

Just in Time Quick Check
Standard of Learning 7.PS.2
Strand: Probability and Statistics

Standard of Learning 7.PS.2

The student will apply the data cycle (formulate questions; collect or acquire data; organize and represent data; and analyze data and communicate results) with a focus on histograms.

Students will demonstrate the following Knowledge and Skills:

- a) Formulate questions that require the collection or acquisition of data with a focus on histograms.
- b) Determine the data needed to answer a formulated question and collect the data (or acquire existing data) using various methods (e.g., observations, measurement, surveys, experiments).
- c) Determine how sample size and randomness will ensure that the data collected is a sample that is representative of a larger population.
- d) Organize and represent numerical data using histograms with and without the use of technology.
- e) Investigate and explain how using different intervals could impact the representation of the data in a histogram.
- f) Compare data represented in histograms with the same data represented in other graphs, including but not limited to line plots (dot plots), circle graphs, and stem-and-leaf plots, and justify which graphical representation best represents the data.
- g) Analyze data represented in histograms by making observations and drawing conclusions. Determine how histograms reveal patterns in data that cannot be easily seen by looking at the corresponding given data set.

Just in Time Quick Check

Just in Time Quick Check Teacher Notes

Supporting and Prerequisite SOL: 6.PS.1

Just in Time Quick Check 7.PS.2

1. The school cafeteria manager wants to study student lunch habits and display what she learns in a histogram. Which question would provide data that are best represented in a histogram?
 - a) How many students bought lunch last week?
 - b) How many minutes does each student spend eating lunch each day?
 - c) Which lunch was purchased most often by students last week?
 - d) What is the average amount of money students spend on lunch each day?

2. Ms. Ellison, the basketball coach, wants to know how long players on her team spend practicing each day. What is the best way for her to collect this information?
 - a) Record how many shots each player takes during practice
 - b) Count how many basketballs are used in each practice
 - c) Ask each player to record how many minutes they practice each day for two weeks
 - d) Survey students to see whether they like to practice in the morning or the afternoon

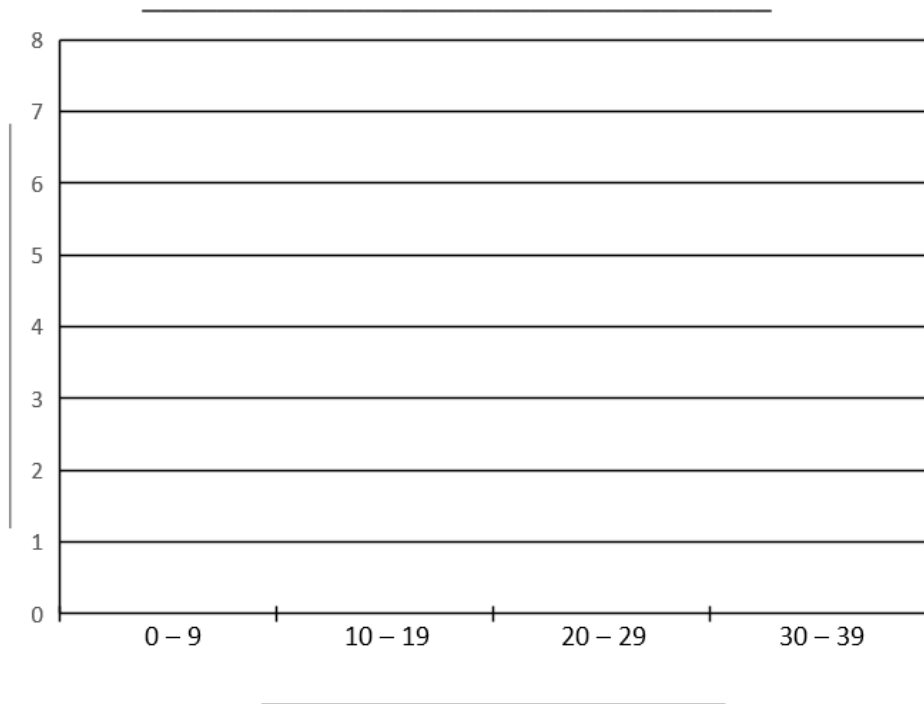
3. Three students are trying to determine how much time students in their middle school spend at the beach each week. They each came up with a plan to collect this data.
 - Anna decides to survey the 10 students in the school's Surf Club about how much time each student spends at the beach each week.
 - Bryce decides to survey every 10th student who walks into the gym about how much time each student spends at the beach each week.
 - Carly decides to randomly survey every 4th student who walks into the school about how much time each student spends at the beach each week.

