

**QA 233 - 001 & 002
 SPRING QUARTER
 2008-2009 ACADEMIC YEAR**

Instructor: James J. Cochran

Office: 117A CAB

Telephone: (318) 257-3445

Hours: M-F 8:00 a.m. - 10:00 a.m. & 1:00 P.M. - 2:00 P.M.
 W 8:00 a.m. - noon
 or by appointment

e-mail: jcochran@cab.latech.edu

URL: <http://www.cab.latech.edu/~jcochran/index.htm>

Textbook(s): Anderson, David R., Dennis J. Sweeney, and Thomas A. Williams, *Essentials of Modern Business Statistics with Microsoft® Excel*, South-Western College Publishing, 4th edition, 2007



Prerequisite: MATH 125 (college algebra) and computer literacy (ability to learn and use Excel)

Grading:

Homework Assignments (≈ 2 - 4)	90 points
Quizzes (≈ 5 - 15)	60 points
Interim Exams (2)	200 points
Comprehensive Final Exam	<u>150 points</u>
	500 points

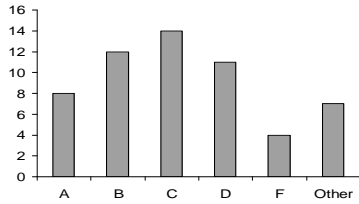
Is Statistics Difficult?



**POPULAR OPINION SUGGESTS SO!
 But this doesn't have to be the case!**

FYI - QA 233 Section 001 Winter Quarter 2003-04 Grade Distribution

ASSIGNED LETTER GRADES



CLASS DISTRIBUTION	
Letter	Frequency
A	8
B	12
C	14
D	11
F	4
Other	7
Total	56

Notes:

2 of the 4 'F' grades were generated by students who did not take the final and did not drop the class
4 of the 7 'Other' grades (withdraws) were generated by students who did not take any exams

HOW TO GET THROUGH STATISTICS WITH *MINIMAL* DIFFICULTY

1. Keep up with the material - the course is extremely cumulative, so most students have great difficulty if they fall behind. Look at the assigned material before the lecture, review the covered material after the lecture, and don't hesitate to ask questions!
2. Spend *quality time* studying the subject - studying statistics for 10 hours on the two days before an exam is not as effective as studying one hour daily for ten days prior to the exam.
3. Develop an understanding of the concepts - superficial knowledge will not get you by in statistics. Attempt to work practice problems on the Virtual Classroom before looking at the answers, and work in groups (this helps immensely).

If you think you can do a thing or think you can't do a thing, you're right.

Henry Ford

I. Introduction to Data & Statistics

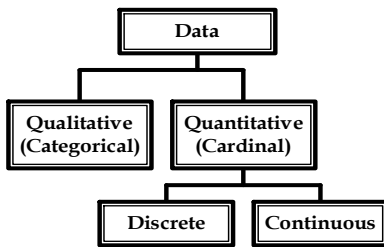
A. Basic Definitions

1. Measurement - process of transforming something our senses can't perceive into something they can perceive
2. Data - measurements that are collected, recorded, and summarized for presentation, analysis, and interpretation.
3. Element - an entity or object on which data are collected. Also called a *case* or an *individual*.
4. Variable - characteristic of the elements whose value may differ from element to element and is of interest to the data collector.
5. Observation - measurement of a variable or variables on a single element.

6. Types of Data:

a. Type of Information In Data - Qualitative vs. Quantitative Data

- Qualitative Data - labels or names for a characteristic.
- Quantitative Data - measurement of amount or quantity.



Consider the following data:

2
4
3
6
4
1

How would you summarize these data?

Calculate their mean?

$$\frac{2+4+3+6+4+1}{6} = \frac{20}{6} = 3.\overline{33}$$

What does this value tell you?

What if these values represented various student majors where

- 1=Accounting
- 2=Computer Information Systems
- 3=Economics
- 4=Finance
- 5=Management
- 6=Marketing

Does the mean now have meaning?

Now how would you summarize these data?

- 2 (Computer Information Systems)
- 4 (Finance)
- 3 (Economics)
- 6 (Marketing)
- 4 (Finance)
- 1 (Accounting)

What if these values represented the order of finish for teams in the National League Central Division?

