Math 220 - Discrete Mathematics

Course Information

Instructor and Course Meeting Information

Instructor: Lola Thompson
E-mail: lola.thompson@oberlin.edu
TuTh 9:30 AM - 10:45 AM (Section 1)
TuTh 11:00 AM - 12:15 PM (Section 2)
Location: King 241
Office: King 200
Office Hours:
M 10 AM - 11 AM
Tu 4:30 PM - 5:30 PM
Th 2 PM - 3 PM
   *And by appointment.

Course Objectives

By the end of this course, you will be able to:

- Read and understand mathematical proofs
- Write your own mathematical proofs in a clear and precise fashion
- Orally communicate mathematical ideas to others
- Apply a variety of techniques from different disciplines within mathematics (logic, number theory, combinatorics, and graph theory).

Course Structure

This course will be taught using a mixture of lectures and problem-solving. The format will be very different from that of a typical math course. In particular, you will be expected to spend a large portion of each class period solving problems in small groups.

Textbook

There is no required textbook for this course. This is for several reasons. First, there is no single book that adequately covers ALL of the topics from this course. Second, many of the "standard" textbooks in discrete mathematics are quite expensive and I do not want anyone's success in the course to be hindered by issues of financial accessibility.

As a result, I have designed this course to be self-contained. All homework problems will be explicitly stated on worksheets that I hand out in class (i.e., no need to hunt through a textbook searching for problem 7 on page 248). All course content, including the definitions that you need to know, will be covered in my lectures and worksheets.

For those who wish to consult a published resource, you are welcome to look at any of the books in Mudd Library. One popular choice for learning how to write proofs is "How To Think Like A Mathematician" by Kevin Houston. Another popular choice is Susanna S. Epp's "Discrete Mathematics with Applications." Both books will be on reserve at Mudd Library this semester. There are also many other excellent choices – feel free to explore and find a book that is compatible with your personal learning style. My one caveat is that, while you are free to use any book that you like in order to fill in gaps in your understanding of the course content, you *may not* consult outside sources while working on the homework assignments. Not only is it unfair to your classmates, it also robs you of the learning experience.

Grades

The grades in this course will be calculated as follows:

	Weight
Class Participation	10%
Homework	30%
Quizzes	30%
Final Exam	30%

Class participation

Class participation is essential in a course of this nature. When you miss class, you are not only affecting your own progress in the course but you are also causing your working group to be short one member.

Attendance: Each student is granted three "unexcused" absences. After that, absences will adversely affect your Class Participation grade. There is no need to e-mail me to explain an unexcused absence. If you have a legitimate academic reason for missing a class (or a documented illness), please e-mail me as soon as possible. All "excused" absences must be cleared with me before the start of the missed class period.

Group Work: Working groups will be assigned. They will normally consist of 3-4 students. Groups will be shuffled (approximately) every two weeks.

Student presentations: Student presentations are an important component of this course. During most class periods, I will ask several groups to present their solutions to the worksheet problems at the board. Audience questions are strongly encouraged! That said, all questions MUST be posed in a respectful and encouraging manner. You are welcome to take notes and revise your own work based on what you learn from the in-class presentations. However, you may not copy directly from another group. If you borrow ideas from your classmates' presentations, you need to explain them in your own words.

Homework Assignments

Problem sets will be due at **noon** on **Wednesdays**. Please turn in your problem set by placing it in your section's folder in the bin outside of my office. The weekly problem set will normally consist of writing up a selection of problems from the previous week's worksheets. You are welcome (and encouraged!) to work closely with your group members on solving any of the problems, provided that each student writes up their own set of solutions in their own words. **Late homework will not be accepted unless you have cleared it with me in advance.** I will drop your two lowest scores at the end of the semester.

Quizzes and Exams

There will be three 30-minute in-class quizzes. The in-class quizzes will test your ability to recall (and correctly use) definitions, solve routine problems, and write basic proofs. Quizzes will always begin promptly at the beginning of the class period.

There will also be a final exam. You should think of the final exam as a triple length quiz (with an extra 30 minutes built in at the end for checking over your work).

Blackboard

Copies of the lecture notes, worksheets, and other course materials can be found on the course Blackboard site. Go to `http://blackboard.oberlin.edu` to access these materials.

