

SYLLABUS

Math 125-B03, Summer 2022 1B

3 Credit Hours, CRN 43568

Discrete Mathematics I

Class Location:	Horizon Hall, Room 3010
Class Time:	T/Th 10:30 am - 1:10 pm
Mode of Instruction:	In-Person
Student Hours on Campus:	T/Th 1:15 - 2:00 pm
Student Hours Online:	W 11:30 am - 1:30 pm
Instructor:	Tyler Russ
Office:	Exploratory Hall, Room 4311
Phone:	703-993-1460 (Math Dept. Office)
e-mail:	truss3@gmu.edu (preferred)

The Course: Math 125 is a course in Discrete Mathematics. Discrete mathematics includes methods of counting, and functions with natural number domains. This distinguishes 'discrete' mathematics from the 'continuous' mathematics of Calculus, which studies continuous functions with real number domains.

The official catalog description follows: Introduces ideas of discrete mathematics and combinatorial proof techniques including mathematical induction, sets, graphs, trees, recursion, and enumeration. Offered by Mathematics. Limited to three attempts. The prerequisite for the course is one of the following: a minimum score of 13 in 'Math Placement Algebra I', or a grade of C or better in one of MATH 105, Math 108, or MATH 113.

Refer to this website: <https://catalog.gmu.edu/courses/math/>.

Mason Core: This course fulfills the Mason Core requirement for Quantitative Reasoning.

Course Goals: After completing the course you will

- approach *problem solving* methodically using the *4MAT Problem Solving Method*, and identify your problem solving steps explicitly.
- gain proficiency writing *proofs* both in clarity of writing and in logical reasoning with clearly defined transitions.
- internalize a variety of problem solving strategies, including 'solve a simpler problem', 'provide an example', 'make a table', and others.
- determine whether a *logical argument* is *valid*, devise and evaluate logical arguments using *implication* and other logical relations (e.g. "or", "and", "not", etc.), and apply basic rules of inference (modus ponens, modus tollens, etc.), as well as *negation* and *De Morgan's laws*.
- identify the elements of a *set* explicitly using *set builder* notation, calculate the *union* and *intersection* of sets, and represent data correctly in a *Venn diagram*.
- define the terms *relation*, *function*, *equivalence relation*; determine the *domain* of a function and calculate its *range*; distinguish functions from relations, and generate relations and functions (often as a set of *ordered pairs*) with specific properties (e.g., *antisymmetric*, *transitive*; *injective*, *surjective*), and perform function *compositions*; determine whether a function is *invertible*, and calculate its *inverse*.
- apply *mathematical induction* correctly, using a *base case* and *induction hypothesis*, to prove mathematical identities; inspect sequences for *recursive* relationships, express these as explicit functions, and calculate *partial sums* of *arithmetic* and *geometric* sequences.

- distinguish which counting technique—e.g., *inclusion-exclusion*, *addition rule*, *multiplication rule*, *permutation*, *combination*, or some combination of these—is most appropriate for a variety of real-world word problems, and correctly carry out the necessary calculations.
- detect when the *pigeon hole principle* is relevant and construct logical arguments applying the principle.
- expand sums of the form $(a + b)^n$, n an integer, using the *binomial theorem*, and determine any specified term in the sum.
- define the terms *graph* and *bipartite graph* (See Chapter 9), explain the relations among the *vertices* and *edges* of a graph, write the *degree sequence* of a graph, and test multiple graphs to determine if they are *isomorphic*.
- define the term *Eulerian circuit*, classify graphs as Eulerian, and produce a graph given its corresponding *adjacency matrix* and vice-versa.
- classify graphs as *trees* and illustrate subgraphs called *spanning trees* of a general graph.
- generalize from basic to more intricate problems, combining various counting techniques, such as the multiplication and addition rules, and permutations and combinations. (Working through homework problems helps with this ability.)
- classify problems as essentially discrete in nature (combinatorial, counting problems), as opposed to algebraic, or continuous (e.g. optimization, continuous functions).

Course Outline: The text for the course is *Discrete Mathematics with Graph Theory*, by Goodaire and Parmenter, Third Edition, published by Pearson. (ISBN-13: 978-0-13-468955-5) We will cover sections 1.1 - 1.3, 2.1 - 2.4, 3.1 - 3.2, 5.1 - 5.2, 6.1 - 6.3, 7.1 - 7.2, 7.7, 9.1 - 9.3, 10.1, 10.3, 12.1 - 12.2.

Course Expectations: You can expect to put in 15-20 hours of work each week on assignments outside of lectures. This course satisfies Mason's Quantitative Reasoning requirement, so a requisite level of effort is expected of you. As your instructor, I am dedicated to your success at Mason. I am providing transparency on course expectations by providing access to explicit course objectives, and frequent quizzes and minitests. If you strive to master these components of the course, you stand your best chance of succeeding. In the end, you must put in the time and effort, but I am here to support you through this with office hours, activities, recitation, and advising by email. Mastery of the logical reasoning developed in this course is crucial to your continuing success at Mason and in your future studies.

