

Probability&RV Assignment-10

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Download Latex code from

https://github.com/Anuradha-Uggi/Assignments-AI5002-Probability-and-Random-Variables/blob/main/Prob_ass10/rvsp_10.tex

Download Python code from

https://github.com/Anuradha-Uggi/Assignments-AI5002-Probability-and-Random-Variables/blob/main/Prob_ass10/rvsp_10.py

from equation (2)

$$\Pr[X] = \frac{0.5}{1 - 0.5^2} = \frac{2}{3} \quad (3)$$

similarly for even number of tosses getting first head can be computed as below

$$X = 2, 4, 6, \dots \quad (4)$$

$$\Pr[X] = \left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^6 + \dots \quad (5)$$

$$\Pr[X] = \frac{0.5^2}{1 - 0.5^2} = \frac{1}{3} \quad (6)$$

I. QUESTION(GATE-Q18)

A fair coin is tossed till a head appears for the first time. the probability that the number of required tosses is odd, is..

- 1) $\frac{1}{3}$
- 2) $\frac{1}{2}$
- 3) $\frac{2}{3}$
- 4) $\frac{3}{4}$

II. SOLUTION

Let X be the random variable represents odd number of tosses to get first Head. possibilities are

X	1	3	5	7 ...
Pr[X]	$\frac{1}{2}$	$\left(\frac{1}{2}\right)^3$	$\left(\frac{1}{2}\right)^5$	$\left(\frac{1}{2}\right)^7 \dots$

probability of odd tosses for first head can be computed as

$$\Pr[X] = \frac{1}{2} + \left(\frac{1}{2}\right)^3 + \left(\frac{1}{2}\right)^5 + \left(\frac{1}{2}\right)^7 + \dots \quad (1)$$

we can observe that above series is a Geometric Series so the sum of infinite terms in Geometric Series can be computed as

$$Sum = \frac{FirstTerm}{1 - CommonRatio} \quad (2)$$

III. CONCLUSION

Correct Option is : 3