

# What Is The Standard Deviation Of The Data Set Given Below? 4, 7, 8, 9, 12 A. -2.50 B. 18.50 C. 6.80

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A. -2.50 B. 18.50 C. 6.80**

Understanding statistical concepts like standard deviation is crucial for analyzing data sets effectively. In this article, we will explore what the standard deviation is, how to calculate it step-by-step using the data set 4, 7, 8, 9, 12, and determine which of the options—A. -2.5, B. 18.5, or C. 6.8—is the correct standard deviation. This comprehensive guide aims to improve your grasp of statistical analysis, enhance your data interpretation skills, and optimize your SEO understanding of this key concept.

## What Is Standard Deviation?

Standard deviation is a statistical measure that quantifies the amount of variation or dispersion in a data set. It indicates how spread out the data points are around the mean (average) of the data set.

## Definition of Standard Deviation

The standard deviation (denoted by the symbol  $\sigma$  for a population and  $s$  for a sample) reflects the average distance of each data point from the mean. A low standard deviation indicates that data points tend to be close to the mean, whereas a high standard deviation signifies that data points are spread out over a wider range.

## Importance of Standard Deviation

- Assessing Data Variability: Helps understand the consistency within a data set.
- Comparing Data Sets: Facilitates comparison of variability between different data sets.
- Risk Analysis: In finance and investment, standard deviation is used to measure risk.
- Quality Control: Used in manufacturing to monitor process variability.

## Calculating Standard Deviation: Step-by-Step Process

Calculating the standard deviation involves several straightforward steps. Let's walk through these using the data set 4, 7, 8, 9, 12.

## Step 1: Find the Mean

The mean ( $\mu$  or  $\bar{x}$ ) is the sum of all data points divided by the number of points.

- Sum of data points:  $4 + 7 + 8 + 9 + 12 = 40$
- Number of data points: 5

Mean ( $\bar{x}$ ):

$$\bar{x} = 40 / 5 = 8$$

## Step 2: Calculate Each Data Point's Deviation from the Mean

Subtract the mean from each data point:

| Data Point | Deviation (Data Point - Mean) |
|------------|-------------------------------|
| 4          | $4 - 8 = -4$                  |
| 7          | $7 - 8 = -1$                  |
| 8          | $8 - 8 = 0$                   |
| 9          | $9 - 8 = 1$                   |
| 12         | $12 - 8 = 4$                  |

## Step 3: Square Each Deviation

Square each of the deviations to eliminate negative values and emphasize larger deviations:

| Deviation | Squared Deviation |
|-----------|-------------------|
| -4        | $(-4)^2 = 16$     |
| -1        | $(-1)^2 = 1$      |
| 0         | $0^2 = 0$         |
| 1         | $1^2 = 1$         |
| 4         | $4^2 = 16$        |

## Step 4: Find the Variance

- For a population standard deviation, sum all squared deviations and divide by the total number of data points.
- For a sample standard deviation, divide by  $(n - 1)$  instead of  $n$  to account for sample bias.

Assuming we're working with the entire data set (population), the variance ( $\sigma^2$ ) is:

Variance = (Sum of squared deviations) /  $n$

$$\text{Variance} = (16 + 1 + 0 + 1 + 16) / 5 = 34 / 5 = 6.8$$

## Step 5: Take the Square Root to Find the Standard Deviation

Standard deviation ( $\sigma$ ):

$$\sigma = \sqrt{\text{Variance}} = \sqrt{6.8} \approx 2.607$$

## Comparing Calculated Standard Deviation with Provided Options

The calculated standard deviation is approximately 2.607. When comparing to the options given:

- A. -2.5
- B. 18.5
- C. 6.8

None of these options exactly match 2.607. However, since option C is 6.8, which is the variance, not the standard deviation, it suggests a common confusion.

Important Note: The variance (6.8) is the square of the standard deviation. The options seem to mix variance and standard deviation values.

Clarification:

- Variance = 6.8
- Standard deviation  $\approx$  2.607

Given the options, Option C (6.8) is the variance, not the standard deviation. The question asks for the standard deviation, which is approximately 2.6, not directly listed among the options.

Why the Options Might Be Confusing:

- The options may be incorrectly labeled or intended to test understanding of variance versus standard deviation.
- Option C (6.8) corresponds to the variance, which is a common point of confusion.

Correct Interpretation:

- The standard deviation of the data set is approximately 2.6.
- The variance is 6.8.

Since none of the options precisely match 2.6, but option C is 6.8 (variance), it is essential to clarify the context.

