

1. The Better Business Council of a large city has concluded that students in the city's schools are not learning enough about economics to function in the modern world. These findings were based on test results from a random sample of 20 twelfth-grade students who completed a 46-question multiple-choice test on basic economic concepts. The data set below shows the number of questions that each of the 20 students in the sample answered correctly.

2007(B)

12	16	18	17	18	33	41	44	38	35
19	36	19	13	43	8	16	14	10	9

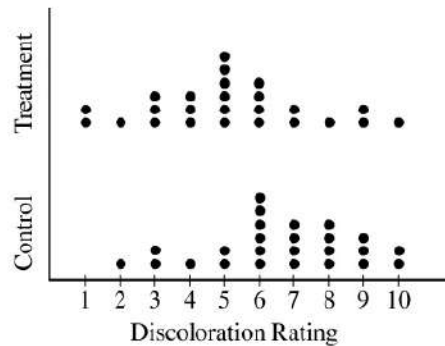
- (a) Display these data in a stemplot.
- (b) Use your stemplot from part (a) to describe the main features of this score distribution.
- (c) Why would it be misleading to report only a measure of center for this score distribution?

1. The department of agriculture at a university was interested in determining whether a preservative was effective in reducing discoloration in frozen strawberries. A sample of 50 ripe strawberries was prepared for freezing. Then the sample was randomly divided into two groups of 25 strawberries each. Each strawberry was placed into a small plastic bag.

The 25 bags in the control group were sealed. The preservative was added to the 25 bags containing strawberries in the treatment group, and then those bags were sealed. All bags were stored at 0°C for a period of 6 months. At the end of this time, after the strawberries were thawed, a technician rated each strawberry's discoloration from 1 to 10, with a low score indicating little discoloration.

The dotplots below show the distributions of discoloration rating for the control and treatment groups.

2007



- (a) The standard deviation of ratings for the control group is 2.141. Explain how this value summarizes variability in the control group.
- (b) Based on the dotplots, comment on the effectiveness of the preservative in lowering the amount of discoloration in strawberries. (No calculations are necessary.)
- (c) Researchers at the university decided to calculate a 95 percent confidence interval for the difference in mean discoloration rating between strawberries that were not treated with preservative and those that were treated with preservative. The confidence interval they obtained was (0.16, 2.72). Assume that the conditions necessary for the t -confidence interval are met.

Based on the confidence interval, comment on whether there would be a difference in the population mean discoloration ratings for the treated and untreated strawberries.

1. A consumer advocate conducted a test of two popular gasoline additives, A and B. There are claims that the use of either of these additives will increase gasoline mileage in cars. A random sample of 30 cars was selected. Each car was filled with gasoline and the cars were run under the same driving conditions until the gas tanks were empty. The distance traveled was recorded for each car.

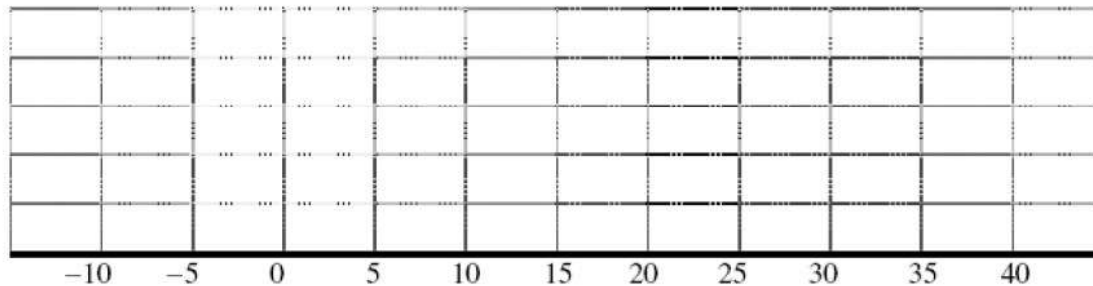
Additive A was randomly assigned to 15 of the cars and additive B was randomly assigned to the other 15 cars. The gas tank of each car was filled with gasoline and the assigned additive. The cars were again run under the same driving conditions until the tanks were empty. The distance traveled was recorded and the difference in the distance with the additive minus the distance without the additive for each car was calculated.

The following table summarizes the calculated differences. Note that negative values indicate less distance was traveled with the additive than without the additive.

2004

Additive	Values Below Q_1	Q_1	Median	Q_3	Values Above Q_3
A	-10, -8, -2	1	3	4	5, 7, 9
B	-5, -3, -3	-2	1	25	35, 37, 40

