121COM: Introduction to Computing

Academic Year 2015/16

LabSheet 3

For use in labs the week beginning Mon 12th October 2015

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C Lab Exercises 1

Q1 Write a script to complete each of the following tasks. They are all simple to do using the built in methods. The challenge is working out the name of the function and how to call it. You can use the interactive help system or the Python documentation (online or offline).

(a) Reverse all the elements in the list `[True, False, True, True, False]`.

(b) Insert `"John"` into the list `["George", "Paul", "Ringo"]` as the second element.

(c) Remove the value `"15"` from this list `[2,3,5,7,11,13,15,17,19]`. There are two ways to do this: one by value and one by index. Discover them both.

(d) Convert all letters in the string "GOod Morning" to lowercase.

(e) Centre the word "Title" in a string of length 44.

(f) Split the string "This is a string" up into a list of the individual words.

(g) Remove the `http://` from `"http://www.coventry.ac.uk"`.

I **Extension:** There are many more useful string and list methods other than the ones used above. If you have time, read and experiment with some more.

Q2 Create a program which asks the user for a width and a length and then prints out a tree shape like to the side (this one has width 9 and trunk length 3). You should insist that the user picks an odd width.

```
    *
   ***
  *****
 *******
*********
   ***
   ***
   ***
```

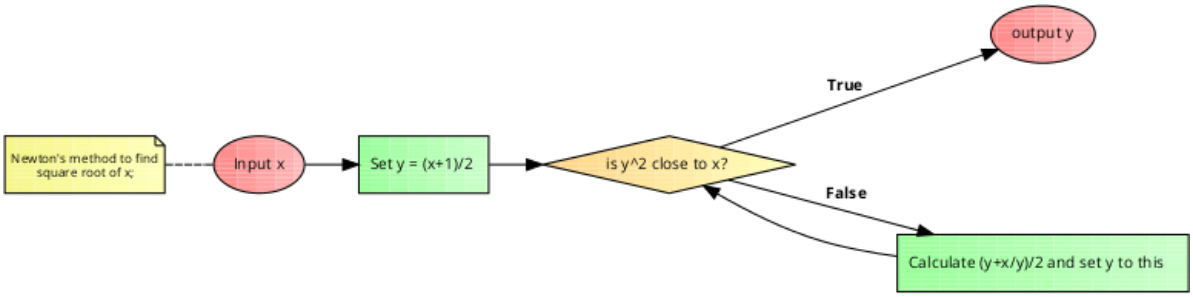
Q3 Ask the user for a sentence and print out a table of words in that sentence. The words should be printed alphabetically with its number of occurrences next to it. Note: You should avoid editing the list a for loop traverses over. If you need to edit a list use the while loop.

Q4 Fix the logic error in the file `BuggyCode.py` on Moodle.

I Lab Exercises 2

Q5 Newton's method is a way to calculate square roots incrementally: improving your approximation in each step. The method is described in the flow chart over the page.

Implement the method in Python using a loop. We can say y^2 is close to x if the absolute value of their difference is less than 0.001. Compare your answers with the `sqrt` function of the `math` module.



Extend your script so that it also prints the total number of loops required. See if this changes for different values of x.

Q6 Recall that a prime number is an integer greater than 1 that is divisible only by itself and 1. The Sieve of Eratosthenes is a method for finding all prime numbers below a given integer. The idea is to eliminate numbers which are multiples of known primes. So we start with 2; accept it is prime; rule out all its multiples (4,6,8,...); repeat for 3; then 5 (skipping 4 since it has already been ruled out).

Write a Python script to find all prime numbers less than 500 using the Sieve of Eratosthenes. Before you start coding draw a flow chart for the script.

A Extended Task - Quandl

Quandl is an online search engine for financial, economic and social data located at `www.quandl.com`. Data is organised into first datasets and then tables each identified by codes. For example, dataset LSE is the London Stock Exchange and within table TSCO gives the share prices of supermarket Tesco.

Pull the following repository from GitHub:
`https://github.com/Matthew-England/121COMWeek3ExTask.git`
This contains a Python module I have written, in particular a function `getFromQuandl` which makes calls to the Quandl website. The function uses Python tools you have not met yet but the documentation should explain how to use it. Experiment with my function until you understand: how to make calls; what my function prints; and what it outputs.

In a separate file import my function and use it to gather share data from the London Stock Exchange for three of the biggest UK supermarkets: Tesco, Sainsburys and Morrisons. Write you own code to compare the stock price levels and volatility (e.g. different averages, standard deviation) and compare with the results of commands from the `statistics` package. Use the third party package `matplotlib` (already installed on EC computers) to plot the data.

The fourth big supermarket in the UK, Asda, is not listed as it is owned by US company Wal-Mart. You could try to find stock data for Wal-Mart from another of Quandl's databases.