Which student's plan for collecting data is going to result in a sample that is best representative of the middle school population? Justify your answer.

4. The table shows homeruns the Cardinals' players had in the 2019 baseball season. Create a histogram that correctly represents the data.

Cardinal Homeruns in the 2019 Season

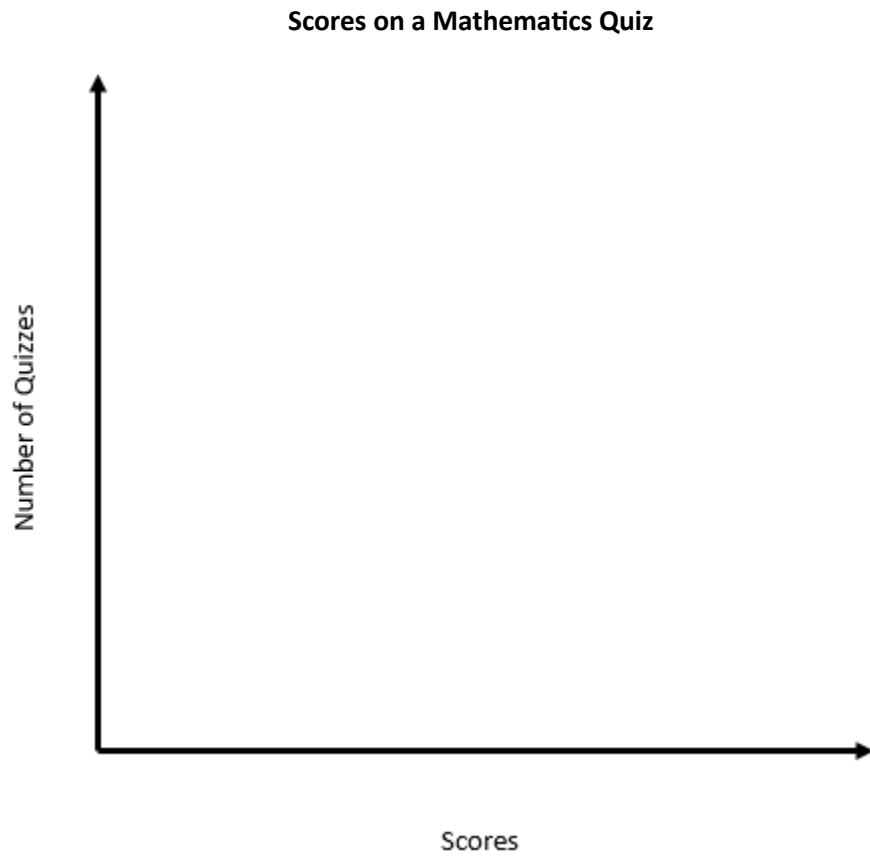
Player	Homeruns
Player 1	11
Player 2	29
Player 3	11
Player 4	2
Player 5	34
Player 6	5
Player 7	0
Player 8	10
Player 9	15
Player 10	2
Player 11	30
Player 12	2
Player 13	11
Player 14	12
Player 15	19



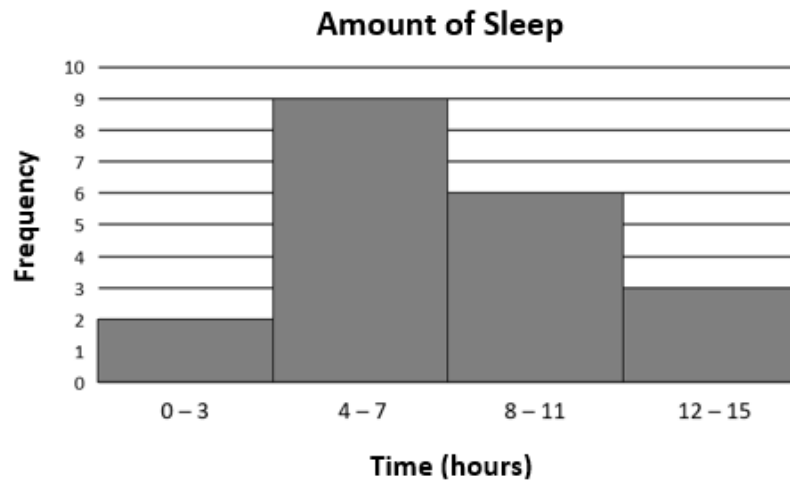
5. The following set of data represents the scores on a mathematics quiz:

