6.6.11

EE24BTECH11050 - Pothuri Rahul

Question :
If 4-digit numbers greater than 5,000 are randomly formed from the digits 0,1,3,5,7 .
What is the probability of forming a number divisible by 5 when the digits are repeated.
Solution:
Theoretical solution: Let A,B,C and D be the digits of four digited number ABCD .
S be the set containing four digit numbers formed with 0,1,3,5,7 that are greater than
5000.
No.of values A can take - 2 (5,7)
No.of values B can take - 5 (0,1,3,5,7)
No.of values C can take - 5 (0,1,3,5,7)
No.of values D can take - 5 (0,1,3,5,7)
Total no.of numbers can be formed = 2 x 5 x 5 x 5 = 250
But the number 5000 is included in this set (A=5, B=0, C=0, D=0) .
n(s) = 250 - 1 $\implies$ n(s) = 249 .
E be the set containing the four digit numbers formed with 0,1,3,5,7 that are greater than
5000 and divisible by 5.
No.of values A can take - 2 (5,7)
No.of values B can take - 5 (0,1,3,5,7)
No.of values C can take - 5 (0,1,3,5,7)
No.of values D can take - 2 (0,5)
Total no.of numbers can be formed = 2 x 5 x 5 x 2 = 1000
But the number 5000 is included in this set (A=5, B=0, C=0, D=0) .
n(E) = 100 - 1 $\implies$ n(s) = 99 .

$$Probability = \frac{n(s)}{n(E)}$$
$$Probability = \frac{99}{249}$$

Simulation

1) Let us randomly get the numbers formed by 0,1,3,5,7 and greater than 5000.
2) Run this loop for large no.of times i.e., n(s) .
3) Count the number of times a multiple of 5 comes i.e., n(E) .
4) Now required probability is $\frac{n(E)}{n(s)}$
5) Run this iteration large no.of times so that we get probability of each times and the
   most repeated one is closest value of the required probability.

The simulated one is not exactly equal to that of the theoretical one because the outcomes
dare not equally likely, where we consider outcomes to be equally likely in theoretical

solution .
The plot below shows the no.of times the particular probability repeats.
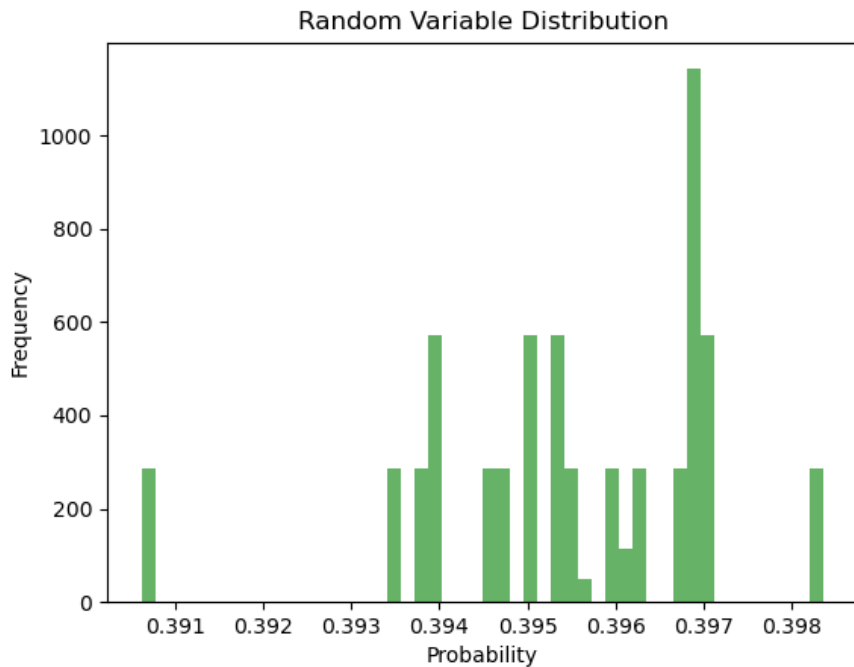

Fig. 5.1: Plot

From the plot above , probability is nearly 0.397 which is nearly equal to the theoretical value. i.e., $\frac{99}{249}$.