Lecture Notes: Lecture note outlines, typewritten, will be available on our Blackboard page. It is recommended that you are able to annotate the lecture notes during class by downloading or printing the notes. You are encouraged to take complete handwritten notes. Also, the lecture notes contain a number of exercises that you can use to verify comprehension. I plan to provide partial solutions and hints for the exercises in the lecture notes following the end of each chapter.

Quizzes: There will be a total of 11 quizzes as in the Course Calendar on the Syllabus page in Blackboard. Quizzes will be done in pairs, groups of two students. You can consult the list of Course Goals, and the list of Course Objectives for each chapter, as you prepare for the quizzes. Once you can successfully complete problems matching the stated course goals and objectives, you should be successful on the quizzes. Conversely, success on the quizzes demonstrates a basic mastery of the Course Goals listed in this syllabus and the relevant chapter-specific objectives.

Worksheets and Recitation: Our recitation is currently planned to take place on Thursdays from 11:30 am - 12:20 pm during the regular class. Each recitation will involve small groups of two to four students

collaboratively exploring a worksheet in the Inquiry Based Learning (IBL) style of instruction. Each worksheet relates to material covered in its respective week.

Policy Memos: You will write five policy memos, each worth 15 points. You can earn up to 75 points which will be graded out of 70 points. The writing will be graded on the 6-point wholistic scale used for the GRE (Graduate Record Examination) analytic essay (see links provided by email for details), requiring a score of 4 or higher for full credit. Additionally, each memo must meet all the following criteria for full credit: typed, double-spaced, one-inch margins, $1\frac{1}{4}$ to 2 pages in length; Each memo will use at least 3 relevant techniques/concepts from our course (Math 125), and in total you must use at least 10 (distinct) techniques/concepts. You are permitted to include (mathematical) concepts from other courses.

The policy memos must address the following (four) points: (i) Relevant background (to provide context for the issue). (ii) Problem identification and (concise) description (must answer the question “Why is this a problem?”) (iii) Identify probable causes of the problem/issue. (iv) Make recommendations and provide a (partial) implementation for your recommendations. You must explain how your recommendations address the causes you identified in the previous step. You must verify that your implementation achieves the goal of the recommendations. You should support each of the four points with analysis, evidence, logical arguments, and/or relevant math concepts.

You will have the opportunity to resubmit each policy memo one time with revisions. This holds for all memos submitted by 7/21/22. The due dates of the first draft submissions follow: 1st memo due by Thursday, 6/23/22. 2nd memo due by Thursday, 6/30/22. 3rd and 4th memos due by 7/21/22. All 5 memos due by 7/28/22. Plagiarism will be treated as a violation of the Honor Code. If you have questions, you can cite your sources and ask me for clarification. The university provides a statement at the following website: <https://writingcenter.gmu.edu/guides/plagiarism>.

Minitests: Every two weeks, we will have a minitest. Minitest 1 will take place in class on Thursday, June 16th. It includes chapters 1, 2 and 3. Minitest 2 will take place in class on Thursday, June 30th. It includes chapters 5, 6 and 7 with some problems from chapters 1-3. Minitest 3 will take place in class on Thursday, July 14th. It includes chapters 9, 10 and 12 with some problems from chapters 1-7. The minitests are used in place of a single midterm. More frequent testing is designed to decrease anxiety and provide frequent feedback in the course. You can consult the list of Course Goals, and the list of Course Objectives for each chapter, as you prepare for the minitests. Once you are able to successfully complete problems matching the stated goals and objectives, you should be successful on the minitests. Conversely, success on the minitests guarantees an intermediate mastery of the Course Goals listed above and chapter-specific objectives.

Grading: *Quizzes:* There will be a total of 11 quizzes as in the schedule on Blackboard. The lowest score will be dropped, and the quiz score calculated based on 10 quizzes at 10 points each for a total of 100 points. The quizzes will consist of T/F, multiple choice and short answer questions. *Worksheets:* On Thursdays, we will have a virtual class session resembling a recitation. During these meetings, we will complete a worksheet for that week, working in small groups. There will be a total of 7 worksheets worth 10 points each for a total of 70 points. If you must be absent from a Wednesday meeting you need to seek approval prior to the meeting time. To earn points, you will then complete the worksheet and post it asynchronously in the corresponding Discussion Board forum by the date listed in the Course Calendar. If you are absent from a Wednesday meeting without prior approval, you may earn up to half credit for the worksheet. *Policy Memos:* You will write 5 policy memos, each worth 15 points, which will be graded out of 70 points. (This means you have the opportunity to earn 5 extra credit points.) Specific criteria, including length requirements, will be included.

