

# NUMBER THEORY

Summer 2022, Session 2

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<b>Instructor:</b>	Sam K. Miller	<b>Time:</b>	MWF 11:00 - 01:30 PST
<b>Email:</b>	<a href="mailto:sakmille@ucsc.edu">sakmille@ucsc.edu</a>	<b>Place:</b>	Zoom
<b>Office Hours:</b>	T 11:00 - 1:00	<b>TA:</b>	N/A

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**Course Description:** The goal of this course is to introduce students to the study of number theory, a mathematical field which asks questions about, among many things, integers and integer-valued functions, with a special emphasis on primes. The course will be divided into two portions; in the first half, we will study topics such as the Euclidean Algorithm, primes, rational and algebraic numbers, and other integer systems. In the second half, we will introduce the world of modular arithmetic and its applications.

## Textbook:

- *An Illustrated Theory of Numbers* by Martin Weissman

In addition, the following handout will be a handy reference for using good mathematical style when writing proofs or problem writeups: [“Guidelines for Good Mathematical Writing”](#) by Francis Su.

## How You Will Be Evaluated:

There are three main deliverables in this course: in-class work (10%), homework (40%), exams (50%). No scores in this course will be curved - I do not believe that students should be forced to compete with each other in this way. The following grading scale will be used, with a passing grade a C or higher:

<b>A+</b>	$\geq 95\%$	<b>B+</b>	80 – 84%	<b>C+</b>	65 – 69%	<b>D</b>	40 – 54%
<b>A</b>	85 – 94%	<b>B</b>	70 – 79%	<b>C</b>	55 – 64%	<b>F</b>	$< 40\%$

*Homework:* Homework will be assigned on a weekly basis, due before Monday’s lecture on Gradescope. I strongly believe that learning mathematics happens by doing mathematics, not just hearing mathematics, so I will design the homework in a way that is as beneficial to your understanding of the course material as possible. Homework must be written *in proper English*, and justifications for any statement made must be present and clear. Homework will be graded based on style as well as correctness - I encourage you to refer to Francis Su’s handout above when proofreading your homework. **Homework must be typeset**, preferably with  $\text{\LaTeX}$ . Resources for learning  $\text{\LaTeX}$  may be posted on Canvas or found online.

I highly encourage each and all of you to work with your peers if possible (I know it can be difficult remotely), however you must write up your own solutions to each problem individually and *must list each person you worked with*. This will help me gain a sense of your problem-solving ability with regards to the course, and will help me make adjustments and cater to your academic needs. Productive struggle is how math is learned, and the homework will be designed in that way.

*Exams:* Exams are the primary way you will demonstrate proficiency in this course. There will be two exams, with the final being cumulative. Details and rules of the exams will be presented closer to the official dates of each exam, but I expect each student to adhere to the guidelines presented for Academic Integrity. I also believe that not everyone learns at the same pace, and it is the understanding one has at the end of the quarter which matters. In the spirit of this, I offer the following: if a student performs better on the final exam than the midterm, the midterm grade will be replaced with the final exam.

*In-Class Work:* Math110 is a big step up in mathematical maturity from the lower-division mathematics courses, and will present novel challenges. Practice writing proofs and solving proof-oriented problems is invaluable, and a considerable amount of time during each lecture will be spent working on problems. During most lectures, we will work on example problems, and I will assign one to be turned in before the following lecture. All rules which apply for homework also apply for these write-ups.

**Academic Integrity:** “All members of this course are responsible for maintaining their integrity and the integrity of the college community in all academic matters and in all affairs concerning the community.”

All members of the UCSC community benefit from an environment of trust, honesty, fairness, respect, and responsibility. You are expected to present your own work and acknowledge the work of others in order to preserve the integrity of scholarship. Academic integrity includes:

- Following exam rules
- Using only permitted materials during an exam
- Viewing exam materials only when permitted by your instructor
- Keeping what you know about an exam to yourself
- Incorporating proper citation of all sources of information
- Submitting your own original work

Failure to adhere to these standards will result in disciplinary action. Exams which are determined to have been completed unfairly *will be voided*.

**Inclusion & Equity:** My goal is to welcome *everyone* to the beautiful study of proofs and proof-writing. There is no such thing as a person who is innately “good at math” and I believe that everyone in this class is fully capable of engaging and mastering the material through practice and productive struggle. I will try my best to make our classroom an inclusive space, where ideas, questions, and misconceptions can be discussed with respect. There is usually more than one way to see and solve a problem and we will all be richer if we can be open to multiple paths of knowledge and understanding. I am committed to creating a classroom environment that welcomes all students regardless of race, gender, social class, religious beliefs, et cetera. We all have implicit biases, and I will try to continually examine my judgments, words, and actions to keep my own biases in check and treat everyone fairly with respect. I hope that you will all do the same, and that you will let me know if there is anything I can do to make sure everyone is encouraged to succeed in this class.

**DRC Statement:** UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me by email, preferably within the first two weeks of the quarter. I would also like us to discuss ways we can ensure your full participation in the course. I encourage all students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089 or by email at [drc@ucsc.edu](mailto:drc@ucsc.edu).