Assignment 3

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Outline

QUESTION 4.13 : QUESTION 4.13 : A fair coin is tossed three times and the random variable x equals the total number of heads. Find and sketch $F_x(x)$ and $f_x(x)$. **Solution :** let x be a random variable which maps to 1 when coin denotes head and 0 when it denotes tail.

Table 1: Events and Description

probability of getting r heads is $\Pr(X = k) = \binom{n}{k} \times p^k \times (1-p)^k$ so

$$\Pr(X = 0) = \binom{3}{0} \times \frac{1}{2}^0 \times (1 - \frac{1}{2})^3 = \frac{1}{8} \tag{1}$$

$$\Pr(X = 1) = \binom{3}{1} \times \frac{1}{2}^1 \times (1 - \frac{1}{2})^2 = \frac{3}{8} \tag{2}$$

$$\Pr(X = 2) = \binom{3}{2} \times \frac{1}{2}^2 \times (1 - \frac{1}{2})^1 = \frac{3}{8} \tag{3}$$

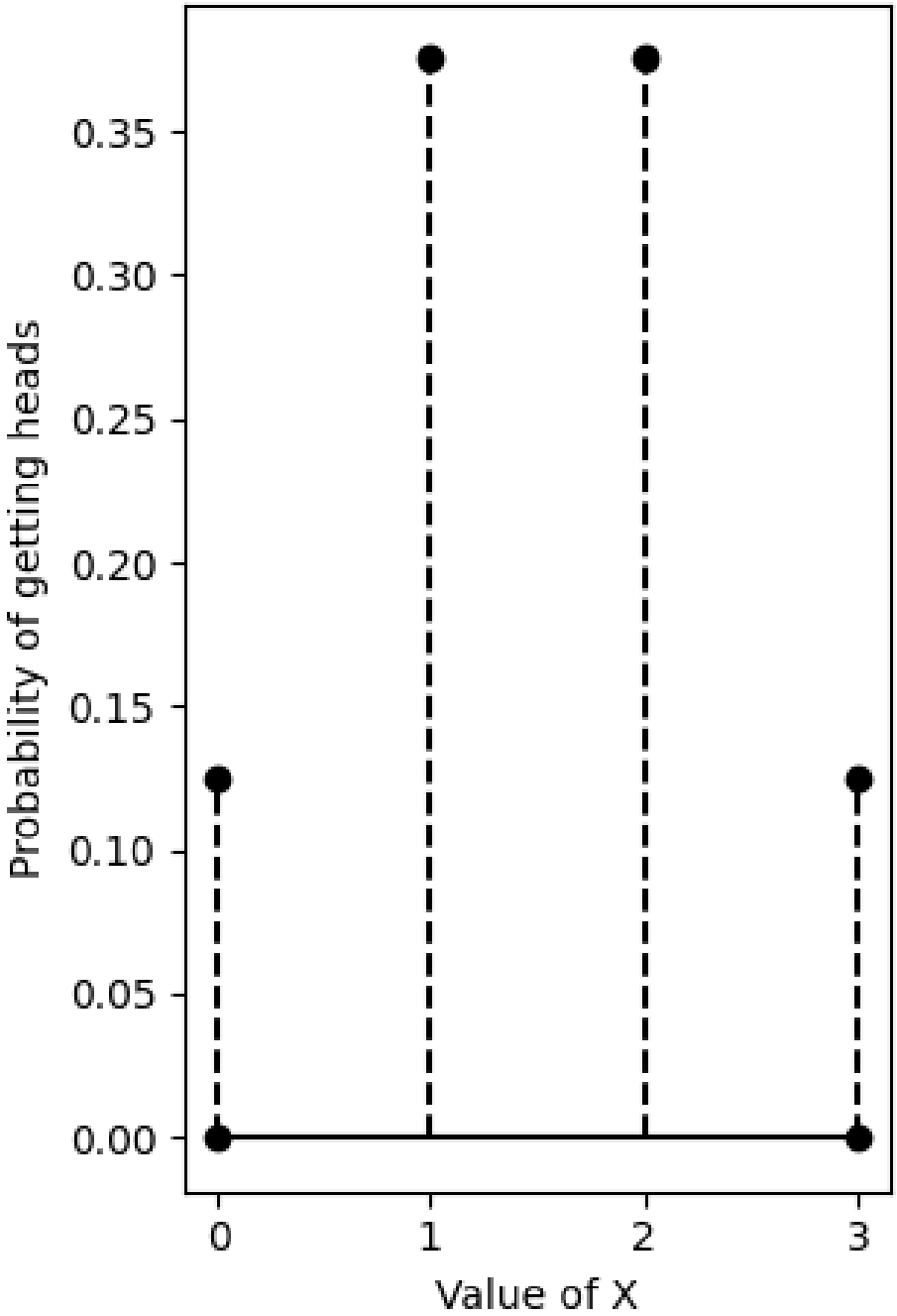
$$\Pr(X = 3) = \binom{3}{3} \times \frac{1}{2}^3 \times (1 - \frac{1}{2})^0 = \frac{1}{8} \tag{4}$$

