**Question 1:**

Find a formula to price the following fixed-odds contract:

I wish to win ◆if over the next ◆days, the ◆has a high-low range
[exceeding/not exceeding] ◆points.

Implement the solution in the programming language of your choice.

Example: I wish to win $1000 if over the next 7 days the USD/JPY has a high-low range exceeding 2 points.

For example, if the USD/JPY has a range of low=98.45 and high=100.98 over the next 7 days, I will win $1000 (because high – low = 2.53 > 2).

You can use Monte Carlo simulation to confirm/verify your results, but it shouldn't be the primary solution. Please provide all the relevant details about the solution.


**Question 2:**

Simulate the following situation.  Attach the code as part of your submission.

At a post office, customers enter a single line waiting to be served by any one of two clerks. Every minute there is a 60% chance that a new customer arrives.  If there is no one in line and a server is free, the customer does not wait to be served.  When a customer is being served there is a 25% chance every minute that they complete their business and leave.  When the clerk is free he will take the next customer in line, in the order that they arrived.  Every minute, there is a 5% chance that a person standing in line will give up and leave.  The post office is always open (24/7/365).
Note: For simplicity you can assume customers will always arrive at the beginning of the minute and if they leave they do so at the end of the minute.

a) What is the average amount of time a customer spends in the post office (including those not served)?

b) What percentage of customers leave without being served?

c) What percentage of time are the clerks idle?

**Question 3:**

Sports teams 'A' and 'B' are to play each other until one has four wins and is declared the series winner. You have $100 to bet on Team A to win the series. You are, however, only allowed to bet on individual games, not the final outcome directly, and you must bet a positive amount on each

game. So, if Team A wins the series, you must walk away with $200, but if Team A loses the series, you must walk away with zero, and you must do so having placed a non-zero bet on every game. How do you place your bets?