

F. Measurement scales (levels) determine data's exactness

1. **Nominal** scaled data is the weakest, providing the least information. Data can only be put into groups called categories and be counted. No order or scale exists. Examples include the number of shoppers who buy or do not buy when going into a store and the number of parts that pass or do not pass inspection.
2. **Ordinal** scaled data can be arranged in order. An example would be the number of customers who think a product is poor, average, or good. While good is better than average, no attempt is made to quantify such differences into measurable intervals.
3. **Interval** scaled data allows for the quantification of difference. Fahrenheit and Celsius thermometers have interval scales. These scales have equal intervals. But, their measure of zero is arbitrary because zero degrees does not measure the absence of heat. Such arbitrary starting points place restrictions on the math operations that can be done with interval scaled data. For example, the use of proportions is not appropriate.
4. **Ratio scaled data** has an inherent starting point. Temperature measured on a Kelvin scale is ratio scaled data because zero represents the absence of heat. Total variable costs are ratio scaled data because costs are zero when production is zero. Total costs, because of fixed costs, are interval scaled data.

III. Collecting data

A. Primary versus secondary sources of data

1. **Primary source data** is published by the original collector (data collected by the Bureau of the Census).
2. **Secondary source data** is published by a noncollector (Bureau of the Census data printed in a newspaper).

B. Methods of gathering data

1. **Observation**
2. **Personal interview**
3. **Telephone interview**
4. **Self-administration** is when a form (questionnaire) is completed by the respondent (individual, company, etc.).
5. **Registration** is when the respondent is responsible for bringing the desired information to a prescribed location (registering a car).

C. Data gathering alternatives

1. A **survey** is the collecting of information concerning existing material.
 - a. A **census** contains information from an entire population.
 - b. A **sample** contains information from part of a population.
 - 1) **Sampling error** occurs because a sample is taken rather than a census. The primary cause of sampling error is the sample is not representative of the population.
 - 2) **Nonsampling error**, which occurs with any survey, exists because of poor collection techniques. Because a sample is smaller than a census, more effort may be put into eliminating nonsampling error. This means that limited funds may make a sample more accurate than a census.
2. An **experiment** is a process for generating and measuring data.