

Learn How to Calculate the Line of Best Fit on a TI-84 Calculator

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In the realm of statistics, determining the [line of best fit](#)--formally known as the least-squares regression line--is a crucial analytical technique. This method is employed to mathematically model the linear relationship existing between two quantitative variables. The resulting line is calculated to minimize the sum of the squared vertical distances (known as residuals) from every data point to the line itself, thereby providing the most accurate linear summary of the data trend.

The derived linear equation serves as a powerful predictive tool, enabling researchers and analysts to forecast outcomes and precisely quantify the strength and direction of the correlation within a given [dataset](#). Its applications are essential across diverse fields, ranging from economic forecasting and market analysis to rigorous scientific experimentation, offering a clear and actionable mathematical representation of association between variables.

This comprehensive tutorial offers a precise, step-by-step guide focused on leveraging the capabilities of the [TI-84 calculator](#), a staple tool in secondary and collegiate mathematics curricula, to efficiently derive this critical regression equation. We will detail the exact sequence of keystrokes required to calculate the line of best fit using the following sample data points:

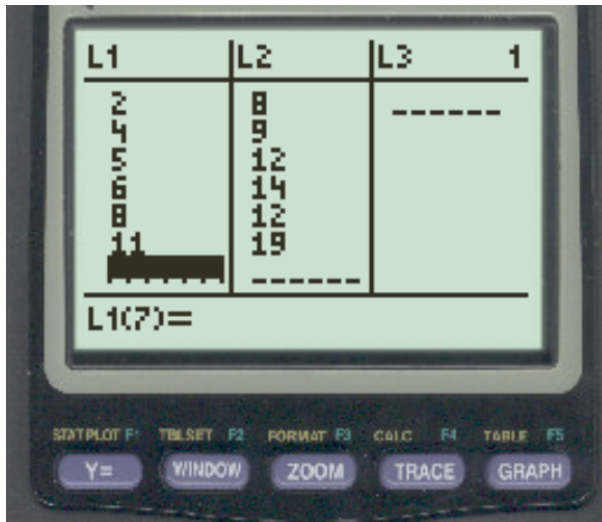
x	y
2	8
4	9
5	12
6	14
8	13
11	19

Step 1: Preparing the Calculator and Inputting Data

The initial and most critical phase of any statistical analysis performed on the TI-84 involves the accurate entry of paired data points into the calculator's statistical lists. Precision is absolutely paramount in this step, as any errors in data entry will inevitably propagate and skew the final regression equation. It is highly recommended practice to first ensure that the calculator's existing lists are clear of any residual data, though new entries typically overwrite old values automatically.

To commence the data entry process, press the core statistical access button, labeled STAT. This action brings up the main statistical menu. From the subsequent options displayed, verify that option 1, corresponding to the EDIT function, is highlighted and selected. Executing this step opens the list editor interface, which commonly displays columns designated as L1, L2, L3, and so forth.

Proceed by meticulously entering the independent variable values (often denoted as X-values) into list L1, ensuring you press ENTER following the input of each number. Immediately thereafter, enter the corresponding dependent variable values (Y-values) into list L2. Maintaining the integrity of the data pairs is crucial: the X and Y coordinates must align horizontally, meaning the total count of entries in L1 must exactly match the total count of entries in L2.



