MATH 232 Discrete Mathematics
2025 Fall

Basic Information

Instructor: Prof. Jen Paulhus jpaulhus@mtholyoke.edu
I do not check email between 8 PM and 8 AM on weekdays, and only infrequently on the weekends. I will make every effort to respond to emails within 24 hours.
Class Meetings: 10:00 - 11:15 AM MWF Clapp 420
Class Webpage: jenpaulhus.com/teaching/MHC/ma232f25.html

My Office Hours: Mondays 11:30 AM - 1:00 PM
Wednesdays 2:30 PM - 3:30 PM
Thursdays 1:30 PM - 2:30 PM
or email me to schedule an appointment
My Office: 402A Clapp
Text: We will use several different online textbooks which are linked in Moodle and on the course webpage. The course webpage will be regularly updated with weekly reading.

Learning Goals

This course serves as an introduction to higher level mathematics. We will use discrete mathematics as a backdrop to discuss how to think about mathematics, how to read mathematical writing, and how to write good mathematics. Even if your life goals do not involve further mathematical study, many of the skills you will learn translate to other fields. As this course is a prerequisite for higher level computer science courses, we will also cover material in preparation for those courses.

By the end of the semester, a student who is successful in this course will:

- Be able to wield the basic building blocks of mathematical logic and proofs such as *if... then...*, *there exists*, and *for all* statements, as well as negations.
- Understand how to structure basic proofs, and how to construct correct math proofs.
- Learn key concepts of discrete math: permutations, combinations, general counting, binomial coefficient, graphs, and trees.
- Learn general mathematical concepts: induction and equivalence relations.
- Hone problem-solving skills: learn how to approach problems in a new field and how to attack different types of problems.
- Develop individualized study skills in preparation for future courses by devising personalized strategies to:
  - get the most out of class time,
  - best utilize time spent on homework,
  - prepare for exams at this level, and
  - successfully internalize the material.
- Be confident articulating their ideas in small groups and to the class.
- Continue to develop skills to work well with a diverse group of colleagues.

Growth towards these goals will be measured in class by the student's ability to
- solve new never before seen problems during exams,
- solve increasingly difficult homework problems,
- write increasingly sophisticated mathematical explanations and basic proofs,
- write clear solutions to homework problems which may be understood by peers,
- know definitions, computational techniques, and core examples in the subject,
- articulate the shared ideas of their group, and
- interact well with all students in the class.

Grading Breakdown

- homework: 25%
- pre-class reading: 15%
- in-class exams (2): 15% each
- final exam (cumulative): 18%
- engagement: 12%

Grading Policies

Homework Assignments
Homework assignments are **due on Gradescope by 10:00 PM almost every Wednesday**. As you learn how to write mathematics you will make mistakes along the way. That is a perfectly natural part of the learning process and so I will sometimes offer rewrite opportunities for specific problems from your homework. The rewrites will typically be due a week after the homework is returned to you

Each student has the possibility to use up to 2 no-questions-asked late homeworks throughout the semester. This means each student can turn in 2 assignments up to 48 hours late as long as they let me know they will be doing so before the initial due date of the particular assignment. I will also drop your lowest score.

Homework will be graded for accuracy. Each assignment may be worth a different number of points, but they will all be weighted the same in the final grade. Show your work on the homework, and answer questions that ask for an explanation in complete sentences. **Answers with no work will receive 0 points.** See the grading rubric for more information and suggestions for mathematical writing, as well as tips for solving math problems at this level.

Pre-Class Reading
To get the most out of our class time, we want our brains to already be thinking about the material. As such, it will be a substantial benefit to you if you do the assigned reading *before* each class. To demonstrate that you are keeping up with the readings, on days you do not have homework due you will file a brief report (link on Moodle) about

the reading material for the upcoming class. The report will take the form of a few questions in a Gradescope form, **due by 10 PM the night before class**.

There will be 1 homework problem on each reading assignment, which will be posted with the weekly homework. I will generally grade your responses for completion, not correctness. I expect students to fill in at least 85% of the reports before the relevant class. This means you can miss up to 3 reports without any impact to your grade.

