

# How to Calculate Skewness and Kurtosis in SPSS: A Step-by-Step Guide

Authored by  
**mohammed looti**

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Understanding the shape of a data distribution is a fundamental requirement in rigorous statistical analysis. Specifically, metrics like Skewness and Kurtosis provide critical insights into how data points deviate from a symmetrical, bell-shaped pattern. This guide, tailored for users of IBM SPSS Statistics (commonly referred to as **SPSS**), details the precise steps needed to calculate these two essential descriptive statistics.

The primary method for obtaining these values involves navigating the **Analyze** menu. While **SPSS** offers several pathways, including the comprehensive **Explore** command, utilizing the **Descriptives** function offers a streamlined approach for quickly generating Skewness and Kurtosis scores. These metrics are instrumental in confirming assumptions required for various parametric tests, such as the assumption of normality.

To initiate the calculation, ensure your dataset is loaded into **SPSS**. Proceed by selecting the **Analyze** tab, followed by **Descriptive Statistics**, and finally, **Descriptives**. Within the subsequent dialog box, the relevant continuous variable must be transferred to the **Variables** list. Accessing the **Options** menu then allows the user to explicitly request both **Skewness** and **Kurtosis** outputs before generating the final results. These numerical outputs serve as objective measures of the distribution's shape.

## The Statistical Significance of Distribution Shape

In the field of statistics, the analysis of a dataset's shape is paramount. Skewness and Kurtosis are the two primary quantitative descriptors used to characterize this shape, providing more detail than just measures of central tendency or dispersion. Understanding these values helps analysts determine if the data conforms to the expectations of a normal distribution, which is a prerequisite for many advanced statistical models.

**Skewness** specifically quantifies the degree of asymmetry in a distribution. If a distribution is perfectly symmetrical, its skewness value will be zero. Deviations from zero indicate that the bulk of the data is concentrated on one side, with a tail extending toward the other side. Analyzing skewness is crucial because highly skewed data can violate the assumptions of statistical tests, potentially leading to inaccurate conclusions regarding hypothesis testing.

Conversely, **Kurtosis** focuses on the extremity of the distribution's tails relative to the center, often interpreted as the measure of "peakedness" or "tailedness." A high kurtosis suggests that the data contains more extreme outliers than a normal distribution would predict, meaning the distribution has heavy tails. Conversely, low kurtosis suggests lighter tails and fewer extreme values. Together, these two measures provide a comprehensive picture of data shape and risk profile.

## Deep Dive into Skewness Interpretation

**Skewness** is calculated based on the third standardized moment of the data. Its sign indicates the direction of the asymmetry, while its magnitude reflects the extent of that asymmetry. Interpreting this value is straightforward but crucial for accurate modeling and understanding the underlying data generating process.

A **Negative Skew** (or Left-Skewed Distribution) indicates that the longer tail is on the left side of the distribution, extending toward more negative values. This suggests that the majority of the data points have high values, while a smaller number of unusually low values pull the mean toward the left.

A **Positive Skew** (or Right-Skewed Distribution) indicates that the longer tail is on the right side of the distribution, extending toward more positive values. This scenario implies that most data points have low values, but a few extremely high values inflate the mean and pull the tail to the right.

A value close to **Zero Skewness** signifies that the distribution is approximately symmetrical. For datasets following the normal distribution, the theoretical skewness is exactly zero, implying the Mean, Median, and Mode are closely aligned.

## Detailed Understanding of Kurtosis

**Kurtosis**, derived from the fourth standardized moment, is often misunderstood. It is not simply a measure of peak height, but rather a measure of how much variance arises from the tails versus the shoulders of the distribution. In SPSS, the output is typically the **Excess Kurtosis**, meaning it is calculated relative to the normal distribution, for which the excess kurtosis is defined as zero.

A **Mesokurtic** distribution has a kurtosis value of 0 (or very close to zero). This describes distributions that have the same level of tailedness as the normal distribution.

A **Leptokurtic** distribution has a kurtosis value **greater than 0**. These distributions feature heavier tails, meaning they tend to produce more extreme outliers than the normal distribution. This is often associated with a higher probability of rare, extreme events occurring within the dataset.

A **Platykurtic** distribution has a kurtosis value **less than 0**. These distributions feature lighter tails, indicating that they produce fewer and less extreme outliers compared to the normal distribution. Such distributions are considered less volatile or risky in fields like finance.

