

**MATH 372: COMBINATORICS
COURSE INFORMATION**

FALL 2022

Location:	Library 389, MWF 2:40–3:30
Instructor:	David Perkinson (he/his) (davidp@reed.edu)
Course homepage:	https://people.reed.edu/~davidp/372/
Moodle:	https://moodle.reed.edu/course/view.php?id=4351
Text:	<i>Alg. Combinatorics: Walks, Trees, Tableaux, and More</i> , by Richard Stanley
Office hours:	11–12 M, 3–4 TuTh, by appointment, or by drop-in

Course description. This is a course in algebraic combinatorics for advanced undergraduates.

Learning outcomes. After taking this course, you will understand some of the basic theory of algebraic combinatorics. The topics will include:

- » Walks on graphs.
- » Partially ordered sets: basic theory including Sperner property and Möbius inversion.
- » Polya counting.
- » Theory of ordinary, exponential, and Dirichlet generating functions.
- » Homology of abstract simplicial complexes.
- » Miscellaneous topics may include: domino-counting, parking functions, the abelian sandpile model, Bruhat order.

Distribution requirements. This course can be used towards your Group III, “Natural, Mathematical, and Psychological Science,” requirement. It accomplishes the following goals for the group:

- » Use and evaluate quantitative data or modeling, or use logical/mathematical reasoning to evaluate, test, or prove statements.
- » Given a problem or question, formulate a hypothesis or conjecture, and design an experiment, collect data or use mathematical reasoning to test or validate it.

This course **does not** satisfy the “primary data collection and analysis” requirement.

Class attendance and participation. This is an in-person class. Therefore, when your health allows, you are expected to be present and engaged. At the same time, each community member has an individual responsibility to help prevent the spread of the coronavirus and other diseases. If you need to miss a class, or series of classes, due to illness, self-isolation, and/or quarantine, you are responsible for emailing me to let me know as soon as possible.

While in class, I expect you to actively engage in conversations by asking questions and participate in classroom discussions and activities. You are expected to do the assigned reading in advance of class, and doing so will help you to participate more effectively.

Text. Our primary text will be *Algebraic Combinatorics: Walks, Trees, Tableaux, and More*, by Richard Stanley. Either edition is fine. When we discuss generating functions, we will refer to Herbert Wilf's *Generatingfunctionology*, which is freely available online.

Homework. Homework assignments will be posted on our course homepage and will be due via Gradescope.¹ Excellent solutions take many forms, but they all have the following characteristics:

- » they use complete sentences, even when formulas or symbols are involved;
- » they are written as explanations for other students in the course; in particular, they fully explain all of their reasoning and do not assume that the reader will fill in details;
- » when graphical reasoning is called for, they include large, carefully drawn and labeled diagrams;
- » they are neatly typeset using the L^AT_EX document preparation system. A guide to L^AT_EX resources is available on the course homepage.

I reserve the right to not accept late homework. If health or family matters might impede the timely completion of your homework, please contact me as early as possible.

Feedback. You will receive timely feedback on your homework via Gradescope. Most homework problems will be graded on a five-point scale (5 = perfect; 4 = minor mistake; 3 = major mistake, right idea; 2 = significant idea; 1 = attempted, 0 = none of the above). *The quality of your writing will be taken into account.* If your answer is incorrect, this will be reflected in the score, and there will also be a comment indicating where things went wrong with your solution. You are strongly encouraged to engage with this comment, understand your error, and try to come up with a correct solution.

Collaboration. You are permitted and encouraged to work with your peers on homework problems. It is best practice to cite those with whom you worked, and you must write up solutions independently. **Duplicated solutions will not be accepted and constitute a violation of the Honor Principle.**

Grades: Your grade will be based on the quality of your homework and class participation.

Academic honesty: As noted above, for homework you should write your own solutions and disclose your collaborators. The internet is a great source of information about mathematics; you are welcome to search for information about the material of the course online, but you should not search for solutions to specific problems in the homework. You should not consult solutions to homework from previous versions of this class. **Copying solutions from fellows students or from the Internet is an Honor Principle violation and will result in an academic misconduct report.**

¹Gradescope is an online homework submission and evaluation platform. You are likely to already be enrolled in our Gradescope class. If not, you will be able to enroll using a link+code provided on our Moodle page.

Help. There are a number of resources you can access for help with this course's content. Everyone is welcome and encouraged to attend my **office hours**. They are an opportunity to clarify difficult material and also delve deeper into topics that interest you. Further, every Reed student is entitled to one hour of free **individual tutoring** per week. Use the tutoring app in IRIS to arrange to work with a student tutor.

Technology: The use of electronic devices (computers, cell phones, tablets, etc.) is not allowed in the classroom without my authorization. Browsing the internet, answering your email, and texting during class is rude—it disrupts learning. It distracts your classmates and your instructor. Talk to me if you have a specific reason for needing to use technology (for example, note-taking).

Academic accommodations. If you have a documented disability requiring academic accommodation, please have Disability & Accessibility Resources (DAR) provide a letter during the first week of classes. We can then discuss your accommodations. I cannot provide accommodations after an assignment has been turned in or within 24 hours of an exam. If you believe you have an undocumented disability and that accommodations would ensure equal access to your Reed education, I would be happy to help you contact DAR.