

Learning to Use invNorm on the TI-84 Calculator: A Step-by-Step Guide

Authored by
Mohammed loot

November 4, 2025

RECOMMENDED CITATION

Mohammed loot (2025). *Learning to Use invNorm on the TI-84 Calculator: A Step-by-Step Guide*. PSYCHOLOGICAL STATISTICS. Retrieved from <https://statistics.arabpsychology.com/?p=10058>

The **invNorm()** function stands as a cornerstone of statistical computation available on the [TI-84 calculator](#) series. This sophisticated function serves a critical purpose: determining the value (often referred to as a [Z-critical value](#) or a raw score) that corresponds precisely to a specified cumulative area or probability under the [Normal distribution](#) curve.

In the realm of statistics, probability calculations typically flow in one direction: you are given a score and asked to find the probability associated with it (a task handled by the normal cumulative density function, or normalcdf). **invNorm()** reverses this workflow. It performs the inverse operation, enabling statisticians and students to quickly find the score boundary when the probability or percentile is already known. Mastering this tool is absolutely essential for efficiently solving problems related to percentiles, confidence intervals, and defining rejection regions in formal [hypothesis testing](#).

Understanding the invNorm() Syntax and Parameters

To successfully utilize the **invNorm()** function, it is paramount to understand the specific parameters required by the TI-84 operating system. Unlike simple arithmetic functions, statistical distribution functions require inputs that define the probability area and the specific characteristics of the distribution being analyzed. The standard syntax utilized by the TI-84 family of calculators is concise yet powerful:

invNorm(probability, μ , σ)

Each variable within this function serves a distinct and vital role in calculating the inverse probability:

probability: This is the most crucial input, representing the cumulative area, or the left-tail probability, under the curve. This value must range between 0 and 1. In practical applications, such as defining rejection regions, this probability is often directly related to the [significance level](#) (α).

μ : This symbol represents the [population mean](#). When conducting calculations related to the standard normal distribution (Z-scores), this parameter is always set to 0.

σ : This symbol represents the [population standard deviation](#). Similar to the mean, when calculating standard Z-scores, this parameter must be set to 1. If you are calculating a raw score (X) from a non-standard distribution, you must substitute the actual mean and standard deviation of that specific data set.

It is critical to note the TI-84's default setting for **invNorm()**: it calculates the boundary based on the area accumulated from the far left (the negative infinity side) of the distribution. This is known as the left-tail or cumulative area. If you are working with a right-tail probability, you must perform a preliminary subtraction ($1 - \text{probability}$) before inputting the value into the function.

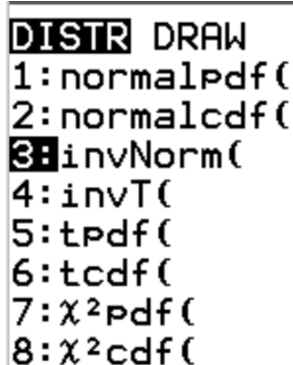
Navigating the TI-84 to Access invNorm()

Locating and executing the **invNorm()** function is straightforward once you are familiar with the calculator's menu structure. The function is housed within the calculator's dedicated distribution library, which consolidates all probability and density functions necessary for statistical analysis. Follow these precise steps to bring up the input screen for **invNorm()**:

Press the 2nd button, typically located in the upper left corner of the keypad.

Immediately press the VARS button. Note that the distribution menu, labeled **DISTR**, is printed directly above the VARS key, accessible via the 2nd function.

This sequence will open the **DISTR** (Distribution) screen, which lists dozens of functions. You will typically need to scroll down to find **invNorm()**, which is usually listed third or fourth in the menu, following density and cumulative functions like normalpdf and normalcdf. Always confirm that you have selected the correct function before entering your probability, mean, and standard deviation parameters.

A screenshot of the TI-84 calculator's DISTR (Distribution) menu. The menu is displayed in a black box with white text. At the top, 'DISTR' is highlighted in a black box, followed by 'DRAW'. Below these are eight numbered options: '1:normalpdf(', '2:normalcdf(', '3:invNorm(', '4:invT(', '5:tPdf(', '6:tcdf(', '7:X^2Pdf(', and '8:X^2cdf('.