## Case Study: Calculating Skewness and Kurtosis in SPSS

To illustrate the practical application of these concepts, we will use a sample dataset within **SPSS** that records the final exam scores received by a group of students in a class. Calculating descriptive statistics for these scores helps determine if the student performance data is normally distributed, which is crucial if we intend to run inferential tests like a T-test or ANOVA later.

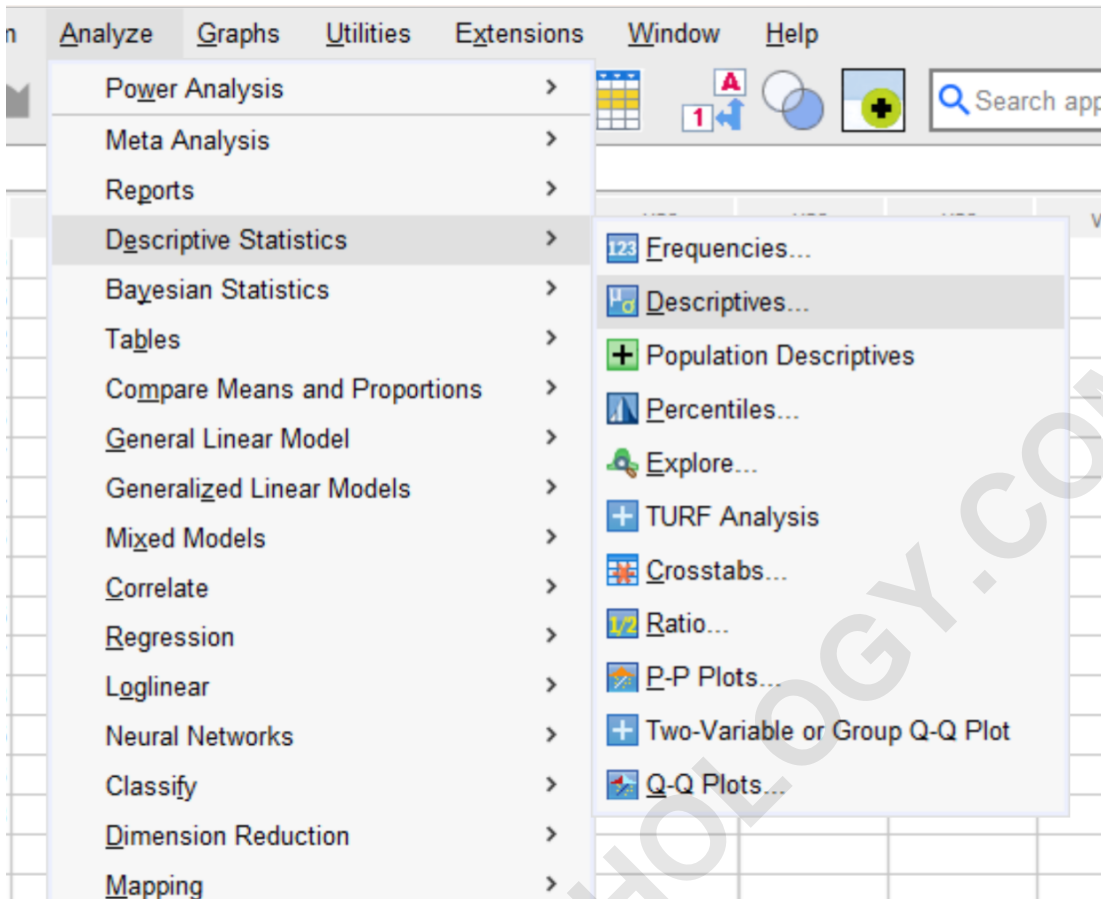
First, ensure the data is correctly entered into the **SPSS** Data View. Our variable of interest is named **Exam\_Score** and is defined as a continuous scale variable. The initial dataset view appears as follows:

