Hyper Geometric Distribution

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Hyper Geometric Distribution

The hypergeometric distribution is a discrete probability distribution that describes the probability of k successes (random draws for which the object drawn has a specified feature) in n draws, without replacement, from a finite population of size N that contains exactly K objects with that feature, wherein each draw is either a success or a failure. In contrast, the binomial distribution describes the probability of k successes in n draws with replacement.

Hyper Geometric Distribution

Hyper Geometric Distribution has the following Properties:

- There are only two possible outcomes of each trial. The outcomes can be classified as a success (S) or as a failure (F).
- The experiment is repeated for a fixed number of times, say n.
- The successive trial are all dependent.
- The probability of a success, denoted by p, is the change on each trial.

Notation for Hyper Geometric Distribution

Symbol	*Description*
n	The number of object in the sample
K	Number of successes in the population
N	Number of objects in the population

Hyper Geometric Distribution

The hyper geometric Distribution has the following formula

$$P(X = x) = \frac{\binom{k}{x}\binom{N-k}{n-x}}{\binom{N}{n}},$$

$$for \quad x \quad such \quad that \quad x = 0,1,2,3....n \, and \quad x = 0,1,2,3.....k$$

Hyper Geometric Distribution

Hyper Geometric Distribution has three parameters N, n and k.

Mean=$\mu = np =$ n$\frac{k}{N}$

Variance=$\sigma^2 = npq\,\frac{N-n}{N-1} = n\left(\frac{k}{N}\right)\left(\frac{N-k}{N}\right)\left(\frac{N-n}{N-1}\right)$

Standard Deviation=$\sqrt{npq\,\frac{N-n}{N-1}}$

Question 1

A committee for size 3 is selected from 4 men and 2 women. Find the probability distribution for the number of men on the committee.

Question 2

Printed circuits cards are placed in functional test having been populated with semiconductor chips. Lots contain 25 cards and 5 are selected for functional testing.

- if 5 cards are defective, what is the probability that at least a defective card in the sample?
- If 3 cards are defective, what is the probability that more than two defective cards in the sample.

Question 3

A batch of parts contains 100 parts from a local supplier of tubing and 200 parts from a supplier of tubing in the next state. If four parts are selected randomly and without replacement, what is the probability that

- All are of local supplier?
- At least one part of sample is from the local supplier?
- Two or more parts in the samples are from the local supplier?

Question 4

Four items are taken at random from a box of 12 items inspected. The box is rejected if more than one item is found to be faulty. If there are 3 faulty items in the box, find the probability the box is rejected.