Compsci 101
Python Code, Variables

```python
st = f.read().decode('utf-8')
st = st.lower()
total = len(st)
```
Every lecture:
DO NOT SIT IN THE LAST 5 FULL ROWS
or the small 2 seater row at the top!
B is for ...

- Bug
  - What you will always have and need to fix
- Bits
  - Zeros (0) and Ones (1), like C,G,A,T makes up DNA
- Byte
  - 8 bits that represent a character

- Boolean
  - Type that's true or false
B is for ...

• Bug
  • What you will always have and need to fix

• Bits
  • Zeros (0) and Ones (1), like C,G,A,T makes up DNA

• Byte
  • 8 bits that represent a character
    01000001 code for letter "A"

• 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.'"""
Grace Hopper Celebration of Women in Computing Conference
Announcements

• Prelab 1 before lab 1— 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, Last day this afternoon
• Ed Discussion Back channel during lecture
• QZ03 and reading due Thursday at 10:15am
• Assignment 0 - Blockly due 1/19
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
Where to sit? Laptops?

• Sit anywhere but the top 2 seater row and the top 5 full rows. NEVER SIT THERE, WE will ask you to move!
  • Come forward meet someone

• Laptop policy
  • Use your laptop in class only for CompSci 101
    • No watching sports videos, or shop, etc
      – RUDE and distracting to other students
      – Don't come to class if you feel you have to do this
  • Not be doing other coursework
Practice, Practice, Practice
Practice, Practice, Practice
Practice results in Success
Practice results in Success
Don’t get behind!!!

• Difficult to catch up...
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
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 Wotos Work with Google form links

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

- **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
```python
import urllib.request

def processURL(url):
    f = urllib.request.urlopen(url)
    st = f.read().decode('utf-8')
    st = st.lower()
    total = len(st)
    print("total # chars = ", total)
    print("total # z's = ", st.count("z"))
    for ch in "abcdefghijklmnopqrstuvwxyz":
        print(ch, st.count(ch))

if __name__ == '__main__':
    processURL("https://www2.cs.duke.edu/csed/data/kjv10.txt")
```
WOTO-1 Understanding Code
```python
import urllib.request

def processURL(url):
    f = urllib.request.urlopen(url)
    st = f.read().decode('utf-8')
    st = st.lower()
    total = len(st)
    print("total # chars = ", total)
    print("total # z's = ", st.count("z"))
    for ch in "abcdefghijklmnopqrstuvwxyz":
        print(ch, st.count(ch))

if __name__ == '__main__':
    processURL("https://www2.cs.duke.edu/csed/data/kjv10.txt")
```

Output:

```
total # chars = 4345018
total # z’s = 2977
a 275338
b 48761
c 54774
d 157899
e 411615
f 83377
g 55089
h 282472
i 193510
...
```
Names, Types, and Values

• Relate to a file. Consider: homework.pdf
• What is its name? homewor.pdf
• What is its type? .pdf (portable document format)
• File format created by Adobe
• What is its value? Content of the file, homework for a class?
Names, Types, and Values

• Relate to a file. Consider: homework.pdf
• What is its name?
  • homework.pdf
• What is its type?
  • .pdf (portable document format)
  • File format created by Adobe Acrobat
• What is its value?
  • Content of the file, your homework for a class?
Names, Types, and Values

• Relate to a file. Consider:  cats.jpg
• 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?
  • cats.jpg
• What is its type?
  • .jpg (type of image file)
• What is its value?
  • Content of the file, picture of cats?
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**

  - What can you do with numbers?
    - Add (+)
    - Subtract(-)
    - Multiply(*)
    - Divide(/)
    - Exponent(**)
    - Integer division (/\)
    - Mod (%)
Numeric Python Building Blocks

- Numbers are not everything! But good start
  - Values and arithmetic expressions
  - Integer aka int: 0, 3, -2, 5, ...
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  - 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?
Types and Conversion

• How do you convert a .jpg to a .png?
  • Change the bits from one format to another

• Can we add a string and an integer?
  • What does 5 + "cow" mean?
  • What does 5 * "cow" mean?
  • Why?

• Python Console Demo
Using Python Console

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

What is the difference in Python Console of:

```python
>>> print("a" + " " + "b")

>>> "a" + " " + "b"
```
Using Python Console

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

What is the difference in Python Console of:

```python
>>> print("a" + " " + "b")
'a b'

>>> "a" + " " + "b"
'a b'
```

Print means: output
Value of the expression
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
Variable idea
1) num = 6

Computer

num

6
Variable idea

2) \( y = \text{num} + 4 \)
Variable idea

2) \( y = \text{num} + 4 \)
Variable idea

2) $y = num + 4$

Computer

$\begin{array}{c}
\text{num} \\
6 \\
\text{y} \\
10
\end{array}$
Variable idea

3) \( \text{num} = \text{y} \times 2 \)
Variable idea

3) \( \text{num} = y \times 2 \)

Computer

\[ \begin{array}{c}
\text{num} \\
6 \\
\text{y} \\
10
\end{array} \]
Variable idea

3) num = y * 2

Computer

num  20

y  10
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)
  • `address = "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
Subtleties

- Variables on LHS and RHS
  - Value compared to Name
  - LHS – Left Hand Side
  - RHS – Right Hand Side
  - 1) Evaluate RHS
  - 2) Store in LHS

- What happens here?
  - Value compared to Name

- In expressions? What is value

```
num1 = 17
num2 = num1 + 12
num1 gets 17
num2 gets 29

var1 = 17
var2 = var1 + 12
var1 gets 17
var2 gets 29

var1 = "hi"
var2 = var1 * 3
var1 gets "hi"
var2 gets "hihihi"
```
Basic Python