

NCERT: Class XII

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13.4.4 Find the probability distribution of

- (i) number of heads in two tosses of a coin.
- (ii) number of tails in the simultaneous tosses of three coins.
- (iii) number of heads in four tosses of a coin.

Solution:

| Variable | Value | Description |
|----------|---------------------|---------------------------------------|
| n | $\{2, 3, 4\}$ | Number of trails |
| p | $\frac{1}{2}$ | Probability of getting a head |
| q | $1 - p$ | Probability of not getting a head |
| X_1 | $\{0, 1, 2\}$ | Number of heads in 2 tosses of a coin |
| X_2 | $\{0, 1, 2, 3\}$ | Number of tails in 3 tosses of a coin |
| X_3 | $\{0, 1, 2, 3, 4\}$ | Number of heads in 4 tosses of a coin |

Table 13.4.0.2: Variable Description

- (a) Number of heads in two tosses of a coin.

By using binomial distribution

$$P_X(X_1) = {}^nC_{X_1} p^{X_1} q^{n-X_1} \quad (13.4.1.1)$$

$$F_X(X_1) = \begin{cases} \frac{1}{4}, & \text{if } X_1 = 0 \\ \frac{1}{2}, & \text{if } X_1 = 1 \\ \frac{1}{4}, & \text{if } X_1 = 2 \end{cases} \quad (13.4.1.2)$$

- (b) Number of tails in the simultaneous tosses of three coins.

By using binomial distribution

$$P_X(X_2) = {}^nC_{X_2} p^{X_2} q^{n-X_2} \quad (13.4.2.3)$$

$$F_X(X_2) = \begin{cases} \frac{1}{8}, & \text{if } X_2 = 0 \\ \frac{3}{8}, & \text{if } X_2 = 1 \\ \frac{3}{8}, & \text{if } X_2 = 2 \\ \frac{1}{8}, & \text{if } X_2 = 3 \end{cases} \quad (13.4.2.4)$$

- (c) Number of heads in four tosses of a coin.
By using binomial distribution

$$P_X(X_3) = {}^nC_{X_3} p^{X_3} q^{n-X_3} \quad (13.4.3.5)$$

$$F_X(X_2) = \begin{cases} \frac{1}{16}, & \text{if } X_3 = 0 \\ \frac{4}{16}, & \text{if } X_3 = 1 \\ \frac{6}{16}, & \text{if } X_3 = 2 \\ \frac{4}{16}, & \text{if } X_3 = 3 \\ \frac{1}{16}, & \text{if } X_3 = 4 \end{cases} \quad (13.4.3.6)$$