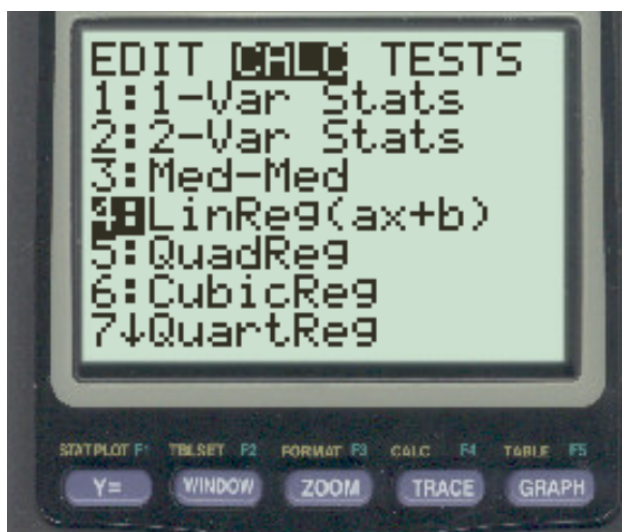
For our illustrative [dataset](#), L1 holds the X values, while L2 contains the associated Y values. Once all data points have been entered, perform a swift, visual verification by double-checking your entries against the original source data. This simple preventative measure can avert systemic calculation errors before proceeding to the analytical phase.

Step 2: Executing the Linear Regression Calculation

With the paired data securely stored within lists L1 and L2, the subsequent objective is to command the calculator to perform the linear regression analysis. This process utilizes the TI-84's powerful built-in statistical functions specifically engineered for determining the algebraic structure of the line of best fit, which is conventionally represented in the slope-intercept form: $y = ax + b$.

Begin by pressing the STAT button once more. However, instead of remaining in the EDIT menu, navigate one position to the right using the arrow keys until the cursor rests upon the CALC menu. This menu serves as the repository for all essential computational statistics functions, encompassing various types of regressions, statistical tests, and confidence interval calculations.

Within the comprehensive CALC menu, scroll down the list of options until you locate option 4, labeled LinReg(ax+b). This precise function is designed to compute the linear regression model using the slope-intercept format, where the coefficient a represents the calculated slope and b represents the calculated y-intercept. Select this option by pressing ENTER.



If you are operating a newer model, such as the TI-84 Plus CE, a configuration wizard screen will typically appear, prompting you to designate the Xlist, Ylist, and the desired location to Store RegEQ. For users of older calculator models, the command LinReg(ax+b) will simply populate the home screen, requiring the manual input of list names and the storage location, as elaborated in the next step.

Step 3: Specifying Lists and Storing the Regression Equation

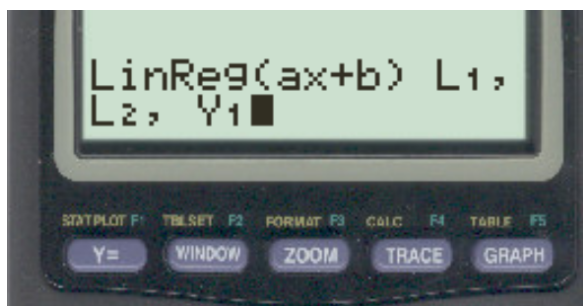
To guarantee the calculation executes correctly, it is necessary to explicitly inform the regression function which lists contain the independent (X) and dependent (Y) data. While the [TI-84 calculator](#) often defaults to L1 and L2, clearly specifying these lists is vital, particularly when working with complex or multiple datasets. The required command structure on the home screen must follow the format: LinReg(ax+b) L1, L2, Y1.

To input L1, press the 2nd key followed immediately by the number 1 (which functions as the shortcut for L1). Next, press the comma key , which is situated directly above the 7 key. Subsequently, input L2 by pressing 2nd followed by 2. Press the comma key , once more to cleanly separate the data lists from the desired storage location.

The final, crucial administrative step involves storing the resulting calculated regression equation directly into the calculator's Y= function editor. This step, facilitated by the "Store RegEQ" feature, is essential because it allows the equation to be graphed automatically alongside the original data points in the scatterplot. To access this storage destination, press VARS. Use the arrow keys to scroll right until you highlight the Y-VARS menu, and then select option 1: Function. Finally, choose the first function slot, Y1, and press ENTER.

