Math 120A: Group Theory
Winter 2019 Course Information and Syllabus

Professor: Nathan Kaplan, Rowland Hall 540C, `nckaplan@math.uci.edu`.
TA: Hayan Nam, Rowland Hall 440M, `hayann@uci.edu`
Lectures: M,W,F 12:00 - 12:50 PM in DBH 1500.
Nathan's Office Hours: Wednesday 1:00 - 2:30 PM, Math Common Room RH 410.
If this time does not work for you, *please feel free to email me to set up an appointment.*
**Hayan's Office Hours**: Tu 9:00 - 11:00AM, Th 9:00 - 10:00 AM, RH 250B.

Discussion Sections: Tu,Th 8:00 - 8:50 in MSTB 120.

Textbook: *A First Course in Abstract Algebra, Seventh Edition*, John B. Fraleigh.
ISBN: 9780201763904

This textbook is **very** expensive when purchased from the UCI bookstore. Earlier editions will be adequate for the course and should be more reasonably priced.

Prerequisites: We will not assume any prior familiarity with abstract algebra, but we will assume that you have taken a course in linear algebra, such as Math 3A, and that you have taken a proof-based math course, like Math 13. Chapter 0 of the textbook gives a nice introduction to some material you should have seen before- **please read it before the second class meeting**. If you have any questions about your background or prerequisites for the course, please send me an email and I would be happy to meet with you to discuss these issues.
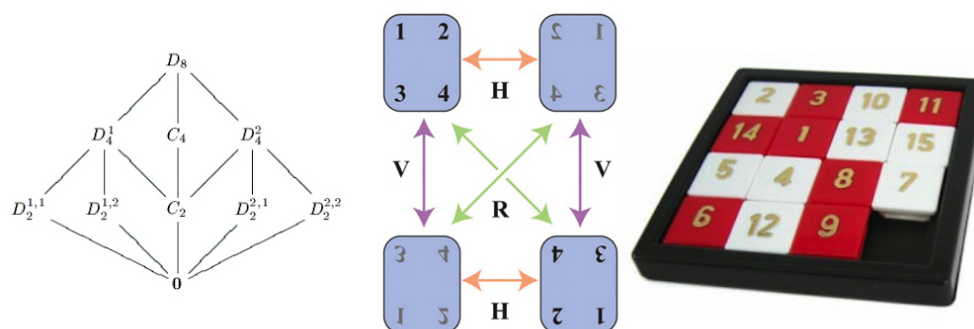
Course Goals

Math 120A is a rigorous proof-based introduction to group theory. It is likely that this is your first math course taught at this level of abstraction. This class will develop your ability to think axiomatically, but at the same time it will be grounded in concrete problems and examples. Learning abstract algebra is almost like learning a new language. There will be lots of new concepts and definitions, but we will reinforce them with lots of concrete examples. Becoming comfortable with this type of abstract reasoning will be a valuable experience as you progress in your mathematical studies.

Groups are fundamental mathematical objects and we will learn as much as we can about them. They provide a useful language for understanding a diverse array of problems that arise in many different areas of math. This course provides a solid base of knowledge for when these topics come up again in other courses. Most importantly, you will develop important mathematical reasoning and problem-solving skills by reading and writing lots of proofs.

Major Topics

1. Basics of Groups: Definitions and Examples

2. Binary Algebraic Structures and Group Tables, Isomorphism of Groups

3. Subgroups, Cyclic Groups, Order of an Element

4. Properties of the Integers and Integers Modulo n

5. More Examples: Groups of Permutations, Dihedral Groups

6. Cayley's Theorem

7. Lagrange's Theorem, Cosets and the Index of a Subgroup

8. Group Homomorphisms

9. Normal Subgroups and Factor Groups

Grading

- Final Exam (DBH 1500, Monday, March 18th 1:30-3:30): 40%

- Exam 1 (in lecture Friday, February 1): 15%

- Exam 2 (in lecture Wednesday, February 27): 15%

- Quizzes (in section, approximately 6 total): 15%

- Weekly Homework: 15%

Homework: Homework and the weekly sections will be a big part of this course. The best way to become comfortable with a new and challenging subject is to do lots of problems. Since this is an abstract course there are lots of new definitions and concepts to absorb. We will get lots of practice working with them through weekly homework and occasional quizzes in section. As a policy, I do not accept late homework. However, if you have a good reason why you need a few extra days to complete an assignment email me and we can discuss the situation.

Collaboration: I have always found that I think better about mathematics when I can discuss it with others and that I only really understand a problem when I can explain its solution to somebody else. **You are encouraged to work together on problem sets, but write up your solutions individually**. If you use outside sources (other textbooks, websites, etc.) for your homework, you must acknowledge them. If you have any questions about this policy, or about academic integrity issues within the course, please email me.

Quizzes: We will have approximately six quizzes in discussion section. The quizzes will last approximately 20 minutes each. These quizzes are not designed to test new material in a clever way, but rather are meant to reinforce the basic definitions and results of the course. If you are keeping up with the homework and the reading in the textbook then the quizzes should not be a problem. No makeup quizzes will be offered. If you know ahead of time that you will not be able to attend one of the quizzes, email me **before the quiz** to make other arrangements.

The lowest HW score and the lowest quiz score will be dropped from your grade.

Accommodation Policies: If you need an accommodation to participate in this course, please come see me no later than the end of the second week of class.
Review the policies on accommodation at: `http://disability.uci.edu/`.