Assignment 3

AI1110:Probability and Random Variables
Indian Institute Of Technology Hyderabad

Name: Pradyumn Kangule
Roll no.: CS22BTECH11048

11.16.3.7 Question: A fair coin is tossed four times, and a person win Rs 1 for each head and lose Rs 1.50 for each tail that turns up. From the sample space calculate how many different amounts of money you can have after four tosses and the probability of having each of these amounts.
Solution:

Number of heads	Amount
0	-6
1	-3.5
2	-1
3	1.5
4	4

TABLE : Amount Table

Let X be a random variable denoting the number of heads obtained after four coin tosses.

$$\therefore X = \{0, 1, 2, 3, 4\}$$

The sample space S of the experiment is given by:

$$\begin{aligned} S = \{&HHHH, HHHT, HHTH, HTHH, && (1)\\ &THHH, HHTT, HTHT.THHT, && (2)\\ &HTTH, THTH, TTHH, HTTT, && (3)\\ &THTT, TTHT, TTTH, TTTT\} && (4)\end{aligned}$$

From the above sample space,

$$\Pr(X = 0) = \frac{1}{16} \quad (5)$$
$$\Pr(X = 1) = \frac{1}{4} \quad (6)$$
$$\Pr(X = 2) = \frac{3}{8} \quad (7)$$
$$\Pr(X = 3) = \frac{1}{4} \quad (8)$$
$$\Pr(X = 4) = \frac{1}{16} \quad (9)$$

Let A be a random variable denoting the amount money a person can have which can take five different values.

$$\therefore A = \{-6. - 3.5, -1, 1.5, 4\}$$

$\therefore$ by above table

$$\Pr(X = 0) = \Pr(A = -6) = \frac{1}{16} \quad (10)$$
$$\Pr(X = 1) = \Pr(A = -3) = \frac{1}{4} \quad (11)$$
$$\Pr(X = 2) = \Pr(A = -1) = \frac{3}{8} \quad (12)$$
$$\Pr(X = 3) = \Pr(A = 1.5) = \frac{1}{4} \quad (13)$$
$$\Pr(X = 4) = \Pr(A = 4) = \frac{1}{16} \quad (14)$$