

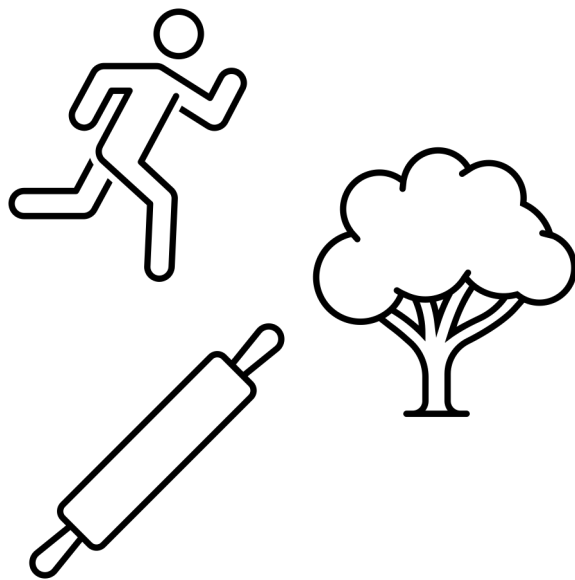
Discrete Structures— Welcome!

Dr. Ab Mosca (they/them)

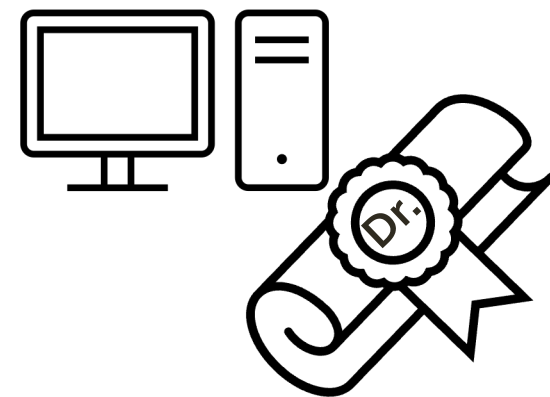
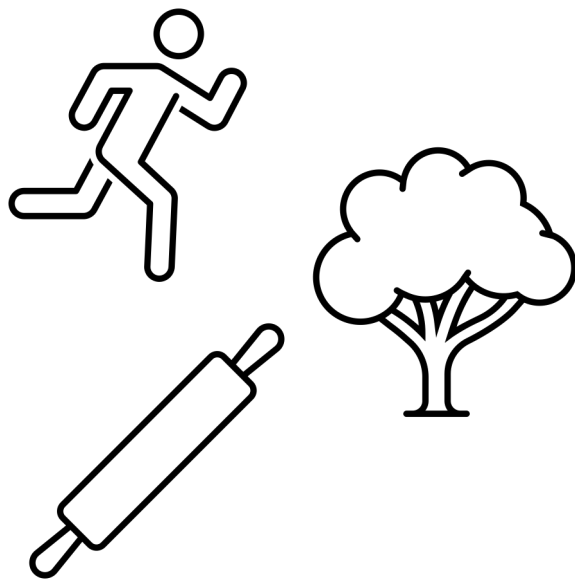
Plan for Today

- Who am I?
- Who are you?
- What will we do in this class?
- What is discrete math?
- Mathematical Statements

