

# Concepts of Mathematics (21-127)

*SummerII 2017*

---

## COURSE INFO

Times MTWRF 9:00–10:20  
Location 125 Scaife Hall  
Units 10  
Course [math.cmu.edu/~cocox/teaching/cmu\\_concepts\\_summer\\_2017.html](http://math.cmu.edu/~cocox/teaching/cmu_concepts_summer_2017.html)  
Webpage

## INSTRUCTOR INFO

Name Christopher Cox  
Email [cocox@andrew.cmu.edu](mailto:cocox@andrew.cmu.edu)  
Webpage [math.cmu.edu/~cocox](http://math.cmu.edu/~cocox)  
Office 6201 Wean Hall  
Hours MTWRF 10:30–11:30 or by appointment

## TEXTBOOK

Main **Everything You Always Wanted To Know About Mathematics.**  
B.W. Sullivan  
A free electronic copy of this text will be provided to you  
Optional **Mathematical Thinking, Problem Solving and Proofs.**  
J.P. D'Angelo & D.B. West

## COURSE DESCRIPTION

The ability to reason logically and clearly from a set of accepted principles is fundamental not only in mathematics, but in life in general. In this class we will learn how to provide concrete explanations of why certain things are true. We will also determine how to detect false statements and provide conclusive evidence of their falsity. In mathematics, the ultimate goal is to construct a proper, understandable and irrefutable argument.

We will begin with concrete objects like numbers, sets and functions and learn to prove things about them using elementary logic. We will then learn more in depth techniques such as mathematical induction, and lightly explore branches of mathematics such as number theory, combinatorics and analysis.

By the end of this course you should be able to

- Use elementary logic and other techniques to provide clear and concise proofs of basic mathematical statements.
- Read and critique the proofs of others.
- Understand definitions of mathematical objects and prove basic properties.

---

## HOMEWORK

Homework exercises are an essential part of the course. It is difficult to understand the material without working through the homework problems in a thoughtful manner, especially since this is an accelerated summer course. Homework is especially important as this course will build upon itself, so if you lack the understanding of a certain topic, this will make understanding later topics more difficult. Discussion of the homework with your peers is encouraged, but copying any part of another person's homework is not permitted. Please think about the problems posed, your strategies, and the validity of your logic and explanations.

There will be two types of homework assigned:

Nightly Homework ○ Due Monday, Tuesday and Wednesday at the start of class.  
○ Nightly homework will consist of one or two questions to cement your understanding of what has been covered in class.

Weekly Homework ○ Due Friday at the start of class.  
○ Weekly homework will be more involved than nightly homework and will often work to extend what we have done in class.  
○ With the exception of the first week, weekly homework is required to be typeset in L<sup>A</sup>T<sub>E</sub>X, although any pictures may be hand-drawn. I will provide a homework template which will ease the learning curve, but you may use your own if you wish. For L<sup>A</sup>T<sub>E</sub>X resources, see [math.cmu.edu/~cocox/links.html](http://math.cmu.edu/~cocox/links.html). Also, simply Googling a specific question or command is a great way to go!

Homework Grading In mathematics, communication is essential, so you will be graded not only on your ability to form a valid argument, but also on your ability to communicate said argument clearly and concisely. As such, take care in writing up your proofs and rewrite them many times; more likely than not, first drafts will lose points.

---

## FINAL EXAM

The final exam will be held on the last day of class, Friday, August 11, during the normal class time. As there are no other exams during the class, the final will be a mixture of everything we have covered. If you put in the effort and understand all of the homework questions, this should be no big deal.

---

## COURSE POLICIES

General Time will not allow me to check attendance in this class; however, it is expected that you will attend class regularly. If you do miss a class, you are responsible to find out what was covered.

Participation is strongly encouraged. I ask a lot of questions during class and will want to hear your thoughts and ideas. Do not hesitate to go for it! I highly encourage you to question my reasoning if something does not make sense to you, as it is possible I have made a mistake, or at the very least, I am sure others in the class have the same question.

Only under grave circumstances, such as a documented medical illness, will I grant an extension on homework, so even if you are unable to attend a class, you are responsible for turning in the homework on time (by email or otherwise).

- Rewrites If you are unhappy with your grade on a homework, within two days of receiving the grade, you may submit a rewrite for full points. I highly encourage you to take advantage of this. However, in order to submit a rewrite, there will be an additional problem you must solve; your final score will then be the larger of your original score and your rewrite score. When submitting a rewrite, you must turn in both the rewrite and the original homework. Rewrites will undergo a more scrutinous grading process, so be sure your rewrite is correct and polished!
- Academic Integrity I encourage you to collaborate and form study groups. Learning collaboratively opens your mind to new ideas and forces you to clarify yours. Nonetheless, you should write your solutions by yourself. To avoid what I could consider to be plagiarism, you should not write your assignment during collaborative sessions, but do so alone once your mind is clear. Please review CMU's Academic Integrity Policy at [www.cmu.edu/academic-integrity/](http://www.cmu.edu/academic-integrity/).

---

## GRADING

Nightly HW. . . . . 40%  
Weekly HW. . . . . 40%  
Final Exam. . . . . 20%

---

## TAKE CARE OF YOURSELF

I want you to enjoy this course, and I care about your mental state, so do not hesitate to talk to me for any reason. I encourage feedback, which you can provide by speaking to me or through email. If you encounter difficulties of any kind, I will be here to help you find a solution or to guide you; the sooner the better.

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.

If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at [www.cmu.edu/counseling/](http://www.cmu.edu/counseling/). Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.