COMP 1805 (Fall 2026)

Discrete Structures

Course Information

Instructor: Prof. Alexa Sharp (she/her)	**Class Location:** See Carleton Central
Email: alexasharp3@cunet.carleton.ca	**Lectures:** **A** Tue/Thu 11:35am - 12:55pm **B** Tue/Thu 4:05pm - 5:25pm **C** Wed/Fri 11:35am - 12:55pm
Course Website: brightspace	**Course Forum:** discord
Best Ways to be in Touch: on discord, via email, or during student hours	**Teaching Assistants:** a list of TAs and their office hours will be posted on Brightspace

Course Calendar Description

Introduction to discrete mathematics and discrete structures. Topics include: propositional logic, predicate calculus, set theory, complexity of algorithms, mathematical reasoning and proof techniques, recurrences, induction, finite automata, and graph theory. Material is illustrated through examples from computing.

Precludes additional credit for MATH 1800.
Prerequisites: one Grade 12 university preparation mathematics course.

Inclusivity Statement

I am committed to fostering an environment for learning that is inclusive for everyone regardless of gender identity, gender expression, sex, sexual orientation, race, ethnicity, ability, age, class, etc. All students in the class, the instructor, the course staff, and any guests should be treated with respect during all interactions.

Land Acknowledgement

I would like to acknowledge that the land on which we gather is the traditional, unceded territories of the Algonquin Anishinabeg people. In doing so, I acknowledge that I and Carleton University have a responsibility to the Algonquin people and a responsibility to adhere to Algonquin cultural protocols. More information on Prof Alexa's work to take some responsibility can be found on brightspace in the module titled "Beyond the Land Acknowledgement."

Learning Materials

Textbook: D. Liben-Nowell, *Connecting Discrete Mathematics and Computer Science* — free online.

Course Goals

Discrete math is a precise language used to describe structures, patterns, and reasoning; in this course, you will use that language to model situations, write proofs, find counterexamples, and communicate mathematical ideas clearly.

By the end of the course, you should be able to:

- **Use mathematical language precisely**
  Read and write statements involving sets, functions, logic, graphs, relations, counting, induction, and asymptotic notation.
- **Model situations using discrete structures**
  Represent real-world problems with sets, graphs, functions, relations, etc.
- **Write and evaluate proofs**
  Use definitions and facts to prove and disprove claims, and explain why reasoning works.
- **Choose appropriate proof strategies**
  Recognize when to use direct proof, cases, counterexample, construction, contradiction, contrapositive, induction, or the Pigeonhole Principle.
- **Reason from definitions**
  Unpack assumptions and goals, work backward from what must be shown, and justify each step.
- **Diagnose and repair flawed reasoning**
  Identify incomplete, circular, too-strong, too-weak, or invalid arguments.
- **Communicate mathematical ideas clearly**
  Write solutions that a peer can follow, with clear setup, assumptions, goals, and reasons.

Topics Overview

Readings, videos and course work for each week are available on Brightspace.

Weeks	Topics
0 - 2	Course intro; proof expectations; direct proof; counterexamples; sets; graphs as models; proof by cases; set operations; Cartesian products; directed relationships
3 - 4	Proof by contradiction, construction and contrapositive; basic functions; colouring as a model; logic toolkit; precise negation/ modelling with graphs
5 - 6	Function properties; one-to-one, onto, and bijections; comparing sizes; Pigeonhole Principle; combined proof strategies
7 - 8	Induction; algorithms as processes; loop and recursive correctness; repeated constructions; properties of relations and graphs; paths, cycles, trees, and DAGs
9 - 10	equivalence relations; partial orders; directed acyclic structure; topological ordering; algorithms as constructions; correctness and runtime motivation
11 - 12	Big-O notation; sums; synthesis; applications; final exam preparation

Course Format (Flipped)

Each week will usually follow this cycle; Week 1 is a “dry run” to get used to the course rhythm.

Before the First Class of the Week

- Watch the weekly **~2–2.5 hours of videos** (views are tracked)
- Start the weekly tutorial preparation proof

First Class of the Week — Fri (C) or Tue (A/B)

- Activity-based session (participation is tracked)
- Work through structured proof activities with neighbours and the teaching team

Before Tutorial

- Complete the tutorial preparation proof and the short self-review (completion is checked)

Tutorial (Proof Workshop) — Tue (C) or Wed (A/B)

- Proof review workshop led by TAs (participation is tracked)
- Review proofs with peers, diagnose flawed reasoning, repair and reflect on your proof

Second Class of the Week — Wed (C) or Thu (A/B)

- **Weekly Quiz, Weeks 2-11**; Week 12 has no quiz.