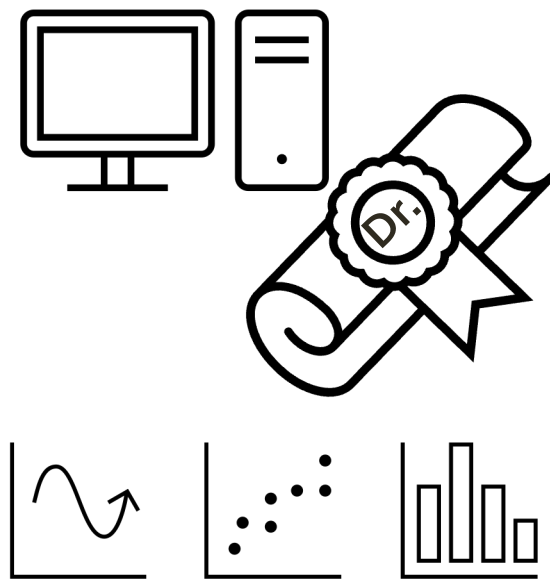
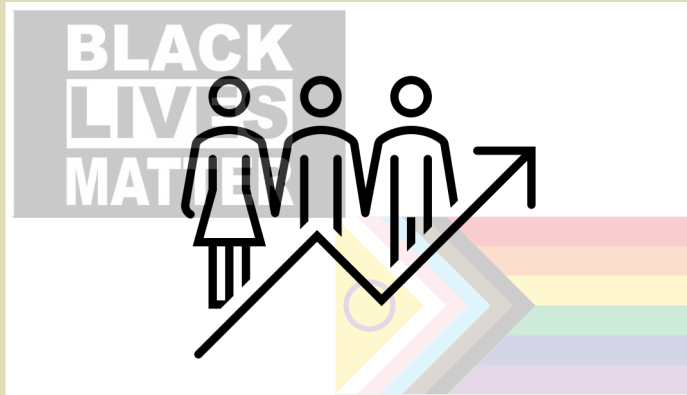
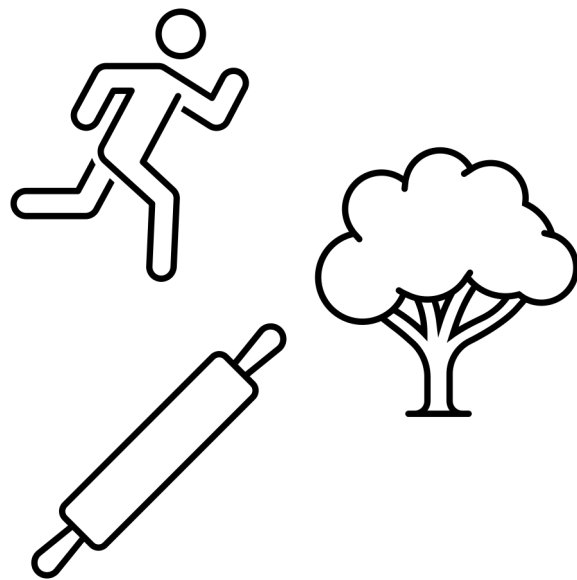
Who Am I?



Who Am I?



Who Am I?



Who Are You?

- Form groups of 3
- Introduce yourselves (name, pronouns)
- Share:
 - A highlight of your winter break
- Find 1 thing that your entire group has in common (favorite color? hometown? left-handed? Be creative!)
- After about 5 minutes we will go around, introduce ourselves, and share what each group has in common

Who Are You?

- Form **new groups** of 3 (move around!)
- Introduce yourselves (name, pronouns)
- Share:
 - Would you rather have telekinesis (the ability to move things with your mind) OR telepathy (the ability to read minds)?
- After about 5 minutes we will go around, introduce ourselves, and share our would you rather answers

Who Are You?

- Form **new new groups** of 3 (move around!)
- Introduce yourselves (name, pronouns)
- Share:
 - Would you rather take amazing selfies but look terrible in all other photos OR take terrible selfies but look amazing in all other photos?
- After about 5 minutes we will go around, introduce ourselves, and share our would you rather answers

Who Are You?

- Name tags!



What You Will Learn & Logistics

What Is This Class?

- An introduction to discrete mathematics
- You will learn to...
 - Logically prove mathematical statements
 - Model scenarios combinatorically
 - Describe functions, relations, and sequences
 - Model scenarios graphically

****Important Info****

- Course website (**write this down!**):
<https://amoscao1.github.io/MATH220-S24/>
- Office Hours
 - Wilson Hall 325
 - Wednesday 09:30 - 11:00
 - Thursday 14:30 - 16:30
 - By Appointment

****Important Info****

- Textbook: *Discrete Mathematics: An Open Introduction*, 3rd Edition
 - See course website for instructions
- Assignments:
 - Turn in on Gradescope – Demo!
(<https://help.gradescope.com/article/ccbppppziug-student-submit-work>)
- Due Dates: As listed on course schedule.
 - 24hr grace period; no late submissions
 - Lowest homework dropped
 - **See syllabus for revise and resubmit policy**

