Section 1.1 - Statistical and Critical Thinking

Statistics - The science of planning studies and experiments, obtaining data, and then organizing, summarizing, presenting, analyzing, interpreting, and drawing conclusions based on the data.

Data - Collections of observations (such as measurements, genders, survey responses, etc.)

Population - A complete collection of all individuals to be studied.

Census - The collection of data from every member of the population.

Sample - A subcollection of members selected from the population.

- Sample data must be collected in an appropriate way, such as through a process of random selection.

- If sample data are not collected in an appropriate way, the data may be completely useless!

When analyzing data, we must consider the following factors:

- Context of the data --- *The context affects the kind of statistical analysis that should be used.*

- Source of the data --- *Be skeptical of studies from sources that may be biased.*

- Sampling method --- *The sampling method can introduce bias and influence the validity of the conclusions.*

- Conclusions --- *Claims must be justified by the statistical analysis.*

- Practical implications --- *Statistical significance can differ from practical significance.*

Common sense and practical considerations are very important when thinking statistically.

Read Pages 4 - 7.

Common problems when analyzing data...

- Misuse of graphs - bad scale, inconsistent scale, wrong type of graph, etc.

- Bad samples - self-selected (voluntary response) samples are often biased. People with strong opinions tend to participate.

- Correlation does not imply causality

- Reported results - reported observations may be biased; collect observations yourself

- Small samples

- Percentages - Will you give 110% to this course?

- Loaded questions

- Order of questions

- Nonresponse

- Missing data - data can be omitted intentionally or unintentionally; data can missed because of special factors

- Self-interest study - be wary of studies where the sponsor has something to gain

- Precision vs. accuracy

- Deliberate distortions