58, 79, 81, 99, 68, 92, 76, 84, 53, 57, 81, 91, 77, 50, 65, 57, 51, 72, 84, 89

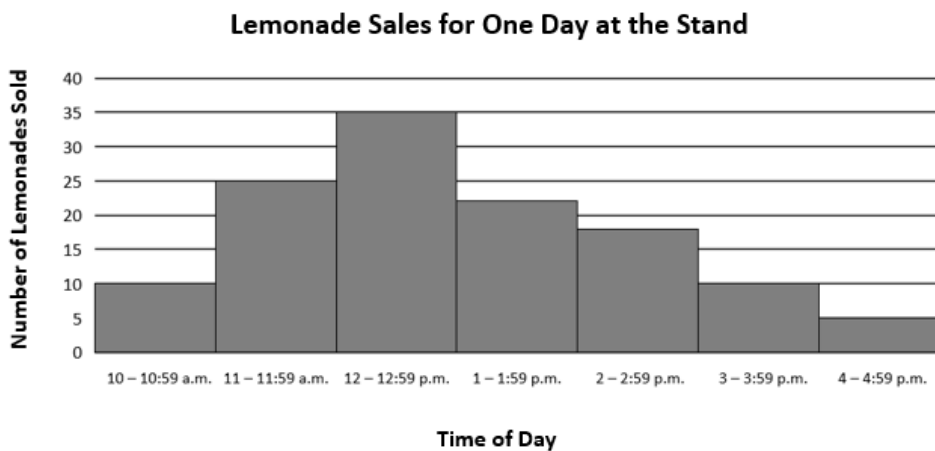
Create a histogram to correctly represent these data.



6. Mr. Hamilton surveyed his class to find the total number of hours each of his students slept the previous night. The histogram shows the results of the survey. Use the histogram to answer the questions below.



- a) How many students slept at least 8 hours?
- b) How many more students slept 4 – 7 hours than 12 – 15 hours?
- c) How would the histogram change if the bins were 0 – 7 and 8 – 15?
7. On a typical summer day, the owners of a local lemonade stand recorded the times they sold lemonades during the day. The results are displayed in the histogram shown.



The owners of the lemonade stand have decided to hire one extra worker to help during the day when sales are the highest. Would it be more beneficial to hire an extra worker before or after 1:00 p.m.? Justify your reasoning.

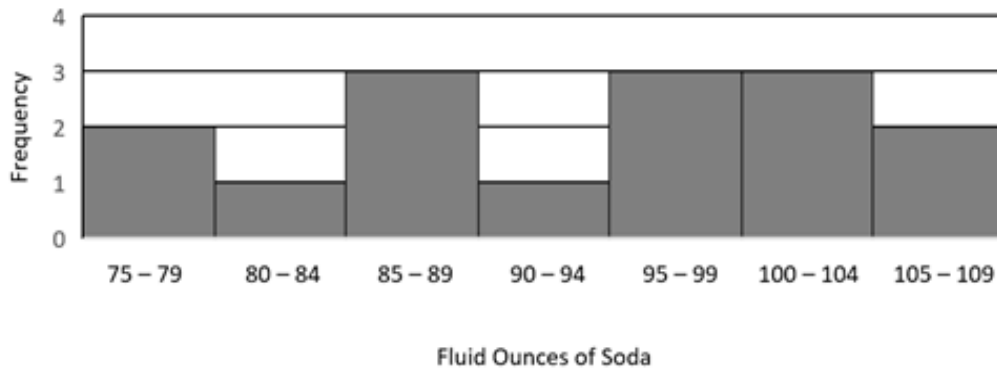
8. The owner of a restaurant recorded the total amount of fluid ounces of soda that customers consumed on Tuesday. The information was recorded in a stem-and-leaf plot and a histogram.

