

## Honors Seminar Mathematical Modeling

### Homework #3

Assigned: 9/18/2014 (Thursday)

Due: 9/25/2014 (Thursday)

1) In a version of the card game Poker, each player is dealt five cards from a standard deck of 52 playing cards. A few good hands in Poker are: four of a kind, a full house (three of one kind and two of another kind), and three of a kind. Determine the probability of being dealt each of these three types of hands.

2) Write a simulation that deals a million hands of five randomly selected cards out of a standard deck of 52 and prints out the experimental probabilities of achieving a four of a kind, full house and three of a kind. How close are your simulation results to the theoretical results you calculated in question 1?

3) In a different version of Poker called Texas Hold 'Em, five cards are laid out on the table for all to see and each player is dealt two cards. The player gets credit for the best hand they can make out of their two cards and any set of three cards out of the five showing on the table. Assume for the purposes of this question that the player is trying to maximize the number of cards of one kind, followed by maximizing the number of cards of another kind. (Thus, the player is aiming for 4 of a kind first, barring that, then aiming for 3 of a kind, and withing choices for three of a kind, matching it with two of a kind is preferred.) Write a program that asks the user to enter the five cards showing and then calculates the probabilities of the player being able to form a four of a kind, full house, or three of a kind. Use the following code when asking players to enter cards:

0 - 3 are aces, 4 - 7 twos, 8 - 11 threes, ..., 36 - 39 tens, 40- 43 jacks, 44 - 47 queens, 48 - 51 kings.

Namely, ask the user to enter five integers in between 0 and 51 inclusive to indicate the five cards showing on the table.

Your program should simply use brute force, looping through each pair of cards the player may receive. Remember, the player CAN'T receive any of the cards showing on the table and CAN'T receive the same card twice!!!

4) Simulate a million hands of Texas Hold Em' and print out the percentage of times a four of a kind, full house and three of a kind were achieved. Based on these numbers, can you guess why this version of poker is very popular? Are your results here consistent with your results for test runs of the program you write in question 3?