	Student_ID	Exam_Score	var	var
1	1	88		
2	2	95		
3	3	92		
4	4	97		
5	5	96		
6	6	97		
7	7	94		
8	8	86		
9	9	91		
10	10	95		
11	11	97		
12	12	88		
13	13	85		
14	14	76		
15	15	68		
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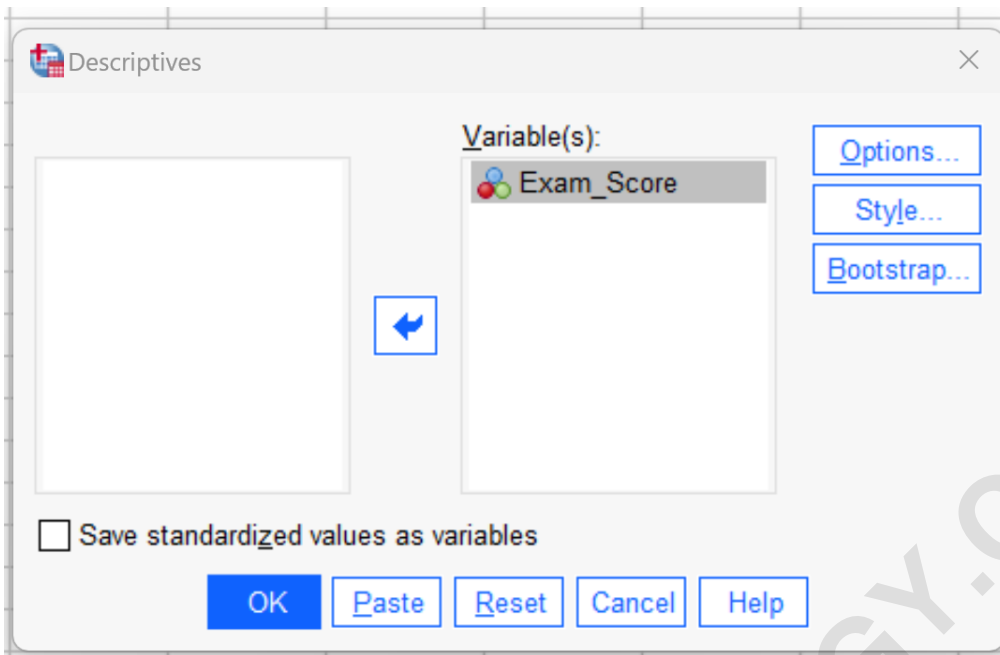
## Step-by-Step Procedure for Obtaining Descriptive Statistics

The calculation process in **SPSS** is highly intuitive and follows a standard workflow for requesting descriptive outputs. We will specifically utilize the **Descriptives** command, as it is the most streamlined method for quickly generating these numerical metrics.

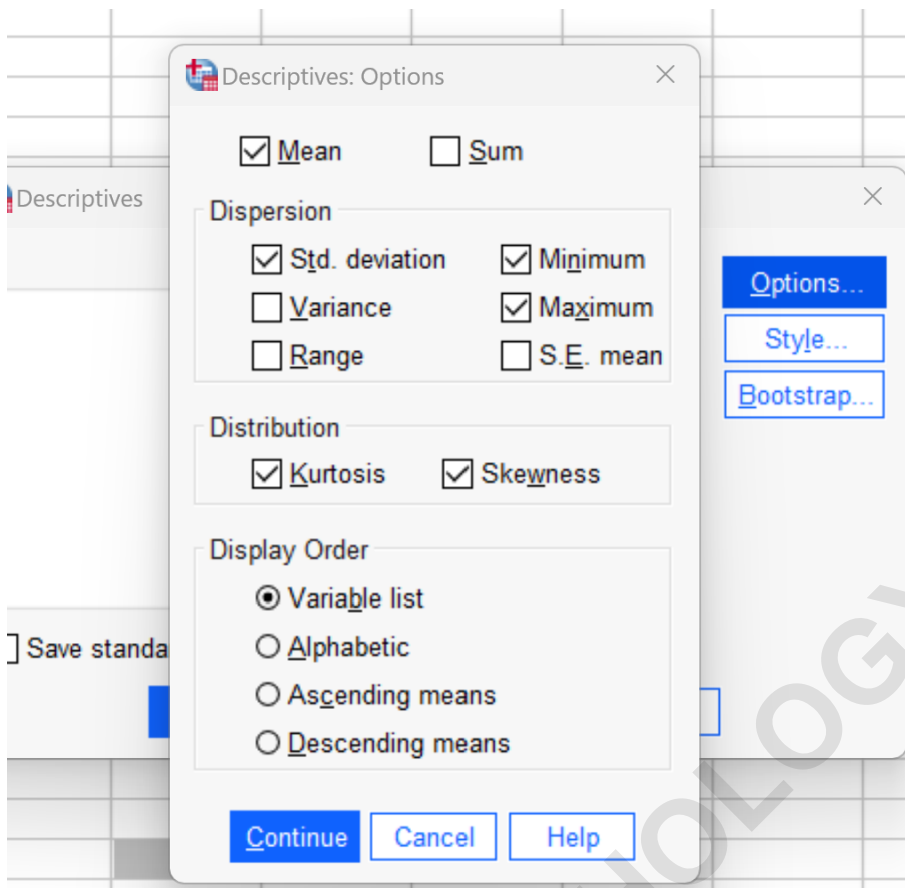
**Step 1: Accessing the Descriptives Dialog Box.** Navigate to the top menu bar and click on the **Analyze** tab. Hover over **Descriptive Statistics**, and then select **Descriptives** from the cascading menu. This action opens the primary configuration window where variables are selected.



