

# Math 188 – Algebraic Combinatorics (Fall 2022)

- Lecture times and location: TuTh 11AM-12:20PM, APM 5402
- Discussion time and location: Th 10-10:50AM, APM B402A
- Textbook: Bruce Sagan, *Combinatorics: The Art of Counting*
- Course website: <http://mathweb.ucsd.edu/~ssam/188/>
- Instructor: Steven Sam [ssam@ucsd.edu](mailto:ssam@ucsd.edu)
- Office hours: some in-person, some online, see website for times and location
- Discord invite link: see Canvas

## Course description

Prerequisites: (Math 31CH or 109) and (Math 18 or 31AH) and (Math 100A or 103A)

The main topics are: counting techniques, combinatorial identities, generating functions, sieving methods, and counting up to symmetry. We will do mathematical proofs in this course, so the ability to read and write proofs is crucial. The contents of Math 184 (as I teach it) are a strict subset of this course, so **students looking for a less demanding experience should take 184 instead**. Familiarity with linear algebra (Math 18) and basic group theory (Math 100A or 103A) will be assumed.

Most of the topics can be found in Sagan's book (the first 6 chapters), 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 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. Discord is also available as an asynchronous option for discussion of the course with the other students and also the TA and the instructor.

## Expectations

The university requires masking in all instructional settings. **Please wear a mask during all lectures and exams.**

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 the office hours without appointment. Office hours are an underused resource, so feel free to drop in even if you don't have questions about homework.

If you need to meet with me at another time, please email me to schedule.

For organizing discussion, there is a Discord server.

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 about general topics: it is more efficient to have everything in one place. Also, please refrain from posting 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 homework, but the final writeup must be done individually. If you work with other students, please list their names on your assignment (this will not affect your score). Please refrain from looking up solutions or soliciting 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.

## Grading policy

You get the maximum of the following two grading schemes:

- Homework: 1/3
- Midterm ( $\times 2$ ): 1/6 each
- Final: 1/3
- Homework: 1/3
- Midterm (best score): 1/6
- Final: 1/2

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:

The midterms are during lecture on **October 18** and **November 8**.

The final exam is scheduled for **December 7 11:30AM - 2:29PM**, location TBD.

Exams will be graded by the instructor. Problems will largely focus on computations, but you will also be asked to state or rederive key formulas and identities from lecture. For that reason, exams are **closed book and closed notes**.

## Homework

Homework is due via Gradescope on Saturdays by 11:59PM except weeks with an exam and week 1. So there will be 6 assignments. Late homework up to 24 hours will be accepted with a 25% penalty; furthermore the lowest homework score is dropped.

Homework will be graded by the TA. Half of the homework score is based on a few exercises to be graded carefully, and the other half is based on overall 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. 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: every time you do this, you cheat yourself out of learning.

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.

## **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 OSD liaisons in the department in advance of any exams or assignments.