

# Learn How to Calculate the Coefficient of Variation Using a TI-84 Calculator

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## Defining the Coefficient of Variation (CV)

The [coefficient of variation](#) (CV) stands as a fundamental [statistical measure](#) designed to quantify the dispersion, or spread, of values within a [dataset](#) relative to its average value, known as the [mean](#). Unlike the standard deviation, which reports variability in the absolute units of the original data, the CV is a standardized, dimensionless ratio. This unique characteristic makes it an invaluable tool when comparing different statistical distributions.

The core utility of this standardization is its ability to facilitate direct and meaningful comparisons of variability across two or more datasets that might employ entirely different units of measurement, scales, or magnitudes. Because it removes the influence of the data's scale, the coefficient of variation provides a true measure of relative variability, answering the question: How large is the variation compared to the expected value?

Mathematically, the coefficient of variation is calculated by determining the ratio of the [standard deviation](#) to the mean. When working with population parameters, which is customary in theoretical statistical modeling, the foundational relationship is expressed by the following succinct formula:

$$CV = \sigma / \mu$$

The variables used in this definition are clearly established:

$\sigma$ : Represents the population standard deviation, which quantifies the average distance data points lie from the center of the distribution.

$\mu$ : Represents the arithmetic mean of the population, defining the central tendency of the data.

## The Strategic Importance of Relative Variability

In practical application, the CV reveals the amount of volatility, uncertainty, or risk that exists per unit of expected value. Since the calculation deliberately eliminates the influence of the data's overall magnitude, the resulting ratio offers powerful insight. A lower [coefficient of variation](#) indicates greater consistency and reliability within the data relative to its average level. Conversely, a high CV suggests that the data points are widely scattered, implying that the mean is not a particularly reliable predictor of individual outcomes.

This statistical metric is crucial across numerous disciplines that require precise [risk assessment](#), including quality control engineering, environmental science, and epidemiology. However, its most widely cited and frequent application is within the field of finance, where it is leveraged extensively to evaluate the risk-adjusted performance of investment instruments.

In sophisticated investment analysis, portfolio managers utilize the CV to compare the anticipated

return of an asset relative to the expected [standard deviation](#)--which serves as the proxy for volatility or risk--associated with that investment. This methodology facilitates an essential apples-to-apples comparison of risk efficiency between investments with vastly different scales and return profiles, such as evaluating a low-volatility bond portfolio against a high-growth, high-risk technology stock fund.

## Calculating CV Manually: A Financial Example

To fully grasp the analytic power of this metric, let us examine a common scenario encountered by professional portfolio managers. Imagine an investor evaluating whether to allocate capital to one of two distinct mutual funds, labeled Fund A and Fund B. The gathered historical performance characteristics are detailed below:

Mutual Fund A: Mean expected return = 9.0%, Standard Deviation (Risk) = 12.4%

Mutual Fund B: Mean expected return = 5.0%, Standard Deviation (Risk) = 8.2%

While Fund A clearly promises a higher return, it also carries a significantly higher risk profile. Conversely, Fund B presents lower risk but yields a smaller return. To objectively determine which fund offers the superior return per unit of risk, the investor must calculate the [coefficient of variation](#) for each fund:

CV for Mutual Fund A =  $12.4\% / 9.0\% \approx 1.38$

CV for Mutual Fund B =  $8.2\% / 5.0\% = 1.64$

The results conclusively demonstrate that Mutual Fund A possesses a lower coefficient of variation (1.38 is less than 1.64). This crucial finding implies that for every unit of return generated, Fund A incurs less risk relative to Fund B. Consequently, Fund A is identified as the more efficient and less volatile choice when assessing performance against the risk it is expected to generate.

## Preparing the TI-84 for Statistical Analysis

For datasets containing hundreds or thousands of observations, calculating the mean and standard deviation manually becomes prohibitively time-consuming and highly susceptible to calculation errors. Fortunately, the [TI-84 calculator](#) series is equipped with powerful, built-in statistical functions designed to automate the initial complex steps. This allows us to quickly retrieve the two essential components--the sample mean ( $\bar{x}$ ) and the sample standard deviation ( $S_x$ )--required for the final CV calculation.

