

# CompSci 101 Introduction

**CompSci 101, Spring 2023**  
**Home**

Home About Data Labs Assign APTs Help Forms Resources Sakai

```
Write code in Python 3.8
1 def greetersonce():
2     greeting = "Hi" + name
3     if name != "Susan":
4         return greeting + ", old friend!"
5     return greeting + ", nice to meet!"
6
7 print(greetersonce("Susan"))
8 print(greetersonce("Susan"))
```

**CompSci 101: Introduction to Computer Science**

**Course Description**

Introduction to practices and principles of computer science and programming and their impact on and potential to change the world. Algorithmic, problem-solving, and programming techniques in domains such as art, data visualization, mathematics, natural and social sciences. Programming using high-level languages and design techniques emphasizing abstraction, encapsulation, and problem decomposition. Design, implementation, testing, and analysis of algorithms and programs. No previous programming experience required. For this version of the course, you will learn the programming language Python 3.

**Due Dates**

- **Sakai Quizzes on Prework (reading in textbook):** due 10:15am on Lecture days. Take quizzes in Duke Sakai.
- **Labs:** weekly on Fridays, finish and submit by Sunday night - [see labs page](#)
- **APTs and APT Quizzes:** [see APT page](#)
- **Assignments:** [See assignment page](#)

**Course Announcements**

- January 10, 2023
  - First lecture is Thursday, January 12.



Susan Rodger  
January 12, 2023

1/12/23

CompSci 101, Spring 2023

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## About Prof Rodger

1/12/23

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# Every lecture: DO NOT SIT IN THE LAST 5 FULL ROWS

or the small 2 seater row at the top!

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## A long time ago, back in 1979....



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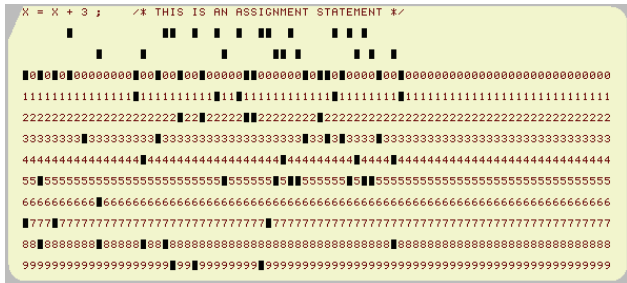


**NC State**

## B.S. Computer Science and Mathematics

- My first semester, my first course in programming - PL/I

```
Hello2: proc options(main);
        put list ('Hello, world!');
end Hello2;
```



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## Decisions? Industry? Grad School?

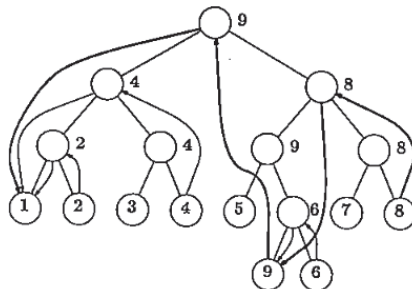
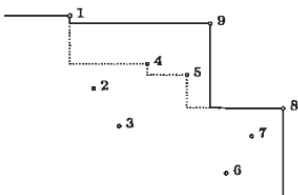
- **Systems Programmer**
  - NCSU, University Systems Control Center
- **Undergraduate Research**
  - Cleanup data from buoys in the water
- Last minute decision
  - IBM Summer job
  - Go to Grad School



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- MS. 1985, P.h.D 1989
- New Data Structure  
Dynamic contour search tree



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Assistant Professor

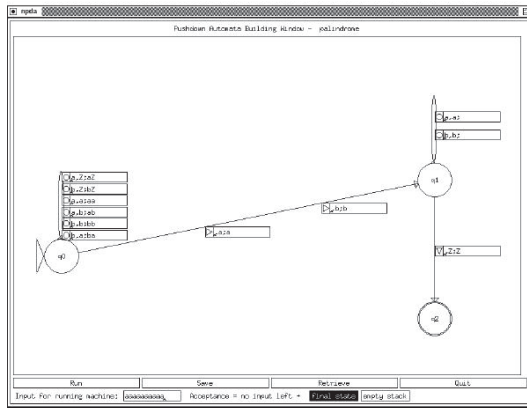
- Continued research in algorithms
- CAREER CHANGE....
- Got more interested in education

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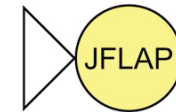
Started developing education tools  
 Changed area to Visualization Tools  
 and CS Education

