

AI1103 Assignment-2

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Download all python codes from

<https://github.com/CS20BTECH11062/AI1103/tree/main/Assignment-2/codes>

and latex-tikz codes from

<https://github.com/CS20BTECH11062/AI1103/tree/main/Assignment-2/Assignment-2.tex>

- Probability that chosen 2 'heads' are from FIRST and SECOND tosses = $\frac{1}{^{10}C_2}$

Probability that ONLY the first 2 tosses yield heads = $\Pr(M = 2) \times$ Probability that chosen 2 'heads' are from FIRST and SECOND tosses.

QUESTION (GATE PROB 27)

A fair coin is tossed 10 times. What is the probability that ONLY the first 2 tosses will yield heads?

SOLUTION

Let M be a random variable representing number of 'heads' in 10 tosses.

So M has a binomial distribution :

$$\Pr(M = k) = {}^nC_k \times (h)^{n-k} \times (t)^k \quad (0.0.1)$$

Where

- n = Total number of tosses = 10
- h = Probability that 'head' appears in a toss = $\frac{1}{2}$
- t = Probability that 'tail' appears in a toss = $\frac{1}{2}$

So,

$$\Pr(M = k) = {}^{10}C_k \times \left(\frac{1}{2}\right)^{10-k} \times \left(\frac{1}{2}\right)^k \quad (0.0.2)$$

$$\Rightarrow {}^{10}C_2 \times \left(\frac{1}{2}\right)^{10} \times \frac{1}{^{10}C_2} = \left(\frac{1}{2}\right)^{10}$$

Probability that 'head' appears ONLY in the first two tosses is $\left(\frac{1}{2}\right)^{10}$

Correct Option : C

n	10
$\Pr(2heads)$	$\Pr(X = 2)$
Calculation	${}^{10}C_2 \times \left(\frac{1}{2}\right)^{10-2} \times \left(\frac{1}{2}\right)^2$
Value	0.043945

- Now, these 2 heads can occur at any position in 10 tosses.
- Number of ways of choosing 2 positions from 10 tosses = ${}^{10}C_2$

