Assignment 1
AI1110:Probability And Random Variables
Indian Institute of Technology, Hyderabad

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EE22BTECH11213

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

Solution:

1) **Case 1**: *When he gets* 6 *in first throw*

$$\Pr(win) = \frac{1}{6} \tag{1}$$

$\therefore$ Amount won = +1

2) **Case 2**: *When he doesn't get* 6 *in* 1*st throw but gets it in* 2*nd throw*

$$\Pr(win) = \frac{5}{6} \times \frac{1}{6} \tag{2}$$

$\therefore$Amount won = + 1 - 1 = 0

3) **Case 3**: *When he doesn't get* 6 *in* 1*st and* 2*nd throw but gets it in* 3*rd throw*

$$\Pr(win) = \frac{5}{6} \times \frac{5}{6} \times \frac{1}{6} \tag{3}$$

$\therefore$Amount won = + 1 + 1 - 1 = +1

4) **Case 4**: *When he doesn't get* 6 *in any of the three throws*

$$\Pr(win) = \frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \tag{4}$$

$\therefore$Amount won = + 1 + 1 + 1 = +3

Expected Value = Amount won x $\Pr(won)$for all cases

$$ExpectedValue = 1 \times \frac{1}{6} + 0 \times \frac{5}{36} + (-1) \times \frac{25}{216} + (-3) \times \frac{125}{216} \tag{5}$$

$$= \frac{1}{6} + 0 - \frac{25}{216} - \frac{375}{216} \tag{6}$$

$$= \frac{36 - 25 - 375}{216} \tag{7}$$

$$= \frac{-364}{216} \tag{8}$$

$$= \frac{-91}{54} \tag{9}$$

$$= -1.6851 \tag{10}$$