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Algebra II

## Statistical Studies

1. Which scenario is best described as an observational study?

1) For a class project, students in Health class ask every tenth student entering the school if they eat breakfast in the morning. Survey

3) A researcher wants to learn whether or not there is a link between children's daily amount of physical activity and their overall energy level. During lunch at the local high school, she distributed a short questionnaire to students in the cafeteria. Survey

2) A social researcher wants to learn whether or not there is a link between attendance and grades. She gathers data from 15 school districts.

4) Sixty seniors taking a course in Advanced Algebra Concepts are randomly divided into two classes. One class uses a graphing calculator all the time, and the other class never uses graphing calculators. A guidance counselor wants to determine whether there is a link between graphing calculator use and students' final exam grades.

Treatment  
Controlled  
Experiment

2. A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study best describes this situation?

- 1) census
- 2) survey
- 3) observation
- 4) controlled experiment

Treatment  
Controlled experiment

3. Which task is *not* a component of an observational study?

- 1) The researcher decides who will make up the sample.
- 2) The researcher analyzes the data received from the sample.
- 3) The researcher gathers data from the sample, using surveys or taking measurements.
- 4) The researcher divides the sample into two groups, with one group acting as a control group.

Controlled experiment

4. Which statement about statistical analysis is *false*?

- 1) Experiments can suggest patterns and relationships in data.
- 2) Experiments can determine cause and effect relationships.
- 3) Observational studies can determine cause and effect relationships.
- 4) Observational studies can suggest patterns and relationships in data.

only controlled experiments

ask them  
5. A market research firm needs to collect data on viewer preferences for local news programming in Buffalo. Which method of data collection is most appropriate?

- 1) census
- ~~2) survey~~
- 3) observation
- 4) controlled experiment

6. A school cafeteria has five different lunch periods. The cafeteria staff wants to find out which items on the menu are most popular, so they give every student in the first lunch period a list of questions to answer in order to collect data to represent the school. Which type of study does this represent?

- 1) observation → Survey
- 2) controlled experiment
- 3) population survey → Census. not practical
- ~~4) sample survey~~

7. Is the following an observational study or an experiment? Explain your answer.

- a) A study is done to see how high soda will erupt when mint candies are dropped into two-liter bottles of soda. You want to compare using one mint candy, five mint candies, and 10 mint candies. You design a cylindrical mechanism, which drops the desired number of mint candies all at once. You have 15 bottles of soda to use. You randomly assign five bottles into which you drop one candy, five into which you drop five candies, and five into which you drop 10 candies. For each bottle, you record the height of the eruption created after the candies are dropped into it.

→ Treatment  
Controlled experiment

- b) You want to see if fifth-grade boys or fifth-grade girls are faster at solving Ken-Ken puzzles. You randomly select twenty fifth-grade boys and twenty fifth-grade girls from fifth graders in your school district. You time and record how long it takes each student to solve the same Ken-Ken puzzle correctly.

observational study

you did not apply a treatment

8. Suppose that in your health class you read two studies on the relationship between eating breakfast and success in school for elementary school children. Both studies concluded that eating breakfast causes elementary school children to be successful in school.

- a) Suppose that one of the studies was an observational study. Describe how you would recognize that they had conducted an observational study. Were the researchers correct in their causal conclusion?

they did not administer a treatment. No, observational studies cannot establish causation, only correlation.

- b) Suppose that one of the studies was an experiment. Describe how you would recognize that they had conducted an experiment. Were the researchers correct in their causal conclusion?

A treatment was applied. Breakfast would be given to one group but not the other.

9. Data from a random sample of 50 students in a school district showed a positive relationship between reading score on a standardized reading exam and shoe size. Can it be concluded that having bigger feet causes one to have a higher reading score? Explain your answer.

No, only a controlled experiment can establish causation. This was an observational study.

10. Howard collected fish eggs from a pond behind his house so he could determine whether sunlight had an effect on how many of the eggs hatched. After he collected the eggs, he divided them into two tanks. He put both tanks outside near the pond, and he covered one of the tanks with a box to block out all sunlight. State whether Howard's investigation was an example of a controlled experiment, an observation, or a survey. Justify your response.

Controlled experiment. He administered a treatment (sunlight).

11. Darryl conducted a study comparing the statistics of baseball players in the steroid era compared to the non steroid era. Would this investigation be an example of a controlled experiment, an observation, or a survey? Justify your response.

Observational study. He did not give people steroids (apply a treatment)

12. Todd bought a bag of magic soil at a carnival that is supposed to grow plants without sunlight. What type of study would he perform to determine if the magic soil works?

Controlled experiment is the only way to determine if the soil causes the plants to grow

Use the following scenarios for Problems 13–15.

- A. Researchers want to determine if there is a relationship between whether or not a woman smoked during pregnancy and the birth weight of her baby. Researchers examined records for the past five years at a large hospital.
- B. A large high school wants to know the proportion of students who currently use illegal drugs. Uniformed police officers asked a random sample of 200 students about their drug use.
- C. A company develops a new dog food. The company wants to know if dogs would prefer its new food over the competition's dog food. One hundred dogs, who were food deprived overnight, were given equal amounts of the two dog foods: the new food versus the competitor's food. The proportion of dogs preferring the new food versus the competitor's was recorded.

13. Which scenario above describes an experiment? Explain why.

C. A treatment was applied (dog food)

14. Which scenario describes a survey? Will the results of the survey be accurate?

Why or why not?

B. The officers asked people. No, students wouldn't tell police officers they did something illegal.

15. The remaining scenario is an observational study. Is it possible to perform an experiment to determine if a relationship exists? Why or why not?

It would not be ethical to give pregnant women cigarettes