Compsci 101
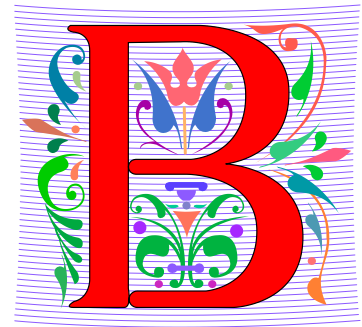# Python Code, Variables

Susan Rodger

September 1, 2022

```
st = f.read().decode('utf-8')
st = st.lower()
total = len(st)
```

B is for …

- **Bug**
  - What you will always have and need to fix
- **Bits**
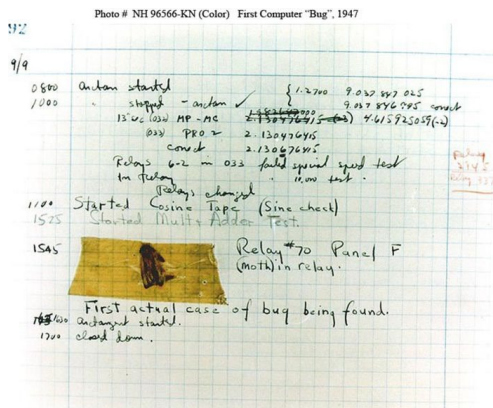 - Zeros and Ones, like C,G,A,T makes up DNA
- **Byte**
  - 8 bits that represent a character

- **Boolean**
  - Type that's true or false

Grace Hopper

- Computer Scientist
- Rear Admiral in US Navy
- One of first programmers for one of first computers: Harvard Mark 1
- Handed out nanoseconds
- First computer bug in 1947

""The only phrase I've ever disliked is, 'Why, we've always done it that way. ' I always tell young people, 'Go ahead and do it."

Announcements

- Survey coming out– complete this week
- Lab 0 is Friday, no Prelab
- Prelab 1 before lab– Install Python/Pycharm
  - Ways to get help:
    - Office hours, consulting hours
    - Post on Ed Discussion – what type of machine, etc
    - Install Fest at Co-lab, Sept 6-7, 2pm-8pm
- Ed Discussion Back channel during lecture
- QZ03 and reading due Tuesday at 10:15am
- Assignment 0 - Blockly due 2/8

Is this the right course for you?

- **CompSci 101**
  - beginner
  - little or no programming experience
- **CompSci 201**
  - 4/5 on AP CS A
  - OR Programming Experience in Python or Java or ?
    - Problem solving with arrays or lists
    - Looping structures (while/for)
    - Writing functions/methods
    - Problem solving with Sets, Dictionaries or maps?

Can't take CompSci 101 if

- You already took CompSci 201, or CompSci 116, or ENG 103 ……

- You won't get credit for this course

- This is a beginner course

Practice, Practice, Practice

Practice results in Success

Compsci 101, Fall 2022   10

Don't get behind!!!

- Difficult to catch up…

Plan for the Day (PFTD)

- Look at a sample Python Program

  - OK if you don't understand it all

- How to run Python Code

  - Run complete program in Pycharm

  - Short code segments with Python Console

    - Python Console is in Pycharm

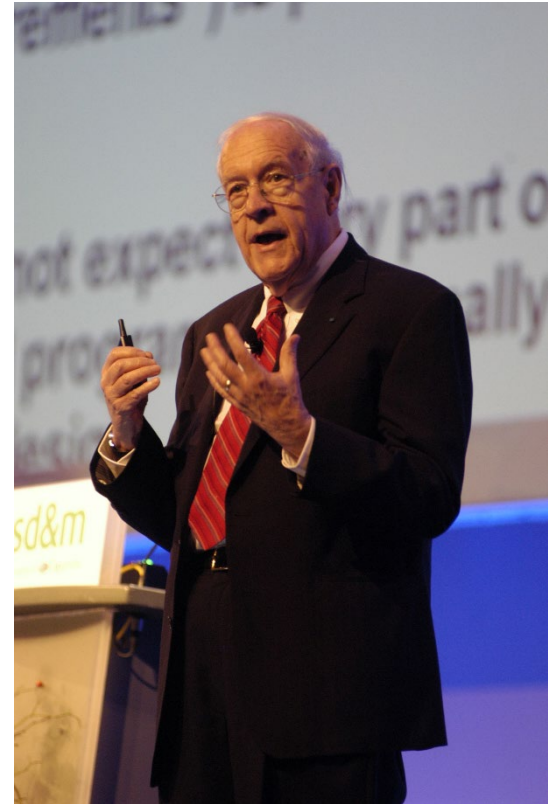- Names, types, and values in Python

- Functions in Python

Finish Slides from Last Time

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."