- 2 (Chicago Cubs)
- 4 (Cincinnati Reds)
- 3 (Houston Astros)
- 6 (Milwaukee Brewers)
- 4 (Pittsburgh Pirates)
- 1 (St. Louis Cardinals)

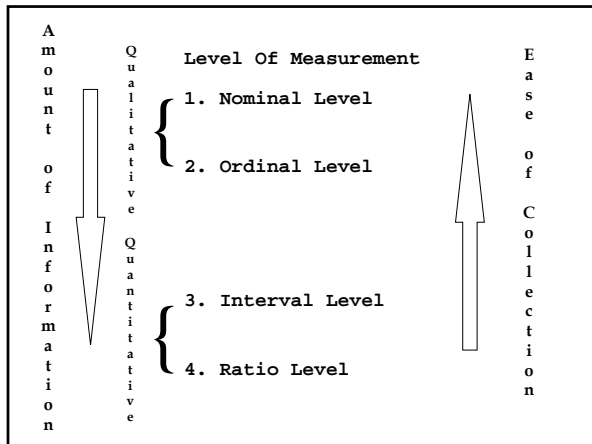
Does the mean now have meaning?

Now how would you summarize these data?

This is an important consideration when deciding how to analyze/summarize data!

b. Levels/Scales of Data Measurement - Categorization of the values of a variable according to the amount of information conveyed about the elements to which they correspond. The levels are:

- Nominal Level - values represent category or group membership of elements (is A = B?)
- Ordinal Level - values convey less than, equal to, and greater than relationships among the elements, i.e. the relative ranks of the elements with respect to their values for the variable in question (is A > B? is A < B?)
- Interval Level - values convey how much more or less one value is less than another value (how much is A - B?)
- Ratio Level - values can take on a 'natural' or 'absolute' zero (How much is A/B?)



Examples - Levels of Data Measurement

Discrete Ratio
How Many Automobiles Do You Currently Own?
___ (Number)

Continuous Interval
What Is The High Temperature Today?
___ (Fahrenheit)

Continuous Ratio
What Is Your Annual Income?
_____ (\$)

Nominal
Are You Married?
[] Yes [] No

Ordinal
How Would You Rate The Value Of This Product?
[] Excellent [] Good [] Fair [] Poor?

Again consider the data:

2
4
3
6
4
1

Suppose these were unit sales of automobiles for a dealership. How would you display these data?

Are these

i) weekly sales for one salesperson
or
ii) sales for a particular week for six different salespeople?

Does it make any difference?

c. Serial Nature of Data - Cross-Sectional vs. Time Series

- Cross-Sectional Data - values are collected from many entities during a given period of time.
- Time Series Data - values are collected from a single entity over several (usually successive) time periods.

Examples - Cross-Sectional vs. Time Series Data

Cross-Sectional Data

How Tall is each Student in this Class?

Time Series Data

How Tall was a Single Student on each of His/Her Birthdays?

d. Method of Data Collection

- Survey/Observation - Selection of a proportion of the population and measurement or observation of the values of the variables in question for the selected elements
- Experimentation - Manipulation of the values (or levels) of one or more (independent) variables or treatments and observation of the corresponding change in the values of one or more (dependent) variables or responses

e. Source of Data

- Primary Data - Data collected by the user to *to answer a specific question*
 - Survey collection (observation)
 - Experimentation
- Secondary Data - Data used to answer a question *other than that for which they were originally intended*
 - Newspapers, Magazines, Books
 - e.g. Wall Street Journal, Value-Line, etc.
 - Government Publications
 - e.g. Statistical Abstract of the United States
 - On-Line Databases
 - eg. Lexus-Nexus, S & P's Research Insight
 - Web Sites
 - <http://www.census.gov/>
 - <http://stats.bls.gov/blshome.htm>

7. Statistics - art and science of collecting, describing, analyzing, interpreting, and presenting data.

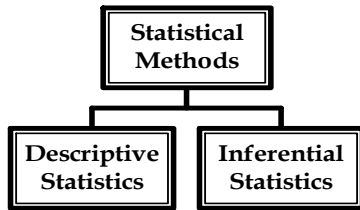
8. Population - Collection of all possible elements of interest.

9. Census - Collection of the values for all variables of interest that correspond to all elements of a population. The size of the census (number of elements in the population) is usually denoted N. Note that when a census is collected, we can say that the data *tell/say* something to us.

