

CS230 Spring 2024

Discrete Math for Computer Science

Overview

What is CS230?

- CS230 is
Discrete Math for Computer Science

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Discrete Math for Computer Science

MATH230: Probability CS445: Introduction to High Dimensional Data Analysis
 CS330: Introduction to the Design and Analysis of Algorithms MATH375: Linear Programming
 CS316: Introduction to Database Systems CS371: Elements of Machine Learning
 CS671D: Theory and Algorithms for Machine Learning CS334: Mathematical Foundations of Computer Science
 CS351: Introduction to Computer Security MATH356: Ordinary and Partial Differential Equations

What is CS230?

- CS230 is
Discrete Math for Computer Science
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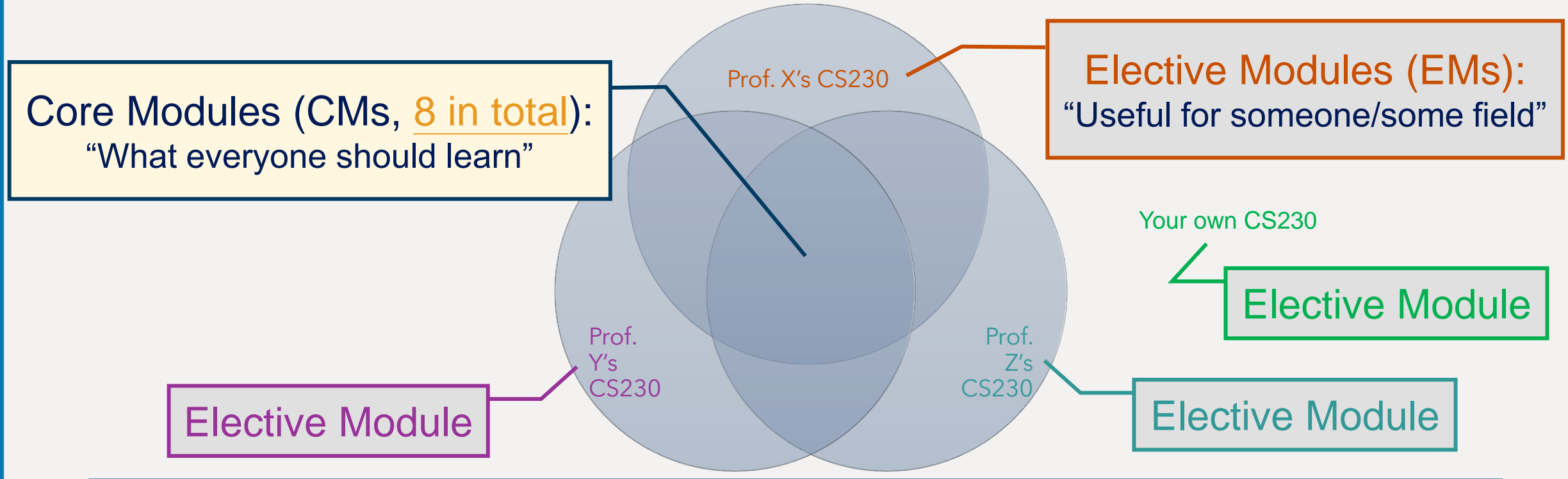
What is CS230?

- CS230 is **some but NOT ALL**
Discrete Math for Computer Science
 - CS is growing so fast, we can't agree on what topics are essential
 - **What should be included in CS230?**
-

The goals of CS230

- Acquire and enhance your ability in **abstract thinking** and **formal mathematical communication**.
 - Familiarize yourself with math concepts and tools essential for **advanced topics in computer science**.
-

How do we go about CS230 in Spring 24

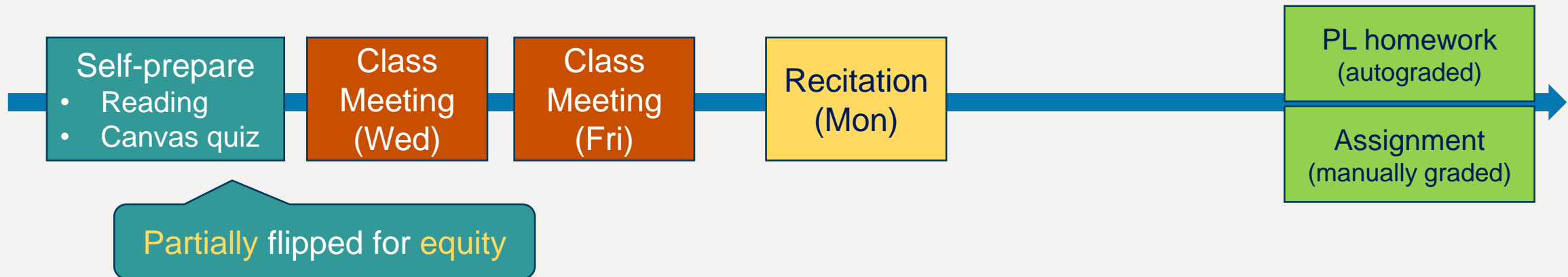


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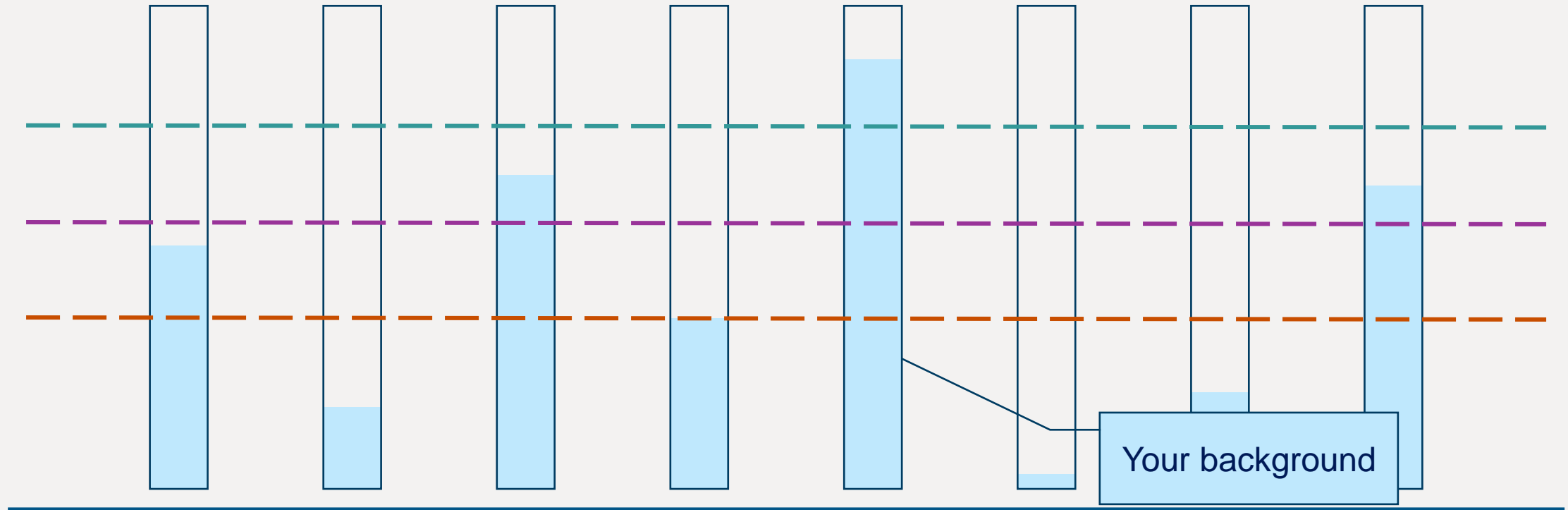
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Class Components

