Math 335: Abstract Algebra I, Fall 2023
General Course Information

Professor: Noah Aydin **Office:** RBH 319 **E-mail**: aydinn@kenyon.edu **Class Meetings**: MWF 9:10-10 in RBH 215
Course web page: http://www2.kenyon.edu/depts/math/aydin/teach/335
Office Hours: MW: 10:10-Noon; F:10:10-11am, or by appointment. See my weekly schedule on course web page.
Textbook: A first course in Abstract Algebra, J. B. Fraleigh, 8th ed, e-book version, Pearson, ISBN: 9780135859759.

Course Description and Learning Objectives: Abstract Algebra is one of the principle branches of modern mathematics. It is the study of general properties of algebraic structures. The abstraction refers to the perspective taken in the subject, which is very different from that of high school algebra courses. Rather than looking for the solutions to a particular problem, we will be interested in such questions as: When does a solution exist? If a solution does exist, is it unique? What general properties does a solution possess? What general properties are common between different algebraic structures? Our exploration will go beyond such algebraic structures as the integers and the real numbers, and our approach will be axiomatic. Indeed, working from a fairly small set of axioms one can describe the properties of a wide range of algebraic structures concisely and elegantly. Focusing on group theory, our study will be motivated by the desire to describe algebraic structures in a rigorous, concise, and elegant way. Rigorously proving theorems and writing formal proofs in the context of axiomatic algebraic systems is a major goal of this course as well as communicating proofs and solutions to problems orally. Group theory also allows us to quantify various types of symmetries so prevalent in the world around us. In fact, abstract algebra turns out to have a surprisingly wide range of applications some of which will be briefly discussed. We will cover most of the topics in sections 1-17 in the textbook. These chapters include the following topics: Binary operations, groups, subgroups, cyclic groups, permutation groups, group isomorphisms, cosets and the theorem of Lagrange, finitely generated Abelian groups, homomorphisms, factor groups, groups actions, isomorphism theorems, Sylow theory. The course will focus on theory, proof writing and problem solving. Active learning methods will be used throughout the semester. Prerequisite: Math 222 or equivalent.

Course Learning Goals: Math 335 serves the general student learning goals of Mathematics department in the following ways.

1. Understand the role of an axiomatic system in theoretical mathematics.
2. Evaluate arguments and proofs to justify assertations.
3. Develop rigorous proofs to justify assertations.
4. Develop precision in mathematical writing and expression.
5. Communicate mathematical proofs, arguments, and solutions in writing.
6. Communicate mathematical proofs, arguments, and solutions orally.
7. Generalize from specific examples to general cases
8. Prepare majors and minors for graduate study and careers that use mathematics.
9. Employ algebraic techniques to solve problems.
10. Read formal algebraic material with clarity, understanding, and persistence.

Grading and Evaluation Criteria:
Final grades will be determined based on the performance in the following components.

Component	Percentage
Written Homework (weekly)	20
Daily Quizzes	15
Presentation/Participation/Attendance	10
Midterm Exams	30
Final Exam	25

Exams: All exams will have a take home part and an in-class part.
The dates of the midterm exams are indicated on course calendar page (Oct 2 and Nov 13).
The final exam will be on Wednesday, December 13 at 8:30 am, and it will be 3 hours long.

Class Format and Daily Reading. This course will be a version of the flipped classroom model. There will not be many traditional lectures in class meetings. Instead, lectures will be delivered via recorded videos that accompany the textbook. For each class meeting, you will read one section from the textbook and watch the accompanying video lecture(s) BEFORE the class. To encourage you to do the readings before class, there will be a short quiz at the beginning of each class based on the readings and the videos. Most of the quizzes will be on Moodle, so bringing a laptop to class is necessary. If you are late to class, you will miss the quiz. Most of the class time will be devoted to solving problems in

groups and presentations and discussions of those problems. The problems will be either from the textbook or given as handouts. Note that daily quizzes and participation are a significant part of the course grade.

One of the most important and useful skills that you can pick up in a math class is to learn how to *read a math book*. Reading math is difficult and, unlike some other types of reading, you have to constantly stop, think about the material, maybe write stuff on paper in order to figure things out for yourself, and, often, reread what you have already read to catch the subtle points. It is essential that you push yourself to read the text. While doing homework problems you may need to read the relevant material again in the text.

Textbook Video Lectures: For each section in the textbook, there is a video lecture (for some sections there are two videos). Most of them are about 15-25 minute long. When watching the videos, you can slow down or speed up the pace, you can go back to re-watch confusing parts, and you can take breaks whenever you want to. As such, you may find learning from the videos "easier" than reading the text. However, you should not skip reading. Figure out what combination of reading and watching videos is most helpful for you.

Presentations: Every week a number of problems will be assigned to be presented in class (usually on Fridays). You can work on these problems in groups of size 2 or 3. I will pick problems from the assigned sets of problems and ask for volunteers. A significant part of your participation grade will be based on your performance on these presentations throughout the semester. Here are the rules and expectations on presentation problems.

- You work in groups but present your solutions individually.
- You must have a written solution at hand when you volunteer to present a solution.
- You must talk to and explain the solution to your classmates, not just your professor.
- The audience must examine the solutions carefully, and ask clarifying questions.
- Asking questions to the presenter is part of participation.
- Friendly and constructive criticism is expected and appreciated from the audience.
- If a presenter gets stuck or another student offers a significantly different way of solving the problem, alternative solutions may be presented by another student.

