

Assignments for Prob/Stat/Discrete

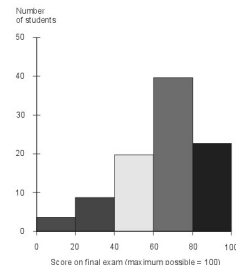
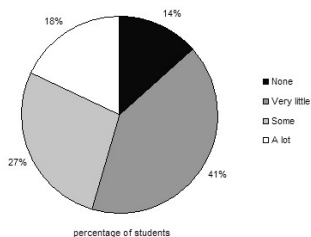
Unit 3: Introduction to Statistics

Day	Date	Assignment (Due the next class meeting)
		3.1 Worksheet
		3.2 Worksheet
		3.3 Worksheet
		3.4 Worksheet
		Unit 3 Practice Test and Work on Chapter 3 Project
		Chapter 3 Test in class Chapter 3 Project due today!

NOTE: You should be prepared for daily quizzes.

HW reminders:

- If you cannot solve a problem, get help **before** the assignment is due.
- Help is available before school or during lunch in room 107.
- For extra practice, visit www.interactmath.com
- Click ENTER, then scroll down to Larson, Elementary Statistics 4th edition. Pick the assignment you need extra practice with. You can get immediate feedback and hints.
- Don't forget that you can get 24-hour math help from www.smarthinking.com!



Prob/Stat/Discrete

Unit 3 Notes

3.1: Overview of Statistics

Objectives

- Can you define statistics?
- Can you identify a population and a sample?
- Can you distinguish between a parameter and a statistic?
- Can you distinguish between descriptive statistics and inferential statistics?

Vocabulary

Data

Consist of _____ coming from observations, counts, measurements, or responses.

- “People who eat three daily servings of whole grains have been shown to reduce their risk of...stroke by 37%.” (Source: *Whole Grains Council*)
- “Seventy percent of the 1500 U.S. spinal cord injuries to minors result from vehicle accidents, and 68 percent were not wearing a seatbelt.” (Source: *UPI*)

Statistics

The science of _____, _____, _____, and _____ data in order to make decisions.

Population

The collection of _____ outcomes, responses, measurements, or counts that are of interest.



Sample

A _____ of the population.



_____ : a numerical description of a _____ characteristic.

_____ : a numerical description of a _____ characteristic.

Example: In a recent survey, 1708 adults in the United States were asked if they think global warming is a problem that requires immediate government action. Nine hundred thirty-nine of the adults said yes. (Adapted from: *Pew Research Center*)

Identify a) the population

b) the sample.

c) Describe the data set.

Responses of adults in the U.S. (population)

Responses of adults in survey (sample)

Example 2: Decide whether the numerical value describes a population parameter or a sample statistic.

Starting salaries for the 667 MBA graduates from the University of Chicago Graduate School of Business increased 8.5% from the previous year.



Branches of Statistics

Descriptive Statistics Involves organizing, summarizing, and data.



e.g. Tables, charts, averages



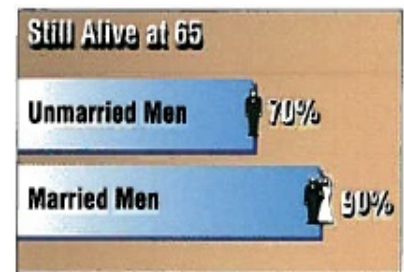
Inferential Statistics
Involves using *sample data* to draw
about a *population*.



Example: Decide which part of the study represents the descriptive branch of statistics. What conclusions might be drawn from the study using inferential statistics?

A large sample of men, aged 48, was studied for 18 years. For unmarried men, approximately 70% were alive at age 65. For married men, 90% were alive at age 65. (Source: The Journal of Family Issues)

Descriptive statistics:



A possible inference drawn from the study is:

3.2 Notes: Data Classification

Objectives:

- Can you distinguish between qualitative data and quantitative data?
- Can you classify data with respect to the four levels of measurement?

Qualitative Data

Consists of _____, _____, or _____ entries.



