Texts We will be using *Abstract Algebra: Theory and Applications*, by Thomas W. Judson as our textbook. We will cover material from Chapters 1–15, as described on the attached calendar. This is an open source textbook, which in part means you are free to make unlimited copies. The book's website is abstract.pugetsound.edu. The "2015 Annual Edition" will be the version I will follow for this course. Do not purchase an older edition, as there have been substantial changes in how theorems and examples are numbered, and it will be difficult to follow along with an older copy.

The book's website has links to help you with the purchase of a physical copy of the book, should you desire one. You may also download a PDF that is nearly identical to the hard copy, or another PDF which contains the extra material about Sage. Additionally, the online version has all the same content and the Sage examples are executable and editable, via the Sage Cell server.

Course Web Page Off of buzzard.ups.edu/courses.html you can find the link to the course web page. This page will evolve as the course progresses.

Office Hours My office is in Thompson 303. Making appointments or simple, **non-mathematical** questions can be handled via email — my address is `beezer@ups.edu`. Do not confuse this address with the one used for submitting homework (I only look at the homework address when something is due). I rarely do not receive your email, and I read all of my email all of the time, usually very shortly after receiving it. Urgency of replying varies by the hour, day and nature of the message. Office Hours are 1:30–3:00 on Monday, Tuesday, Thursday and Friday. Office Hours are first-come, first-served, so I do not make appointments for these times, nor do you need to ask me if I will be present at these times. You may assume I will be there, unless I have announced otherwise in class or by email. You **may** make an appointment for other times, or just drop by my office to see if I am in. Office Hours are your opportunity to receive extra help or clarification on material from class, or to discuss any other aspect of the course.

Class Preparation Reading questions will help you prepare for the lectures on each chapter. They are posted on the course webpage, as a single PDF for the entire semester. The course page also includes careful directions about submitting your responses. These are due to me by 6:00 AM the morning of the day when we begin discussing a new chapter, as indicated on the schedule and announced in class. Under no circumstances will they be accepted late. These should be submitted to the email address announced in class, **not** my `beezer@ups.edu` address. Please read the course web page for more procedural details (and to locate the questions themselves).
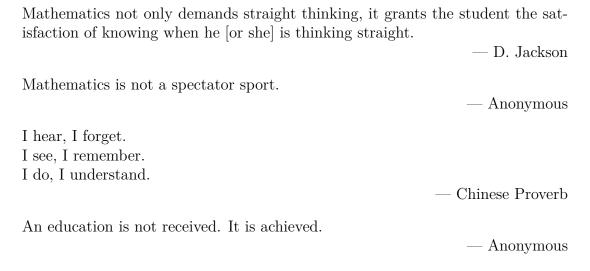
Computation Abstract algebra has become increasingly important for its application to digital technologies. We will cover cryptography (a key component of the Internet) in Chapter 7 ("Introduction to Cryptography") and efficient digital communication in Chapter 8

("Algebraic Coding Theory"). Conversely, digital technologies are an ideal assistant for studying the subject. So computation will be a feature of the course.

For this reason, we will make extensive use of Sage. Since Sage is open source software, it is available freely in many places. You will need to purchase an account at SageMathCloud where we will have access to a powerful servers via your web browser and we can effeciently manage homework assignments. (Details on accounts will be provided in class, cost is $28 for the semester.) A backup is the on-campus server at sage.pugetsound.edu which will be running the latest version of Sage (6.9) within the Sage Notebook interface (which is radically different than the SageMathCloud interface). If you want to access the UPS server from off-campus, learn to use the university's vDesk software or virtual private network (VPN). Availability, version incompatibility or convenience of other sites is not an excuse for not being able to use Sage. Again, tthe assumption is that you have a paid membership on SageMathCloud for doing these assignments.

For each chapter there will be assigned exercises to work in Sage. These will be due roughly on the discussion day following the lectures for each chapter, as a SageMathCloud worksheet. We will discuss the exact procedure in class. Exact due dates will be announced in class. Under no circumstances will these assignments be accepted late.

