

## Statistical inferencing and confidence intervals

**Statistical inference** to make inferences about a population from sample data collected using Probability. **Sampling** allows you to choose a small group of individuals/objects and to use probability to estimate the characteristic measured. This is then extended to include the whole populations.

A **population** is any large collection of people or objects about which we are trying to draw inferences. For example: Australians, students in a school, applicants for a job.

A **Sample** is a subset of the populations. A **simple random sample** is the best way to choose a sample as it better represents the population.

The number of objects/individuals in a population is called **population size (N)**. The number of objects/individuals in a sample is called **sample size (n)**.

The **population proportion p** is the proportion of objects/individuals in the entire population possessing a particular characteristic that is being investigated. The population proportion is given by

$$p = \frac{\text{number in the population with the particular characteristic}}{\text{population size}}$$

The sample **proportion  $\hat{p}$**  (p hat) is the proportion of objects/ individuals in a sample that possesses the characteristic is being investigated. The sample proportion is given by

$$\hat{p} = \frac{\text{number in the sample with the particular characteristic}}{\text{sample size}}$$

The sample proportion varies as the samples vary. Hence  $\hat{p}$  is a variable and takes the values of a random variable  $\hat{P}$

### Types of Samples:

**Simple Random sample:** The sample members are randomly chosen and every member of the population is equally likely to be a member of the sample.

**Voluntary response sample (self-selected sample):** Here subjects from the population determine whether they will be members of the sample or not. This type of sample is not reliable to do meaningful statistical work.

**Systematic sample:** A systematic sample is chosen in an ordered manner. In a systematic sample, the members of the population are ordered in a list and then every  $n^{\text{th}}$  member in the list is chosen (systematically) for inclusion in the sample.

**Cluster sample:** A cluster sample involves using a simple random sample of groups of members that the population contains.

**Stratified sample:** The members of the population are divided into non-overlapping sub-groups based on a particular characteristic (either geographic, ethnic background, class, or religion). The sample is chosen in such a way that each subgroup is represented.

Note: Choose your textbook and work through the following questions:

Math Quest: Exercise 14.2

Cambridge Essential Math: 17 A