Assignment 1

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

- $0 \rightarrow$ man wins in 1^{st} roll.
- $1 \rightarrow$ man wins in 2^{st} roll.
- $2 \rightarrow$ man wins in 3^{st} 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 $\frac{5}{6}$

x_i		P(X=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

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

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

$$E(X) = \frac{1}{6} - \frac{25}{216} - \frac{375}{216} \quad (2.0.3)$$

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

$$\boxed{E(X) = -1.685} \quad (2.0.5)$$