Welcome to CS103A!

- Two handouts!
- Find a nice group of people to work with!
  - Break apart into groups of two or three.
  - No one should be all by their lonesome selves. If you have a pair, adopt someone who's going solo. 😊
What is this course all about?
Course Objectives

- Provide extra practice and review of the content from CS103.
- Explore problem-solving strategies useful in mathematics.
- Improve teamwork skills for mathematics.
Class Website

http://cs103a.stanford.edu
Class Format

- You'll spend most of your time in CS103A working through extra practice problems in small groups.
- Usually we'll start off with a quick review of the material from the past week.
- We'll then turn you loose to work on problems in groups, periodically coming back together as a group.
- (Please don’t work on your CS103 assignments during class—until office hours at 5 pm.)
Grading

- Every Wednesday at 5:00PM, we’ll post a quick assignment for you to complete. These assignments are designed to
  - help you review the material you learn in class, and
  - not take much time.
- To receive credit for this course, you need to complete at least eight of the ten assignments on time.
- Additionally, you must attend at least eight of the ten class meetings, since that's where most of the learning happens!
Introduction: How to Approach Mathematics
Proof-Based Mathematics

- Most high-school math classes – with the exception of geometry – focus on calculation.
- CS103 focuses on argumentation.
- Your goal is to see why things are true, not check that they work in a few cases.
- Be curious! Ask questions. Try things out on your own. You'll learn this material best if you engage with it and refuse to settle for a “good enough” understanding.
Mathematical Prerequisites

- There is a handout on the CS103 website called “Mathematical Prerequisites”. We recommend that you read over it and ask us questions. (See also problems 1 and 2.)

- We will not be referencing concepts from linear algebra, calculus, trigonometry, etc. in CS103 or CS103A. You should be good to go with basic algebra and innate curiosity.
Mental Traps to Avoid

- “Everyone else has been doing math since before they were born and there is no way I'll ever be as good as them.”
- “A small minority of people are math geniuses and everyone else has no chance at being good at math.”
- “Being good at math means being able to instantly solve any math problem thrown at you.”
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“Being good at math means being able to instantly solve any math problem thrown at you.”
“A little slope makes up for a lot of $y$-intercept.”

- John Ousterhout
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Pro Tip #1:

Never Confuse Experience for Talent
Pro Tip #2:

Have a Growth Mindset
Fun Math Question

Suppose you improve at some skill at a rate of 1% per day. How much better at that skill will you be by the end of the year?

After one day, you're 1.01 times better. After two days, you're \((1.01)^2\) times better.

After one year, you'll be \((1.01)^{365} \approx 37.8\) times better!
Pro Tip #3:

Avoid an Ingroup/Outgroup Mindset
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Simple Open Problems

- Math is often driven by seemingly simple problems that no one knows the answer to.
- Example: the *integer brick problem*:
  
  Is there a rectangular brick where every line connecting two corners has integer length?

- Having open problems like these drives the field forward – it motivates people to find new discoveries and to invent new techniques.
Don't Psych Yourself Out

- It is *perfectly normal* to get stuck or be confused when learning math.
- We've all been on the Struggle Bus. Don't be afraid to ask for help!
Getting Good at Math

- **Engage with the concepts.** Work through lots of practice problems. Play around with new terms and definitions on your own time to see how they work.

- **Ask for help when you need it.** We're here to help you. We want you to succeed, so let us know what we can do to help!

- **Work in groups.** Get help from your problem set partner, the TAs, and your CS103A buddies.
Today's Plan

- Review some concepts from high-school mathematics (different types of numbers, polynomials, and inequalities.)
- Review set theory concepts from the first lecture.
- Play around with those concepts to get a familiarity with how they work.
Recommendations

- Read Chapter 1 of the course notes for a more thorough introduction to the concepts from the first lecture. (Textbooks -> Course Reader)

- Read the “Mathematical Prerequisites” handout for a review of some key mathematical ideas.

- Do the quick CS103A assignment, released Wednesday around 5 pm.