PGEO6050 [FALL2015]

ASSIGNMENT 03 – [30 Points]

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1 Working with Python *for* statement [10 points]

Please develop a PYTHON program that uses a **for** loop to generate and print a table of numbers. Your program should print four columns: (i) number, (ii) number squared, (iii) square root of the number, and (iv) exponential of the number. Make sure your program prints first a header information for the columns and that the columns are tab separated. Also, your program should print at least 5 (five) different numbers.

Table 1: Example of output produced by the requested program in problem 1.

integer	square	square root	exponential
13	169	3.60555127546	442413.391038
7	49	2.64575131106	1096.63315713
9	81	3.0	8103.08391526
1	1	1.0	2.718281828
15	225	3.87298334621	3269017.36419

Notes:

(1) Please use $e = 2.718281828$ for your exponential operation.

(2) Make sure to use meaningful variable names.

(3) Make sure to include comments in your program to describe each part of it.

(4) Please submit your python program (file01.py) to D2L.

2 Working with Python workflow control statements [10 points]

You are given a set of three-dimensional coordinates representing a LIDAR point cloud. Please write a program to determine the mean (μ) of each of the three coordinates and print them to the screen. Also, your program should three-dimensionally subset the point cloud to be:

$$\mu_{x,y,z} - \delta \leq subset_{x,y,z} \leq \mu_{x,y,z} + \delta \tag{1}$$

Notes:

(1) Use the code listed in the Listing 01 to generate your point cloud.

(2) Make sure to use meaningful variable names and to include comments in your program to describe each part of it.

(3) Your program should produce the similar outcome to the one listed in Table 2.

```python
# listing01.py
import random as rd

pts_x = []
pts_y = []
pts_z = []
pts_n = 1000
delta = 200
for i in range(pts_n):
    x = 1000.00 * rd.random()
    y = 1000.00 * rd.random()
    z = 1000.00 * rd.random()
    pts_x.append(float(x))
    pts_y.append(float(y))
    pts_z.append(float(z))
```

Table 2: Example of output produced by the requested program in problem 2.

mean X	:	513.419940523
mean Y	:	492.769133501
mean Z	:	493.577481462
maximum X	:	713.419940523
maximum Y	:	692.769133501
maximum Z	:	693.577481462
minimum X	:	313.419940523
minimum Y	:	292.769133501
minimum Z	:	293.577481462
subset has	:	71 points
last sub pts x	:	364.188109194
last sub pts y	:	687.219688271
last sub pts z	:	613.363699676

3 Working with Python *while* statement [10 points]

A number of mathematical quantities can be represented using a series of approximations, in which a series of summation of an finite number of terms is used. This is called *iterative approximations*. In this problem, please develop a program to estimate the base logarithm number e. The number e can be estimated by:

$$\sum_{i=0}^{n} \frac{1}{n!} \tag{2}$$

where, $n! = n * (n-1)$ if $n > 1$ and $n! = 1$ if $n \leq 0$. You can consider (2) as $1 + 1/1! + 1/2!...1/n!$.

Your program should stop when the difference between your estimated e value and the e value given in problem 1 is smaller than 0.0000001. Also, please report the n value that you obtained when your program stoped.

Notes

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