AI1110: Assignment 5

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***Abstract*—This document contains the solution to Question of Chapter 13 (Probability) in the NCERT Class 12 Textbook.**

Probability Exercise 13.4 Q10: Find the mean number of heads in three tosses of a fair coin.

Solution: Let X denote the number of heads in three tosses of a fair coin. X is a random variable which can assume the values 0,1,2 or 3.
Probability of getting head in one toss of a fair coin is

$$p = \frac{1}{2} \tag{1}$$

Probability of not getting head in one toss of a fair coin is

$$1 - p = \frac{1}{2} \tag{2}$$

$\Pr(X = k) = {}^{n}C_k p^k (1-p)^{n-k}, \quad k = 0, \ldots,$ n
Here n = 3.

$$\Pr(X = 0) = {}^{3}C_0 \left(\frac{1}{2}\right)^3 = \frac{1}{8} \tag{3}$$

$$\Pr(X = 1) = {}^{3}C_1 \left(\frac{1}{2}\right)^3 = \frac{3}{8} \tag{4}$$

$$\Pr(X = 2) = {}^{3}C_2 \left(\frac{1}{2}\right)^3 = \frac{3}{8} \tag{5}$$

$$\Pr(X = 3) = {}^{3}C_3 \left(\frac{1}{2}\right)^3 = \frac{1}{8} \tag{6}$$

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

TABLE I: Probability Distribution of X

The mean of X is given by,

$$E(X) = \Sigma_{i=0}^{3} x_i p(x_i) \tag{7}$$

$$= 0 \times \frac{1}{8} + 1 \times \frac{3}{8} + 2 \times \frac{3}{8} + 3 \times \frac{1}{8} \tag{8}$$

$$= \frac{3}{2} \tag{9}$$

Therefore, the mean number of heads in three tosses of a fair coin = $\frac{3}{2}$