The calculator will then prompt you to enter the required parameters based on the specific model you are using. Newer TI-84 models feature a user-friendly wizard that guides the input process, while older models require the parameters to be entered manually, separated by commas, following the syntax **invNorm(probability, μ , σ)**.

Core Application: Calculating Z-Critical Values for One-Tailed Tests

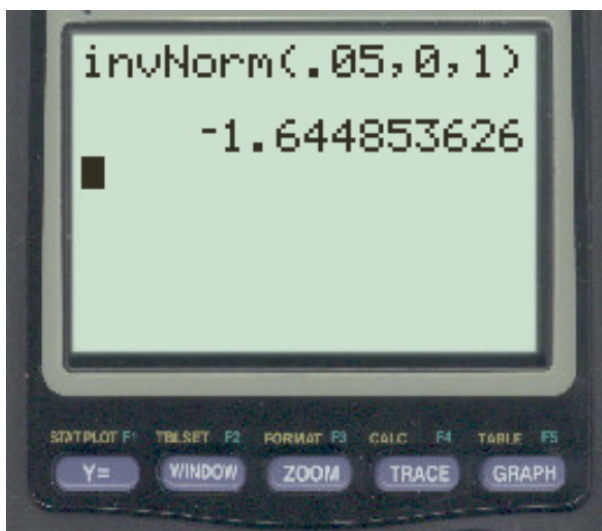
One of the most frequent uses of the **invNorm()** function in academic and professional statistics is determining the Z-critical boundary that delineates the rejection region in [hypothesis testing](#). These critical values define the threshold beyond which a test statistic is considered statistically significant.

Left-Tailed Test Example

Consider a scenario where a researcher is performing a left-tailed test, seeking evidence that a population parameter is less than a hypothesized value. If the chosen [significance level](#) (α) is set to 0.05, this means 5% of the probability mass is concentrated in the far left tail, representing the rejection region. Since the TI-84 calculates cumulative area from the left, a left-tailed test allows for direct input of the alpha value.

We use the standard normal distribution, where the [population mean](#) (μ) is 0 and the [population standard deviation](#) (σ) is 1:

`invNorm(0.05, 0, 1)`



Executing this calculation yields the [Z-critical value](#): **-1.64485**. Any test statistic falling below this value (i.e., further into the negative direction) would lead to the rejection of the null hypothesis at the 5% significance level.

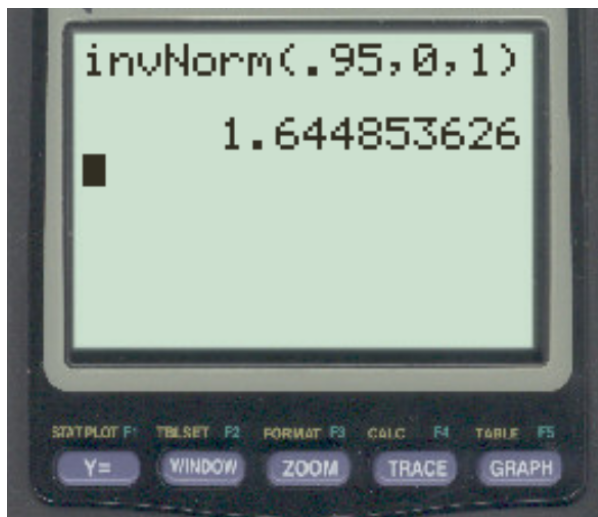
Right-Tailed Test Example

Conversely, if the researcher conducts a right-tailed hypothesis test, aiming to find evidence that a parameter is greater than the hypothesized value, the rejection region is located in the far right tail. If the [significance level](#) (α) remains 0.05, this 5% area is on the right side of the curve.

