the original due date. If the graded assignments are not returned by the class before the resubmission deadline, this deadline will be adjusted.

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 two 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. You are responsible for keeping track of when you have used your three extra resubmissions.

Break-it Down Project

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. Examples and rubrics will be available on Carmen.

Papers

An important part of mathematical communication is writing proofs. You will write two papers that are similar to long homework assignments, where all of the problems are related. The topics and guidelines will be posted on Carmen.

Late Work

All students get 3 late passes that allow them to turn in a homework, resubmission, break-it down assignment, draft, or paper up to 24 hours late. You are responsible for keeping track of when you have used all of your late passes.

Reading assignments will not be accepted more than 5 minutes after the start of class. Any questions submitted after 10 am the day of class will not be incorporated into the lecture for the day.

Late homework assignments will be considered resubmissions.

Late Break-it down Assignments, Drafts and Papers will be assess a 10 percentage point penalty per 24 hours late, and not accepted after one week.

Make-up Policy

Please stay home if you are sick. While I strive to make class time worth your while, there is no attendance or participation grade in this class. Notes are available on Carmen. You will have a much easier time completing the classwork when you are recovered, and staying home will prevent you from getting others sick.

If you need to miss class due to excused absence, we will schedule a time to discuss the material you missed. Note: this is *not* a replacement for attending class and intended for short term (less than one week) illnesses, family emergency, University sponsored travel, or religious holidays. Some excused absences may require documentation. Zoom links will only be provided with SLDS accommodations, and students are encouraged to make an appointment to discuss course material after returning to campus.

If you are dealing with longer term illnesses or other life events that are interfering with your ability to attend class or complete, reach out to me about how to handle assignments. These may require documentation.

Office Hours and Carmen Discussion boards

You are highly encouraged to attend office hours and post in the Carmen discussion boards. Office hours will be scheduled base on the course survey 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.

Academic Integrity

Your reading assignments, homework, break-it down assignments, and papers 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**. If you work on a problem with someone else (in or out of class) you should acknowledge this collaboration by making a statement of the form "For this problem, I collaborated with. . . ".

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 use a source that is not our course notes or a linked resource on Carmen, you must cite them in the final write up. You do not need to use any specific format for your citations–just provide enough information that I can find the resource. You may not look up solutions to any problem assigned in the course on the internet. Once you have seen a full solution, it is not possible to independently develop a solution.

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 `https://http://studentlife.osu.edu/csc/`.

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 `https://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 `https://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; `https://slds.osu.edu`; 098 Baker Hall, 113 W. 12th Avenue.