## Conclusion: Which Option Is Correct?

Based on the calculations:

- The standard deviation of the data set 4, 7, 8, 9, 12 is approximately 2.6.
- The variance is 6.8.

Given the options:

- A. -2.5 (Incorrect, standard deviation cannot be negative)
- B. 18.5 (Too high)
- C. 6.8 (Matches the variance, not the standard deviation)

Therefore, if the question is asking for the variance, the answer is C: 6.8.

If asking explicitly for the standard deviation, none of the options match exactly, but the closest approximation is 2.6, which is not listed.

Summary:

- The standard deviation of the data set 4, 7, 8, 9, 12 is approximately 2.6.
- The variance is 6.8.
- Option C (6.8) correctly represents the variance, which is sometimes confused with standard deviation.

## Additional Insights on Standard Deviation

Understanding the significance of standard deviation helps in various real-world scenarios:

### Applications of Standard Deviation

- Financial Markets: Investors use standard deviation to assess the volatility of stocks.
- Quality Management: Manufacturers analyze process variability to maintain product quality.
- Academic Performance: Educators evaluate the consistency of student scores.
- Scientific Research: Researchers analyze experimental data for variability.

### Types of Standard Deviation

- Population Standard Deviation: Used when analyzing an entire population.
- Sample Standard Deviation: Applied when analyzing a subset or sample of the population.

## Final Thoughts

Calculating and interpreting standard deviation is a fundamental skill in statistics that helps in understanding data variability and making informed decisions. The data set 4, 7, 8, 9, 12 has a variance of 6.8 and a standard deviation of approximately 2.6. When selecting an answer from multiple-choice options, it's crucial to understand whether the question refers to variance or standard deviation to avoid confusion.

By mastering these concepts, you'll enhance your ability to analyze data effectively, interpret statistical results accurately, and apply these insights across various fields like finance, research, quality control, and more.

Remember: Always verify whether the question asks for variance or standard deviation, and double-

check your calculations to ensure accuracy.

## Frequently Asked Questions

### **What is the first step to calculate the standard deviation of the data set 4, 7, 8, 9, 12?**

The first step is to find the mean (average) of the data set by adding all numbers and dividing by the total count.

### **How do you calculate the variance for the data set 4, 7, 8, 9, 12?**

Calculate the squared differences between each data point and the mean, sum these squared differences, and divide by the number of data points (for population variance).

### **Based on the options provided, what is the correct standard deviation for the data set 4, 7, 8, 9, 12?**

The correct standard deviation is approximately 2.5, so the answer is A. -2.50, but since standard deviation cannot be negative, the closest correct choice is 2.5.

### **Why is option B (18.5) not a suitable standard deviation for this data set?**

Because 18.5 is significantly larger than the typical deviation for these numbers, indicating it doesn't accurately represent the spread of this small data set.

### **What is the importance of calculating the standard deviation in data analysis?**

Standard deviation measures the dispersion or variability in a data set, helping to understand how spread out the data points are around the mean.

## Additional Resources

What Is The Standard Deviation Of The Data Set Given Below? 4, 7, 8, 9, 12

Understanding the concept of standard deviation is fundamental for statisticians, data analysts, and researchers alike. It provides a quantitative measure of the dispersion or spread in a data set, illustrating how much individual data points deviate from the mean. In this comprehensive review, we will explore the process of calculating the standard deviation of a specific data set: 4, 7, 8, 9, and 12. We will examine the importance of standard deviation, outline detailed steps for calculation, analyze the options provided, and clarify common misconceptions associated with this statistical measure.

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## Introduction to Standard Deviation

Before diving into the calculations, it is essential to understand what standard deviation signifies within the realm of statistics. The standard deviation (denoted as  $\sigma$  for population data or  $s$  for sample data) measures the amount of variation or dispersion of a set of data points.

- Low standard deviation indicates that data points tend to be close to the mean.
- High standard deviation shows data points are spread out over a wider range.

In practical terms, standard deviation helps determine the consistency or variability in data, which is crucial in fields such as finance, quality control, scientific research, and social sciences.

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## Understanding the Data Set

The data set under consideration is:

4, 7, 8, 9, 12

This is a small, discrete data set, which makes manual calculation straightforward. The data points are numerical observations, and our goal is to measure how dispersed these points are around their central tendency.

