

#1 Identify the population, variable and statistic.

A researcher wants to estimate the average height of women aged 20 years or older. From a simple random sample of 45 women, the researcher obtains a sample mean height of 63.9 inches.

population: all women aged 20 or older

Variable: average height

statistic: average height of 63.9 inches

#2 Identify the population, variable and statistic.

A nutritionist wants to estimate the mean amount of sodium consumed by children under the age of 10. From a random sample of 75 children under the age of 10, the nutritionist obtains a sample mean of 2993 milligrams of sodium consumed.

population: all children under 10

variable: mean amount of sodium consumed

statistic: mean amount of 2993 mg of sodium consumed

#3 Identify the population, variable and statistic.

Nexium is a drug that can be used to reduce the acid produced by the body and heal damage to the esophagus. A researcher wants to estimate the proportion of patients taking Nexium that are healed within 8 weeks. A random sample of 224 patients suffering from acid reflux disease is obtained, and 213 of those patients were healed after 8 weeks.

population: all patients who take Nexium

variable: proportion healed by Nexium in 8 weeks

statistic: 0.951 is the proportion healed by Nexium

$$\frac{213}{224}$$

→ whether or not healed in 8 weeks is ok

#4 Identify the population, variable and statistic.

A researcher wants to estimate the average farm size in Kansas. From a simple random sample of 40 farms, the researcher obtains a sample mean farm size of 731 acres.

population: all farms in  
Kansas

Variable: average farm size

statistic: mean farm size  
of 731 acres

#5 Identify the population, variable and statistic.

An energy official wants to estimate the average oil output per well in the United States. From a random sample of 50 wells throughout the United States, the official obtains a sample mean of 10.7 barrels per day.

population: all oil wells in  
the US

Variable: average oil output  
per well

statistic: mean oil output  
of 10.7 barrels

#6 Identify the population, variable and statistic.

An education official wants to estimate the proportion of adults aged 18 or older who had read at least one book during the previous year. A random sample of 1006 adults aged 18 or older is obtained, and 835 of those adults had read at least one book during the previous year.

population: all adults aged  
18 or older

variable: proportion who read  
at least 1 book last yr.

statistic: 0.830 is the proportion  
who read at least  
1 book last yr.

$$\frac{835}{1006}$$

#7 Identify the population, variable and statistic.

The International Dairy Foods Association (IDFA) wants to estimate the average amount of calcium male teenagers consume. From a random sample of 50 male teenagers, the IDFA obtained a sample mean of 1081 milligrams of calcium consumed.

population: all male teenagers

variable: average amount of calcium consumed

Statistic: mean amount of 1081 mg of calcium consumed

#8 Identify the population, variable and statistic.

A sociologist wants to the proportion of adults with children under the age of 18 that eat dinner together 7 nights a week. A simple random sample of 1122 adults with children under the age of 18 was obtained, and 337 of those adults reported eating dinner together with their families 7 nights a week.

population: all adults with children under 18

Variable: proportion who eat dinner together 7 times

Statistic: .3000 is the proportion who ate together per wk

$$\frac{337}{1122}$$

#9 Identify the population, variable and statistic.

A school administrator wants to estimate the mean score on the verbal portion of the SAT for students whose first language is not English. From a simple random sample of 20 students whose first language is not English, the administrator obtains a sample mean SAT verbal score of 458.

population: all student at the school whose 1st language is not English

variable: mean score on verbal portion of the SAT

Statistic: mean SAT verbal score of 458

**Types of Studies**

**1. Determine whether the following represent an experiment or an observational study.**

a. Xavier wonders about the effects of listening to classical music while studying. He randomly assigns students to listen to classical music while they study and another group to study in a quiet room. What type of study is he performing?  
**experiment**

b. Kayla wonders if athletes perform better in Math or Language Arts classes. She recruits 50 athletes from her school to take a basic test in each subject and compares results. What type of study is she performing?  
**observational study**

c. Hunter wonders what cafeteria food high school students prefer. He goes around the lunch room during all 4 lunch periods and randomly asks 50 students in each what their preference is. What type of study is he performing?  
**observational study**

**Vocabulary**

**Individuals, Variables, Quantitative, Categorical, Census, Population**

2. a. What is the difference between a population and a sample?

**A population is the whole group  
and a sample is part of the population**

b. What is the difference between a sample survey and a census?

**surveys  
a sample**      **samples a  
population**

3. On the first day of school, Ms. Morel asked her students 32 various questions

a. What were the individuals in this survey?

**Students**

b. List 4 questions she could have asked that yielded quantitative variables.

**answers may vary**

c. List 4 questions she could have asked that yielded categorical data.

