

**Instructor:** Anna Haensch  
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**Office:** 418 College Hall

**Meeting times:** M,W 3:00-4:15, 447 College Hall  
**Office Hours:** T,Th 11:00-1:00, and by appt.  
**Course Website:** [www.mathcs.duq.edu/~haensch/Math311.html](http://www.mathcs.duq.edu/~haensch/Math311.html)

## Course Objectives

The goal of *Math 311: Number Theory*, is to gain an understanding of the general principles of elementary number theory and to see these in the context of the big problems in current number theoretic research. More specifically, this course will cover: divisibility theory of integers, distribution of primes, theory of congruences, Fermat's theorems, special number theoretic functions, primitive roots, and the quadratic reciprocity law. By the end of the semester you will be able to apply the basic notions of number theory to write clear, concise, mathematical proofs.

## Course Structure

The format will be very different from a typical math course; it will be taught using inquiry based learning (IBL). There will be very few lectures, minimal assigned reading, in fact there won't even be a textbook! Rather than being presented with theorems and proofs, it will be up to you to discover them on your own. A typical class period in Math 311 will consist of working on problems in small groups or presenting solutions at the blackboard in front of your classmates. I'll be tracking our progress and documenting the course on the Course Log, available through the course website.

- **Supplies**

You will be writing the textbook for this course, so you will need a computer equipped with Latex.

- **Grading**

Participation	10%	90-100% A 80-89% B 70-79% C 60-69% D below 60% F
Homework	10%	
Midterm Exam	15%	
Final Exam	15%	
Research Project	20%	
Textbook Project	30%	

*Note: I will give  $\pm$  grades accordingly. If in doubt, please come and ask me.*

- **Participation:** Each day you will be given a worksheet with a list of exercises and conjectures. You will be expected to work with your group during class time, preparing for your individual presentations, and weekly portfolios. This is an essential part of your progress in the class, and since there are no lectures or textbook, you can expect that this is where a great deal of the learning happens. Your participation grade will be out of 44 points, determined by the following:
  - \* Attendance (26 pts): Our class meets 28 times, for each class you miss, you will lose a point. This allows you to miss two times without consequence (but of course you shouldn't do this, for other obvious reasons).

- \* **Group Work (10 pts):** You are encouraged to be an active and participating member in your group. At the end of the semester I will ask you to give yourself a score out of 10 points for your group work effort, and I will give you a score based on what I've observed. I will average the two, and this will be your points out of 10. If there is a large discrepancy, we can have a conversation about it, otherwise this should be very straightforward.
- \* **In-Class Presentations (8 points):** You are expected to present proofs at the board this semester. For each presentation you do, you will be give points according to the following scale
  - 2: Flawless proof and presentation.
  - 1: Flawed proof, but student was able to recover with intervention.
  - 0: Totally unsalvageable.

If you present more than 8 points worth of material, there will be opportunities to move around some "bonus points."

- **Homework:** Problem sets are available on the course website. You are responsible for submitting at least 2 problems every second Friday (I'll remind you when they are due). You are welcome to try as many problems as you wish (for reasons that become clear below), but only two will be graded.
- **Midterm and Final Exam:** There will be an in-class midterm and final. These will be based on the homework assignments due each week; the problems will come directly from the homework problem sets. This will be an opportunity for you to demonstrate your ability to solve problems individually. The final exam will be Tuesday Dec. 15th, 1:30-3:30.
- **Textbook Project:** The textbook project will be the ultimate culmination of all our efforts this semester. In small groups, you will produce your own number theory textbook, see the textbook project handout on our course website for more specific details on that. Points will be awarded based on a number of criteria, including: mathematical completeness/correctness, clarity of exposition, organization of content. Part of your grade on the textbook project will be based one the completion of weekly portfolios.
- **Research Project:** Since number theory is so rich in topics outside the scope of what we cover, we will dedicate the last two weeks of class to individual research presentations. Each of you will pick a topic in number theory and you will be expected to give a 20 minute presentation. A list of possible topics is on our course website.

## Course Policies

- **Academic Integrity:** You are encouraged (indeed, required!) to work together on most components of this course, but any work you submit should be your own. The discovery based nature of this course is integral to its structure, so it is essential that your brain, and the brains of your classmates are the only places you turn for assistance. Looking for proofs on the internet or in other textbooks is not allowed and is considered cheating. This, or any other cheating in the form of copying, plagiarizing, or allowing others to do so, will be grounds for receiving an F in the course.
- **Disabilities:** It is the policy of Duquesne University to provide reasonable accommodations to students with documented disabilities. If you require accommodations in this class, please contact the Office of Freshman Development and Special Student Services in 309 Duquesne Union (412-396-6657) as soon as possible.