

Binomial Distribution

Two outcome Situation

Mean = np , Var = npq

1. The outcomes of each trial may be classified into two categories, called Success and Failure.
2. The probability of success remains constant for all trials.
3. The successive trials are independent.
4. Experiment is repeated a fixed no of times.

$$f(x) = P(X=x) = \binom{n}{x} p^x q^{n-x}$$

where $x = 0, 1, 2, \dots, n$

p : probability of success

q : " " Failure

n : Number of trials

x : No of successes

Parameters: n and p

Multinomial distribution

More than two outcomes

1. A binomial experiment becomes multinomial if each trial have more than two possible outcomes. The outcomes of each trial may be classified into one of the K mutually exclusive categories.

(Other conditions are same as binomial)

$$P(X_1=x_1, X_2=x_2, \dots, X_K=x_K) = \frac{n!}{x_1! x_2! \dots x_K!} p_1^{x_1} p_2^{x_2} \dots p_K^{x_K}$$

Parameters: n, p_1, p_2, \dots, p_K

$$\text{Mean} = np_i$$

$$\text{Var} = np_i q_i$$

Geometric Distribution.

(First three conditions are same as binomial)

1. Same as binomial
2. "
3. "
4. The experiment is repeated a variable number of times until first success occurs.

$$P(X=x) = p q^{x-1}$$

x : No. of trials required upto and including the first success

x : $1, 2, \dots$

Parameter: p

$$\text{Mean} = \frac{1}{p}, \text{Var} = \frac{q}{p^2}$$