

**21-127 - CONCEPTS OF MATHEMATICS, SUMMER 1
2014**

MTWRF 01:30PM-02:50PM, WEH 4623

Instructor: Sebastien Vasey **Office:** Wean Hall 7108 **Email:** sebv@cmu.edu

Office hours: TBA

Grader: Ryan Murray **Office:** Wean Hall 7209 **Email:** rwmurray@andrew.cmu.edu

Office hours: TBA

Course website: <http://www.math.cmu.edu/~svasey/concepts-summer-1-2014/>

Course overview. The course aims to introduce you to proof-based mathematics. In mathematics, when we say a statement is true, we usually mean something very precise: there is an unambiguous argument, a *proof*, which explains *why* the statement is true. The course will study those mysterious proofs. We will discuss:

- What they are.
- How to understand and appreciate them.
- How to verify them, and most importantly:
- How to *write* your own.

We will see that (at least in mathematics) there is a big difference between saying “I believe X is true” and “ X is true”. All throughout the session, I will encourage intellectual honesty and critical thinking. Another goal of the course is to introduce several mathematical topics (logic and set theory, combinatorics, number theory, probability) that are fundamental to further mathematical practice and also crucial in computer science and engineering. These topics will be developed from first principle and will serve both as motivation and examples in our study of proofs.

Course text. There is no required text to purchase. I will post lecture notes on the course website. Here are some other *optional* resources:

- Martin Days, *An introduction to proofs and the mathematical vernacular*. Available online at <http://www.math.vt.edu/people/day/ProofsBook/IPaMV.pdf>.
- John P. D’Angelo and Douglas B. West, *Mathematical thinking: problem-solving and proofs*. 2nd ed., Prentice Hall, 2000.

Prerequisites. There are no formal prerequisites. Our approach to mathematics will probably be very different from the one you learned in high school or in calculus courses, but it will be helpful if you remember some basic algebra and arithmetic.

Assessment. Your grade for the course will be determined by scores on homework assignments, a midterm exam, and a final exam as follows:

- The *midterm* will take place on Monday, June 9th, during regular class time. It will count for *30%* of your final grade.
- The *final exam* will take place on Friday, June 27th, during regular class time. It will count for *40%* of your final grade.
- There will tentatively be 10 *homework assignments*. Cumulatively, they will count for *30%* of your final grade. See below for more details on homework assignments.

The *highest* grade cutoffs will be as follows: 90%: A, 80%: B, 70%: C, 60%: D. These cutoffs *might* be lowered, but will not be raised.

If you qualify for special accommodation (such as extra time) for the tests, or if you already know you will not be able to take one of the tests at the planned time (e.g. because of a religious observation or a university event), you should let me know as soon as possible.

Homework assignments. They will be announced in class and posted on the course website. Solutions will typically be distributed in class the day after an assignment is due. Assignments will usually be due at the *beginning* of class. Only half credit will be given if an assignment is turned in after class, and no credit if it is turned in after solutions have been distributed. If you can't make it to class, put your assignment in my mailbox (in Wean Hall 6113) or slide it under my office door. I don't check my mailbox very often, so let me know promptly by email if you choose the former option.

Assignments are one of the key elements of this course and they will be checked very thoroughly. You should make every effort to write down your thoughts clearly and precisely. Your writeup should contain little to no extraneous material (no scrap work). I also encourage you to *be intellectually honest*: it is better to say that you are not exactly sure how to solve a problem / justify a particular step and write your thoughts than to write three pages of obscure equations and hope the grader will trust your solution to be correct.

On the first page of your assignment please include:

- Your name and Andrew ID.
- The *list of other students with whom you collaborated* (if any).

As long as you list your collaborators, collaboration is allowed and encouraged. You may discuss ideas on, and even possible solutions of,

specific problems. *However*, you may *not* maintain a record (written, audio, photographic, etc.) of the discussion. This means that *you are required to write up solutions entirely on your own* and that you cannot show the assignment you are submitting to other students. For example, if you discuss a problem with others using a blackboard, you must erase the board once the discussion is over and write up your solution on your own.

Other policies.

Contacting me. Feel free to talk to me anytime. I will often be in my office, and you are welcome to drop by, but I might tell you I am busy if you come outside regular office hours. The best way to otherwise contact me is via email, as it provides me with a written record of our conversation.

Attendance. I strongly encourage you not only to attend lectures, but also to actively participate in them: stop me if anything is unclear and feel free to share your thoughts about the material (what do you find easy? What do you find hard?).

That being said, I consider you are old enough to make your own choices, including whether to attend class or not. It's perfectly fine with me if you choose not to attend, but catching up will always be your own responsibility. Do *not* fall behind. If you do choose to attend, I expect your full attention during lectures: no loud conversation, use of cell phones, or other activities unrelated to class.

Grading issues. If you have any questions or complaints concerning the way an assignment has been graded, please come talk to me. You should first look at the official solution and make sure you understand it.

Academic integrity. Any acts of academic dishonesty, such as cheating, plagiarism, etc. will be dealt with according to University Policy. Examples of violation include searching the web (or inside a textbook) for solutions, copying part of another student's assignment or showing your assignment to another student. Please speak to me if you have any questions about this.