

# 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 random variable  $X$  is a real-valued function whose domain is sample space  $S$ .

Let head and tail of coin be denoted by  $H$  and  $T$  respectively.

$\therefore$  Sample space for tossing a coin thrice is

$$S = \{HHH, HHT, HTH, THH, \quad (2.0.1)$$

$$TTH, THT, HTT, TTT\} \quad (2.0.2)$$

According to the question,  $X$  is the amount gained or lost by the person such that

$$\text{Each } H = \text{Rs } 2 \quad (2.0.3)$$

$$\text{Each } T = -\text{Rs } 1.5 \quad (2.0.4)$$

From table 2.1,

$$X = \{6, 2.5, -1, -4.5\} \quad (2.0.5)$$

$\therefore$  All values of  $X$  are real.

$\therefore$  According to axiom 2.1,  $X$  is a random variable.

Probability of  $X$  is calculated in table 2.2 and probability distribution of  $X$  is shown in fig. 2.1.

	$X$
$X(HHH)$	$2+2+2=6$
$X(HHT)$	$2+2-1.5=2.5$
$X(HTH)$	$2-1.5+2=2.5$
$X(THH)$	$-1.5+2+2=2.5$
$X(TTH)$	$-1.5-1.5+2=-1$
$X(THT)$	$-1.5+2-1.5=-1$
$X(HTT)$	$2-1.5-1.5=-1$
$X(TTT)$	$-1.5-1.5-1.5=-4.5$

TABLE 2.1: Values of  $X$

Expression	Value
$\Pr(X=6)$	$\frac{1}{8}$
$\Pr(X=2.5)$	$\frac{3}{8}$
$\Pr(X=-1)$	$\frac{3}{8}$
$\Pr(X=-4.5)$	$\frac{1}{8}$

TABLE 2.2: Probability of  $X$

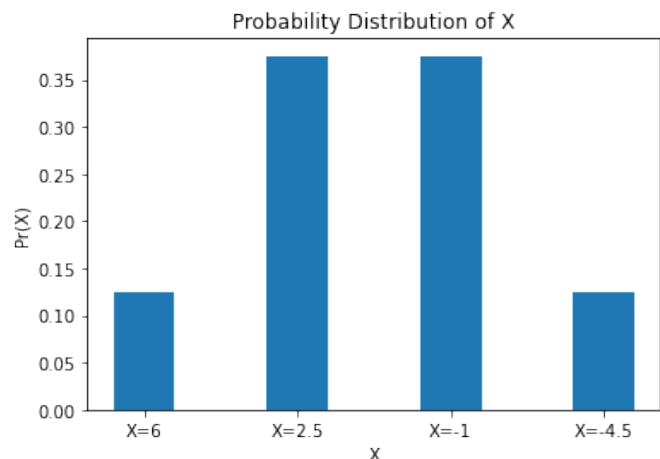


Fig. 2.1: Probability Distribution of  $X$