SimpleBet Data Science/Data Analyst Math Assessment

Question 1:

Every year, the New England Patriots play 6 games against teams inside of their own division (the AFC East), 4 games against teams from the NFC, and 6 games against other teams in the AFC. We know that the Patriots win 50% of their games against teams in the NFC, 60% of their games against other teams in the AFC (but not in the AFC East), and 70% of their games against teams in the AFC East. The Patriots won their most recent game. What is the probability the game was against a team outside the AFC East?

Question 2:

SimpleBet is offering bets on the Kentucky Derby, which this year will be contested by 4 horses (A, B, C and D). SimpleBet offers odds of 2/1 for Horse A to win 1, 3/1 for Horse B, 4/1 for Horse C and 5/1 for Horse D. You are a customer trying to bet against these odds.

To understand what these odds mean mathematically, suppose you place a $5 bet on Horse A. If Horse A wins, then you get 5*(2+1)/1=15 dollars (or a profit of 10 dollars), and if Horse A does not win, then you end up with 0 dollars (or a loss of 5). More generally, if odds are of the form a/b and a bet is placed for x dollars, then the payout in the event of a successful bet is x*(a+b)/b.

What bets do you place on the 4 horses so that no matter who wins the race, you always make money?

Question 3:

You are currently in a game of tennis, where each person has won 1 point each. If you win each point 60% of the time, and each point is independent, what is your probability of winning the game? In tennis, a game is played until one player wins and a player wins when they have greater than or equal to 4 points AND at least 2 more points than their opponent

Question 4:

We are currently about to start the American and National League Championship Series (ALCS/NLCS). In the ALCS, the Boston Red Sox are facing the New York Yankees, and in the NLCS the Los Angeles Dodgers are facing the San Francisco Giants. In each series, the first team to win 3 games wins the series.

In each game, the home team has a 2/3 chance of winning. The home team in each series is based on the following table.

Game #	Home Team
1	Red Sox/Dodgers
2	Red Sox/Dodgers
3	Yankees/Giants
4 (If Necessary)	Yankees/Giants
5 (If Necessary)	Red Sox/Dodgers

The winners of the two series will meet in the World Series, which has the same format (i.e. the American League winner will play games 1,2,5 at home) and the home team still has a 2/3 chance of winning).

What is the probability that the Boston Red Sox defeat the San Francisco Giants by 3 games to 2 in the World Series?