

MATH 371.01: Combinatorics, Fall 2020

Class website: <https://sakai.duke.edu/portal/site/math.371.01.f20>

MWF 12:00 – 12:50 pm ET over Zoom

<https://duke.zoom.us/j/95992904824>

- Instructor:** Dr. Margaret (Maggie) Regan (mregan@math.duke.edu, www.margaretregan.com)
- Contact Method:** Please contact me by email with questions, comments, concerns, or requests for meetings or help. I will respond within 24 hours.
- Office Hours:** Tuesday's 9:00 - 10:00 am ET, Wednesday's 2:00 - 4:00 pm ET or by appointment.
Recurring Zoom link: <https://duke.zoom.us/j/93994886193>
- Books:** *Applied Combinatorics*, 2nd edition, Tesman and Roberts, 2008, ISBN-10 1-4200-9982-5.
- Description:** Permutations and combinations, generating functions, recurrence relations; topics in enumeration theory, including the Principle of Inclusion-Exclusion and Pólya Theory; topics in graph theory, including trees, circuits, and matrix representations; applications.
Prerequisites: MATH 122, 112L, 122L, or consent of instructor.
- Attendance:** Students are expected to attend every class lecture. In the online learning environment, “attendance” is measured by your *presence* on the site and your *contributions* to the site. If a student has a major time zone misalignment, contact me and we will discuss attendance and class participation requirement accommodations.
- Electronics:** Please respect your fellow students and prevent your electronics from disrupting class. When entering a Zoom meeting, make sure to mute your audio. I encourage you to attend the Zoom meetings with your camera on as it helps us all communicate better.
- Course Structure:** Lecture videos on chapter material will be uploaded prior to class meetings to go over definitions, theorems, and illustrative examples. These will include notes and a transcription of the audio that will be available on Sakai at all times. Scheduled class meeting times (MWF 12:00 – 12:50 pm ET) will happen on Zoom and will consist of class discussions, critical thinking and applications problems, software exploration, and group work. Group discussion and help from fellow classmates will also take place on Piazza within Sakai. Participation in all aspects of the course is expected — please see grading structure for more details.
- Topics:** As time permits, this course will cover the following:
1. Basic Counting Rules: Permutations, Combinations, Probability, Pigeonhole Principle (Chapter 2)
 2. Introduction to Graph Theory: Coloring, Trees (Chapter 3)
 3. Generating Functions and Applications (Chapter 5)
 4. Recurrence Relations (Chapter 6)
 5. The Principle of Inclusion-Exclusion (Chapter 7)
 6. The Pólya Theory of Counting (Chapter 8)

7. Coding Theory (Chapter 10)
8. Existence Problems in Graph Theory (Chapter 11)

Objectives: As time permits, the students will achieve the following objectives:

1. Students will be able to effectively use definitions and examples from the topics outlined above.
2. Students will be able to generate conjectures from examples and formulate precise conjectures.
3. Students will be able to recognize and write valid proofs. Proof techniques involve bijective/combinatorial proofs, induction, and the pigeonhole principle.
4. Students will be able to discuss mathematics, including: presenting solutions via zoom, generating examples for illustration as appropriate, seeking and finding holes in proposed proofs.

Software: This course will use software to perform computations related to topics in combinatorics. In class demonstrations will mainly use MATLAB (available for free to students from [Duke OIT](#)).

Collaboration and Honor Code: Students are permitted and encouraged to work together when doing homework, but copying work is not allowed. Include the names of any collaborators at the top of your homework submission. Examinations and homework are conducted under the [Duke Community Standard](#).

Absences and Makeup Work: Students are expected to arrive on time, stay the entire class, and contribute to the class discussion and group work. Excused absences and makeup exams will be handled according to [University policy](#). Please notify the instructor in writing (email message is acceptable) prior to the date of absence when this is feasible. In cases where advance notification is not feasible (e.g., accident or emergency), the student should notify me as soon as possible.

Grading: The grading will be the following:

Class Participation	5%
Homework	16%
Midterms 1, 2, & 3	3 @ 18% each
Final Exam	25%

Class participation will be graded weekly with a maximum of 6 points as follows:

	2 points	1 point	0 points
Attendance	Presence in all zoom meetings (preferred with camera on) or viewing of Zoom cloud recording (with permission of instructor)	Presence in 1-2 Zoom meetings or viewing of 1-2 Zoom cloud recordings	No presence on Zoom or no viewing of Zoom cloud recordings

Engagement	Participation in discussions on Zoom within breakout or main room, post or respond to posts on Piazza discussion board on Sakai, record a presentation of an example for the class — these are well thought out and related to topic comprehension. Participates multiple times throughout the week.	Participation in various course elements is not on track with or is unrelated to the discussion/topic. Participates 1-2 times throughout the week.	No participation in any elements of discussion/ assignment.
Preparedness	Watched pre-recorded lectures and completed any necessary readings — graded by completing all Do Now quizzes at the start of every Zoom lecture with only 1-3 wrong answers (total) and viewing all videos from Sakai	Only watched or read for 1-2 of the Zoom meetings — graded by only completing 1-2 Do Now quizzes and/or completing the quizzes with over 3 answers wrong (total) and viewing 1-2 videos from Sakai	Didn't watch or read — graded by not completing any Do Now quizzes or incorrectly answering all questions and viewing no videos from Sakai

Homework will be submitted using Gradescope and is due every Wednesday starting August 26 at 10 pm ET. *Late homework will not be accepted.*

Exam Dates

Midterm 1: Wednesday, September 9 @ TBD

Midterm 2: Wednesday, October 7 @ TBD

Midterm 3: Wednesday, October 28 @ TBD

Final Exam: Monday, November 23 @ 2:00 - 5:00 pm ET

Appeal: All appeals related to homework and exam grades must be submitted within 1 week after they are graded. To appeal, the student must submit to me the following: homework question or exam, written or typed note explaining which question(s) is/are being appealed, and the basis for the appeal (e.g., the question was mistakenly marked incorrectly, etc.). I will review each appeal and make appropriate changes.

Disabilities: Reasonable accommodations will be made for students who are registered with the [Student Disability Access Office](#). Such students should speak with me as soon as possible.

Inclusivity: Duke University's Office for Institutional Equity provides resources, events, and information about current initiatives at Duke to support equality for all members of the Duke community. I hope that you will communicate with me if you experience anything in this course that does not support an inclusive environment, and you can also report any incidents you may witness or experience on campus to the [Office for Institutional Equity](#).