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.

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

$$P(X=0) = \frac{1}{6} \tag{2.0.1}$$

$$P(X=1) = \frac{5}{6}\times\frac{1}{6} \tag{2.0.2}$$

$$= \frac{5}{36} \tag{2.0.3}$$

$$P(X=2) = \frac{5}{6}\times\frac{5}{6}\times\frac{1}{6} \tag{2.0.4}$$

$$= \frac{25}{216} \tag{2.0.5}$$

$$P(X=3) = \frac{5}{6}\times\frac{5}{6}\times\frac{5}{6} \tag{2.0.6}$$

$$= \frac{125}{216} \tag{2.0.7}$$

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

$$Expected\ value = \sum_{i=0}^{3} P(X=i)\times(Amount\ gained\ when\ X=i) \tag{2.0.8}$$

$$Expected\ value = \left(\frac{1}{6}\times 1\right) + \left(\frac{5}{36}\times 0\right) + \left(\frac{25}{216}\times(-1)\right) + \left(\frac{125}{216}\times(-3)\right) \tag{2.0.9}$$

$$Expected\ value = \frac{1}{6} - \frac{25}{216} - \frac{375}{216} \tag{2.0.10}$$

$$= \frac{-364}{216} = -1.685 \tag{2.0.11}$$