Exams
There will be two in-class exams scheduled for: **Friday, October 10**, and **Monday, November 17**. The exams will be closed books, closed notes, etc. No make up exams will be given, unless agreed to beforehand so contact me immediately if any issue arises with the scheduled exams.

Final
There will be a cumulative self-scheduled final exam. There are added opportunities on the final exam to demonstrate mastery of topics you struggled with on earlier exams.

Engagement
The only way to learn mathematics is to engage deeply with it. Your collaboration with group members during class, your contributions to questions or discussions in class, or your questions in my office hours can each positively impact this part of your grade. While I will not officially take attendance, if you miss a lot of classes or if you are perennially late for class, your engagement grade will suffer.

Accommodations

Please contact me right away if you have an accommodation as I would like to meet with you and discuss your approved accommodations and our class. Disability Services is the office on campus that determines academic accommodations for students with disabilities. If you need official accommodations through Disability Services, you have a right to have these met and kept confidential. Please contact Disability Services, located in Mary Lyon Hall 3rd Floor, at 413-538-2634 or disability-services@mtholyoke.edu. If you are eligible for academic accommodations, you will be provided with an accommodation letter. For more information on who might be eligible for accommodations and the application process please see the Disability Services website.

Class Policies

Random Daily Seating
Each week, you will be randomly assigned a discussion partner. You and your discussion partner will work together at specific times during class to help each other understand the material. Importantly, the discussion partnerships will change, allowing you to meet most of your classmates and to work with students from different backgrounds. I will post partner assignments weekly on Moodle.

Warm-up Exercises
Classes will begin with a warm-up exercise posted on the screen at the front of the room. The warm-up exercise helps us reset our frame of mind to be ready to engage with mathematics. This will also give you a chance to meet your partner for the days we change partners. The warmup period will conclude approximately 5-10 minutes into the class. You should be in your seat working on the warmup by 10:00 AM. If you are regularly late to class, your engagement grade will suffer.

Short Discussions
Up to a few times each class period (including at the beginning of class for the warmup) we will break for a short discussion of the material. This will be accompanied by a prompt from me. Discussion partners will work together to answer a question, complete a computational exercise, identify misunderstandings, solidify concepts, and/or develop questions about the material.

- All partners should contribute to the discussion; in fact all partners are required to say something!
- Identify any ideas, confusions, or new questions generated by the discussion.
- The partnership will formulate a response that all partners understand.
- Each partner should be prepared to share the response with the class.

After we return from the breakout group, I will randomly select a student, and that student should explain the partnership's answer to the class. It is not a tag team answer. **Only the person I called should answer the question.** It is ok to say that you and your partners were not sure of an answer, but I will ask a followup question regarding what you and your partners discussed while you were trying to answer the question. So if your group cannot figure out the answer to the question I pose, come up with other questions you would like to ask me, or an explanation of where you got stuck. Participation in these conversations contributes to your engagement grade.

Partnerships
As described above, we will spend part of the class time working in small breakout groups. When working in a partnership it is important to remember that varied backgrounds and experiences naturally induce varied explicit and implicit assumptions and attitudes towards each other. Each student should work to be a cooperative, contributing member of the partnership who is helping the group achieve a common goal. Successful partnerships are founded on mutual respect. This can be achieved by:

- using your partners' names;
- recognizing that all partners matter and actively listening to all other partners;
- graciously inviting all of your partners to offer insights, suggestions, questions, etc.;
- being courageous enough to offer your own insights, suggestions, questions, etc.;
- being cognizant of the process by which partnership functions and how you operate within the partnership;
- thanking your partners at the end of each session.

Homework Submissions and Returns
All homeworks will be submitted and returned on gradescope.com (also linked on Moodle). They have a Student Hub with lots of great information about troubleshooting issues, and information about using Gradescope through Moodle.

Make sure you scan your homework and quizzes in black and white, in pdf format, and one document for the whole assignment.

Workload
The amount of time students spend on this course outside of class varies depending on many factors, but about 8 hours a week beyond the class sessions is quite typical.

Academic Honesty
I expect all your work to abide by the MHC Honor Code, and if there is any work that does not, I will report it to the Academic Honor Board. For more detail on what constitutes an academic violation of the Honor Code, please see the College Academic Rights and Responsibilities webpage.

