

# Programming I (Python)

## Assignment 2

1. Apply run-length encoding on a string of arbitrary length, and return the encoded string.  
(*Reference:* Run-length encoding)

## Instructions

- (a) Your code should be written between the following two lines in your solution file `Q1.py`)

```
# Your code - begin

# Your code - end
```

- (b) Please avoid modifying the code anywhere else.
  - (c) The current value of the input  
`inp` = "BB". You will find this in the file `Q1input.py`. Please note that the input must always come via the `inp` variable and not be taken from any other source, e.g. other variables. Please do not define your own `inp` variable.
  - (d) If you wish to test your code against any other input, feel free to modify the `inp` in file `Q1input.py`.
  - (e) At the end of the computation, your answer should be placed in the variable `output`.
  - (f) Before submitting, please remove any extraneous input/output instructions carefully. Any extra IO from your code will break our test script.
2. Write a program to check if a given expression has balanced parentheses. The input string is allowed to contain only three types of brackets: parentheses, i.e. `'('/')'`, curly braces `'{'/'}'` and square brackets `'['/']'`.

(Hint: Implement a stack in Python using lists)

(*Reference:* Balanced parentheses and stacks)

## Instructions

- (a) Similar to Q1.

- (b) Input file: Q2input.py
  - (c) Code file: Q2.py.
3. (a) Write a program to calculate the product of two matrices, taking into account the fact that they should be multipliable and if they are not, return an appropriate message. (**file:** Q3a.py)
- (b) Write a program to find the transpose of the matrix. (**file:** Q3b.py)

### Instructions

- (a) Similar to Q2.
  - (b) Input file: Q3input.py
  - (c) Code files: Q3a.py and Q3b.py.
4. You have been given 5 lists. One of the list contains the names of the students, and the other 4 contain their marks in different subjects. Create a list of tuples so that each tuple contains the name of the student and their marks.

For example:

```
names = ['Malcolm', 'Timon', 'Tintin', 'Bob']
English = [10, 15, 11, 12]
Maths = [9, 8, 3, 1]
DS = [10, 10, 10, 10]
Physics = [5, 3, 1, 5]
```

Then the answer should be

```
[('Malcolm', 10, 9, 10, 5), ('Timon', 15, 8, 10, 3), ('Tintin', 11, 3, 10, 1), ('Bob', 12, 1, 10, 5)]
```

### Instructions

- (a) Similar to Q2 etc.
  - (b) Input file: Q4input.py
  - (c) Code file: Q4.py.
- (**file:** Q4.py)
5. Given a list and an integer  $n$ , write a program to rotate towards left the list by  $n$  elements.
- For example: `l = [1,2,3,4,5]` and `n=2`, then the answer should be `output=[3,4,5,1,2]`.

### Instructions

- (a) Similar to Q2 etc.
- (b) Input file: Q5input.py
- (c) Code file: Q5.py.

(file: Q5.py)

6. (a) Write a program to find the mean of a given unsorted list. (file: Q6a.py)  
(b) Write a program to find the median of a given unsorted list.(file: Q6b.py)  
(Reference: Mean and median)

### Instructions

- (a) Similar to Q2 etc.  
(b) Input file: Q6input.py  
(c) Code file: Q6a.py and Q6b.py.
7. Given a sorted list, and another unsorted list, write a program to insert the elements of the second list into the first list such that the sorted nature of the first list is maintained.

For example: `l1 = [ 2, 5, 8, 10, 15]` and `l2 = [3, 4, 1, 9, 7]` then  
`ans = [1, 2, 3, 4, 5, 7, 8, 9, 10, 15]`.

Note: The two lists could be of different lengths. And there won't be any integer which appears in the both the lists.

### Instructions

- (a) Similar to Q2 etc.  
(b) Input file: Q7input.py  
(c) Code file: Q7.py.

(file: Q7.py)