Exemplar - 12.13.3.13

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Question: In a dice game, a player pays a stake of Re 1 for each throw of a die. She receives Rs 5 if the die shows a 3, Rs 2 if the die shows a 1 or 6, and nothing otherwise. What is the playerâs expected profit per throw over a long series of throws?.
Solution: Let the random variable X denote the net profit on the roll of a die.

RV	Values	Description
X	-1	If the number 2 or 4 or 5 are rolled
	1	If the number 1 or 6 are rolled
	4	If the number 3 is rolled

TABLE 0
NET GAIN

Thus, the probability distribution function of X is:

$$p_X(k) = \begin{cases} \frac{3}{6} & \text{if } k = -1 \\ \frac{2}{6} & \text{if } k = 1 \\ \frac{1}{6} & \text{if } k = 4 \end{cases} \tag{1}$$

The expected profit per roll over a long series of throws, in Rupees, is

$$E(X) = \sum_k k p_X(k) \tag{2}$$

$$= \frac{3}{6}(-1) + \frac{2}{6}(1) + \frac{1}{6}(4) \tag{3}$$

$$= 0.5 \tag{4}$$