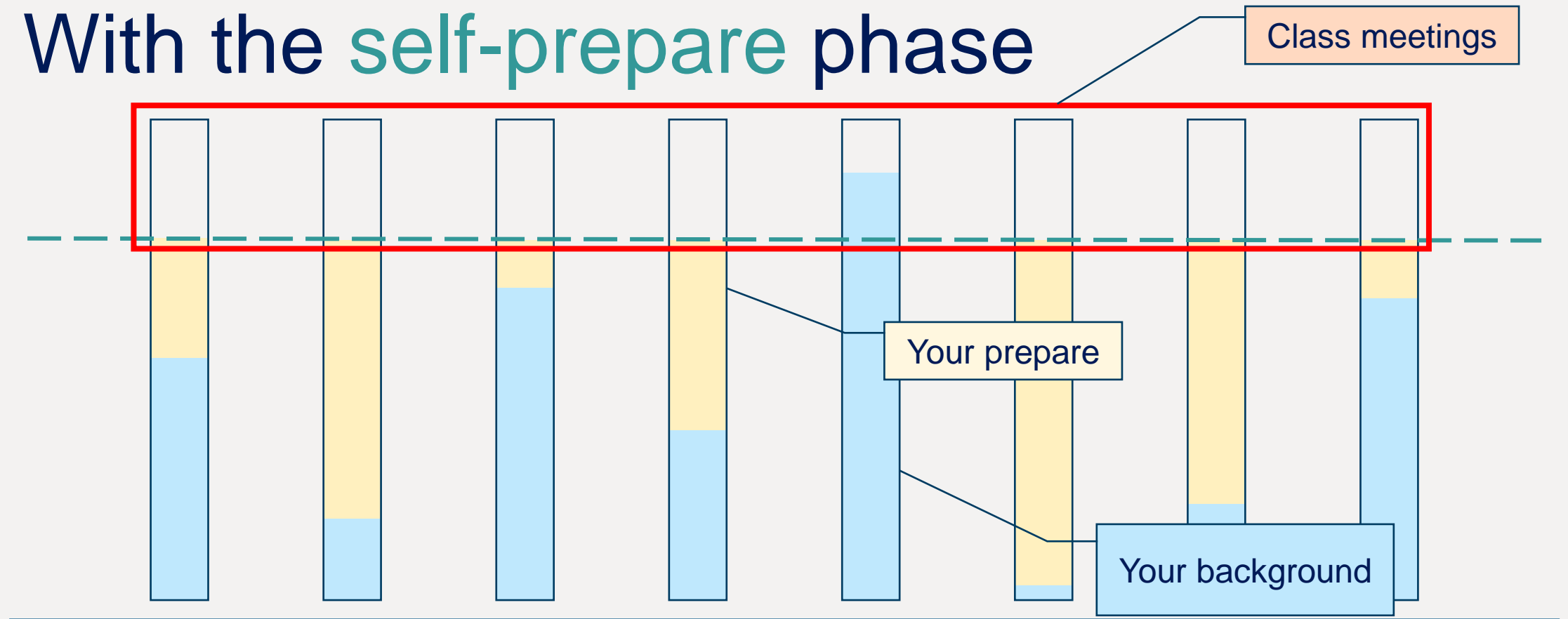
What happens for a typical CM



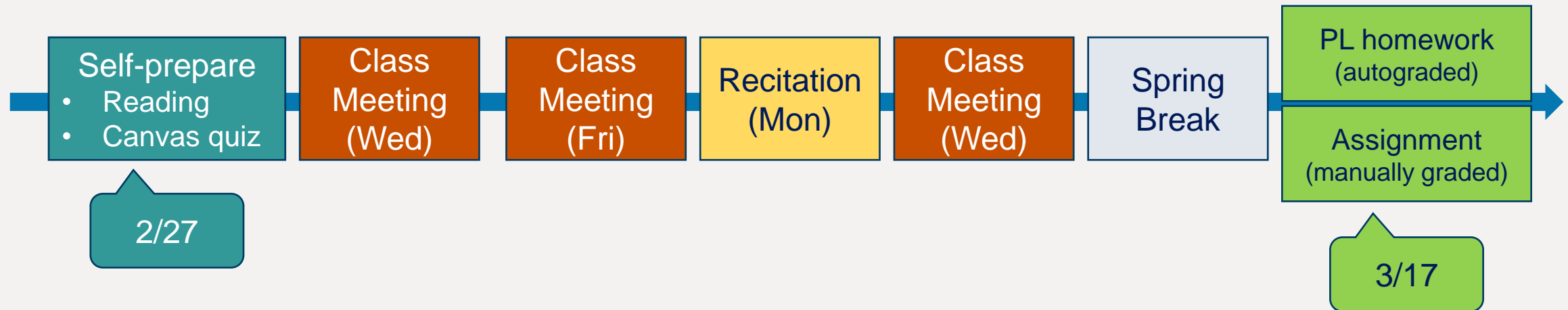
Why do we partially flip the material



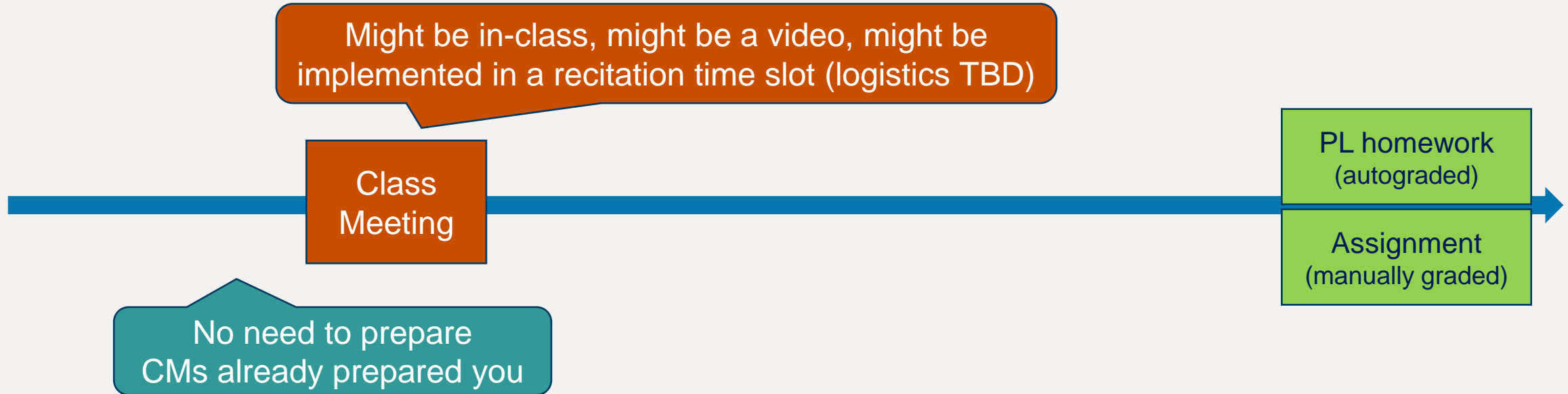
With the self-prepare phase



A longer CM

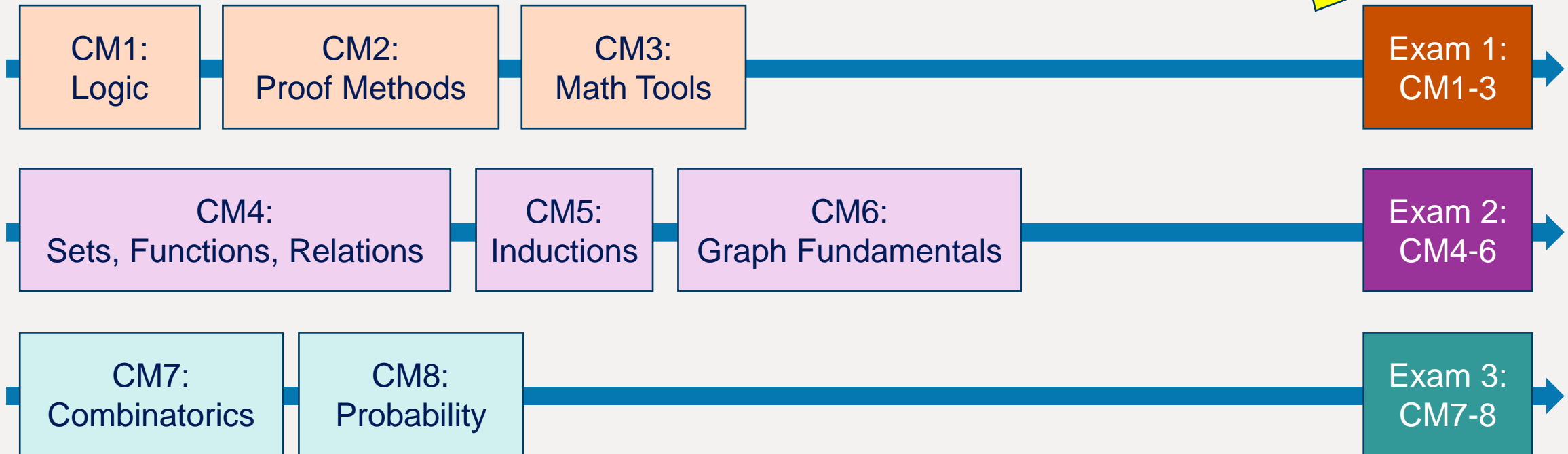


What happens for an EM (more ad-hoc)



Okay what about exams?

EMs are not tested in exams!



