Assignment 5

AI1110: Probability and Random Variables

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CBSE Probability Grade 10

Exercise 15.1.10 A piggy bank contains hundred 50 p coins, fifty ₹ 1 coins, twenty ₹ 2 coins and ten ₹ 5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin:

(i) will be a 50 p coin?
(ii) will not be a ₹ 5 coin?

Solution. Let a random variable $X \in \{0, 1, 2, 3\}$ denote the possible outcomes of obtaining a random coin from the piggy bank.

X	Outcome	Probability
0	50 p	$\Pr(X=0) = \frac{100}{180} = \frac{5}{9}$
1	₹ 1	$\Pr(X=1) = \frac{50}{180} = \frac{5}{18}$
2	₹ 2	$\Pr(X=2) = \frac{20}{180} = \frac{1}{9}$
3	₹ 5	$\Pr(X=3) = \frac{10}{180} = \frac{1}{18}$

TABLE 1

(i) The probability that the coin will be a 50 p coin is given by:

$$\Pr(X=0) = \frac{n(X=0)}{\sum_{i=0}^{3} n(X=i)} = \frac{100}{180} \tag{1}$$

$$\therefore \Pr(X=0) = \frac{5}{9} \approx 0.556 \tag{2}$$

(ii) The probability that the coin will not be a ₹ 5 coin is given by:

$$\Pr(X \neq 3) = \frac{\sum_{i\neq 3} n(X=i)}{\sum_{i=0}^{3} n(X=i)} = \frac{170}{180} \tag{3}$$

$$\therefore \Pr(X \neq 3) = \frac{17}{18} \approx 0.944 \tag{4}$$

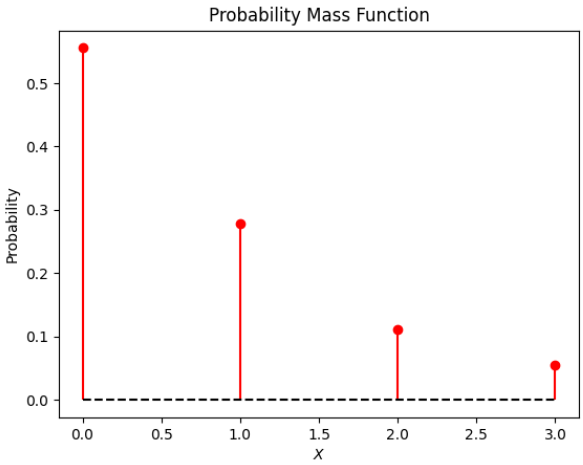

Fig. 1: Plot of the probability mass function