

# Learn to Calculate Correlation Coefficients Using a TI-84 Calculator

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## RECOMMENDED CITATION

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The [correlation coefficient](#), designated primarily by the symbol  $r$ , is an essential metric in statistics used to precisely quantify both the strength and the direction of the [linear association](#) between any two distinct sets of variables. This dimensionless value is always constrained to a specific range, taking a value between  $-1$  and  $1$ . Grasping the meaning of this range is paramount for accurate statistical interpretation of bivariate data.

The resulting value of  $r$  offers immediate, critical insight into how the two data sets interact linearly, providing a quick assessment of their relationship:

A value approaching  $-1$  signifies a perfectly strong negative linear correlation. This means that as one variable uniformly increases, the other variable decreases with equal consistency.

A value near  $0$  suggests little to no observable [linear relationship](#) between the variables.

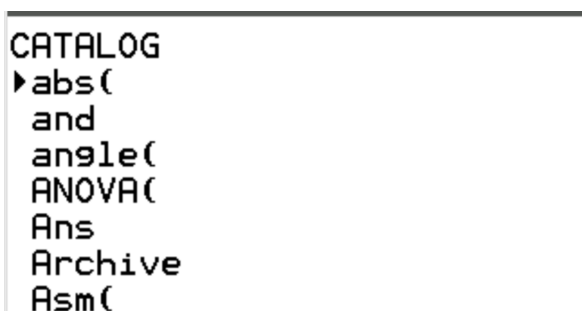
A value approaching  $1$  represents a perfectly strong positive linear correlation, indicating that both variables increase or decrease together in a highly predictable, synchronized manner.

While calculating the correlation coefficient manually using its complex formula is often time-consuming and prone to error, the powerful [TI-84 Calculator](#) is specifically designed to streamline this process. The following step-by-step guide details how to leverage the calculator's built-in functions to efficiently compute and display the correlation coefficient  $r$ .

## Step 1: Ensuring Statistical Diagnostics are Enabled

A critical preliminary step often overlooked is enabling the [statistical diagnostics](#) feature on the **TI-84** graphing calculator. If this internal setting remains disabled, the calculator will successfully compute the regression equation but will notably omit the display of the crucial values for the correlation coefficient ( $r$ ) and the [coefficient of determination](#) ( $r^2$ ). Activating this feature ensures a complete statistical output.

To access and modify this setting, press the sequence **2nd** followed immediately by the number **0**. This key combination instantly navigates to the comprehensive **CATALOG** screen, which functions as the calculator's master index, listing every available function alphabetically.



```
CATALOG
▶abs(
  and
  angle(
  ANOVA(
  Ans
  Archive
  Asm(
```

Within the **CATALOG**, you must scroll down the extensive list until you locate the specific command labeled **DiagnosticOn**. Due to the alphabetical organization, rapidly scrolling downwards is the most efficient method for locating this option. Once **DiagnosticOn** is highlighted, press the ENTER key to select it.

```
CATALOG
DependAsk
DependAuto
det(
DetectAsymOff
DetectAsymOn
DiagnosticOff
▶DiagnosticOn
```

To finalize the command and permanently enable the display of the correlation coefficient output, press ENTER one final time. The screen will display the word **Done**, confirming that the statistical diagnostics are successfully turned on and prepared for subsequent regression analysis. This crucial setting will remain active until the calculator's memory is manually cleared or reset.

```
DiagnosticOn
.....Done
█
```

## Step 2: Inputting Paired Data into the Statistical Lists

The next essential phase involves accurately inputting the raw data points for the two variables being analyzed. The [TI-84 Calculator](#) manages data through dedicated internal lists, conventionally labeled L1, L2, L3, and so forth. To initiate data entry, press the dedicated Stat button, and then verify that the **EDIT** menu option (usually option 1) is highlighted. Press ENTER to access the list editor interface.

For linear regression analysis, it is standard practice to input the independent variable (X-values) into list **L1** and the corresponding dependent variable (Y-values) into list **L2**. Maintaining the correct alignment of paired data across the rows is paramount; the integrity of the correlation calculation depends entirely on ensuring that each X value correctly corresponds to its specific Y observation.

