

Summary of key points

- 1** • In statistics, a **population** is the whole set of items that are of interest.
 - A **census** observes or measures every member of a population.
- 2** • 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.
 - Individual units of a population are known as **sampling units**.
 - Often sampling units of a population are individually named or numbered to form a list called a **sampling frame**.
- 3** • A **simple random sample** of size n is one where every sample of size n has an equal chance of being selected.
 - In **systematic sampling**, the required elements are chosen at regular intervals from an ordered list.
 - In **stratified sampling**, the population is divided into mutually exclusive strata (males and females, for example) and a random sample is taken from each.
 - In **quota sampling**, an interviewer or researcher selects a sample that reflects the characteristics of the whole population.
 - **Opportunity sampling** consists of taking the sample from people who are available at the time the study is carried out and who fit the criteria you are looking for.

Sampling

In statistics, a **population** is a group of people you are interested in. A **sample** is a smaller group chosen from a larger population. In order to select a sample, you need to name or number the population to create a list called a **sampling frame**. Here are four types of sample you need to know about:

Random samples

- 1** **Simple random sample** – pick names out of a hat or generate random numbers.
- 2** **Systematic sample** – number the population, and select sampling units at regular intervals. The first sampling unit is selected randomly.

Non-random samples

- 3** **Quota sample** – select a predetermined number of sampling units with certain defined characteristics.
- 4** **Opportunity sample** – select most conveniently available sampling units that meet required criteria.

Worked example

A chicken farmer wants to test the shell thickness of a batch of 100 eggs.

Give one reason why a census might not be suitable for this test. (1 mark)

The farmer might need to break the eggs to test them, and he would have none left to sell.

If the testing process destroys or consumes the sampling unit, then a census may not be appropriate.

Sample vs census

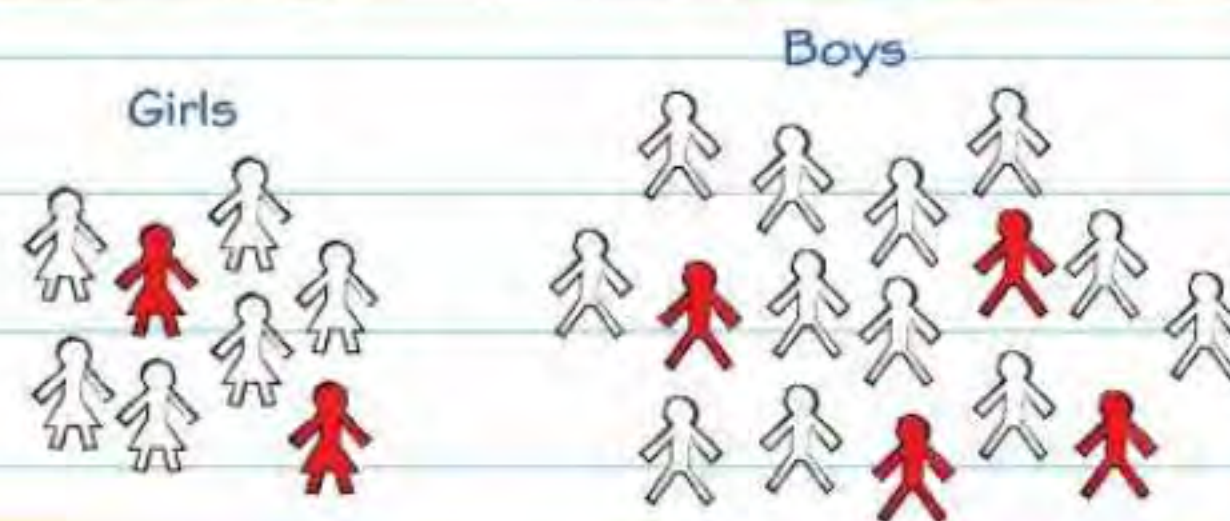
A **census** observes or measures every member of a population. Carrying out a census can be time-consuming and expensive, and can produce a large amount of data to clean and process.

A **sample** is quicker and cheaper than a census, but if the sample is not representative of the population then it can introduce bias.

Stratified sampling

If a population is split into groups, you can select a stratified sample by ensuring the number of elements selected from each group is proportional to the size of the group. To work out how many members to select from each group, find the **sampling fraction** and multiply this by the size of each group.

$$\text{Sampling fraction} = \frac{\text{Sample size}}{\text{Population size}}$$



For a sample of size 6 from this population of size 24 you need to select $8 \times \frac{6}{24}$ girls and $16 \times \frac{6}{24} = 4$ boys.

Now try this

This table shows the number of employees in an engineering company. The CEO of the company wants to select a random sample of 50 employees, stratified by gender and office location.

- (a) How many female employees from Bristol should she select for her sample? (2 marks)
- (b) Describe a suitable sampling frame. (1 mark)

	Bristol	London	Total
Male	119	91	210
Female	152	74	226
Total	271	165	436

A stratified sample is an example of a random sample – all items have an equal chance of selection.