

Qishi Quiz 4

Instructions: Please post your solutions by **Thursday, Nov. 5th**. You are encouraged to discuss the questions with other Qishi members. Please DO NOT share the problems with people outside Qishi.

1 Math/Stat.

1. Given a fifty-seat room where each seat is numbered, people entered the room in ordered. The first one is drunk and he will take a seat randomly. The rest people will take their own seat as long as it is not taken. Calculate the probability that last two people can take their own seats.
2. There are 5 girls who need to guard a store from Mon-Fri. Calculate the number of possible arrangements given the constraint: (a) Everyone works twice a week. (b) Two girls guard the store in a single day and no two girls can work together twice.
3. Follow up, what if there are 7 girls and 7 days schedule to be set up, what is the number of possible arrangement?
4. (sellside) Given a stock, assume the implied volatility to time t_1 is σ_1 and the implied volatility to time t_2 is σ_2 , calculate the correlation between S_{t_1} and S_{t_2} .
5. (sellside) Given a Brownian motion W_t , when is W_t^N a martingale? Why W_t^3 is not a martingale?
6. (sellside) Calculate the price of the option with payoff $\frac{1}{S_t}$ under traditional geometric Brownian motion assumption.
7. (sellside) What is the definition of stability in numerical PDE? What is the definition of implicit and explicit scheme?
8. Consider the basketball shooting game, define success rate as number of successful shoots divided by number of total shoots. Assume the successful rate rising from below 0.5 to above 0.5, is there a moment which has exactly success rate 0.5.
9. Given two strategies A and B, as well as the corresponding P&L of these strategies on each day. If one is going to be shut down, how to decide which one to shut?

2 Programming

10. Design an algorithm to check is a point is inside the triangle or not.
11. Design an algorithm to check palindrome sequence.

12. Given an array, design an algorithm to return the longest decreasing sub-array.
13. Implement the Sudoku algorithm.
14. Consider a chess board with each cell has a value on it, you can only walk right or down, find the path from up-left to down-right which has largest value.