

# Lesson 3: Describing Quantitative Data; Shape, Center & Spread

## Homework

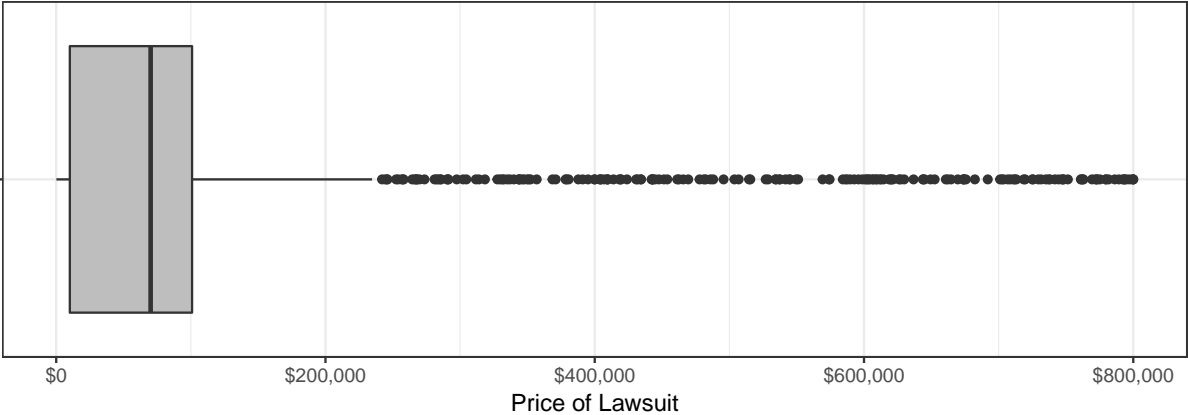
Plot B



Plot C

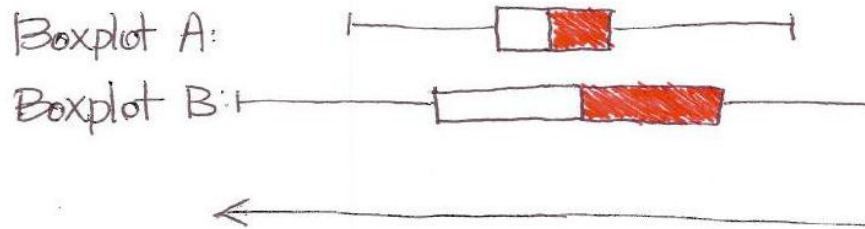


Plot D



3. What is the shape of the distribution of wrong-patient lawsuit costs?

- a. Right Skewed
  - b. Symmetric
  - c. Left Skewed
  - d. Bell Shaped
4. Find the mean amount hospitals had to pay in wrong-patient lawsuits. Round your answer to the nearest whole dollar.
  5. Find the median amount hospitals had to pay in wrong-patient lawsuits.
  6. Find the standard deviation of the amount paid in wrong-patient lawsuits. Round your answer to the nearest whole dollar.
  7. If the distribution of the data is left-skewed, we expect the boxplot will.
    - a. be symmetric
    - b. have a longer whisker on the right side than on the left side
    - c. have a longer whisker on the left side
  8. The boxplots for two different data sets are given below. Which of these boxplots has a greater percentage

