IC-252 Lab

Lab Assignment-2

due for submission on Moodle by 26th Feb

1. Suppose that a laboratory test to detect a certain disease has the following statistics.
   A = event that the tested person has the disease
   B = event that the test result is positive
   It is known that P (B|A) = 0.99 and $P(B|\bar{A}) = 0.005$, and 0.1 of the population actually has the disease. What is the probability that a person has the disease given that the test result is positive?

2. Let there be two unbiased N-sided dice that are thrown once, for instance, a 5-sided dice will have five faces, each having 1, 2, 3, 4, 5 number of dots respectively. Write a general program which takes N as input and give the following outputs,

(a) Sample space S = {· · ·}.
(b) Event E_1 that the sum of the dots on the dice equals N.
(c) Event E_2 that the dots on the first dice is $\lfloor N/2 \rfloor$, where $\lfloor \cdot \rfloor$ indicates greatest integer function.
(d) Event E_3 that the sum of the dots on the dice is greater than $N + \lfloor N/2 \rfloor$, where $\lfloor \cdot \rfloor$ Indicate the greatest integer function.
(e) Event $E_4 = E_1 \cap E_3$, i.e., when the sum is N and greater than $N + \lfloor N/2 \rfloor$.
(f) Probabilities of the events E_1, E_2, E_3, and E_4, i.e., P (E_1), P (E_2), P (E_3), and P (E_4).
(g) Are events E_1 and E_2 independent? Also, output whether the events E_1 and E_3 independent.

3. Repeat Question 2 to write a general program which takes N as input to output the parts 2f and 2g without using the probability formulas. Hence, run the simulation K times in a program and compute the probabilities by utilizing the counts of the desired outcomes. In your report, prepare the below table, Table 3, for a fixed N and increasing K to state your observations.

Table 1: Table for Question-3.

For a fixed value of N =	K = 10	K = 50	K = 100	K = 1000	K = 5000
P (E_1)					
P (E_2)					
P (E_3)					
P (E_4)					
Are E_1 & E_2 seem independent?					
Are E_3 & E_4 seem independent?					