Welcome to CS109A!

CS109A CA: Gili Rusak

Agenda

- Introductions
- Course Logistics
- Your goals for the course
- Review

Introductions

Introduce yourselves

- Name
- Pronouns (optional)
- Year
- Where are you? (optional)
- Favorite animal **or** fun fact

Course Logistics

Course Objectives

- CS109A is designed to help you develop a deeper understanding of the CS109 material.
- Provide extra practice and review of probability.
- Form study groups and collaborate on problems.

Class Website

cs109a.stanford.edu

Contact me: gili@stanford.edu or Slack

Grading and Attendance

- To get credit for the course, you must attend **at least *eight*** of the ten sessions in person, since this is where most of the learning happens.
  - If you plan to miss a section, please email Gili at least 24 hours before section (or as soon as practical in case of emergency).
  - Note that we understand that this is a particularly challenging quarter for many reasons, so please reach out if we can help accommodate in any way!
- Additionally, you must complete **two mid-quarter check-ins**.

Remote Learning

- If attending section live, have your webcam on if you're comfortable (this helps improve the interactive and communal nature of section)
  - This may not be possible for you (e.g. you don't have a camera on your device or your internet is slower), and that's okay.
- Mute yourself when you're not speaking to help reduce outside noise during class meetings. Unmute yourself when you're ready to chime in!
- Actively participate and ask questions!

Class Format

- Most of the time, students will be working together and solving problems.
- In most classes, we will start with a quick review of the previous week's material.
- In order to get the most out of class, please try to watch all lectures from the previous week of material: Wednesday, Friday, Monday.

Class Tools

- cs109a.stanford.edu: syllabus, notes, class problems
- Slack (coming soon)
- Zoom: weekly class meetings, office hours, exam review
- Email

CS109A Resources

- Weekly section [Tuesday at 10:30 - 11:50 am Pacific] **(required)**
- Office Hours (optional)
- Exam review (optional)
- One-on-one tutoring (optional)

Please email me or Slack message if there's anything else that I can help out with

Your goals for the course

Activity

- https://docs.google.com/presentation/d/1oFCgJpZqd5fJkiKjpZ76D9H6YWMlakQ3LCEpk_gth4M/edit?usp=sharing

Review

Review

- Applications of probability
- Counting
- Later this week: inclusion exclusion principle, pigeonhole principle, permutations and combinations

Practice Problem 1

How many 3-digit numbers have exactly one zero?*

* Source: the Art of Problem Solving: Intermediate Counting & Probability by David Patrick.

Practice Problem 1

Technique: Casework

How many 3-digit numbers have exactly one zero?*

Solution:

Case 1: _ _ 0

(9 distinct options for blank 1) * (9 distinct options for blank 2) = 81 options

Case 2: _ 0 _

(9 distinct options for blank 1) * (9 distinct options for blank 2) = 81 options

Total number: 81 + 81 = 162 options

* Source: the Art of Problem Solving: Intermediate Counting & Probability by David Patrick.

Practice Problem 2 [Midterm 1 Spring 2020]

As new social chair of your club, you would like to hold 3 (indistinct) socials over the next 3 quarters (Autumn, Winter, and Spring). Each social is equally likely to be assigned to any of the quarters, and it is possible that a quarter has no socials. Order of socials within a quarter doesn't matter.

- In how many distinct ways can the 3 (indistinct) socials be allocated to the 3 quarters?

Practice Problem 2 [Midterm 1 Spring 2020]

In how many distinct ways can the 3 (indistinct) socials be allocated to the 3 quarters?

Practice Problem 2 [Midterm 1 Spring 2020]

In how many distinct ways can the 3 (indistinct) socials be allocated to the 3 quarters?

Solution:

A: 0, W: 0, S: 3

A: 0, W: 3, S: 0

A: 0, W: 1, S: 2

A: 0, W: 2, S: 1

A: 1, W: 1, S: 1

A: 1, W: 2, S: 0

A: 1, W: 0, S: 2

A: 2, W: 1, S: 0

A: 2, W: 0, S: 1

A: 3, W: 0, S: 0

Practice Problem 2 [Midterm 1 Spring 2020]

In how many distinct ways can the 3 (indistinct) socials be allocated to the 3 quarters?

How would we generalize if we wanted to count the number of distinct ways we can allocate 100 (indistinct) socials to the 3 quarters instead?

Practice Problem 2 [Midterm 1 Spring 2020]

In how many distinct ways can the 100 (indistinct) socials be allocated to the 3 quarters?

Solution:

Next class, we will explore techniques to help us generalize more complicated counting problems. Some key techniques include:

- Inclusion Exclusion Principle
- Pigeonhole principle
- Permutations and Combinations
- Divider method

See you next Tuesday!