

Math 146 1.1 - Statistical and Critical Thinking

Definitions and Terminology

Data are collections of observations, such as measurements, genders, or survey responses. (A single data value is called a datum, a term that does not see very much use.)

Statistics is the science of planning studies and experiments; obtaining data; and then organizing, summarizing, presenting, analyzing, and interpreting those data and then drawing conclusions based on them.

A **population** is the complete collection of all measurements or data that are being considered.

A **census** is the collection of data from every member of the population. A sample is a sub-collection of members selected from a population.

A **voluntary response sample** (or **self-selected sample**) is one in which the respondents themselves decide whether to be included. *It is generally a bad practice to use voluntary response (or self-selected) samples, even though their use is common.*

Statistical Significance -vs- Practical Significance

Statistical significance is achieved in a study when we get a result that is very unlikely to occur by chance.

- Flipping a coin 50 times and getting 47 heads is *statistically significant* because such an extreme outcome is very unlikely to be the result of random chance.
- Flipping a coin 50 times and getting 27 heads is not statistically significant because the event could easily occur by random chance.

Practical Significance is where there may be statistical significance in an outcome, but in reality, it may not be practical or of value. A test-prep company can guarantee an improvement of 10 points in a standardized placement test. But if the average score 680, a 10 point improvement is not very practical.

One of the most misleading conclusions often made in statistics is that if there is a correlation between two sets of data there must be correlation. But

CORRELATION DOES NOT IMPLY CAUSATION

