Probability Assignment 3

Poker Introduction

In a standard deck of cards, there are 4 "suits" (called club, diamond, spade, heart).

♣ 🔶 ♠ 🧡

Each of the suit can take 13 possible values (Ace, 2,3,4,5,6,7,8,9,10, Jack, Queen, King). The Ace, Jack, Queen and King will be denoted by A, J, Q and K respectively. Below you can find Jack of Hearts and King of clubs. The total number of cards in a deck is 13*4=52.

In Poker, every player gets 5 cards out of the 52 cards. This is called a "hand". There are some special hands.
a) Royal flush: This hand consists of values 10, J, Q, K, A all of the same suit.
b) Four of a kind: This hand consists of 4 cards of the same value and another card. For example, all the four Aces and a 5.

Poker Questions

Phil Ivey and you are playing Poker. Each person has 5 cards in their hand.
1. [2] What is the probability that (a) you get a royal flush, (b) you get four of a kind.
2. [2] You see that you have four 8s and a King of spade. What is the probability that Phil is having a Royal flush?
3. [3] As in previous question, you have four 8s and a King of spade (that is, you have four of a kind). You can either quit the game now or continue. If you continue you will lose only if Phil has a Royal flush. Otherwise you win. If you quit game you will lose 1 Lakh Rs. If you continue and Phil has a Royal flush, you lose 10 Lakh Rs. If you continue and win, you gain 1 Lakh Rs. What is the expected money you gain if you continue? Should you continue or quit?
4. [3] Let us assume the game is now played by n players $p_1, \ldots, p_n$. The players are sitting in chairs s_1 to s_n respectively. After a game, every player went for lunch. Coming back from lunch all the n players randomly sit in a chair. What is the expected number of players sitting in the same chair they were sitting before?