

Number Theory is the study of whole numbers, especially related to the notion of divisibility of numbers. It evolves around two key notions: On one side the decomposition of numbers into 'prime' components, on the other side modular arithmetic, which is essentially a generalization of the arithmetic that would take place in a 12-hour clock. Number theory has been an object of study since the ancient times, and still contains numerous simple to state but quite intractable questions.

Number Theory also has important applications in Cryptography. In essence, the security of every internet transaction is based on some fundamental number theory facts, the most common amongst them being that if a number is the product of two large prime numbers, then there is no efficient way to recover those prime numbers if all you know is their product. All current cryptographic techniques make heavy use of the tools we will learn in this class. We will explore some of these connections along the way.

This course is also a perfect opportunity to familiarize yourselves with the various research and proof techniques that mathematicians employ. We will try to provide proofs for most of our assertions, and your homework will ask you to do the same. We will spend considerable parts of each class discussing theorems and their proofs.

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## Course Components

### Class Attendance

You are expected to attend every class meeting, including any labs. You are only allowed to miss 3 classes without excuse. From that point on, every unexcused absence will result in a reduction of your final score by a percentage point, up to a total of 5 points. Excused absences should be arranged in advance, and backed by appropriate documentation. Emergencies will be dealt with on an individual basis. There are very few reasons that would qualify as an excuse for an absence.

### Homework Assignments

Your homework assignment each day will be to work out the proofs of a number of theorems, and then present these proofs and discuss other people's proofs in class. You will be evaluated on the effort you have put on the proof, as well as the effort you put in class presenting and discussing these proofs with the rest of the class.

### Exams

There will be two midterms, Friday, February 8th and Friday, March 22nd, and a final/3rd midterm during finals week. **You have to be here for the exams.** If you have conflicts with these days, let me know as soon as possible. Be prepared to

provide substantial documentation. Do not plan your vacation before you are aware of the finals schedule. In terms of your final grade, the exams you did better at will weigh more.

The three tests are weighted according to which one you did the best on: Your best test score counts almost twice as much as your worst test score.

## Grading

Your final grade depends on class attendance and participation, quizzes, midterms and the final, as follows (the weights on the 3 exams are based on which exams you did better on: Your best exam will count for 30%, your second best for 25% and so on):

Class Attendance	5%
Class Participation	25%
Worst Exam	15%
Middle Exam	25%
Best Exam	30%
Total	100%

This gives a number up to 100, which is then converted to a letter grade based roughly on the following correspondence:

Letter grade	Percentage Range
A, A-	90%—100%
B+, B, B-	80%—90%
C+, C, C-	70%—80%
D+, D, D-	60%—70%
F	0%—60%