

EE23010 NCERT Exemplar

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Question 10.13.3.35

Box A contains 25 slips of which 19 are marked Rs 1 and others are marked Rs 5 each. Box B contains 50 slips of which 45 are marked Rs 1 and others are marked Rs 13 each. Slips of both boxes are poured into a third box and reshuffled. A slip is drawn at random. What is the probability that it is marked other than Rs 1?

Solution:

Random variable	Value	Definition
X	0	Slips of Rs 1
	1	Slips of Rs 5
	2	Slips of Rs 13
Y	0	Box A
	1	Box B

TABLE I
DISTRIBUTION

The PMF of Y (the box that the slip came from) is given as.

$$p_Y(k) = \begin{cases} \frac{1}{3} & \text{if } k=0 \\ \frac{2}{3} & \text{if } k=1 \end{cases} \quad (1)$$

Conditional Probability,

$$\begin{cases} \Pr(Y = 0|X = 0) = \frac{19}{25} \\ \Pr(Y = 0|X = 1) = \frac{6}{25} \\ \Pr(Y = 1|X = 0) = \frac{45}{50} \\ \Pr(Y = 1|X = 2) = \frac{5}{50} \end{cases} \quad (2)$$

The desired probability is the probability that a slip drawn at random is marked other than Rs 1,

$$= 1 - p_X(0) \quad (3)$$

$$= p_X(1) + p_X(2) \quad (4)$$

Using Bayes theorem,

$$= p_Y(0) \times \Pr(Y = 0|X = 1) + p_Y(1) \times \Pr(Y = 1|X = 2) \quad (5)$$

$$= \frac{1}{3} \times \frac{6}{25} + \frac{2}{3} \times \frac{5}{50} \quad (6)$$

$$= \frac{11}{75} \quad (7)$$