Assignment 1

AI1110: Probability and Random Variables

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Question : A fair coin is tossed four times, and a person win Rs 1 for each head and lose Rs 1.5 for each tail that turns up. From the sample space calculate how miany different amounts of money you can have after four tosses and the probability of having each of these amounts.

Solution.

The Sample space of for tosses is S = { HHHH, HHHT, HHTH, HTHH, THHH, HHTT, HTTH, TTHH, HTHT, THTH, THHT, HTTT, THTT, TTHT, TTTH, TTTT } After 4 tosses he can have 5 different amounts

(i) 4 heads & 0 tails - Rs 4
(ii) 3 heads & 1 tails - Rs 1.5
(iii) 2 heads & 2 tails - Rs -1
(iv) 1 head & 3 tails - Rs -3.5
(v) 0 heads & 4 tails - Rs -6

Let X be a discrete random variable.

X = ”The amount he can win after 4 tosses”.

(i) Probability of having Rs 4 is

$$\Pr(X = 4) = \frac{{}^4C_4}{2^4} \tag{1}$$

$$= \frac{1}{16} \tag{2}$$

(ii) Probability of having Rs 1.5 is

$$\Pr(X = 1.5) = \frac{{}^4C_3}{2^4} \tag{3}$$

$$= \frac{1}{4} \tag{4}$$

(iii) Probablity of having Rs -1 is

$$\Pr(X = -1) = \frac{{}^4C_2}{2^4} \tag{5}$$

$$= \frac{3}{8} \tag{6}$$

(iv) Probability of having Rs -3.5 is

$$\Pr(X = -3.5) = \frac{{}^4C_1}{2^4} \tag{7}$$

$$= \frac{1}{4} \tag{8}$$

(v) Probability of having Rs -6 is

$$\Pr(X = -6) = \frac{{}^4C_0}{2^4} \tag{9}$$

$$= \frac{1}{16} \tag{10}$$