The goal of CS230

They call this “proof-writing” but it applies to more than only proofs

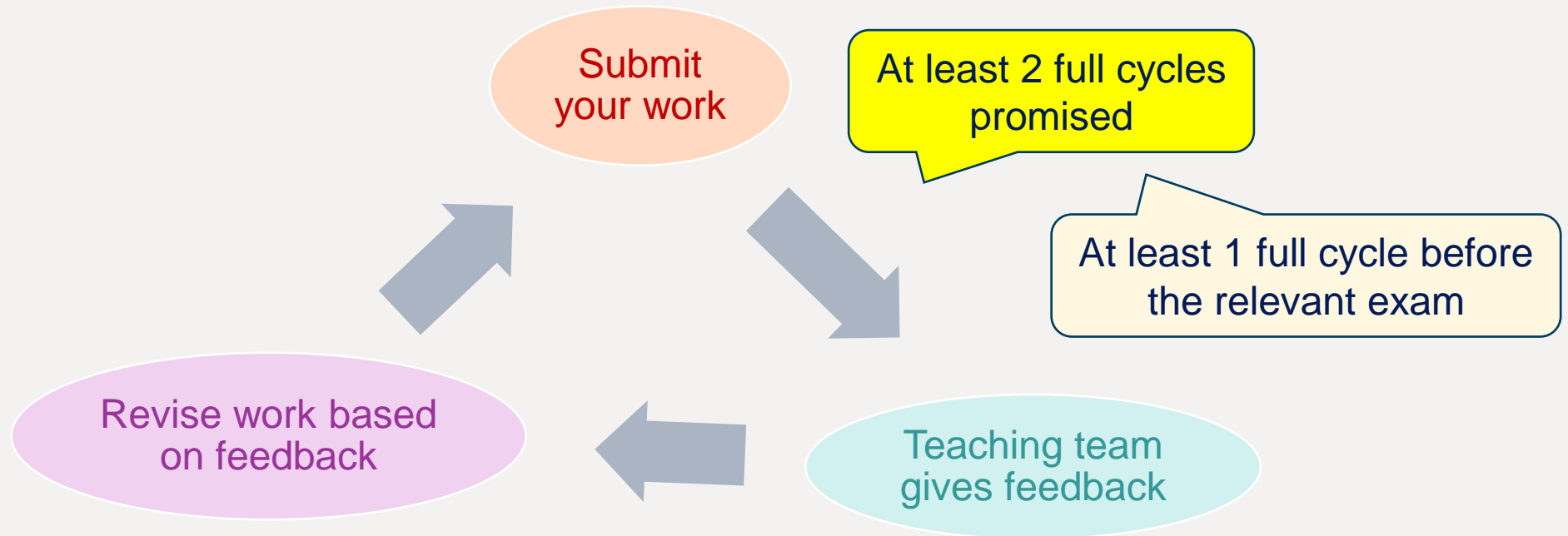
- Acquire and enhance your ability in **abstract thinking and formal mathematic communication.**
 - Familiarize yourself with math concepts and tools essential for **advanced topics in computer science.**
-

How do we go about communication

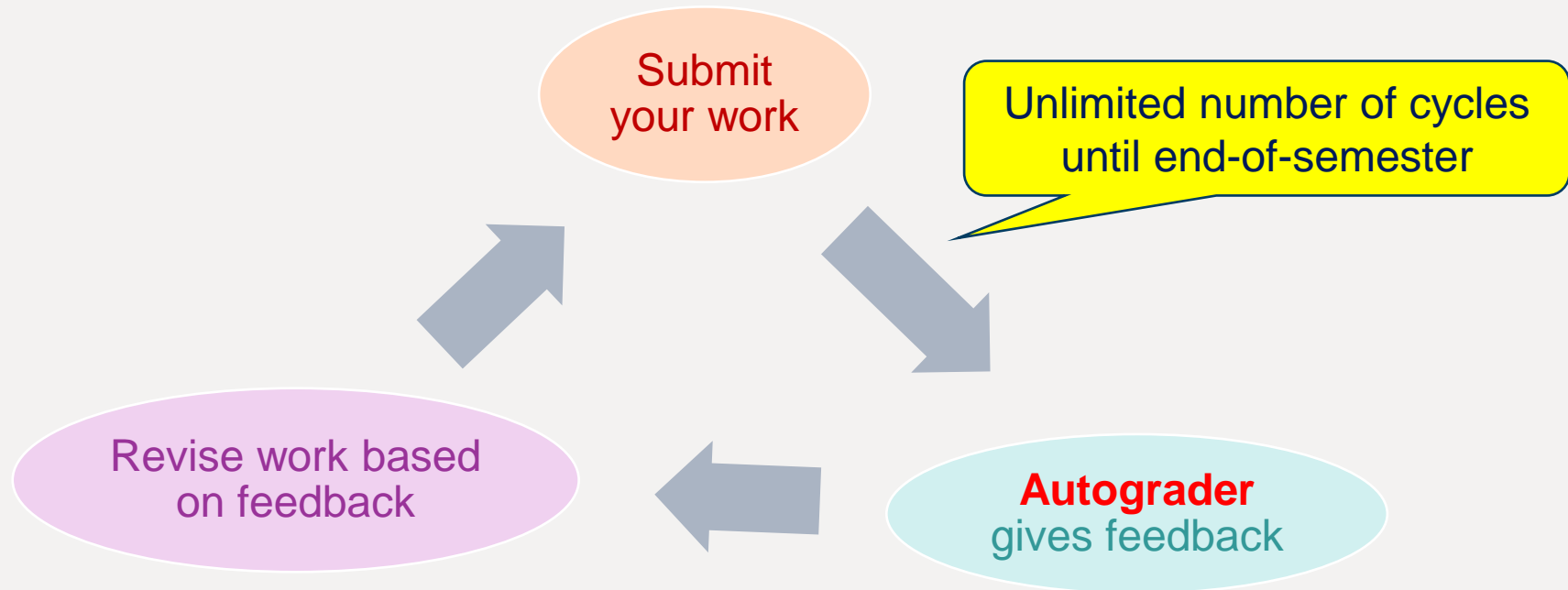
- **Communication is an art, so is math communication**
 - It is usually subjective and context-dependent:
 - Is the writing logically solid?
 - Is the writing clear and easy to understand?
 - Does the writing use too many symbols/too many words?
 - Does the writing contain irrelevant or circular arguments?
 - Everything here needs **feedback**
-

Human-graded

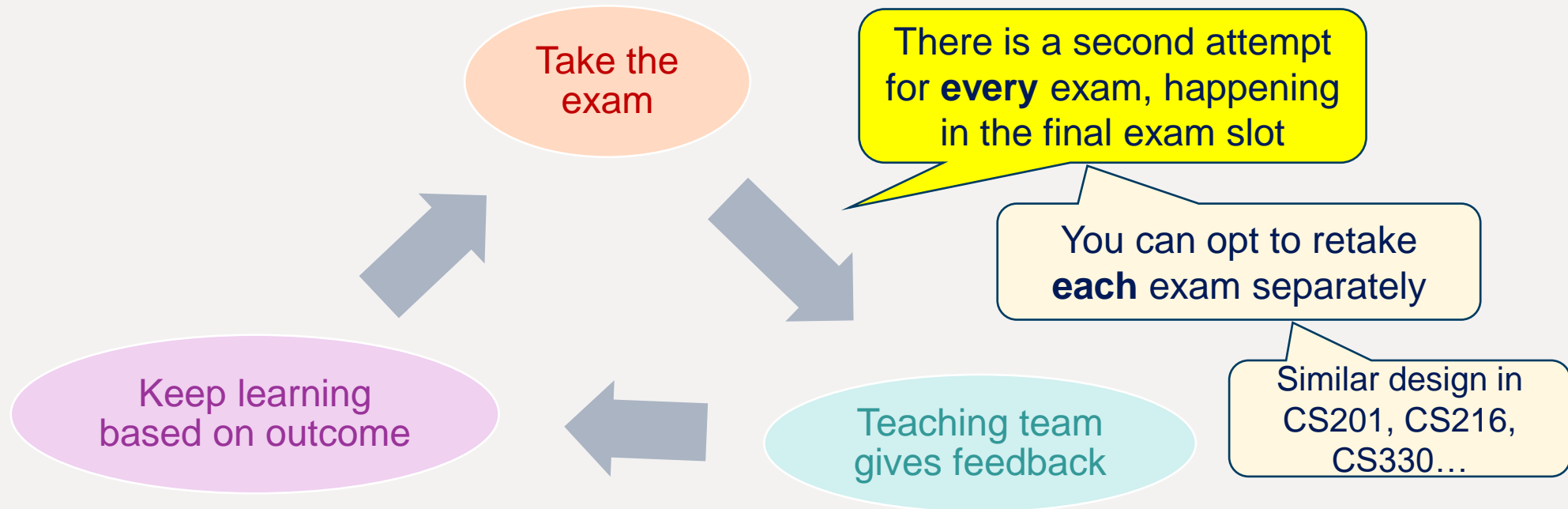
What happens for a written assignment



What happens for autograded things



What happens for exams then?



