

How to Make a Histogram from a Frequency Table

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A histogram is one of the most powerful graphical tools used in statistics and data analysis. It provides a visual representation of the distribution of numerical data by using vertical bars of varying heights, where the height of each bar corresponds to the frequency of data points falling into a specific range. To effectively construct a histogram, the initial step often involves summarizing the raw data into a structured format known as a frequency table. This systematic approach ensures that the resulting chart accurately reflects the underlying patterns and spread of the collected information, making complex datasets easily interpretable.

The process of translating raw measurements into a clear visual chart requires careful preparation, including defining appropriate data ranges, counting observations, and mapping these counts onto a coordinate system. A properly constructed histogram allows analysts and readers to quickly grasp key statistical characteristics, such as the shape of the distribution, the central tendency, and the presence of outliers or multimodal peaks within the data set.

Understanding the Core Components: Frequency Tables and Histograms

A frequency table serves as the foundational element for creating a histogram. It is a statistical representation that organizes raw data values by grouping them into classes or intervals and recording the number of times (the frequency) values fall within each specified interval. This crucial step simplifies large, unwieldy lists of numbers into a compact and digestible summary.

Conversely, the histogram is the resulting graphical visualization. It translates the numerical frequencies from the table into proportional bar heights. While both tools convey the same information about data distribution, the histogram offers an immediate visual impact, which is often far more accessible and impactful than simply viewing the raw tabulated numbers. This article provides a comprehensive, step-by-step example detailing how to move efficiently from a collected raw data set to a finalized, insightful histogram.

Collecting and Preparing the Raw Data

Before any visualization can occur, a robust data set must be collected and organized. For our example, we will analyze the performance of students in a recent academic evaluation. Suppose we have gathered the following 20 exam scores from students in a specific course. These scores represent the raw, ungrouped data upon which our analysis will be built.

Scores: 50, 58, 62, 65, 70, 71, 72, 74, 74, 78, 81, 82, 82, 85, 87, 88, 89, 92, 94, 96

The first step in making this data useful is summarizing these individual scores into meaningful groups. This process helps smooth out minor variations and highlights the concentration points of the scores, which is essential for accurate visualization.

Step 1: Constructing the Frequency Table

The transition from raw data to a manageable frequency distribution requires defining specific intervals or classes. These intervals are commonly referred to as bin ranges. The choice of bin size is critical, as it directly influences the appearance and interpretation of the final histogram; too few bins can obscure details, while too many bins can make the data look too noisy.

For this example, we have chosen a bin range of 10 points. This means we will group all scores that fall within a 10-point spread (e.g., 50-59, 60-69, etc.). We then count the number of students whose scores fall into each of these defined ranges. The resulting structure, which summarizes the frequency of each range of scores, is presented below:

Score	Frequency
50-59	2
60-69	2
70-79	6
80-89	7
90-99	3

This frequency table now clearly indicates the number of observations corresponding to each class interval. It is the necessary bridge between the chaotic raw numbers and the structured visual display we aim to create.