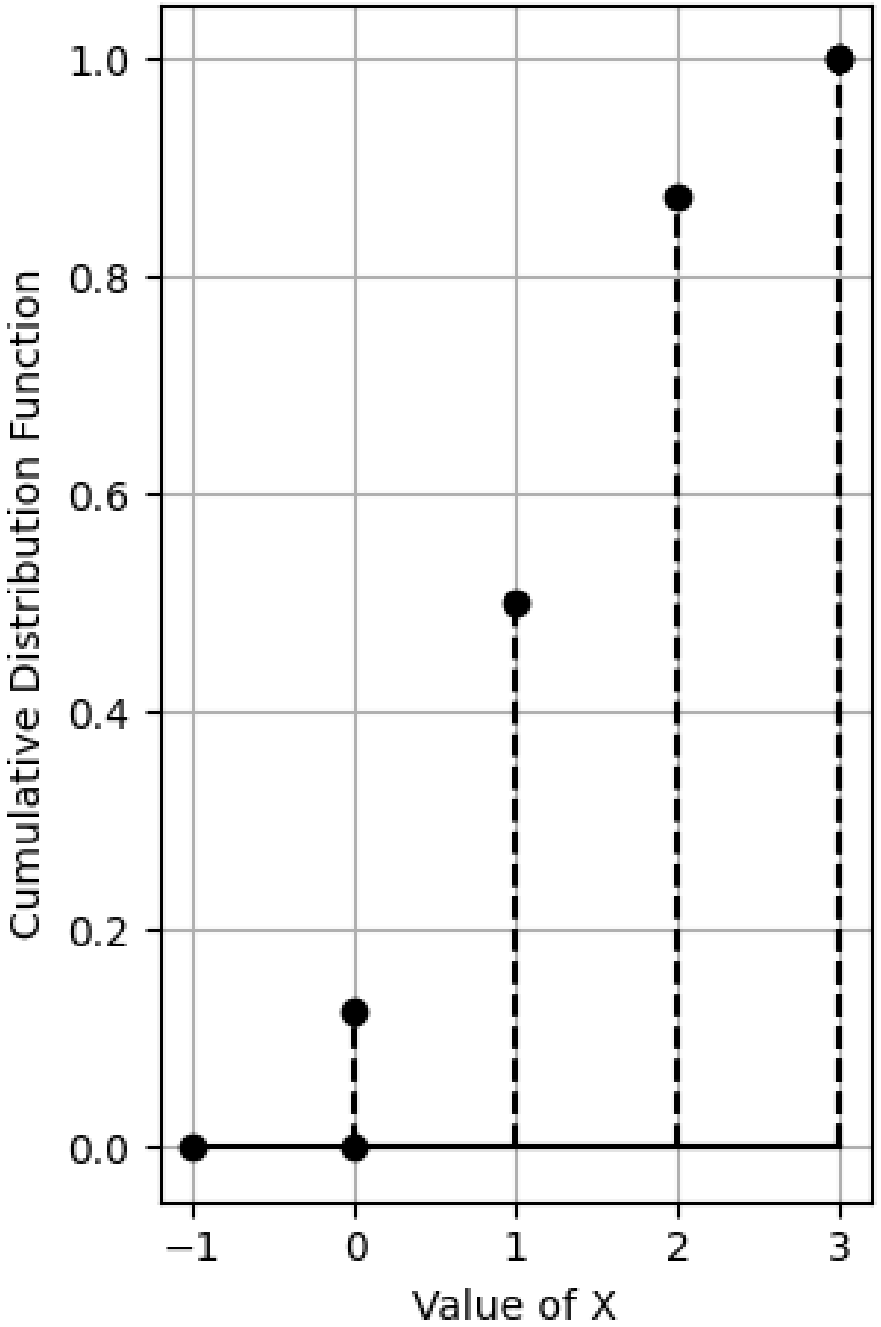
the $F_x(x)$ i.e PMF is given by :

$$\begin{cases} 0, & k < 0 \\ \frac{1}{8}, & k = 0 or 3 \\ \frac{3}{8}, & k = 1 or 2 \end{cases} \tag{5}$$

the $f_x(x)$ CDF is given by :

$$\begin{cases} 0, & k < 0 \\ \frac{1}{8}, & k = 1 \\ \frac{1}{2}, & k = 2 \\ \frac{7}{8}, & k = 3 \\ 1, & k > 3 \end{cases} \tag{6}$$


Probability of getting heads
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
Value of X


Cumulative Distribution Function
1.0
0.8
0.6
0.4
0.2
0.0
−1
0
1
2
3
Value of X