Okay, now tell me the weights of things?

- **There is no weights for anything in our grading.**
 - Check the next short video on grading
-

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Grading

What we want your final grade to measure

Relevant

- Your ability in **abstract thinking** and formal **mathematical communication**
- Your **mastery** of important **math concepts** and **tools**

Irrelevant

- Your time management
 - Your ability in avoiding typos and calculation mistakes
 - Your ability to perform under immense pressure
-

What we should do using point weights

Relevant **100%**

- Your ability in **abstract thinking** and formal **mathematical communication**
- Your **mastery** of important **math concepts** and **tools**

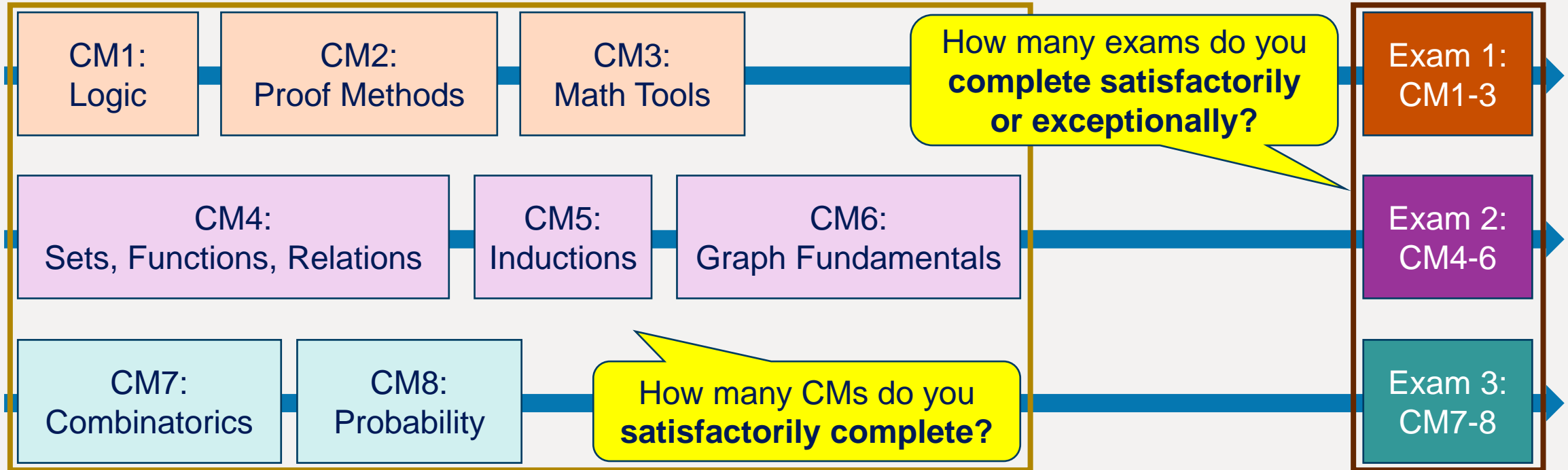
Irrelevant **0%**

- Your time management
 - Your ability in avoiding typos and calculation mistakes
 - Your ability to perform under immense pressure
-

What we actually count

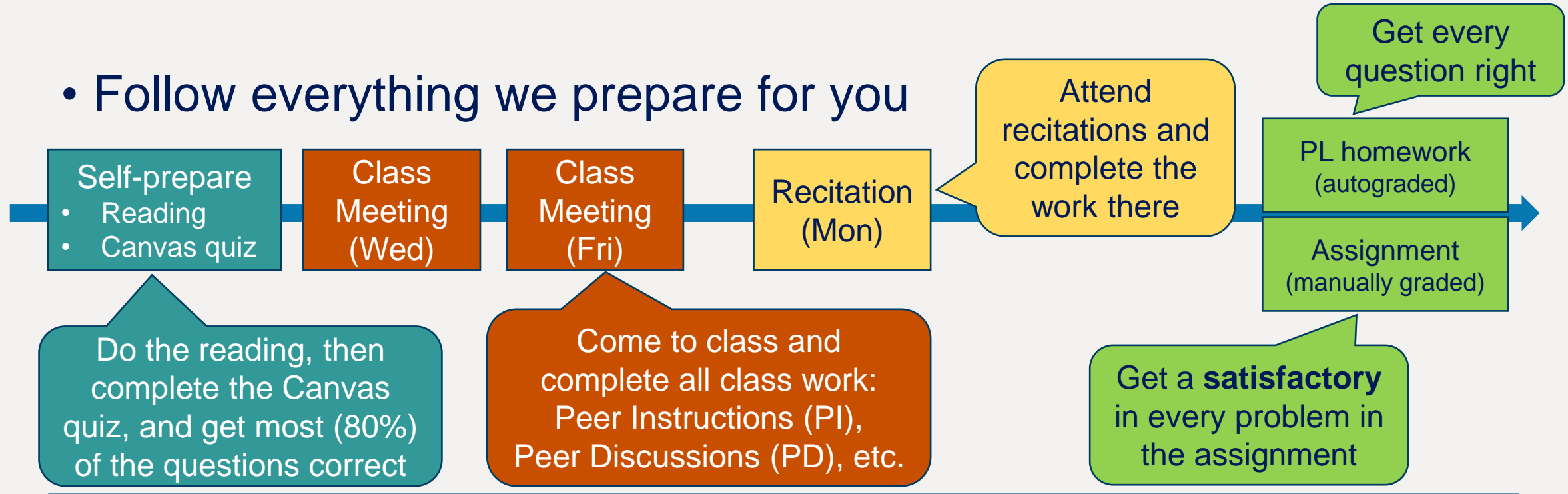
Also: how many **EMs** do you choose to complete?

Finally: be communicative and complete the miscellaneous items (surveys, etc.)



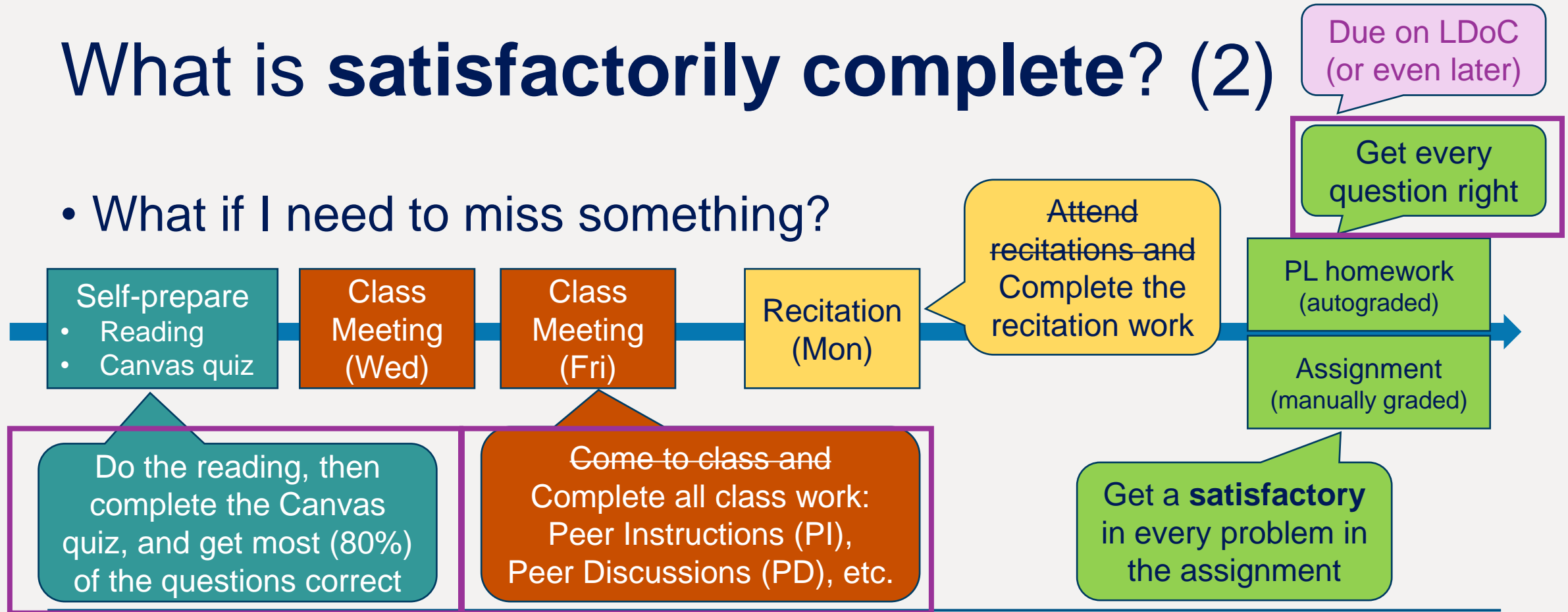
What is **satisfactorily complete**? (1)