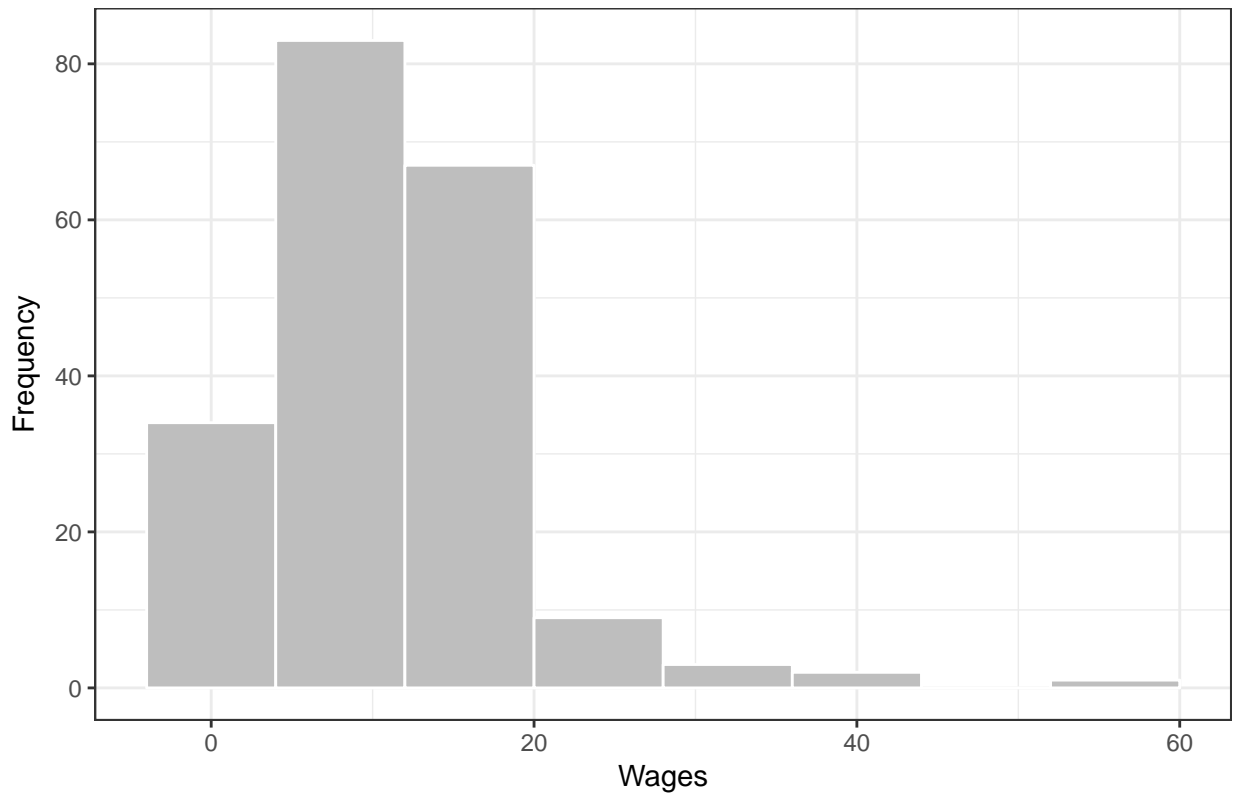


of data in the area that is highlighted in red?

- a. Boxplot A
- b. Boxplot B
- c. The percentage of data is the same for both.
- d. There is not enough information to answer this question. We need the original data to make this determination.

Use the following information to answer Questions 9 and 10. The graph below illustrates typical student hourly wages for BYU-Idaho.