****Important Info****

Assignments

- Homework
 - Pair assignments
 - Graded on effort and correctness
- Quizzes (on PLATO)
 - Individual assignments
 - Can re-take as many times as wanted before deadline
- In-class Activities
 - Graded on effort
- Final Project
 - Small group
 - Graded on creativity and correctness

****Important
Info****

- I'm here to help you succeed
- Please come to office hours or reach out if you need any additional support



Now the good stuff

What is Discrete Math?

discrete adjective

dis·crete (di-'skrēt) 'dis-

[Synonyms of discrete >](#)

- 1** : constituting a separate entity : individually **distinct**
| several *discrete* sections
- 2 a** : consisting of distinct or unconnected elements :
NONCONTINUOUS
b : taking on or having a **finite** or countably **infinite** number of
values
| *discrete* probabilities
| a *discrete* random variable

What is Discrete Math?

In this class we'll cover four main topics:

- Logic
- Combinatorics (counting)
- Sequences
- Graphs

Warm Up

While walking through a fictional forest, you encounter three trolls guarding a bridge. Each is either a *knight*, who always tells the truth, or a *knave*, who always lies. The trolls will not let you pass until you correctly identify each as either a knight or a knave. Each troll makes a single statement:

Troll 1: If I am a knave, then there are exactly two knights here.

Troll 2: Troll 1 is lying.

Troll 3: Either we are all knaves or at least one of us is a knight.

Which troll is which?

Vocab

statement: any declarative sentence which is either true or false

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Example Statements:

- Telephone numbers in the US have 10 digits.
- The moon is made of cheese.

Example non-Statements:

- Would you like some cake?
- The sum of two squares.

Vocab

statement: any declarative sentence which is either true or false

Which are statements and which are not?

- 42 is a perfect square.
- $1 + 3 + 5 + 7$
- Go to your room!
- $3 + 7 = 12$
- $3 + x = 12$

Vocab: Types of Statements

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atomic: a statement that *cannot* be divided into smaller statements

molecular: a statement that *can* be divided into smaller statements

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Practice: Form 5 groups. Each will be assigned a connective. Come up with two examples of statements using your connective. For each example, identify molecular statements, atomic statements, and connective.

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 - Ex. *P, Q, R, S*
- Note: In this context, a variable only has 2 possible values – True (written T or 1) or False (written F or 0)

Practice: Return to your groups. Re-write your statements from the previous exercise using variables.

Symbolic Representation

- We also have shorthand symbols for connectives:
 - **and**
 - Symbol: \wedge
 - Example: $P \wedge Q$
 - **or**
 - Symbol: \vee
 - Example: $P \vee Q$
 - **if ... then ...**
 - Symbol: \rightarrow
 - Example: $P \rightarrow Q$
 - **if and only if**
 - Symbol: \leftrightarrow
 - Example: $P \leftrightarrow Q$
 - **not**
 - Symbol: \neg
 - Example: $\neg P$

Symbolic Representation

- We also have shorthand symbols for connectives and **fancy names**:
 - **and** *conjunction*
 - Symbol: \wedge
 - Example: $P \wedge Q$
 - **or** *disjunction*
 - Symbol: \vee
 - Example: $P \vee Q$
 - **if ... then ...** *implication* or *conditional*
 - Symbol: \rightarrow
 - Example: $P \rightarrow Q$
 - **if and only if** *biconditional*
 - Symbol: \leftrightarrow
 - Example: $P \leftrightarrow Q$
 - **not** *negation*
 - Symbol: \neg
 - Example: $\neg P$

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 - Symbol: \rightarrow
 - Example: $P \rightarrow Q$
 - **if and only if** *biconditional*
 - Symbol: \leftrightarrow
 - Example: $P \leftrightarrow Q$
 - **not** *negation*
 - Symbol: \neg
 - Example: $\neg P$

Practice: Return to your groups. Add the appropriate connective to your statements from the previous exercise.