- Follow everything we prepare for you



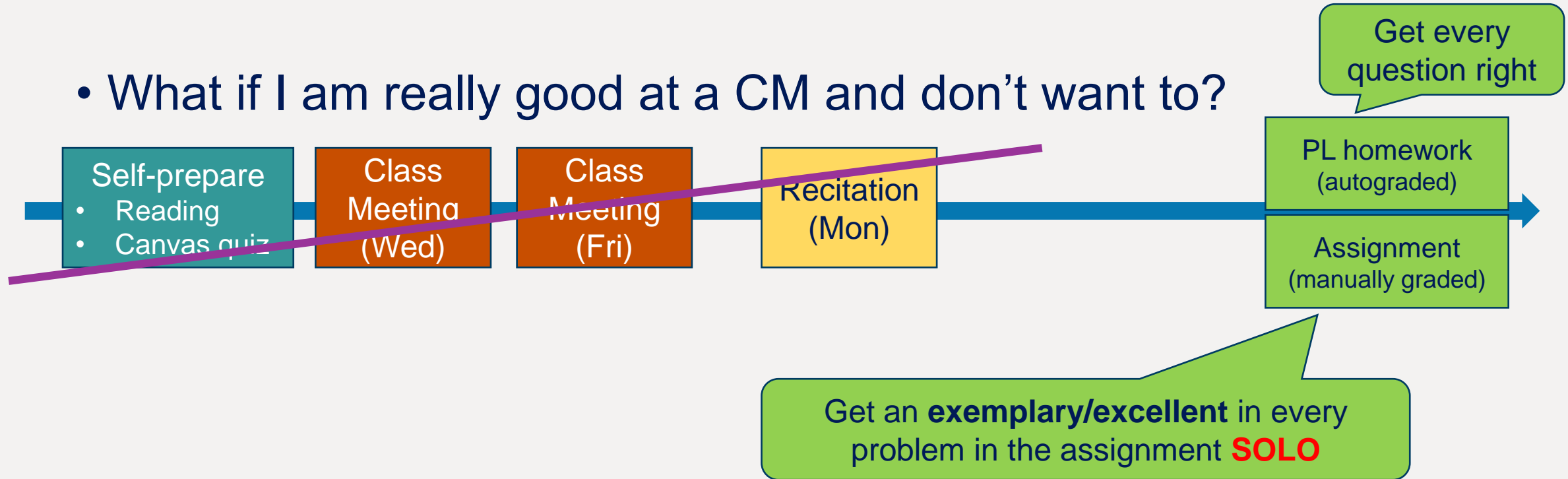
What is **satisfactorily complete**? (2)

- What if I need to miss something?



What is **satisfactorily complete**? (3)

- What if I am really good at a CM and don't want to?



What is ESNU?

You can get an A- by climbing every mountain up to here despite never submitting

E (Excellent or Exemplary)

S (Satisfactory, can use minor revisions)

N (Not yet, need major revisions)

U (Unassessable)

Keep in mind:

- These are about you and your own learning
- **Your classmates' success NEVER factor into your success**
 - We don't curve the class
 - We might lower the standard for satisfactory for individual items
- Your letter grade NEVER decreases

Also: how many **EMs** do you choose to complete?

Finally: be communicative and complete the miscellaneous items (surveys, etc.)

How many exams do you **complete satisfactorily or outstandingly**?

How many CMs do you **satisfactorily complete**?

For more information

- You can find details of our grading mechanism in Canvas
 - Due to Canvas not designed for a course like ours, some items may have “fake point values” of 0 or 1 point in Canvas
 - We will configure Gradebook for you to track module completion status
 - Next video: course policies
-

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Policies

Manually-graded assignment policies

- One for each CM/EM, submit via Gradescope
 - You may do the assignments *solo* or *in pairs*
 - You must stick with the same pair throughout the feedback process for the same assignment (i.e., if round 1 is solo, can't pair for round 2)
 - Can't collaborate with the same partner in consecutive CMs
 - So your partner for CM2 assignment cannot be the same one in CM1
 - No such rule for EMs (EMs are not ordered at all)
-

Manually-graded assignment policies

- Gradescope assignments must be *typed*
 - In other words: handwritten and photocopied work is not accepted
 - Exception is when you *augment* your work with figures/diagrams
 - Using LaTeX is strongly recommended but not required
 - All these policies are consistent with past CS230 semesters as well as CS330
-

Collaboration policies

- *Open whiteboard* rule:
 - It is okay to discuss stuff at a high concept-level, on an actual or imaginary whiteboard, with anyone (LLMs treated as people)
 - It is prohibited to transcribe from the whiteboard discussion; write-ups should be completed on your own
 - Cite and acknowledge everyone you collaborated/discussed, including if it's an online resource or it's a LLM
 - Looking at past CS230 material is prohibited
-

Communication policies

- Check [course website](#) before asking a logistical question anywhere
 - For technical help (i.e., on course content), use [consulting hours](#) and/or [Ed discussions](#) (see [Help Resources](#) on course website)
 - Don't ask for technical help via email
 - For personal questions about the course (grades, accommodations, etc.) use our course inbox: compsci-230@duke.edu (reaches head staff)
 - Don't use personal emails unless it's really between you and that person
-

Technical help channels

- Ed discussions is open/public, 24/7, more general
 - Consider using Ed if your question may benefit the others
 - All Ed questions are public (viewable by everyone in class) but you may stay anonymous
 - Search before posting
 - Consulting hours are one-to-one, synchronous, more personalized
 - Consider attending consulting hours if the help needs to be personal, e.g., about your own approach to an assignment problem
 - Regular TA consulting hours start on 1/23 (Tue)
-

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Class starts after this song

Sunset Rollercoaster - Coffee's on Me (2021)

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About your instructor

Shao-Heng Ko

- Ph.D. candidate (4th year)
 - Research area: *computing/CS education*
 - Previous research experiences in other CS subfields (check [website](#) if interested)
 - Please call me ***Shao-Heng***
 - This is my full first-name (*not Shao*)
 - Do NOT use the word ~~PROFESSOR~~
-



Shao-Heng Ko

- I was a grad TA for:
 - CS330 [Fall 20] [Fall 21]
 - CS230 [Spring 21*] [Fall 23]
 - CS216 [Fall 22] [Spring 23*]
 - I am your *instructor* for CS230
 - Treat me like your other instructors re: 230
 - and like any other grad student outside of 230
-



I am like your other professors in:

- I care about your learning
- I also want you to like me (and my policies)
- But if I have to choose one,
I take the former every day



I am **unlike** your other professors in:

- I am inexperienced
- ... but I am also less busy and have more time/energy for you
- ...younger?
- ...I am on Reddit and Sidechat?



“Are you experimenting on us”?

- My research is (so far) *observational*, not *experimental*
 - I collect/analyze data of existing classes
 - I do NOT tweak the classes “to see what works better”
 - Every bit of design of this class, is **what I think works the best for our class context and for you, and not an experiment**
 - I didn’t invent anything. All the things like ESNU, discrete grading, peer instructions, partially flipped classes... are existing pedagogical designs that have proven to be useful.
-