**answers may vary**

4. Here are some nutritional data about four popular fast food burgers:

| Burger                         | Restaurant  | Calories | Fat | Cholesterol | Sodium |
|--------------------------------|-------------|----------|-----|-------------|--------|
| Quarter Pounder with cheese    | McDonald's  | 430      | 30  | 95          | 1310   |
| Classic Single with everything | Wendy's     | 410      | 19  | 70          | 890    |
| Whopper with cheese            | Burger King | 706      | 43  | 113         | 1164   |
| Cheeseburger                   | In-N-Out    | 480      | 27  | 60          | 1000   |

a. What are the individuals?

the burgers

b. What are the variables? Identify each as quantitative or categorical.

Restaurant → C

Calories → Q

Fat → Q

Chol. → Q

Sodium → Q

### Statistical Problem-Solving Process

**Ask a question (hypothesis), Collect Data (procedure), Analyze Data, Interpret Data (Conclusion)**

5. Psychologists designed a study involving 47 experienced creative writers who were college students. Students were divided into two groups using a chance process (like drawings name from a hat). The students in one group were given a list of statements about external reasons for writing, like public recognition, making money, or pleasing their parents. Students in the other group were given a list of statements about internal reasons for writing, such as expressing yourself and enjoying working with words. Both groups were then instructed to write a poem about laughter. Each student's poem was rated separately by 12 different poets using a creativity scale.

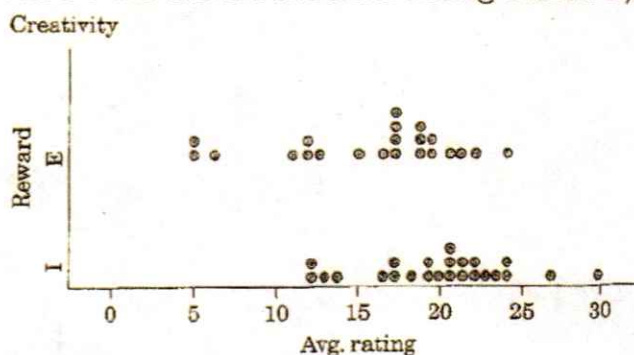
a) What is a good question of interest for this study?

Does intrinsic vs. extrinsic motivation impact creativity?

b) What type of study was this?

experiment

Here's the data collected during this study:



c) Analyze the data (what do you notice?):

→ intrinsic motivation is more creative

→ results are similar

d) Interpret the results (draw a conclusion):

motivation can impact creativity, but other factors

6. According to scientists, a typical cow burps about every 40 seconds. When cows burp, they release methane gas this is built up while digesting their food. Some estimates suggest that livestock produce over 25% of methane emissions each year. Researchers in Germany have developed a pill this is designed to reduce the amount of methane that cows produce.

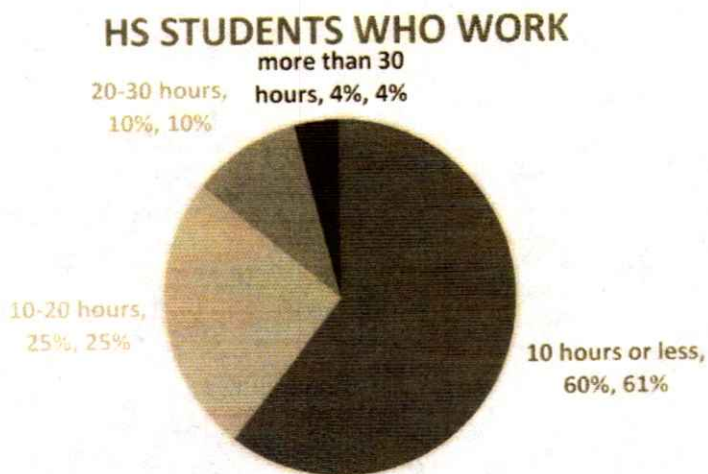
a. What would be a reasonable question of interest?

Does the new pill reduce methane that cows produce?

b. What type of study would be better: an observational study or an experiment? Explain.

An experiment → it can prove the impact of the new pill

7. The following pie chart shows GPA of high school students who work at least 10 hours per week.



a. What would be a reasonable question of interest in this case?

How many hrs. per week do teens work?

b. Do you think these results were obtained using on observational or experimental study? Why?

Observational study

c. Who are the individuals?