**Fluid Ounces of Soda
Consumed on Tuesday**

Stem	Leaf
7	8 9
8	0 5 8 9
9	2 8 8 9
10	0 2 3 7 8

Key 7|0 = 70

Fluid Ounces of Soda Consumed on Tuesday



One of the restaurant employees concluded that the median amount of soda that customers consumed that day was between 90 and 94 fluid ounces. Is this employee correct? Justify your reasoning and include evidence from one of the graphs.

7.PS.2 Just in Time Quick Check Teacher Notes

Common Errors/Misconceptions and their Possible Indications

1. The school cafeteria manager wants to study student lunch habits and display what she learns in a histogram. Which question would provide data that are best represented in a histogram?
 - a) How many students bought lunch last week?
 - b) How many minutes does each student spend eating lunch each day?
 - c) Which lunch was purchased most often by students last week?
 - d) What is the average amount of money students spend on lunch each day?

Students may have difficulty determining which question would provide information that would be best represented in a histogram. It may be helpful for students to think about what kind of information will be provided when answering each question. For example, the answer to a) will be a single number (e.g., 120 students bought lunch last week). The answer to c) will be a type of food, which is categorical data (e.g., pizza is the lunch purchased the most by students). The answer to d) will provide a single summary statistic (e.g., students spend an average of \$4.50 on lunch each day). Answers to b) will be numerical data that would be appropriate to represent on a histogram.

2. Ms. Ellison, the basketball coach, wants to know how long players on her team spend practicing each day. What is the best way for her to collect this information?
 - a) Record how many shots each player takes during practice
 - b) Count how many basketballs are used in each practice
 - c) Ask each player to record how many minutes they practice each day for two weeks
 - d) Survey students to see whether they like to practice in the morning or the afternoon

Students may have difficulty determining the best way to collect data to answer a specific question. For example, students may incorrectly choose a) because they see the number of shots each player takes during practice as an indicator of how long each player practiced. Students may benefit from noting what type of information would be provided by each data collection method, and which method will best answer the coach's question. Additionally, conversations about why each incorrect answer choice is not correct may be helpful (e.g., given two students, Student A could spend 30 minutes practicing their shooting and Student B could spend 60 minutes practicing their dribbling and passing; thus, Student B spent more time practicing but took less shots, which is why a) is not correct).

3. Three students are trying to determine how much time students in their middle school spend at the beach each week. They each came up with a plan to collect this data.
- Anna decides to survey the 10 students in the school’s Surf Club about how much time each student spends at the beach each week.
 - Bryce decides to survey every 10th student who walks into the library about how much time each student spends at the beach each week.
 - Carly decides to randomly survey every 4th student who walks into the school about how much time each student spends at the beach each week.

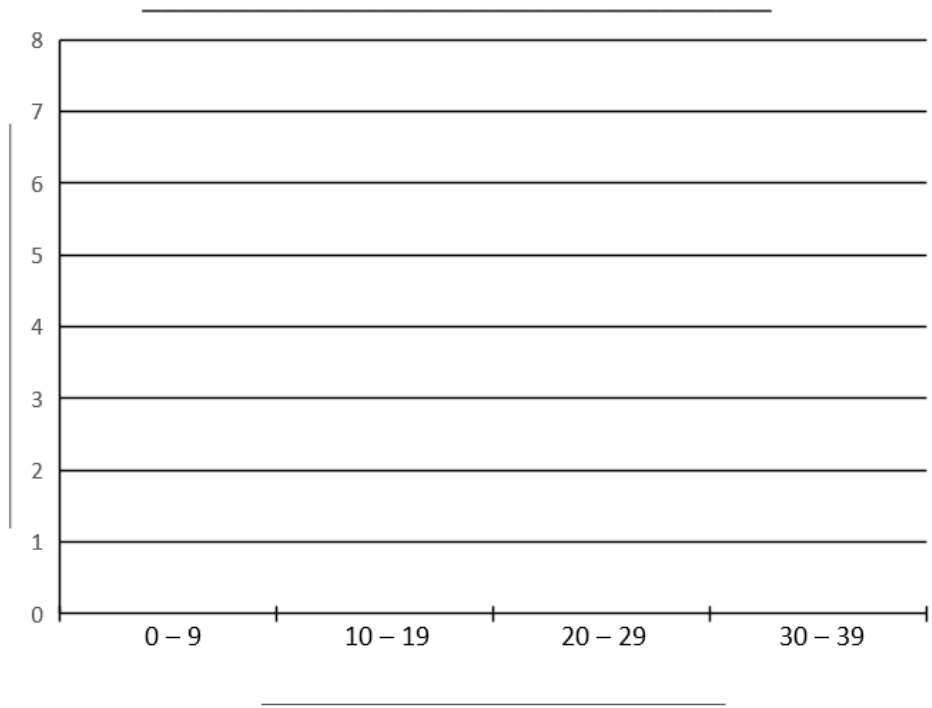
Which student’s plan for collecting data is going to result in a sample that is best representative of the middle school population? Justify your answer.