Some typical violations in this course fall under the following categories (taken from the webpage above).

- The unauthorized or unacknowledged use of material that is not a student's own.
- Cheating in any form in preparing assignments (including homework, essays or take-home exams), in completing in-class work (including quizzes or tests), or in taking a final examination.
- Unlawful or improper use of digital or online materials.

For this class, you are welcome to use any resource you find helpful for learning about the concepts and ideas in the class (see below for more about using AI). However, the homework is designed to help you gain practice *yourself* in solving the problems. As such, it is important that while doing homework, **you do not seek out solutions to the specific problems** (this includes solution manuals, online systems that solve problems, or asking someone down the hall who took the class last year). If you do so, you are cheating yourselves of the essential practice you need to master the material in this course. I do encourage you to work together to solve homework problems, but everyone must write their own solutions. Exams will have more explicit instructions and you should not use anything besides writing tools and paper.

AI

My personal views of generative AI are complicated. Training AI uses a lot of energy and water, it infringes on many artists' copyrights, and there are terrible stories of AI giving deadly advice to people. At the same time, lots of people are using it (including possible future employers of yours) and there are useful applications for it.

You are not prohibited from using generative AI for *learning* content in this course. **However, you may not use it in any capacity to help you solve homework**

problems, ask it to solve similar problems to those on the homework, or get its help answering the daily reading reports. (Protip: you can search Google by using "-AI" at the end of your search to exclude AI answers or use the "Web" option near the top of the search results page. The grading rubric has more specific information.)

Learning discrete math and solving problems in this class will be hard sometimes. It will require you to spend time thinking deeply yourself. That may be a new experience for many of you in a math class, and sometimes you will be frustrated and confused. That is a natural part of the learning process. **But do not outsource your thinking.** We will talk about strategies to solve hard problems but you will not learn anything nor grow if you ask a machine to solve the problems for you.

In my past experiences, students are more likely to contemplate violating the honor code when they are very stressed or overwhelmed in a class. If you find yourself thinking about violating the honor code on the homework or exam or using AI when you shouldn't, come talk to me. If you are worried about your grade, or if you're frustrated about the material, come talk to me. If you just need a pep talk, come talk to me!

Cellphones and Laptops
Our class time together is limited and valuable. Cellphone and laptop usage should be restricted to only what is essential for this class. Don't be shopping during class!

Getting Help

- There will be TA evening hours. More information coming soon!
- Come to my office hours with questions about material, assignments, or general questions about the course or your grade. These are times I specifically set aside to be available to answer questions. They are drop-in hours so I may be answering questions from several different students at once.
- I'm also happy to schedule an appointment to talk with you about your performance in the class so far, concerns about the class, or if you are frustrated or overwhelmed in the class. Email me to find a time to meet
- Work together with others.
- The internet is full of other good resources that help explain math. Just make sure you understand the course academic honesty policies.

Success in my Classes

Students come to this class was very different backgrounds, skills, and experiences. Usually the most successful students in my class have two things in common: they work hard, and they are able to self reflect honestly and then make adjustments accordingly.

My job is to help you *all* learn discrete math. I do not think any less of you if you struggle with the material, or if you come ask me for help in office hours. In fact, I view struggling and discomfort with material as an essential part of learning! If you are frustrated or overwhelmed with the course, email me and we'll set up a time to talk.

Unsolicited Advice

- Take ownership of your education.
- Embrace the discomfort and struggle. There will also be moments of joy and excitement in the class!
- There will be no extra credit and you cannot retake an exam. However on the final exam, there will be opportunities to demonstrate mastery of prior exam content.
- Exam problems will not necessarily be exactly like the homework problems. Understanding *why* we solve a problem in a certain way will result in a better grade than simply trying to mimic examples we have done previously.
- Think of math a bit like learning how to bowl. You can have someone explain to you how to throw the ball and how to put spin on it to make it hit the pins but chances are the first time you throw the bowling ball, you will throw a gutter ball. How do you improve at bowling? You practice. The same is true in math. The best way to learn math is to **practice, practice, practice**.
- I can't say it enough, work together when you can.
- If you are struggling more than you think you should be, make an appointment to talk with me.