**Step 2: Selecting the Variable.** In the dialog box that appears, locate the list of available variables on the left side. Select the **Exam\_Score** variable and move it to the **Variables** panel on the right side using the arrow button. Only continuous or interval variables should typically be used for Skewness and Kurtosis calculations.



**Step 3: Requesting Skewness and Kurtosis.** Next, click the **Options** button located in the lower-left corner of the Descriptives dialog box. This opens a secondary window where specialized statistics can be requested. Ensure that the checkboxes next to **Kurtosis** and **Skewness** are explicitly checked. By default, **SPSS** typically includes the Mean, Standard Deviation, Minimum, and Maximum; adding these checks ensures the inclusion of the critical shape statistics required for normality assessment.



After selecting these options, click **Continue** to close the Options window, and then click **OK** in the main Descriptives dialog box. **SPSS** will execute the command and generate the statistical output in the dedicated **SPSS Viewer** window.

## Interpreting the SPSS Output Table

Upon execution, **SPSS** generates a table detailing the descriptive statistics for the selected variable. This output consolidates all requested metrics, including the crucial Skewness and Kurtosis values, along with their associated Standard Errors. The Standard Error is essential for determining if the calculated values significantly deviate from zero (i.e., significantly deviate from the theoretical expectations of a normal distribution).

The resulting output table for the **Exam\_Score** variable is shown below, detailing both the computed statistic and its corresponding measure of sampling variability:

→ **Descriptives**

Descriptive Statistics									
	N Statistic	Minimum Statistic	Maximum Statistic	Mean Statistic	Std. Deviation Statistic	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
Exam_Score	15	68	97	89.67	8.372	-1.551	.580	2.230	1.121
Valid N (listwise)	15								

Analyzing the generated metrics allows us to fully characterize the distribution of student exam scores:

The calculated **Skewness** value is **-1.551**. Since this value is negative and its magnitude is substantially larger than its standard error (0.359), it decisively indicates a **left-skewed** distribution. This means a disproportionate number of students scored highly, with a long, sparse tail extending toward the lower end of the scores.

The calculated **Kurtosis** value is **2.230**. Since this is a positive value, it indicates a **leptokurtic** distribution. The distribution is heavy-tailed compared to a normal distribution, suggesting that the scores include more extreme values, both high and low, than would be expected under normal assumptions, potentially driven by exceptional performers or significant grading anomalies.

For a formal assessment of normality based on these values, the Z-score can be computed by dividing the statistic by its Standard Error. If the absolute Z-score exceeds typical critical values (e.g., 3.29 for a large sample size, or 1.96 for a more conservative test), the deviation is considered statistically significant.