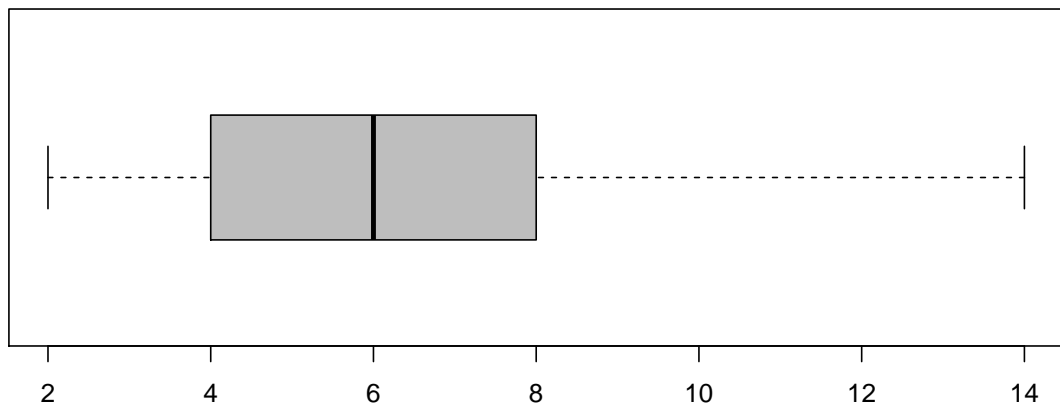
Wages of BYU-I Students



9. Approximately, how many students are in this survey?

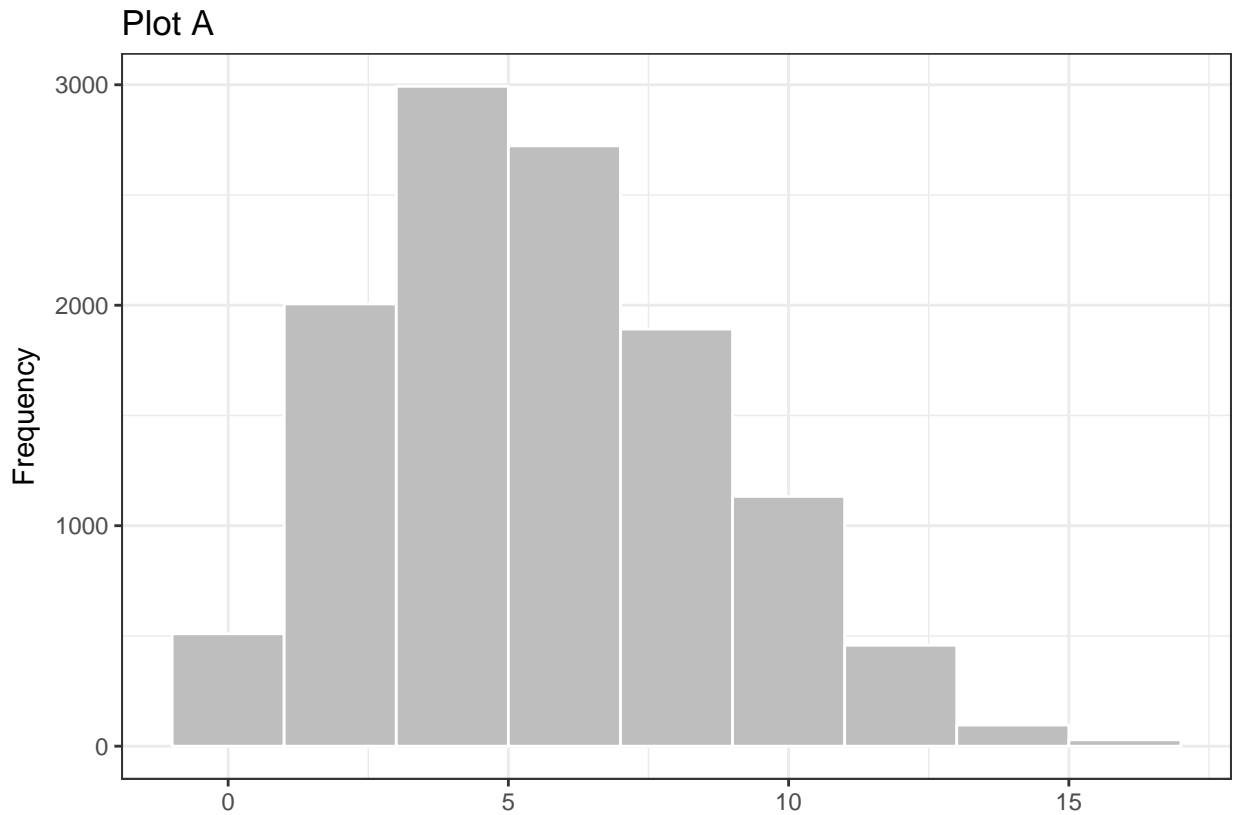
10. How would you describe the shape of the distribution of wages?

The number of hours students spent studying for an exam were recorded. The data are represented by the boxplot below. Use this boxplot to answer Questions 11 through 13.

