

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

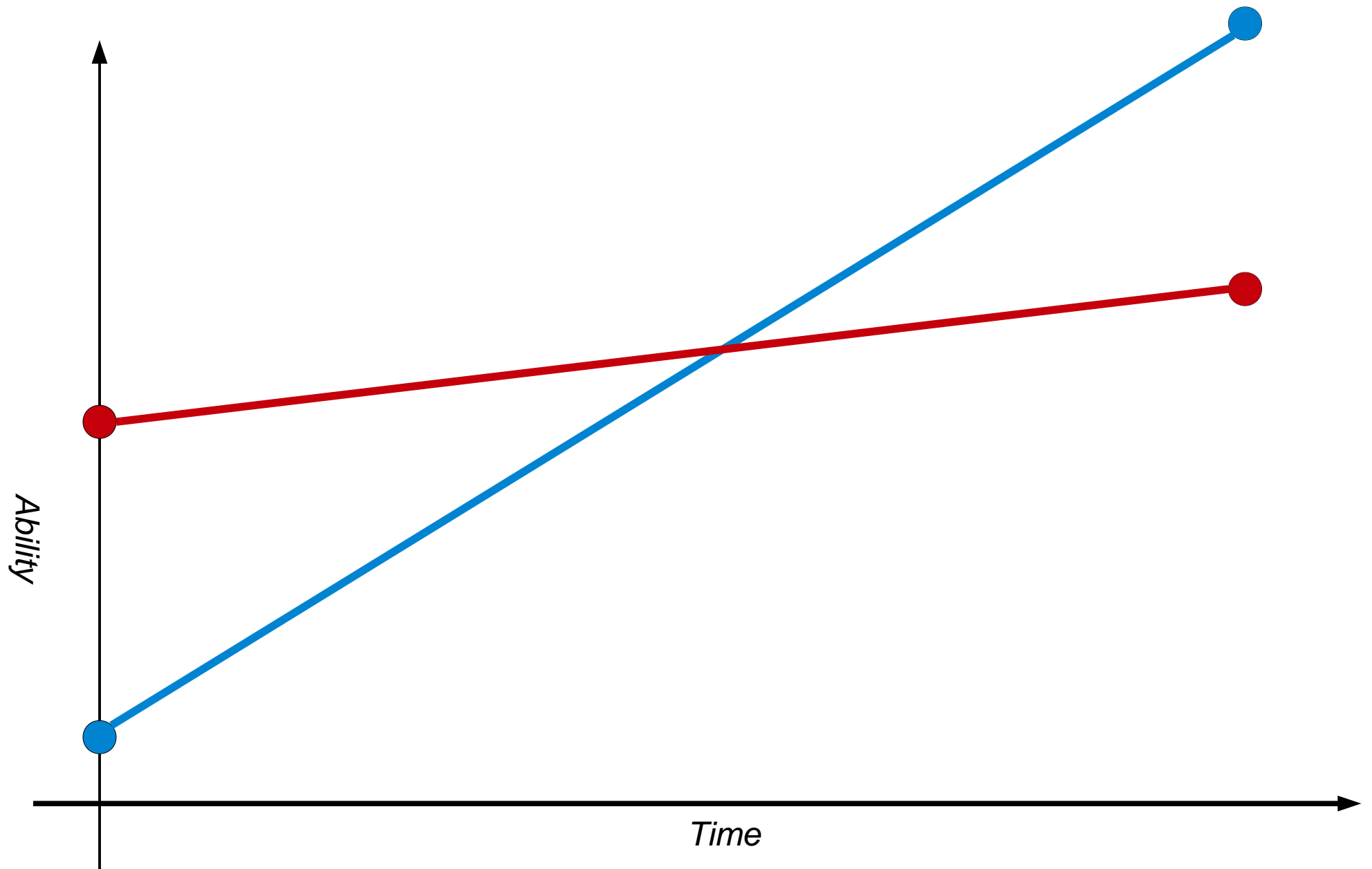
- “Everyone else has been doing math since before they were born and there is no way I'll ever be as good as them.”
- “A small minority of people are math geniuses and everyone else has no chance at being good at math.”
- “Being good at math means being able to instantly solve any math problem thrown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

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“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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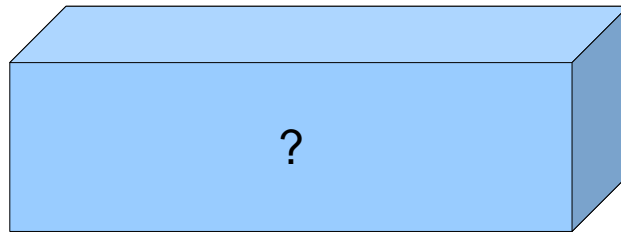
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Simple Open Problems

- Math is often driven by seemingly simple problems that no one knows the answer to.
- Example: the *integer brick problem*:

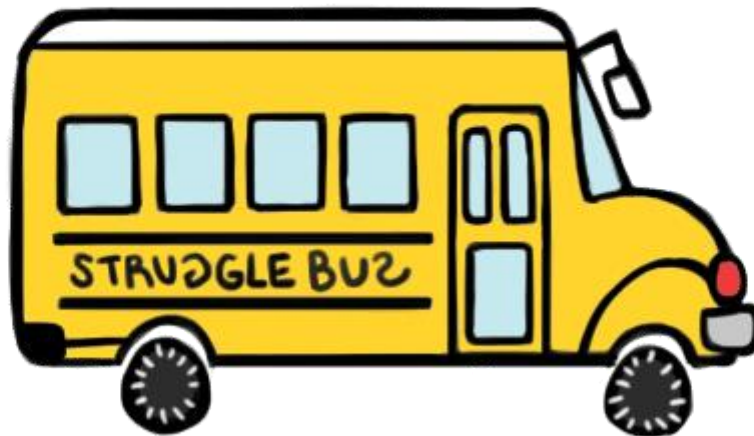


Is there a rectangular brick where every line connecting two corners has integer length?

- 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.