LAB 28 Conducting an Experiment

In this lab, you will design and conduct an experiment, and compare statistics from two samples.

Conducting An Experiment

1. Define and design the experiment. Determine the control group and the treatment group, and randomly assign individuals to groups.
2. Perform the experiment and collect data.
3. Organize and display the data.
4. Analyze the data to develop statistics.
5. Conduct a *t*-test.

STEP 1 Define and design the experiment. Determine the control group and the treatment group, and randomly assign individuals to groups.

EXAMPLE You want to find out if students who take math tests do better when they are allowed to use a reference sheet that provides formulas or other information. Design the experiment as shown.

Experiment

- A control group of classmates will take a 10-question quiz on fraction operations without a reference sheet.
- A treatment group of classmates will take the same quiz and be provided with a reference sheet that summarizes fraction operations.
- Students for the two groups will be selected by putting the names of all classmates in a hat and choosing names at random for the two groups.

a. What is the purpose of your experiment?

b. Describe your control group and treatment group. Explain how you will choose individuals for each group.

c. Is your experiment a randomized comparative experiment? Why or why not?

STEP 2 Perform the experiment and collect data.

EXAMPLE Give the quiz to the control group and the treatment group under the same conditions. Grade the quizzes and collect the scores, as shown.

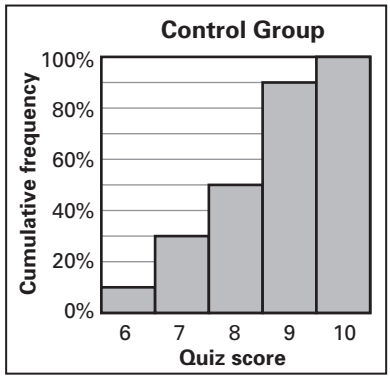
Control group	6	9	9	8	7	10	9	8	9	7
Treatment group	7	10	9	9	7	9	8	10	9	7

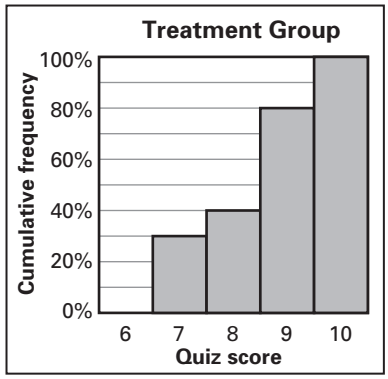
a. What is the variable for your experiment? Is it continuous or discrete?

b. What should you do to ensure that your experiment is free of bias?

STEP 3 Organize and display the data.

EXAMPLE You can use cumulative frequency distributions to display the quiz data.





a. What conclusions can you make from your data displays?

b. What conclusions can you make using percentiles? For example, how does the 80th percentile for the treatment group compare to the 80th percentile for the control group?

STEP 4 Analyze the data to develop statistics.

EXAMPLE Enter the data for the control group in a calculator as list L1. Enter the data for the treatment group as list L2. Use the **1-Var Stats** function to find the mean and standard deviation for each group, as shown.

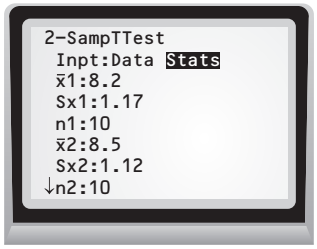
	Control group	Treatment group
Mean	8.2	8.5
Standard deviation	1.17	1.11

a. What is the mean and standard deviation for each group?

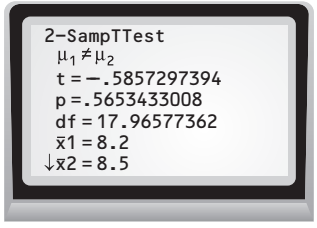
b. What conclusions, if any, can you make using these statistics?

STEP 5 Conduct a *t*-test.

A *t-test* determines whether differences in statistics from two samples are likely to be caused by chance. The test returns a *p*-value, which measures the probability that the differences are due to chance. In general, a *p*-value less than 0.05 means that the differences are *not* likely to be due to chance.



EXAMPLE Use the calculator's two-sample *t*-test by entering the mean, standard deviation, and sample size for each sample. The *p*-value is 0.57, which is greater than 0.05, so any differences in the samples' statistics are likely to be due to chance. You *cannot* conclude that having a reference sheet made a statistically significant difference in quiz scores.



a. What *p*-value for do you get? What does it tell you?

b. What conclusions can you draw from your experiment?

What Do You Think?

1. Which of the data displays, statistics, or analyses gave you the most useful information about the results of your experiment? Explain.
2. Do you think you would get similar results if you repeated your experiment with different individuals? Why or why not?