Quantitative data

_____ measurements or counts.



Example: The base prices of several vehicles are shown in the table. Which data are qualitative data and which are quantitative data? *(Source: Ford Motor Company)*

Model	Base Price
Fusion 14 S	\$17,795
F-150 XL	\$18,710
Five Hundred SEL	\$23,785
Escape XLT Sport	\$24,575
2007 Explorer Sport Trac Limited	\$26,775
Freestar SEL	\$27,500
Crown Victoria LX	\$28,830
Expedition XLT	\$35,480

LEVELS OF MEASUREMENT

Nominal level of measurement

- _____ data only
- Categorized using _____, labels, or qualities
- _____ mathematical computations can be made!

Ordinal level of measurement

- _____ or _____ data
- Data can be arranged in _____
- Differences between data entries is not _____

Example: Two data sets are shown. Which data set consists of data at the nominal level? Which data set consists of data at the ordinal level? *(Source: Nielsen Media Research)*

Network Affiliates in Pittsburgh, PA	
WTAE	(ABC)
WPXI	(NBC)
KDKA	(CBS)
WPGH	(FOX)

Top Five TV Programs (from 2/12/07 to 2/18/07)	
1.	American Idol—Tuesday
2.	American Idol—Wednesday
3.	Grey's Anatomy
4.	House
5.	CSI

Interval level of measurement

- _____ data
- Data can _____
- Differences between data entries is _____
- Zero represents a _____ on a scale (not an inherent zero – zero does not imply “none”)

Ratio level of measurement

- Similar to _____ level
- Zero entry is an _____ zero (implies “none”)
- A _____ of two data values can be formed
- One data value can be expressed as a _____ of another

Example: Two data sets are shown. Which data set consists of data at the interval level? Which data set consists of data at the ratio level? (*Source: Major League Baseball*)

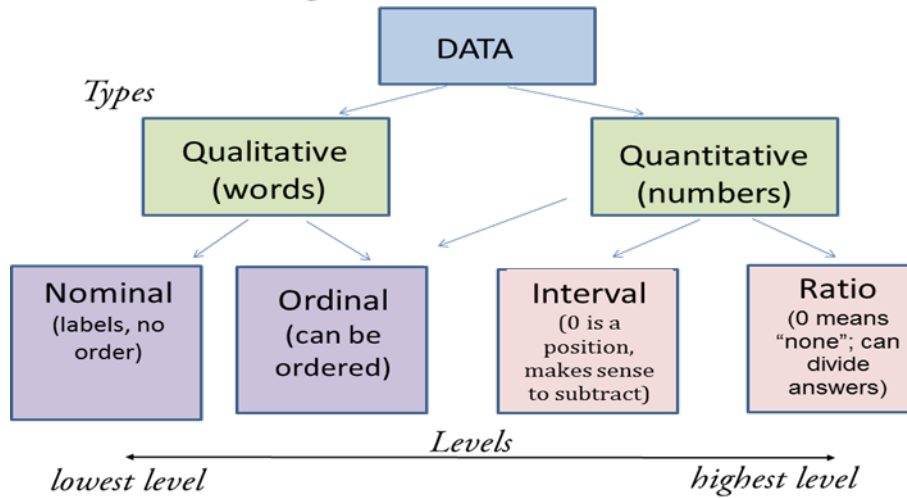
New York Yankees' World Series Victories (Years)
1923, 1927, 1928, 1932, 1936, 1937, 1938, 1939, 1941, 1943, 1947, 1949, 1950, 1951, 1952, 1953, 1956, 1958, 1961, 1962, 1977, 1978, 1996, 1998, 1999, 2000

2003 National League Home Run Totals (by Team)	
Baltimore	164
Boston	192
Chicago	236
Cleveland	196
Detroit	203
Kansas City	124
Los Angeles	159
Minnesota	143
New York	210
Oakland	175
Seattle	172
Tampa Bay	190
Texas	183
Toronto	199

Summary of Four Levels of Measurement (yes or no?)

Level of Measurement	Put data in categories	Arrange data in order	Subtract data values	Determine if one data value is a multiple of another
Nominal				
Ordinal				
Interval				
Ratio				

Visual Organization of Data Classification



3.3 Notes

Objectives:

- ☐ Can you summarize how to design a statistical study?
- ☐ Can you identify data collection techniques?
- ☐ Can you design an experiment?