Students may have difficulty determining which data collection method will result in a sample that is best representative of the middle school population. Students might incorrectly choose Anna because she is surveying students in the Surf Club. However, this will produce a biased sample, as students in the Surf Club are likely to spend more time at the beach than other middle school students. Students may incorrectly choose Bryce because he is randomly surveying students who walk into the library. However, his sample will only include students who enter the library and may leave out many other students who do not enter the library during the day. Students may benefit from conversations about the possible strengths and weaknesses of each student’s data collection method.

4. The table shows homeruns the Cardinals’ players had in the 2019 baseball season. Create a histogram that correctly represents the data.

Cardinal Homeruns in the 2019 Season

Player	Homeruns
Player 1	11
Player 2	29
Player 3	11
Player 4	2
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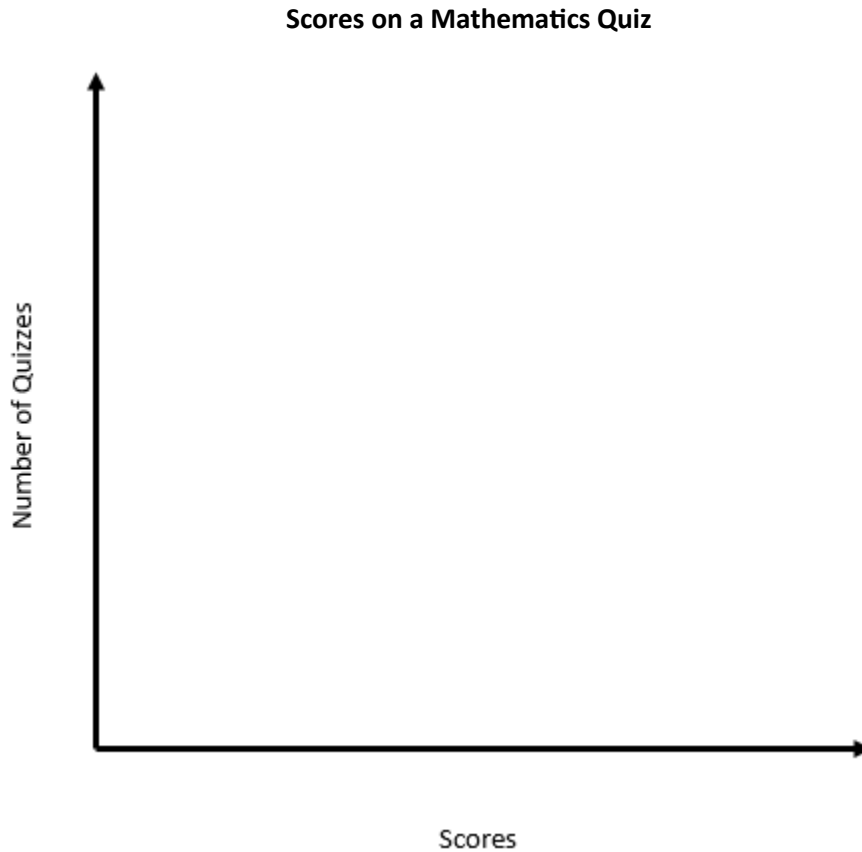


A common error is for students to incorrectly label the horizontal axis as players and the vertical axis as the number of homeruns. This may indicate that students are still confusing a histogram with a bar graph. In a bar graph, the data in the first column of the table are usually displayed on the x-axis, and the data from the second column are usually displayed on the y-axis. These students may need to review that a histogram presents an analysis of a set of numerical data by showing the frequency with which pieces of data fall within given intervals, or bins. These students may also benefit from more experience collecting data and representing the data in a histogram.

