Lesson 4: Describing Quantitative Data; Center & Spread

Homework

5. Find Q1 for the study time data summarized in the boxplot above.
6. One of the observations represented in the boxplot above is a suspected outlier. How long did that student spend studying?
7. The lowest 25% of hours spent on an exam are approximately between what two numbers?
8. What is the mean of the data illustrated in the boxplot?

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		

9. What is the mean of the concentration levels?
10. What is the value of the number that goes in the position marked with an "A" in the table above?
11. What is the value of the number that goes in the position marked with a "B" in the table above?
12. What is the sample variance of these concentration levels?
13. What is the sample standard deviation of these concentration levels?
14. Which of the following sets of numbers has the largest standard deviation? (No calculations are required.)

    a. {7, 8, 9, 10}
    b. {10, 10, 10, 10}
    c. {0, 0, 10, 10}
    d. {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.

15. When the error is corrected, what will happen to the sample standard deviation?

    a. The standard deviation will increase.
    b. The standard deviation will decrease.
    c. The standard deviation will stay the same.
    d. It is not possible to determine this without the full data set.

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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	-	$NA
4	-	c. The percentage of data is the same for both.
5	-	4 hours
6	-	14 hours
7	-	2 and 4 hours
8	-	There is not enough information to answer this question. We need the original data to make this determination.
9	-	28.5 nCi/L
10	-	-23.9 nCi/L
11	-	1777.5 nCi/L
12	-	$904.1(\text{ nCi/L})^2$
13	-	30.1 nCi/L
14	-	c. {0, 0, 10, 10}
15	-	b. The standard deviation will decrease.