Minitests: Every two weeks, we will have a mini-test. Mini-tests will be completed individually. These follow the point scale in the table below. *Final Exam:* **The minitests culminate with the final exam on July 28th from 10:30 am - 1:15 pm.** The final exam is cumulative. *Homework:* Homework problems will be ungraded. A list of suggested homework problems will be provided. It is advised that you work through as much of the homework as you can. We will have forums in Discussion Board for homework.

	Quiz	IBL Worksheet	Policy Memos	Minitest 1	Minitest 2	Minitest 3	Final	Total
Points Each	10	10	15	60	60	90	150	
Number	10	7	5	1	1	1	1	
Points Total	100	70	70	60	60	90	150	600
Percentage	16	12	12	10	10	15	25	100

Late Work: Any missed quiz or minitest without prior approval will result in a score of zero (0) for that item.

Office Hours: My office hours are listed in the course information above. You can also email your questions to me (truss3@gmu.edu). I check my e-mail frequently throughout the day. Additionally, you can contact me (truss3@gmu.edu) to arrange office hours at other times if you are unavailable for the scheduled office hours. We will use email and Blackboard for communication throughout the semester. You must use your Mason email account for this course.

Expectations on Students, Environment of Inquiry: Our classroom is a participatory environment where freedom of thought is encouraged.

Reporting: Title IX Coordinator — Title IX protects any person from sex-based discrimination, including sexual assault. Call 703-993-8730, email cde@gmu.edu, or complete the intake form online at <https://diversity.gmu.edu/intake-form>. Student Support and Advocacy Center — Provides comprehensive services for students in an effort to foster the safety and well-being of the Mason community. Call 703-993-3686. <http://ssac.gmu.edu>. Call 703-380-1434 for the 24-hour sexual and intimate partner violence helpline. (CONFIDENTIAL) Office of Housing and Residence Life — Professional and student staff are available 24 hours a day to assist students and ensure safety. For 24-hour, non-emergency line, Call 703-993-2720. <https://housing.gmu.edu/>. Employee Relations — Provides assistance to university employees and their supervisors to help identify and resolve work-related problems and proactively avoid potential problems. Call 703-993-3878. http://hr.gmu.edu/emp_relations/.

Special Accommodations: If you are a student with a disability and you need academic accommodations, please contact me (truss3@gmu.edu) and contact the Office of Disability Services (ODS) at 993-2474 or by email at ods@gmu.edu. You can access their website at <https://ds.gmu.edu/>. All academic accommodations must be arranged through the ODS with the appropriate documentation <https://ds.gmu.edu/forms/>.

Important Dates: This course meets in the summer 1B session from 06/07 to 07/27. The last day to add classes or drop with no tuition liability is Thursday, June 9th (06/09/22). The last day to drop classes with a 50% tuition liability is Wednesday, June 15th (06/15/22). For reference, the university is closed (no classes) on Monday, July 4th in observation of Independence Day. There will be no classes on Monday, June 20th in observation of the Juneteenth Emancipation Day.

Our final class meeting will be on Tuesday, July 26th (07/26/22). **Our final exam is scheduled for Thursday, July 28th (7/28) from 10:30 am - 1:15 pm.**

Academic Integrity: The Honor Code will be taken seriously in this course. It is expected that students adhere to the George Mason University Honor Code as it relates to integrity regarding coursework and grades. The Honor Code reads as follows: “To promote a stronger sense of mutual responsibility, respect, trust, and fairness among all members of the George Mason University community and with the desire for greater academic and personal achievement, we, the student members of the University Community have set forth this: Student members of the George Mason University community pledge not to cheat, plagiarize, steal and/or lie in matters related to academic work.”

More information about the Honor Code, including definitions of cheating, lying, and plagiarism, can be

found at the Office of Academic Integrity website at <https://oai.gmu.edu/mason-honor-code/full-honor-code-document/>.
The honor code will be strictly observed during tests.

Diversity, A Cornerstone at Mason: Mason strives to maintain a quality environment for work, study and personal growth. An emphasis upon diversity and inclusion throughout the campus community is essential to achieve these goals. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, and sexual orientation. Diversity also entails different viewpoints, philosophies, and perspectives. The reflection of Mason's commitment to diversity and inclusion goes beyond policies and procedures to focus on behavior at the individual, group and organizational level. The implementation of this commitment to diversity and inclusion is found, notably, in the classroom setting, including, but not limited to, curriculum, teaching, and advising. Mason seeks to continuously improve its environment. For the University's complete statement see <https://stearnscenter.gmu.edu/knowledge-center/general-teaching-resources/mason-diversity-statement/>
Diversity includes a variety of cultural backgrounds. If a holiday coincides with a class session or due date, please alert me by email (truss3@gmu.edu) prior to the absence. A list of religious holidays is provided by the university at <https://ulife.gmu.edu/religious-holiday-calendar/>.