Practice Exercises from the text will be suggested for each chapter. Of course, you are not limited to working **just** these assigned problems and you can find many more in textbooks in the library (ask me for suggestions). We have twelve call days reserved for discussions when we can talk about these problems. It is your responsibility to be certain that you are learning from the homework exercises. The best ways to do this are to work the problems diligently, start studying them early, and participate in the classroom discussion. If at this point you are still unsure about a problem, then a visit to my office is in order, since you are obviously not prepared for the examination questions. Making a consistent effort outside of the classroom is the easiest way (only way?) to do well in this course.

> Mathematics not only demands straight thinking, it grants the student the satisfaction of knowing when he [or she] is thinking straight.
>
> — D. Jackson

> Mathematics is not a spectator sport.
>
> — Anonymous

> I hear, I forget.
> I see, I remember.
> I do, I understand.
>
> — Chinese Proverb

> An education is not received. It is achieved.
>
> — Anonymous

Examinations There will be six 50-minute timed examinations. Planned dates are all listed on the **tentative** schedule. The comprehensive final examination will be given at 8 AM on Monday, December 14. The final exam cannot be given at any other time, so be certain that you do not make any travel plans that conflict, and also be aware that I will allow you to work longer on the final exam than just the two-hour scheduled block of time.

Grades   Grades will be based on the following breakdown:

- Examinations: 50%

- Sage: 25%

- Reading Questions: 5%

- Final Examination: 20%

The lowest of your six examination scores will be dropped. Attendance and improvement will be considered for borderline grades. Scores will be posted anonymously on the web at a link off the course page.

Reminders   Here are three reminders about important university policies contained in the *Academic Handbook*. These are described thoroughly online at `http://www.pugetsound.edu/student-life/student-handbook/academic-handbook/`, or a printed copy may be requested from the Registrar's Office (basement of Jones Hall).

"Regular class attendance is expected of all students. Absence from class for any reason does not excuse the student from completing all course assignments and requirements." (Registration for Courses of Instruction, Non-Attendance)

Withdrawal grades are often misunderstood. A Withdrawal grade (W) can only be given prior to the university deadline listed on our course schedule, and after that time (barring unusual circumstances), the appropriate grade is a Withdrawal Failing (WF), **even if your work has been of passing quality**. See the attached schedule for the last day to drop with an automatic 'W'. (Grade Information and Policy, Withdrawal Grades)

All of your graded work is expected to be ***entirely*** your own work, this includes Reading Questions and Sage Exercises. Anything to the contrary is a violation of the university's comprehensive policy on Academic Integrity (cheating and plagiarism). Discovered incidents will be handled strictly, in accordance with this policy. Penalties can include failing the course and range up to being expelled from the university. (Academic Integrity)

Purpose   At this point in your college career, you should be well on your way to being an independent scholar, who appreciates the beauty of mathematics and understands the effort needed to master new and difficult ideas. Consistent with that, I will be giving you a fair degree of freedom to learn this material in a manner that suits you.

Read the book before the lectures, work the exercises diligently, tidy up your class notes each evening, and ask questions. Arriving late to class, or having conversations with others during class, not only disrupts your peers, but tells me you are not serious about your education.

"Modern" algebra is the basis of one of the two main branches of mathematics (analysis being the other). So every mathematician should have a basic understanding of its principal concepts. The investment of your time and energy applied to studying it will be amply repaid by a full understanding of its deeper ideas.

Conduct   Daily attendance is required, expected, and overall a pretty good idea. Class will begin on-time, so be here, settled-in and ready to go. In other words, walking in the door at the exact time class is to begin is not considered arriving on-time. Repeated tardieness

and absences will result in grade penalties, in accordance with university policies. Do not leave class during the lecture unless there is a real emergency — fill your water bottles, use the toilet, and so on, **in advance**. I do not care how much food or drink you bring to class, so long as it does not distract others or make me hungry. Please do not offer me sweets. Please keep phones in your pocket or bag, unless you are using them to read course material. In short, we are here to learn and discuss mathematics together. It is your responsibility to not distract your peers who are serious about their education or distract me as I endeavor to make the best use of the class time for you and your colleagues.

Student Accessibility and Accommodation   "If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodation, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential."

I request that you give me at least two full working days to respond to any requests from this office.

