Basic Course Information

**MATH 120. Discrete Mathematics for Computer Science.**

**Prerequisite:** Precalculus (MATH 122 or the equivalent)

Section: MATH 120, Section XX
Meeting Times: XX
Instructor: XX (Email: X.X@qc.cuny.edu)
Student Hours: XX

**Textbook:** Our main textbook will be *Discrete Mathematics: An Open Introduction, 3rd Edition* by Oscar Levin and is accessible at [http://discrete.openmathbooks.org/dmoi3/dmoi.html](http://discrete.openmathbooks.org/dmoi3/dmoi.html). This is a free online textbook that covers the vast majority of the topics in this class. Your instructor will provide additional readings for the topics that are not in the textbook.

**Online Homework:** Webwork, accessible at [https://webwork.qc.cuny.edu](https://webwork.qc.cuny.edu).

What is the structure of this course?

This is not your standard math class. Many people find the ideas you learn in this class engaging and eye opening. The goal of this course is to build your fluency with the mathematical ideas you will be seeing throughout your computer science training. This class is structured to give you plenty of practice actively grappling with the concepts and discussing them with your peers.

This course will be taught using “flipped learning”. This means that the content delivery (or “lecture”) portion of the course happens outside the classroom through pre-recorded videos. You are responsible for watching the videos and completing a “daily preparation” exercise before class. In-class time is devoted to diving deeper into the course material through discussion, structured activities, and group work. Afterward, the day’s learning is reinforced through homework exercises.

Approximately once per week there will be a quiz that occur to ensure that you have become proficient in each of the concepts. These quizzes will be supplemented by two midterms and a final exam: One midterm will cover Topics 1 and 2; one midterm will cover Topics 3 and 4, and a cumulative final exam will cover Topics 1-5.

What will I be learning?

By the end of the course, you will be able to do the following.

**Topic 1: Sets**

Objective 1.1. I can represent a set in roster notation and set-builder notation; determine if an object is an element of a set; and determine set relationships (equality, subset).

Objective 1.2. I can perform operations on sets (intersection, union, complement, difference, power set, Cartesian product).

Objective 1.3. I can relate practical examples to the appropriate set, function, or relation model, and interpret the associated operations and terminology in context.
Objective 1.4. I can distinguish between finite sets and infinite sets; I can determine the cardinality of a finite set

**Topic 2: Functions**

Objective 2.1. I can determine whether a rule described in words is a function, including whether it is well defined.

Objective 2.2. I can determine the domain, range, and codomain of a function.

Objective 2.3. I can evaluate special computer science functions: floor, ceiling, factorial, DIV, and MOD (%).

Objective 2.4. I can determine the image of an element in the domain and a preimage of an element in the codomain.

Objective 2.5. I can determine whether a function is injective, surjective, or bijective.

**Topic 3: Algebra of Sequences, Series, and Products**

Objective 3.1. For a constant sequence, alternating sequence, arithmetic sequence, or geometric sequence: (a) If the sequence is given as a formula, I can determine a given term of the sequence (b) if a sequence is written using ellipses, I can find a formula for the nth term of the sequence.

Objective 3.2. I can write a finite or infinite sum in sigma notation. I can write a finite or infinite product in pi notation. I can interpret an expression written in sigma or pi notation correctly.

Objective 3.3. I can convert between expressions involving exponents and expressions involving logarithms and apply exponential and logarithmic operations. I can convert between lg, ln, and log.

Objective 3.4. I can do sigma and pi manipulations involving sums, products, and logarithms.

**Topic 4: Counting**

Objective 4.1. I can use the sum and product rules to formulate and solve counting problems.

Objective 4.2. I can count the number of permutations of a group of objects and the number of \( \text{k}\)-permutations from a set of \( \text{n}\) objects.

Objective 4.3. I can calculate a binomial coefficient and correctly apply the binomial coefficient to formulate and solve counting problems.

Objective 4.4. I can use the "walls and balls" method to count the number of ways to distribute objects among a group.

Objective 4.5. I can determine whether a real-world scenario concerns ordered or unordered objects and replacement or non-replacement and apply the correct method of counting.

Objective 4.6. I can use the Principle of Inclusion and Exclusion to formulate and solve counting problems.
Topic 5: Divisibility and Modular Arithmetic

Objective 5.1. I can determine the prime factorization of a positive integer and use this information to determine all divisors of an integer.

Objective 5.2. I can use the prime factorizations of two positive integers to determine the GCD and LCM of those numbers.

Objective 5.3. I can use the Euclidean algorithm to find the GCD of given two numbers.

Objective 5.4. I can add, subtract, and multiply numbers in \( \mathbb{Z}_n \). I can take powers of numbers in \( \mathbb{Z}_n \).

Objective 5.5. I can compute multiplicative inverses in \( \mathbb{Z}_n \) and use them to solve linear congruences where coefficients are relatively prime.

