

# Learning Relative Frequency Histograms: A Beginner's Guide with Examples

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In the expansive field of [statistics](#), the ability to summarize and present complex data distributions is paramount. Researchers and analysts frequently rely on structured tables to transform raw datasets into meaningful information. A cornerstone of this summarization process is the concept of **frequency**, which precisely quantifies the number of times a specific observation or event occurs within a given dataset. Grasping these fundamental raw counts is the essential first step toward comprehensive data analysis and insightful interpretation of the underlying phenomena.

For example, consider a typical retail business scenario where management tracks sales performance based on the price of items sold. Organizing data this way allows the team to swiftly identify which price categories, or "bins," are driving the highest sales volume. The following tabulation provides a clear snapshot, displaying the raw [frequency](#) of items sold across carefully defined price ranges.

Item Price	Frequency
\$1 - \$10	20
\$11 - \$20	21
\$21 - \$30	13
\$31 - \$40	8
\$41 - \$50	4

This organized structure is formally recognized as a **frequency table**. It systematically groups raw data points into distinct classes and tallies the corresponding count for each class. In our retail example, the "Item Price" column defines these classes, while the "Frequency" column provides the absolute count of observations falling into each price bracket. This method offers immediate, quantifiable insight into the data's distribution based on absolute values.

## Aggregating Data: The Role of Frequency Tables

The strategic use of [frequency tables](#) is foundational to exploratory [statistics](#). These tables provide a consolidated, aggregated perspective on large datasets that would otherwise be overwhelming or impossible to interpret in their unprocessed form. By condensing potentially hundreds or thousands of individual data points into a manageable number of classes with associated counts, we gain critical clarity regarding the central tendencies, dispersion, and overall shape characteristics of the data distribution. While frequency tables excel at providing exact numerical reporting, they often lack the immediate visual impact necessary for rapid interpretation and compelling presentations to a non-technical audience.

To significantly enhance comprehension and facilitate quick analytical comparisons, the numerical information contained within a frequency table is typically translated into a visual format. The most

widespread and direct graphical representation derived from such a table is the [histogram](#). This powerful charting technique converts the numerical counts into proportional visual bars, rendering the distribution pattern instantly apparent to the viewer. This transition aligns seamlessly with the established principles of effective [data visualization](#), which leverage the human brain's natural ability to recognize and process visual patterns more efficiently than raw data lists.

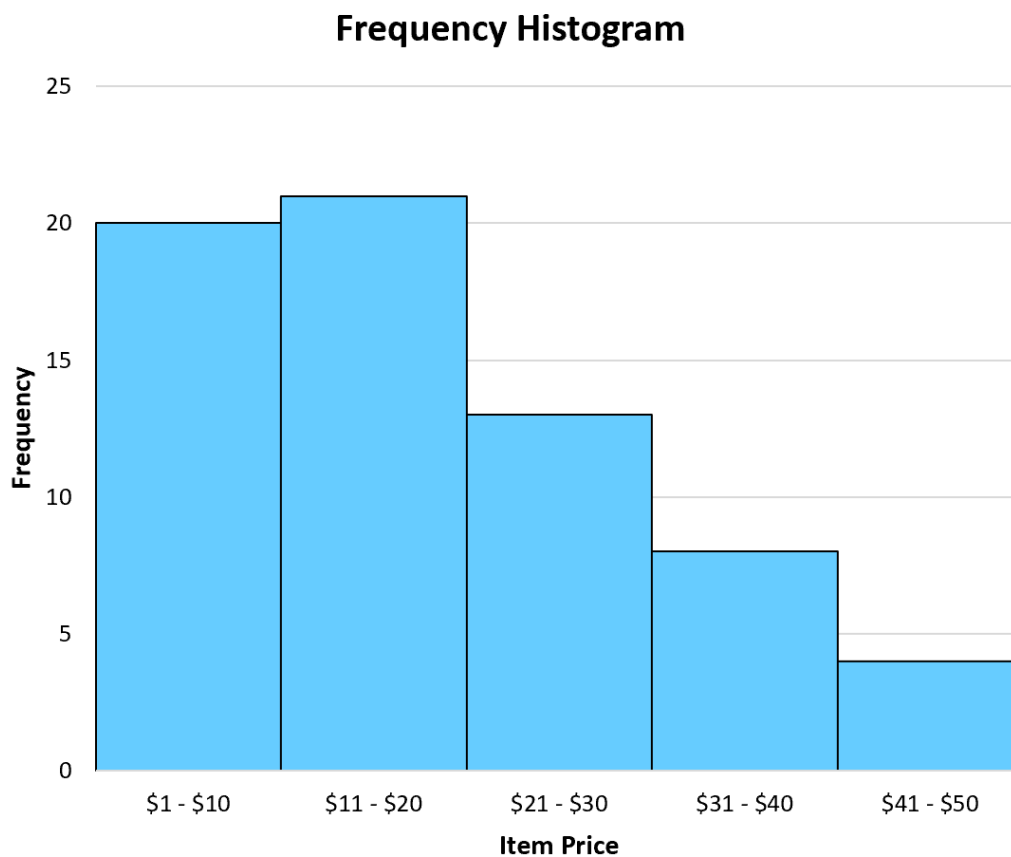
Ultimately, the process of moving from a chaotic list of raw data observations to a structured frequency table, and subsequently to a visual representation, encapsulates a core workflow in descriptive statistics. This journey shifts the analyst's focus from individual, isolated observations to summarizing the collective behavior and characteristics of the entire population or sample under study. This comprehensive process is indispensable for quality assurance, the early identification of potential outliers, and the informed selection of appropriate statistical modeling techniques for advanced analysis.

