

Math 332: Number Theory

Fall 2019

Jay Daigle

Course Goals

In Math 322 we will gain a broad understanding of number theory, a mathematical topic that has been of great interest since the ancient Greeks. The two major topics we will study are the distribution of prime numbers and solution sets to Diophantine equations. We will explore connections with modular arithmetic and with cryptography and learn Gauss's law of quadratic reciprocity. We will also practice good mathematical writing and clear communication of mathematical and technical ideas.

Instructor Info

Lectures:	MWF 4:05 – 5:00 PM	Johnson 302
Instructor:	Jay Daigle	Office Hours: MWF, 1:45 – 2:45 PM
Office:	Fowler 305	Often in Office: MWF, 1:00 - 2:45 PM, 5:00 - 6:00 PM
Email:	gdaigle@oxy.edu	T, 12:30 - 1:30 PM, 4:30 - 5:00 PM
Course Webpage:	http://jaydaigle.net/number-theory	R, 12:30 - 1:30 PM

References

There is *no mandatory textbook* for this course. I will post complete lecture notes and homework assignments on the course webpage. The following references may be helpful to you if you're looking for extra reading; I will try to include pointers to specific chapters in the notes.

- *Elementary Number Theory & its applications* by Kenneth H Rosen is the main reference I will be (loosely) following. We have used it for this course in previous years. It is currently in the sixth edition.
- *Number Theory: A Lively Introduction with Proofs, Applications, and Stories* by Pommersheim, Marks, and Flapan is probably the most readable reference on this list.
- *Elementary Number Theory: Primes, Congruences, and Secrets* by William Stein is available free online at <http://wstein.org/ent/>. It is targeted at a slightly higher level than this course, but you still may find it helpful. It focuses on computational applications and cryptography.
- *A Computational Introduction to Number Theory and Algebra* by Victor Shoup is also free online, at <http://shoup.net/ntb/>. Unsurprisingly, it is also focused on computational applications. Like the previous entry, it is more advanced than I intend for this course; it may be slightly confusing if you are not familiar with rings and ideals.

Grading

- Homework: 40%
- Starred Problems: 10%
- Midterms: 10% each
- Final: 15%
- Paper: 15%

Details

- **Homework:** Homework is by far the most important component of this course. Math is a skill that can only be learned by practice, and it's very difficult to understand the material until you have worked through applying it.

Homework will be assigned weekly and collected on Fridays. I will do my best to return it by the following Monday. I will *not* except late homework without prior permission or a note from the dean or the health center. If you need an extension, please email me before the homework is due. I am usually up late.

Please begin the homework early, and discuss it with your classmates and with me. This is important enough to get its own paragraph.

- **Starred Problems:** One problem on each week's homework will be starred. You may *not* discuss this problem with classmates, though you should of course feel free to discuss it with me as much as you like. You must submit the starred problem on a *separate, detached sheet of paper* each week.

I will be exceptionally picky grading the starred problems, and in particular I will grade clarity of writing. After receiving my feedback, you may resubmit the problem the following week with corrections and edits made, and the new grade will supplant the earlier.

If you go a full week without submitting a problem or getting an extension from me, your grade will be locked in. This mostly means you can't put them off and then redo all of them in the last week of the term. (This is a terrible idea and never works).

- **Exams:** There will be two midterms and a final. The midterm dates are tentatively October 2 and November 6. The final exam time will be listed here when the registrar announces it.

The tests are less important than the homework, and of necessity can only test material shallowly. We will discuss the tests more when the test dates approach.

- **Paper:** All students in this course will be required to submit a roughly 4-5 page paper on some number theory related topic. I will hand out a separate sheet with topic suggestions.

A first draft of the paper will be due on Monday, November 18. Submitting a full draft by this date will be worth 5% of your final grade. I will give feedback and a preliminary grade; your final submission, worth 10% of your final grade, will be due Tuesday, December 3. (Note: by college policy I can not give extensions on this date).

- **Disabilities:** It is the policy of Occidental College to make reasonable accommodations for qualified individuals with disabilities. If you are a person with a disability and wish to request accommodations to complete your course requirements, please make an appointment with the course instructor as soon as possible to discuss your request. For information on documentation requirements, contact the Center for Academic Excellence (x2545).

- **Academic Accommodations for Reasons of Faith and Conscience:** Consistent with Occidental College's commitment to creating an academic community that is respectful of and welcoming to persons of differing backgrounds, we believe that students should be excused from class for reasons of faith and conscience without academic consequence. While it is not feasible to schedule coursework around all days of conviction for a class as a whole, faculty will honor requests from individual students to reschedule coursework, to be absent from classes that conflict with the identified days. Information about this process is available on the ORSL website: <https://www.oxy.edu/student-life/resources-support/orsl/academic-accommodations>.