Why is programming fun?
Fred Brooks

• First is the sheer joy of making things

• Second is the pleasure of making things that a
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,
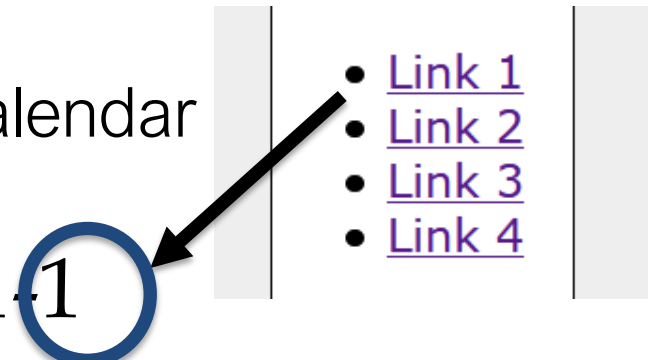works only slightly removed from pure thought-
stuff.

Understanding Code

- We will look at an interesting Python program
  - Try to figure out what it does

- You Likely Will NOT understand all this code
- Maybe none of it

- That's OK

How Breakout Groups Work with Google form links

- **Given a bitly link**
  - Type it in OR click on it on the calendar page

  - http://bit.ly/101f22-0901-1

- **What you should do:**
  - Introduce yourselves
  - Each person fills out the google form
  - Includes your email, name and netid
  - Discuss each question and fill out
  - Be mindful of time

- Link 1
- Link 2
- Link 3
- Link 4

WOTO-1 Understanding Code
http://bit.ly/101f22-0901-1

WOTO-2 Understanding Code
http://bit.ly/101f22-0901-2

Names, Types, and Values

- Relate to a file. Consider: homework.pdf
- What is its name?

- What is its type?

- What is its value?

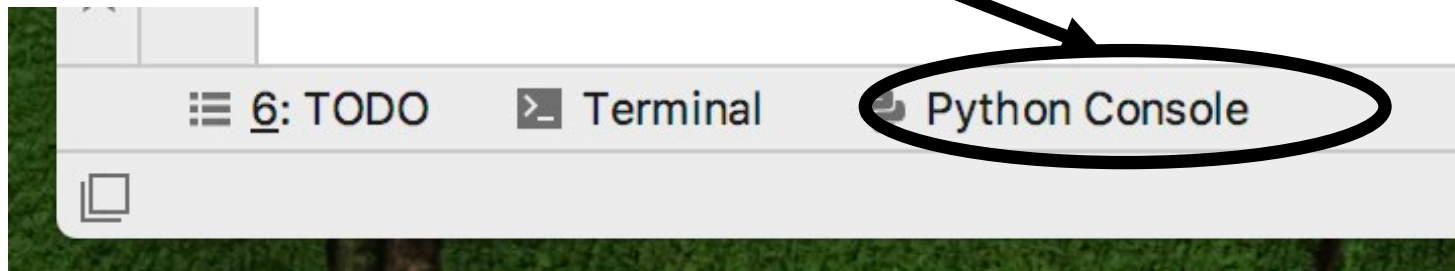# Names, Types, and Values

- Relate to a file. Consider: cats.jpg
- What is its name?

- What is its type?

- What is its value?

Numeric Python Building Blocks

- **Numbers are not everything! But good start**
  - Values and arithmetic expressions
  - Integer aka int: 0, 3, -2, 5, …
  - Float: 2.5, 3.6673, 1.938e+120
  - Operators: +, -, *, /, **
  - Operators: // and %

- **Demo in Python Console**

Interactive Console

- Short way to look at Python values and expressions

- Look in the bottom left corner of PyCharm

- Click on "Python Console"

Summary of Numbers

- Integers are arbitrarily large in Python 3
- Float values do not have infinite precision
  - Floats are for decimal values

- Be attentive to parentheses and precedence
- Understand / and // and %
  - Modulus or remainder

Python Strings

- A string is a sequence of characters
  - String literals use single or double quotes
  - `"hello"` and `'world'` are both strings

- Operators we'll use: `+` and `[:]`
  - Concatenation and Slicing
  - Adding and taking apart?
    - *Today just adding*

- Demo in Python Console

Types and Conversion

- How do you convert a .jpg to a .png?

- Can we add a string and an integer?

Using Python Console

- Not writing a whole program
- Just checking out values or writing simple code

- What is the difference in Python Console of:
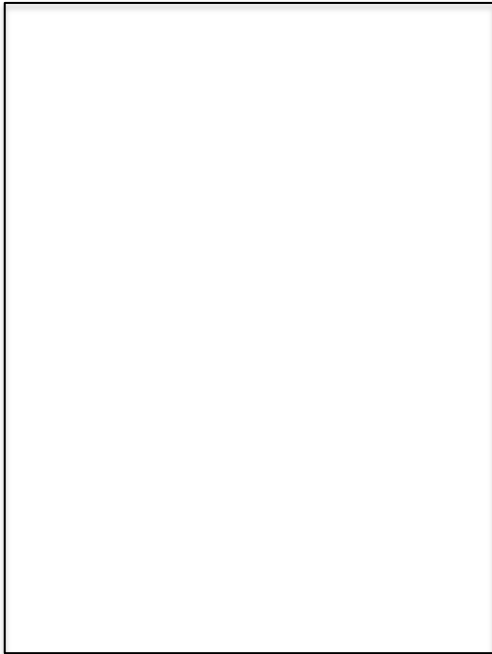
    >>> print("a" +" " + "b")

