Laboratory 06 — Revising and Consolidating Programming Concepts

Topics covered:

- Writing functions
- Loops & Conditions
- Processing files using loops with conditions

PREPARATION

Lab attendance is compulsory. You will receive 1 mark for being present at the start of the lab and staying at least until the tutor has finished introducing the lab and has signed your attendance sheet.

EXERCISES

The following exercises must be completed during your allocated laboratory time. You must show your work to the laboratory tutor who will sign off when the work is completed correctly.

EXERCISE 6.1

[2 marks] Given an aeroplane's acceleration a and take-off speed v, you can compute the minimum runway length needed for an aeroplane to take off using the following formula:

$$length = \frac{\mathrm{v}^2}{2*a}$$

Write the `get_runway_length()` function which takes an acceleration a and speed v as parameters and returns the minimum runway length rounded up to the nearest integer.

Arguments: an acceleration a (float) and speed v (float)

Returns: the minimum runway length rounded up to nearest whole integer

Extra knowledge: Use math.ceil() to round up to nearest whole integer

Sample output:

```
>>> get_runway_length(3.5, 60.0)
515
```

EXERCISE 6.2

[2 marks] Write the `get_gender()` function which returns a gender description based on the `code` passed in as a string parameter. The gender will be determined as follows:

- If `code` is equal to "`F`", then the function should return "`Female`"
- Otherwise, if `code` is equal to "`M`", then the function should return "`Male`"
- Otherwise, the function should return "`Unknown`".

Arguments: a code (String)

Returns: Female/Male/Unknown

Sample output:

```
>>> get_gender("F")
'Female'
>>> get_gender("M")
'Male'
>>> get_gender("A")
'Unknown'
```

EXERCISE 6.3

[3 marks] Write the `five_letter_words()` function which takes an input filename and an output filename as parameters. Your function should read the contents from the input file and write out all the 5 letter words to the output file.

Arguments: an input filename and an output filename

Sample contents of input file (words.txt):

```
The woods are lovely dark and deep
But I have promises to keep
And miles to go before I sleep
And miles to go before I sleep
```

Sample Call to function:

```
>>> five_letter_words("words.txt", "five-letter-words.txt")
```

Contents of the output file (five-letter-words.txt):

```
woods
miles
sleep
miles
sleep
```

EXERCISE 6.4

[2 marks] Complete the `add_mark()` function which takes a filename and an additional mark as parameters. The file contains a series of marks (integer), separated by spaces. Your function should append the additional mark to the end of the file.

Arguments: a filename and a mark (integer) to be added to the end of the file

Sample contents of input file (marks.txt):

```
70 32 67 90 80
```

Sample Call to function:

```
>>> add_mark("marks.txt", 89)
```

Contents of the updated file (marks.txt):

```
70 32 67 90 80 89
```

HOMEWORK EXERCISES

The following exercises are due at 11:30pm, Friday 18th April 2014. Include all the exercises in a single module (file), named “Lab06_Homework.py”. Your file must include a docstring at the top of the file containing your name, UPI and ID number. Submit the file containing your exercises using the Assignment Dropbox.

EXERCISE 6.5

The cumulative sum of a list [a, b, c, ...] is defined as [a, a+b, a+b+c, ...]. Write the `cumulative_sum` function which takes a list of integers as input and returns the cumulative sum of the list.

Arguments: an integer list

Returns: the cumulative sum of a list.

Sample output:

```
>>> cumulative_sum([1, 2, 3, 4])
[1, 3, 6, 10]
>>> cumulative_sum([4, 3, 2, 1])
[4, 7, 9, 10]
```

EXERCISE 6.6

Write the `unique_file()` function which takes an input filename and an output filename as parameters. Your function should read the contents from the input file and create a file of unique words.

Arguments: an input filename and an output filename

Sample contents of input file:

```
The woods are lovely dark and deep
But I have promises to keep
And miles to go before I sleep
And miles to go before I sleep
```

Sample Call to function:

```
>>> unique_file("words.txt", "unique_values.txt")
```

Contents of the output file (unique_values.txt):

```
The
woods
are
lovely
dark
and
...
```

ADVANCED EXERCISES (OPTIONAL)

EXERCISE 6.7

[0 mark] Write the `generate_random_numbers()` function that takes a filename as a parameter and writes 100 random integers to the file. The range is from 0 to 20 inclusive. Integers are to be separated by a space in the file. After that, your function should read the data back from the file and print a non-duplicate integer list.

Arguments: a filename

Sample output:

```
>>> generate_random_numbers("numbers.txt")
8 3 4 10 12 17 13 11 19 9 0 7 20 15 5 6 14 2 18 16 1
```

Note: your output may look different from the above example but you should have approximately 21 integers.

ASSESSMENT

Name: ____

Lab day and time: ____

Check list for laboratory exercises (to be completed by Lab tutor)

On time: □ (1 mark)

Exercise 6.1: □ (2 marks)

Exercise 6.2: □ (2 marks)

Exercise 6.3: □ (3 marks)

Exercise 6.4: □ (2 marks)

Teaching Assistant: ______________

Total mark: ____________________/10 Lab tutor: __________________________

MARKING SCHEME

Marks	Feedback
0.5	Include a docstring at the top of the file containing your name, UPI and ID number
0.5	Include a docstring in each function.
1	Include all the exercises in a single file
1	The `cumulative_sum ()` function is defined correctly.
3	Well done! Your function passed test case 1, 2, and 3
1	The `unique_file()` function is defined correctly.
1	A text file is created correctly.
2	Well done! Your function passed test case 1 and 2.