Questionnaire 1

1. The paradox of Chevalier De Méré. We analyzed this paradox in class using a simulation, now you are asked to compute the required probabilities using the tools learned in class. In the seventeenth century, French gamblers used to bet on the event that with 4 rolls of a die, at least one ace would turn up. In another game, they bet on the event that with 24 rolls of a pair of dice, at least one double-ace would turn up. The Chevalier De Méré, a French nobleman of the period, thought the two events were equally likely. He reasoned this way about the first game:

   • In one roll of a die, I have 1/6 of a chance to get an ace.
   • So in 4 rolls, I have 4 × 1/6 = 2/3 of a chance to get at least one ace.

   His reasoning for the second game was similar

   • In one roll of a pair of dice, I have 1/36 of a chance to get a double ace.
   • So in 24 rolls, I have 24 × 1/36 = 2/3 of a chance to get at least one double ace.

   By this argument, both events have the same probability. However, experience showed that the first event is a bit more likely than the second. Where did De Méré’s calculation go wrong.

2. Rank your preferences for the following four lotteries (all cost 1 dollar to enter). Explain your choices:

   L1: Pays 0 with probability 1/2 and $40,000 with probability 1/2.
   L2: Pays 0 with probability 1/5 and $25,000 with probability 4/5
   L3: Pays -$10,000 (so you need to pay $10,000 dollars if you lose!!) with probability 1/2 and $50,000 with probability 1/2.
   L4: Pays $10 with probability 1/3 and $30,000 dollars with probability 2/3.

3. Albert Einstein once said: “No one can possibly win at roulette unless he steals money from the table while the croupier isn’t looking”. Explain Einstein quote in the context of the Law of Large Numbers.

4. Discuss in which senses gambling can be consider “rational” or “irrational”.

5. In no more than 200 words, discuss the role of gambling in early (colonial) American history.
6. According to the movie “High Rollers”, describe the “three waves” of gambling in the US.

7. Explain the point spread system of betting and how it compares with an odds-based system. From a historical perspective, what was its impact on gambling in the US?

8. In no more than 250 words, discuss what you consider the main conclusions of the National Gambling Impact Study Commission to be.

9. In roulette all bets have the same expected value (the “house advantage”). However, do they all have the variance? If you think that they don’t you should show a counterexample. If you just want to enjoy your time and play for as long as possible, what bets would you prefer.

10. How large is the “house advantage” in European and American roulette? Remember that the house advantage is expected gain of the house on a $1 bet. Show all details of your calculation.

11. What are “even bets” in roulette? Are they really even?

12. What is the Labouchere system? How can it fail?

13. What is the martingale doubling system? How can it fail?

14. In the “first and third column” strategy in roulette, one bets 2 pieces in the first column, 2 pieces on the third column and 2 pieces on black. What is the expected value of this system?

15. In American-style roulette, which one of the following bets has a higher winning probability? Which one has a higher payoff? Which one has the higher variance? Which one would you prefer, and why?
   
   - Bet 18 dollars on red.
   - Bet 2 dollars on a split.

16. You decide to play roulette using the martingale doubling system. If your bankroll is $30 dollar, your initial bet is $1 and you do not reinvest your winnings, what is the average amount of time you might expect to play?

17. The payoffs in roulette are selected assuming that all numbers have the same probability (in European roulette, that is 1/37 ≈ 0.027). Assume that, after collecting multiple spins from one given roulette, you find that three numbers, 25, 17 and 34 have a slightly higher probability of coming out (say 0.04), while the other 34 numbers have about the same probability (0.88/34 ≈ 0.02588).
Assume that you pick a strategy where you make $1 straight up bets to each one of the high probability numbers. What would be the expected payoff from this bet?