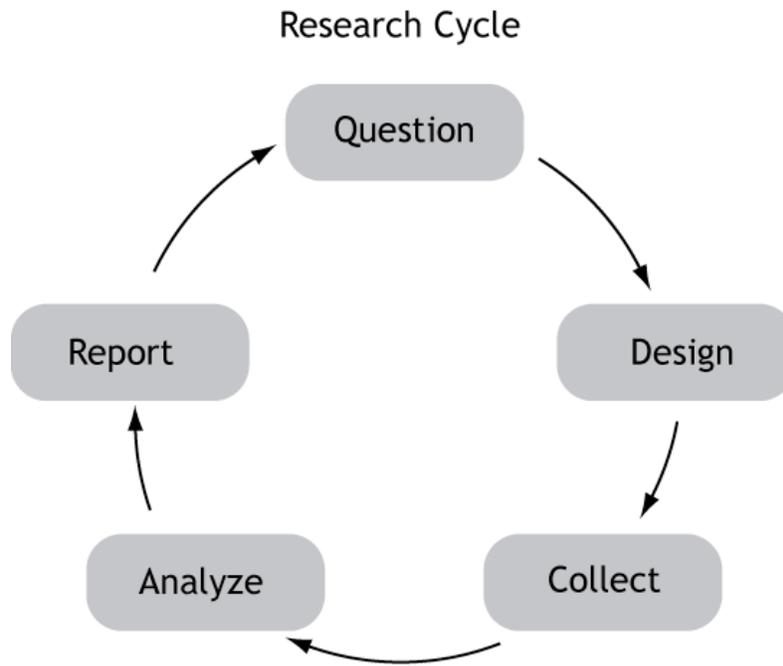


Statistical Studies: Analyzing Data

III.B Student Activity Sheet 5: Histograms

1. What does the histogram in the opening of the lesson represent? Describe the distribution as completely and accurately as possible with regard to center, shape, and spread.
2. Refer to the research cycle. Where in the cycle is examining histograms located?



Statistical Studies: Analyzing Data

III.B Student Activity Sheet 5: Histograms

So, let's collect some data!

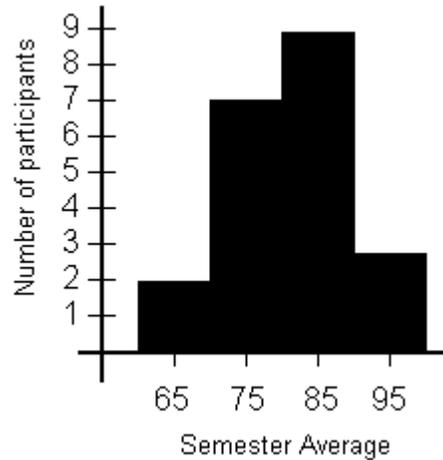
3. Without discussing with your classmates, answer the following questions—write one answer on each of your 12 slips of paper. Place each slip in the appropriate paper bag.
 - a. What year were you born?
 - b. What is your gender?
 - c. How many text messages did you send yesterday?
 - d. What does your cell plan charge for texting?
 - e. How many people under the age of 18 live in your house?
 - f. Which is your favorite food from the following choices: pizza, hamburgers, sushi, salad, chicken, other?
 - g. Do you have a job that pays by the hour?
 - h. If yes, how many hours do you work in an average week? (If no, put 0.)
 - i. List how many hours you work a week (again) and then the average number of hours that you study a week.
 - j. List your gender (again) and your shoe size.
 - k. List your gender (again) and number of text messages (again).
 - l. What is your favorite kind of music?

4. While your classmates finish Question 3, jot down your thoughts about the following questions:
 - What do you think *categorical data* means?
 - What do you think *quantitative data* means?
 - What do you think *univariate* means?
 - What do you think *bivariate* means?

Statistical Studies: Analyzing Data

III.B Student Activity Sheet 5: Histograms

Use the following histogram to answer Questions 5-7.

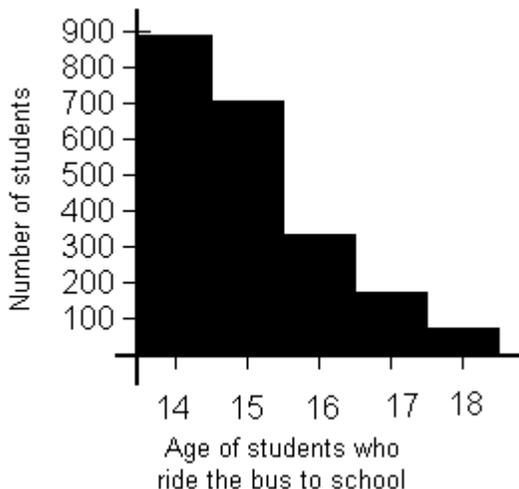


5. Does the histogram illustrate univariate data or bivariate data? Categorical or quantitative?
6. Would you describe the histogram as symmetric? Why or why not?
7. Describe the distribution of grades for the class. Justify any estimates you make.