Students surveyed

8. You are interested in the proportion of 75 Statistical Reasoning students that will end up with an A this semester. You ask the 30 students, just in your class, at the end of the year and you conclude that 60% of those students receives an A. Identify the

- a. population: 75 Stats students
- b. parameter: % that get an A
- c. sample: 30 stats students
- d. statistic: 60% get an A

9. The mean income of all subscribers to a particular magazine is \$26000. We draw a random sample of 100 subscribers and find that their mean income is \$27300. Identify the

- e. population: all subscribers
- f. parameter: \$26,000
- g. sample: 100 subscribers
- h. statistic: \$27,300

10. For the studies described, identify the population and sample:

- a. In a USA Today Internet poll, readers responded voluntarily to the question "Do you consume at least one caffeinated beverage every day?"

population: all readers

sample: readers who responded

- b. Astronomers typically determine the distance to galaxy (a galaxy is a huge collection of billions of stars) by measuring the distances to just a few stars within it and taking the mean (average) of these distance measurements.

population: all stars

sample: selected few stars

11. Identify the population and the sample in each of the following situations.

- a. A realtor is interested in the median selling price of homes in Worcester County, Massachusetts. She collects data on the selling prices of 50 homes.

population: all homes in Worcester Co.

sample: 50 homes

- b. A psychologist is concerned about the health of veterans who served in combat. She examines 25 veterans to assess whether or not they are showing signs of post-traumatic stress disorder (PTSD).

population: all veterans who served in combat

sample: 25 veterans

- c. An educator asks 20 seniors from Eastern Connecticut State University whether or not they had taken an online course while at the university.

population: all seniors at ECSU

sample: 20 seniors at ECSU

12. Choose the type of Study that is most likely to be used (each is used just once).

(Exp) Experimental (Cen) Census (Obs) Observational

Cen a) You want to know how many pets the teachers at Phoenix High School own.

Exp b) A drug is given to 15 patients and a placebo to another group to determine its effect on an illness.

Obs c) You are doing a study at a mall in which you are counting the number of men that wash their hands after using the restroom.

Sample survey d) You need data on the average number of hours worked per week by an American teenager with a part-time job.

13. A mathematics teacher wanted to determine whether assigning homework had a beneficial effect on student academic performance. His class met at 2:00 in the afternoon and he obtained the cooperation of another teacher of the same class that met at 8:00 in the morning. He gave his class no homework while the other teacher continued to assign homework as he usually did. Both teachers gave the same tests so that they could compare the results.

a) Is the study observational or experimental?

experiment

b) What is the variable of interest?

test scores

14. The student newspaper runs a weekly anonymous question that readers can answer online or by campus mail. One question was "Do you think North Cobb is doing enough to prepare students for college?" Of the 176 people who responded, 35% said "No." The number 35% is a

(a) statistic

(b) parameter

(c) sample

(d) average



16. In Super Bowl XXXVII, the Tampa Bay Buccaneers defeated the Oakland Raiders. Here is a portion of Tampa Bay's team roster:

|                  | No. | Pos. | Ht. | Wt. | Birth date | Exp. | College       |
|------------------|-----|------|-----|-----|------------|------|---------------|
| Brad Johnson     | 14  | QB   | 77  | 224 | 09/13/68   | 9    | Florida State |
| Warren Sapp      | 99  | DT   | 74  | 303 | 12/06/72   | 8    | Miami         |
| Martin Gramatica | 7   | K    | 68  | 170 | 11/27/75   | 4    | Kansas State  |
| Tom Tupa         | 9   | P    | 76  | 235 | 02/06/66   | 14   | Ohio          |

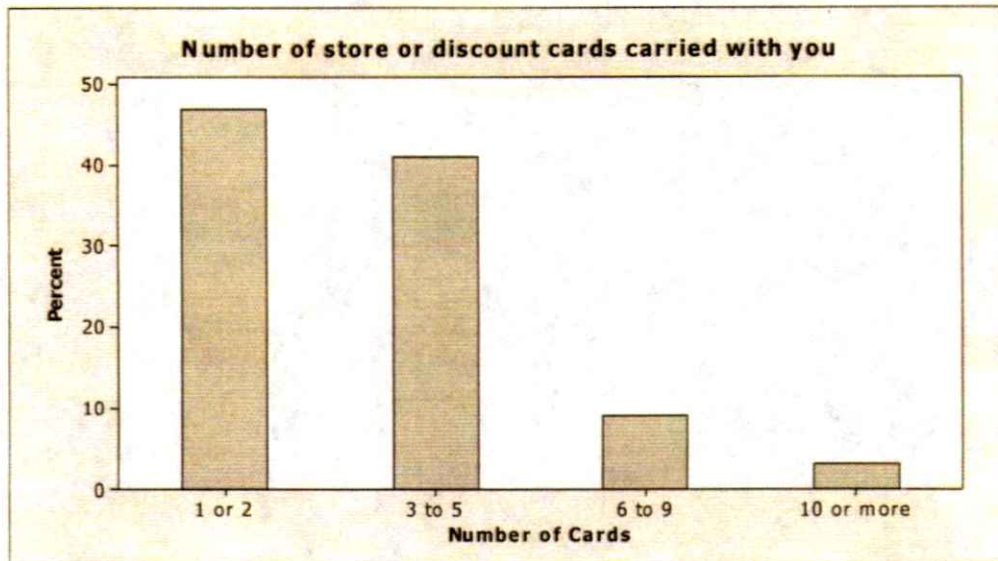
(a) What individuals does this data set describe?

players

(b) How many variables does the data set contain? Identify each as categorical or quantitative.

