How to Perform a Chi-Square Goodness of Fit Test on Your TI-84 Calculator

Authored by

stats writer

March 11, 2026

Understanding the Chi-Square Goodness of Fit Test

The **Chi-Square Goodness of Fit Test** is a fundamental statistical procedure used to determine how well an observed set of data matches a theoretical or expected **probability distribution**. In the realm of **statistics**, researchers often encounter **categorical variables** where data is grouped into distinct classes. The primary objective of this test is to ascertain whether the frequencies observed in these categories deviate significantly from the frequencies we would expect under a specific **null hypothesis**.

When performing this analysis, the researcher compares the **observed frequencies**--the actual counts collected from a sample--against the **expected frequencies**, which are calculated based on the hypothesized distribution. If the discrepancy between these two sets of values is large enough, it suggests that the proposed model does not accurately represent the real-world data. Conversely, if the differences are minor and can be attributed to random sampling error, the model is considered a "good fit."

Utilizing a **TI-84 Plus** graphing calculator streamlines this complex calculation significantly. Instead of manually computing the squared differences and dividing by expected values for each category, the calculator's built-in **statistical functions** handle the arithmetic, allowing the user to focus on interpreting the **p-value** and the implications for their research. This tutorial provides a comprehensive walkthrough on how to leverage this technology for accurate results.

Theoretical Foundations and Requirements

Before proceeding with the technical steps on your calculator, it is essential to understand the underlying assumptions of the **Chi-Square Goodness of Fit Test**. First, the data must be obtained through a **simple random sample** to ensure that the observations are representative of the population. Furthermore, the variable under study must be categorical, and the sample size must be sufficiently large. A common rule of thumb is that every expected frequency should be at least 5 to ensure the **chi-square distribution** provides a valid approximation.

The test relies on a specific mathematical formula where the test statistic is the sum of the squared differences between observed and expected values, divided by the expected values. This calculation results in a **chi-square statistic**. The higher this value, the less likely it is that the observed data fits the expected distribution. To reach a conclusion, we compare this statistic against a **critical value** or analyze the resulting **p-value** relative to a predetermined **significance level**, usually denoted as alpha (α).

In the context of the **TI-84 Plus**, the calculator automates the comparison between the test statistic and the distribution. It also calculates the **degrees of freedom**, which is defined as the number of categories minus one. Understanding these components is vital for anyone engaged in **statistical**

hypothesis testing, as it ensures the results are not just numbers, but meaningful insights into the data's behavior.

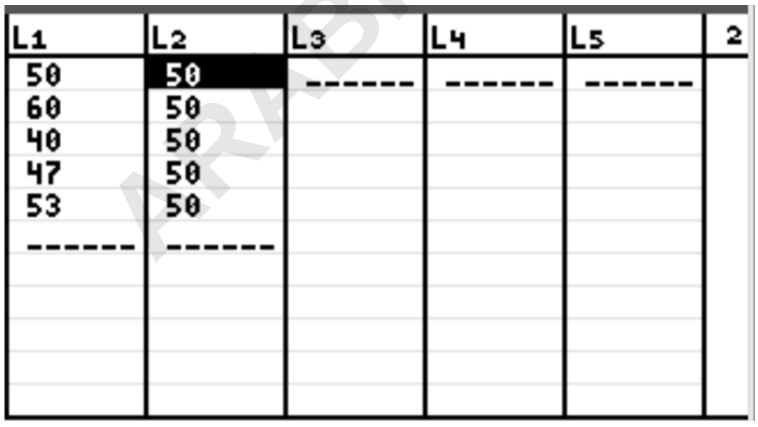
Step 1: Organizing and Inputting Data into Lists

To begin the process on your **TI-84 Plus**, you must first clear any existing data from your lists to avoid errors. Press the **STAT** button and select **EDIT**. This will open the list editor, where you will see columns labeled L1, L2, and so on. We will use L1 for our **observed frequencies** and L2 for our **expected frequencies**. This organizational structure is critical for the calculator to perform the correct pairings during the test execution.

Consider the following example: A shop owner claims that customer traffic is distributed equally across all five weekdays. To verify this, a researcher collects data and finds the following **observed frequencies**:

Monday: 50 customers
Tuesday: 60 customers
Wednesday: 40 customers
Thursday: 47 customers
Friday: 53 customers

In this scenario, the total number of customers is 250. Under the **null hypothesis** that customers are evenly distributed, the **expected frequency** for each of the five days would be 250 divided by 5, which equals 50. You will now enter the observed values (50, 60, 40, 47, 53) into column **L1** and the expected values (50, 50, 50, 50, 50) into column **L2**.



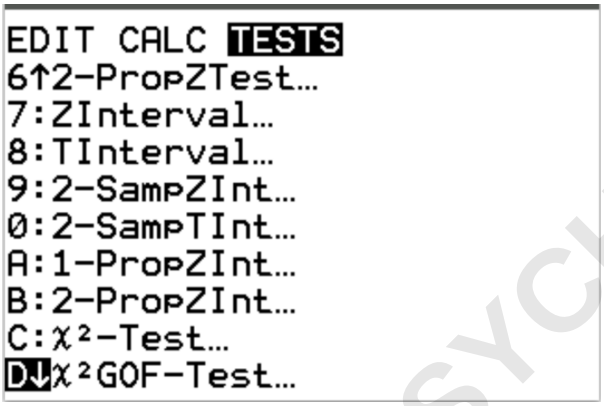
Accuracy during this data entry phase is paramount. Double-check that the number of entries in L1 matches the number of entries in L2. If there is a mismatch, the **TI-84 Plus** will return a "Dimension Mismatch" error when you attempt to run the test. Once your lists are correctly populated, you are

ready to move to the calculation phase.

