

**NATIONAL UNIVERSITY OF COMPUTER & EMERGING
SCIENCES ISLAMABAD CAMPUS
INTRODUCTION TO COMPUTING (CS101) - FALL 2017
ASSIGNMENT-4**

Due Date: November 5, 2017 (09:00pm)

Instructions:

1. Write Python program for all the problems.
2. Solution to all the problems should be written in a separate (.py) file.
3. Submit the source code (i.e. python code in .py file) via slate. Submissions via email will not be accepted.
4. Moreover, you must submit your notebook file (.ipynb) as well with all the codes and their outputs in different cells.
5. Use proper naming convention to name the file containing source code.

For example, the file containing the source code for first question of the first assignment should be named as i17xxxx_assignment_4_q1.py, replace i17xxxx with your student number

1. Consider the following function definitions:

```
def fun1(n):
    result = 0
    while n:
        result += n
        n -= 1
    return result
def fun2(stars):
    for i in range(stars + 1):
        print("*"),
        print("")
def fun3(x, y):
    return 2*x*x + 3*y
def fun4(n):
    return 10 <= n <= 20
def fun5(a, b, c):
    return a <= b if b <= c else false
def fun6():
    return randrange(0, 1)
```

Consider each of the following statements. If the statement is illegal, explain why it is illegal; otherwise, indicate what the statement will print:

(a) `print(fun1(5))`
(b) `print(fun1())`
(c) `print(fun1(5, 2))`
(d) `print(fun2(5))`
(e) `fun2(5)`
(f) `fun2(0)`
(g) `fun2(-2)`
(h) `print(fun3(5, 2))`
(i) `print(fun3(5.0, 2.0))`
(j) `print(fun3('A', 'B'))`
(k) `print(fun3(5.0))`
(l) `print(fun3(5.0, 0.5, 1.2))`
(m) `print(fun4(15))`
(n) `print(fun4(5))`
(o) `print(fun4(5000))`
(p) `print(fun5(2, 4, 6))`
(q) `print(fun5(4, 2, 6))`
(r) `print(fun5(2, 2, 6))`
(s) `print(fun5(2, 6))`
(t) `if fun5(2, 2, 6):`
 `print("Yes")`
 `else:`
 `print("No")`
(u) `print(fun6())`
(v) `print(fun6(4))`
(w) `print(fun3(fun1(3), 3))`
(x) `print(fun3(3, fun1(3)))`
(y) `print(fun1(fun1(fun1(3))))`
(z) `print(fun6(fun6()))`

Make sure to do it on paper first so that you can practice how to dry run the codes. You have to write all the answers in the Word file and then submit this file along with your codes.

2. Write a function ***permute(str)*** to display all possible permutations of a given input string--if the string contains duplicate characters, you may have multiple repeated results. Input should be of the form.

Sample Input:

Permute("cat")

Expected Output:

cat
cta
act
atc
tac
tca

3. Write a function to find the squared-standard deviation of the list l. Recall that squared standard deviation is average of the squared-difference of each data point from the mean. Thus, calculate the square of difference of each element from the mean and divide it by total number of elements.

Sample Input:

l=[13, 99, 6, 76, 11, 83, 27, 84, 28, 67, 66]
squared_standard_deviation(l)

Expected Output:

1063.3

4. Ask the user for a string and print out whether this string is a palindrome or not. (A palindrome is a string that reads the same forwards and backwards.)
5. **Compute the Maximum Value of Some Function.** Given some integer-valued function $f(x)$, we want to know what value of x has the largest value for $f(x)$ in some interval of values.

Imagine we have an integer function of an integer, call it $f(x)$. Here are some examples of this kind of function.

- `def f1(x): return x`
- `def f2(x): return -5/3*x-3`
- `def f3(x): return -5*x*x+2*x-3`

The question we want to answer is what value of x in some fixed interval returns the largest value for the given function? In the case of the first example, `def f1(x): return x`, the largest value of $f1(x)$ in the interval $0 \leq x < 10$ occurs when x is 9. Find the maximum value of all the above functions in the range $(-10000 \leq x \leq 20000)$

6. Write and test the ***digit()*** function:
int digit(int n,int k)

This function returns the k th digit of the positive integer n . For example, if n is the integer 29,415, then the call `digit(n,0)` would return the digit 5, and the call `digit(n,2)` would return the digit 4. Note that the digits are numbered from right to left beginning with the "zeroth digit."

