

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 $X \in \{0, 1, 2, 3\}$ 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.

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

$$\Pr(X = 0) = \frac{1}{6} \quad (2.0.1)$$

$$\Pr(X = 1) = \frac{5}{6} \times \frac{1}{6} \quad (2.0.2)$$

$$= \frac{5}{36} \quad (2.0.3)$$

$$\Pr(X = 2) = \frac{5}{6} \times \frac{5}{6} \times \frac{1}{6} \quad (2.0.4)$$

$$= \frac{25}{216} \quad (2.0.5)$$

$$\Pr(X = 3) = \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \quad (2.0.6)$$

$$= \frac{125}{216} \quad (2.0.7)$$

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

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

Expected value

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

$$\text{Expected value} = \frac{1}{6} - \frac{25}{216} - \frac{375}{216} \quad (2.0.10)$$

$$= \frac{-364}{216} = -1.685 \quad (2.0.11)$$