

Assignment 5 (2023)

be21b004@smail.iitm.ac.in [Switch account](#)



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Random Numbers

First three questions - Use the *random* module in python - no other modules are permitted

Q1. Area

Estimate the area of the ellipse $((x^2)/4 + (y^2)/1 = 1)$ using random numbers. Also, solve it analytically and find the error in the area when estimated using random numbers. How will the error change when the number of random points generated is increased?

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Q2. Birthday Problem

The birthday problem can be solved analytically, but another method to solve it is by using Monte Carlo simulations. Write a function ***birthday_problem*** that takes an integer n as input and returns the probability that at least two people in the group of size n share a birthday. Solve this problem using random number generation as discussed in class.

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Q3. Monte Carlo integration

Estimate value of e by evaluating integral $f(x)=(1/x)$ from $x=\frac{1}{2}$ to $x=2$ by Monte-Carlo Integration and analytically.

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RegEx

Use re library in python to solve the following

Q4. Given [words.txt](#) as a file:

Find the number of words in [words.txt](#) that satisfy each criteria

- Word starts with a vowel and ends with a consonant
- Words that contain at least 3 a's
- Word has repeated alphabets consecutively

(Ex: (i) aardvark, 'a' repeats twice at start, (ii) abasia should not match here)

Word starts and ends with the same vowel (Ex: abasia)

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Q5. Write regex to match time of the format HH:MM (HH can range from 00 to 23, MM can range from 00 to 59)

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Q6. Answer the questions, with respect to the [Data](#) provided here.

Write code to remove the numbering and indentation from the text. Commands **split()** and **strip()** commands are prohibited

All the members from "**Data.txt**" apply for a lottery and the lottery system is designed in such a way that the winner can be a person who lives in an address with no vowels in it or has more than 3 vowels in it. In case if the lottery system shortlists multiple people, it checks if for the domain of the email id. Since you, the owner of the lottery company, hate Google, you will give the money to the person who doesn't use Google account. You have to get the address of this person so that you can send the money across. Use regex only and extra brownie points if you can give the correct "grep" command.

Clue: Grepping once might not be enough....

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