Know Your Rights under FERPA: When a student turns 18, or attends a postsecondary institution, FERPA rights belong to the student, not the parent. In general, Mason does not disclose non-directory information to third parties unless the student has provided consent. For more information see <https://registrar.gmu.edu/ferpa/>.

Title IX: Diversity and Ethics: As a faculty member and designated "Responsible Employee", I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason's Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434), Counseling and Psychological Services (703-993-2380), Student Health Services, or Mason's Title IX Coordinator (703-993-8730; cde@gmu.edu); <https://diversity.gmu.edu/sexual-misconduct>. If you feel harassed or threatened by another student, please report it to me or to Compliance, Diversity, and Ethics in Aquia Hall 373, MS 2C2, or at (703) 993-8730.

Campus Resources

- If you feel harassed or threatened by another student, please report it to me, another professor, or to Compliance, Diversity, and Ethics in Aquia Hall 373, MS 2C2, or at (703) 993-8730.
- Title IX protects any person from sex-based discrimination, including sexual assault. Call 703-993-8730, email cde@gmu.edu, or complete the intake form online at <https://diversity.gmu.edu/intake-form>.
- Office of Student Conduct, 703-993-6209, <https://studentconduct.gmu.edu/>
National Sexual Assault Lifeline: 1-800-656-4673 (on back of GMU ID card)
- Counseling and Psychological Services (CAPS), 703-993-2380, <https://caps.gmu.edu/>
- Here are numbers if you or a student you know is in crisis:
Crisis Text Line: Text 741-741
CrisisLink: 703-527-4077
National Suicide Prevention Lifeline: 800-273-8255 (on back of GMU ID card)
- Student Support and Advocacy Center: Provides comprehensive services for students in an effort to foster the safety and well-being of the Mason community. Call 703-993-3686. <https://ssac.gmu.edu>. Call 703- 380-1434 for the 24-hour sexual and intimate partner violence helpline.

In an emergency you can dial 911 or 703-993-2810 (University Police and Public Safety; on back of GMU ID card), <https://police.gmu.edu>

- Sign up for the following to receive texts to your phone:
Visit <https://alert.gmu.edu> today to add your cell phone to receive text alerts from Mason Alert. Rave Guardian is a campus safety mobile application that enhances preparedness and safety on-campus. The app is free for all students with a university email address through the iTunes store and the Google Play store. See <https://ready.gmu.edu> for more information.
- Office of Housing and Residence Life: Professional and student staff are available 24 hours a day to assist students and ensure safety. For 24-hour, non-emergency line, Call 703-993-2720.
<https://housing.gmu.edu/>.
- Online Education Services, University Libraries <https://library.gmu.edu/for/online>.
- Take advantage of the Writing Center as you work on written assignments in any course you take at Mason. You can book free 45-minute appointments with tutors who will work with you on any phase of a writing project. They can provide feedback on a draft, answer your questions, and show you strategies for brainstorming, organizing, drafting, revising, and editing. To schedule an appointment, visit the center's main location in Robinson Hall B 213 or go to <https://writingcenter.gmu.edu>, register with the center, and make an appointment using the online scheduler.

Mathematical text-editing software: Homework in this class is not required to be typed-up. **We will have an introduction to the LaTeX software during our class.** LaTeX is a (free) software for type-setting mathematical documents. I can provide basic examples to help you get started using LaTeX. You can find it here: <https://www.latex-project.org/get/>

Alternatively, a more immediate alternative is ShareLaTeX, which can be found here:
<https://www.sharelatex.com/>

Mathematica and Software Workshops: The Mathematics Department often offers free Mathematica workshops. You can check for and sign up for Scientific Computing Workshops at www.math.gmu.edu/mtc.php or <http://math.gmu.edu/mtc.php> or math.gmu.edu/mtc.php

Tutoring for Mathematics: Mathematics tutoring is available over Summer 2021 at Mason. Information is here:

<https://science.gmu.edu/academics/departments-units/mathematical-sciences/math-tutoring/tutoring-center>

Blackboard Log-in Instructions: You can find access the Blackboard homepage for GMU by searching for "my gmU" in your browser. The url is the following:

<https://mymason.gmu.edu>

Click the "Mason Bb Login" button, a large green virtual button. Enter your username/NetID and password. Your username/NetID is the same as your email excluding the last part. For example if your mason email is "flast@gmu.edu" (or flast@masonlive.gmu.edu), then the string 'flast' is your username/NetID. Be sure you've created your account before logging in.