Math 245: Discrete Mathematics
Spring 2026

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Course Content: This course is a rigorous introduction to many of the tools useful in higher mathematics and computer science. The major topics to be covered will be logic and proof techniques. Also included will be a brief introduction to set theory, number theory, relations, functions, recurrences, and complexity.

Text: *Mathematical Maturity via Discrete Mathematics*, by Vadim Ponomarenko.

Prerequisites: Math 124 or Math 150, with a grade of C or better; Math 151 is recommended.

Course Organization: The course is organized as follows.

- This course has in-person meetings three times per week, all of which students must attend. There are also many office hours, held by the professor or the ISAs, which students are highly encouraged to visit regularly.
- Class meetings will include a definition quiz, on Canvas. Students will need to take these quizzes on their phones or laptops.
- Students are expected to produce solutions to all exercises, but will not turn any homework in for credit. Completing these problems is vital to success in the course. You are strongly encouraged to bring these solutions to office hours and use that time to obtain feedback.
- There will take four midterm exams taken throughout the semester.

Exercises in this course are likely very different than you are used to in your previous math courses. One of the primary things we will be learning in this course is how to construct and communicate logical arguments. Unlike your previous math courses (e.g., calculus), where the majority of your work on a problem involves calculations, and your final answer is often a number, function, or formula, in this course many problems will require writing an argument that is (i) mathematically and logically sound, and (ii) communicated clearly and unambiguously to the reader.

Now, both (i) and (ii) typically have multiple options: there are often different logical arguments that may be used to derive the desired conclusion, and there are often different ways to communicate the same argument in writing. Additionally, there are a lot of subtleties and pitfalls that are easy to miss; sometimes, the distinction between a valid argument and an invalid one lies in word choices that would be inconsequential in non-technical settings.

With all of this in mind, expect that many homework problems will require repeated attempts to obtain a solution, and that getting feedback on your solutions will be *vital* to ensuring mastery of the material; it is not enough to simply compare your writeup to another and conclude "yeah, they seem pretty much the same". As the semester progresses and we learn to construct logical arguments, we will learn to locate potential pitfalls in our logic/communication and avoid them in our solutions. But while we build and refine those skills, the only way to reliably check solutions and get the necessary feedback is by utilizing office hours, study groups, and the class Discord server. These resources are essential supplements to independent worktime on exercises.

Students are strongly encouraged to form study groups, ideally of size 4, and to meet with their groups at least weekly to discuss homework solutions. Office hours are a good place to get to know people for a study group.

Grading Policy: Your grade will be determined by four midterm exams, a cumulative final exam, daily lecture quizzes, and participation (office hours visits), weighted as follows.

Daily Quizzes	*1 quiz/lecture*	20%	A = 90-100
Midterm Exam 1 (Ch 1-4)	*Friday, February 20*	20%	B = 80-89
Midterm Exam 2 (Ch 5-7)	*Friday, March 13*	20%	C = 70-79
Midterm Exam 3 (Ch 8-10)	*Wednesday, April 15*	20%	D = 60-69
Midterm Exam 4 (Ch 11-13)	*Friday, May 8*	20%	F = 0-59
Total		100%	

Homework: Students are expected to solve every exercise in the "Big Book O' Exercises" supplement, and are encouraged to seek help from their study group, office hours, and the course Discord server. The math department also keeps a list of paid tutors.

Students are advised to be cautious seeking help from other online sources (e.g., a friendly video/website, or AI); as described above, there are subtle differences between valid and invalid logical arguments, and the reliability of the authors/creators of online sources are often difficult to verify (posted credentials, perceived correctness/confidence, etc., can all be misleading). When in doubt, seek assistance from humans associated with this course (the instructor, ISAs, or classmates/groupmates).

Office Hours: The primary purpose of office hours is to seek hints/guidance on homework problems and feedback on mathematical writing. Although they are not required, **regular attendance is critical for success** and thus highly, highly recommended.

Quizzes: On all class days except exam days, students take a 4 minute quiz, typically on recent material. These quizzes consist of true/false and multiple choice questions. Students may use their textbook and notes if they wish, but may not ask for help from other people. Makeup quizzes are not given under any circumstances. Quizzes must be completed before 11:10am, at which time solutions will be released in Canvas for 24 hours. We will take approximately 40 quizzes, and the 2 lowest quiz scores will be dropped.

Note that a high quiz score is *not* a substitute for doing the homework problems; the purpose of the quizzes is to provide a "quick check-in" to help ensure you are not falling behind. Homework problems require a deeper understanding of the material than quiz problems, and exam problems will more closely resemble homework problems.

