121COM: Introduction to Computing

Academic Year 2015/16

Lab Sheet 1

For use in labs the week beginning Mon 28th Sep 2015

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These exercises requires the Python syntax introduced in Worksheet 1 and the material in this weeks slides.

C Lab Exercises 1 - First Steps in Python

Write Python scripts to solve each of these problems. Make sure you use appropriate variable names and comments. When there is a final answer have Python print it to the screen.

Q1 A person's body mass index (BMI) is defined as:

$$BMI = \frac{\text{mass in kg}}{\text{height in m}^2}.$$

Have Python find out a users height and weight in meters and kilograms, and then tell them their BMI.

Q2 If you invest £S and receive interest of i% for t years then the compound interest formula will calculate the value of your investment at the end.

$$\text{Value} = S\left(1 + \frac{i}{100}\right)^t$$

Suppose you win £10,000 in a programming contest. If you leave it in the bank for 5 years earning interest of 2% how much will you have at the end?
Compare your bank to the investment products below.

Product A: This pays 1% a year for the first 3 years then 5% a year for the last 2.

Product B: This pays 1% a year for the first 4 years then 10% in the final year.

Which of the three options is the best for your 5 year investment?

Q3 You live 4 miles from university. The bus drives at 25mph but spends 2 minutes at each of the 10 stops on the way. How long will the bus journey take?
Alternatively you could run to university. You jog the first mile at 7mph; then run the next two at 15mph; before jogging the last at 7mph again. Will this be quicker or slower than the bus?

Lab Exercises 2 - First mistakes in Python

Debugging (fixing errors / mistakes in code) is a fundamental part of programming. You probably will have already done some debugging when solving the exercises above.

On the 121COM Moodle site there is a file called `BuggyCode.zip` within the Section for Week 1. (Zip files are a file format that gathers multiple files into one and compresses them.) Download the file; unzip it (using 7zip or any other suitable program); and you should find 8 files. You know these are Python scripts because they end in `.py`

Each of these files has at least one error and needs debugging. For each file:

- make a copy in which you fix all the bugs;
- add comments briefly noting the changes you made;
- make a note of how many errors there were and what type: syntax, runtime or logical.

Extended Task - Currency Converter

This task is all about currency conversions.

Every day at 3pm Central European Time the European Central Bank (ECB) publishes how much one Euro is worth in a variety of different currencies. You can see today's publication here:

`http://www.ecb.europa.eu/stats/exchange/eurofxref/html/index.en.html`

They also publish the data in XML format. XML is not a programming language (as you cannot compute in it) but a **Mark-up Language**: a very structured way of presenting data. Another example of a mark-up language is the html code used to make websites. The ECB data in XML format is placed here daily:

`http://www.ecb.europa.eu/stats/eurofxref/eurofxref-daily.xml`

Download the file `ECB.py` from Moodle. This contains Python code that downloads the XML data and uses it to define variables for each of the currencies with values equal to today's rate. Start by working out:

(a) Today's value of 500 euros in US Dollars;

(b) Today's value of £200 in Chinese Yuan;

(c) Today's value of 1000 Russian roubles in Indian Rupee.

Special drawing rights (XDR) is not an actual currency. However, it is used to define value for various purposes by organisations like the International Monetary Fund. It is defined as:

$$1 \text{ XDR} = 0.423 \text{ Euros } + 12.1 \text{ Japanese Yen} + 0.111 \text{ British Pounds } + 0.66 \text{ US Dollars.}$$

Extend your script so that it also supports XDR as a currency.

Finally, most currency transactions carry commission (buying and selling fees) to the user. Extend your script further to show how a travel agent may make a profit on currency conversions.