10. Parameter - A summary measure used to describe values of a variable for the entire population.

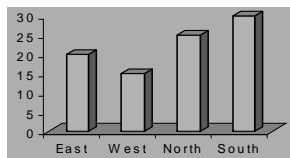
11. Sample - a collection of elements that comprise a subset of the population. The size of the sample (number of elements to be included) is usually denoted n. Note that when a sample is collected, we can only say that the data *suggest/imply* something to us.

12. Statistic - an estimate of the value of a parameter based on the elements that belong to the sample. Can be descriptive or inferential.



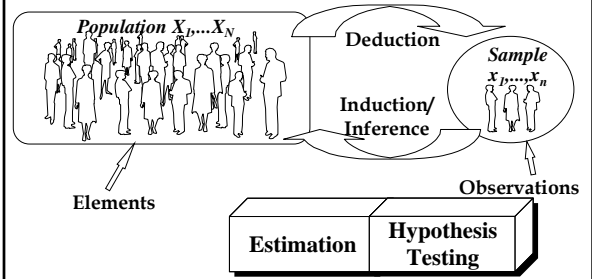
13. Descriptive Statistics - tabular, graphical, and numerical methods used to summarize one or more characteristics of a population or a sample.

Income	Gender		Total
	Male	Female	
<\$25,000	25	33	58
\$25,000-\$50,000	36	37	73
\$50,000-\$75,000	61	58	119
>\$75,000	17	22	39
Total	139	150	289

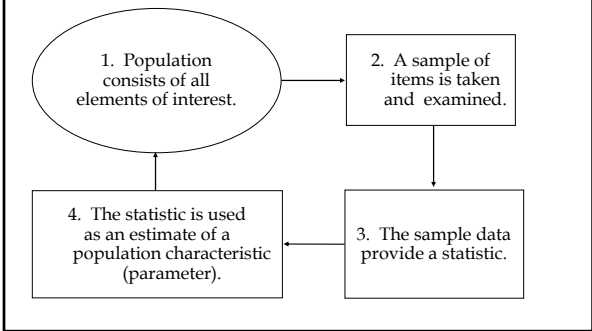


$$\bar{x} = 120, s = 25$$

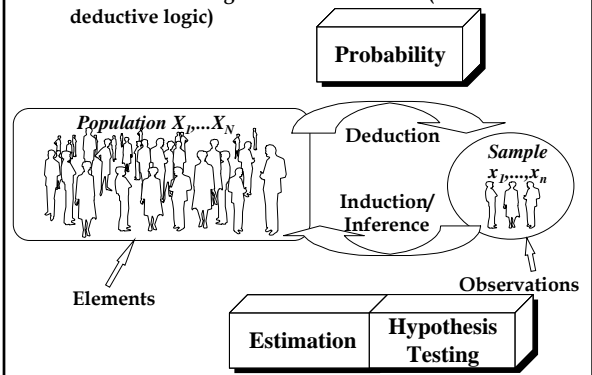
14. Inferential Statistics - use of data obtained through sampling to estimate the value of or test a hypothesis about a parameter (i.e., use of inductive logic).



Process of Statistical Inference



15. Probability - science of numerically measuring the likelihood that a given event will occur (i.e. use of deductive logic)



B. Sampling

1. Why Sample?

- Expense
- Speed
- Destructive Nature of Data Collection
- Accuracy
- Inaccessibility of Some Elements

- Invasiveness of some Sampling (blood, human tissue)

2. How To Sample?

- Simple Random Sampling - All samples of size n are equally likely
- Other Approaches

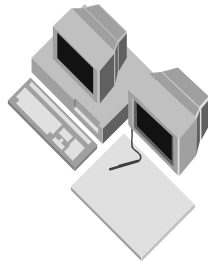
C. Applications - Areas of application of statistics to business disciplines include:

Production <ul style="list-style-type: none">• Quality Control• Acceptance Sampling	Marketing research <ul style="list-style-type: none">• Consumer Preferences• Marketing Mix Effects
Finance <ul style="list-style-type: none">• Revenue Trends• Portfolio Theory	Accounting <ul style="list-style-type: none">• Auditing• Revenue Allocation
Management <ul style="list-style-type: none">• Human Resource• Productivity	Economics <ul style="list-style-type: none">• Economic Indicators• Forecasting

D. Popular Statistical Computing Software

1. Dedicated Statistical Software

- SAS
- SPSS
- Systat
- S Plus



2. Spreadsheet Software With Statistical Capabilities

- Excel
- Quatro Pro