Personal bias

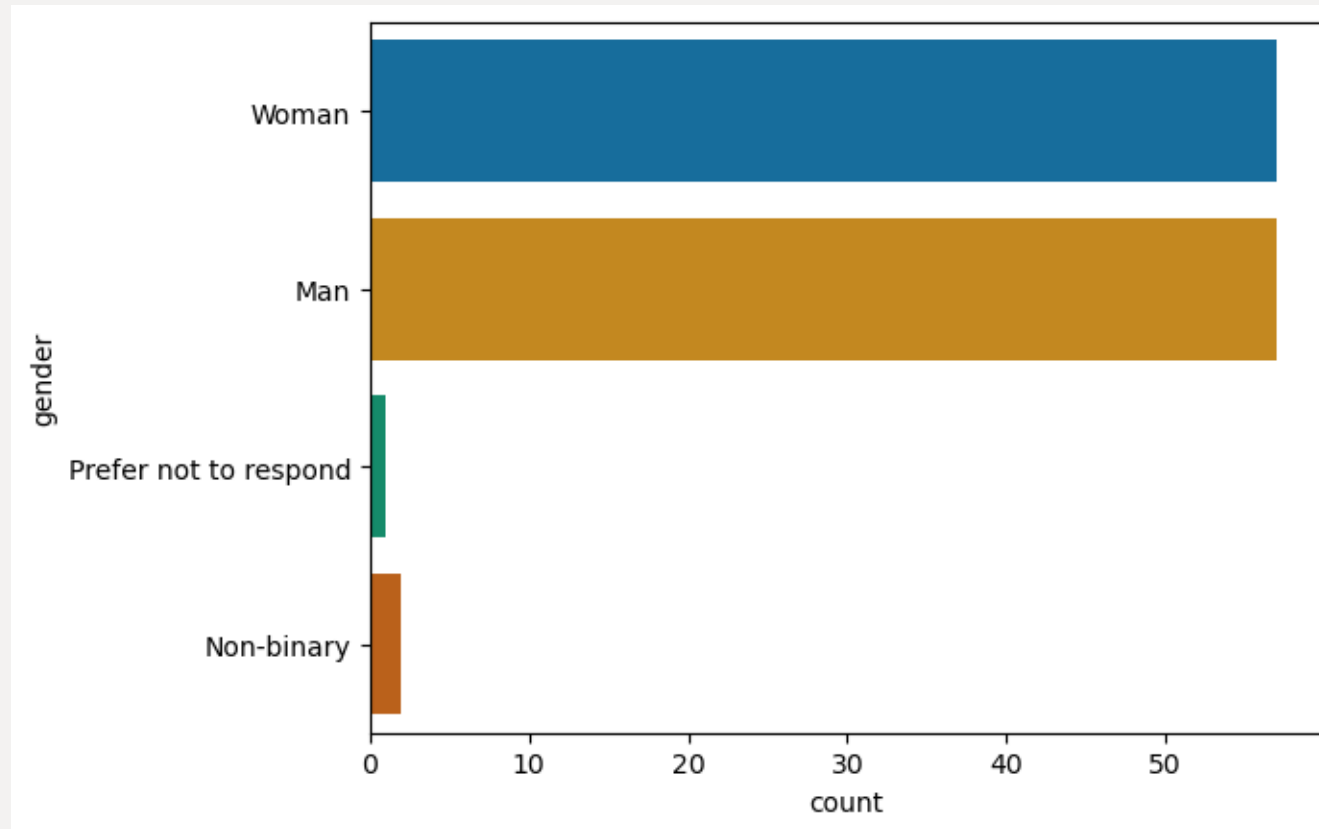
- Every person learns differently (with different styles)
 - Therefore, every instructor injects personal bias into their class design
 - When I was an undergrad, *the #1 thing I hated was being treated like a baby*. So I will try my best to *treat you like adults*:
 - I think students should own their learning experience
 - I give you as much flexibility/autonomy as I reasonably can; but you should be responsible for your own learning
-

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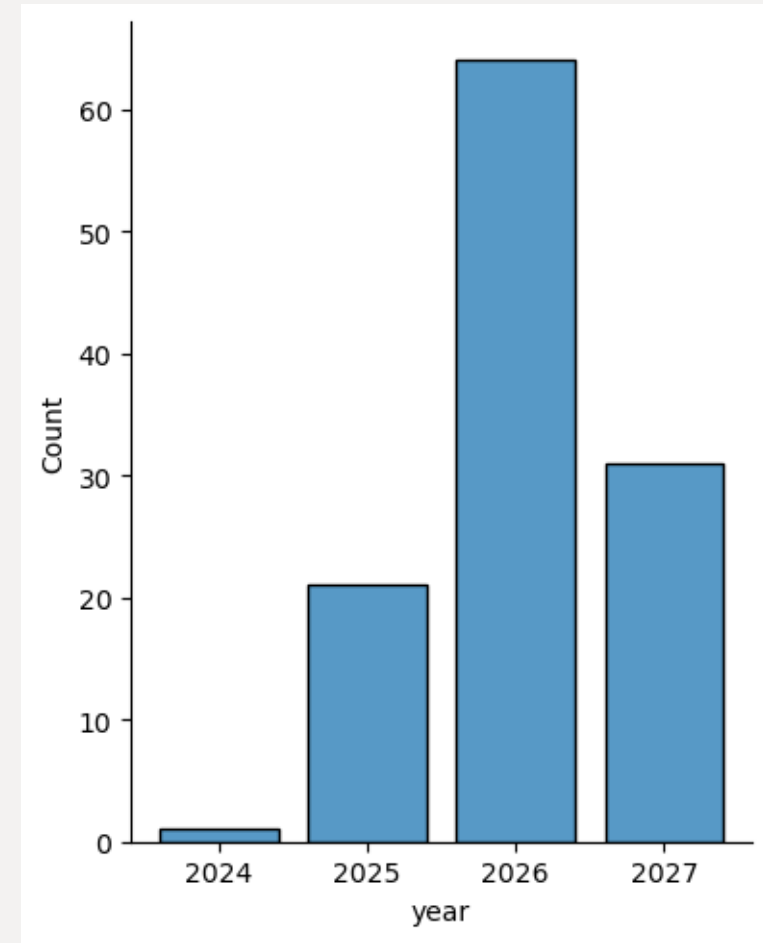
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About you

Gender



Year

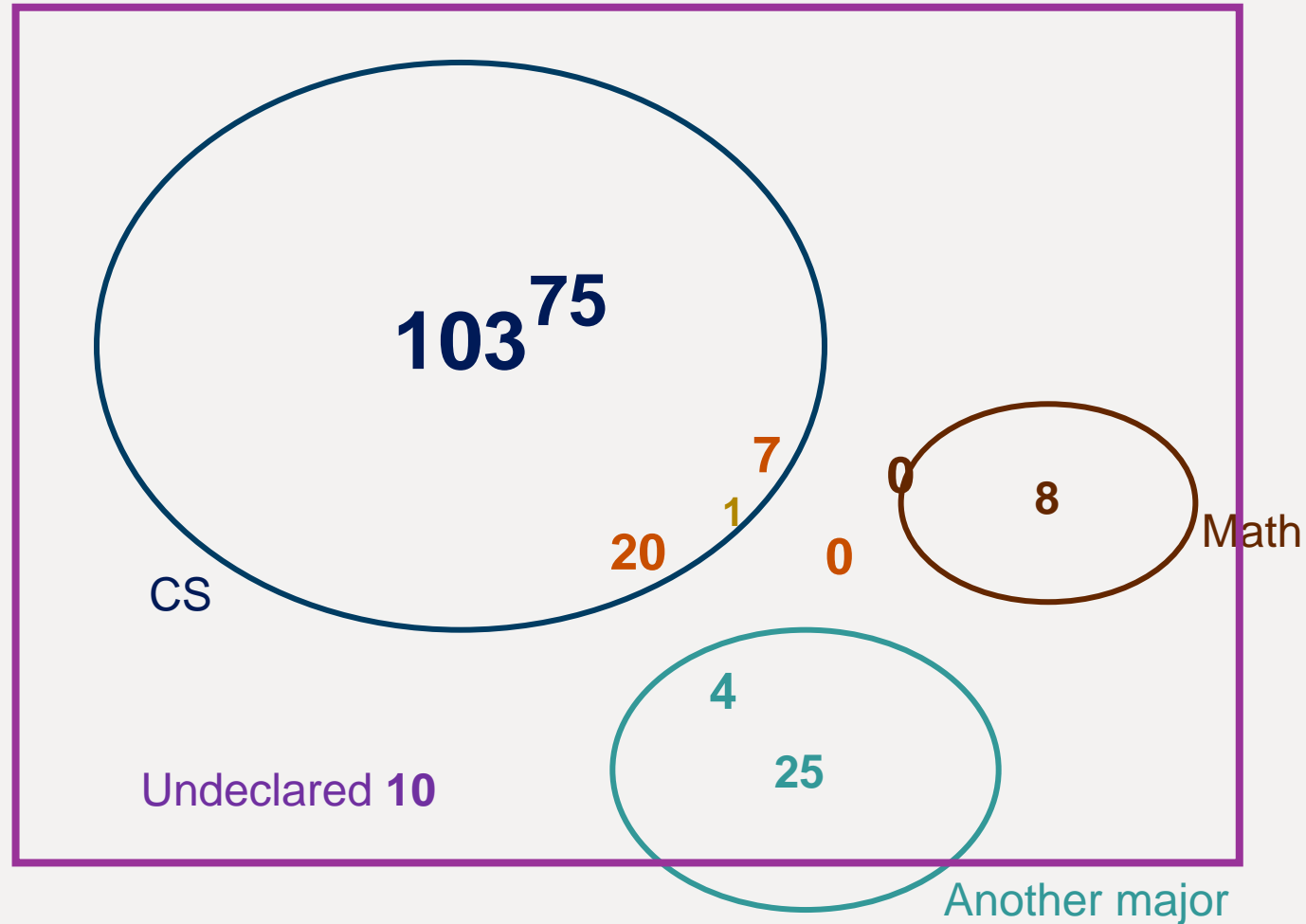


Race

- ~10% of you (that filled out the survey) self-identified as **neither Asian nor White**.
 - ~3% of you (that filled out the survey) **preferred not to respond**.
 - How many % of you are Asian, White, or both?
- Concepts:
 - Logical connectors and De Morgan's law (CM1)
 - Set difference and universal set (CM4)
-