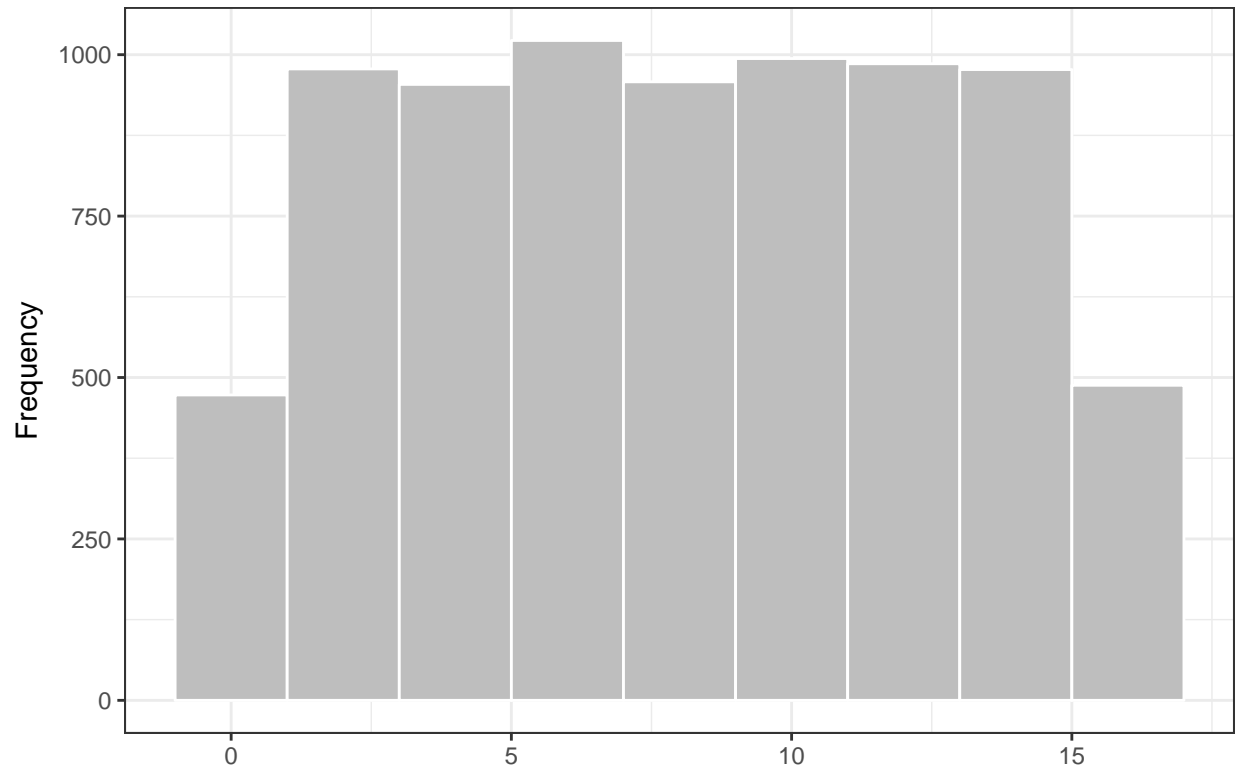


11. Find Q1 for the study time data summarized in the boxplot above.
12. One of the observations represented in the boxplot above is a suspected outlier. How long did that student spend studying?
13. The lowest 25% of hours spent on an exam are approximately between what two numbers?
14. What is the mean of the data illustrated in the boxplot?
15. Match each graph below to the description of its shape.

