

How to Calculate Quartiles in Power BI: A Step-by-Step Guide

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The ability to accurately calculate and interpret statistical measures is fundamental to deep data analysis. Among the most crucial of these measures are quartiles, which provide invaluable insights into the spread and distribution of data points within any given dataset. A quartile is defined as a value that divides a dataset into four equal parts, where each section represents exactly 25% of the total observations. Mastering the calculation of these values within a powerful analytical tool like Power BI is essential for data professionals looking to move beyond simple averages and grasp the underlying shape of their metrics.

While the theoretical concept is straightforward, implementing quartile calculation efficiently in a business intelligence environment requires understanding how to leverage specific functions within the Data Analysis Expressions (DAX) language. Unlike calculating these values manually in a static spreadsheet, Power BI demands dynamic measures that respond instantly to filters and context changes. This detailed guide explores both the foundational statistical steps and the practical, automated DAX methods necessary to calculate Q1, Q2, and Q3, enabling comprehensive data distribution analysis.

Calculate Quartiles in Power BI (With Example)

Introduction to Quartiles and Their Importance in Distribution Analysis

In the realm of statistics, quartiles serve as specific values that divide a numerical dataset into four segments, with 25% of the data falling into each segment. These measures are pivotal for summarizing the central tendency, dispersion, and skewness of a distribution, offering a much richer picture than traditional measures like the mean or median alone. Understanding the position of the first quartile (Q1), the second quartile (Q2), and the third quartile (Q3) helps analysts identify potential outliers, assess data symmetry, and compare distributions across different categories or time periods.

The three main quartile values are defined by their associated percentile boundaries. The quartile system is fundamentally tied to percentiles, providing standardized points of reference regardless of the dataset's size. Specifically, the First Quartile, or Q1, is the value situated at the 25th percentile, meaning 25% of the data points fall below this value. The Second Quartile, Q2, is located at the 50th percentile, which is synonymous with the statistical median. Finally, the Third Quartile, Q3, marks the 75th percentile, indicating that 75% of the data falls below this point. Analyzing these three points gives analysts a robust framework for constructing visualizations like box plots, which are critical for executive summaries and detailed exploratory data analysis.

Theoretical Steps for Manual Quartile Calculation

Before automating the process using DAX, it is beneficial to grasp the fundamental, theoretical

steps involved in calculating quartiles manually. This process relies heavily on sorting the data and finding the median of the whole set, followed by the medians of the resulting halves. When working with raw data, the very first prerequisite is to ensure the dataset is arranged in strictly ascending order. This organizational step is mandatory because percentiles are entirely dependent on the positional ranking of values. If the data is not sorted, any subsequent calculations for Q1, Q2, or Q3 will be invalid, leading to flawed analytical conclusions.

Once the data is sorted, the calculation of the quartiles proceeds in a structured manner. The method involves dividing the dataset based on position, which can vary slightly depending on whether the total number of observations (N) is odd or even. The overall process can be summarized into the following conceptual steps, which mirror what DAX functions perform internally:

Sort the Data: Arrange all numerical data points in ascending order, from the smallest value to the largest value.

Determine the Total Count (N): Calculate the total number of data points in the dataset. This count determines the position calculation for the percentiles.

Calculate the Second Quartile (Q2): Q2 is simply the statistical median of the entire dataset. If N is odd, Q2 is the middle value; if N is even, Q2 is the average of the two middle values.

Calculate the First Quartile (Q1): Q1 is the median of the lower half of the data. The lower half includes all values located before Q2 in the sorted list.

Calculate the Third Quartile (Q3): Q3 is the median of the upper half of the data. The upper half consists of all values located after Q2 in the sorted list.

While conceptually sound, attempting to implement these manual positional calculations for large, dynamic datasets in Power BI is impractical and introduces unnecessary complexity. Therefore, we turn to the specialized calculation engine powered by DAX.

Leveraging DAX for Automated Quartile Calculation in Power BI

In a production environment where data refreshes constantly and analysts need instant, accurate results, relying on manual steps is not feasible. This is precisely where the power of DAX (Data Analysis Expressions) becomes apparent. DAX is the formula language used throughout Power BI, Analysis Services, and Power Pivot in Excel, designed specifically for calculating custom measures and columns based on relationships and filters within the data model. To calculate quartiles efficiently, DAX provides a family of percentile functions, which are far more accurate and dynamic than attempting to recreate the manual median-splitting logic.

