**Q.1 Harvard Law School courses often have assigned seating to facilitate the “Socratic method.” Suppose that there are 100 first year Harvard Law students, and each takes two courses:**

**Torts and Contracts. Both are held in the same lecture hall (which has 100 seats), and the seating is uniformly random and independent for the two courses.**

**(a) Find the probability that no one has the same seat for both courses (exactly; you should leave your answer as a sum).**

Ans:

We can use poisson approximation to binomial distribution. That’s basically describe randomly occurring events and probability distribution mass function gives us the probability of observing k events in a time period given the length of the period and the average events per time:

P(K events in the period) = (e^-events/time\*time period)\*((events/time\*time period)/k!)^k

P( K events in an interval) = e^-lambda\*(lambda^k/k!)

Approximation: P(K=1) = 99/100

Lambda = E(N) = 100 E[1] = 99

So, P(N=100) ~ e^-99\*(99^100/100!) = 0.0396

**Q.2 There are 100 passengers lined up to board an airplane with 100 seats (with each seat assigned to one of the passengers). The first passenger in line crazily decides to sit in a randomly chosen seat (with all seats equally likely). Each subsequent passenger takes his or her assigned seat if available, and otherwise sits in a random available seat. What is the probability that the last passenger in line gets to sit in his or her assigned seat?**

**Ans:**

To solve this if we reduce the number from 100 to 2 passengers, then the probability of sitting in a reserved seat would be 0.5.

Now, if we do the same calculation for 3 passengers then we would end up with 4 scenarios. Suppose, seat A and seat B are occupied, now B didn’t turn up yet and he/she goes and sits in the seat C. He/she is in the position. Again, if we can assume that candidate A doesn’t turn up yet, then also he/she is in his/her seat.

For other two scenarios he/she would get to sit in a reserved seat. So, the probability would be 0.5 again.

Similarly, we can increase the number till 100 and we can conclude the probability would be the same as 0.5.