Designing a Statistical Study

1. _____ the variable(s) of interest (the focus) and the population of the study.
2. Develop a detailed plan for _____ data. If you use a sample, make sure the sample is representative of the population.
3. Collect the _____.
4. _____ the data using descriptive statistics techniques.
5. _____ the data and make _____ about the population using inferential statistics.
6. Identify any possible _____.

Observational study

- ☐ A researcher _____ and _____ characteristics of interest of part of a population.

Sample: *Researchers observed and recorded the mouthing behavior on nonfood objects of children up to three years old. (Source: Pediatric Magazine)*

Experiment

- ☐ A _____ is applied to part of a population and _____ are observed.
- ☐ Subjects are called _____

Sample: *An experiment was performed in which diabetics took cinnamon extract daily while a control group took none. After 40 days, the diabetics who had the cinnamon reduced their risk of heart disease while the control group experienced no change. (Source: Diabetes Care)*

Simulation

- ☐ Uses a mathematical or physical _____ to _____ the conditions of a situation or process.
- ☐ Often involves the use of _____.

Sample: *Automobile manufacturers use simulations with dummies to study the effects of crashes on humans.*

Survey

- ☐ An _____ of one or more characteristics of a population.
- ☐ Commonly done by _____, _____, or _____.
- ☐ A census *attempts to* question the whole _____.

Sample: *A survey is conducted on a sample of female physicians to determine whether the primary reason for their career choice is financial stability.*

Examples: Consider the following statistical studies. Which method of data collection would you use to collect data for each study?

1. A study of the effect of changing flight patterns on the number of airplane accidents.
2. A study of the effect of eating oatmeal on lowering blood pressure.
3. A study of how fourth grade students solve a puzzle.
4. A study of U.S. residents' approval rating of the U.S. president.

KEY ELEMENTS OF EXPERIMENTAL DESIGN

- ☐ Control
- ☐ Randomization
- ☐ Replication

Control for effects other than the one being _____.

- ☐ **Confounding variables**

- ☐ Occurs when an experimenter cannot tell the difference between the effects of different factors on a variable.

Sample: *A coffee shop owner remodels her shop at the same time a nearby mall has its grand opening. If business at the coffee shop increases, it cannot be determined whether it is because of the remodeling or the new mall.*

- ☐ **Placebo:** A _____ treatment. Subjects (experimental units) may believe they are receiving a treatment, but it is not a true one.

- ☐ **Placebo effect**

- ☐ A subject reacts _____ to a placebo when in fact he or she has been given no medical treatment at all.

Sample: *Andrew suffers from chronic neck pain. His doctor gives him a sugar pill (a _____), and Andrew reports less neck pain.*

- ☐ **The Placebo effect needs to be controlled in an experiment!**

- ☐ **Blinding** is a technique where the subject does not know whether he or she is receiving a _____ or a _____.
 - ☐ **Double-blind** experiment neither the subject nor the _____ knows if the subject is receiving a treatment or a placebo.

Randomization is a process of randomly assigning _____ to different treatment groups.

- ☐ **Completely randomized design**

- ☐ Subjects are assigned to different treatment groups through _____.

- ☐ **Randomized block design**

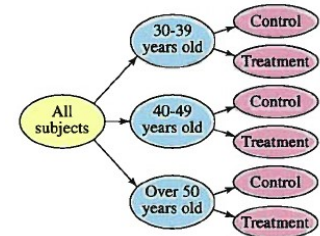
- ☐ Divide subjects with similar _____ into **blocks**, and then within each block, randomly assign subjects to treatment _____.

Randomized design

Sample: A doctor wants to try a new treatment on patients with Alzheimer's disease. He puts the names of 100 patients in a hat, and randomly draws the names of 20 patients to try the new treatment.

Randomized block design

Sample: An experimenter testing the effects of a new weight loss drink may first divide the subjects into age categories. Then within each age group, randomly assign subjects to either the treatment group or control group.



❑ Matched Pairs Design

- ▣ Subjects are paired up according to a _____. One subject in the pair is randomly selected to receive _____ treatment while the other subject receives a _____ treatment.

