

Calculating Interquartile Range (IQR) in Excel: A Step-by-Step Guide

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This comprehensive, expert tutorial is designed to guide data analysts and students through the efficient process of calculating the [interquartile range](#) (IQR) for any [dataset](#) using the robust statistical capabilities embedded within [Microsoft Excel](#). The IQR is not merely a statistical curiosity; it is a fundamental measure in descriptive statistics, absolutely crucial for evaluating the variability and spread of the central portion of your data distribution. Mastering this calculation is an essential skill set for tasks ranging from rigorous data cleaning and the identification of potential anomalies to accurately summarizing complex distributions in reports. We will explore both the theoretical foundation of the IQR and the practical, step-by-step application of Excel's powerful functions to derive this value with precision.

The Essential Role of the Interquartile Range

The calculation of dispersion measures is paramount in statistics, offering insights beyond simple averages (means or medians). The [interquartile range](#), universally denoted as IQR, serves as one of the most reliable metrics of statistical dispersion available. It specifically quantifies the distance between the 75th percentile (the third quartile, Q3) and the 25th percentile (the first quartile, Q1) of a given distribution. By focusing exclusively on the middle 50% of all observed values, the IQR effectively isolates the core spread of the data, providing a stable measure of central tendency variability.

Unlike the overall range, which is simply the maximum value minus the minimum value, the IQR offers a measurement of variability that is significantly less susceptible to the distorting influence of extremely high or low values. These extreme values, known as [outliers](#), can severely skew basic range and even standard deviation calculations. Therefore, when working with real-world data--which often contains errors or unusual observations--the IQR provides a more representative and robust assessment of the typical data spread.

Understanding the IQR is central to creating effective data visualizations, particularly [box plots](#), where the central box directly represents the IQR. This range establishes clear boundaries for what constitutes the typical behavior of the data points. Analysts utilize this measure extensively in exploratory data analysis (EDA) to understand concentration, symmetry, and to establish formalized rules for identifying points that deviate significantly from the norm.

Deconstructing the IQR: Quartiles and Dispersion

The calculation of the IQR is mathematically defined as the result of subtracting the first [quartile](#) (Q1) from the third quartile (Q3). To grasp this concept fully, a clear understanding of what quartiles represent is paramount. Quartiles are specific numerical values that act as markers, dividing an ordered dataset into four distinct, equal parts, with each segment containing exactly 25% of the total data points.

The first quartile (Q1) marks the boundary for the lowest 25% of the data, meaning 25% of all observations fall at or below this value. Conversely, the third quartile (Q3) defines the boundary for the highest 25% of the data, indicating that 75% of observations fall below this value. The space between Q1 and Q3, therefore, encapsulates the middle 50% of the distribution. It is this middle spread that the IQR quantifies, offering a concentrated view of where the bulk of the observations lie.

To illustrate this partitioning concept outside of the automated environment of Excel, consider the necessary steps for calculating the IQR manually. Given any dataset, the data must first be sorted in strict ascending order to accurately determine the positional location of the quartiles. This initial ordering step is conceptually vital, even though specialized Excel functions handle it automatically behind the scenes.

For example, suppose we analyze an ordered sample distribution of 20 observations, spanning the values below:

In this specific instance, based on established methods for determining quartile indices for $N=20$ observations, the calculated value for the [first quartile](#) (Q1) is determined to be **75.5**, and the [third quartile](#) (Q3) is **91**. Consequently, the **interquartile range** (IQR) is calculated by the simple subtraction: $91 - 75.5 = 15.5$. This resulting value precisely informs the analyst about the range spanning the central 50% of the recorded data points, providing a clear and resilient picture of the data concentration around its median.

Choosing the Right Excel Function for Quartiles

While **Microsoft Excel** is a powerhouse for statistical computation, it notably lacks a single, dedicated function explicitly named "IQR." Instead, it relies on a suite of robust statistical functions to perform the necessary sub-calculations easily and reliably. The primary tool for this task is the **QUARTILE()** function, although modern versions of Excel (2010 onwards) offer specialized variants: **QUARTILE.EXC()** (Exclusive) and **QUARTILE.INC()** (Inclusive).

The distinction between these variants lies in their interpolation method--specifically, how they handle the inclusion or exclusion of the median (Q2) and boundary points when calculating quartiles. However, for most fundamental descriptive statistics and for consistency across different versions of Excel, the original **QUARTILE()** function remains widely supported and conceptually straightforward for Q1 and Q3 identification. For the purposes of this tutorial, we will focus on the application of the classic **QUARTILE()** function.

The structure of the **QUARTILE()** function is straightforward. It is designed to return the specific quartile value of a dataset based on a numerical percentile argument. It requires two primary

arguments to execute the calculation successfully, which must be provided in the following structured format:

QUARTILE(array, quart)

Accurate calculation hinges on correctly understanding the inputs for this function:

array: This argument specifies the contiguous range of numerical data points in your spreadsheet for which the quartiles are to be calculated (e.g., A2:A17). This range should contain all the observations of the [dataset](#) being analyzed.

quart: This argument is a numerical indicator (ranging from 0 to 4) specifying which quartile value the function should return. To find the IQR, we are concerned with two key values: using 1 will return Q1 (the 25th percentile), and using 3 will return Q3 (the 75th percentile).

Step-by-Step Tutorial: Calculating IQR in Excel

We now proceed with a practical demonstration using a sample dataset within the Excel environment. For this example, assume we have recorded a collection of 16 measurements or scores in Column A, specifically spanning cells A2 through A17. Our clear objective is to determine the measure of spread for the middle half of these scores, which is the IQR.

	A	B	C	D	E	F
1	data					
2	14					
3	19					
4	20					
5	22					
6	24					
7	26					
8	27					
9	30					
10	30					
11	31					
12	36					
13	38					
14	44					
15	47					
16	47					
17	49					
18						
19						
20						
21						

The process of finding the **interquartile range** (IQR) can be logically broken down into three distinct steps. While a single formula can achieve the final result (as shown later), separating the calculation of Q1 and Q3 into intermediate steps is highly beneficial for transparency, allowing easy verification and detailed reporting in larger statistical projects.

Step 1: Determine the First Quartile (Q1).

To identify the first **quartile**, which represents the 25th percentile of our data range (A2:A17), we must input the necessary formula into an empty cell (for instance, cell D2). The formula is **=QUARTILE(A2:A17, 1)**. The critical argument '1' explicitly instructs Excel to calculate and return the value that marks the boundary of the lowest quarter of the data. Executing this command provides the numeric value for Q1, which establishes the lower bound for our desired IQR calculation.

	A	B	C	D	E	F
1	data					
2	14		Q1	=QUARTILE(A2:A17, 1)		
3	19					
4	20					
5	22					
6	24					
7	26					
8	27					
9	30					
10	30					
11	31					
12	36					
13	38					
14	44					
15	47					
16	47					
17	49					
18						
19						
20						
21						

Step 2: Determine the Third Quartile (Q3).

Next, we must find the third **quartile**, which corresponds to the 75th percentile and defines the crucial upper boundary of the IQR. We input the corresponding formula into another empty cell, such as cell D3. The formula is **=QUARTILE(A2:A17, 3)**. The argument '3' is paramount here, directing Excel to return the value below which 75% of the data falls. This Q3 value is the final primary component required before the concluding subtraction step.

	A	B	C	D	E	F
1	data					
2	14		Q1	23.5		
3	19		Q3	=QUARTILE(A2:A17, 3)		
4	20					
5	22					
6	24					
7	26					
8	27					
9	30					
10	30					
11	31					
12	36					
13	38					
14	44					
15	47					
16	47					
17	49					
18						
19						
20						
21						

Step 3: Calculate the Interquartile Range (IQR).

The final calculation computes the absolute difference between the Q3 value (identified in Step 2) and the Q1 value (identified in Step 1). Assuming Q3 is located in cell D3 and Q1 is in cell D2, we use the simple subtraction formula **=D3 - D2** in a designated output cell (e.g., D4). This difference yields the definitive **interquartile range** for the sample dataset.

	A	B	C	D	E	F
1	data					
2	14		Q1	23.5		
3	19		Q3	39.5		
4	20		IQR	=D3-D2		
5	22					
6	24					
7	26					
8	27					
9	30					
10	30					
11	31					
12	36					
13	38					
14	44					
15	47					
16	47					
17	49					
18						
19						
20						

Following the specific data from the example images, the calculated Q3 was 39.5, and the calculated Q1 was 23.5. Therefore, the resulting IQR is $39.5 - 23.5 = 16$. This numerical result effectively quantifies the variability of the middle 50% of the scores, indicating that the central mass of data spans 16 units. This measure of dispersion is a vital input for subsequent statistical analysis, frequently serving as the basis for generating robust box plots or for applying the $1.5 \times \text{IQR}$ rule used in identifying potential [outliers](#).

	A	B	C	D	E	F
1	data					
2	14		Q1	23.5		
3	19		Q3	39.5		
4	20		IQR	16		
5	22					
6	24					
7	26					
8	27					
9	30					
10	30					
11	31					
12	36					
13	38					
14	44					
15	47					
16	47					
17	49					
18						
19						
20						

Streamlining Analysis: The Single-Formula Approach

While the three-step method provides unmatched clarity and is ideal for beginners or verification purposes, highly proficient **Microsoft Excel** users often seek to maximize efficiency by consolidating the entire calculation into a single, comprehensive formula. This advanced approach eliminates the need for intermediate cells dedicated to storing Q1 and Q3 values, resulting in a cleaner, more streamlined spreadsheet that is faster to audit and update.

This optimization is achieved by substituting the explicit cell references (D3 and D2 in the previous example) with the actual **QUARTILE()** functions that generated those values. By nesting the two quartile calculations within a single subtraction operation, we create an immediate and direct calculation of the difference between the third and first quartiles. For the dataset residing in the range A2:A17, the combined formula is elegantly structured as follows:

=QUARTILE(A2:A17, 3) - QUARTILE(A2:A17, 1)

This concise expression instructs Excel to perform both the Q3 and Q1 calculations and the final subtraction in one immediate operation. Applying this method to the prior dataset will seamlessly and instantaneously return the correct value of **16**. This technique represents a highly optimized

way to integrate the IQR calculation directly into complex financial models, statistical dashboards, or automated reporting systems where space and computational speed are prioritized over displaying intermediate quartile values.

Why IQR Matters: Robustness Against Outliers

The **interquartile range** stands as a powerful, single metric for effectively measuring the "spread" or dispersion of a dataset. While data analysis provides several measures of dispersion--including the range, the [standard deviation](#), and the variance--the IQR often emerges as the preferred choice in situations where data quality is uncertain, or where the dataset is suspected of containing influential extreme values.

The most significant analytical advantage of employing the IQR is its inherent resistance to the influence of [outliers](#). Because the IQR calculation intentionally discards the lowest 25% and the highest 25% of the data points, it effectively bypasses those extreme observations that can disproportionately skew other statistical measures based on all data points. This characteristic is invaluable when analyzing large volumes of real-world data, which frequently includes inevitable recording errors or genuinely unusual measurements that do not reflect the typical behavior of the sampled population.

The resistance of the IQR stems from the fact that it is based on positional statistics (quartiles) rather than being dependent on the magnitude of every single value. To illustrate, consider a scenario where the largest value in a dataset is mistakenly recorded as ten times its actual magnitude. A simple metric like the range (maximum minus minimum) would drastically and misleadingly increase. However, since the IQR only uses Q3 (the 75th percentile value) as its upper bound, that single, erroneous extreme observation, residing well above Q3, would have no effect whatsoever on the final IQR calculation. This structural integrity maintains the reliability of the dispersion measure for the central core of the data.

Therefore, the IQR is overwhelmingly preferred over the simple range, which merely communicates the difference between the largest and smallest observed values. By concentrating its focus on the central tendency, the IQR ensures that the reported variability accurately reflects the concentration of the majority of the data points, providing a reliable and robust foundation necessary for sound statistical inferences and decision-making.

Related: [How to Calculate the Midrange in Excel](#)