The complete instruction set on your home screen command line (or the final line of the wizard

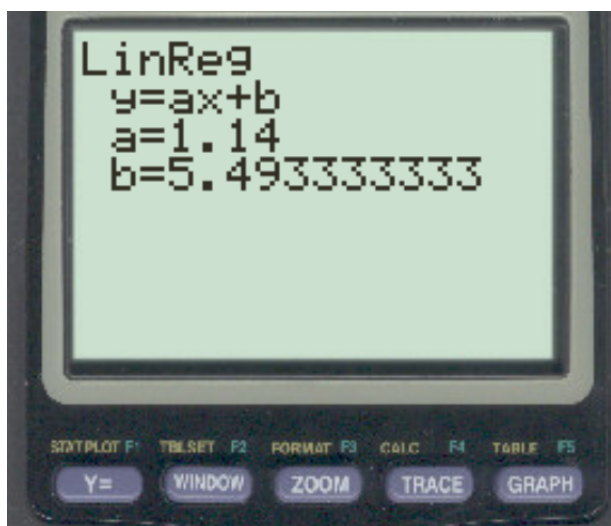
screen) should now accurately reflect the following structure, guaranteeing that the calculation utilizes L1 as the X-list, L2 as the Y-list, and stores the resulting algebraic expression into Y1 for immediate graphing:



Press ENTER one final time to execute the command. The [TI-84 calculator](#) will swiftly process the statistical calculations using the least squares method and immediately present the comprehensive results output on the screen.

Step 4: Interpreting the Regression Output

Once the command is executed, the calculator generates a detailed output screen containing several vital statistical measurements. A clear understanding of these values is indispensable for correctly interpreting the nature of the relationship between your independent (X) and dependent (Y) variables. The output adheres to the standard linear model notation $y = ax + b$, where the coefficient a represents the slope and b represents the y-intercept.



By analyzing the results generated by the TI-84 for this specific dataset, we can instantly identify the fundamental components of the regression equation. In this case, the calculator yields the

values: $a \approx 1.14$ and $b \approx 15.4$. Consequently, the calculated [line of best fit](#) is precisely expressed as: $y = 1.14x + 15.4$.

The value $a=1.14$ represents the slope of the line, which provides the calculated rate of change. Specifically, this indicates that for every single unit increase observed in the X variable, the Y variable is statistically predicted to increase by approximately 1.14 units, clearly demonstrating a positive linear relationship. The Y-intercept, $b=15.4$, signifies the predicted value of Y when the X variable is exactly zero. It is crucial, however, that the practical significance of this intercept always be carefully evaluated within the specific real-world context of the data being analyzed.

Beyond the equation parameters, the output also furnishes the correlation coefficient (r) and the [coefficient of determination](#) (r^2 , often referred to as the R-squared value). The correlation coefficient (r) quantitatively assesses both the strength and the direction of the linear relationship, falling within the range of -1 to 1. An r value close to 1 or -1 denotes an exceptionally strong relationship, whereas a value near 0 suggests a weak or statistically non-existent linear relationship. For our example, $r \approx 0.9945$, which is indicative of an extraordinarily strong positive correlation.

The [R-squared value](#) (r^2) is arguably the most critical metric for evaluating the model's overall predictive efficacy. This value quantifies the proportion of the total variation observed in the dependent variable (Y) that can be reliably explained or predicted by the established linear relationship with the independent variable (X). If $r^2 \approx 0.989$, as calculated here, it means that approximately 98.9% of the variability in Y is successfully accounted for by this linear model. Such a high value strongly suggests that the derived line of best fit functions as an excellent linear model for accurately summarizing this particular data trend.