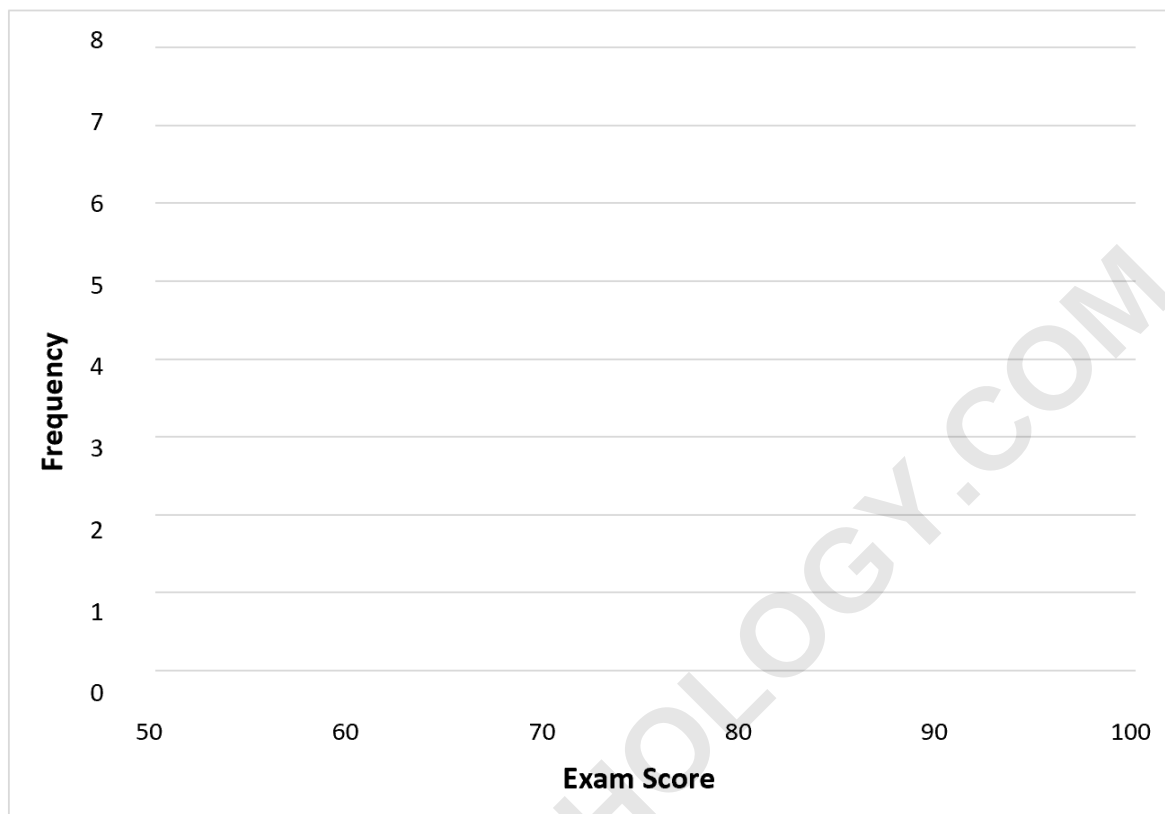
Step 2: Designing the Histogram Axes

Once the frequency table is complete, the next phase involves setting up the visual framework--the axes of the histogram. Histograms rely on two primary axes to convey information: the horizontal axis (X-axis) and the vertical axis (Y-axis).

The X-axis must be dedicated to representing the data values themselves, specifically the class intervals defined in the frequency table. For our exam scores, the X-axis must range continuously from the lowest value in the lowest bin (50) to the highest value in the highest bin (99). We must label the axis clearly, maintaining the chosen increment size of 10 points, ensuring that the visual representation matches the underlying data grouping.

The Y-axis, conversely, represents the frequency, or the count, of observations within each bin. Its scale must accommodate the highest frequency recorded in the table (which is 7 in this case, corresponding to the 80-89 range). By setting up these axes correctly, we establish the foundation

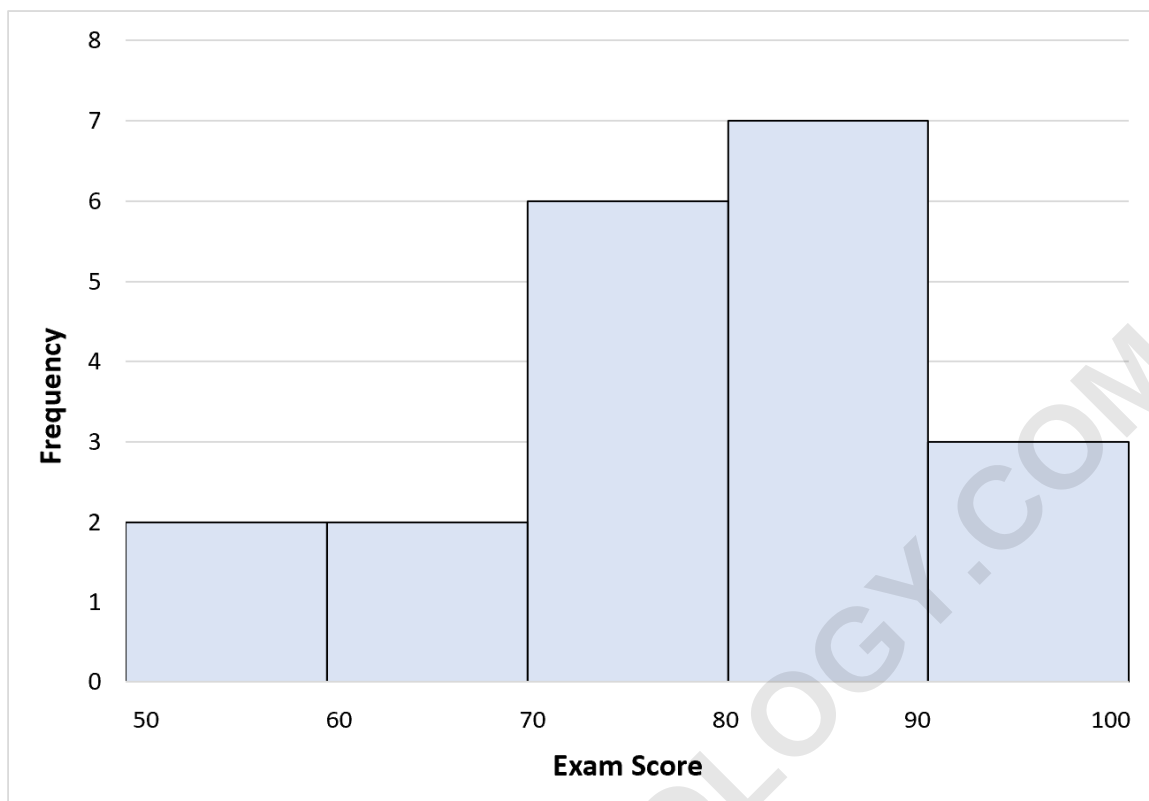
for plotting the visual data distribution.



