

Quant Dev Assignment 2023

LGIM Solutions Team

Instructions

You will be assessed on both the content of your answers and how you answer the question. Answers should be written in python and be structured so that a reasonably technical user can run and understand the code with minimal setup. If you are chosen for progression to the next round, please be prepared to justify your answers and explain your logic and code structure.

Please send your solutions as a zipped folder including clearly labelled source code to Portland.Goszka@lgim.com.

Questions

Q1. I have £10 and I'm gambling on a series of coin flips. For each head I win £2 and for each tail I lose £1.

- (A) What's the probability that I will run out of money?
- (B) Write a model that simulates this outcome to verify this.

Q2. Suppose we have a radar screen where battleships are represented by points on a grid. A battleship can occupy one or more adjacent points on the grid, but unlike the traditional game, battleships can be varying shapes including any squares that are connected horizontally or vertically **but not** diagonally. For example, in the radar screen below there are three battle ships:

$$\begin{bmatrix} X & 0 & X & 0 \\ 0 & X & X & 0 \\ X & 0 & 0 & 0 \end{bmatrix}$$

Construct an algorithm that will count the number of battleships in an $[N \times N]$ grid. Verify your algorithm with three examples.

Q3. You're given a ordered list of strings (e.g. ['one', 'two', 'three', 'four', 'five', 'six']). Write a function to find the longest sub-list where the length of the strings are in strictly ascending order (i.e. ordered from shortest to longest). For the given example, the answer is ['two', 'three']. If you find two or more sub-lists of the same maximum length, return the first one. Provide both the function and any tests you used to verify your function works correctly as part of your answer. If the ordered list you are provided with is really long, how well will you algorithm perform?