## The Importance of Visual Confirmation: Generating a Histogram

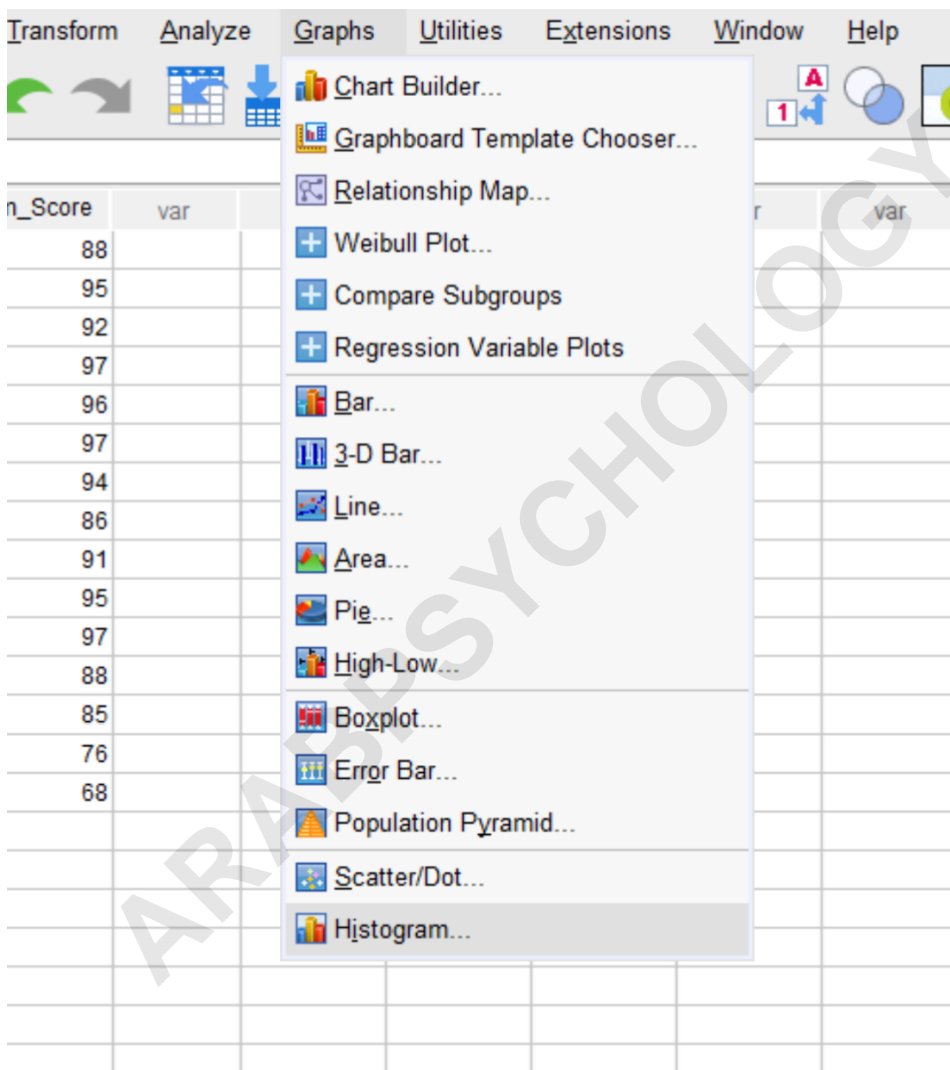
While numerical metrics like Skewness and Kurtosis provide precise quantification of shape, a **histogram** remains the most powerful visual tool for confirming and interpreting these findings. A histogram provides a graphic representation of the frequency distribution, allowing the analyst to visually confirm the direction of the skew and the thickness of the tails in context.

In cases where numerical output suggests a significant deviation from normality, visualization helps contextualize the issue. For instance, a small, highly influential cluster of outliers might drive the positive kurtosis, and the histogram makes these clusters immediately visible, aiding in data cleaning or transformation decisions. It serves as an essential diagnostic step before proceeding with inferential statistics.

