

AI1110 Assignment 1

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EE22BTECH11204

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Question: 10.15.1.10 A piggy bank contains hundred 50p coins, fifty Rs.1 coins, twenty Rs.2 coins and ten Rs.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 50p coin ? (ii) will not be a Rs.5 coin? **Solution:** Let,

number of 50 p coins = A = 100

number of Rs.1 coins = B = 50

number of Rs.2 coins = C = 20

number of Rs.5 coins = D = 10

We can calculate the PMF as follows:

$$\Pr(X = 50p) = \frac{A}{A + B + C + D} \quad (1)$$

$$\Pr(X = 50p) = \frac{100}{100 + 50 + 20 + 10} \quad (2)$$

$$\Pr(X = 50p) = \frac{100}{180} \quad (3)$$

$$\Pr(X = 50p) = \frac{5}{9} \quad (4)$$

$$\Pr(X = Rs.1) = \frac{B}{A + B + C + D} \quad (5)$$

$$\Pr(X = Rs.1) = \frac{50}{100 + 50 + 20 + 10} \quad (6)$$

$$\Pr(X = Rs.1) = \frac{50}{180} \quad (7)$$

$$\Pr(X = Rs.1) = \frac{5}{18} \quad (8)$$

$$\Pr(X = Rs.2) = \frac{C}{A + B + C + D} \quad (9)$$

$$\Pr(X = Rs.2) = \frac{20}{100 + 50 + 20 + 10} \quad (10)$$

$$\Pr(X = Rs.2) = \frac{20}{180} \quad (11)$$

$$\Pr(X = Rs.2) = \frac{1}{9} \quad (12)$$

$$\Pr(X = Rs.5) = \frac{D}{A + B + C + D} \quad (13)$$

$$\Pr(X = Rs.5) = \frac{10}{100 + 50 + 20 + 10} \quad (14)$$

$$\Pr(X = Rs.5) = \frac{10}{180} \quad (15)$$

$$\Pr(X = Rs.5) = \frac{1}{18} \quad (16)$$

Now using PMF;

(i) Probability that a 50p coin will fall out:

$$\Pr(X = 50p) = \frac{5}{9} \quad (17)$$

∴ The probability of a 50p coin falling out of the bank is $\frac{5}{9}$

(ii) Probability that the coin is not a Rs. 5 coin:

$$\Pr(X = Rs.5)' = \Pr(X = 50p) + \Pr(X = Rs.1) + \Pr(X = Rs.2) \quad (18)$$

$$\Pr(X = Rs.5)' = \frac{5}{9} + \frac{5}{18} + \frac{1}{9} \quad (19)$$

$$\Pr(X = Rs.5)' = \frac{17}{18} \quad (20)$$

∴ The probability that Rs.5 coin won't fall out of the piggy bank is $\frac{17}{18}$