The streamlined process involves three key actions: first, inputting the raw numerical data into a designated list; second, executing the 1-Variable Statistics function; and finally, using the resulting output values to compute the ratio ( $CV = S_x / \bar{x}$ ) on the calculator's main home screen.

We will use the following specific numerical [dataset](#) to walk through the detailed, step-by-step procedure on the TI-84 platform:

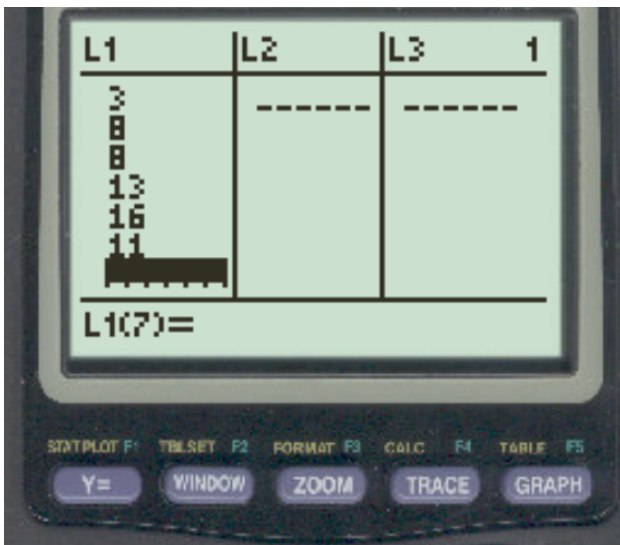
**Target Dataset:** 3, 8, 8, 13, 16, 11

## Step 1: Inputting Raw Data into List L1

The prerequisite for initiating any statistical analysis on the TI-84 is the organization and entry of the raw data. We must begin by accessing the foundational List Editor tool.

Start by pressing the dedicated Stat key, which is typically located near the top center of the keypad. Next, select the EDIT menu, corresponding to option 1. This action opens the screen displaying the list columns (L1, L2, L3, etc.), which are used for data storage.

If the L1 column currently contains old data, you must clear it before proceeding. Navigate the cursor up until the L1 label is highlighted, press the Clear key, and then press Enter to execute the list clearing command. Once L1 is empty, carefully enter each data value from our target dataset (3, 8, 8, 13, 16, 11) sequentially into column L1, ensuring you press Enter after each individual number to advance the cursor to the next row.



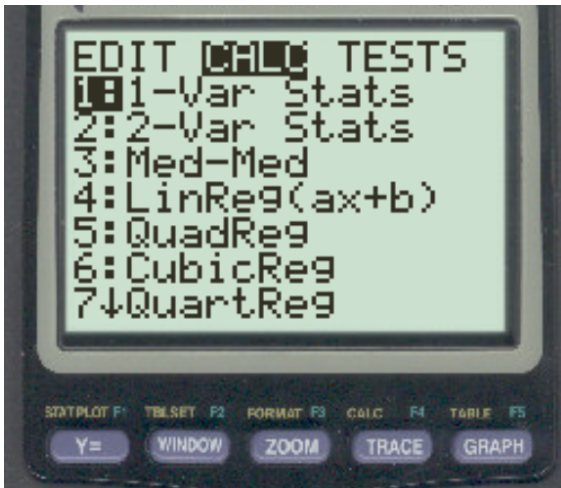
It is absolutely critical at this stage to double-check that every data point has been entered accurately. Even a single entry mistake will inevitably skew both the calculated [mean](#) and standard deviation, resulting in an incorrect final coefficient of variation.

## Step 2: Executing 1-Variable Statistics

With the dataset securely stored in List L1, we are now ready to instruct the calculator to compute

the essential descriptive statistics.

Press the Stat key again. Utilize the right arrow key to scroll horizontally past the EDIT menu and onto the CALC menu. Within this calculation menu, select option 1, which is designated as 1-Var Stats (One-Variable Statistics).

