Python - Lesson 1

An Introduction to Computer Programming

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What is Computer Programming?

- Just like how humans have workflows and procedures and steps to follow, computers do too.
- Computers are hilariously stupid, they need to be told how to do things very precisely.
  - This can be a challenge, which is why it’s a skill.
- We program a computer with a language.

What is a Programming Language?

- Computers use binary. Humans use gobbledygook. We need something that both parties can understand.
- Computers need to communicate in a standardised way.
  - Syntax, semantics, grammar, structure, order.

  Unfortunately, humans created computers.
  - All programming languages suck, just like human all languages.

What is a Programming Language?

- Examples:
  - Assembly
    - Close to the metal
  - C/C++
    - Low level
  - Java
    - Medium level
  - Python
    - High level
  - Bash/Shell/command line

What is Python? Why use it?

- It’s a programming language that is about as close as you can get to English.
  - So for humans, it is very easy to write and read.
  - For computers, it’s hard to read. But who gives a shit.
- It’s quick to get things done.
- It rewards laziness.
- It sucks less than most languages.
- It exists.

What Does Python Look Like?

```
#!/usr/bin/env python

from collections import defaultdict

wordCounts = defaultdict(int)
text = raw_input("Enter text: ")
words = text.split()

for word in words:
    wordCounts[word] += 1

for word in sorted(wordCounts.keys(), key = lambda x: -wordCounts[x]):
    print '%s\t%s' % (wordCounts[word], word)
```

A Few Things Before we Begin

- The Python stuff on the previous slide is what programmers refer to as ‘code’ or ‘The Matrix’ ;)
- Each line in the code is called a ‘statement’.
  - There are many types of statements that we will cover:
    - Conditions, loops, assignments, etc.
- Saying all that - lets go!

How to Start?

- Linux and Mac have Python installed by default.
- Windows users can download Python - but you are on your own.
- Python programs have two ways of running:
  - As an interpreter.
  - As a script.

The Interpreter

- Type ‘python’ on the command line to open up the interpreter.
- The interpreter executes your python code as you type.
  - You type a line, the computer runs it. You type another… etc.
- Very useful for playing around.
- Can be used as a useful calculator!

Scripts

- Running scripts are just like running normal programs on your computer.
- You tell the computer what file you want to run, and any arguments you want to give it, and it runs.
  - BillLotsOfHoursToIndus.py sallen 99999999999

The Hashbang - #!

- We use this when writing Python scripts.
- The hashbang tells the computer how to run the program.
- If we don’t use the hashbang, the computer won’t know how to run the script!
- Alternatively, we can explicity tell the computer to run a script with Python:
  - python script.py ...

Data Types

- Data types are representations of different ‘things’. You may be familiar with Excel data types. Python has a few standard ones:
  - strings - free form text
  - integers - -1, 0, 1, 2, 3, ...
    - These can be of any size!
  - floats - 3.1415926535, 2.7181818, 42, -12
  - dictionaries, lists, sets, tuples, etc.
    - We’ll go into these later on.

Maths - YAAAAAAY!

- The Python interpreter is a great little calculator. It's better at math than you are.
- Try typing these in to see the results.
  - 4 * 2 (4 times 2)
  - 4 - 2 (4 minus 2)
  - 4 + 2 (4 plus 2)
  - 4 / 2 (4 divided by 2)
  - 4 % 2 (4 modulo 2)
  - 4 ** 2 (4 to the power of 2)
- What is 9999 to the power of 9999?

A Little More Math Goes a Long Way

- If you have two integers (whole numbers) and you use them in such a way that you get you get a number with a remainder back, Python will ignore the remainder.
  - 10 / 4 = 2
- If you want the remainder, tell python, by using a float as one of the numbers:
  - 10 / 4.0 = 2.5

Printing

- Printing is the term we use to output text to the screen or to a file.
- We print by using the ‘print’ keyword and putting our text in any type of quotes.

```
print "Hello, World!"

print 'hi there'

print """I like cake
because it's nice"""
```

Printing

- We can use maths and printing together!
- To do this, we ‘format’ our output in a few ways.
  - Separating items with a comma prints them out with a space between them.
  - We can use a ‘placeholder’ like ‘%s’ in a text string, and fill in the value afterwards.
  - We can add two strings together with a ‘+’, just like numbers. However we can’t mix numbers and strings, that would be an error!

Printing

```
print "I am", 22 + 2, "years old."

print "I am %s years old." % 24

print "I am %s years old." % (22 + 2)

print "My name is %s and I am %s years old." % ('Simon', 24)

print "My name is " + "Simon"
```