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Q1] Describe the methods of sampling in brief.
Ans: Sampling is the process of selecting a sample.
Sampling methods are basically of two types that is -
1) Probability sampling
2) Non probability sampling.
Probability sampling is the type of sampling which has equal chance of getting selected. Where as non probability sampling is the one that does not have an equal chance of getting selected.
There are four types of probability sampling - simple random, systematic, stratified and cluster.
The four types of non probability sampling are quota, judgement, snowball and convenience.

Q2] Explain types of probability sampling.
Ans: Probability sampling is that type of sampling method which has equal chance of getting selected.
The four types of probability sampling are -
1) Simple random sampling
2) Systematic
3) Stratified sampling
4) Cluster sampling
In simple random sampling, every element has an equal chance of getting selected to be a part of the sample.
In systematic sampling, elements of any sample are chosen at regular intervals of population.
In stratified sampling, the elements of the population are divided into smaller strata (subgroups) based on the similiarity then the elements are randomly selected from each of these strata.

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In cluster sampling, the entire population is divided into clusters (sections) and then the clusters are selected randomly. All the elements of the cluster are used for sampling.

Q3] Explain types of the non probability sampling.

Ans: Non probability sampling is the sampling method where in there is no equal chance of getting selected.
The four types of non probability sampling are-
1) Quota sampling
2) Convenience sampling
3) Purposive sampling
4) Snowball (referral) sampling

Quota sampling depends on some pre-set standards or values. It selects the representative sample from the population.

In convenience sampling, the samples are selected based on availability. This method is used when the availability of sample is rare and expensive.

Purposive sampling is based on the intention or the purpose of study. Only the elements that suits the best for the purpose of our study will be selected from the population.

Snowball sampling is the technique used in situations where the population is completely unknown ~~and~~ and rare. With the help of first element we select for the population and ask this element to recommend us the other elements.

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Q4] State central limit theorem.

Ans: The central limit theorem (CLT) states that the distribution of a sample variable approximates a normal distribution (that is a bell curve) as the sample size becomes larger, assuming that all samples are identical in size and regardless of the population's actual distribution shape. It can also be stated as given a sufficiently large sample size from a population with the finite level of variance, the mean of all sampled variables from the same population will be approximately equal to the mean of the whole population.

Q5] Explain sampling distribution of means and hence state standard normal variate.

Ans: The sampling distribution of the mean is the mean of the population from where the items are sampled. If the population distribution is normal then the sampling distribution of the mean is likely to be normal for the samples of all sizes.

The variance of the sample mean is $\frac{\sigma^2}{n}$.

If x_i is a random sample of size n from a normal population with mean μ and variance σ^2 then the sample mean is distributed normally as $\bar{x} \sim N(\mu, \frac{\sigma^2}{n})$.

The standard normal variate corresponding to $\bar{x}$ is -

$$Z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} \sim N(0,1)$$