5. The following set of data represents the scores on a mathematics quiz:

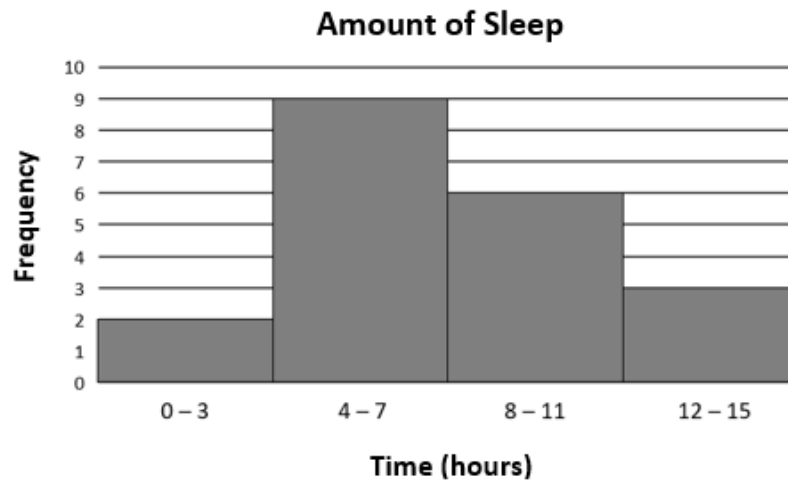
58, 79, 81, 99, 68, 92, 76, 84, 53, 57, 81, 91, 77, 50, 65, 57, 51, 72, 84, 89

Create a histogram to correctly represent these data.



A common error is for students to create bins that do not represent equal intervals of data or to struggle with determining how to set up the intervals so that they are suitable for the data set provided. This may indicate that students have limited experience analyzing an entire set of data and considering the range of each interval. For example, students may feel that the interval 0 – 5 and the interval 6 – 10 are equal intervals. This may indicate that students need practice finding the range for a given interval. For example, the interval 0 – 5 has a range of 5 while the interval 6 – 10 has a range of 4. A possible strategy to use with students who struggle to determine suitable intervals is to organize the data in ascending order and find the difference between the highest and lowest value and then add one to that difference (i.e., $99 - 50 = 49$ and $49 + 1 = 50$). Students could use the value of 50 to divide by one of its factors to obtain equal intervals of data. For example, $50/10 = 5$. A student could set up 5 equal intervals of data that each have a range of 10. Alternatively, a student could use $50/5$ to obtain 10 intervals all of which have a range of 5.

6. Mr. Hamilton surveyed his class to find the total number of hours each of his students slept the previous night. The histogram shows the results of the survey. Use the histogram to answer the questions below.



- a) How many students slept at least 8 hours?

A common error is that students will inaccurately interpret the phrasing of “at least” to represent the values of 8 and less instead of hours greater than or equal to 8. Students may also make the error of not including the bin 12-15 as part of the solution. This may indicate that students are struggling to understand verbal expressions representing inequalities. Students may benefit from reviewing how to represent practical situations with inequalities.

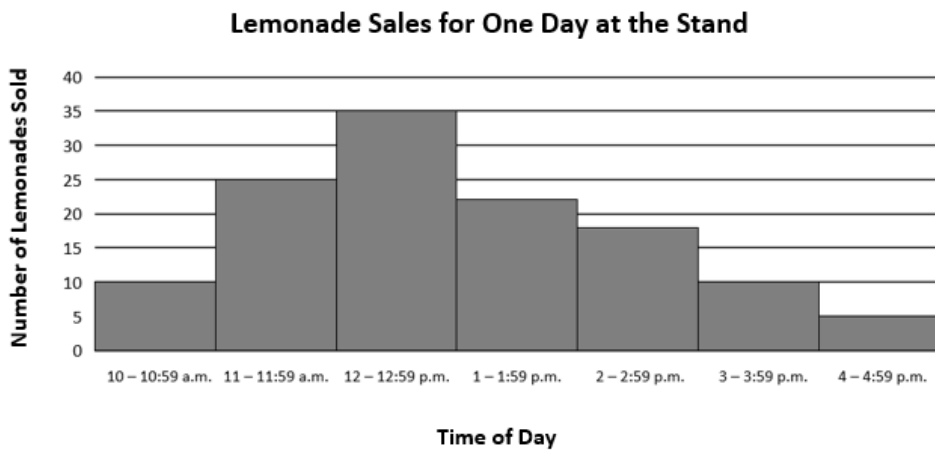
- b) How many more students slept 4 – 7 hours than 12 – 15 hours?

