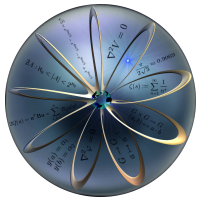

planetmath.org

Math for the people, by the people.

systematic sampling

Canonical name	SystematicSampling
Date of creation	2013-03-22 15:15:23
Last modified on	2013-03-22 15:15:23
Owner	CWoo (3771)
Last modified by	CWoo (3771)
Numerical id	4
Author	CWoo (3771)
Entry type	Definition
Classification	msc 62D05

Systematic sampling is a method of sampling n items from a population of N items with the following sequence of procedures:

1. label each item in the population as x_i, where $1 \leq i \leq N$,
2. randomly select one item from the first k items in the population, where $k = \lceil N/n \rceil$, the smallest integer greater than or equal to N/n,
3. pick the kth item thereafter, $x_i, x_{i+k}, x_{i+2k}, \ldots$, until all n items are picked.

If $N \equiv 0 \mod n$, then all n items can be picked before reaching the end of the population. Otherwise, define $x_{j+N} := x_j$. Using this, we can continue to pick our sample units until all n items are picked.

The above method suggests that we do not have to make our first pick from among the first k items. By the above definition, we can start anywhere in the population and still end up n units of sample.

Remarks.

- If n divides N, then systematic sampling can be viewed as grouping the population into $k = N/n$ strata, and picking one sample from each stratum. The difference between systematic sampling and stratified sampling is that in systematic sampling, only the first sample is picked randomly, all other samples are picked based on the position of the first pick.
- Again, if $n \mid N$, one can view systematic sampling as a one-stage cluster sampling, where a primary sampling unit is defined as the set of units $x_i, x_{i+k}, \ldots, x_{i+(n-1)k}$ in the population, where $k = N/n$ and $1 \leq i \leq k$. In this way, there are k primary sampling units. A simple random sample of one unit can then be drawn from these k units. All of the items within the selected primary sample will then be the complete sample drawn by systematic sampling.
- If some linear trend exists in the population, it is a good idea to order the population so the linearity is preserved by the order, so that when a systematic sampling is performed, the linearity gets carried over to the samples.

- When ordering the population, care should be taken so that there does not exhibit any periodic patterns (seasonality, etc...) that would greatly bias the sample.