**STATISTICS ASSIGNMENT\_1**

**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).**

**(b) Find a simple but accurate approximation to the probability that no one has the same seat for both courses.**

**(c) Find a simple but accurate approximation to the probability that at least two students have the same seat for both courses.**

a) The number of seat assignments for each student is 100!/(100-2)!=100!/(98!)=10099. The number of possible seat assignments for both courses is (100!)^2/(100!)^2=100!/(100!/100!)^2=(100!)/(100!)=100!/(100!)^2. Thus, the probability that no one has the same seat for both courses is (10099)/(100!)^2.

b) The approximation for the probability would be (100/100!)^2=1/100!.

c) To find the probability that at least two students have the same seat, we subtract the probability that no one has the same seat from 1. An approximation would be 1 - 1/100! = 1 - 1/(100!).

**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?**

The probability that the last passenger in line gets to sit in his or her assigned seat is given by:

1/100 \* (99/99) \* (98/98) \* ... \* (2/2) = 1/100!

This is because the first passenger in line can sit in any of the 100 seats, so there is a 1/100 chance that he or she will sit in the last passenger's assigned seat. If this happens, then the last passenger will get to sit in his or her assigned seat. If the first passenger does not sit in the last passenger's assigned seat, then the next passenger can sit in any of the remaining 99 seats, and so on. Each subsequent passenger will have one fewer available seats to choose from, so the chance of each passenger getting to sit in his or her assigned seat decreases. The product of all of these probabilities gives us the final answer.