Before entering a new data set, it is highly recommended to clear any residual data from previous calculations in lists L1 and L2. To clear a list, use the cursor keys to navigate up and highlight the list name (e.g., L1), press the CLEAR button (do not press DEL), and then press ENTER. Once both lists are properly cleared and populated with your current paired observations, the screen should visually confirm the data structure shown below:

L1	L2	L3	L4	L5	2
4	24	-----	-----	-----	
6	26				
6	30				
7	25				
12	35				
14	36				
15	42				
19	40				
19	38				
-----	-----				

### Step 3: Executing the Linear Regression Analysis

Once the data points have been successfully and accurately entered into lists L1 and L2, the **TI-84** is prepared to execute the necessary complex computations required to derive the [correlation coefficient](#). This value is intrinsically generated as a core component of the overall [linear regression](#) analysis.

Begin the calculation process by pressing the Stat button again. Instead of remaining on the EDIT menu, use the right arrow key to navigate horizontally over to the **CALC** menu. This menu aggregates all the statistical calculation functions available on the device, ranging from basic one-variable statistics to advanced regression models.

Within the **CALC** menu, scroll down until you reach option **8: LinReg(a+bx)**. This specific function is designed to calculate the equation for the line of best fit in the form ( $y = a + bx$ ). Crucially, when statistical diagnostics are enabled (as performed in Step 1), this function also generates and displays the correlation coefficient  $r$ . Press Enter to select this calculation method.

```
EDIT CALC TESTS
1:1-Var Stats
2:2-Var Stats
3:Med-Med
4:LinReg(ax+b)
5:QuadReg
6:CubicReg
7:QuartReg
8:LinReg(a+bx)
```

On the subsequent parameter screen, carefully confirm that the **Xlist** is correctly designated as **L1** and the **Ylist** is set to **L2** (these are the default settings, but confirmation is advised). Once these list assignments are verified, navigate the cursor down to the **Calculate** option and press ENTER to instruct the calculator to perform the linear regression analysis based on your data.

```
LinReg(a+bx)
Xlist:L1
Ylist:L2
FreqList:
Store RegEQ:
Calculate
```

#### Step 4: Locating and Identifying the Correlation Value (r)

Immediately following the execution of the command, the calculator will present a detailed summary screen displaying the results of the [Linear Regression \(a+bx\)](#) analysis. This output provides all the coefficients needed to define the line of best fit, including the slope (b) and the y-intercept (a). Crucially, because we enabled the diagnostics in Step 1, the output will also include the correlation coefficient **r** and the coefficient of determination **r<sup>2</sup>**.

For the purposes of determining the relationship strength, the primary focus must be on the value labeled **r**. In the illustrative example displayed on the screen, the correlation coefficient between the two initially entered variables is clearly shown as **0.9145**. This numerical result is the foundation upon which the practical relationship between the data sets must be interpreted.

LinReg
$y=a+bx$
$a=20.69568823$
$b=1.075870647$
$r^2=0.8363943464$
$r=0.9145459783$

## Step 5: Interpreting the Strength and Direction of the Association

The final step in the process involves translating the calculated value of  $r$  into a meaningful description of the relationship between the variables. The sign of  $r$  (positive or negative) dictates the direction of the association, while the absolute magnitude of  $r$  (how close it is to 1 or -1) determines the strength of the linear relationship.

Statisticians rely on established benchmarks to categorize the strength of the linear association based on the absolute value of the correlation coefficient ( $|r|$ ). These accepted guidelines are essential for converting a raw decimal number into a clear, descriptive understanding of how tightly coupled the movement of the two variables is:

Absolute Value of $r$ ( $ r $ )	Strength of Relationship
$ r  < 0.25$	Negligible or <b>No discernible linear relationship</b>
$0.25 \leq  r  < 0.5$	<b>Weak linear relationship</b>
$0.5 \leq  r  < 0.75$	<b>Moderate linear relationship</b>
$ r  \geq 0.75$	<b>Strong linear relationship</b>

Applying this robust interpretation framework to our example result,  $r = 0.9145$ , allows for a definitive conclusion: the relationship between the two tested variables is classified as **strong and positive**. This high numerical magnitude confirms a highly reliable and closely coupled linear relationship, signifying that observable changes in one variable are highly predictive of corresponding changes in the other.