Sample: The athletic trainer at a university wants to test the effectiveness of a new protein shake. He has 20 athletes, and he puts them in pairs based on their starting similar physical condition. One member from each pair will receive the treatment, while the other member receives a placebo.

Replication is the _____ of an experiment using a large group of subjects.

Sample: To test a vaccine against a strain of influenza, 10,000 people are given the vaccine and another 10,000 people are given a placebo. Because of the sample size, the effectiveness of the vaccine would most likely be observed.

Example: A company wants to test the effectiveness of a new gum developed to help people quit smoking.

Identify a potential problem with the given experimental design and suggest a way to improve it.

The company identifies one thousand adults who are heavy smokers. The subjects are divided into blocks according to gender, and each block is given the new gum. After two months, the female group has a significant number of subjects who have quit smoking.



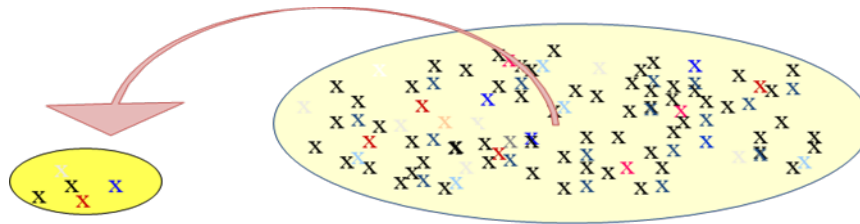
3.4 Notes and Objectives:

- ☐ Can you distinguish between different sampling methods?
- ☐ Can you identify a biased sample?

Sampling Techniques

Simple Random Sample (____ _)

Every possible sample of the same size has the same _____ of being selected.



- Random numbers can be _____ by a random number table, a software program or a calculator.
- _____ a number to each member of the population.
- Members of the population that correspond to these numbers become members of the _____.

Example: Using a table of random values:

There are 731 students currently enrolled in statistics at your school. You wish to form a sample of eight students to answer some survey questions. Select the students who will belong to the simple random sample. Start at Row 3.

Table 1— Random Numbers									
92630	78240	19267	95457	53497	23894	37708	79862	76471	66418
79445	78735	71549	44843	26104	67318	00701	34986	66751	99723
59654	71966	27386	50004	05358	94031	29281	18544	52429	06080
31524	49587	76612	39789	13537	48086	59483	60680	84675	53014
06348	76938	90379	51392	55887	71015	09209	79157	24440	30244
28703	51709	94456	48396	73780	06436	86641	69239	57662	80181
68108	89266	94730	95761	75023	48464	65544	96583	18911	16391
99938	00704	93621	66373	39271	05868	85341	51709	91616	32109

Stratified Sample

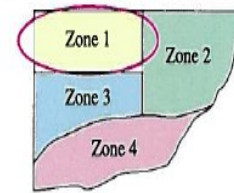
- Divide a population into groups (_____) and select a _____ sample from each group.
- *To collect a stratified sample of the number of people who live in West Ridge County households, you could divide the households into socioeconomic levels and then randomly select households from each level.*



Cluster Sample

- Divide the population into groups (_____) and select _____ of the members in one or more, but not all, of the clusters.
- *In the West Ridge County example you could divide the households into clusters according to zip codes, then select all the households in one or more, but not all, zip codes.*

Zip Code Zones in West Ridge County



Systematic Sample

- Choose a starting value at random. Then _____ every k^{th} member of the population.
- *In the West Ridge County example you could assign a different number to each household, randomly choose a starting number, then select every 100th household.*



Examples: You are doing a study to determine the opinion of students at your school regarding stem cell research. Identify the sampling technique used.

1. You divide the student population with respect to majors and randomly select and question some students in each major.
2. You assign each student a number and generate random numbers. You then question each student whose number is randomly selected.

BIAS

- Samples have bias if the results cannot be _____ because the collection was done in a manner that does not reflect the entire population.
- Questions can have bias if they unfairly _____ the answers given by subjects.
 1. **Types of Sampling Bias**
Convenience: Choosing the _____ subjects to be part of the sample.
 2. Self-Selected: Subjects (experimental units) _____ to be a part of the sample.
 3. Undercoverage: Sample size is too _____ to represent the population OR sample leaves out one or more _____ of the population.
 4. **Questioning Bias:** Poorly worded questions have _____ or lead the subject toward a _____.

