Lesson 2

2.1 Populations and Samples

A Population

In statistics, a population is the whole set of items that are of interest.
e.g. All the pupils in a school.

A Census

A census is when every member of a population is observed, measured or questioned. It should result in a completely accurate result but for large populations gathering and processing the data may become too time consuming or expensive for it to be practical.

A Sample

Taking a sample of data from the population of interest will be less demanding of time and money but it can result in bias, especially if the sample is not sufficiently large.
If a population is varied a larger sample is needed in comparison to one more uniform.

Sampling Units

The individual members of a population are termed the sampling units.

Sampling Frame

Typically the sampling units of a population are individually named or numbered to form a list. Such a list is called a sampling frame.

2.2 Exercise

Question 1

It is wishes to investigate the preferred meals of the pupils at a school.

(i) What are the sampling units ?

(ii) What is the sampling frame ?

(iii) Give one advantage and one disadvantage to the school of using a census.

Question 2

It is wished to take a random sample of five pupils from a class of twenty.

(i) The class of twenty are listed below, and you are to select the five using the random number button RanInt on your calculator.
Describe in detail how you will go about selecting the sample of five.

George Tosh	Peter Perfect	Lucy Luck
Bill Bank	Jess Dough	Daisy Diamond
Jim Roberts	Toby Klingon	Walter White
Sophia Flight	Fred Fast	Henry Light
Robert Hodge	Nancy Sweet	Colin McBright
Trish Smith	Joanna Jarvis	Dave Wong
Kevin Cool	Sam Morris	

(ii) Suggest another method of randomly selecting five names from the list

Question 3

Here is a list of the ten soldiers in an American Special Weapons and Tactics (SWAT) D-Platoon in the Los Angeles Police Department along with their ID numbers.

ID N°	Officer's Name
23 667	Butch Briggs
23 789	Joe 'killer' Higgins
23 441	Mat 'marauder' Smith
23 023	Duane Fox
22 896	Logan Taylor
23 723	Ethan Jones
23 023	Mason Charles
23 777	Bill 'bater' Bond
22 916	Dylan 'babyface' Peterson
23 621	Lucas 'jester' Robinson

(i) It is suggested using RanInt#(23000, 24000) to select four members of the platoon to go on a special operations mission.
Identify three separate problems, mathematically, with this suggestion.

(ii) What alternative method would you recommend be used ?

Question 4

A factory makes safety harnesses for climbers and has an order to supply 3000.
The buyer wishes to know the safe load, beyond which the harness is likely to fail.

(i) Suggest a reason why a census would not be used to determine the safe load.

The factory tests four harnesses and the load at which they fail is recorded as;

320 kg 270 kg 250 kg 160 kg

The factory claims that the harnesses are safe for loads up to 260 kg.

(ii) Is the factory giving the mean or the median statistic for the sample ?

(iii) Comment on the factory's claim,

(iv) Suggest a way of obtaining a more trustworthy measurement of the safe load.