

Sets and Logic - Math 260 (5 credits) – Fall 2022

Instructor: Dr. Brent Hancock

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Class times: MTWRF 9:00-9:50am, Samuelson 103

Office hours: Mon & Wed from 11:00-11:50am, Tues & Fri from 10:00-10:50 am (Samuelson 218B), or by appointment (email to set up a time)

- Office hour visits: Plan ahead and bring your prior work so I can best assist you 😊

Required Materials:

- **Textbook:** *Mathematical Reasoning: Writing and Proof* (version 2.1) (<https://scholarworks.gvsu.edu/books/9/>) by Ted Sundstrom.

You can download the book online for free, or purchase a paper copy online.

(https://www.amazon.com/Mathematical-Reasoning-Writing-Proof-Version/dp/1500143413/ref=sr_1_1?s=books&ie=UTF8&qid=1520897349&sr=1-1&keywords=t+Sundstrom).

NOTE: There is a newer edition of this book (version 3) but we will be using version 2.1 because some of the notation is a bit better and they're not that different otherwise.

- **Access to Canvas** online at <http://canvas.cwu.edu> (this is where I will post course handouts, assignments, readings, grades, policies, announcements etc. so it is important that you log on regularly).

Course Description:

The primary purpose of this course is to ramp up your ability to think and approach problems like mathematicians, providing a cognitive bridge between more procedural lower-level courses such as Calculus and upper-level abstract courses such as Real Analysis, Probability Theory, or Abstract Algebra. The primary goals of the course are to help you develop the habits of mind of mathematical thinkers and problem solvers such as thinking analytically, engaging in logical reasoning, communicating effectively and with precise language, and using mathematics to advance arguments and increase understanding. Working with written and oral communication is an essential part of the course.

This course concentrates on training you in clear thinking and creative experimentation in the exploration of mathematical ideas. Because proof solidifies intuition into certainty, this course also focuses on the careful use of mathematical language, logical reasoning, and proof. Upon successful completion of this course, you should be able to:

- read, understand, and construct proofs
- write and speak about mathematics using precise mathematical language

- understand the role of definitions in mathematics and use (and possibly construct) them effectively
- understand elementary logical principles and proof techniques
- understand generalization and abstraction and their roles in mathematics
- know how to capture the essential elements of intuitive mathematical objects in precise language that can make them subject to rigorous mathematical analysis (e.g., definitions and axiom systems), and understand the importance of this process in mathematical discourse

Major content topics of the course include proper use of logical connectives and quantifiers, negation of mathematical statements, the equivalence of a statement and its contrapositive, direct proof, proof by contradiction, proof by induction, and basic set theory. Exploration of these topics will follow the outline:

Unit 1: Introduction to Proofs and Logical Reasoning (CH 1 and 2)

Unit 2: Constructing and Writing Mathematical Proofs (CH 3 and 4)

Unit 3: Proof in Context (CH 5)

Important Dates:

- **Final Exam:** Wednesday December 7 from 8:00-10:00 am. All students must take the final exam at the scheduled time and date.
- **Thanksgiving Holiday** – no class will be held Wed Nov 24-Fri Nov 26.

Important policies:

- No late work is accepted without *prior arrangements* made with me due to extenuating circumstances.
- Don't cheat, and don't plagiarize. Respect the CWU Student Conduct Code (<http://app.leg.wa.gov/WAC/default.aspx?cite=106-125>)
- I follow CWU's policies and recommendations for academic misconduct.

COURSE ASSESSMENT DETAILS

Homework quizzes:

So that you can practice the essential skills, procedures, and proofs in the course, there will be practice homework problems assigned throughout the week. Some of these problems will include further practice of skills developed during class, while others will ask you to explore and prove new results that build on the existing ideas discussed during class. These homework problems will NOT be collected and graded. Instead, we will have a weekly "homework quiz" with problems that are very similar to either assigned homework problems or a problem done during class throughout the previous week. Quizzes will take place weekly (except for week 1 and any

weeks when we already have a midterm exam in this class), and specific dates will be announced in class with appropriate advance notice.

Attendance and Professional Participation:

You are expected to actively participate during class in a variety of ways. For example, you are expected to contribute meaningfully to small-group discussions, ask questions, present solutions, and share your individual and small-group ideas and questions during whole-class discussions. I may periodically assign short “daily” exercises (separate from the homework sets described above) to help guide our discussions/investigations in the following class. In such cases, students are expected to complete these exercises before the next class and be ready to present their solutions. Students are expected to arrive to class on time and to not leave class early unless previously discussed with the instructor.

Midterm Exams and Final Exam:

We will have two “midterm” exams in this class. The official exam dates will be announced in class well before the exam is scheduled to occur. Each exam will have an in-class portion, and one or more of the exams may additionally have a take-home portion (to be announced ahead of time). We will also have a cumulative final exam covering all the material from this course. You may wish to bring a calculator to each exam, but please note that *you will not be allowed to use your cell phone as a calculator* during exams.

****Important Note about Exams and Quizzes**

Please note that there will be no makeup exams or quizzes. Exceptions will only be granted if you miss an exam due to a *verifiable and documented* medical emergency or other university-authorized absence and have given me *appropriate advance notice*. Please consult the University student handbook for details on what is considered to be a University-authorized absence, and provide me with a written request ASAP (i.e. before the drop deadline) if you think you will have a conflict with any test dates.

Mastery Portfolio:

Students will submit a portfolio at the end of the quarter comprised of select revised homework quiz problems from throughout the course. The problems submitted will be revised solutions of previous quiz problems in which the student did not receive full credit. The rationale behind this portfolio is to allow students to demonstrate mastery of particular topics that they might not have fully grasped earlier in the course. You will submit in your portfolio up to one revised problem per homework quiz, along with a brief accompanying reflection on what the revision consisted of for that problem. If you received a perfect score on a homework quiz then you do not have to include any problems from that quiz in your mastery portfolio. Details about the submission and contents of the mastery portfolio will be provided on the Canvas assignment for this mastery portfolio and discussed in class.

COURSE GRADE CALCULATION

Weight	Assessment category (grading scale)
20%	Homework Quizzes
5%	Attendance and Professional Participation
40%	“Midterm” Exams (2 total)
25%	Final Exam
10%	Mastery portfolio

Letter grades will be assigned as follows:

A- 90.0 - 92.9%	A 93.0 - 100%	
B- 80.0 - 82.9%	B 83.0 - 86.9%	B+ 87.0-89.9 %
C- 70.0 - 72.9%	C 73.0 – 76.9%	C+ 77.0 - 79.9%
D 60.0 - 69.9%		
F 0 - 59.9%		

Accommodations for students with disabilities:

Students who need accommodation of their disabilities should contact me privately to discuss specific accommodations for which they have received authorization. If you need accommodation due to a disability, please register with Disability Support Services in Hogue 126. They may also be reached via email at (DS@cwu.edu).

Respect, inclusivity, and diversity:

In my classroom, diversity and individual differences are respected, appreciated, and recognized as a source of strength. Students in this class are encouraged and expected to speak up and participate during class meetings, **and** to carefully and respectfully listen to each other. So that everyone feels comfortable participating, every member of this class **must** show respect for every other member of this class. Be good to each other.

Cell phone policy:

I will not allow cell phones or similar devices to be used during exams. This includes using your phone as a calculator. During exams, please keep all phones out of sight and silent. If I see anyone using a cell phone during an exam, I may assign that student a zero on that exam.

Changes to the syllabus:

I reserve the right to make modifications to this syllabus at any time. In the event of such changes, I will notify the class and upload a revised syllabus on Canvas.