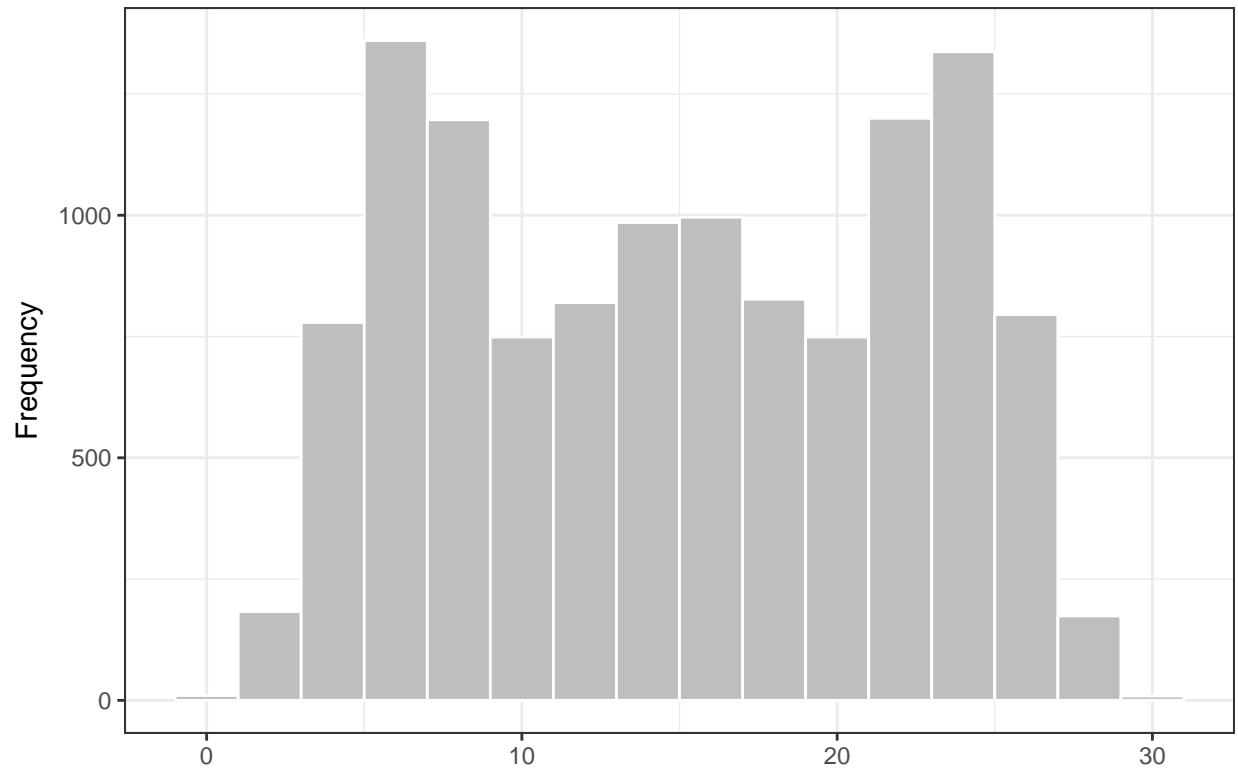
Uniform =  
 Bell-shaped =  
 Right-skewed =  
 Left-skewed =  
 Symmetric, but not bell-shaped or uniform =



