Assignment 1: Python

- Due by: Friday 10th September, 2021 by 5pm IST.
- To be submitted to the following email address: office.of.gr@gmail.com
- The subject of the email should be: Assignment Number [1]: Algorithms, 2021
- Please clearly mention your name and roll number.
- Submit your work as a single pdf file. Additional material, code, etc can/should also be submitted, but there should be atleast 1 pdf, which has the entire assignment.
- Wherever there is code, in the assignments, the code should be well documented and easy to understand / follow.

A. Reinforcement of concepts / methods

Q1

(a) Write a Python function that takes a positive integer n, and returns the sum of the squares of all the positive integers smaller than n.

(b) Write a Python function that takes a positive integer n, and returns the sum of the squares of all the *odd* positive integers smaller than n.

Q2

What parameter values should be sent to the range constructor to produce a range with values:

(a) 60,70,80

(b) 4,2,0,-2,-4

B. Creativity (combinatorial -- exploratory)

Q3

Write a Python function that takes a sequence of integer values and determines if there is a distinct pair of numbers in the sequence whose product is *odd*.

Q4

Write a Python function that counts the number of vowels in a given character string.

Q5

Write a Python program that takes as input three integers, “a”, “b” and “c”, from the console and determines if they can be used in the following arithmetic formulas: (i) “a+b=c”, (ii) “a=b-c”, (iii) “a*b=c”.

Q6

Write a Python function that takes a sequence of numbers and determines if all the numbers are different from each other (that is, they are distinct).

C. Project-based / Cross-Contextual (academic -- real world)

Q7

https://en.wikipedia.org/wiki/Birthday_problem

Design a program that can test the Birthday problem, by a series of experiments, on randomly generated birthdays which test this paradox for n = 5,10,15,20,25,30...200.

Q8

Write a Python program that outputs all possible strings formed by using the characters `'c'`, `'a'`, `'t'`, `'d'`, `'o'`, and `'g'` exactly once.

Q9

Write a Python program that can take a positive integer greater than 2 as input and write out the number of times one must repeatedly divide this number by 2 before getting a value less than 2.