Name _____ Date _____

LESSON 6.5

Study Guide

For use with the lesson "Compare Surveys, Experiments, and Observational Studies"

GOAL **Learn how studies are used to collect data.**

Vocabulary

Survey questions that are flawed in a way that leads to inaccurate results are called **biased questions**.

An **experiment** imposes a treatment on individuals in order to collect data on their response to the treatment. An **observational study** observes individuals and measures variables without controlling the individuals or their environment.

In a **controlled experiment**, two groups are studied under identical conditions with the exception of one variable. The group under ordinary conditions is the **control group**. The group that is subjected to the treatment is the **treatment group**.

In a **randomized comparative experiment**, individuals are randomly assigned to the control group or the treatment group.

EXAMPLE 1 Identify and correct bias in survey questioning

A survey question asks, "Are you in favor of closing the library, our town's most historic and valuable resource, one day a week to reduce taxes?" Tell why the question may be biased or otherwise introduce bias into the survey. *Describe* a way to correct the flaw.

Solution

The wording of the question implies that closing the library one day a week is the wrong thing to do. A better question is "Are you in favor of closing the library one day a week to reduce taxes?"

Exercise for Example 1

1. A survey question asks, "Do you agree with the proposed law about skateboarding at the local park?" Tell why the question may be biased or otherwise introduce bias into the survey. *Explain*.

EXAMPLE 2 Identify experiments and observational studies

A doctor asks her patients how much they exercise each week, and then investigates the relationship between her patients' exercise frequency and blood pressure. Determine whether this is an example of an experiment or an observational study. *Explain*.

Solution

The doctor gathers data without controlling the individuals or applying a treatment. This is an observational study.

LESSON 6.5

Study Guide *continued*

For use with the lesson "Compare Surveys, Experiments, and Observational Studies"

EXAMPLE 3 Evaluate a published report

Determine whether the study at the right is a randomized comparative experiment. If it is, describe the treatment, the treatment group, and the control group. If it is not, explain why not and discuss whether the conclusions drawn from the study are valid.

Solution

The study is a randomized comparative experiment because the cars are randomly selected for the control and treatment groups. The treatment is applying the new car wax, the treatment group is the cars that had wax applied, and the control group is the cars that did not have wax applied.

Prevent Scratches on Your Car!

A new car wax can prevent scratches on your car. A study monitored 150 new cars randomly divided into two groups. The new car wax was applied to the cars in one group, but not applied to the cars in the other group. Cars treated with the new wax had 88% fewer scratches after being tested under the same conditions.

EXAMPLE 4 Design an experiment or observational study

You want to know if treating a lawn with weed control in the fall will prevent weed growth in the spring. Explain whether this topic is best investigated through an experiment or an observational study. Then explain how you would design the experiment or observational study.

Use an experiment. Apply the weed control (treatment) to a randomly chosen group of lawns (treatment group) in the fall. Do not apply the weed control to another randomly chosen group of lawns (control group), but otherwise make sure both groups of lawns receive the same treatment. In the spring, monitor the weed growth in both groups of lawns.

Exercises for Examples 2, 3, and 4

2. Determine whether the study at the right is an example of an observational study or a randomized comparative experiment. *Explain*.

3. If your answer to Exercise 2 was "randomized comparative experiment," describe the treatment, the treatment group, and the control group. If your answer was "observational study," discuss whether it is valid to conclude from the study that living in a city with poor air quality causes heart disease.

4. Explain whether the following research topic is best investigated through an experiment or an observational study. Then explain how you would design the experiment or observational study.

You want to know if texting while driving increases traffic accidents in a city.

Pollution and Heart Disease

A researcher examined the health records of 500 people who live in cities with poor air quality and 500 people who live in areas with good air quality. The researcher found that there are 15% more people with heart disease in areas with poor air quality than in areas with good air quality.