Welcome to CS 210

Written by Rachel J. Morris, last updated Jun 20, 2017

Welcome to CS 210!

Welcome to CS 210: Discrete Structures!

This is a math course that is standard in Computer Science curriculum. If you have no idea what Discrete Math is about, this lecture is meant to introduce you to what we will be doing this semester.

"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"?

dis•crete (dĭ-skrēt′) ▶

adj. Constituting a separate thing. See Synonyms at distinct.
adj. Consisting of unconnected distinct parts.
adj. *Mathematics* Defined for a finite or countable set of values; not continuous.

🧡 More at Wordnik | from The American Heritage® Dictionary of the English Language, 4th Edition

dis•creet (dĭ-skrēt′) ▶

adj. Marked by, exercising, or showing prudence and wise self-restraint in speech and behavior; circumspect.
adj. Free from ostentation or pretension; modest.

🧡 More at Wordnik | from The American Heritage® Dictionary of the English Language, 4th Edition

What is "Discrete Math"?

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

0.0625
0.125
0.25
0.5
0.75
0
1
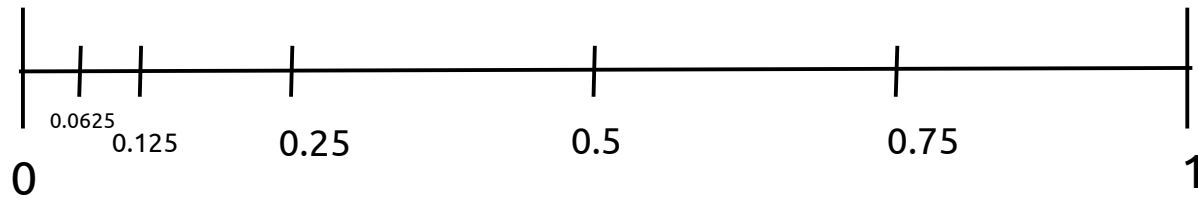
Discrete is defined as "individually separate and distinct."

What is "Discrete Math"?

We will be working with integers, as well as other topics, such as boolean logic (something that results in either <u>true</u> or <u>false</u>), 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:
Sets and boolean algebra

Chapter 4:
Functions and relations

CS 210 Topics

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*

CS 210 Topics

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

CS 210 Topics

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

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

$$A \cup B = \{\ 1, 2, 3, 4, 5\ \}$$

(A∪ B is the union of sets A and B)

Chapter 4 is about…

- Definitions and properties of functions

- Doing composition operations like (f∘g)(x)

- Definitions and properties of relations

- Diagramming relations

For example:

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

f

f^{-1} NOT A FUNCTION
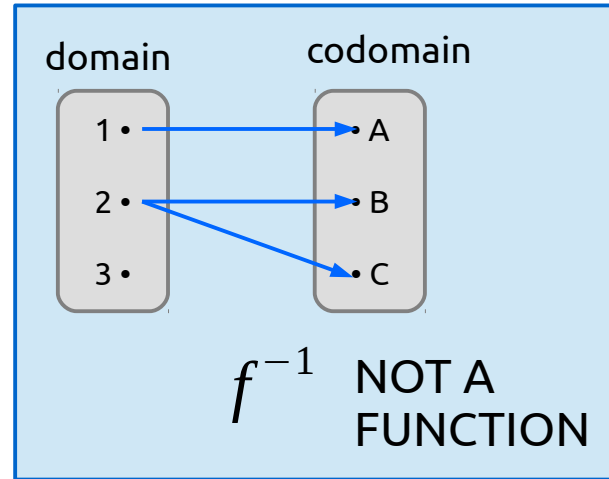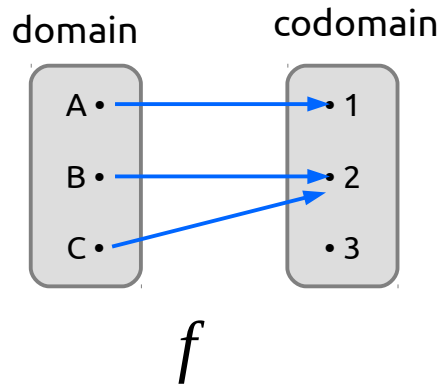
By knowing function properties, we can determine whether the inverse of a function is also a function... or not.

CS 210 Topics

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.

Chapter 1: Puzzles, patterns, and mathematical language

Chapter 2: A primer of mathematical writing

Chapter 3: Sets and boolean algebra

Chapter 4: Functions and relations

CS 210 Topics

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

Chapter 1:
Puzzles, patterns, and mathematical language

Chapter 2:
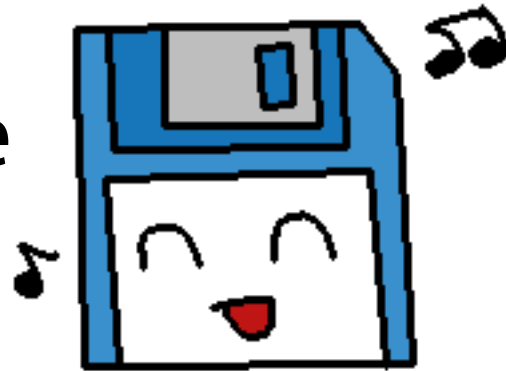A primer of mathematical writing

Chapter 3:
Sets and boolean algebra

Chapter 4:
Functions and relations

CS 210 Topics

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.

CS 210 Topics

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!