

# Assignment 2

## Probability

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### I. PROBLEM

A die is thrown three times. Events A and B are defined as below:

A : 4 on the third throw.

B : 6 on the first and 5 on the second throw.

Find the probability of A given that B has already occurred?

### II. SOLUTION

Total sample space = 216

Sample space of A (4 on the third throw) = 36

Sample space of B (6 on the first and 5 on second throw) = 6

$$P(A) = \frac{36}{216} \quad (1)$$

$$P(B) = \frac{6}{216} \quad (2)$$

$$P(A \cap B) = P(A) \times P(B) \quad (3)$$

$$= \frac{36}{216} \times \frac{6}{216} = \frac{1}{216} \quad (4)$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} \quad (5)$$

$$= \frac{\frac{1}{216}}{\frac{6}{216}} = \frac{1}{6} = 0.167 \quad (6)$$

### III. SIMULATION

In an experiment of throwing a fair die, the outcome can be any number from 1 to 6. So total sample space = {1,2,3,4,5,6}. If a die is thrown for three times, then total sample space =  $6 \times 6 \times 6 = 216$ .

$Samplespace = \{(1, 1, 1), (1, 1, 2), \dots, (6, 6, 6)\}$

Each event in the sample space can be simulated by generating 3 random numbers between 0 to 6 and storing them into an array.

The frequency of event A from the simulated sample space = no. of times the last element of the generated array is 4 = a.

$$\Rightarrow P(A) = \frac{a}{totalsamplespace}$$

The frequency of event B from the simulated sample space = no. of times the first and second element of the generated array are 6 and 5 respectively = b .

$$\Rightarrow P(B) = \frac{b}{totalsamplespace}$$

Since event A and B are independent events,

$$P(A \cap B) = P(A) \times P(B)$$

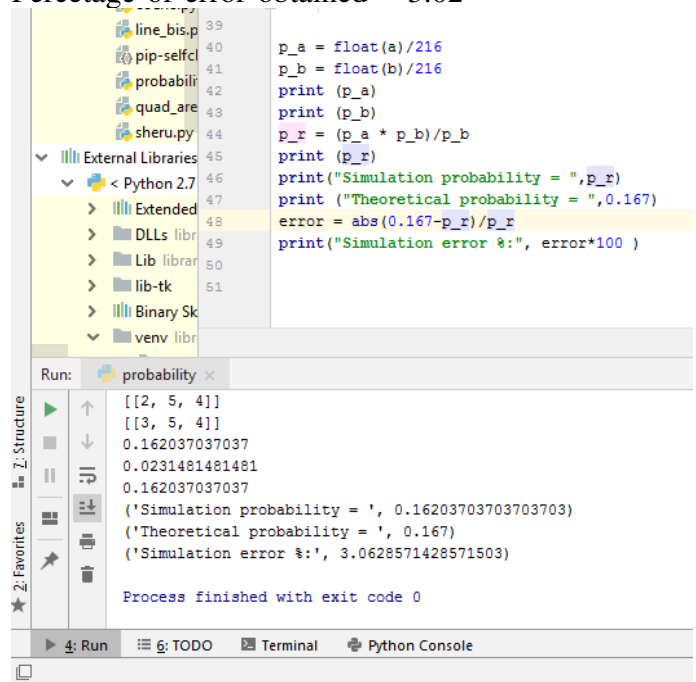
. Substituting the values in equation(5) we obtain the required probability.

### IV. RESULT ANALYSIS

Theoretical probability = 0.167

Simulated probability = 0.162

Percentage of error obtained = 3.02



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54 Run: probability x
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56 [[2, 5, 4]]
57 [[3, 5, 4]]
58 0.162037037037
59 0.0231481481481
60 0.162037037037
61 ('Simulation probability = ', 0.162037037037037)
62 ('Theoretical probability = ', 0.167)
63 ('Simulation error %:', 3.0628571428571503)
64
65 Process finished with exit code 0
66
67 Run: TODO Terminal Python Console

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Python project link : <https://github.com/Swati-Mohanty/EE5600/tree/master/Assignment>