7  
 no. → Q      wt. → Q      College → C  
 pos. → C      Birthdate → C  
 Ht. → Q      Exp. → Q

17. In October 2007, 543 randomly selected subscribers of the Money Management magazine of a national consumer organization were asked how many store membership or discount/buying bonus cards they carried with them. The bar chart below summarizes the data.



(a) Is this an observational study or an experiment? Justify your answer.

observational study

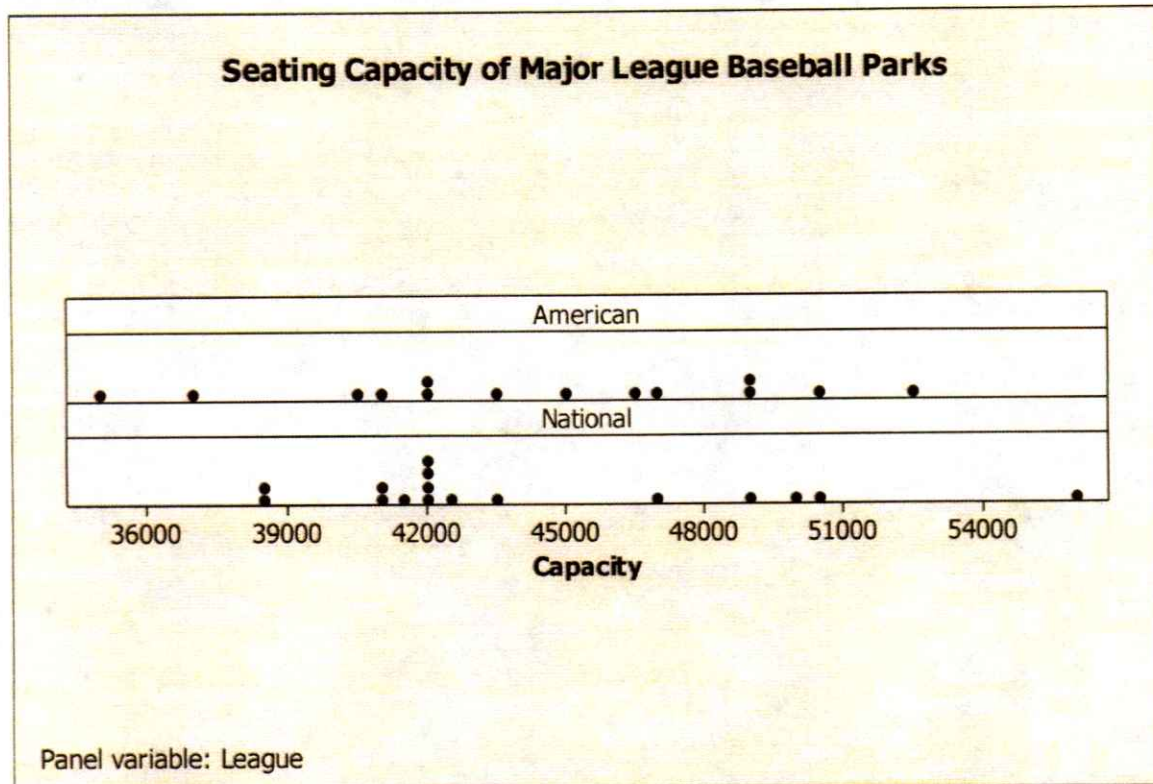
(b) Approximately what percent of the surveyed subscribers carry 5 or less cards with them?

85%

(c) Do you think that this survey will tell you about the number of store or discount/bonus buying cards carried by U.S. consumers in general? Explain your answer.

No → people who subscribe to Money Management probably have more savings cards

18. Below are the dotplots of the stadium capacity of all major league baseball teams in 2008 organized by National and American Leagues.



(a) Is this a sample or a census? Explain your answer.

Census → all teams are represented

(b) In a few sentences compare the seating capacity of American League versus National League baseball stadiums.

- NL has the largest capacity
- NL and AL have a similar spread
- 42,000 is the most common capacity in the NL

\*answers may vary\*