Written Homework: In addition to presentation problems, you will have weekly written homework (usually due on Mondays). You must work on these homework problems alone. Any help you get from others on written homework must follow Math Department's guidelines on healthy collaboration (link available on course web site as well)

Late and Make-up Policy: All assignments must be turned in at the beginning of the class period on the assigned due date, unless specified otherwise by the instructor. There will be no make-up for daily quizzes. Several low quiz scores will be dropped at the end of the semester. The only exception to this policy will be in situations in which all of the following conditions are met: i) the student has a legitimate excuse, ii) the student informs the instructor before the class, and iii) the student is able to take the quiz during the regular class time synchronously with the class, if that quiz is on Moodle. For weekly homework assignments, each student will be allowed two "free" 24-hour extensions on homework assignments; no reason needs to be provided. Simply email the professor in advance of the due date (no later than the evening prior to the due date) to say you'd like to use one of your extensions. After the second extension, late homework will not be accepted. For exams, a make-up can only be granted with an official notice from one of the deans (the dean of academics or the dean of students).

Attendance and Tardiness Policy: Regular attendance is an essential part of this course and is expected. After one unexcused absence, each unexcused absence will lower your overall course grade by (n-1)*0.5% where n is the number of unexcused absence. A total of 9 absences (whether excused or not) will result in expulsion from the course. Tardiness and walking out of the classroom are really distracting for everyone. Unless there is a real emergency, please do not leave the classroom before the class is over. Two tardiness or leaving the room during the class will count as an unexcused absence. See Math Dept's Class Attendance Policy.

Academic Honesty: The rules set forth in the 2023-2024 Course Catalog apply to all aspects of this course. In general, any work submitted for credit must result directly from your own understanding, thoughts, and ideas. Presenting the work of others as your own is strictly prohibited. You must follow the guidelines given in this document in general and mathematics department's guidelines for written homework in particular. Using chatGPT or other generative AI tools are prohibited for any of the assignments or exams in this course. If you have any questions, please ask your professor for clarification.

Accessibility and Accommodations: Students who anticipate they may need accommodations in this course because of the impact of a learning, physical, or psychological disability are encouraged to meet with me privately early in the semester to discuss their concerns. In addition, students must contact Student Accessibility and Support Services (SASS) (740-427-5453 or sass@kenyon.edu), as soon as possible, to verify their eligibility for reasonable academic accommodations. Though I am happy to help you in any way I can, I cannot make any special accommodations without proper authorization from the SASS staff. Except in extraordinary circumstances (and at the very start of the course), accommodations must be certified and discussed with me at least one week before they are to take effect.

Non-Discrimination, Civil Rights and Title IX Compliance

Kenyon College does not discriminate in its educational programs and activities on the basis of race, color, national origin, ancestry, sex, gender, gender identity, gender expression, sexual orientation, disability, age, religion, medical condition, veteran status, marital status, genetic information, or any other characteristic protected by institutional policy or state, local, or federal law. The requirement of non-discrimination in educational programs and activities extends to employment and admission. As a faculty member, I am deeply invested in the well-being of each student I teach. I am here to assist you with your work in this course. If you come to me with non-course-related concerns, I will do my best to help. However, it is important for you to know that *all faculty, are considered Mandated Reporters* of any incidents of harassment, discrimination, and intimate partner violence and stalking. Meaning, I must report any such discussion to the Civil Rights/Title IX coordinator. I cannot keep information involving sexual harassment, sexual misconduct, interpersonal violence, or any other form of harassment or discrimination based on a protected characteristic, confidential. The Health and Counseling Center, the College chaplains, and the staff at New Directions Domestic Abuse Shelter & Rape Crisis Center are confidential resources. For further information, please refer to the following Kenyon College policies: Discrimination, Sexual Misconduct & Harassment: Title IX, VAWA, Title VII. Civil Rights Policy
ADA & Section 504 Student Grievance Procedures

Class Norms

- We are a community of learners and we help and support each other
- We are fully present and fully engaged.
- Everyone should speak. Do not be shy to speak.
- We are respectful of each other.
- We offer friendly and constructive criticism.
- Everyone has something to learn.
- Everyone has expertise to offer.

How to Study for this Class

- Regular work and genuine engagement in the material are the most important aspects of deep learning in any class.
- Read the assigned sections from textbook and watch the accompanying video BEFORE the class. You may not understand everything in the first reading but that's OK. Do your best. Take notes to ask questions in class.
- Come to the class and actively participate in problem solving other class activities and discussions. Do not hesitate to ask and answer questions, or contribute to class discussions in other ways. Daily quizzes and presentation of problems in class are significant part of your grade.
- Start doing homework problems early. Do not wait until the last minute.
- Do homework problems regularly. Do a few problems every day instead of trying to do everything the night before an assignment is due.
- If you have any questions, some see Prof. Aydin during the regular office hours (no appointment needed) or make an appointment. See Prof Aydin's weekly schedule to find a mutually convenient time.
- You are welcome to chat with Professor Aydin for matters outside the course content as well.
- Form study groups. Research shows studying in groups is really beneficial. BUT make sure that you write your own solutions independently at the end. Follow Math Dept's guidelines on healthy collaboration.

Book Recommendation on Learning and Study Habits

The New Science of Learning: How to Learn in Harmony With Your Brain, by T. Doyle, and T. Zakrajsek
http://www.goodreads.com/book/show/17783567-the-new-science-of-learning

The 5 Elements of Effective Thinking, by E. B. Burger, and M. Starbird
http://www.goodreads.com/book/show/14891980-the-5-elements-of-effective-thinking#other_reviews