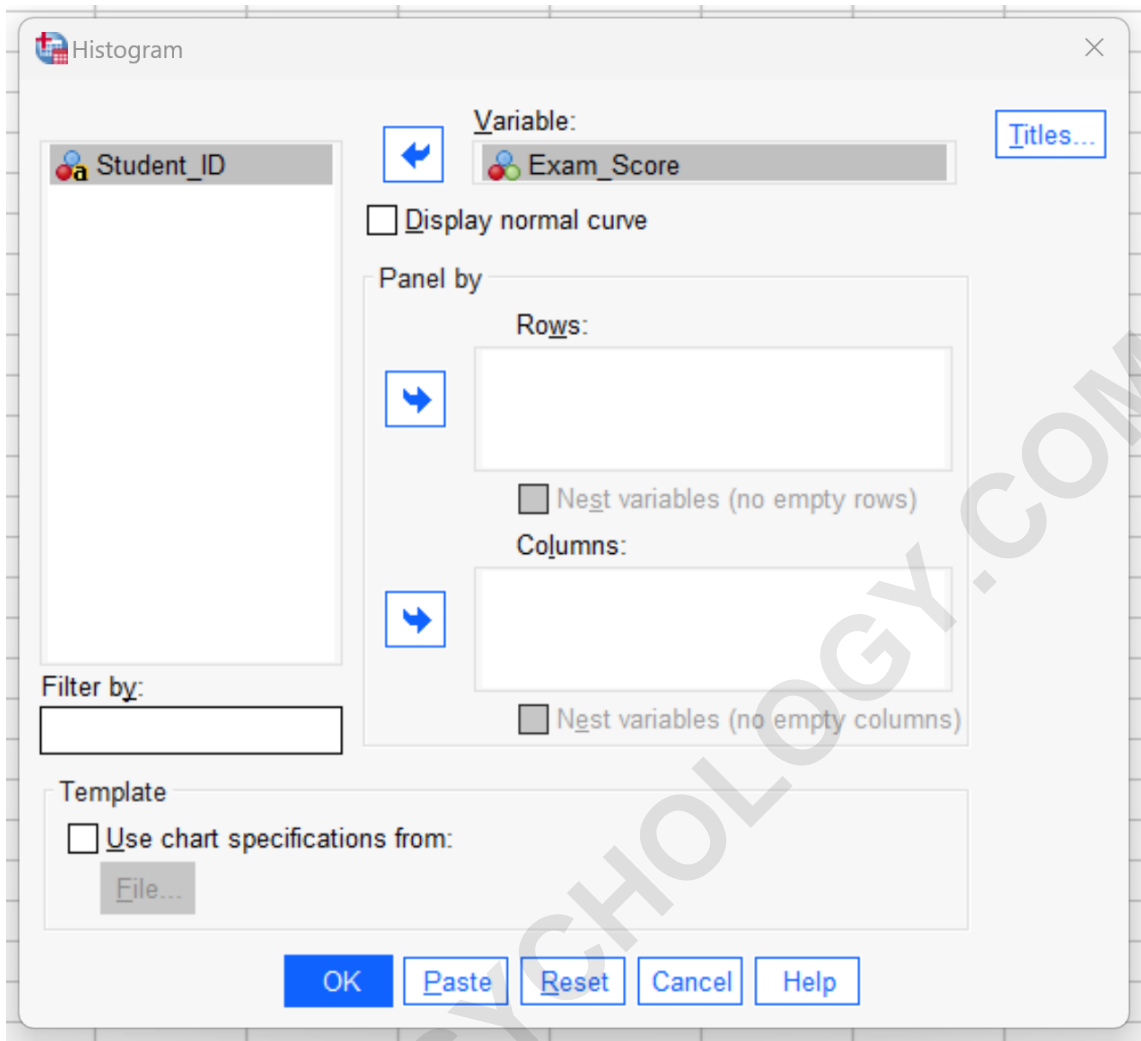
## Generating the Histogram in SPSS

To generate a **histogram** for the **Exam\_Score** data, follow these steps using the legacy dialogs method, which provides quick graphical output and the option to overlay the normal curve:

**Step 1: Accessing the Histogram Tool.** Click on the **Graphs** tab in the main menu bar. Hover over **Legacy Dialogs**, and then select **Histogram** from the options provided. This method is straightforward for generating basic frequency plots and is necessary if using older **SPSS** versions or prioritizing simplicity over advanced Chart Builder customization.

