

MACM 101: Discrete Mathematics I

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Agenda for Today

- Course overview
 - Topic list
- Administrative details
 - Marking scheme
 - Course components
- How to get help and do well in the course

Course Website

<https://coursys.sfu.ca/2024fa-macm-101-e1/pages/>

What is this Course About?

- Combinatorics
- Symbolic logic
- Proof techniques
- Number theory
- Set theory
- Functions and relations
- Graphs and Trees

Combinatorics

- The art of counting
- Why it matters:
 - In statistics and probability, one often needs to count possibilities.
 - E.g. What's the chance you'll win Lotto 6/49?
 - In computer science, measuring the speed of programs is often done by counting critical operations.
 - Combinatorial proofs are often simple and elegant.
 - It is profound and beautiful.

Symbolic Logic

- Laws of logic and rules of inference
- Propositional logic
 - If Jared goes to Hawaii and he doesn't go to Japan, then he will go to Mexico
- Quantified logic
 - For every person, there is a special somebody.
- Why it matters:
 - Clarifies the rules of logical thinking
 - Vital when writing computer programs
 - Useful in mathematical proofs

Proof Methods

- Introduces the basic mathematical proof techniques
- A proof is an impeccable explanation of why a fact is true
- Why it matters:
 - Writing proofs is the business of mathematics, and so to succeed in later math courses being able to read and write proofs is vital

Number Theory

- The study of integers
 - ... -2, -1, 0, 1, 2, 3, ...
- Why it matters:
 - Excellent practice for reading and writing proofs
 - Important modern cryptographic codes are based on results from number theory
 - Beautiful branch of mathematics.

Set Theory

- Along with logic, set theory is the bedrock of mathematics
- Why it matters:
 - Allows us to talk precisely about many mathematical ideas in a consistent way
 - See how other mathematical ideas are built up from set theory and logic

Functions and Relations

- Functions and relations are perhaps the most common mathematical objects
 - $f(x) = x^2$
 - $32 < 35$ (“less than” relation)
 - $45 + 2$ (“addition” binary operator)
 - `isPrime(n)` (boolean function)
- Why it matters:
 - Functions and relations are fundamental to all mathematics
 - They’re also ubiquitous in programming and computer science

Graphs and Trees

- An abstraction that allows us to model real world constructs in a mathematical way
- Why it matters:
 - Allows us to come up with solutions to problems like:
 - How can we connect all the major cities of Uganda with a railway network while using the least amount of track?



Practice Assignments

- I will assign semi-weekly assignments consisting of questions from the textbook
 - Not for marks!
- Meant to help you prepare for the assignment quizzes and exams in the course

Assignment Quizzes

- There will be about 5 assignment quizzes during the course
 - About every 2 weeks on Tuesdays
 - 15% of your final mark
 - Written *online* during a 48-hour window (due on Wednesdays)
- Practice quizzes will be provided

Common Info for all In-person Tests

- Students must attain an overall passing grade on the weighted average of tests in the course in order to obtain a clear pass (C- or better)
- Students who do not obtain a passing grade in the final exam may not obtain a pass (D or better).

Midterms

- Two midterms
 - 17.5% each
 - Held in-class during lecture
 - *Tentatively* scheduled for weeks 7 and 12
 - One piece of 8.5-by-11 in paper is allowed with whatever you want written on both sides
 - You can write by hand, or use a photocopier, or print it out via computer, or write in tiny letters --- whatever you want

Final Exam

- Worth 50% of your mark
- Will be during the final exam week, and will be scheduled by the registrar
 - The time and location will be announced a few weeks beforehand
- One piece of 8.5-by-11 in paper is allowed with whatever you want written on both sides

What if I miss something?

- If you will miss an assignment quiz, email me *as soon as possible*
 - You **do not need** medical documentation in this case
- If you will miss a midterm/final exam, email me *as soon as possible*
 - You **will need** medical documentation in this case

Academic Conduct

- You must abide by the [SFU Academic Integrity Policy](#)
- Assignment quizzes and any other online activities/tests **must be done alone**
- No sharing of work with others, or looking at others work
- You may discuss the general approach you use to solve a problem
 - No written/recorded notes should be taken away

How to Pass This Course

- Attend the class and lab
- Read the textbook
- Do all the homework assignments
- Form a study group
- **Master** the material --- don't just memorize it
- Do lots of practice problems
- Ask questions of the TA or instructor or your cat or *someone* when you are stuck