

Chapter 13 Probability

Jay Vikrant EE22BTECH11025

Q10.13.3.38: In a game, the entry fee is Rs 5. The game consists of a tossing a coin 3 times. If one or two heads show, Sweta gets her entry fee back. If she throws 3 heads, she receives double the entry fees. Otherwise she will lose. For tossing a coin three times, find the probability that she

- 1) loses the entry fee.
- 2) gets double entry fee.
- 3) just gets her entry fee.

Solution: Let, X_i and Y_i be the sequence of independent Bernoulli random variables and the total number of trials be n and Z be the random variable that represents the number of tails in n trials which is given by:

$$p_X(k) = {}^nC_k p^{n-k} q^k, k \in 0, 1, 2 \quad (1)$$

Random variable	denoted	Events
X	0	loses the entry fees
	1	gets double the entry fees
	2	just gets the entry fees

TABLE 3
RANDOM VARIABLES

Probability that she loses the entry fees,

$$\Pr(X = 1) = {}^3C_3 \left(\frac{1}{2}\right)^{3-3} \left(\frac{1}{2}\right)^3 \quad (2)$$

$$= \left(\frac{1}{2}\right)^3 \quad (3)$$

$$= 0.125 \quad (4)$$

Probability that she gets double entry fees,

$$\Pr(X = 1) = {}^3C_3 \left(\frac{1}{2}\right)^{3-3} \left(\frac{1}{2}\right)^3 \quad (5)$$

$$= \left(\frac{1}{2}\right)^3 \quad (6)$$

$$= 0.125 \quad (7)$$

Probability that she just gets the entry fees,

$$\Pr(X = 2) = 1 - \Pr(X = 0) - \Pr(X = 1) \quad (8)$$

$$= 1 - 0.125 - 0.125 \quad (9)$$

$$= 0.750 \quad (10)$$