Exams: The first three midterm exams will take place during the posted class meeting. The fourth midterm exam will take place during the final exam slot. All exams will be closed book, closed notes, with no calculators, smartwatches, or other technology permitted. A $3'' \times 5''$ index card of hand-written notes will be allowed on each midterm exam. No makeup exams will be offered under any circumstances; in case of a documented medical emergency, please contact the professor via email to discuss other options.

Student Learning Outcomes:

- Students will carefully state all definitions relevant to the course, apply these definitions to objects, and determine whether or not the definition applies. This determination will often involve a calculation.
- Students will have a ready supply of examples and non-examples to these definitions, and will be able to justify why these are examples or non-examples.
- Students will prove and disprove statements using the methods of discrete mathematics. They will construct rigorous proofs following the rules of logic.
- Students will carefully state and apply many mathematical theorems.
- Students will recognize and give examples of contributions to mathematics that have been made by members of diverse cultural and gender groups; they will also articulate ideas and exhibit behaviors that cultivate teamwork, critical thought, and communication skills needed to function in a diverse workforce and global community.

Boilerplate A.D.A. Statement: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. This legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring accommodation, please contact Student Disability Services. If you require additional time on exams, you must **contact me ahead of time**.

For additional information, visit `https://sds.sdsu.edu/`.

Full Disability Statement (adapted from Lydia X.Z. Brown's): I am committed to creating a learning space where everyone can participate as fully as possible. I strive to provide information and resources in multiple formats (text, visuals, audio, silent work, group work, lecture, conversation, etc.) to enable more access possibilities for every student. I recognize that there are many reasons students may need to adjust their pace, style, or method of learning, including but not limited to disability, temporary or ongoing personal life circumstances, unexpected emergencies, or other learning differences.

All students are always allowed to use the bathroom, get drinks of water, or take breaks outside the classroom at any time without needing to ask permission. All students are also always allowed to use technology and devices in the classroom at any time, including cell phones (with the exception of exams where such technology is forbidden). My only requests are that: (a) you set your devices to silent or vibrate-only during class time; (b) you don't intentionally open any visuals that contain sudden or rapid flashing, since these can cause potentially fatal seizures, migraines, and sensory overload; and (c) if you plan or expect to use a device for a non-traditionally academic purpose, you sit on

the sides or back of the room to reduce chances of accidentally distracting someone else. You can also step outside to take calls if needed.

If you have any access needs that I can better support by changing any aspect of my teaching, or the way I have handled assignments, you are welcome and encouraged to let me know in public or in private how I can better support your access needs, and I will do my best to accommodate. Disabled students/students with disabilities may also formally register with the office responsible for disabled student support services, which is the official process for receiving reasonable accommodations in the classroom. You need not have a specific reason or diagnosis to talk to me about your access needs; everyone deserves to learn in the way that makes the most sense for them at any point in time.

Class Announcements, E-mail Policy and Communications: Class announcements will be posted to the course Canvas page and sent to your university e-mail account. Be sure to regularly check your e-mail. If you send me an e-mail, please include your name, course information, and any additional information that I might need to respond.

Student Privacy and Intellectual Property: The Family Educational Rights and Privacy Act (FERPA) mandates the protection of student information, including contact information, grades, and graded assignments. Canvas will be used to communicate with students. Grades will not be posted in public spaces, and graded assignments will not be left in public spaces. Students will be notified at the time of an assignment if copies of student work will be retained beyond the end of the semester or used as examples for future students or the wider public. Students maintain intellectual property rights to work products they create as part of this course unless they are formally notified otherwise.

Scholastic Dishonesty: *An Aztec Does Not Lie, Cheat, or Steal, or Tolerate Those Who Do.* The San Diego State University Student Conduct Code will be enforced in this course. For the purpose of this course, cheating will be defined as (but not limited to) access or use of unauthorized material or technology during exams and quizzes, collaboration between students during exams, quizzes or assignments for which group work is not allowed, perusal of another individual's work during exams and quizzes, copying other individual's work or allowing other students to copy your work on any assignment, quiz or exam, submitting work generated in part or in full by ChatGTP or other generative AI as if it were your own work, and having unauthorized programs or other information stored on calculators when these calculators are accessible during an exam or quiz. Note: Falsifying documentation is considered scholastic dishonesty and may result in a grade of F for the course.

For more info: `https://sacd.sdsu.edu/student-rights/academic-dishonesty/cheating-and-plagiarism`.

Land Acknowledgment: For millennia, the Kumeyaay people have been a part of this land. This land has nourished, healed, protected and embraced them for many generations in a relationship of balance and harmony. As members of the San Diego State University community, we acknowledge this legacy. We promote this balance and harmony. We find inspiration from this land, the land of the Kumeyaay.