Objective 5.6. I can solve simultaneous congruences using the Chinese Remainder Theorem.

Pathways Learning Outcomes

MATH 120 fulfills the MQR Pathways requirement. As such, this course also includes the following learning objectives.

MQR1. Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.

MQR2. Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.

MQR3. Represent quantitative problems expressed in natural language in a suitable mathematical format.

MQR4. Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.

MQR5. Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.

MQR6. Apply mathematical methods to problems in other fields of study.

How do I get help?

Learning takes time. You need to make time in your schedule to watch the content videos before class, go back over the day’s content after class, complete the homework assignments, and prepare for the assessments. Even though the content may seem easy at the beginning of the semester, things will get harder as time progresses. There is a large community of people thinking about the ideas in this course.

Help from classmates

The strongest part of your support network is your set of peers. You are encouraged to work together with your fellow classmates to understand the material. There are many ways in which you can do this: Form study groups with regularly scheduled meetings. Have a video watching party in person or over zoom. Work together on the homework. Ask each other questions about the material. Make up practice quiz or exam questions for each other.

Help from peer mentors and tutors

Queens College has free tutoring available for students in this class. These tutors can be found in the Mathematics Laboratory in Kiely 334 (learn more here: https://sites.google.com/view/qc-math-
tutoring/home) and in the Learning Commons (learn more here: https://www.qc.cuny.edu/academics/qclc/).

Help from your instructor
Your instructor wants you to succeed. At the first sign that you feel like you are falling behind in class, reach out to your instructor and discuss ways to get back on track. Your instructor offers Student Hours (sometimes called Office Hours) which is time for you to ask questions, get additional feedback, and learn about additional support structure available to you. Student hours are posted at the top of the syllabus.

How will I be graded?
You will be graded based on your work throughout the semester. Each of the following criteria will be graded separately and then a weighted average will be computed with the following weights given:

Daily Preparation Assignments: 5%
In-class participation: 5%
Online Homework Assignments: 5%
Weekly Quizzes: 20%
Midterm 1: 20%
Midterm 2: 20%
Final Exam: 25%

Daily Preparation Assignments are graded on completeness. (0 or 1) You may miss up to three Daily Prep assignments and still receive full credit.

Online Homework Assignments are graded on correctness. Your homework percentage will be boosted by 10% to a maximum of 100%.

You should make every effort to come to class regularly. In-class participation is graded on your active involvement in the discussions and activities. (0 or 1) You may miss up to three classes without impacting your participation grade.

Make-up quizzes will not be given. A missed quiz counts as a 0. However, your lowest three quiz grades will be dropped.

There will be no make-up exam except in the case of a documented emergency. In the event of an unavoidable conflict with the midterm (an athletic meet, wedding, funeral, etc...), you must notify me BEFORE the exam (ideally a week before) so that we can arrange alternate arrangements for you to take the exam.

We are still living through a pandemic and life happens. I have tried to build flexibility into this grading scheme to address this. If you need additional flexibility or consideration, do not hesitate to contact me.

Grading Scale

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Accommodations for Students with Disabilities:
Students with disabilities needing academic accommodation should register with and provide documentation to the Office of Special Services, Frese Hall, room 111. The Office of Special Services will provide a letter for you to bring to your instructor indicating the need for accommodation and the nature of it. This should be done during the first week of class. For more information about services available to Queens College students, contact the Office of Special Services (718-997-5870) or visit their website (http://sl.qc.cuny.edu/oss/). If you need special accommodation for an assessment, contact me at least one week beforehand.

Cheating/Plagiarism:
DON'T DO IT! It makes me very mad and very frustrated when students cheat. Cheating is the quickest way to lose the respect that I have for each student at the beginning of the semester. Both receiving and supplying the answers on a quiz or an exam is cheating.

I take cheating very seriously. If you cheat, you will receive a zero for the quiz/exam and I will report you to the academic integrity committee in the Office of Student Affairs to be placed on your permanent file. If you cheat twice, you will receive a zero for the class.

See the CUNY Policy on Academic Integrity: http://www.cuny.edu/about/administration/offices/legal-affairs/policies-resources/academic-integrity-policy/

Course Evaluations
During the final four weeks of the semester, you will be asked to complete an evaluation for this course by filling out an online questionnaire. Please remember to participate in these course evaluations. Your comments are highly valued, and these evaluations are an important service to fellow students and to the institution, since your responses will be pooled with those of other students and made available online at http://ctl.qc.cuny.edu/evaluations/data). Please also note that all responses are completely anonymous; no identifying information is retained once the evaluation has been submitted.

Technical Support
The Queens College Helpdesk (http://www.qc.cuny.edu/computing/, (718) 997-4444, helpdesk@qc.cuny.edu) is located in the I-Building, Room 151 and provides technical support for students who need help with Queens College email, CUNY portal, Blackboard, and CUNYfirst.