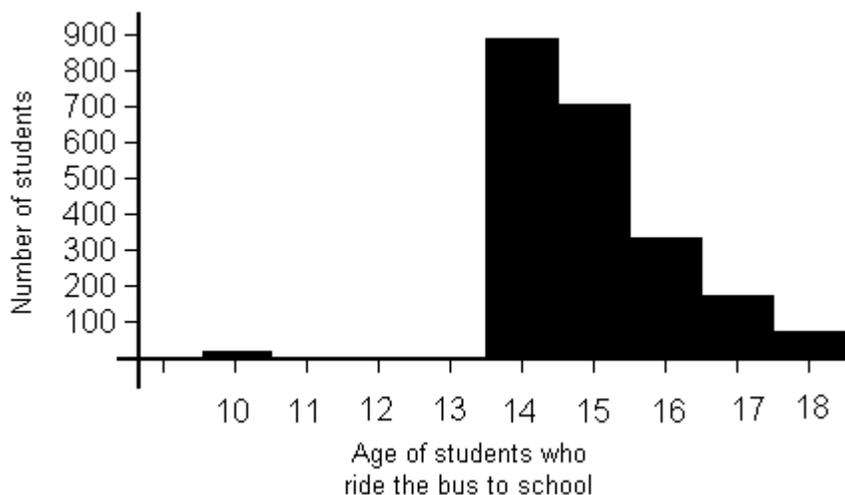
Statistical Studies: Analyzing Data

III.B Student Activity Sheet 5: Histograms

Use the following histogram to answer Questions 8 and 9.



- Consider the new histogram showing bus ridership at a local high school. This histogram is not symmetric; it is skewed to the right. You know this because the distribution has a tail out toward the right side. What is happening with this population that causes the distribution to be skewed to the right?
- Estimate the average age of students who ride the bus. This average is the center of the distribution. Justify your estimate.
- Suppose the histogram of bus ridership looked like this instead. Data values that are distant from most of the other values are generally thought of as *outliers*. What may have happened? Does this data distribution affect your answers to Questions 8 and 9?



Statistical Studies: Analyzing Data

III.B Student Activity Sheet 5: Histograms

11. **REFLECTION:** Make a histogram that represents the number of students of each age at the same school who drive to school each day (either in their own car or riding with friends). Describe the center, shape, and spread of your histogram.

Several of the previous histograms, including the one in Question 10, had a set interval width (for example, the ages of bus riders in intervals of one year). Now you will investigate the effect that interval width (also known as *bin size*) can have on a histogram as well as on a reader of the histogram.

Go to the following website and select the “Colleges’ SAT Math Scores” data set:

illuminations.nctm.org/ActivityDetail.aspx?id=78

(National Council of Teachers of Mathematics. [NCTM] Histogram Tool. In Illuminations: Resources for Teaching Math.)

12. The default interval width for this data set is 19.1. Use the slider under the histogram to change the interval width to approximately 30. What does this do to the appearance of the graph? Explain.
13. Change the interval width to approximately 50. Comment on the new graph.
14. Try an interval of approximately 75. Interpret your result.
15. Try an interval of 250. What do you think of this graph and the information it communicates?
16. Reset the interval size back to approximately 75. Change the value on the Maximum Frequency on Histogram box to 300 (click the Update Histogram button to enact the change). What do you think of this change to the graph and the information it communicates?
17. **EXTENSION:** Above the histogram is a drop-down menu from which you can choose another data set. Select one of the other data sets and explore a variety of interval widths for the graph. Sketch three histograms that show how changing the interval width results in widely differing perceptions for the reader of the graph. Explain each choice.

Statistical Studies: Analyzing Data

III.B Student Activity Sheet 5: Histograms

18. **EXTENSION:** Use the drop-down menu to choose a third data set. Once again, sketch three histograms that show how changing the interval width results in widely differing perceptions for the reader of the graph. Explain each choice.

19. **EXTENSION:** Use the drop-down menu to choose My Data. Go to the Describe Your Data box below the histogram and give your histogram a name. Below that is a data input box (*Enter your data below, one per line*). Enter your data and try a variety of interval widths. Choose two graphs to sketch—one that accurately communicates the data to the reader and another that distorts the data. Explain each choice.