NCERT Assignment

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Three unbiased coins were tossed. Provided that at least two outcomes are tails,the probability of having all three outcomes as tails is

Solution:

Parameter	Values	Description
X	0,1,2,3	No.of Tails.

TABLE 0
DEFINITION OF X AND PARAMETERS.

$$p_X(k) = \begin{cases} \frac{1}{8} & \text{k} = 0 \\ \frac{3}{8} & \text{k} = 1 \\ \frac{3}{8} & \text{k} = 2 \\ \frac{1}{8} & \text{k} = 3 \end{cases} \tag{1}$$

$$F_X(k) = \Pr(X \le k) \tag{2}$$

$$= \sum_{k=0}^{k} p_X(k) \tag{3}$$

$$\implies F_X(k) = \begin{cases} \frac{1}{8} & \text{k} = 0 \\ \frac{1}{2} & \text{k} = 1 \\ \frac{7}{8} & \text{k} = 2 \\ 1 & \text{k} = 3 \end{cases} \tag{4}$$

$$\Pr(X \ge k) = 1 - F_X(k-1) \tag{5}$$

$$\implies \Pr(X \ge 2) = 1 - F_X(1) \tag{6}$$

$$= 1 - \frac{1}{2} \tag{7}$$

$$= \frac{1}{2} \tag{8}$$

$$\Pr(X = 3 | X \ge 2) = \frac{\Pr(X \ge 2 \quad \& \quad X = 3)}{\Pr(X \ge 2)} \tag{9}$$

$$= \frac{\Pr(X = 3)}{\Pr(X \ge 2)} \tag{10}$$

$$= \frac{\left(\frac{1}{8}\right)}{\left(\frac{1}{2}\right)} \tag{11}$$

$$= \frac{1}{4} \tag{12}$$

$\therefore$ The probability of having all three outcomes as tails is 0.25.