When analyzing a distribution within DAX, we are primarily interested in defining measures for the three key quartiles mentioned previously:

First Quartile (Q1): Represents the 25th percentile.

Second Quartile (Q2): Represents the 50th percentile (the Median).

Third Quartile (Q3): Represents the 75th percentile.

By utilizing the `PERCENTILE` functions available in DAX, analysts can bypass the need to manually sort data or determine the total count. Instead, they can simply point the measure to the desired column and specify the exact percentile (k) they wish to calculate, resulting in robust measures that automatically adjust to any context filtering applied in reports, such as slicers or visual interactions.

Understanding the PERCENTILE.INC Function Syntax

The most commonly used function for calculating percentiles and thus quartiles in Power BI is PERCENTILE.INC. This function calculates the k-th percentile for a given range, where k is inclusive, meaning it represents the percentile value based on the range from 0 (minimum value) to 1 (maximum value). It returns the interpolated value at that specific percentile boundary. The syntax is straightforward, requiring two key arguments: the column containing the numerical data, and the percentile value expressed as a decimal between 0 and 1.

The standard syntax used in DAX to calculate the three primary quartiles looks like this, where `table_name` identifies the specific metric of interest:

Q1 = PERCENTILE.INC(table_name, 0.25)

Q2 = PERCENTILE.INC(table_name, 0.5)

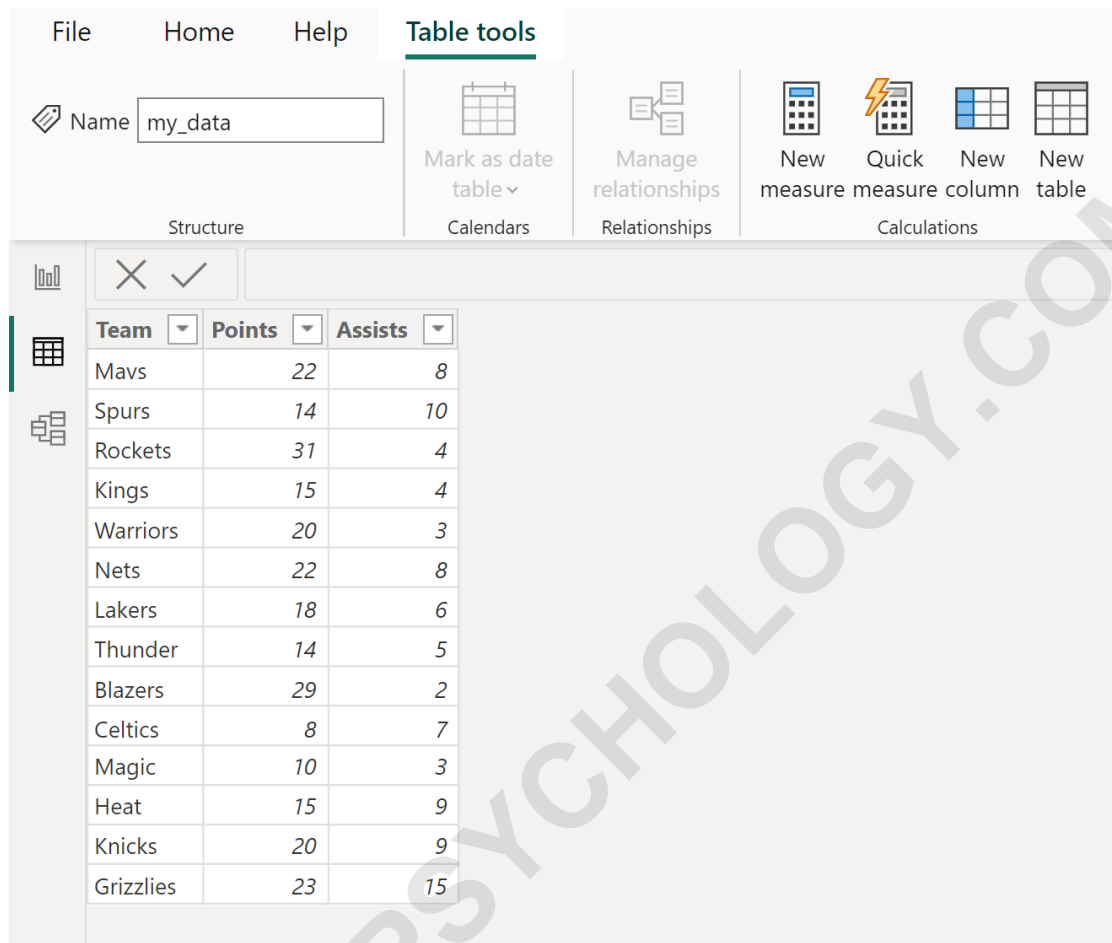
Q3 = PERCENTILE.INC(table_name, 0.75)

It is important to note the percentile arguments: 0.25 corresponds to the 25th percentile (Q1), 0.5 corresponds to the 50th percentile (Q2), and 0.75 corresponds to the 75th percentile (Q3). When creating these as measures in Power BI, they become reusable calculations that can be displayed on cards, incorporated into key performance indicators (KPIs), or used as input variables for more advanced analysis, providing analysts with incredible flexibility and precision.

Practical Example: Calculating Quartiles for a Dataset

To illustrate the practical application of the `PERCENTILE.INC` function, let us consider a sample dataset within Power BI. Suppose we are working with a table named **my_data** that contains performance metrics for various basketball players. This table includes relevant fields such as Player Name, Team, and a crucial numerical metric: **Points** scored. Our goal is to calculate the quartiles for the **Points** column to understand the distribution of scoring ability among the players in the dataset.

The structure of the data table, **my_data**, is displayed below. This visualization confirms we have a sufficiently diverse set of numerical data points in the target column, allowing for meaningful quartile calculation.



The screenshot shows the Power BI interface with the 'Table tools' ribbon selected. The ribbon includes options for 'Mark as date table', 'Manage relationships', 'New measure', 'Quick measure', 'New column', and 'New table'. Below the ribbon, a data table is displayed with the following data:

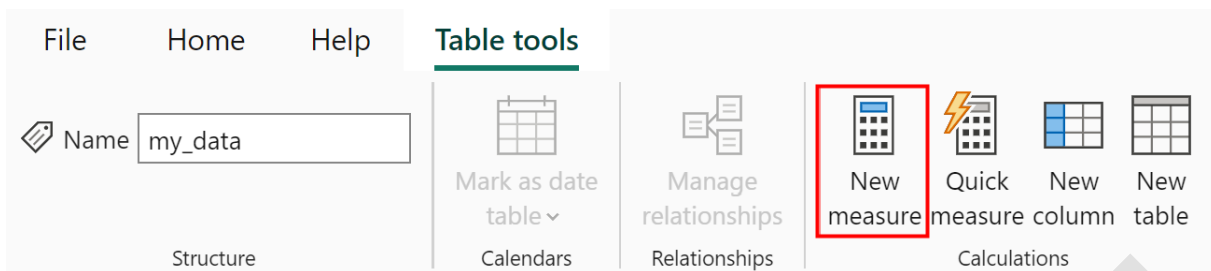
Team	Points	Assists
Mavs	22	8
Spurs	14	10
Rockets	31	4
Kings	15	4
Warriors	20	3
Nets	22	8
Lakers	18	6
Thunder	14	5
Blazers	29	2
Celtics	8	7
Magic	10	3
Heat	15	9
Knicks	20	9
Grizzlies	23	15

Our subsequent steps will involve creating three distinct measures within the Power BI data model: one for Q1, one for Q2, and one for Q3. These measures will reference the **my_data** column, applying the appropriate percentile fraction (k value) to each calculation. This approach ensures that the resulting quartile values are stored as dynamic measures, ready to be utilized in any report visual.

Step-by-Step Implementation in Power BI

The process begins by accessing the measure creation tools within the Power BI Desktop environment. With the **my_data** table selected in the Fields pane, the analyst must navigate to the ribbon menu. To calculate the first quartile (Q1), click the **Table tools** tab and then select the **New measure** icon. This action opens the formula bar where the DAX expression will be defined. This is the standard procedure for creating any calculation that needs to aggregate or summarize data

across rows.



For the first quartile (Q1), the analyst must input the following formula into the DAX formula bar. This expression correctly specifies the function, the table, the column, and the required percentile boundary (0.25):

Q1 Points = PERCENTILE.INC(my_data, 0.25)

Upon committing this measure, a new calculation, named 'Q1 Points', is added to the data model. This measure immediately contains the calculated value of the 1st quartile for the **Points** column. When displayed on a card visual, this value provides instant feedback on the distribution's lower boundary, highlighting that 25% of the observed player scores fall below this numerical value.

File Home Help **Table tools** **Measure tools**

Name Format

Home table \$ %

Structure Formatting

1 Q1 Points = PERCENTILE.INC(my_data[Points], 0.25)

Team	Points	Assists
Mavs	22	8
Spurs	14	10
Rockets	31	4
Kings	15	4
Warriors	20	3
Nets	22	8
Lakers	18	6
Thunder	14	5
Blazers	29	2
Celtics	8	7
Magic	10	3
Heat	15	9
Knicks	20	9
Grizzlies	23	15

The subsequent step involves repeating this precise measure creation process for the 2nd quartile (Q2) and the 3rd quartile (Q3). This is achieved by creating two additional new measures, adjusting only the k value in the `PERCENTILE.INC` function. For Q2, the k value must be set to **0.5**, representing the median. For Q3, the k value must be set to **0.75**. This systematic approach ensures all three critical statistical values are available as discrete measures within the data model, ready for comprehensive analysis and reporting.

Team	Points	Assists
Blazers	29	2
Celtics	8	7
Grizzlies	23	15
Heat	15	9
Kings	15	4
Knicks	20	9
Lakers	18	6
Magic	10	3
Mavs	22	8
Nets	22	8
Rockets	31	4
Spurs	14	10
Thunder	14	5
Warriors	20	3

14.25

Q1 Points

19.00

Q2 Points

22.00

Q3 Points

Interpreting and Applying the Calculated Quartile Values

After successfully generating the measures for Q1, Q2, and Q3, the final and most crucial step is interpreting these results to gain actionable insights into the underlying dataset. Based on the output from our example, we obtained the following specific values:

The first quartile (Q1) is located at **14.25**.

The second quartile (Q2) or median is located at **19**.

The third quartile (Q3) is located at **22**.

These three numbers alone provide a detailed snapshot of the distribution of points scored. The Q1 value of 14.25 indicates that 25% of the players scored 14.25 points or less. The median (Q2) of 19 tells us that half of the players scored 19 points or less, serving as the true center of the data. The Q3 value of 22 shows that 75% of the players scored 22 points or less, and conversely, only 25% of the players scored above 22 points. This information is significantly more descriptive than simply stating the average score.

By comparing the distance between Q1 and Q2, and Q2 and Q3, analysts can determine the skewness of the data distribution. For instance, if the distance between Q3 and Q2 is significantly larger than the distance between Q2 and Q1, it suggests a left-skewed distribution, meaning the lower half of the scores are more tightly packed than the upper half. Furthermore, the difference between Q3 and Q1 defines the Interquartile Range (IQR), which measures the spread of the

middle 50% of the data. Knowing only these three values offers a robust understanding of the distribution of values in the **Points** column, guiding subsequent analysis into player performance segmentation and goal setting.

Note: You can find the complete documentation for the **PERCENTILE.INC** function in [DAX](#) which covers specific nuances regarding interpolation and handling of duplicate values.

Further Power BI Analytical Techniques

Having mastered the calculation of [DAX](#) quartiles, analysts are well-positioned to explore other advanced statistical and data transformation tasks within Power BI. Quartiles often serve as prerequisite measures for more complex calculations, such as identifying outliers based on the IQR rule or normalizing data distributions. Expanding your knowledge of DAX and its statistical capabilities allows for increasingly sophisticated analytical models.

The following tutorials explain how to perform other common tasks in Power BI, building upon the foundational knowledge of measure creation and statistical analysis:

Tutorial on Calculating Standard Deviation in Power BI
Guide to Creating Dynamic Segmentation based on Quartile Ranges
How to Implement Conditional Formatting using DAX Measures