A Note on Learning

You need both:

- **Videos** → definitions, notation, proof structures, and worked examples
- **Activities** → trying proofs, making mistakes, revising reasoning, learning from peers

Skipping either makes the course much harder. Both will be highly encouraged and tracked.

How to Succeed

Students who do well:	Students who struggle:
Watch videos **before class**	Only watch enough video to do proof workshops
Write things down during activities	“Just think” or avoid committing to answers
Engage in activities (even when unsure)	Disengage during activities or leave early
Ask questions early	Struggle alone and/or at length
Focus on reasoning, not memorization	Try to memorize proof templates

Assessment Overview

This course uses a **bucket-based grading system**.

Category	Available	Bucket Capacity	Schedule & Deadlines
Quizzes* (10 × 5.5%)	55%	50%	**Weeks 2-11**, in class
Tutorial Workshops (11 × 1.5%)	16.5%	15%	**Weekly** tutorial
Lecture Engagement	12%	10%	**Weekly** class
Video Engagement	5.5%	5%	**Before** class
Final Exam*	20%	20%	Exam Period
Quiz Revision Recovery	10%	+5%	After eligible quizzes
Bonus	>3%	+3%	See below

* See Passing Requirements

How the Bucket System Works

Each category has **more marks available than needed**.

- Your total in a category is **capped at the bucket capacity**
- Extra marks provide flexibility
- Missing one assessment usually won't hurt much, if at all
- Doing poorly still contributes and helps fill your bucket (every bit helps)
- Consistent effort is rewarded

This system is at least as favourable as a "drop the lowest," while encouraging continued effort.

Quizzes (50%)

- 10 weekly quizzes (Weeks 2-11); Week 1 is a "dry run" practice, no quiz in Week 12.
- **5.5% (55% total available → capped at 50%)**
- Assess your understanding of the material without external assistance

Format: In-person, paper-based, individual, closed notes (proof "toolkit" provided)

Rules:

- Must be written at scheduled time
- **No make-up quiz**
- Revision recovery is only available for quizzes with a serious in-class attempt

The bucket system provides flexibility; repeated absences will affect your grade.

Tutorial Proof Review Workshops (15%)

- 11 weekly tutorials, **1.5% each (16.5% total available → capped at 15%)**
- Proof attempts and self-evaluations **due before tutorial (no lates)**
- Preparation marks require a serious proof attempt and self-review before tutorial
- Participation marks require meaningful engagement during tutorial

Format: In-person, TA-led, paper- and laptop-based, preparation + participation

Rules:
- Must attend **your scheduled tutorial**
- No make-up tutorial

Lecture Engagement (10%)

- 12 lecture-engagement opportunities, 1% each (**12% total available → capped at 10%)**
- Assessed across all classes.

May include:
- Wooclap submissions
- Written activity work
- Group participation
- Responsiveness when called on

Important:
- Attendance ≠ engagement
- Passive attendance may receive little or no credit
- Missing multiple classes will significantly impact this component

Video Engagement (5%)

- 11 weekly video groups, 0.5% per week **(5.5% total available → capped at 5%)**
- Earned by completing the required videos before the relevant class.

Important:
- Videos and partial notes prepare you for in-class activities and quizzes
- You may be able to survive class and the course without the videos, but you will not get the full benefit of activities if you are not prepared

Final Exam (20%)

- **In-person, paper-based, scheduled by the university during the exam period**
- Cumulative
- May include multiple-choice, short-answer, and proofs; proof “toolkit” provided

Quiz Revision Recovery (5%)

A revision recovery bucket of up to **5%** may be filled through:

- Revising an eligible quiz after receiving feedback and reflecting on that feedback
- Only available for quizzes with serious in-class attempts; it is not a quiz replacement
- Submit revised proof + short reflection on brightspace within 24h of receiving feedback
- You may not use GenAI, your peers, web search, or other non-course materials.

Bonus (3%)

A bonus bucket of up to **3%** may be filled through:

- Overflow from other categories (when you exceed a bucket)
- Optional activities (e.g., drills)

Added after all other categories are computed.

