

Assignment 4

Gorantla Pranav Sai- CS20BTECH11018

Download all python codes from

[https://github.com/pranav-159/
ai1103_Probability_and_Random_variables/
blob/main/Assignment_4/codes/
experimental_verification_GATE_IN_2018_Q5
.py](https://github.com/pranav-159/ai1103_Probability_and_Random_variables/blob/main/Assignment_4/codes/experimental_verification_GATE_IN_2018_Q5.py)

and latex-tikz codes from

[https://github.com/pranav-159/
ai1103_Probability_and_Random_variables/
blob/main/Assignment_4/Assignment4.tex](https://github.com/pranav-159/ai1103_Probability_and_Random_variables/blob/main/Assignment_4/Assignment4.tex)

$$C = AB \quad (2.0.5)$$

$$\Pr(C) = \Pr(AB) \quad (2.0.6)$$

$$= \Pr(A) \Pr(B) \quad (2.0.7)$$

$$= \frac{1}{2} \times \frac{3}{8} \quad (2.0.8)$$

$$= \frac{3}{16} \quad (2.0.9)$$

Therefore probability of getting the head for the third time in the fifth toss is $\frac{3}{16}$.

1 PROBLEM(GATE IN 2018, Q. 5)

Consider a sequence of tossing a fair coin where outcomes of tosses are independent. The probability of getting the head for the third time in the fifth toss is

(A) $\frac{5}{16}$ (B) $\frac{3}{16}$ (C) $\frac{3}{5}$ (D) $\frac{9}{16}$

2 SOLUTION(GATE IN 2018, Q. 5)

Let the random variable $X \in \{0, 1\}$ denotes head and tail in a toss. As both are equally probable.

$$\Pr(X = 0) = \frac{1}{2} \quad (2.0.1)$$

$$\Pr(X = 1) = \frac{1}{2} \quad (2.0.2)$$

Event	Description
A	5th toss is a head
B	Exactly 2 heads in first four tosses
C	5th toss is the third head

TABLE 4: Description of events used in problem

$$\Pr(A) = \Pr(X = 1) = \frac{1}{2} \quad (2.0.3)$$

$$\Pr(B) = \frac{{}^4C_2}{2^4} = \frac{3}{8} \quad (2.0.4)$$

As A and B are independent events.