LaTeX

Beginning in the third week of classes, all students will be required to type up their homework using LaTeX. I will offer an in-class LaTeX tutorial during the second week to help you get up to speed. If you do not wish to deal with the hassle of installing LaTeX on your computer, you can use it (for free!) on the web: `https://www.sharelatex.com`

Course Policies

Academic Honesty

Homework

Each day, your homework assignment will be to finish and carefully write up solutions to a selection of the worksheet problems. You are welcome to consult with your class notes, your classmates and the instructor. However, you *may not* consult any books or internet resources when writing up the homework. Copying solutions from outside resources constitutes an honor code violation. Moreover, your experience in Math 220 will be much richer (and your intuition for the subject far greater) if you arrive at your answers without the aid of a book.

You are encouraged to work with your group members outside of class. You are also welcome to form study groups with other students in the course. In any collaborative efforts (outside of working with your group members), you must abide by the following guideline: you may discuss the general problem-solving techniques for homework problems with other students, but you must write up your solutions independently.

Quizzes and Exams

You are not allowed to use any electronic device or consult any source other than the instructor during an in-class quiz or exam. In particular, this means *no calculators, smartphones, regular cellphones, iPods, eReaders, laptops, notes, textbooks, etc.* You are on your honor not to talk to another student about a quiz or exam until both students have turned them in.

Note: Information about the Honor System at Oberlin can be found at the following website: `http://www.oberlin.edu/students/links-life/honorcode.html`. Please familiarize yourself with its content.

Disabilities

Students in this course with disabilities, including "invisible" disabilities such as chronic diseases and learning disabilities, and who may need disability-related classroom accommodations, are encouraged to make an appointment with me as soon as possible.

Make-up Policy

Typically, I will not accept late homework, and a missed midterm exam cannot be made up. That said, I understand that some circumstances are beyond your control. Should you contract a serious illness or find yourself in an emergency situation, please contact me *immediately.* I will be happy to make arrangements with you under these types of extreme circumstances.

Religious Observances

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me before the end of the second week of the semester to discuss appropriate accommodations.

Important Dates

Add/Drop Deadline	February 13th (Wednesday)
Spring Break!	March 23rd (Saturday) - March 31st (Sunday)
Withdraw and P/NP Deadline	April 8th (Monday)
Classes End	May 10th (Friday)
Reading Period	May 11th (Saturday) - May 14th (Tuesday)
Final Exam	May 15th (Wednesday) from 2 - 4 PM (Section 2)
Final Exam	May 16th (Thursday) from 2 - 4 PM (Section 1)

Course Schedule

The following is an estimated schedule for the course. Please note that the quiz dates are tentative.

Lectures	Brief Description
2/5	Thinking Mathematically
2/7	Logic: Truth Tables
2/12	Logic: Implications
2/14	Interlude: LaTeX and Other Tools
2/19	Logic: Quantifiers; More Fun with Quantifiers!
2/21	Proof-writing Skills: Proof Techniques
2/26	Proof-writing Skills: Induction
2/28	Number Theory: Modular Arithmetic & gcds; **Quiz**
3/5	Number Theory: Euclid's Algorithm, Diophantine Equations
3/7	Number Theory: Multiplicative Orders
3/12	Number Theory: Unique Factorization
3/14	Number Theory: Gems of Number Theory
3/19	Counting: Sets in Mathematics
3/21	Counting: Functions in Mathematics
3/23 - 3/31	**Spring Break (No Class!)**
4/2	Counting: Binomial Coefficients and Pascal's Triangle
4/4	Counting: Binomial Theorem; **Quiz**
4/9	Counting: More Fun with Counting Techniques!
4/11	Graph Theory: Intro to Graph Theory
4/16	Graph Theory: Walks, Cycles, Paths, and Trees
4/18	Graph Theory: Diameters and Subgraphs
4/23	Graph Theory: Chromatic Number
4/25	Graph Theory: Hamiltonian Paths and Cycles
4/30	Graph Theory: Planar Graphs; **Quiz**
5/2	Special Topic: Sizes of Infinity
5/7	Special Topic: The Triangle Game and Ramsey Theory
5/9	Special Topic: Cryptography and Digital Security
5/15	**Section 2 Final Exam** 2 - 4 PM
5/16	**Section 1 Final Exam** 2 - 4 PM