Binomial Distribution

1. Ten coins are tossed simultaneously. Find the probability of obtaining,

   a) No head
   b) Exactly 6 heads
   c) At least one head
   d) Not more than three heads i.e. at most 3 heads

2. A multiple choice test has 5 questions. There are 4 choices for each question. A student who has not studied for the test decides to answer all questions randomly. What is the probability that he will get:

   a) Five questions, correct?
   b) At least four questions, correct?

3. In a local hospital 48% of all babies born are males. On a particular day five babies are born. What is the probability that:

   a) None of them are male
   b) Two of them are male
   c) At least one is male

4. Out of 9000 families 4 children each, how many families would you expect to have 3 boys and 1 girl, the birth of male child and female child is assumed equal?

5. If the mean of a binomial distribution is 0.4 and its standard deviation is 0.6, find the probability of at least one success.

6. In a binomial distribution with 6 independent trials the probabilities of 3 and 4 successes are found to be 0.2457 and 0.0819. find the parameter 'p' of the binomial distribution.

7. It is known that on an average the probability that Shyam will win the game is 40%. What is the probability that out of 8 games Shyam will win between 2 and 6 games? (including 2 and 6)

8. Forty five percent of the Nepalese workers have been gone abroad are illegal. If in a sample of six, Nepalese workers who have gone abroad, what is the probability that

   a) Three are illegal
   b) All are legal
   c) At least one is legal

Fitting of Binomial Distribution

If n independent trials are repeated N times and satisfying the condition of binomial distribution, then theoretical or expected frequencies of x successes is given by

$$f(x) = N \, {}^nC_x \, p^x \, q^{n-x}, \text{ where } x = 0, 1, 2, \ldots, n$$

The following steps are generally followed to fit binomial distribution.

- First of all, we compute the mean of given frequency distribution by using the following formula $\bar{X} = \dfrac{\Sigma fX}{N}$

  If p is known (given), it is not necessary to find mean.

- Equate the value of mean with np to find the values of p and q,

  i.e., $\bar{X} = np$

- Calculate the expected frequency by using the formula

$$f(x) = N \, {}^nC_x \, p^x \, q^{n-x}, \text{ where } x = 0, 1, 2, \ldots, n$$

Practical problems

1. Fit the binomial distribution for the following data:

No. of heads	0	1	2	3	4	Total
Frequency	28	62	46	20	4	160

2. Fit the binomial distribution for the following data

X	0	1	2	3	4	5	Total
f	1	4	10	31	26	13	85