Assignment 14

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Download all python codes from

https://github.com/ka−raja−babu/Matrix−Theory/tree/main/Assignment14

and latex-tikz codes from

https://github.com/ka−raja−babu/Matrix−Theory/tree/main/Assignment14

1 Question No. 6.17

A person plays a game of tossing a coin thrice. For each head, he is given Rs 2 by the organiser of the game and for each tail,he has to give Rs 1.50 to the organiser. Let X denote the amount gained or lost by the person. Show that X is a random variable and exhibit it as a function on the sample space of the experiment.

2 Solution

Axiom 2.1. *A discrete random variable X is said to be a Bernoulli random variable if*

$$Pr(X) = \begin{cases} p & X = 1 \\ q = 1 - p & X = 0 \\ 0 & otherwise \end{cases} \tag{2.0.1}$$

Let success(X=1) and failure(X=0) be defined as in table 2.1 .

Success(X=1)	Total Amount ≥ 0
Failure(X=0)	Total Amount < 0

TABLE 2.1: Assumption for X

Values of X are calculated with this assumption in table 2.2 .

From table 2.3 ,probability of X can be defined as

$$\Pr(X) = \begin{cases} p = \frac{1}{2} & X = 1 \\ q = 1 - p = \frac{1}{2} & X = 0 \\ 0 & \text{otherwise} \end{cases} \tag{2.0.2}$$

Hence,according to axiom 2.1,X is a Bernoulli random variable.

Probability distribution of X is shown in fig. 2.1 .

Sample Space	Total Amount	X
HHH	2+2+2=6	1
HHT	2+2-1.5=2.5	1
HTH	2-1.5+2=2.5	1
THH	-1.5+2+2=2.5	1
TTH	-1.5-1.5+2=-1	0
THT	-1.5+2-1.5=-1	0
HTT	2-1.5-1.5=-1	0
TTT	-1.5-1.5-1.5=-4.5	0

TABLE 2.2: Values of X

Expression	Value
Pr(X=0)	$\frac{1}{2}$
Pr(X=1)	$\frac{1}{2}$

TABLE 2.3: Probability of X

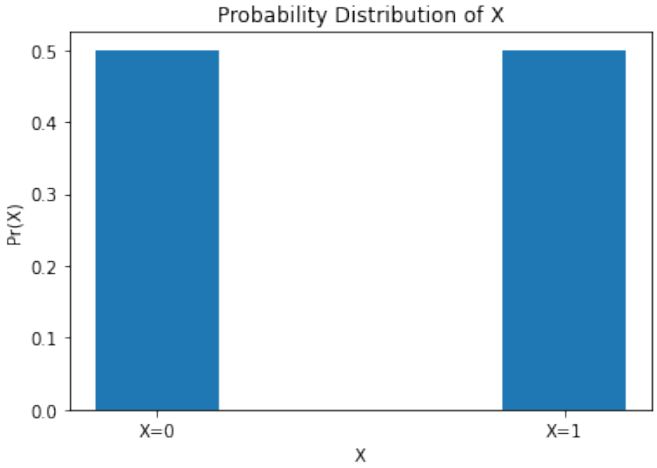

Fig. 2.1: Probability Distribution of X