Major

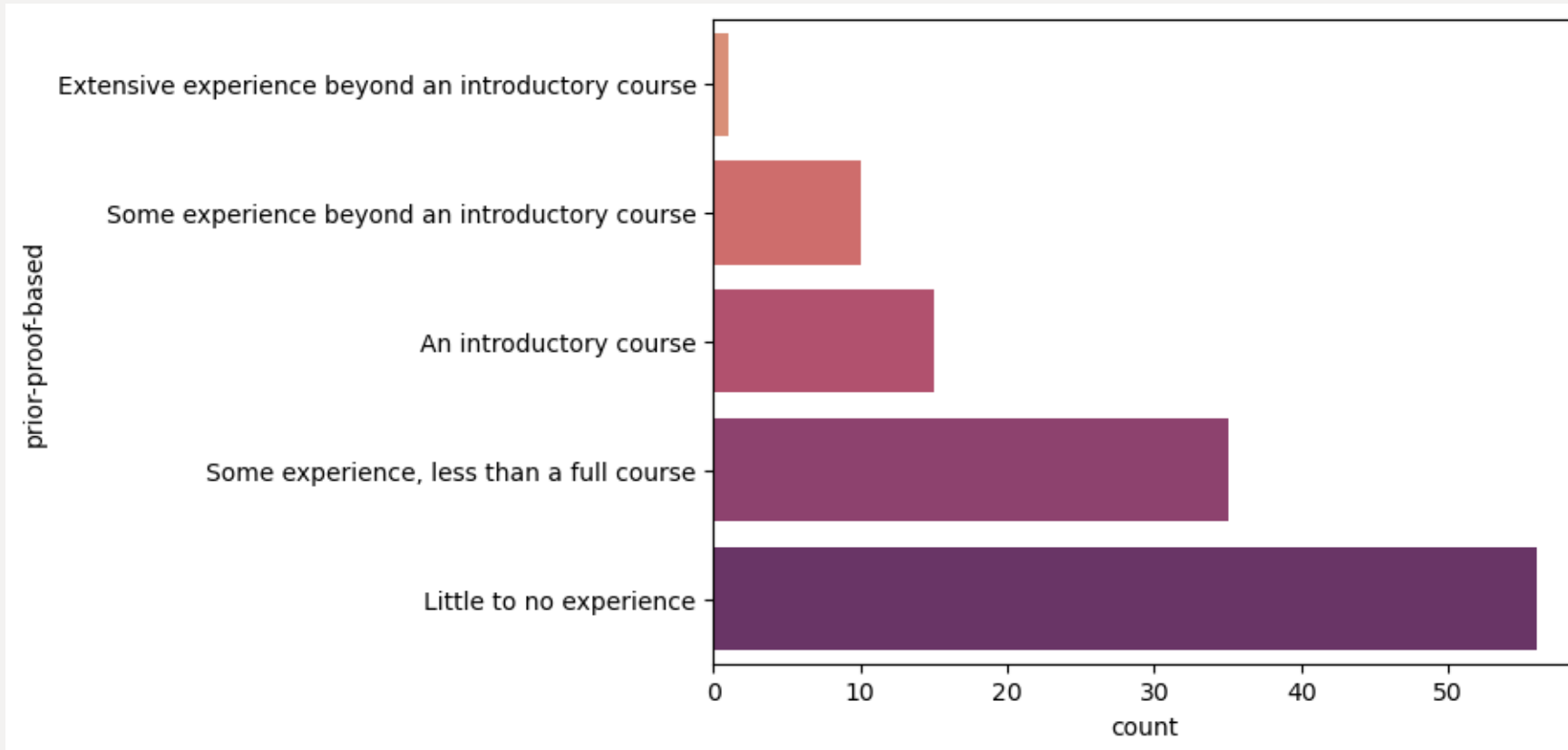
- Concepts:
 - Set union and intersection (CM4)
 - Universal set (CM4)
 - Inclusion-exclusion counting (CM7)