Crucially, because **invNorm()** requires the cumulative area from the left, we must calculate the area that is *not* in the rejection region. This cumulative area up to the critical point is $1 - \alpha$. Therefore, we calculate $1 - 0.05 = 0.95$. This 0.95 represents the 95% of the distribution to the left of the critical boundary.

We input the calculated cumulative probability (0.95) using the standard normal parameters:

invNorm(0.95, 0, 1)



The resulting [Z-critical value](#) is positive: **1.64485**. This boundary indicates that any test statistic greater than 1.64485 falls into the top 5% of the distribution, leading to the rejection of the null hypothesis.

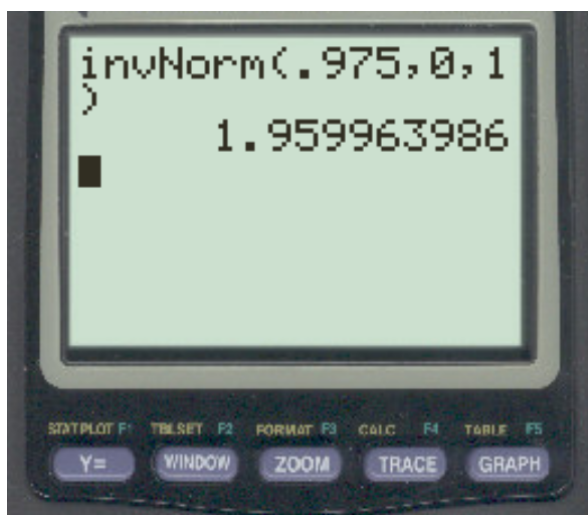
Determining Boundaries for Two-Tailed Tests

In many statistical investigations, particularly those focused on whether a parameter is merely "different from" a hypothesized value, a two-tailed [hypothesis test](#) is employed. This structure necessitates splitting the total [significance level](#) (α) equally between the extreme upper tail and the extreme lower tail of the distribution.

If we maintain a standard $\alpha = 0.05$, the area in the upper tail must be $0.05 / 2 = 0.025$, and the area in the lower tail is also 0.025. To find the positive Z-critical value (the upper boundary), we must calculate the cumulative area from the far left up to that point. This area encompasses the lower tail, the central region, and stops right at the positive critical boundary: $1 - 0.025 = 0.975$.

We input this cumulative probability into the **invNorm()** function to find the positive boundary:

invNorm(0.975, 0, 1)



The resulting positive [Z-critical value](#) is **1.96**. Due to the symmetry of the Normal distribution, the corresponding negative critical value (for the lower tail) is exactly **-1.96**. These two values define the boundaries of the central 95% region, which is the standard range used for constructing 95% confidence intervals.

Calculating Non-Standard Raw Cut-Off Scores (Percentiles)

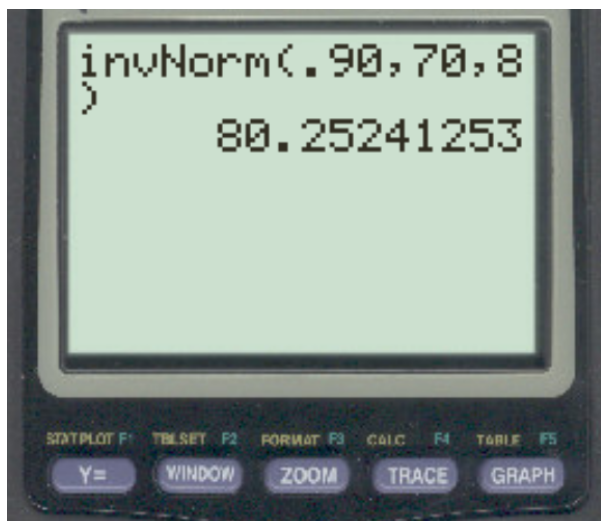
While calculating Z-scores (using $\mu=0$ and $\sigma=1$) is essential, the `invNorm()` function offers greater flexibility by allowing users to directly calculate the raw score (X) corresponding to a specific [percentile](#) or probability, without first converting to Z-scores. This is achieved by substituting the actual [population mean](#) (μ) and [standard deviation](#) (σ) of the data set into the function.