## Standard Frequency Histogram: Visualizing Absolute Counts

The **frequency histogram** functions as the precise visual analog to the numerical frequency table. In this graphical tool, the classes (such as the defined item price ranges) are plotted along the horizontal, or x-axis, which represents the continuous spectrum of the measured variable. Crucially, the vertical, or [y-axis](#), is dedicated to representing the raw [count](#)--the absolute number of observations that fall into each respective class. Consequently, the height of every bar on the chart corresponds exactly to the count listed in the associated frequency table.

Presenting data visually through a histogram offers profound benefits over merely scanning a dense table of numbers. For instance, the resulting shape of the histogram immediately communicates crucial characteristics of the data distribution, including its skewness, overall symmetry, and modality (how many peaks it exhibits). Applying this visualization to our sales data example clearly demonstrates that the overwhelming majority of sales volume occurred in the lower price brackets (\$1-\$20), with sales counts dropping off dramatically as the price of the item increases. This powerful visual confirmation is significantly more persuasive and easier to grasp than simply reviewing a column of decreasing numerical values.

The following image exemplifies the standard frequency histogram derived from our retail sales data. It is important to note how the vertical heights of the bars directly map to the raw counts (20, 21, 13, 8, and 4) displayed on the y-axis, thereby providing an unambiguous picture of the distribution of sales volume categorized by price range.



## Introducing Relative Frequency: Proportional Analysis

While raw frequency effectively quantifies the absolute volume of occurrences, it lacks inherent context regarding the overall sample size or the proportion of the whole that each count represents. This analytical gap is filled by the concept of **relative frequency**. [Relative frequency](#) transforms the raw count for every class into a standardized fractional or percentage representation of the total number of observations within the entire dataset. This crucial standardization allows data to be accurately compared across different studies, varying sample sizes, or unequal time periods.

The methodology for calculating relative frequency is fundamentally simple yet powerful: it involves dividing the frequency of a specific class by the total number of observations recorded across all classes. Returning to our ongoing retail example, we must first determine the total number of items sold by summing all frequencies ( $20 + 21 + 13 + 8 + 4 = 66$  items total). Once this crucial denominator is established, the relative frequency for any given class is derived using the following formula:

$$\text{Relative Frequency} = (\text{Class Frequency}) / (\text{Total Number of Observations})$$

For instance, focusing on the \$1-\$10 price range, where 20 items were sold, the calculation yields a relative frequency of  $20 / 66$ , which approximates 0.303. This result indicates that nearly 30.3% of all sales recorded during this period fell within this lowest price bracket. Applying this calculation systematically to every class converts the standard frequency table into a **relative frequency table**, as illustrated below. A key check for accuracy is that the sum of all relative frequencies must always equal 1.0 (or 100%, accounting for minor discrepancies due to necessary rounding).

Item Price	Frequency	Relative Frequency
\$1 - \$10	20	0.303
\$11 - \$20	21	0.318
\$21 - \$30	13	0.197
\$31 - \$40	8	0.121
\$41 - \$50	4	0.061

We rigorously apply this division process across the entire dataset to fully populate the relative frequency column. For the \$11-\$20 range, the calculation is  $21 / 66 \approx 0.318$ , confirming it as the highest proportional contributor to sales. Conversely, for the highest price range (\$41-\$50), the result is  $4 / 66 \approx 0.061$ . This systematic conversion provides a standardized perspective on the data, emphasizing the proportional contribution of each category rather than focusing solely on absolute sales volume, a perspective essential for proportional benchmarking and comparative statistical work.

## The Relative Frequency Histogram (RFH): Visualizing Proportions

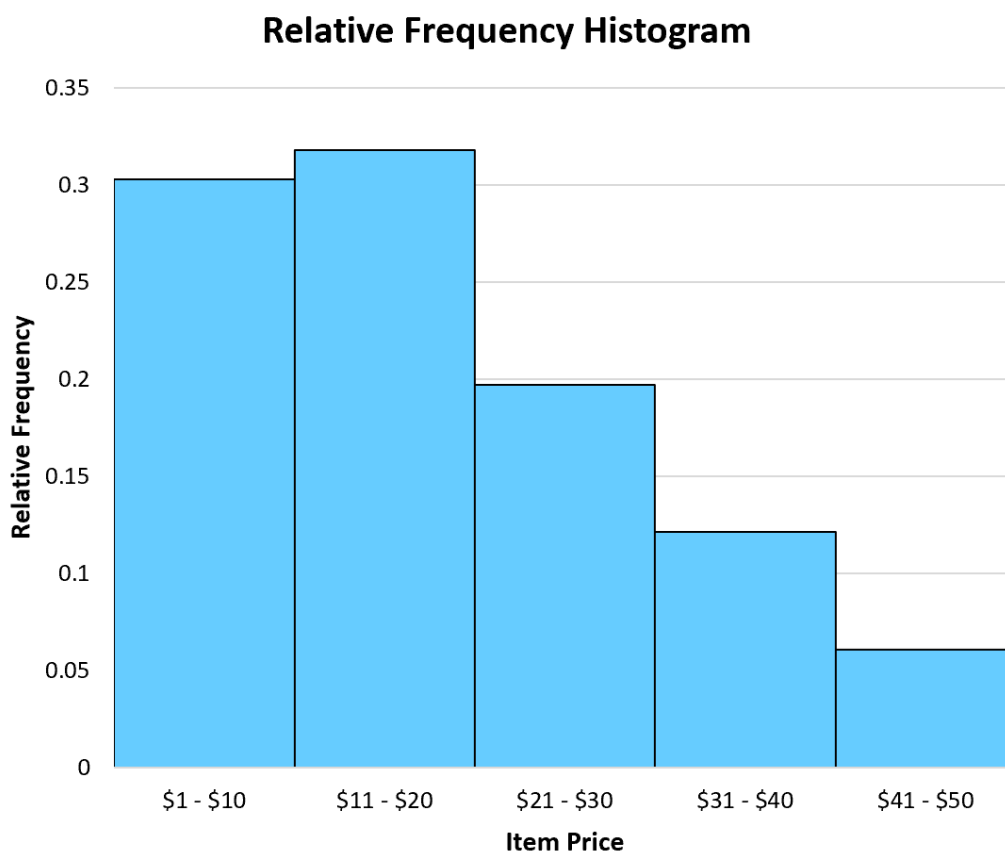
With the relative frequencies successfully calculated and tabulated, the next logical visualization step is the creation of the **relative frequency histogram (RFH)**. In terms of overall structure and visual form, the RFH is nearly indistinguishable from the standard frequency histogram. The horizontal x-axis consistently displays the classes (the price ranges) and maintains the identical bin widths and structure. However, the defining difference resides in the scaling applied to the vertical [y-axis](#).

Instead of displaying the raw counts (absolute frequencies), the [y-axis](#) of the RFH is scaled to reflect the proportional values, ranging typically from 0 to 1 (or 0% to 100%). Consequently, the height of each bar now represents the proportion, or relative frequency, of that specific class within the whole. For instance, the bar representing the \$11-\$20 range will rise precisely to the 0.318 mark on the vertical axis, reflecting its proportional contribution of 31.8%.

It is fundamentally important for analysts to understand that despite the complete shift in the y-axis scale, the inherent shape and overall appearance of the distribution remain absolutely identical to

that of the standard frequency histogram. Both histograms effectively communicate the same underlying distribution pattern; the distinction is purely in the metric used for vertical quantification. The RFH is particularly powerful because it emphasizes the percentage contribution of each class, making it the preferred choice when the primary focus is on metrics like market share, empirical probability, or direct comparison between datasets of unequal sizes.

The visualization provided below illustrates the relative frequency histogram derived from our standardized dataset. Notice that while the general outline mirrors the previous frequency histogram, the vertical axis labels now precisely reflect proportions, offering immediate context regarding the percentage contribution of each price range to the total sales volume.



## Choosing the Right Tool: Frequency vs. Relative Frequency

The decision to employ either a standard frequency histogram or a [relative frequency](#) histogram is entirely dependent on the analytical objective or the specific goal of the [visualization](#). Although their visual shapes are identical, their interpretations are distinct, as each offers a unique advantage based on whether raw volume or proportional contribution is the central metric of interest.

The **frequency histogram** is most effective when the analysis demands a focus on absolute

numbers, such as tracking inventory levels, meeting specific volume production targets, or confirming raw counts against a pre-defined threshold. For example, if a retail manager sets a goal to sell a minimum of 10 items weekly in the premium \$41-\$50 price range to optimize high-margin inventory turnover, they would consult the frequency histogram. Seeing the current raw count of 4 immediately confirms they are significantly underperforming against the absolute goal of 10 items. In this operational context, the proportion of sales is secondary to the absolute, quantifiable number.

Conversely, the **relative frequency histogram** proves indispensable when the task involves comparing distributions, establishing percentage-based benchmarks, or understanding market penetration and share. If the manager's objective was instead to ensure that items in the \$41-\$50 range constitute at least 5% of their total sales volume, the relative frequency histogram provides the immediate and correct answer. By reviewing the RFH, they see the percentage for that range is 6.1% (0.061), confirming that the store is successfully meeting or exceeding this proportional target. This proportional view allows for standardized comparison against industry averages or performance across different stores, irrespective of total sales fluctuations.

## Conclusion: Linking Histograms to Probability

In conclusion, both the standard frequency histogram and the **relative frequency histogram** are exceptionally valuable tools within descriptive [statistics](#), each derived directly from its respective tabular data format. The fundamental distinction rests solely on the metric utilized for the vertical axis: raw counts (absolute magnitude) for the frequency histogram, and proportions (standardized percentages) for the relative frequency histogram. Analysts must judiciously select the appropriate type based on whether their objective requires an understanding of the volume of occurrences or the contribution relative to the total population.

Given that a [histogram](#) is designed to display continuous data and that the area of the bars is directly proportional to the frequency, the relative frequency histogram inherently provides a visual representation of the empirical probability distribution of the underlying dataset. This characteristic makes the RFH a crucial conceptual bridge, serving as a vital stepping stone toward understanding continuous probability distributions, which form the entire analytical foundation of more advanced inferential statistics.

To support the practical application and implementation of these concepts, various statistical software platforms offer methods for generating these visualizations efficiently. Mastering the technical creation and sophisticated interpretation of both frequency and relative frequency histograms is an indispensable skill set for any professional engaged in serious quantitative data analysis.

## Further Learning and Practical Resources

The following tutorials detail the specific steps required to create relative frequency histograms using common statistical software environments, facilitating practical application of the concepts discussed:

[How to Create a Relative Frequency Histogram in R](#)

[How to Create a Relative Frequency Histogram in Python](#)

[How to Create a Relative Frequency Histogram in Excel](#)