1994 – Moved to Duke University  
 Professor of the Practice

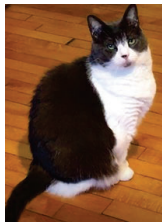
- Tool – NPDA - to experiment with pushdown automata



- Position focuses on Education in the Discipline
- Focused on designing educational software
  - JFLAP – tool for experimenting with theoretical CS concepts



## How I Keep my Sanity



How do you keep your sanity?  
 1/12/23



## Prof. Yesenia Velasco

- Handles logistics, substitute lectures, and much more!
- Will teach some lectures, teaching this course next semester
- Handles accommodations
  - Email her your accommodation letter
  - yvelasco@cs.duke.edu

# Learn the CS Alphabet

A is for ...



- **Algorithm**
  - Step-by-step instructions realized in a program
- **Abstraction**
  - Hiding things is powerful
  - “What” vs “How”
- **APT**
  - Algorithmic Problem-solving Testing
- **API**
  - Application Programming Interface - using Libraries

Feature someone related to CS in every lecture

The New York Times

## Frederick P. Brooks Jr., Computer Design Innovator, Dies at 91

He was a lead designer of the computers that cemented IBM's dominance for decades. He later wrote a book on software engineering that became a quirky classic.

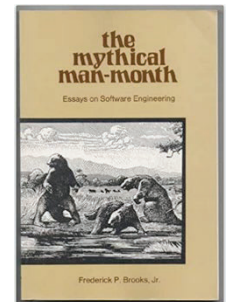
Duke Alum  
BS '53

Founded  
UNC  
Dept of  
Computer  
Science

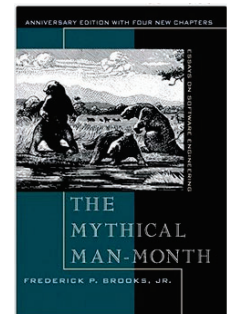


Wrote Software engineering books on his experience

Turing Award – Highest Honor in CS



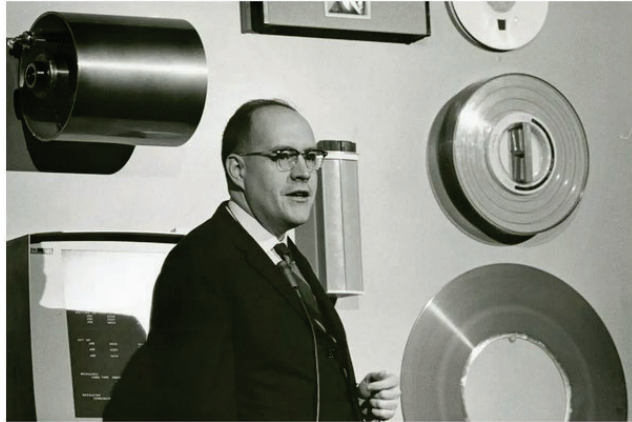
1975



1995

# Brooks – Technical Leader of IBM's 360 computer project

- 1964 – 360 was a family of six compatible computers



# Duke Connection: Fred Brooks '53

- What Would FB Say?

"The most important single decision I ever made was to change the IBM 360 series from a 6-bit byte to an 8-bit byte, thereby enabling the use of lowercase letters. That change propagated everywhere."

- "Fred Brooks" by Copyright owned by SD&M (www.sdm.de) - Request for picture sent by email to Fred Brooks by uploader (Mark Pellegrini; user:Raul654) Fred sent this photo back, along with contact information for Carola Lauber at SD&M, who gave copyright permission.. Licensed under CC BY-SA 3.0 via Wikimedia Commons - [https://commons.wikimedia.org/wiki/File:Fred\\_Brooks.jpg#/media/File:Fred\\_Brooks.jpg](https://commons.wikimedia.org/wiki/File:Fred_Brooks.jpg#/media/File:Fred_Brooks.jpg)



## Why is programming fun?

Fred Brooks



- First is the sheer joy of making things
- Second is the pleasure of making things that are useful
- Third is the fascination of fashioning complex puzzle-like objects of interlocking moving parts
- Fourth is the joy of always learning
- Finally, there is the delight of working in such a tractable medium. The programmer, like the poet, works only slightly removed from pure thought-stuff.

