Math 184 – Enumerative Combinatorics (Fall 2023)

- Lecture times and location: MWF 2-2:50PM, Pepper Canyon Hall 122
- Discussion times and location: Tu 5-5:50PM, 6-6:50PM, 7-7:50PM, APM 5402
- Textbook: Miklós Bóna, *A Walk Through Combinatorics* (4th ed or 3rd ed)
- Course website: http://mathweb.ucsd.edu/~ssam/184/
- Instructor: Steven Sam ssam@ucsd.edu
- Office hours: see website for times and locations
- TAs: Suhas Gondi, Tianyi Yu
- Discord invite link: see Canvas

Course description

Prerequisites: Math 31CH or 109

The main topics are: counting techniques, combinatorial identities, generating functions, and sieving methods. We will do mathematical proofs in this course, so the ability to read and write proofs is crucial. *Note: there is substantial overlap with Math 188. Students who are interested in a more rigorous and challenging experience should instead take 188. You cannot receive credit for both.*

Most of the topics can be found in Bóna's book, though we will not follow its order and we will skip some of the topics. A schedule of topics will be posted on the website and updated as necessary. I will add a few things not in the book, so a copy of my own notes will be kept on the website.

Resources and materials

- Lectures will be podcasted and available through Canvas.
- Discussion section is for further examples and clarification of the course content.
- A written account (my notes) of the lectures are available on the course website. The textbook contains additional examples and details which are omitted from lecture due to time constraints.
- Office hours are available for general discussion or questions about the course and assignments. Discord is also available as an asynchronous option for discussion of the course and assignments with the other students and also the TAs and the instructor.

Expectations

To certify that you have commenced academic activity for financial aid purposes, please complete the FinAid survey on Canvas by the Friday of week 2.

Lectures will closely follow my custom notes. You'll get more out of the lecture if you skim the notes ahead of time and prepare questions. You can find more examples and exercises in the textbook. You are encouraged to work on homework with others, but solutions must be written up individually.

Any students may attend any of the scheduled office hours without appointment (you can go to any TA's office hours). Office hours are an underused resource, so feel free to drop

in even if you don't have questions about homework. If none of the scheduled times work for you, please email to make other arrangements.

For asynchronous help or discussion, there is a Discord server. You are free to remain anonymous but you are expected to be polite and non-disruptive and we will do the same.

All students are expected to use this server, and **announcements will be made there instead of via email**. Any questions about the course or the material should be posted there. **Please do not email me or the TAs about general topics**: it is more efficient to have everything in one place. Also, please refrain from posting full solutions to homework, but hints are fine.

If there are issues that cannot be discussed publicly, please email me.

Academic integrity

https://academicintegrity.ucsd.edu/

You are free to collaborate on solving homework problems, but the final writeup must be done individually. Please refrain from looking up solutions or soliciting outside help online, I really would rather help you myself so that I know which topics are giving students trouble.

You may not work with others during exams. Students suspected of cheating will be forwarded to the AI office.

Grading policy

You get the maximum of the following two grading schemes:

- Homework: 25%
- Midterm (×2): 22.5% each
- Final: 30%

- Homework: 25%
- Midterm (best score): 22.5%
- Final: 52.5%

I do not follow "standard" cutoffs for letter grades but will not be any stricter. So, for example, a 90% score will guarantee an A- or higher, but the actual cutoff for an A- might be lower depending on how the course goes.

Exams

There are 3 **in-person** exams: 2 midterms and the final exam. Make sure that you have no conflicts during the following times:

Midterms are during lecture on **Oct. 25 (Wednesday)** and **Nov. 20 (Monday)**.

The final exam is scheduled for **December 13 3PM-6PM**, location TBD.

Problems will focus on computations but also contain some "proof"-type problems and will mostly reflect the homework assignments. For that reason, exams are **closed book and closed notes**.

Homework

Homework is due via Gradescope (on Wednesdays) by 11:59PM except weeks with an exam and weeks 1 and 10. So there will be 6 assignments. This is a large class, so late homework

will not be accepted; however, the lowest homework score is dropped.

To encourage you to successfully learn the techniques of this course, I will provide numerical answers to special cases of computation-focused problems along with the assignment. You are strongly encouraged to redo problems if your answer does not agree.

Homework will be graded by the TAs. There will be generally be one "proof"-type problem to be graded carefully; there will be 1 or 2 other problems that will be graded more casually and the rest of the assignment will be graded for completion.

How to do well in this course

You cannot learn just from listening to lectures or reading notes. The homework is designed to engage you with the material and help you learn it. So take the homework seriously. Start it early each week and ask questions. Most exam problems will be variations of homework problems, and so if you understand how to solve all of the homework, the exams will be straightforward.

Most of the learning takes place by solving problems, so I strongly discourage looking for solutions online or copying from others. I especially discourage you from using generative AI tools. In principle, these can be helpful, but they might use very strange techniques or completely incorrect logic to answer your questions. The TAs and I are happy to walk you through problems, and you will learn much more from talking to people about the material.

I will make available a past exam and an outline of topics to study and additional exercises from the textbook for practice before each exam. Check the class website for details.

The quarter goes by very quickly and the material builds on itself. As soon as you think you are falling behind, do something about it. We have office hours and Discord, so take advantage of the resources available to you.

Illness / missing exams

All lectures will be made available via podcast and I do not take attendance. If you are feeling ill, please stay home. If you are not able to attend one of the midterms, the grading policy allows you to use your final exam score in place of the missed exam.

If you must miss the final exam due to an illness, you may request an incomplete for the course if your work is otherwise of passing quality (this is university policy).

Accommodations

Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter (paper or electronic) issued by the Office for Students with Disabilities https://osd.ucsd.edu/. Students are required to discuss accommodation arrangements with instructors and/or OSD liaisons in the department in advance of any exams or assignments.