Physics 4321/7305 Professor Scalise
Homework Assignment #11 Spring 2024

4321

1. Six people A, B, C, D, E, and F, stand in a row. Each person is going to roll two fair cubical dice once. The rule of the game is that B must roll a two-dice total that is strictly larger (and not equal to) A's two-dice total. Then C must roll a total strictly larger than B's; D's total must be strictly larger than C's; and so on down the line to F.

   For example, if A rolls an 11 then the game is over because B can roll a 12, but then C has no winning roll. Or A can roll a 3, but if B rolls a 2 or a 3 then the game is over. A winning string would be A=4, B=6, C=7, D=9, E=10, F=12. Another winning string would be A=2, B=3, C=4, D=5, E=6, F=10.

   Use Monte Carlo techniques and run high-statistics simulations to find the odds of winning this game. In your code, remember that the chance of rolling a 2 is not the same as rolling a 3, or a 4, etc.

   I'll give you a bonus if in addition you find the exact probabilty without using MC techniques.

7305

1. Imagine some number of lily pads spanning a river, and a frog at one bank. The frog wants to cross the river. To jump forward, it randomly selects a lily pad (or the far bank) from the available ones ahead of it with equal probability, jumps there, and repeats this process until it has reached the opposite bank.

   For a given number of initially available lily pads p, what is the expected number of jumps $J(p)$ for the frog to make it across?

   Use Monte Carlo techniques and run high-statistics simulations to find the answer.

   I'll give you a bonus if in addition you find the exact probabilty without using MC techniques.

Bonus: Solve as much of the other class' assignment as you can.