7. Write a function named **subtotal** that takes a list of integers as parameter. The function should replace the contents of each cell with the sum of the contents of all the cells in the original list from the left end to the cell in question. Thus, for example, if the list array passed to the function looks like:

L = [5.8, 2.6, 9.1, 3.4, 7.0]

Then when function returns, the array will have been changed so that it looks like:

L= [5.8, 8.4, 17.5, 20.9, 27.9]

Because $5.8 + 2.6 = 8.4$ and $5.8 + 2.6 + 9.1 = 17.5$ and so on. Note that the contents of cell 0 are not changed. The function should not return a value.

8. **Implement the Euclidean Algorithm for finding the greatest common divisor of two given positive integers.** The Euclidean Algorithm transforms a pair of positive integers (m, n) into a pair (d, 0) by repeatedly dividing the larger integer by the smaller integer and replacing the larger with the remainder. When the remainder is 0, the other integer in the pair will be the greatest common divisor of the original pair (and of all the intermediate pairs). For example, if m is 532 and n is 112, then the Euclidean Algorithm reduces the pair (532,112) to (28,0) by (532,112) --> (112,84) --> (84,28) --> (28,0). So 28 is the greatest common divisor of 532 and 112.
9. Write a function that takes an integer value and returns the number with its digits reversed. For example, given the number 7631, the function should return 1367.
10. **Implement the floor and ceiling function for rounding the number.** Write python functions **floor(n)** and **ceiling(n)** that rounds the number to the nearest integer.

Sample Input	Expected Output
floor(5)	5
Floor(5.2)	5
ceiling(6)	6

11. Write a code that takes two strings as input and that prints whether or not they have dashes in the same places (return true if they do and false otherwise). For example, below are four pairs of strings of equal length that have the same pattern of dashes. Notice that the last pair has no dashes at all.

String 1	String 2	Result
hi--there-you.	12--(134)-7539	True
"-15-389	"-xy-zzy	True
criminal-plan	(206)555-1384	True
abc	9.8	True
Hello-world	He-llo-world	False

To be considered a match, the strings must have exactly the same number of dashes in exactly the same positions. The Strings might be of different length.

12. Write a python function that finds either a number is Armstrong or not. **An Armstrong number is an n -digit number that is equal to the sum of the n^{th} powers of its digits.** For example, 371 is an **Armstrong number** since $3^3 + 7^3 + 1^3 = 371$

- 13. Movie Recommendation** You are given a 2-d matrix where each index value is representing rating for each movie by respective reviewer.

		<i>movie</i>			
		0	1	2	3
<i>reviewer</i>	0	4	6	2	5
	1	7	9	4	8
	2	6	9	3	7

Write function as follows:

- ***most_ratedMovies(l)*** to find the highest rated movie.
- ***average_rating(l)*** to find average rating against each movie.
- ***find_movieRating(l,n)*** to find the rating given to movie n
- ***add_newReviewer(l)***: add a new reviewer in the list
- ***add_reviewerRating(l,rating,movie,reviewer)***: add a rating of the movie against the reviewer
- ***most_ratingsByReviewer(l)***: find the reviewer that has given the max number of ratings.

- 14. The combination function $C(n,k)$** gives the number of different (unordered) k-element subsets that can be found in a given set of n elements. The function can be computed from the formula:

$$C(n, k) = \frac{n!}{k!(n-k)!}$$

Implement this formula.

- 15. HangMan or HangWoman:** In this question you are going to write code for hangman. To write your program you will need a list of words, you can create your own list of words. For instance, you can initially use following list of words and then extend it by adding more words to the list

```
listOfWords = ["Fast", "programming", "Student", "are", "lazy",
               "hangmen"]
```

You can display following seven types of hangmen at each level of your game

