Welcome to CS 210

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What is "Discrete Math"?

"Discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous."

-Wikipedia (https://en.wikipedia.org/wiki/Discrete_math)

…But what does *that* mean?

What is "Discrete Math"?

For a lot of this class, we will be working with integers – whole numbers that don't have an infinite amount of numbers in-between.

Discrete is defined as "individually separate and distinct."

What is "Discrete Math"?

We will be working with integers, as well as other topics, such as boolean logic (something that results in either true or false), sets (sets of discrete elements), and functions and relations.

Chapter 1 is about…

- Figuring out formulas to describe a given sequence of numbers
- Evaluating summations
- Using AND, OR, and NOT operators to write boolean expressions, which will result in TRUE or FALSE
- Writing predicates, which will evaluate to either TRUE or FALSE based on the input
- Writing implications (“If-then” statements)

Chapter 1:
Puzzles, patterns, and mathematical language

Chapter 2:
A primer of mathematical writing

Chapter 3:
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Chapter 4:
Functions and relations

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For example:

s represents “save has finished”, and
q represents “user wishes to quit”.

Write a statement for “the user wishes to quit but the save has not finished.”

$$q \wedge \neg s$$

q and not *s*

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Chapter 2 is about…

- Describing numbers (such as even and odd) in mathematical terms
- Proofs on mathematical statements
- Using induction for proofs and other things
- Representing numbers with different number systems, such as binary

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For example:

The sum of an even number and an odd number is odd

$$\text{even number} = 2k \qquad \text{odd number} = 2j+1$$

$$\text{even} + \text{odd} = 2k + 2j + 1$$

$$= 2(k+j)+1$$

2 times some integer plus 1 is the definition of an odd integer.

Chapter 3 is about…

- Using Sets
- Doing operations on sets, such as UNION, INTERSECTION, and SUBTRACTION
- Drawing Venn diagrams
- Working with Boolean algebra notation
- Working with Logic Circuits

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For example:

Given
set A = { 1, 2, 3 } and set B = { 4, 5 }
What is A ∪ B?

A ∪ B = { 1, 2, 3, 4, 5 }

(A∪B is the union of sets A and B)

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Chapter 4 is about…

- Definitions and properties of functions
- Doing composition operations like $(f \circ g)(x)$
- Definitions and properties of relations
- Diagramming relations

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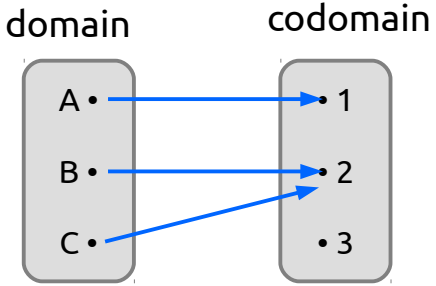
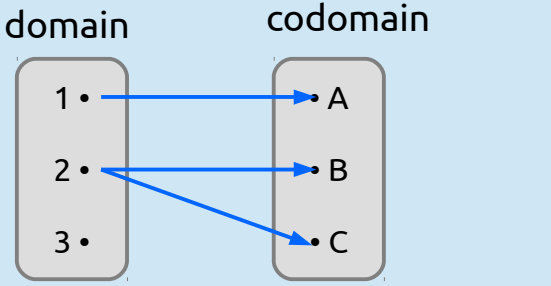
For example:

Draw the inverse of the following function. Is the inverse also a function?



f



f^{-1} NOT A FUNCTION

By knowing function properties, we can determine whether the inverse of a function is also a function… or not.

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Each of these chapters are somewhat independent of the rest, with a few pieces carried over.

If you're feeling shaky in one area, you might do much better in another area down the road.

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Beyond the textbook, there are also additional resources out there; you just have to search.

- YouTube videos
- WikiBooks (free books online)
- Outline books from other publishers

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Some of the topics in this course directly relate to Computer Science basics (such as propositional logic being used for control flow),

or more advanced CS topics
(such as set theory being used for machine learning),

but overall this class will teach you problem solving skills that will help in all areas of CS.

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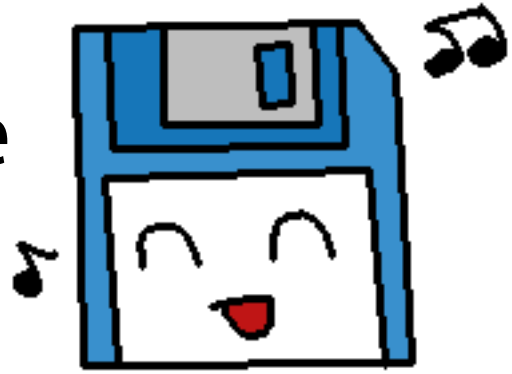
I hope that you enjoy this course!

Ask the instructor questions at any time if you need help with a topic!

Or keep in touch with some classmates so you can study together!



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