1.1 Populations and samples

- **In statistics, a population is the whole set of items that are of interest.**

For example, the population could be the items manufactured by a factory or all the people in a town.

Information can be obtained from a population. This is known as raw data.

- **A census observes or measures every member of a population.**
- **A sample is a selection of observations taken from a subset of the population which is used to find out information about the population as a whole.**

There are a number of advantages and disadvantages of both a census and a sample.

	Advantages	Disadvantages
Census	• It should give a completely accurate result	• Time consuming and expensive • Cannot be used when the testing process destroys the item • Hard to process large quantity of data
Sample	• Less time consuming and expensive than a census • Fewer people have to respond • Less data to process than in a census	• The data may not be as accurate • The sample may not be large enough to give information about small sub-groups of the population

Simple random sampling	
Advantages	**Disadvantages**
• Free of bias • Easy and cheap to implement for small populations and small samples • Each sampling unit has a known and equal chance of selection	• Not suitable when the population size or the sample size is large • A sampling frame is needed

Systematic sampling	
Advantages	**Disadvantages**
• Simple and quick to use • Suitable for large samples and large populations	• A sampling frame is needed • It can introduce bias if the sampling frame is not random

Stratified sampling	
Advantages	**Disadvantages**
• Sample accurately reflects the population structure • Guarantees proportional representation of groups within a population	• Population must be clearly classified into distinct strata • Selection within each stratum suffers from the same disadvantages as simple random sampling

Quota sampling	
Advantages	**Disadvantages**
• Allows a small sample to still be representative of the population • No sampling frame required • Quick, easy and inexpensive • Allows for easy comparison between different groups within a population	• Non-random sampling can introduce bias • Population must be divided into groups, which can be costly or inaccurate • Increasing scope of study increases number of groups, which adds time and expense • Non-responses are not recorded as such

Opportunity sampling	
Advantages	**Disadvantages**
• Easy to carry out • Inexpensive	• Unlikely to provide a representative sample • Highly dependent on individual researcher