## Go over CompSci 101 webpages

A screenshot of the "CompSci 101, Spring 2023 Home" page. The page has a purple header with the title "CompSci 101, Spring 2023 Home". Below the header is a navigation menu with links for Home, About, Dates, Labs, Assign, APTs, Help, Forms, Resources, and Sakai. The main content area is titled "CompSci 101: Introduction to Computer Science" and includes a "Course Description" section. The description states: "Introduction to practices and principles of computer science and programming and their impact on and potential to change the world. Algorithmic, problem-solving, and programming techniques in domains such as art, data visualization, mathematics, natural and social sciences. Programming using high-level languages and design techniques emphasizing abstraction, encapsulation, and problem decomposition. Design, implementation, testing, and analysis of algorithms and programs. No previous programming experience required. For this version of the course, you will learn the programming language Python 3." Below the description is a "Due Dates" section with bullet points: "Sakai Quizzes on Prework (reading in textbook): due 10:15am on Lecture days. Take quizzes in Duke Sakai.", "Labs: weekly on Fridays, finish and submit by Sunday night - see labs page", "APTs and APT Quizzes: see APT page", and "Assignments: See assignment page". At the bottom is a "Course Announcements" section with a bullet point: "January 10, 2023: First lecture is Thursday, January 12." On the left side of the page, there is a code editor showing Python code for a greeting function.

# Announcements

- **Check out the calendar on the course website**
  - PRE-WORK – what you must do before the lecture
  - LECT/LAB – will put notes/videos here from the live lecture or for the lab
  - DUE – what is due each week.
- What has been updated?
- **Assignment 0 is already out!**
- **Lab 0 on Friday**
- **Prelab for Lab1 (install Python)**
- **You will see a link to this video!**

CompSci 101, Spring 2023  
CompSci 101 Calendar

Home About Dates Labs Assignments Help Forum Resources Sakai

All materials we use in class are accessible via this page.  
This is a temporary schedule for what we will do, subject to change!  
[Information about grading and course logistics.](#)

January 9-13 Week					
	Monday	Tuesday	Wednesday	Thursday	Friday
PRE-WORK	1/9	1/10	1/11	1/12 Read Course Webpages Q203 on Sakai	1/13
LECTURE LAB				Introduction Final Lecture	No Probab Lab 0
ASSIGNMENTS APIS DUE				Assign 0 out	

January 16-20 Week					
	Monday	Tuesday	Wednesday	Thursday	Friday
PRE-WORK	1/16	1/17 Topics: Python, Variables, Operators, String Operations Textbook • 1.1-1.5 • 2.1-2.7 • 2.8-2.11 • 3.3 • exercises are optional	1/18	1/19 Topics: Functions, Parameters, Scope, Function Composition Textbook/Document • Functional Document • 6.2 • 6.4 • 6.7 • 6.10 Q203 due	1/20

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# Course overview, logistics

www.cs.duke.edu/courses/spring23/compsci101

- **Programming assignments: APTs and Assignments**
  - Acknowledge assistance, to learn to program ...
  - Be aware of late policy
- **Labs**
  - Attend each Friday
- **Lecture - Classwork**
  - Attend the live lecture - participate
  - If you can't attend you must watch it and participate within 24 hours
- **Exams: 3 exams and final**
  - All old exams available

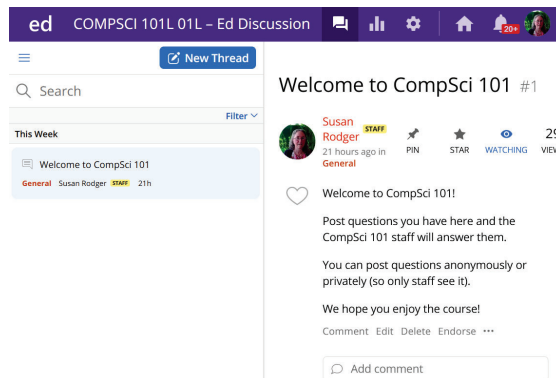
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# Questions?

- **Don't send us email!!!!!!!!!!!!!!**
- **Post your questions on Ed Discussion**
  - We will answer them there!
  - You should try to answer them too
    - Want to be a UTA one day? Answer questions!
- **Post Questions during lecture!**



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# What's in CompSci 101?

