

Lesson A Guided Notes

Population and Sample

_____ is the study of procedures for collecting, describing, and drawing conclusions from information.

A _____ is the entire collection of individuals about which information is sought.

A _____ is a subset of a population, containing the individuals that are actually observed.

Statistic and Parameter

A _____ is a number that describes a sample.

A _____ is a number that describes a population.

Example 1 Which of the following is a statistic and which is a parameter?

- a. 57% of the teachers at Central High School are female.

- b. In a sample of 100 surgery patients who were given a new pain reliever, 78% of them reported significant pain relief.

_____ are individuals who are studied. These can be people, animals, plants, or things. When the experimental units are people, they are sometimes called _____.

The _____, or _____, is what is measured on each experimental unit.

_____ are the procedures applied to each experimental unit.

Example 2 Suppose that scientists want to determine which of three types of seed will result in the largest wheat yield. The study is conducted as follows:

- Prepare three identically sized plots of land, with similar soil types.
- Plant each type of seed on a different plot, choosing the plots at random.
- Water and fertilize the plots in the same way.
- Harvest the wheat, and measure the amount grown on each plot.
- If one type of seed produces substantially more (or less) wheat than the others, then that one is clearly better (or worse) than the others.

The **experimental units** are _____.

The **treatments** are _____.

The **outcome** is _____.

Randomized Experiment & Observational Study

A **randomized experiment** is a study in which the investigator assigns the treatments to the experimental units at random.

An **observational study** is one in which the assignment to treatment groups is not made by the investigator.

Example 3 To assess the effectiveness of a new method for teaching arithmetic to elementary school children, a simple random sample of 30 first graders were taught with the new method, and another simple random sample of 30 first graders were taught with the currently used method. At the end of eight weeks, the children were given a test to assess their knowledge. What are the treatments in this study? Explain why this is a randomized experiment.

Example 4 A study is performed to determine how smoking affects people's health. In this study, people cannot be assigned to smoke. Instead, people choose for themselves whether or not to smoke, and scientists observe differences in health outcomes between groups of smokers and nonsmokers.

Why Randomize?

In a perfect study, treatment groups would not differ from each other in any important way except that they receive different treatments. Then, if the outcomes differ among the groups, the differences in outcome must have been caused by differences in treatment.

In practice, it is impossible to construct treatment groups that are exactly alike, but randomization does the next best thing. In a randomized experiment, any differences between the groups are likely to be small. Therefore, if there are large differences in outcomes among the treatment groups, we can conclude that the differences are due to the treatments.