

# Assignment 1

## Ncert Exemplar

Rajeev Kumar  
EE22BTECH11042

### I. QUESTION 10.13.2.10

I toss three coins together. The possible outcomes are no heads, 1 heads, 2 heads and 3 heads. So, I say that probability of no heads is  $1/4$ . What's wrong with this conclusion

#### **Solution:**

Let,  $X_i$  be the sequence of independent Bernoulli random variables

$$X_i = \begin{cases} 1, & \text{Heads} \\ 0, & \text{Tails} \end{cases} \quad (1)$$

and  $X$  be summation of all sequences

$$X = \sum_{i=0}^k X_i \quad (2)$$

which means,

$$p = p_X(X_i = 1) = 0.5 \quad (3)$$

$$q = p_X(X_i = 0) = 0.5 \quad (4)$$

For number of trials be  $n$  and the pmf of getting  $k$  heads is given by:

$$p_X(k) = {}^nC_k (p)^k (q)^{n-k} \quad (5)$$

$$= {}^nC_k (0.5)^k (0.5)^{n-k} \quad (6)$$

According to question, for  $n = 3$  and  $k = 0$ :

$$p_X(0) = {}^3C_0 (0.5)^3 (0.5)^0 \quad (7)$$

$$= \left( \frac{3!}{(3-0)!(0)!} \right) (0.5)^3 \quad (8)$$

$$= \left( \frac{3!}{3!} \right) \left( \frac{1}{8} \right) \quad (9)$$

$$= \frac{1}{8} \quad (10)$$

Hence, the given statement is wrong ( $\because \frac{1}{8} \neq \frac{1}{4}$ )