Step 2: Navigating to the Chi-Square Test Menu

With your data securely entered into the lists, the next phase involves navigating the calculator's internal **algorithm** for the **Chi-Square Goodness of Fit Test**. Press the **STAT** key again, but this time use the right arrow key to scroll over to the **TESTS** menu. This menu contains all the **inferential statistics** tools available on the device, ranging from z-tests to various **ANOVA** options.

Scroll down through the list until you find **D: χ2GOF-Test**. It is important not to confuse this with the **χ2-Test** (Option C), which is used for tests of independence or homogeneity in **contingency tables**. The "GOF" in the name specifically stands for "Goodness of Fit," which is the procedure we require for comparing a single **categorical variable** against a known distribution.



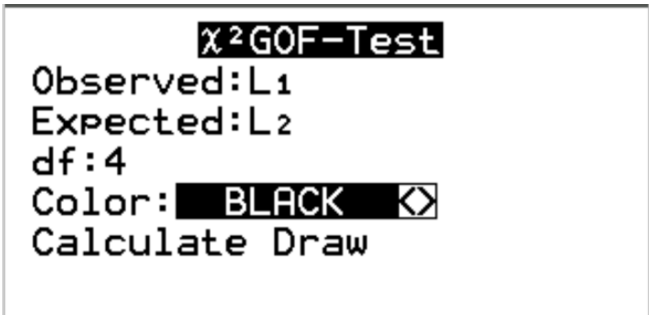
Once you have highlighted **χ2GOF-Test**, press the **ENTER** key. This action will take you to a configuration screen where you will define the parameters for your specific dataset. Proper selection here ensures that the calculator pulls the correct **observed frequencies** and **expected frequencies** from the lists you previously populated.

Step 3: Configuring Test Parameters and Degrees of Freedom

On the **χ2GOF-Test** screen, you will be prompted to specify several inputs. First, ensure that **Observed** is set to **L1** and **Expected** is set to **L2**. If these are not already selected, you can change them by pressing **2nd** followed by the number **1** (for L1) or the number **2** (for L2). This directs the **TI-84 Plus** to the specific columns containing your experimental data and theoretical values.

The next field is **df**, which stands for **degrees of freedom**. This value is central to the **chi-square distribution** and is calculated as the number of categories minus one (k - 1). In our shop owner

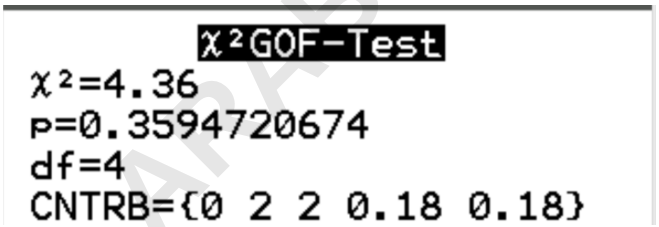
example, there are five categories (Monday through Friday), so the calculation is 5 - 1 = 4. Enter the number **4** into the **df** field to ensure the calculator uses the correct **probability density function** for your specific test.



After entering the degrees of freedom, you have the option to choose **Calculate** or **Draw**. Selecting **Calculate** will provide you with the immediate numerical output, including the test statistic and p-value. Selecting **Draw** will generate a visual representation of the **chi-square curve** and shade the area representing the **p-value**. For most formal analyses, **Calculate** is the preferred method as it provides precise figures for reporting.

Step 4: Interpreting the Statistical Output

Once you press **ENTER** on **Calculate**, the **TI-84 Plus** will display the results of your **Chi-Square Goodness of Fit Test**. The screen will show the chi-square test statistic (denoted as $\chi 2$), the **p-value** (denoted as P), and the **degrees of freedom**. It may also show a list of "CNTRB" values, which represent the individual contribution of each category to the total chi-square statistic.



In our current example, the calculator provides a **chi-square statistic** of **4.36** and a **p-value** of approximately **0.3595**. To interpret these results, we must compare the p-value to our **significance level** (α), which is commonly set at 0.05. If the p-value is less than or equal to α, the result is considered **statistically significant**, and we reject the null hypothesis. If the p-value is greater than α, we fail to reject the null hypothesis.

With a p-value of 0.3595, we observe that it is significantly higher than 0.05. This indicates that the

differences between the shop owner's expected customer distribution and the researcher's observed data are not large enough to be considered statistically meaningful. Consequently, we fail to reject the **null hypothesis**. There is no sufficient evidence to suggest that the shop owner's claim of equal customer traffic throughout the week is incorrect.

Conclusion and Practical Implications

Mastering the **Chi-Square Goodness of Fit Test** on a **TI-84 Plus** empowers researchers and students to validate theoretical models against empirical data with high efficiency. This **statistical inference** tool is indispensable in various fields, including biology, market research, and social sciences, where understanding the distribution of **categorical data** is essential for decision-making.

The ability to quickly input **observed frequencies** and **expected frequencies** allows for a iterative approach to **data analysis**. If a researcher finds that a model does not fit, they can refine their **null hypothesis** and re-test the data using the same calculator functions. This streamlined workflow reduces the risk of manual calculation errors and ensures that the focus remains on the interpretation of **statistical significance**.

In summary, the **TI-84 Plus** serves as a powerful bridge between complex statistical theory and practical application. By following the structured steps of data entry, test configuration, and **p-value** interpretation, you can confidently perform a **Chi-Square Goodness of Fit Test** to uncover the patterns hidden within your data. Whether you are verifying a shop owner's claims or conducting academic research, this method provides a reliable foundation for your statistical conclusions.