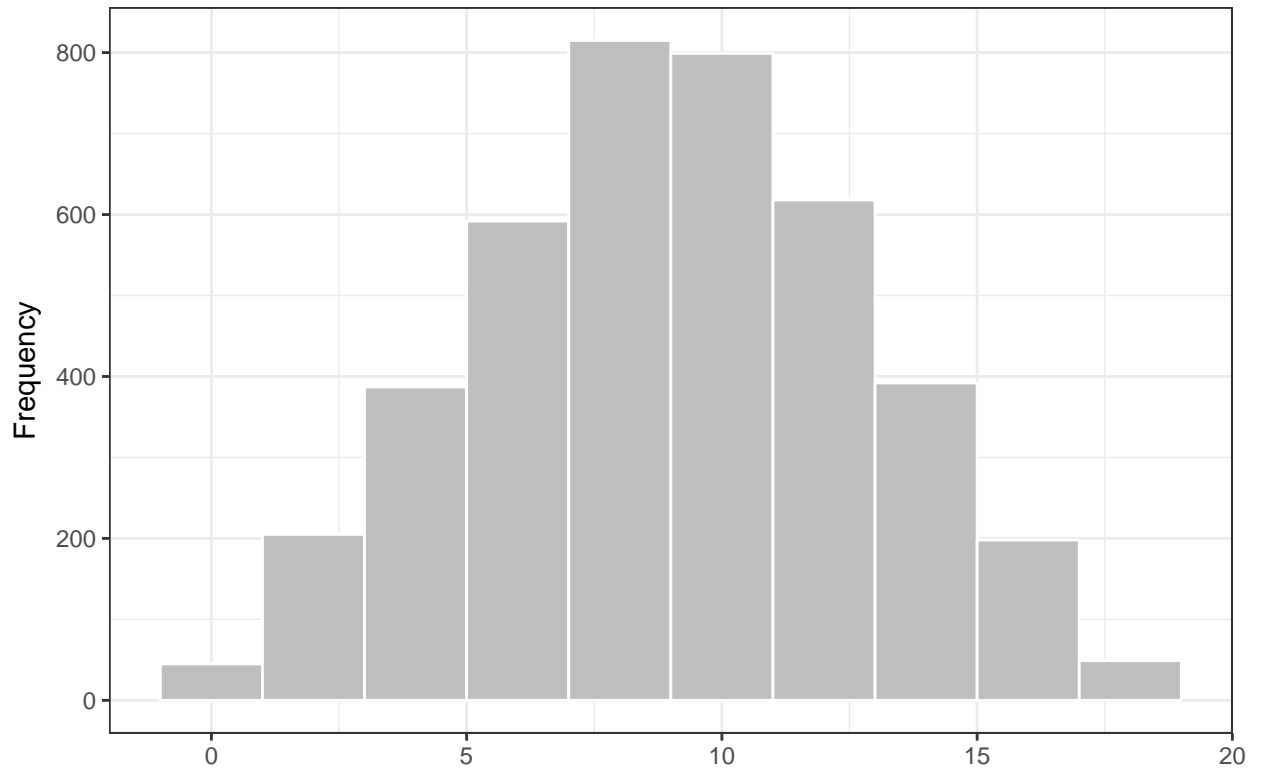
Plot B



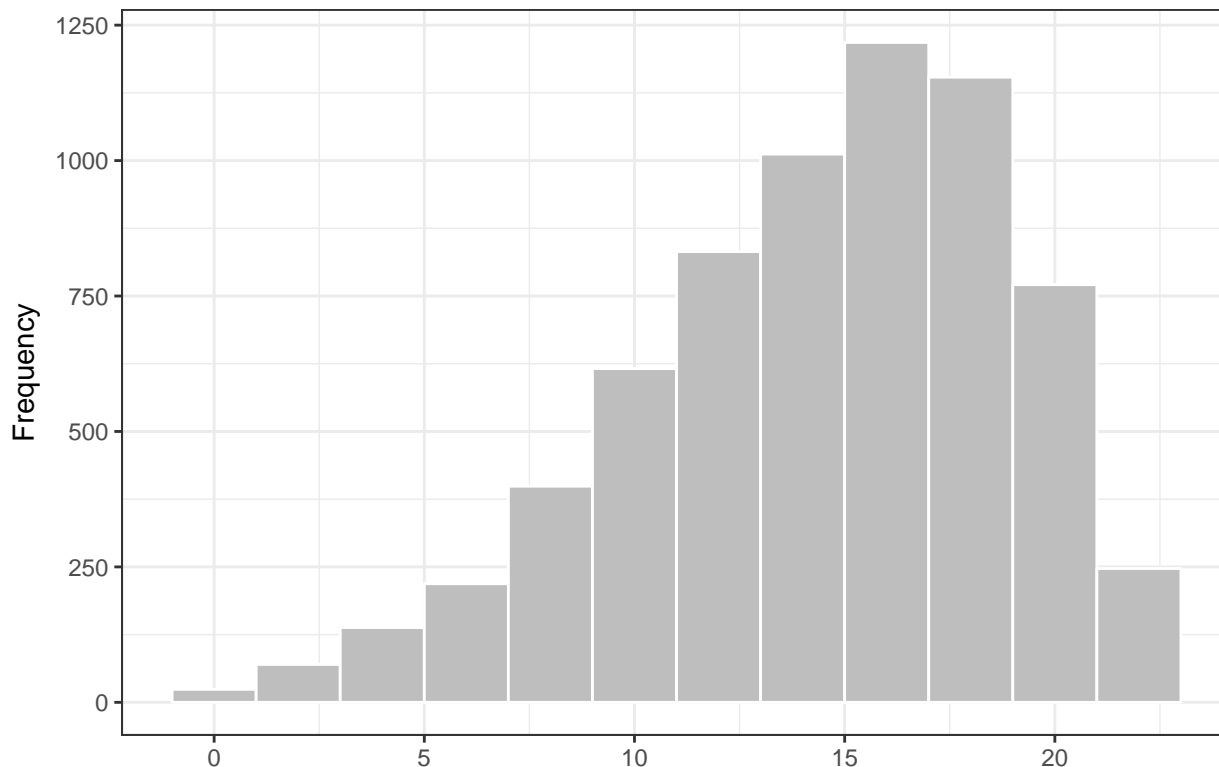
Plot C



Plot D



Plot E



16. A reporter creates a histogram of baseball player salaries and finds that the distribution of salaries is right-skewed. Which measure of center would be greater, the mean or the median?

A scientist tested for the presence of many hazardous elements for nuclear reactors. He considered the concentration of Plutonium-238. Plutonium-238 is a radioactive waste generated by a nuclear reactor. He wants there to be as little Plutonium-238 in the tank as possible.

The data below give the concentration of Plutonium-238 in nanocuries per liter (nCi/L) in his sample.

Complete the following table and answer questions 17 through 21 below.

Concentration Level (nCi/L)	Deviation from the Mean	Squared Deviations
$x$	$(x - \bar{x})$	$(x - \bar{x})^2$
9.4		
70.7		“B”
7.8		
4.6	“A”	
50.2		

17. What is the mean of the concentration levels?
18. What is the value of the number that goes in the position marked with an “A” in the table above?
19. What is the value of the number that goes in the position marked with a “B” in the table above?
20. What is the sample variance of these concentration levels?
21. What is the sample standard deviation of these concentration levels?

22. Which of the following sets of numbers has the largest standard deviation? (No calculations are required.)
- {7, 8, 9, 10}
  - {10, 10, 10, 10}
  - {0, 0, 10, 10}
  - {0, 1, 2, 3}

For a Math 221 project, one group of students studied the ages of students on the BYU-Idaho campus. They collected data from a random sample of  $n = 100$  students. The sample mean was 21.2 and the sample standard deviation was 2.61. An excerpt of their data is given below.