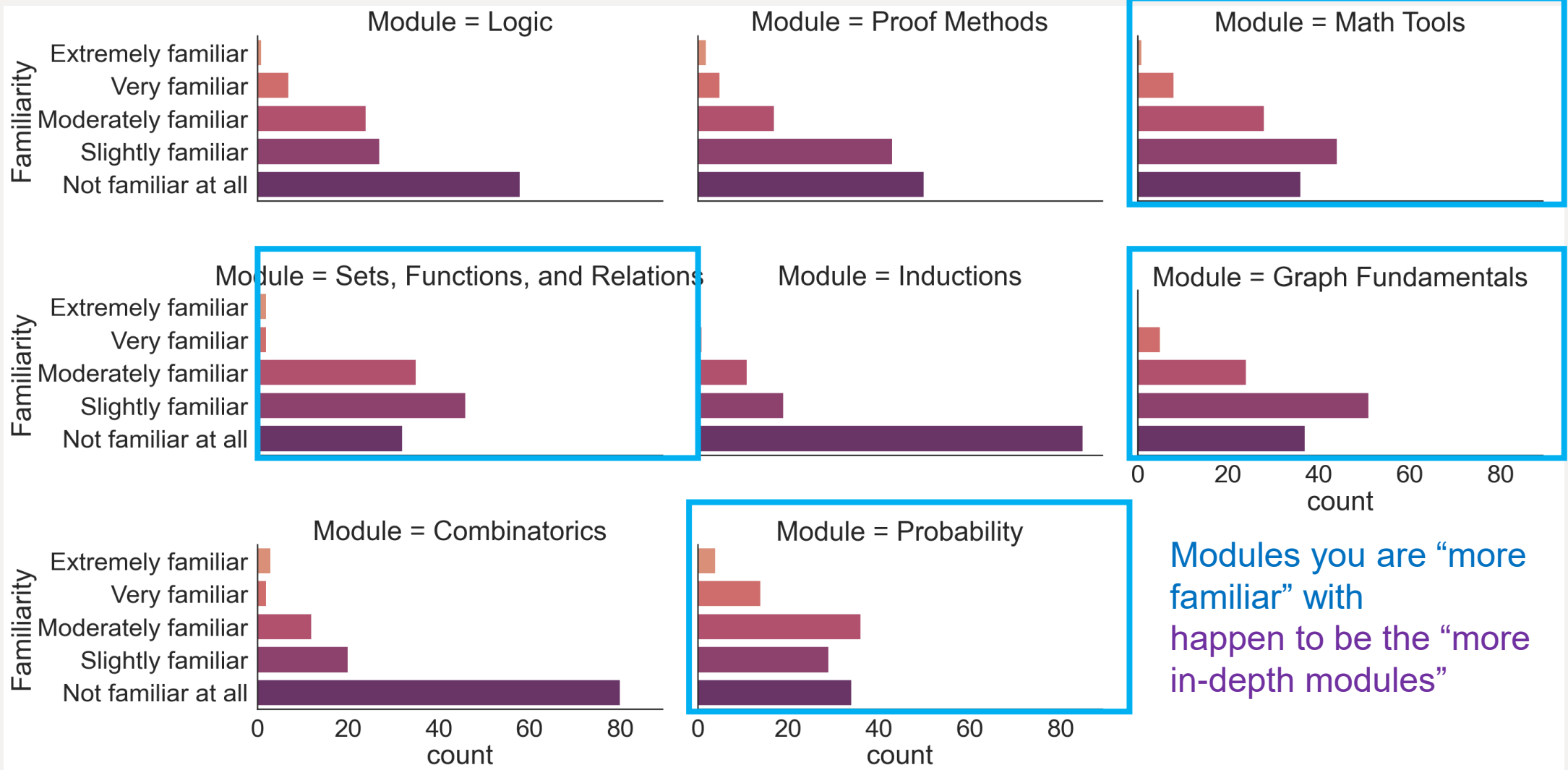


Prior experience in proofs

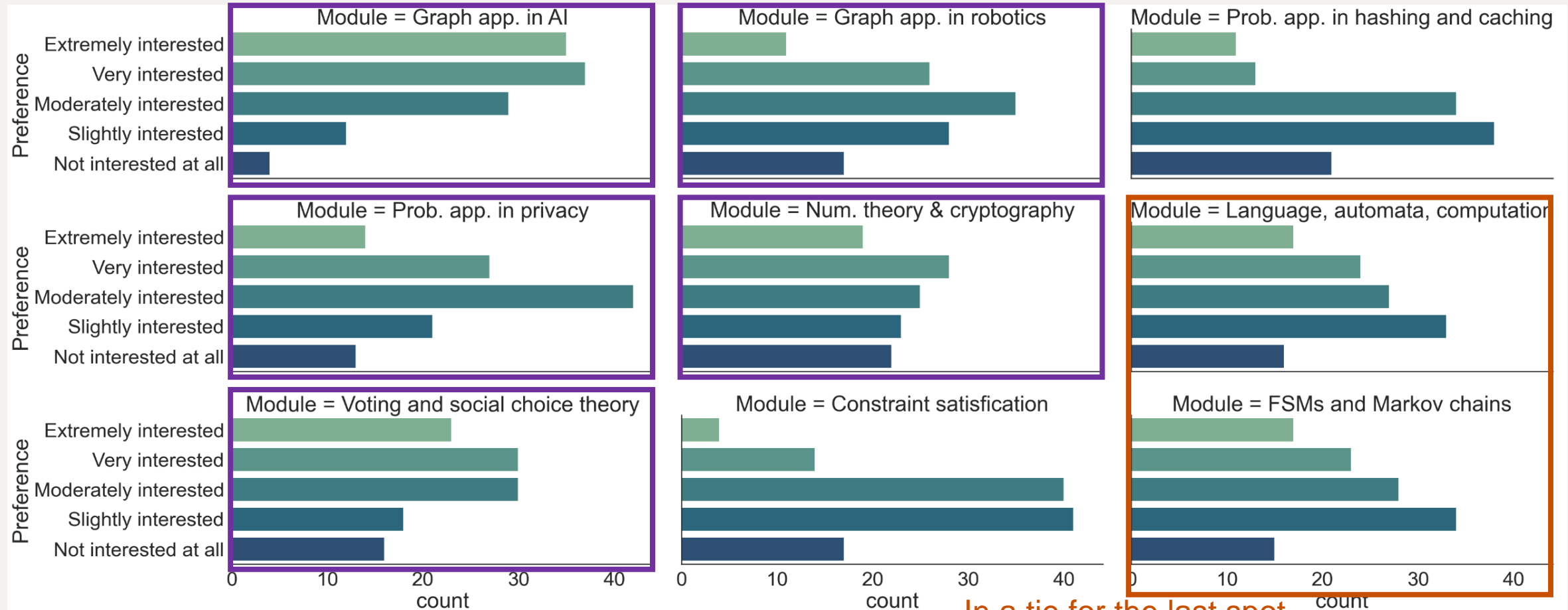
- Concepts:

- Increasing and decreasing sequences (CM3)
- Partition (CM4)





5 clear “winners”



What you liked/disliked

- 100% positive: multiple chances at everything, flexibility
- Mostly positive: groupwork
- Controversial (some like some dislike): grading system

What you liked/disliked

- 100% positive: multiple chances at everything, flexibility
 - Mostly positive: groupwork
 - Controversial (some like some dislike): grading system
 - Negatives:
 - Not knowing what separates E and S in advance
 - Too many details to keep in mind
 - Not being able to “calculate grades” or “see where I stand”
-

Highlighted comments

“If getting an excellent required near perfections, it seems like it might be a little unrealistic to get an A.”

For those with some familiarity with the current module, it would be nice to have access to future readings and assignments.

Not being able to look at past CS230 material. I often found it helpful to use material from past classes (eg. exams from last year) to get extra practice.

I still feel slightly unclear on due dates, as well as when it is recommended each assignment be completed by.

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About the team

Teaching associate: Violet Pang

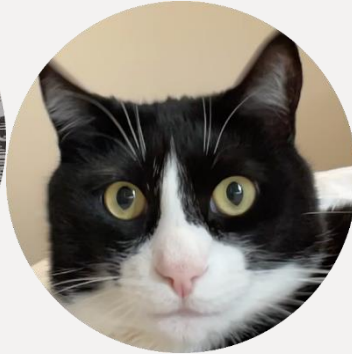
- Oversees:
 - Your accommodations
 - Your personal concerns/struggles
 - Your feedback to the course
 - Your TAs



TAs



Ahbab Abeer



Alex Chao



Anirudh Jain



Anoushka Sinha



Austin Huang



Bruno Lima



Carrie Hang



Divyansh Jain



Elisa Ma



Erik Dahlberg

TAs



George Adu



Hari Srinivasan



Ian Zhang



Jacob Lee



Jerone Samari



Jessica Chen



Luke Lorentzatos



Marie-Hélène Tomé



Nicole Errera



Paige Knudsen

TAs



Prince Ahmed



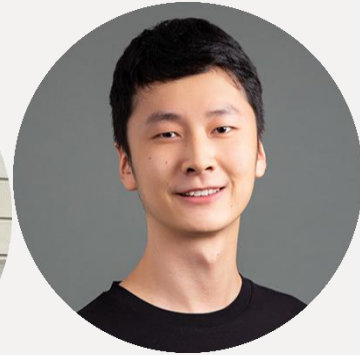
Shawn Ma



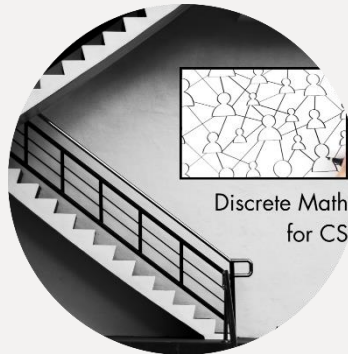
Sydney Lester



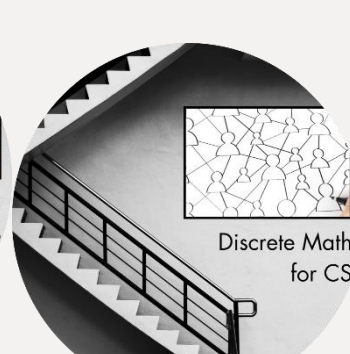
Vincent Capol



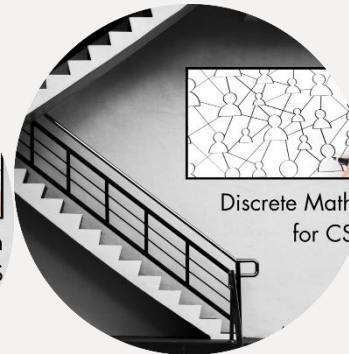
Yiyang Shao



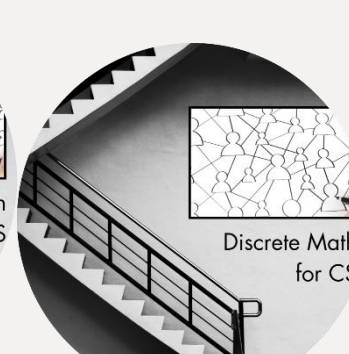
You



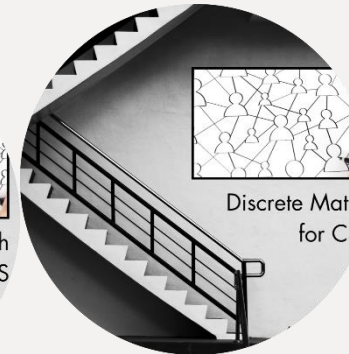
You



You



You



You

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About the platforms

Day 1: Peer Discussion

- Turn to your neighbor
- Introduce yourself:
 - Name, year, major, etc.
- Then discuss the question in the QR code
 - Or go to the newly published item in Canvas with the title
 - No submission required for PDs, but everyone should have an opinion



Day 1: Peer Instruction



- Answer the question in the QR code **on your own**
 - Or go to the newly published item in Canvas with the title
 - Turns to your neighbors, compare answers and discuss
 - You can submit a second time if your answer changes
-

MyDigitalHand

- <https://beta.mydigitalhand.org/>
- Sign in or create new account using a Duke email
- COURSE SEARCH
 - Enter Duke and search for 230
 - Use code **S33L743**

Search for courses

Use this form to search for courses at your school or university. Only active courses will be shown.

School or university

Q Duke University

Course name

Q 230

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Instructed by Shao-Heng Ko

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PrairieLearn

- <https://plearn.cs.duke.edu/>



Recitation sections

- **We are looking for volunteers to switch to 10:05-11:20**
 - Do that right now, you don't need a permission number for it

What to do before next Wednesday?

- **Don't go to recitation sections on Monday (MLK holiday)**
 - **Do** read the required reading
 - **Do** attempt the Canvas prepare quiz
 - Remember you have **unlimited attempts**
 - Watch the Day 0 videos and complete the survey if you haven't
-