A common error students may make is to calculate the sum of the number of students represented in bin 4-7 and bin 12-15, obtaining a value of 12 instead of calculating the difference of 9 and 3, obtaining a value of 6. This may indicate that students need additional practice with translating expressions. Students may benefit from brainstorming common mathematical phrases and their translations, as well as practice translating verbal expressions to algebraic expressions.

- c) How would the histogram change if the bins were 0-7 and 8-15?

Some students may be able to state how the values in the histogram would change if the bins were changed but they may have difficulty stating how this impacts the histogram. For example, combining four bins into two bins will produce bins that cover a wider span of hours. While this will provide a broader summary of the data, it will reduce the amount of detail provided (e.g., it will no longer be clear whether more students were in the 0-3 range or the 4-7 range).

7. On a typical summer day, the owners of a local lemonade stand recorded the times they sold lemonades during the day. The results are displayed in the histogram shown.



The owners of the lemonade stand have decided to hire one extra worker to help during the day when sales are the highest. Would it be more beneficial to hire an extra worker before or after 1:00 p.m.? Justify your reasoning.

A common error is for students to believe that it would be more beneficial to hire an extra worker after 1:00 p.m. since there are four intervals from 1:00 p.m. to 5:00 p.m., but only three before 1:00 p.m. This error may indicate that students believe the greater the number of intervals leads to a greater quantity of sales and do not consider the number of items sold. They may also make this error by making an inference based on a personal preference that they enjoy lemonade in the afternoon instead of making inferences based on the data presented in the histogram. This may indicate that students do not have a strong foundation with the concept of making inferences from a histogram. Students making these errors could benefit from more practice analyzing histograms by making inferences and predictions. Facilitating class discussions around possible inferences in relation to a given histogram would help to promote this type of thinking for students.

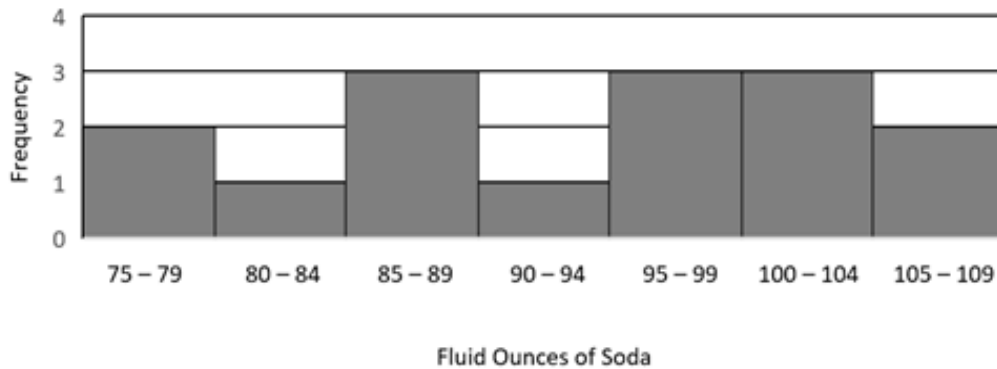
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Fluid Ounces of Soda Consumed on Tuesday



One of the restaurant employees concluded that the median amount of soda that customers consumed that day was between 90 and 94 fluid ounces. Is this employee correct? Justify your reasoning and include evidence from one of the graphs.

A common error students may make is to agree that the median amount of soda that customers consume that day was between 90 and 94 fluid ounces. This may indicate that students mistakenly looked at the middle bar of the histogram and assumed that the middle value would fall within that range. Students may benefit from recording the actual data values from the stem-and-leaf plot onto the bars of the histogram and crossing off individual extreme values until they find the median value. This process will also help to connect the two forms of graphs with one another.