Passing Requirements

To pass, you must:

1. Pass the **final exam**, and
2. Pass the **combined Quizzes + Final buckets**

Late and Missed Work Policy

The grading structure has **built-in flexibility** through its bucket system.

- **No extensions** or make-ups for quizzes, tutorials, or video and lecture engagement.
- Please do not email about individual missed work as the buckets already account for it

This ensures fairness and reduces administrative overhead.
For exceptional cases affecting a large portion of the course, contact the prof within **24 hours**.

Mark Corrections and Regrade Requests

It is your responsibility to check your marks regularly on Brightspace. Requests for mark corrections or regrades must be submitted **within 7 days** of the mark being posted.

This includes:

- Missing or incorrect lecture or video engagement marks
- Missing or incorrect tutorial marks
- Quiz or Revision Recovery marking questions or concerns

After 7 days, marks are considered final unless there is a clear administrative error.

Undergraduate Academic Advisors

The Undergraduate Advisor for the School of Computer Science is available in Room 5302 HP, or by email at scs.ug.advisor@carleton.ca. The undergraduate advisor can assist with information about prerequisites and preclusions, course substitutions/equivalencies, understanding your academic audit and the remaining requirements for graduation. The undergraduate advisor will also refer students to appropriate resources such as the Science Student Success Centre, Learning Support Services and Writing Tutorial Services.

SCS Computer Laboratory

Students taking a COMP course can access the SCS computer labs. The lab schedule and location can be found at: https://carleton.ca/scs/tech-support/computer-laboratories/. All SCS computer lab and technical support information can be found at: https://carleton.ca/scs/tech-support/. Technical support staff may be contacted in-person or virtually, see this page for details: https://carleton.ca/scs/tech-support/contact-it-support/

Mental Health and Wellness

University life can be challenging, especially in a compressed course.

Students are encouraged to make use of the supports available through Carleton's Wellness Services: https://wellness.carleton.ca/

If you are struggling, reaching out early can make a significant difference.

Academic Accommodations and Regulations

Academic Accommodation

The Carleton University Information on Academic Accommodation applies to this course. Here is information on how to apply for academic accommodation. If you are allowed extra time on tests, ventus should take care of it (and it is your responsibility to confirm such accommodations.) If there are accessibility-related needs, please contact me early so we can coordinate with official accommodations.

Chat GPT/Generative AI Usage

Allowed: Definitions and notation help, alternative explanation assistance

Not allowed: Designing, writing, or repairing proofs (either for tutorial or for the repair recovery)

Using AI to bypass that process will leave you unprepared for quizzes and exam.

Academic Integrity

All submitted work must reflect **your own ideas and understanding**.

For tutorial proof preparation:

- Discussion of high-level ideas is allowed
- Proofs must be written independently

For quiz repair recovery:

- You may discuss with course staff and consult course materials
- Proofs must be written independently, with no help from peers or electronic sources

Not allowed:

- Copying or sharing work, except during tutorials when it is expected
- Using online repositories of solutions or student work
- Using AI to generate solutions or proof structures

Typing or hand-writing solutions yourself is not enough — the ideas must be your own.
If you cannot explain how your solution works, you should not submit it.

Violations of academic integrity will be handled according to Carleton University's Academic Integrity Policy. A list of standard sanctions in the Faculty of Science can be found here. Additional details about this process can be found on the Faculty of Science Academic Integrity website. Students are expected to familiarize themselves with and abide by Carleton University's Academic Integrity Policy. **Claiming ignorance of or confusion about the academic integrity standards as described in the Policy does not excuse a student from responsibility for violations of those standards.**

Student Rights & Responsibilities

Students are expected to act responsibly and engage respectfully, collaboratively, and constructively with other students and members of the Carleton and the broader community. Participation requires a classroom where people feel comfortable contributing. See the 7 Rights and Responsibilities Policy for details regarding the expectations of non-academic behaviour of students. Those who participate with another student in the commission of an infraction of this Policy will also be held liable for their actions.

Student Concerns

If you have any concerns regarding this course, your first point of contact is me. Please email me or visit during my student hours, and I will do my best to address your concerns. If I cannot resolve the issue, the next point of contact is the School of Computer Science at studentconcerns@scs.carleton.ca. If the concern remains unresolved, the final point of contact is the Office of the Dean of Science at ODScience@carleton.ca. Please follow this order of contact.

Note: You can also bring your concerns to Ombuds Services or Carleton Equity and Inclusive Communities.