# Quiz 9

1) Population size = N

Marked members = 50

Sample size = 20

Marked members in the sample = X.

X = k is the event of getting k marked members from the 50 marked members of the population. There are $^{50}C_k$ many ways to do so since each member can be counted only once this is sampling without replacement. In total we need 20 members, we have already chosen k so 20 - k are remaining which need to be the unmarked ones. Hence there are $^{N-50}C_{20-k}$ ways of choosing 20 - k unmarked members from the N - 50 unmarked members of the population.

∴ Total number of ways of getting a sample of size 20 with k members marked = $^{50}C_k \times {}^{N-50}C_{20-k}$

If we just had to choose 20 members then the total number of ways to do so = $^{N}C_{20}$.

$$\therefore P(X=k) = \frac{{}^{50}C_k \times {}^{N-50}C_{20-k}}{{}^{N}C_{20}}$$

$P(X = k)$ is of the form

$$\frac{{}^{M}C_{k} \; {}^{N-M}C_{n-k}}{{}^{N}C_{n}}$$ where $N = N, M = 50, n = 20$

This is the probability function of hypergeometric distribution.

$\therefore \; X \sim$ Hypergeometric $(N, 50, 20)$