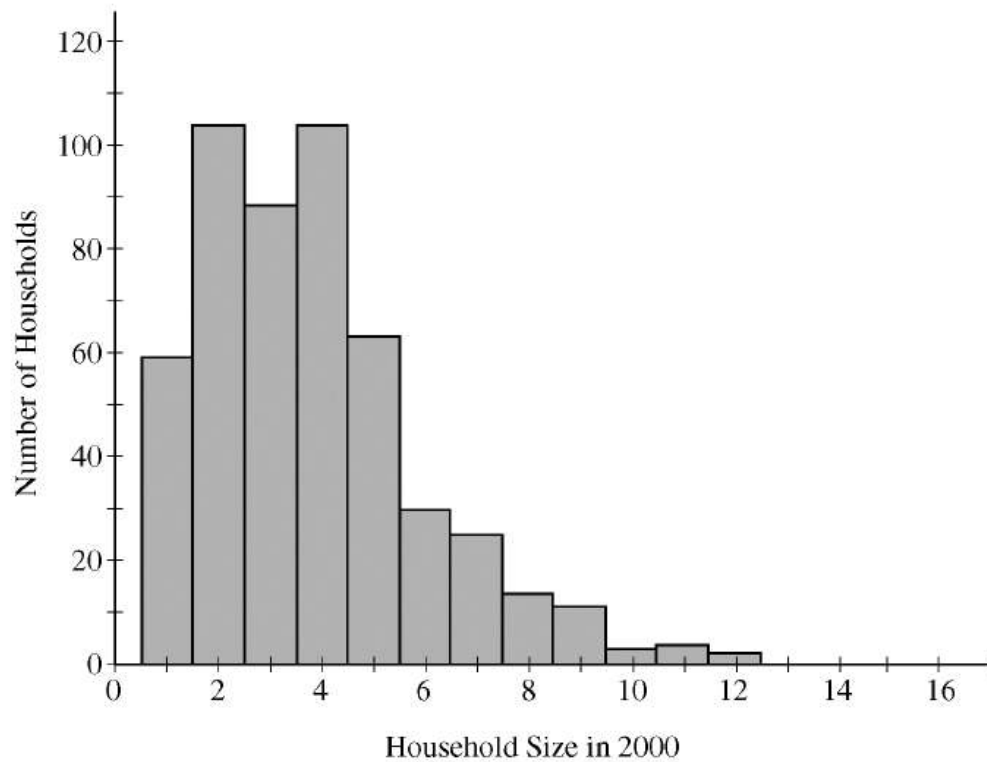
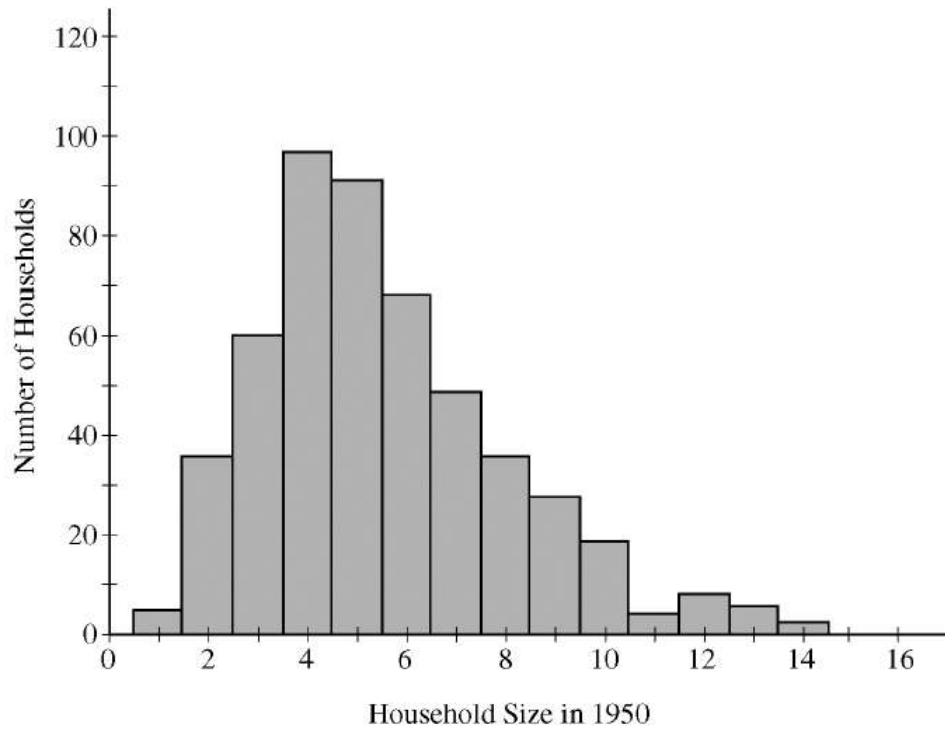
- (a) On the grid below, display parallel boxplots (showing outliers, if any) of the differences of the two additives.



- (b) Two ways that the effectiveness of a gasoline additive can be evaluated are by looking at either
- the proportion of cars that have increased gas mileage when the additive is used in those cars
 - or
 - the mean increase in gas mileage when the additive is used in those cars.
- i. Which additive, A or B, would you recommend if the goal is to increase gas mileage in the highest proportion of cars? Explain your choice.
 - ii. Which additive, A or B, would you recommend if the goal is to have the highest mean increase in gas mileage? Explain your choice.

3. Independent random samples of 500 households were taken from a large metropolitan area in the United States for the years 1950 and 2000. Histograms of household size (number of people in a household) for the years are shown below.

2012



- (a) Compare the distributions of household size in the metropolitan area for the years 1950 and 2000.
- (b) A researcher wants to use these data to construct a confidence interval to estimate the change in mean household size in the metropolitan area from the year 1950 to the year 2000. State the conditions for using a two-sample *t*-procedure, and explain whether the conditions for inference are met.