Math 184 Syllabus

Spring 2022

Lecture: Monday, Wednesday, Friday 4:00-4:50pm in Ledden Auditorium
Discussion Section: Thursday 5-6 or 6-7 in AP&M 2301, Thursday 7-8 or 8-9 in AP&M 7321, or Thursday 5-6 in AP&M B412. Please feel free to attend the discussion section that is most convenient for you.
Course Webpage: `http://cseweb.ucsd.edu/~dakane/Math184/`

Professor: Daniel Kane
Email: dakane "at" ucsd.edu
Office Hours: Wednesdays 12-1pm, Fridays 1:30-3:30pm (or by appointment) in AP&M 7131.

TAs:

Haixiao Wang: Thursdays 9-11am in AP&M 5829 and Fridays 10-12 in AP&M 5218.

Ji Zheng: Tuesdays 3:30-6:00pm in AP&M 5768 and Thursdays 12:30-2:00pm in AP&M 5829.

Zehong Zhao: Tuesdays 9-11am in AP&M 6446.

Course Description: Math 184 will be an introduction to combinatorics. We will study a number of topics for understanding and proving things about discrete objects. Topics include: mathematical techniques like mathematical induction and the pigeonhole principle; basic counting techniques for dealing with permutations, combinations and lists; and advanced counting techniques such as inclusion-exclusion and generating functions. Time permitting, we will also study some basic questions relating to pattern avoidance in permutations.

Prerequisites: A grade of at least C- in Math 109.

Textbook: The textbook for the course will be *A Walk Through Combinatorics* by Miklos Bona, fourth edition.

Exams: There will be two in-class exams on April 29th, and May 20th in addition to a final exam from 3:00-6:00pm on June 9th.

Homework:
Submission Policy: Homework will be assigned due each week excepting the first and last week of class and weeks with exams. Homework should be submitted on gradescope and will be due by 11:59pm on Friday the week that it is due. To accommodate exceptional situations such as accidents or serious illness, your lowest homework score will be dropped. I will attempt to have new homeworks available on the course webpage at least a week before they are due, and generally homeworks will be on material covered in class before they are

released. To get an account for the gradescope for this course (if one was not created for you automatically), use entry code 862Z8E.

Write-up Guidelines: Unless otherwise specified, all homework problems will require you to justify your answers. This will usually mean that you provide some sort of mathematical proof to justify your claims.

In addition to this you should make sure to write your solution either in clear handwriting or typed using a computer. Use of LaTeXor similar typesetting package is recommended (for those unfamiliar, there is a basic introduction to LaTeXon the course webpage at `http://cseweb.ucsd.edu/~dakane/Math184/latexGuide.pdf`). If the graders are unable to decipher your writing, you will not get credit for it.

Collaboration Guidelines: Students are encouraged to collaborate on homework assignments. You should feel free to discuss the problems and talk about how to come up with solutions with each other. On the other hand, you are expected to write up your solution independently of any collaborators, and you *should not* share written solutions to homework problems with other students before the homework deadline. If you do collaborate with other students on the homework, you should make sure to list any collaborators that you had on any given problem.

Use of Outside Resources: You should not attempt to search for homework solutions online or in sources outside of the course text. You may use such sources as a study guide, but if you accidentally stumble upon a homework solution in such an outside source you should cite it in your homework solution. If your solution proves to be too similar to the cited one, you may lose credit on the problem, however failure to cite the other solution will be treated as academic dishonesty.

Academic Integrity: Academic integrity will be taken very seriously be the course staff. Breaches of integrity may have broader consequences outside of the assignment in question. The following will all considered to be breaches of academic integrity:

- Collaboration on homeworks beyond the scope outlined in the section above (including sharing of homework solutions with other students before the homework deadline).
- Failure to cite collaborators on homeworks or outside sources used to find homework solutions.
- Collaboration or copying on exams of any kind.
- Use of aids on exams outside of explicitly allowed materials (this may vary by exam).

Grading: Course grades will be determined using the following breakdown:

Homework:	20%
Midterms:	$2 \times 20\%$
Final	40%

Schedule: Below is a rough schedule for topics covered in the class:
Mathematical Induction (Chapter 2)
Pigeonhole Principle (Chapter 1)
Counting Permutations and Strings (Chapter 3)

Balls and Bins Problems (Chapter 5)
Permutations and Cycle Structure (Chapter 6)
Inclusion-Exclusion (Chapter 7)
Binomial Theorem (Chapter 4)
Generating Functions (Chapter 8)

Time permitting:
Pattern avoidance in permutations (Chapter 14)
Partial orders (Chapter 16)
Combinatorial Designs (Chapter 17)