



Discrete
Structures:
CMPSC 102

Oliver
BONHAM-
CARTER

Getting
Information

About the
class

Instructor's Office
Hours

Two Textbooks

Overview

A Blend of two
things

Discrete
Objects

Continuous
Objects

Video

Discrete for CS

Consider This!

Discrete Structures: CMPSC 102

Oliver BONHAM-CARTER

Fall 2024
Week 1



Websites

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Consider This!

[My Classes](#)

[Contact and About](#)

[Just For Fun](#)

[Portfolio](#)

[Projects](#)

[Resources](#)

[iTea](#)

[OutReach](#)

Office Hours

To be sure that I have enough time with each person during my office hours, I ask that you please schedule an appointment. If the offered times are not convenient for you, other arrangements can be made to meet (in-person and online).

[Schedule an office hours appointment](#)

- **Main website:**
<http://www.cs.allegeny.edu/sites/obonhamcarter/>
- **Course webpage:**
<https://www.oliverbonhamcarter.com/classes/discretestructures/>
- **Office hours:**
<https://www.oliverbonhamcarter.com/contactandabout/>

Class and lab meeting times

Please read the syllabus before next class!!

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Consider This!



- **Lecture, Discussion, Presentations, and Group Work:**

- Monday, Wednesday, Friday 10:00am - 10:50am, Alden Hall 101

- **Laboratory Session:**

- Monday 2:30PM - 4:20PM, Alden Hall 101



Calendar

Meeting times

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January	1	2	3	4	5	6	7	February	1	2	3	4		
	8	9	10	11	12	13	14		5	6	7	8	9	
	15	16	17	18	19	20	21		12	13	14	15	16	
	22	23	24	25	26	27	28		19	20	21	22	23	
	29	30	31						24	25	26	27	28	
March				1	2	3	April	1	2	3	4	5	6	7
	4	5	6	7	8	9	10		8	9	10	11	12	13
	11	12	13	14	15	16	17		15	16	17	18	19	20
	18	19	20	21	22	23	24		22	23	24	25	26	27
	25	26	27	28	29	30	31		29	30				

Google Calendar Clickable Link

Course Calender URL



Instructor's Office Hours

Please make an appointment first!

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Dr. Bonham-Carter's office is Alden Hall RM 203

- Monday: 11am - 12pm, 3pm - 5pm (15 minute time slots)
- Wednesday: 11am - 12pm, 3pm - 4pm (15 minute time slots)
- Friday: 11am - 12 (15 minute time slots)
- Or, by appointment

Office Hours Appointment link

OB'C's Office Hours Appointment Slots

To schedule a meeting with me during my office hours, please visit my "Contact and About" page on my web site and look for the "schedule an appointment" link to reserve a convenient time to meet.



Textbook

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Consider This!



Programming and Mathematical Thinking

A Gentle Introduction to
Discrete Math
Featuring Python

Allan M. Stavely

- *Programming and Mathematical Thinking - A Gentle Introduction to Discrete Math Featuring Python* by Allan M. Stavely; ISBN paperback 978-1-938159-00-8 and ISBN ebook: 978-1-938159-01-5



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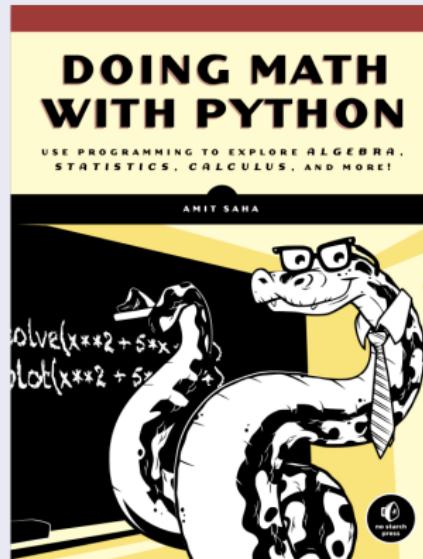
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Consider This!



- *Doing Math with Python* by Amit Saha; ISBN paperback: 1-59327-640-0



Learning as a Computer Scientist?

In terms of programming

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Consider This!

Key Question

*How do I connect **mathematical terminology** (e.g., mapping, function, number, sequence, and set), to the implementation of **Python programs** that declare and call functions and declare and manipulate variables?*

Learning Objectives

To remember and understand some of the discrete mathematics and Python programming concepts, setting the stage for the exploration of discrete structures.

Learning as a Computer Scientist?

For example

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Consider This!

Discrete Structures = Math + Code

- **Discrete mathematics**

- **P** Made up from: *symbols, character strings, truth values, objects, and collections of these entities* as stored in *sets or tuples* (for example)

- **S** Specifying and designing a **computer program**

- Describe input, output, and internal objects
- Use the vocabulary of discrete mathematics
- Implement and test the program in a language

- **Our goal:**

- To implement a program **P** that meets a particular specification **S**



Learning as an Analytical Thinker?

In terms of mathematics

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Consider This!

*"An introduction to the foundations of computer science with an emphasis on understanding the abstract structures used to represent **discrete** objects."*

Wait! What?

We keep using the word, **discrete**. What do we mean here?

Discreet or Discrete

- **Discreet** means *unobtrusive* or *unnoticeable* (not this course!)
- **Discrete** means *separate*, not continuous or *not sharing any common space*

Discrete and Countable Objects

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Consider This!



- *Discrete means “countable” (can be listed in an order)*
- *We can count the number of animals.*

So, Discrete Objects, Then?

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Consider This!

image-space



discrete

object-space



continuous/exact

- Discrete mathematics involves being able to count (*list*) things individually.

... And, Continuous Objects?

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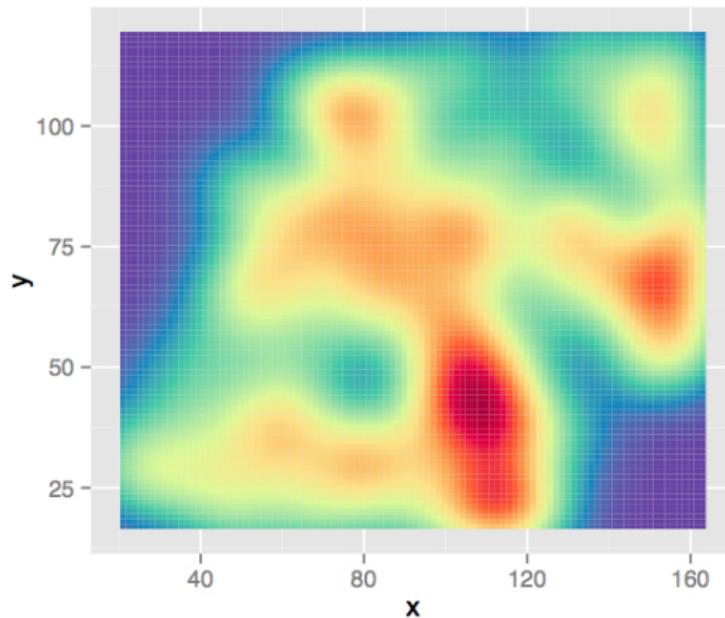
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Consider This!



- “Overlapping” objects cannot be counted (i.e., listed) separately.

Discrete Mathematics

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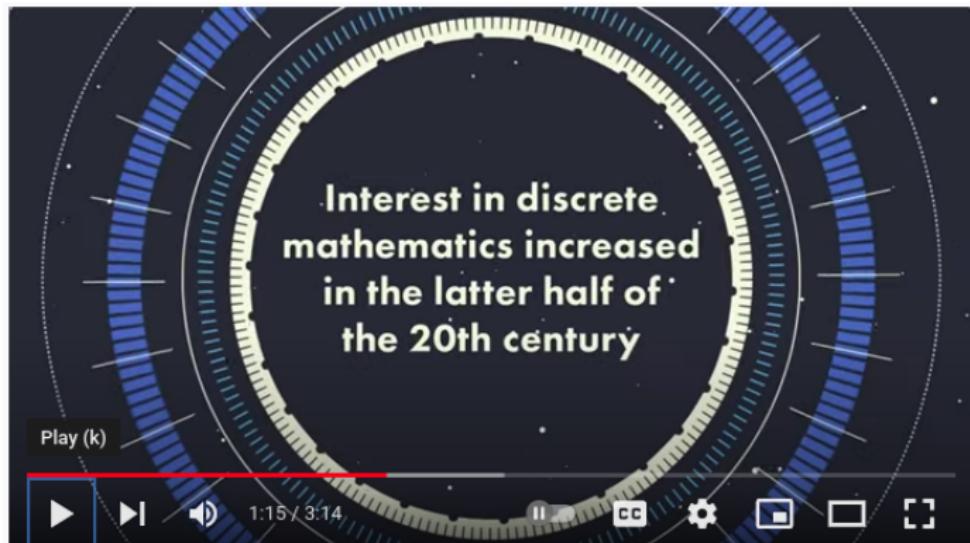
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Consider This!



- Discrete Mathematics for **Computer Science** (developed during the latter half of the 20th century!)
 - <https://www.youtube.com/watch?v=q4L-wUF3yig>



Non-Discrete and *Un-Countable* Objects

Really big amounts of things

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Consider This!



- Are the numbers of grains *uncountable* (i.e., unlistable)?
- Is anything *uncountable* at the beach?
- How do we count an *uncountable* object? Why?

Relationships to Computing

Computer MUST be able to count to compute

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Consider This!

You will have to put uncountable *stuff*
into a system that counts!!

Binary Numbers

In mathematics and digital electronics, a binary number is a number expressed in the base-2 numeral system or binary numeral system, which uses only two symbols: typically, 0 (False, zero) and 1 (True, one).

- Computers use binary to function
- Processes (i.e., memory, computation, networking) are broken down into binary-driven procedures

Binary Numbers

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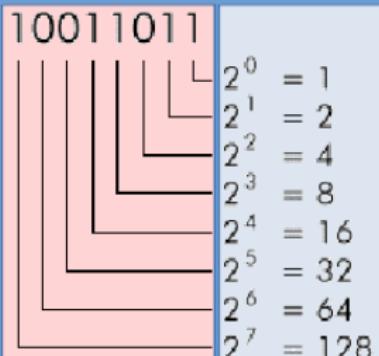
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Consider This!



Binary Value	Decimal Representation				DecimalValue
	8	4	2	1	
0 0 0 0	0	0	0	0	0
0 0 0 1	0	0	0	1	1
0 0 1 0	0	0	2	0	2
0 0 1 1	0	0	2	1	3
0 1 0 0	0	4	0	0	4
0 1 0 1	0	4	0	1	5
0 1 1 0	0	4	2	0	6
0 1 1 1	0	4	2	1	7
1 0 0 0	8	0	0	0	8
1 0 0 1	8	0	0	1	9
1 0 1 0	8	0	2	0	10

- Computing implies digital processing
- Computing binary values is a *countable* task.
- Can anything, or any number, that a computer computes be written in binary?



Countable and Not Countable?

What can be *listed* and what cannot be listed?

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Consider This!

- Discuss with your neighbors!
- What are **countable** (i.e. *list-able*) objects? Can you give an example?
- Can you think of **un-countable** objects that cannot be listed? Give an example?
 - Can you think of types of numbers that may fit into each of these above groups?
 - Need a hint about such numbers? Check out Numberphile's video: <https://www.youtube.com/watch?v=elv0Zm0d4H0>

THINK



Getting to Know You!

Activity 01

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Survey

- Please complete the below survey to help me to get to know you better!
- Survey address:
<https://forms.gle/QivUgQLfjRALB1dm7>
- This is a checkmark grade

THINK