

Assignment 1

S Goutham Sai - CS20BTECH11042

Download all python codes from

<https://github.com/GouthamSai22/AI1103/blob/main/Assignment1/Codes/assign1.py>

and latex-tikz codes from

<https://github.com/GouthamSai22/AI1103/blob/main/Assignment1/main.tex>

1 PROBLEM STATEMENT

In a game, a man wins a rupee for a six and loses a rupee for any other number when a fair die is thrown. The man decided to throw a dice twice but to quit as and when he gets a six. Find the expected value of the amount he wins or loses.

2 SOLUTION

Let $X \in \{0, 1, 2, 3\}$ represent a random variable where

- $0 \rightarrow$ man wins in 1st roll.
- $1 \rightarrow$ man wins in 2nd roll.
- $2 \rightarrow$ man wins in 3rd roll.
- $3 \rightarrow$ man lost in all 3 rolls.

Given, probability of man winning any round is $\frac{1}{6}$ and hence probability of him losing any round is $\frac{5}{6}$

i		P(X=i)
0	$\frac{1}{6}$	$\frac{1}{6}$
1	$\frac{5}{6} \times \frac{1}{6}$	$\frac{5}{36}$
2	$\frac{5}{6} \times \frac{5}{6} \times \frac{1}{6}$	$\frac{25}{216}$
3	$\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6}$	$\frac{125}{216}$

Since the man gets a rupee for every win and gives a rupee for every loss, the expected value of amount gained is

$$\text{Expected value} = \sum_{i=0}^3 \Pr(X = i) \times (\text{Amount gained when } X = i) \quad (2.0.1)$$

Expected value

$$= \left(\frac{1}{6} \times 1\right) + \left(\frac{5}{36} \times 0\right) + \left(\frac{25}{216} \times (-1)\right) + \left(\frac{125}{216} \times (-3)\right) \quad (2.0.2)$$

$$\text{Expected value} = \frac{1}{6} - \frac{25}{216} - \frac{375}{216} \quad (2.0.3)$$

$$= \frac{-364}{216} \quad (2.0.4)$$

$$\boxed{\text{Expected Value} = -1.685} \quad (2.0.5)$$