Student Beravement Policy   "Upon approval from the Dean of Students Office, students who experience a death in the family, including parent, grandparent, sibling, or persons living in the same household, are allowed three consecutive weekdays of excused absences, as negotiated with the Dean of Students. For more information, please see the Academic Handbook."

Classroom Emergency Response Guidance   Please review university emergency preparedness and response procedures posted at http://www.pugetsound.edu/emergency/. There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones or pagers on vibrate so that you can receive messages quietly. Wait for further instructions.

Tentative Daily Schedule

Monday	Tuesday	Thursday	Friday
Aug 31 Syllabus SageMathCloud	Sep 1 Chapter 1	Sep 3 Chapter 1	Sep 4 Problem Session
Sep 7 Labor Day	Sep 8 Chapter 2	Sep 10 Chapter 2	Sep 11 Problem Session
Sep 14 Exam 1 Chapters 1, 2	Sep 15 Chapter 3	Sep 17 Chapter 3	Sep 18 Chapter 3/4
Sep 21 Problem Session	Sep 22 Chapter 4	Sep 24 Chapter 4	Sep 25 Problem Session
Sep 28 Exam 2 Chapters 3, 4	Sep 29 Chapter 5	Oct 1 Chapter 5	Oct 2 Chapter 5/6
Oct 5 Problem Session	Oct 6 Chapter 6	Oct 8 Chapter 6	Oct 9 Problem Session
Oct 12 Exam 3 Chapters 5, 6	Oct 13 Chapter 9	Oct 15 Chapter 9	Oct 16 Chapter 9/10

Mid Term

Tentative Daily Schedule

Monday	Tuesday	Thursday	Friday
Oct 19 Fall Break	Oct 20 Fall Break	Oct 22 Chapter 7	Oct 23 Chapter 7
Oct 26 Problem Session	Oct 27 Chapter 10	Oct 29 Chapter 10	Oct 30 Problem Session
Nov 2 Exam 4 Chapters 7, 9, 10	Nov 3 Chapter 11	Nov 5 Chapter 11	Nov 6 Chapter 11/13 Last Day for Automatic W
Nov 9 Chapter 8	Nov 10 Chapter 8	Nov 12 Problem Session	Nov 13 Chapter 13
Nov 16 Chapter 13	Nov 17 Problem Session	Nov 19 Exam 5 Chapters 11, 13	Nov 20 No Class
Nov 23 Chapter 14	Nov 24 Chapter 14	Nov 26 Thanksgiving	Nov 27 Thanksgiving
Nov 30 Chapter 14/15	Dec 1 Chapter 15	Dec 3 Chapter 15	Dec 4 Chapter 15
Dec 7 Problem Session	Dec 8 Exam 6 Chapters 14, 15	Dec 10 Reading Period	Dec 11 Reading Period

Final Examination: Monday, December 14, 8 AM

Suggested Exercises

Chapter	Computational	Theoretical
1	18, 25	8, 9, 22c, 28, 29
2	15	5, 10, 16, 18, 27
3	1, 3, 5, 6, 10, 17, 32	29, 30, 31, 38, 43, 44, 45, 46, 53, 55
4	3, 4, 5, 6, 7, 8, 9, 11, 20, 21, 22b	24, 26, 27, 28, 30, 34, 37
5	2, 3, 5, 7, 9, 10, 15	4, 18, 20, 23, 25, 27, 30, 33, 35
6	1, 2, 5	3, 6, 11, 12, 17, 19, 20, 23, 23
9	3, 5, 10, 12, 14, 16, 17	20, 21, 22, 24, 25, 29, 34, 35, 38, 48
7	7, 8, 10	
10	1bcd, 2, 3, 4	5, 6, 7, 9, 11, 12, 13, 14, 15
11	2, 3, 4, 5, 6; Additional: 7, 8	8, 15, 16, 17, 20; Additional: 2, 3, 9, 10
8	7–15	18, 19, 20, 23
13	1, 2, 3, 4bc	6, 9, 11, 12, 13
14	2, 3, 4, 6, 9, 11, 13, 17 (S_3 only)	20, 22, 24
15	1, 2, 3, 5, 6, 9, 15, 16, 17, 24	4, 7, 8, 10, 12, 14, 21