Examples: What type of bias exist?

- ❖ The website www.fightforfreedom.com had a survey about gun rights. One question said, “Do you believe that Americans should have the right to own guns?” 85% of the respondents said yes.

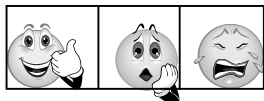
- ❖ As part of a project for Senior Seminar, Amy conducted a survey about plans for seniors after high school. Amy gave her survey to 30 students in her AP Physics class, and she reported that 90% of the seniors at her school plan on attending a four-year university.

- ❖ A local animal shelter sent out a survey to 100 randomly selected families who have visited the shelter in the last year. One question on the survey stated, “Do you believe that defenseless animals should be killed simply because humans refuse to adopt them?” 68% of the subjects answered “No.”

- ❖ In 1910, a telephone survey went out to registered voters to predict the results of an upcoming mayoral election. 67% of the respondents were planning on voting for the Democrat candidate.

Prob/Stat
Unit 3 Objectives

Name _____



Objective #1: Can you define the term “statistics”?



Objective #2: Can you identify a population and a sample?

1) A study of 33,043 infants in Italy was conducted to find a link between a heart rhythm abnormality and sudden infant death syndrome.

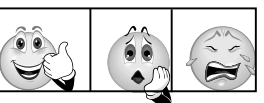
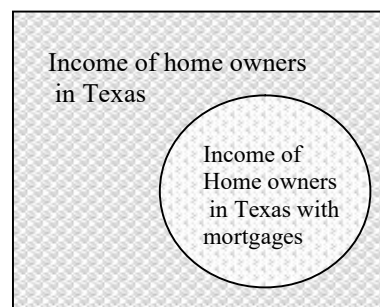
Population	
Sample	

2) A survey of 1906 households in the United States found that 13% have a high definition television.

Population	
Sample	

3) Use the Venn diagram.

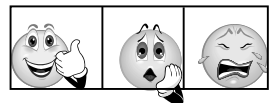
Population	
Sample	



Objective #3: Can you distinguish between a parameter and a statistic?

1) In a survey of high school students, 43% said that their mother has taught them the most about managing money. In this situation, 43% is a _____.

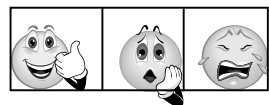
2) Sixty-two of the 97 passengers aboard the Hindenburg airship survived its explosion. In this situation, sixty-two is a _____.



Objective #4: Can you distinguish between descriptive statistics and inferential statistics?

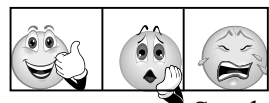
A survey of 546 women found that more than 56% are the primary investor in their household.

- 1) What part of this survey represents the descriptive branch of statistics?
- 2) Make an inference based on the results of the survey.



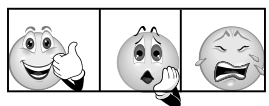
Objective #5: Can you distinguish between qualitative data and quantitative data?

- 1) The player numbers for a soccer team
- 2) Who people are voting for class president
- 3) Measure of diastolic blood pressure

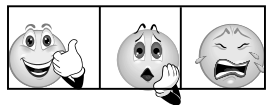


Objective #6: Can you classify data with respect to the four levels of measurement?

- 1) The region representing the top salesperson in a corporation for the mast six years is given:
Southeast, Northwest, Northeast, Southeast, Southwest, Southwest
- 2) The top five hardcover fiction books on *The New York Times* Best Seller List on February 21, 2007 are shown: 1. Step on a Crack 2. Plum Lovin'
3. Natural Born Charmer 4. High Profile 5. Hannibal Rising
- 3) The average ticket prices for 10 rock concerts in 2005 are listed:
\$134 \$104 \$55 \$63 \$76 \$38 \$35 \$81 \$57 \$97
- 4) The low temperatures for the first four months of 2006 in Denver, Colorado:
-3, 0, 11, 39, 49



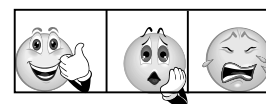
Objective #7: Can you summarize how to design a statistical study?



