### APT: CompSci 101, Spring 2017, APT

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Test file: Browse... No file selected.

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Jan 19, 2017

Prof. Rodger
Announcements

• Reading and RQ3 due next class
• Assignment 1 due today!
  – See the catch up schedule – for everyone!
• APT 1 due on Thursday, Jan 26
• Need a pin to add class – fill out form
• Exam accommodations – fill out form
• Lab 1 this week

• Today – Problem Solving, Python practice, solve an APT
Running and Understanding Code

• Need Python compiler/interpreter
  – We're using Canopy, includes libraries

• Need an editor development environment
  – We use Eclipse and PyDev, open source and widely used, Ambient is Duke Plugin

• You need experience thinking and coding and debugging ideas and code:
  – Installing the suite of tools can be cumbersome
  • Persist, Perservere, Get Help, start over 😞
Understanding terminology: code

• Move from "Hello World" to "Hello Around the World"
  – Look at Python, code, libraries
  – Learning (reviewing) terminology about Python

```python
print "hello world"
```

```python
f = open("hello.txt")
for line in f:
    print line
```
import urllib2

url = "http://www.cs.duke.edu/courses/compsci101/spring17/data/hello.txt"
f = urllib2.urlopen(url)
for line in f:
    print line
Hello Around the World in Python

• We open a file, and we open a URL
  – Syntax slightly different, concept is similar
  – Real-world differences between files and URLs?

  ```python
  f = open("hello.txt")
  ```

• Must adhere to syntactic rules of Python
  – Naming, whitespace, : or . or ( or ) or [ or ]

• Must adhere to semantic rules of Python
  – Can't loop over anything, more rules to follow
Hello Around the World in Python

• We open a file, and we open a URL
  – Syntax slightly different, concept is similar
  – Real-world differences between files and URLs?
    \[
    f = \text{open}("hello.txt")
    \]
    \[
    f = \text{urllib2.urlopen}("http://nytimes.com")
    \]

• Must adhere to syntactic rules of Python
  – Naming, whitespace, : or . or ( or ) or [ or ]
• Must adhere to semantic rules of Python
  – Can't loop over anything, more rules to follow
Barbara Liskov

• (one of) first women to earn PhD from compsci dept
  – Stanford 1968
• Turing award in 2008
  – Programming Languages
  – CLU

“It's much better to go for the thing that's exciting. But the question of how you know what's worth working on and what's not separates someone who's going to be really good at research and someone who's not. There's no prescription. It comes from your own intuition and judgment.”
Starting with Python

• Variable
  – Name of a storage location – holds a value
  = to assign a value to a variable

• Type
  – Different types of data
  – A variable can store data of a certain type
  – int, float, str

• operators in Python for numbers
  – Arithmetic: +, -, *, /, %, **

• Built-in functions: pow, abs, round, int, float
  example: pow(2, 3) + round(1.6),
Starting with Python
Eclipse – Three ways to run

1. Write program and store in file
   – Create a PyDev project – a folder for programs
   – Create a PyDev module for each program (file)
   – Run in console

2. Create an APT in Eclipse and run on web

3. Run interactively
   – Open PyDev console
   – Execute each line as typed
   – Code not saved
Demo: Run interactively in Eclipse PyDev Console

• If Console window is not showing then
  – Click on Window, Show View, Console
• Then at the bottom of Eclipse, click here:

  ![Console Window](image)

• Select PyDev Console, Python Console
Variables, Types, Expressions?

a = 5  
b = 4  
print b 
a = a + b  
print a  
c = "fred"  
print c 

print a + b * 3 
print (a + b) * 3 
print a / b 
print a / (b * 1.0)

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Examples of functions
Functions explained

• In a calculator, sqrt: number in -> number out
  – What is domain, what is range?

• In MSWord, word count: document -> number
  – Domain is word doc, range is integer

• In browser, web: URL -> HTML formatted "page"
  – Domain is valid URL, range is HTML resources

• In Python we see similar structure!
Demo

- In Eclipse write a file with a function and run it
- stuff.py

```python
def sum(a, b):
    return a+b

print sum(3,5)
print sum(1,4)
```
Python Functions

• Answer these questions based on thinking, don't run any code

• Why do we need functions?
  – Manage complexity of large programs
  – Test and develop code independently
  – Reuse code in new contexts: create APIs!
Functions return values

- Most functions return values
  - Sometimes used to make things simpler, but
    returning values is a good idea

```python
def inch2centi(inches):
    return 2.54*inches

xh = inch2centi(72)
```

```python
def pluralize(word):
    return word + "es"

pf = pluralize("fish")
```
Functions can print info

- Some functions only print info
- Note there is no return statement in the function

```python
def helloPerson(name):
    print "hello" + name

helloPerson("Susan")
helloPerson("Ademola")
```
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What is an APT? BMI APT

• Automated/Algorithmic Problem Testing
  – Write one function, 2-30 lines, solve a problem
  – Tested automagically in Eclipse or the browser
  – Lots of test cases – test test test

• Start simple, build toward more complex
  – What is a function? A function call?
  – What is a parameter? Argument?
  – How do you run/execute a program

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Demo Solving APT BMI

• Write your code in Eclipse
  – Create python file
  – Name of file important – case matters
  – name of function important – cut and paste this
  – Write your code
  – Test a few examples in Eclipse

• Run online on using APT Tester
  – Tests on lots of examples, Debug, fix
  – Get all GREEN

• Submit on APT page
  – README form too