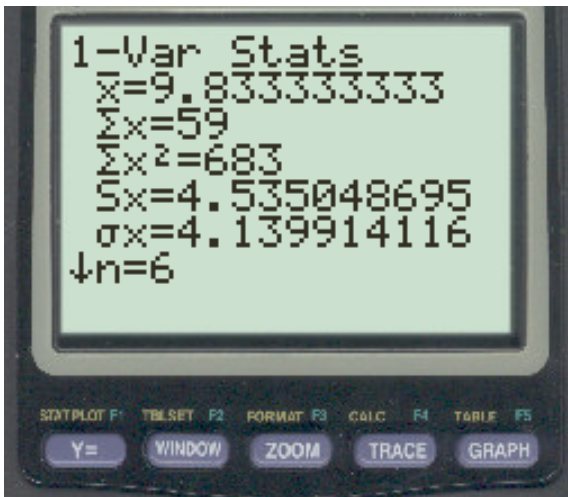


On the setup screen that subsequently appears, verify that the List setting is correctly configured to L1 (this is typically the default selection) and confirm that FreqList is either left empty or set to 1. Scroll down to the Calculate option and press Enter to run the analysis. If you are operating an older TI-84 model that does not feature this menu, you will simply see "1-Var Stats" appear on the home screen; in this scenario, manually type L1 after the command (by pressing 2nd followed by 1) and then press Enter.



### Step 3: Extracting Components and Finalizing the CV

After the execution of the 1-Var Stats function, the [TI-84 calculator](#) will display a comprehensive summary screen listing all calculated statistics derived from the dataset in L1. Our primary objective is to locate and extract the two specific values mandatory for calculating the [coefficient of variation](#): the sample mean ( $\bar{x}$ ) and the sample standard deviation ( $S_x$ ).

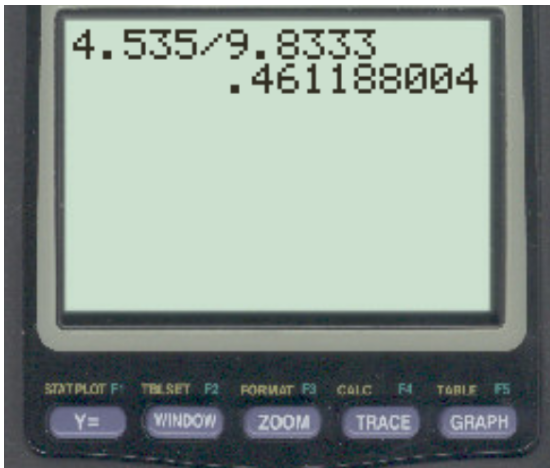


Based on the statistical output generated for our dataset (3, 8, 8, 13, 16, 11), we identify the following key components:

Sample Mean ( $\bar{x}$ ): Denoted by the symbol  $\bar{x}$ , the average value is **9.8333**.

Sample Standard Deviation ( $s$ ): Denoted as  $S_x$ , the calculated measure of dispersion is **4.535** (rounded to four decimal places).

The final analytical step is to compute the CV using the formula:  $CV = \text{Standard Deviation} / \text{Mean}$  ( $S_x / \bar{x}$ ). This straightforward operation must be executed manually on the calculator's main home screen.



By dividing the sample standard deviation (4.535) by the sample mean (9.8333), the coefficient of variation for this particular dataset is determined to be approximately **0.4612**. When this ratio is converted into a percentage (by multiplying by 100), the CV is **46.12%**. This result indicates that the spread of the data, measured by the standard deviation, is nearly half the size of the mean, signifying a relatively high degree of variability relative to the average.

## Conclusion and Further Study

Mastering the efficient calculation of the [coefficient of variation](#) using the TI-84 is a fundamental skill for analysts, students, and professionals engaged in data interpretation and statistical analysis. The CV provides a crucial standardized measure that is essential for objectively comparing risk, volatility, and consistency across diverse datasets, regardless of their underlying units. For those seeking deeper proficiency in descriptive statistics and the advanced functions offered by the TI-84 graphing calculator, it is highly recommended to consult official instructional materials and specialized statistical references.