ID	Gender	Age
1	Female	21
2	Male	18
3	Male	12 (error)
4	Female	20
:	:	:
99	Male	25

The group notices an error in their data. The age of one of the males (ID=3) was entered incorrectly. He is actually 21 years old.

23. When the error is corrected, what will happen to the sample standard deviation?
- The standard deviation will increase.
  - The standard deviation will decrease.
  - The standard deviation will stay the same.
  - It is not possible to determine this without the full data set.

->

## Solutions

Please note that the steps show rounded numbers, but that the final answers to the problems are calculated without rounding.

Problem	Part	Solution
1	-	The standard deviation is a measure of how spread out the data are. A larger standard deviation indicates that data are more spread out and less consistent than data that have a smaller standard deviation.
2	-	Box Plot C
3	-	a. Right Skewed
4	-	\$46,172
5	-	\$18,882
6	-	\$105,987
7	-	c. have a longer whisker on the left side
8	-	c. The percentage of data is the same for both.
9	-	This is just a rough estimate, but somewhere between 190 and 200
10	-	Right-skewed
11	-	4 hours
12	-	14 hours
13	-	2 and 4 hours

Problem	Part	Solution
14	-	There is not enough information to answer this question. We need the original data to make this determination.
15	A	Uniform = b
15	B	Bell-shaped = d
15	C	Right-skewed = a
15	D	Left-skewed = e
15	E	Symmetric, but not bell-shaped or uniform = c
16	-	The mean
17	-	28.5 nCi/L
18	-	-23.9 nCi/L
19	-	1777.5 nCi/L
20	-	$904.1(\text{ nCi/L})^2$
21	-	30.1 nCi/L
22	-	c. {0, 0, 10, 10}
23	-	b. The standard deviation will decrease.