

Bellwork:

Find a question of interest about the school population. Collect a random sample about the question of interest. Determine what inferences can be made about the population from that sample

If you could have a front row ticket to one of the following sports, which would you pick?

Baseball	Basketball	Football	Soccer
$\begin{array}{r} 34 \\ \hline 130 \\ .2615 \end{array}$	$\begin{array}{r} 31 \\ \hline 130 \\ .2384 \end{array}$	$\begin{array}{r} 39 \\ \hline 130 \\ .3 \end{array}$	$\begin{array}{r} 26 \\ \hline 130 \\ .2 \end{array}$

Lesson 9.3 Solutions

$$1. \text{ mode}=32 \text{ med}=32 \bar{x}=31.28 q_1=28.45 \\ q_3=33.05 \text{ IQR}=4.6 S_x=3.32$$

$$2. \text{ mode}=5.75 \text{ med}=6.75 \bar{x}=6.89 q_1=5.75 \\ q_3=7.75 \text{ IQR}=2 S_x=1.19$$

$$3. \text{ mode}=23600 \text{ med}=24500 \bar{x}=25000 q_1=23900 \\ q_3=25600 \text{ IQR}=1300 S_x=1327.9$$

$$4. \text{ mode}=7 \text{ med}=8 \bar{x}=8.35 q_1=7 q_3=10 \text{ IQR}=3 \\ S_x=1.45$$

$$5. \text{ mode}=2 \text{ med}=2 \bar{x}=2.45 q_1=2 q_3=3 \text{ IQR}=1 \\ S_x=1.06$$

$$6. \text{ mode}=15 \text{ med}=16 \bar{x}=15.98 q_1=15 q_3=17 \\ \text{IQR}=2 S_x=2.95$$

Homework 9-4 Solutions

1.
 - a. all eligible voters in Utah
 - b. all eligible voters in 15 state house districts
 - c. percentage of people who vote in Utah
2.
 - a. teenage listeners
 - b. 300 students
 - c. Preferred music
3.
 - a. all Utahns over the age of 12
 - b. 1200 Utahns over the age of 12
 - c. the average amount of time they spend exercising
4. Stratified Sampling, unbiased because each type of student is represented.
5. it is a convenience sampling and it is biased because they are conducting the survey outside of an arts program so arts supporters will be overrepresented
6. SRS, unbiased because each student has an equal chance of getting picked
7. survey, if the sample size is large enough the results can be applied to the population
9. experiment, if the sample size is large enough the results can be applied to the population
11. population survey, if the new customers were selected randomly then the results can be applied to all new customers

Lesson 9.5 Objectives:

I can identify the difference between surveys, experiments, and observational studies.

The **theoretical probability** of an event occurring is the ratio of favorable outcomes to the total possible outcomes

$$P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$$

This is what should happen in theory.

The probability that we calculate from data we collect is called the **experimental probability**.

$$\frac{2}{2} \quad P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{number of trials}}$$

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This will not always match the theoretical probability.

Sample Surveys

The purpose of a sample survey is to gather information about the sample by means of a survey. There are several advantages to using a survey. Surveys are inexpensive and can collect a large amount of data representative of the population. They can be done in a variety of forms and about a variety of topics. Surveys also have the ability to focus only on the necessary information. However, surveys are flawed by non-responders since a survey is generally voluntary; people have the option not to participate. Additionally, people in a survey know that they are being studied and they may not be as honest in their responses as they would be if they were not being studied. Surveys are also open to interpretation and bias. Surveys can be written in a way that biases the responders. Also questions can be interpreted differently than intended by those responding to the survey.

Surveys can be administered with randomization methods, such as simple random sampling, cluster sampling, multistage sampling, stratified sampling, or systematic sampling all of which would ensure that the sample is random and representative of the overall population.

Experiments

The purpose of an experiment is to assign a treatment, using control over some of the conditions in order to gather data about the treatment's effectiveness. An experiment is the only way to establish causation. When an experiment is designed, all of the variables are controlled. This allows the experimenter to demonstrate that a change in one variable causes the change in another variable. There are drawbacks to experiments. They can be very expensive and time consuming. Ethics may be questioned especially if animals or people are used in the experiment. Experiments must not intentionally harm any of the subjects. The attitude and behavior of those conducting the experiment can also affect the results.

It is imperative that randomization is used when assigning subjects to their treatment groups. Each group needs to be representative of the overall population.

Observational Studies

The purpose of an observational study is to observe subjects in their natural environment without their knowledge and without assigning treatments to the subjects. There are some advantages to using an observational study. It is simple and inexpensive to conduct. It provides deeper and richer information than a survey because the observer is seeing behavior firsthand and is able to observe the process not just the result. There are also some disadvantages. The results cannot prove causation nor can they be applied to the general population. It is only representative of those being studied. The results are subjective and open to interpretation by the observer. There may also be a question of ethics, especially if people are involved. People have a right to privacy and the observational study must not infringe upon the rights and expectations of people.

If you are doing the study in the present, you can randomize the individuals involved. If you are gathering data from past records, there is no chance for randomization.

Example 1:

Which type of study method is described in each situation? Should the sample statistics be used to make a general conclusion about the population?

- a. Researchers randomly choose two groups from 20 volunteers. Over a period of 6 weeks, one group works on a computer for an hour right before going to sleep, and the other does not. Volunteers wear monitoring devices while sleeping, and researchers record their quality of sleep. *Experiment - Sample too small - NO.*

- b. Students in an elementary class observe the growth of some newly hatched chickens. *Observational Study - NO.*

- c. Market researchers want to know if people like the new store at the local mall. They ask every fourth person who enters the mall if they like the new store.

Survey - No because convenience sampling was used.

