LA Session - Probability 2

1) In a tennis league, there are six teams of 5 players each. A set of 7 players is selected randomly out of the 30 players in the league. What is the probability that at least one player from each team will be selected?

2) You roll a pair of standard fair six-sided dice three times, and record the sum of the two faces showing each time. Let these three sums be s_1, s_2, and s_3. What is the probability that s_2 is strictly bigger than both s_1 and s_3?

3) Suppose we roll a fair 6 sided die with the numbers [1,6] written on them. After the first die roll we roll the die *k* times where *k* is the number on the first die roll. The number of points you score is the sum of the face-values on all die rolls (including the first). What is the expected number of points you will score?

4) Balls are randomly removed from a bag without replacement. If the probability that the first five balls withdrawn are all green is one-half, what is the fewest possible number of balls in the bag at the start?

5) A Bubble Sort is a common algorithm taught to students that sorts a list of numbers (https://en.wikipedia.org/wiki/Bubble_sort). Given a random permutation of the integers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10, what is the probability that the permutation will be sorted **just one pass** of Bubble Sort? (For example, the permutation 3, 1, 2, 7, 4, 5, 6, 10, 8, 9 would get sorted in a single pass. 3 would swap with 1 and 2. Then 7 would sway with 4, 5 and 6, followed by 10 being swapped by 8 and 9. But, the permutation 3, 1, 2, 7, 4, 5, 8, 6, 10, 9 would not get sorted by one pass of the algorithm. After one pass, the array would be 1, 2, 3, 4, 5, 7, 6, 8, 9, 10.)