Upper Percentile Example

Consider a large standardized exam where the scores are [normally distributed](#) with a population mean (μ) of 70 points and a population standard deviation (σ) of 8 points. Management wishes to identify the score that separates the top 10% of test takers from the remaining 90%.

Since we are looking for the top 10% (0.10), this represents the area in the right tail. Following the cumulative area rule of the TI-84, we must input the area to the left: $1 - 0.10 = 0.90$. We then input this probability along with the non-standard distribution parameters:

`invNorm(0.90, 70, 8)`



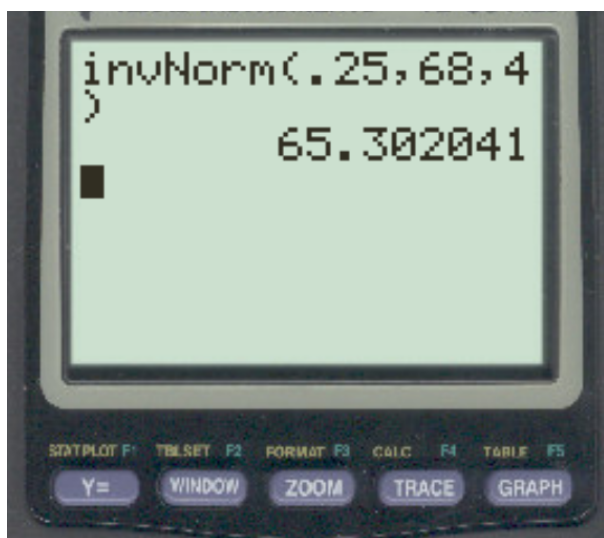
The resulting raw score is **80.25**. This means that a student must score above 80.25 points to be classified within the top 10% of all test takers.

Lower Percentile Example

For a final practical application, we can determine a lower percentile boundary. Assume the heights of adult males in a city are [normally distributed](#), featuring a [mean height](#) (μ) of 68 inches and a [standard deviation](#) (σ) of 4 inches.

If we want to find the height that corresponds to the 25th [percentile](#)--the height that separates the bottom 25% from the rest--we can use **invNorm()** directly. Since the 25th percentile represents the cumulative area of 0.25 from the left, we input this probability directly:

`invNorm(0.25, 68, 4)`



The resulting raw score, or height, that serves as the 25th percentile cutoff is approximately **65.3** inches. Consequently, 25% of the male population in this city is shorter than 65.3 inches.

Summary and Best Practices for Using invNorm()

The **invNorm()** function is an indispensable tool for anyone undertaking intermediate or advanced statistics, providing a rapid and precise method for performing inverse lookups within the normal distribution. Its primary advantage is eliminating the need to consult cumbersome Z-tables, which often only provide probabilities to two or three decimal places, leading to rounding errors.

To ensure accuracy and efficiency when using **invNorm()**, always adhere to the following best practices:

Verify the Probability Input: Always remember that the TI-84 requires the cumulative area from the far left. If you are given a right-tail probability (like α for a right-tailed test), you must manually calculate $1 - \alpha$ before inputting the value.

Standard vs. Non-Standard: Confirm whether you are seeking a standard Z-score ($\mu=0$, $\sigma=1$) or a raw data score (X), and adjust the mean and standard deviation parameters accordingly.

Contextual Interpretation: After obtaining the output (whether it is a Z-score or a raw score), ensure you interpret the value correctly based on the problem's context, especially when identifying cut-off boundaries for percentiles or rejection regions.

Mastering this function significantly streamlines the process of statistical analysis and decision-making. For further resources on related topics, including detailed explanations of Z-scores and comparative guides for other TI-84 distribution functions, consult authoritative statistical texts and online documentation.

Understanding Z-Scores and Standard Normal Tables

Detailed Guide to Normalcdf vs. InvNorm Functions

Advanced Hypothesis Testing Procedures