- **Learning about computing, computer science, and programming**
  - Vocabulary of Python and programming
  - *Power of automation, repetition, scale*
  - Understanding and changing the world
- **Programming using Python**
  - Tools: PyCharm, Libraries, ...
  - Using mathematical and scientific techniques
  - *Art and science of programming*

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# WOTO – Working Together

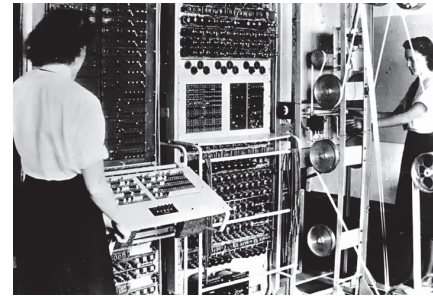
<http://bit.ly/101s23-0112-1>

Discuss with others, then everyone fills out their own form.

## What is Computer Science?

How it started

How it's going



## Computers speak in 0's and 1's

- **In old computers**
  - Control electric current using the vacuum
- **Nowadays, use switches**
  - A switch that is "on" or "closed" represents 1
    - Passes electrical current through
  - A switch that is "off" or "open" represents 0
    - Blocks electrical current
  - Express 0's and 1's, called bits
  - 8 bits are a byte and represent a symbol
- **What letter is 01000001 ?**

1906



## Computers speak in 0's and 1's

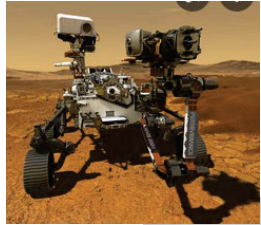
- **In old computers**
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  - A switch that is "off" or "open" represents 0
    - Blocks electrical current
  - Express 0's and 1's, called bits
  - 8 bits are a byte and represent a symbol
- **What letter is 01000001 ?** **A**

1906



# What is Computer Science now?

- Artificial Intelligence

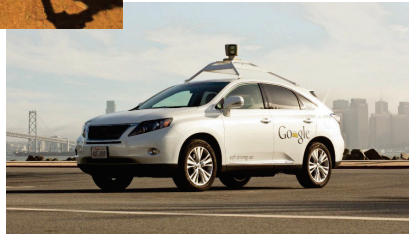


Perseverance  
Mars Rover



Roomba

Self-driving  
car



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Personal Robot

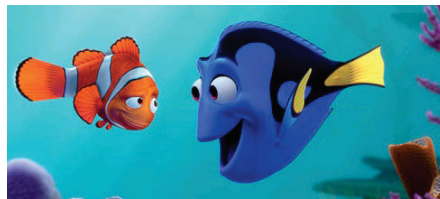
# What is Computer Science?

- Medicine, Genomics



# What is Computer Science?

- Animation



# What is Computer Science?

- The Organization of Data, Sharing, and Searching





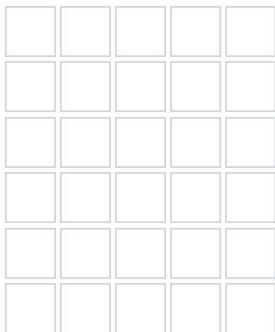
# Prerequisites for Compsci 101



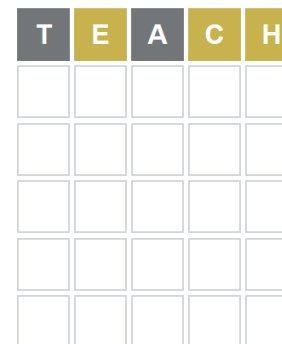
After taking this course you will be able to ....

- Write a program for Wordle
- Write a word finder to help someone solve Wordle

## Wordle



## Wordle



### Wordle Solver

A simple to use tool will help you solve any Wordle answer you are having trouble with. It is simple to use tool will help you solve any Wordle answer you are having trouble with. It is simple to use tool will help you solve any Wordle answer you are having trouble with. It is simple to use tool will help you solve any Wordle answer you are having trouble with.

**Correct Letters**

■ ■ ■ ■ ■

**Misplaced Letters**

■ E ■ C ■ H

**Incorrect Letters**

■ T A

**Potential Answers (10)**

cheek cheer chess chide chief chime choke  
chore chose niche

**Recommended Guesses**

CHIDE CHIEF CHIME NICHE

**Common Letters**

E (12) C (10) H (10) I (4) S (3) O (3) K (2)  
R (2) M (1) F (1)

## Wordle



1/12/23

## Wordle Solver

This simple to use tool will help you solve any Wordle answer you are having trouble with. Just enter in the letters that you have gotten in the right spot into the same spot in the Correct Letters section. Add any letters that are in the puzzle but not in the right spot to the Misplaced Letters area. Finally, enter anything you've guessed that isn't right at all into the Incorrect Letters section. The potential answers will populate as you enter in letters, eventually giving you the solution!

**Correct Letters**  
C H I [ ] [ ]

**Misplaced Letters**  
[ ] E [ ] [ ] [ ] E

**Incorrect Letters**  
T A M

**Potential Answers (1)**  
chief

**Recommended Guess**  
CHIEF

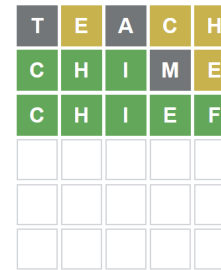
**Common Letters**  
C (1) H (1) I (1) E (1) F (1)

Update

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## Wordle



1/12/23

## Wordle Solver

This simple to use tool will help you solve any Wordle answer you are having trouble with. Just enter in the letters that you have gotten in the right spot into the same spot in the Correct Letters section. Add any letters that are in the puzzle but not in the right spot to the Misplaced Letters area. Finally, enter anything you've guessed that isn't right at all into the Incorrect Letters section. The potential answers will populate as you enter in letters, eventually giving you the solution!

**Correct Letters**  
C H I [ ] [ ]

**Misplaced Letters**  
[ ] E [ ] [ ] [ ] E

**Incorrect Letters**  
T A M

**Potential Answers (1)**  
chief

**Recommended Guess**  
CHIEF

**Common Letters**  
C (1) H (1) I (1) E (1) F (1)

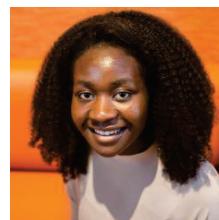
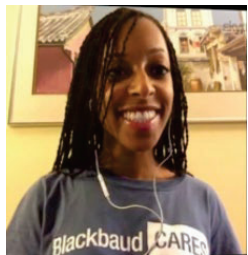
You will be able to write

You will be able to write

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## Who has taken CompSci 101?



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## Who are you?

- Let's look at survey to see who is taking CompSci 101 in Spring 2023
  - Do you recognize yourself?
  - Is there a stereotypical CompSci 101 student?
  - Is there a stereotypical computer scientist?
- Everyone can succeed! Ideally you won't have lots of experience programming

1/12/23

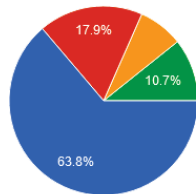
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# From Survey

What year are you?

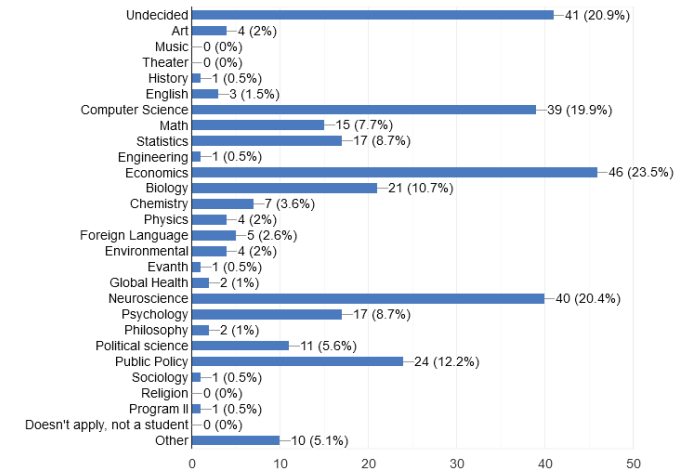
196 responses



- First year
- Sophomore
- Junior
- Senior
- Graduate Student
- Duke Employee

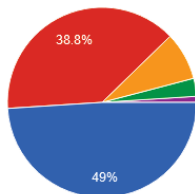
What's a possible or likely major?

196 responses



How much programming have you done before?

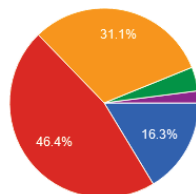
196 responses



- None at all
- A little, but not much
- A decent amount, but been a while
- Enough so that I think of myself as a beginner, somewhat competent
- I've written a lot of code

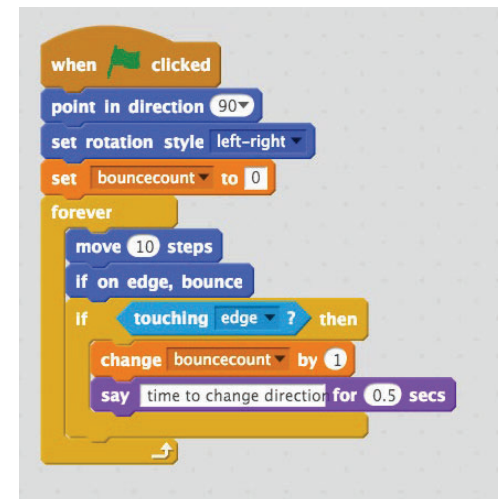
How do you feel about taking CompSci 101?

196 responses



- Really nervous
- a little nervous
- ready to get started
- somewhat confident
- really confident

# What does this program do?



- "Hello World"
- Scratch Program
- Colors
  - Duke blue: motion
  - Mustard: control
  - Light blue: sensing
  - Orange: data
  - Purple: looks

WOTO: WOrking TOgether  
<http://bit.ly/101s23-0112-2>

Analyze this  
Scratch Program?

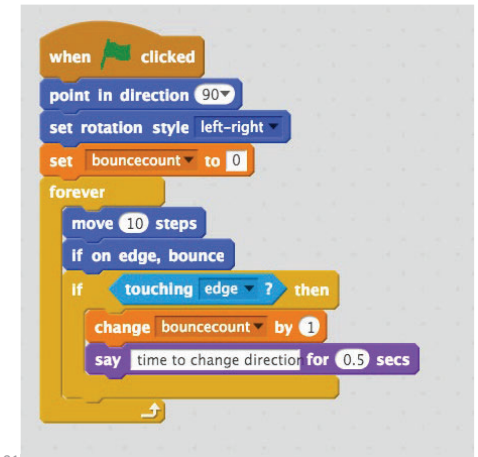
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WOTO: WOrking TOgether  
<http://bit.ly/101s23-0112-2>

Analyze this  
Scratch Program?



1/12/23

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## Scratch Program

- If you want to experiment with this scratch program, here is the link:

<https://scratch.mit.edu/projects/94064630/>

You don't have  
to understand  
this yet!!

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## What language will we learn?

- <http://www.python.org/>
- Python is a *multi-paradigm* language
  - Procedural
  - Functional
  - Object-Oriented
- Simple, libraries, widely used
- Guido von Rossom

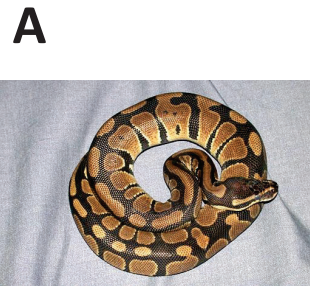


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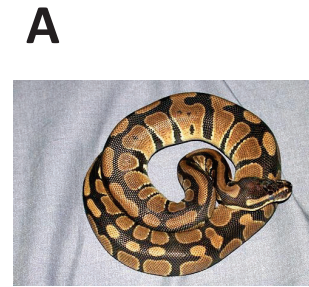
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# Why is it called Python?



# Why is it called Python?



## Python code hello.py

```
1 """
2 Created on 1/6/2022
3
4 @author: Susan H. Rodger
5 """
6
7 if __name__ == '__main__':
8     print("Hello CompSci 101!")
9
```

OUTPUT:

## Python code hello.py

```
1 """
2 Created on 1/6/2022
3
4 @author: Susan H. Rodger
5 """
6
7 if __name__ == '__main__':
8     print("Hello CompSci 101!")
9
```

OUTPUT:

C:\Users\Susan\AppData\Local\Progr  
Hello CompSci 101!

Process finished with exit code 0

You don't have  
to understand  
this yet!!

# Python Code, second program

```
6 def greeting(name):  
7     print("Hello " + name)  
8  
9 ► if __name__ == '__main__':  
10     greeting("CompSci 101!")  
11     greeting("Beenie, Keeah and Moe")
```

OUTPUT:

# Python Code, second program

```
6 def greeting(name):  
7     print("Hello " + name)  
8  
9 ► if __name__ == '__main__':  
10     greeting("CompSci 101!")  
11     greeting("Beenie, Keeah and Moe")
```

You don't have to understand this yet!!

OUTPUT:

```
C:\Users\Susan\AppData\Local\F  
Hello CompSci 101  
Hello Beenie, Keeah and Moe
```