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## Step-by-Step Calculation of Standard Deviation

Calculating the standard deviation involves several key steps:

### 1. Calculate the Mean (Average)

The mean ( $\mu$  for population,  $\bar{x}$  for sample) is the sum of all data points divided by the number of data points.

$$\text{Mean } (\bar{x}) = \frac{\sum_{i=1}^n x_i}{n}$$

Applying to our data:

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$$\bar{x} = \frac{4 + 7 + 8 + 9 + 12}{5} = \frac{40}{5} = 8$$

## 2. Find the Deviations from the Mean

Subtract the mean from each data point:

| Data Point ( $x_i$ ) | $x_i - \text{mean}$ |
|----------------------|---------------------|
| 4                    | $4 - 8 = -4$        |
| 7                    | $7 - 8 = -1$        |
| 8                    | $8 - 8 = 0$         |
| 9                    | $9 - 8 = 1$         |
| 12                   | $12 - 8 = 4$        |

## 3. Square Each Deviation

Square each of the deviations to eliminate negative values and emphasize larger deviations:

| $x_i - \text{mean}$ | $(x_i - \text{mean})^2$ |
|---------------------|-------------------------|
| -4                  | 16                      |
| -1                  | 1                       |
| 0                   | 0                       |
| 1                   | 1                       |
| 4                   | 16                      |

## 4. Calculate the Variance

Variance is the average of these squared deviations.

- Population variance ( $\sigma^2$ ):

$$\sigma^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

- Sample variance ( $s^2$ ):

$$s^2 = \frac{\sum (x_i - \bar{x})^2}{n - 1}$$

Since the problem appears to reference the entire data set, we'll assume it's the population; however, for small data sets, analysis often considers a sample. We will compute both for clarity.

Population variance:

$$\sigma^2 = \frac{16 + 1 + 0 + 1 + 16}{5} = \frac{34}{5} = 6.8$$

Sample variance:

$$s^2 = \frac{34}{4} = 8.5$$

5. Compute the Standard Deviation

Standard deviation is the square root of the variance:

- Population standard deviation:

$$\sigma = \sqrt{6.8} \approx 2.607$$

- Sample standard deviation:

$$s = \sqrt{8.5} \approx 2.915$$

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## Analyzing the Options and Final Results

The options provided are:

- A. -2.5
- B. 18.5
- C. 6.8

None of these options directly match the calculated standard deviation ( $\sim 2.607$  for population,  $\sim 2.915$  for sample). However, the number 6.8 appears as the variance in the population case, which aligns with option C.

This indicates that the question might be asking for the variance, not the standard deviation, or perhaps the options are referencing specific calculations.

- If considering variance: The population variance is 6.8, which matches option C.
- If considering standard deviation: The square root of 6.8 is approximately 2.607, which is not listed.

Given the options, the most logical match is:

Option C: 6.8, representing the population variance of the data set.

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# Implications and Common Misconceptions

Common Misconceptions Addressed:

- Standard deviation is not the variance: Variance is the average squared deviation; standard deviation is its square root.
- Negative standard deviation: It cannot be negative; negative options indicate a misunderstanding or mislabeling.
- Using the wrong denominator: For population data, divide by  $n$ ; for samples, divide by  $n-1$ .

Clarification:

In many introductory problems, variance and standard deviation are both used, but they are distinct. The variance of the data set is 6.8, and the standard deviation would be approximately 2.607.

Practical Relevance:

Knowing whether the question refers to variance or standard deviation is crucial. In this case, the provided options suggest the variance is the focus, making option C (6.8) the correct choice if the question is about variance.

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## Conclusion

The detailed calculation reveals that the population variance of the data set 4, 7, 8, 9, 12 is 6.8, which directly aligns with option C. The standard deviation would be the square root of 6.8, approximately 2.607, but this is not listed among the options.

Key Takeaways:

- The data set's mean is 8.
- The variance (for the entire population) is 6.8.
- The standard deviation (population) is approximately 2.607.
- The options provided most closely match the variance rather than the standard deviation.

Final Answer: The question, as posed, appears to be asking for the standard deviation, but based on the options, the most appropriate choice is C. 6.8, which indicates the variance. For precise clarity, if the question intended the standard deviation, none of the options exactly match, but the variance aligns with option C.

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Note: When dealing with data analysis, always clarify whether the problem asks for variance or standard deviation, and ensure the options correspond appropriately.

## **What Is The Standard Deviation Of The Data Set Given Below** **4 7 8 9 12o A 2 5o B 18 5o C 6 8o**

What Is The Standard Deviation Of The Data Set Given Below 4 7 8 9 12o A 2 5o B 18 5o C 6 8o

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