    >>> "a" + " " + "b"

Variables

- ## We use variables to store values so we can use them and re-use them in expressions
    - ### Name associated with storage (spot in memory)
    - ### Assign value to a variable

- ## How to read: num = 5, word = "hello"
    - ### Why say 'gets' or 'is assigned' and not 'equals'
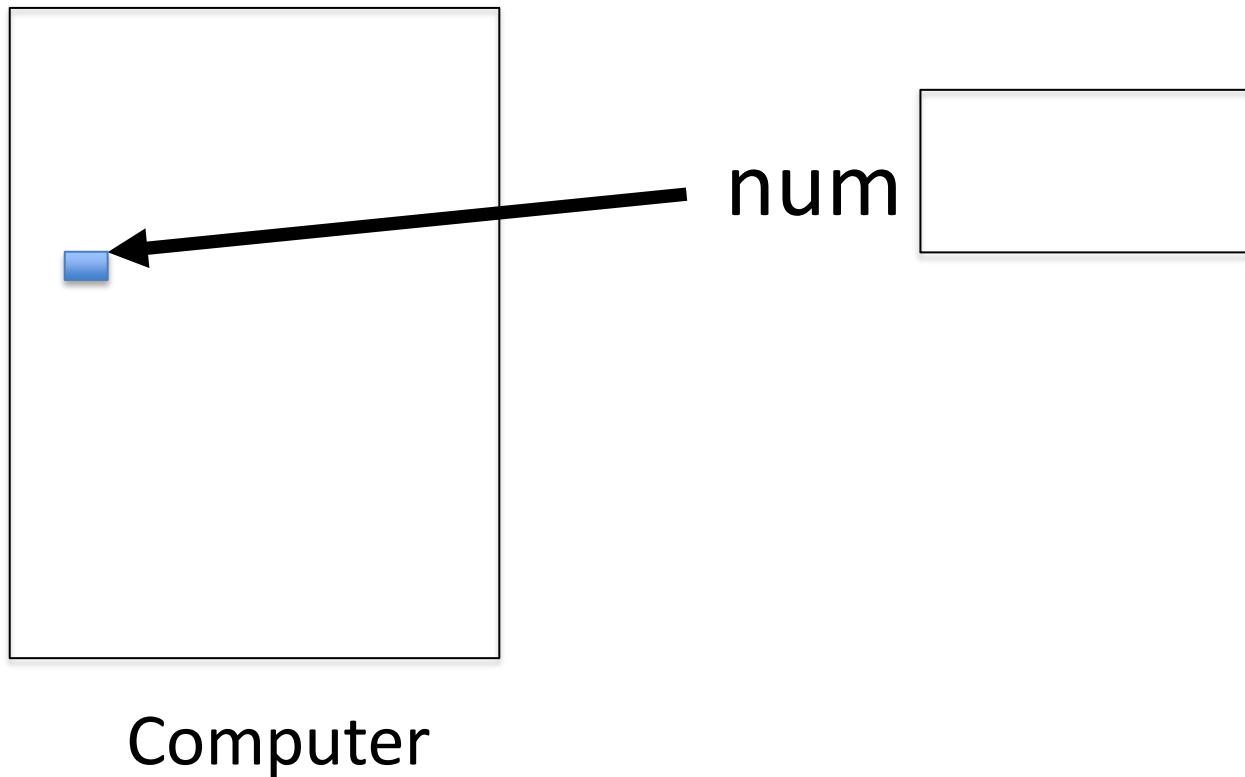   - ### We'll use 'equals' later to mean equality

Variable idea
1)   num = 6

Computer

Variable idea
1)   num = 6

num

Computer

Anatomy of a variable

- **Variables in Python have a type, changeable**
  - Initially `var = 5`, change to `var = "hello"`
  - Use the `type(..)` function to determine type, but documentation/comments are better

- **Variables are names/labels, references to an object stored elsewhere (basically)**
  - My address is "202 Main Street"
  - That's the name/label, my house is elsewhere
  - For `var = "hello"`, the string is elsewhere

Subtleties

- **Variables on LHS and RHS**
  - Value compared to Name
  - LHS – Left Hand Side
  - RHS – Right Hand Side

- **What happens here?**
  - Value compared to Name

- **In expressions? What is value**

```
num1 = 17
num2 = num1 + 12
```

```
var1 = 17
var2 = var1 + 12
var1 = "hi"
var2 = var1 * 3
```

Basic Python
http://bit.ly/101f22-0901-3