Step 3: Plotting the Data and Adding the Bars

The final step in construction involves translating the frequencies from the table onto the visual structure created in Step 2. Each class interval defined on the X-axis will correspond to a single bar, and the height of that bar will be determined by the frequency value listed for that interval in the table.

It is important to note a defining characteristic of a histogram: the bars must touch one another. This emphasizes the continuous nature of the numerical data being displayed, distinguishing it from a standard bar chart where discrete categories are often separated by gaps. We proceed by drawing bars that accurately reflect the count for each score range:



The finished visualization allows for immediate interpretation. The X-axis displays the bins of data values (the scores), and the Y-axis provides the count, indicating exactly how many observations in the data set fall within each specified bin.

Interpreting the Histogram: Analysis and Insights

The primary advantage of the histogram is its utility in data interpretation. By simply glancing at the shape and magnitude of the bars, we can draw immediate conclusions regarding the distribution of the exam scores. We can easily identify which score ranges are the most common and which are the least common.

Based on our visual analysis, we can confirm the distribution of the student scores as follows:

A total of **2** students scored within the 50-59 range.

A total of **2** students scored within the 60-69 range.

A total of **6** students scored within the 70-79 range.

A total of **7** students scored within the 80-89 range.

A total of **3** students scored within the 90-99 range.

This clear distribution highlights that the majority of student performance clustered heavily in the 70s and 80s, suggesting a relatively strong overall performance with fewer students scoring at the

extremes.

Applying the Histogram for Specific Queries

Beyond general observation, histograms enable us to answer specific quantitative questions about the data by simply aggregating the heights of the relevant bars. Consider the question: **How many students scored less than 70 on the exam?**

To determine this, we look at the bars representing scores below 70, which correspond to the 50-59 bin and the 60-69 bin. We can efficiently add the frequencies from these two bars: 2 (students in the 50s) + 2 (students in the 60s) = 4. Therefore, a total of **4 students** scored less than 70.

Alternatively, we might want to know: **How many students scored 80 or higher on the exam?**

In this case, we sum the frequencies of the bars starting at the 80-89 bin and extending to the 90-99 bin: 7 (students in the 80s) + 3 (students in the 90s) = 10. Thus, a total of **10 students** scored 80 or higher. These examples demonstrate the immense utility of the histogram as a rapid analytical tool, allowing for various statistical inquiries simply by observing and combining the visual data.

Further Exploration of Data Visualization

The methods detailed above provide the fundamental framework for converting a raw list of data into a highly informative graphical summary. Mastering the creation of the frequency table and the subsequent visualization via a histogram is an essential skill for anyone dealing with quantitative data, as it offers immediate insights into the underlying distribution patterns.

For those interested in delving deeper into statistical visualization and chart construction, the following tutorials offer additional information and alternative approaches to handling and displaying frequency data: