Assignment 2

AI22BTECH11015

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Question 10.15.1.10: A piggy bank contains hundered 50p coins, fifty 1 rupee coins, twenty rupee 2 coins and ten 5 rupee 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 (1) will be a 50p coin ? (2) will not be a 5 rupee coin?

sol:

Total number of coins in the piggy bank = 100+50+20+10 = 180.

Define a random variable $\mathbf{X}$, where $\mathbf{X}$ represents the type of coin that falls out when the bank is turned upside down.

Assigning numerical values to each type of coin.

$\mathbf{X}$=1 for 50p coins

$\mathbf{X}$=2 for ₹1 coins

$\mathbf{X}$=3 for ₹2 coins

$\mathbf{X}$=4 for ₹5 coins

Given information:

Let's denote the probability of X taking the value x as $\Pr(\mathbf{X} = \mathbf{x})$

$$\Pr(\mathbf{X} = 1)\, being 50p coins = \frac{5}{9}$$

$$\Pr(\mathbf{X} = 2)\, being 1 rupee coins = \frac{5}{18}$$

$$\Pr(\mathbf{X} = 3)\, being 2 rupee coins = \frac{1}{9}$$

$$\Pr(\mathbf{X} = 4)\, being 5 rupee coins = \frac{1}{18}$$

$\mathbf{x}$	1	2	3	4
$\Pr(\mathbf{x})$	$\frac{5}{9}$	$\frac{5}{18}$	$\frac{1}{9}$	$\frac{1}{18}$

So,

1)

$$\Pr(\mathbf{X} = 1) = \frac{number of 50p coins}{Total coins} \quad (1)$$

$$= \frac{100}{180} = \frac{5}{9} \quad (2)$$

2) The probability that the coin will not be a ₹5 is $\Pr(\mathbf{X} \neq 4)$

$$\Pr(\mathbf{X} \neq 4) = \Pr(\mathbf{X} = 1) + \Pr(\mathbf{X} = 2) + \Pr(\mathbf{X} = 3) \quad (3)$$

$$= \frac{5}{9} + \frac{5}{18} + \frac{1}{9} \quad (4)$$

$$= \frac{17}{18} \quad (5)$$