Step 5: Visualizing the Model: Scatterplot and Regression Line

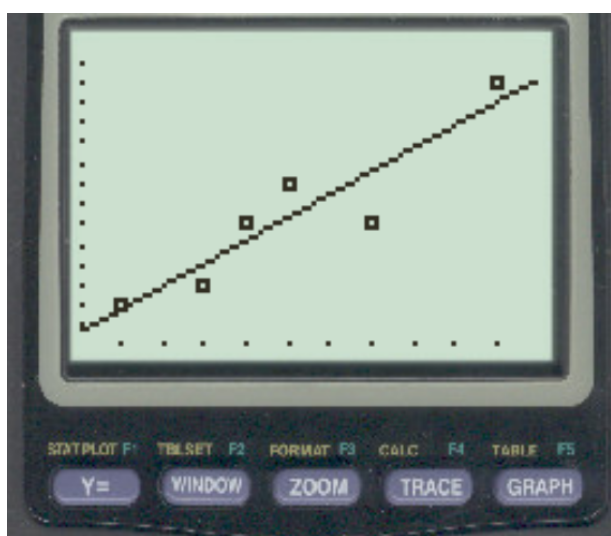
While the numerical output provides the precise mathematical equation, visualizing the actual data points and the regression line simultaneously on a [scatterplot](#) provides indispensable visual confirmation regarding the quality of the fit. Since we successfully stored the regression equation into the Y1 function during Step 3, the calculator is now optimally configured to graph both the discrete points and the calculated line concurrently.

Prior to attempting the graph, ensure that the statistical plot feature is fully enabled. Access this by pressing 2nd followed by Y= (which accesses the STAT PLOT menu). Verify that Plot1 is set to On and is configured to display a scatterplot (typically the first icon), utilizing L1 as the Xlist and L2 as the Ylist. If this plot is not currently enabled, turn it on and confirm the list parameters before moving forward.

To automatically achieve an optimal viewing window--meaning the axes limits are perfectly

adjusted so that all data points are clearly visible--utilize the specialized zoom function. Press the ZOOM button, and then scroll down the extensive menu until you reach option 9: ZOOMSTAT. Selecting this function and pressing ENTER dynamically resizes the viewing window to perfectly encompass the full range of data entered in lists L1 and L2, guaranteeing an ideal visual representation.

The resulting graph provides a clear visual display of the discrete data points overlaid with the calculated line of best fit. The tight clustering of the points around the line visually reinforces the strong positive correlation previously suggested by the high R-squared value, effectively demonstrating the robust nature of the linear model in summarizing the underlying data trend.



Step 6: Summary, Prediction, and Best Practices

Developing proficiency in using the [TI-84 calculator](#) for linear regression is a foundational skill for anyone engaging in statistical analysis. By meticulously adhering to this structured sequence--data entry, calculation execution, equation storage, and visual verification--you can quickly and accurately derive the mathematical equation that models the relationship between any two quantitative variables.

The final regression equation, $y = 1.14x + 15.4$, is now ready to be employed for forecasting purposes. This is particularly useful for estimating Y values for X inputs that fall within the observed data range (a process known as interpolation). For instance, to predict the Y value when $X=7$, we substitute this value into our equation: $y = 1.14(7) + 15.4 = 7.98 + 15.4 = 23.38$.

It is paramount to recall that while the line of best fit minimizes prediction error, a strong statistical correlation, even one supported by a high [R-squared value](#), does not inherently imply causation unless the data was derived from a properly designed, controlled experiment. Analysts must

always consider the contextual implications of their data and the reliability of the model before drawing definitive conclusions about the true nature of the relationship being mathematically modeled.

Additional Resources for Advanced Analysis

For students and researchers seeking to delve into more sophisticated aspects of linear modeling beyond basic calculation, the TI-84 supports a range of advanced statistical functions. Recommended areas for further study and exploration include:

Calculating and analyzing residuals and residual plots to rigorously assess whether the underlying assumption of linearity holds true.

Performing hypothesis tests on the slope coefficient (typically t-tests) to formally determine if the relationship observed is statistically significant or merely due to random chance.

Comparing the results of linear regression with those obtained from non-linear models, such as exponential, power, or logarithmic regression, in order to identify the most appropriate functional form that accurately describes the dataset.