# Assignment 5
# NCERT Class 12 Chapter 13 Exercise 13.4 Question 10

Rishi Manoj - CS21BTECH11045

May 23, 2022

# Outline

# Question

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 $= 3$.

# For X=0

Probabilty of getting no heads in three tosses of a fair coin is,

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

# For X=1

Probabilty of getting no heads in three tosses of a fair coin is,

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

# For X=2

Probabilty of getting no heads in three tosses of a fair coin is,

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

# For X=3

Probabilty of getting no heads in three tosses of a fair coin is,

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

# Table

| **X** | 0 | 1 | 2 | 3 |
|---|---|---|---|---|
| **P(X)** | 1/8 | 3/8 | 3/8 | 1/8 |

Table: Probability Distribution of X

# Mean

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 $= \frac{3}{2}$