Objective #8: Can you identify data collection techniques?

What method of data collection would best be used to collect the following data?

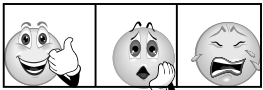
- 1) A study of the effect on the human digestive system of potato chips made with a fat substitute
- 2) A study of the effect of a product's warning label to determine whether consumers will still purchase the product
- 3) A study of how fast a virus would spread in a metropolitan area
- 4) A study of how children solve a puzzle



Objective #9: Can you classify the design of an experiment?

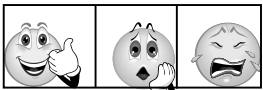
A new type of sneaker is developed to help delay the onset of arthritis in the knee. An experiment designed to determine the effectiveness of the new sneaker could be done in a variety of ways. *For #1 – 3, classify the design as completely randomized, randomized block, or matched-pairs design.*

- 1) 80 subjects are used; 40 of them are randomly chosen to use the new sneakers everyday for one month. The other 40 subjects will wear regular sneakers that look exactly the same as the new sneakers. Only the researchers running the experiment know which subjects are using which type of sneaker.
- 2) 80 subjects are used, and each is put into a pair with another subject of the same age and gender. From each pair, one person will wear the new sneakers and the other subject will wear the regular sneakers that have exactly the same appearance. Neither the subjects nor the researchers conducting the experiment know which type of sneaker is used for each subject (although a record is kept by a person not conducting the experiment.)
- 3) 80 subjects are used, and the men and women are put into separate groups. Half of each group will use the new sneaker, and the other half of each group will use the regular sneaker with exactly the same appearance.
- 4) How many experimental units are there for #3?
- 5) How many treatments are used in #1?
- 6) Is #2 blind, double-blind, or neither?



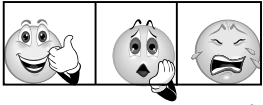
Objective #10: Can you distinguish between different sampling methods (simple random sample, stratified random sample, systematic sample, cluster sample, or convenience sample?)

- 1) Chosen at random, 1210 hospital outpatients were contacted and asked their opinion of the care they received.
- 2) Soybeans are planted on a 48-acre field. The field is divided into one-acre subplots. A sample of plants is taken from each subplot to estimate the harvest.
- 3) A researcher questions teachers as they leave the faculty lounge. She asks 32 teachers about their teaching strategies and methods.
- 4) From a list of people who bought their home in 2008, a surveyor contacts every tenth person to ask them whether or not they have flood insurance.
- 5) Out of the 32 teams in the NFL, four teams are randomly chosen, and every member of the team participates in a survey.



Objective #11: Can you identify a biased sample (convenience, self-selected, undercoverage, or a poorly worded question)?

- 1) For a school project, Carlene is supposed to conduct a survey to find out whether or not students think having school uniforms is a good idea. Carlene asks for volunteers in her PE class, and 29 students volunteer to participate in the survey.
- 2) A survey question is stated as “Why are drivers who change lanes several time dangerous?”
- 3) Danny works for a newspaper, and he is conducting a survey designed to discover whether or not people living in Reno recycle plastic at their homes. He goes door-to-door to 31 homes in Spanish Springs, and he uses these results for the article in the paper.



Objective #12: Can you find a sample using a table of random numbers?

Use the Table of Random Numbers on page 10 of your notes.

1) You wish to choose a sample of size three from the following employees at a small company. Using line 1, select this sample.

- | | | | |
|--------------|--------------|-------------|------------|
| 1. Anderson | 2. Carlson | 3. Lloyd | 4. Sherman |
| 5. Jaramillo | 6. Schroeder | 7. Williams | 8. Wolfe |

2) 62 people volunteer to participate in an experiment, but only five experimental units are needed. The volunteers are numbered 1 to 62. Using line 2, choose which five volunteers will be subjects in the experiment.

3) There are 779 schools in Nevada. A survey is going to be conducted, and 50 schools will be randomly chosen to participate in the survey. Each school is numbered from 1 to 779. Find the first four schools (their numbers) in the sample. Use line 4.