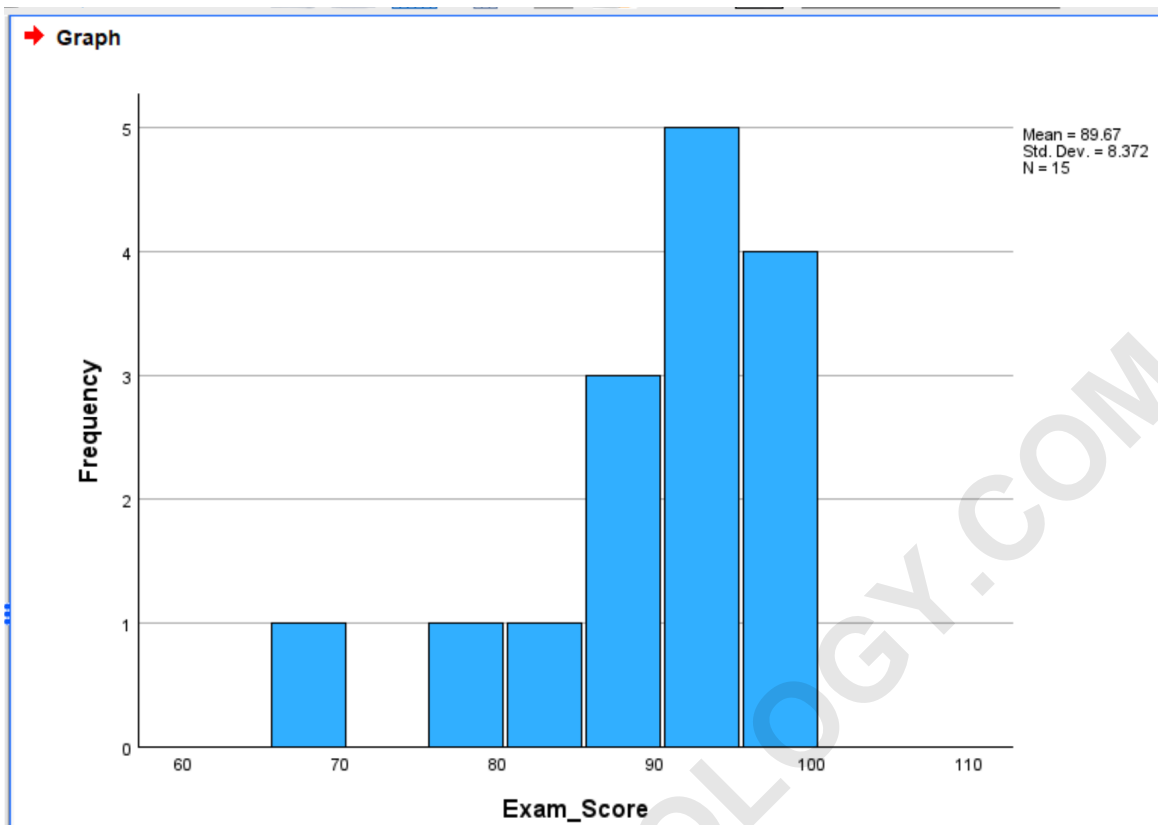


**Step 2: Defining the Variable for Plotting.** In the Histogram dialog box that appears, select the **Exam\_Score** variable from the list on the left and transfer it to the **Variable** panel using the arrow button. Crucially, ensure that the box labeled **Display normal curve** is checked.



Checking the **Display normal curve** option superimposes a theoretical normal distribution curve (using the sample mean and standard deviation) over the empirical histogram bars, which visually highlights the extent of the deviation in terms of both skewness and kurtosis.

**Step 3: Reviewing the Visual Output.** Click **OK** to generate the histogram in the Viewer window. The resulting visualization clearly illustrates the distribution of exam scores:



Observing the histogram confirms our numerical findings. The graph visibly demonstrates a concentration of scores on the high end, with a long, sparse tail extending to the left, confirming the **negative skewness** (-1.551). Furthermore, the steepness of the central peak and the pronounced presence of frequency bars far into the tails suggest a heavier-tailed distribution than the superimposed normal curve, consistent with the positive **kurtosis** (2.230).

### Conclusion: Synthesizing Shape Analysis for Data Quality

By systematically calculating the Skewness and Kurtosis in **SPSS** and complementing these figures with a detailed histogram, we gain a robust understanding of the distribution of exam scores. For this specific dataset, both the numerical output and the visual confirmation indicate significant non-normality--it is substantially left-skewed and leptokurtic.

This comprehensive shape analysis is indispensable for rigorous data preparation. If the planned statistical tests require the assumption of normality, these findings necessitate corrective action, such as data transformation (e.g., using log or square root transformations) or the selection of non-parametric alternatives. Mastering the calculation and interpretation of these descriptive statistics within SPSS ensures the validity and reliability of subsequent statistical inferences.

The following tutorials explain how to perform other common tasks in SPSS: