

How to Easily Calculate the IQR in Excel

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The Interquartile Range (IQR) in Excel is a fundamental statistical measure calculated by finding the difference between the 75th percentile (the third quartile, Q3) and the 25th percentile (the first quartile, Q1) of a given dataset. This crucial measure of spread offers insightful information about the central tendency and distribution characteristics of your numerical data.

Mastering the computation of measures of dispersion is essential for effective statistical analysis. The Interquartile Range provides a statistically robust gauge of data variability, particularly advantageous when assessing distributions that might be skewed or disproportionately affected by extreme values. By focusing solely on the middle 50% of the data, the IQR offers a resilient summary statistic that informs decision-making and pattern identification across various fields.

This comprehensive tutorial is designed for analysts, students, and professionals utilizing Microsoft Excel for statistical computation. We will thoroughly explain the concept of the **interquartile range**, detailing its theoretical foundation, and subsequently provide a clear, step-by-step guide on how to calculate it efficiently using Excel's powerful built-in functions, ensuring accuracy and saving significant time during data processing.

Defining the Interquartile Range (IQR)

The Interquartile Range, commonly abbreviated as **IQR**, is a statistical measure of dispersion that quantifies the spread of the central 50% of a dataset. Unlike the standard range (maximum value minus minimum value), the IQR is defined as the difference between the third quartile (Q3) and the first quartile (Q1). Mathematically, the calculation is represented simply as **IQR = Q3 - Q1**.

This metric is highly valued because it effectively disregards the extreme values (the highest 25% and the lowest 25% of the data), making it resistant to the influence of outliers. When describing the variability of a dataset, the IQR is often used alongside the median, which serves as a measure of central tendency that is also robust against extreme data points. Together, these statistics provide a reliable snapshot of data distribution, especially useful when data is skewed or contains anomalies.

The resulting IQR value represents the width of the interval containing the data points that fall between the 25th and 75th percentiles. A small IQR suggests that the central portion of the dataset is tightly clustered around the median, indicating low variability. Conversely, a large IQR signifies that the middle 50% of data points are widely spread out, indicating high variability within the core distribution.

The Role of Quartiles in Data Segmentation

To fully grasp the Interquartile Range, one must first understand the concept of **quartiles**.

Quartiles are specific values that divide a rank-ordered dataset into four equal segments, with each segment containing 25% of the total observations. These divisions rely on percentile calculations:

First Quartile (Q1): This is the 25th percentile. It marks the point below which 25% of the data values fall.

Second Quartile (Q2): This is the 50th percentile, which is synonymous with the **median**. It divides the dataset exactly in half.

Third Quartile (Q3): This is the 75th percentile. It marks the point below which 75% of the data values fall, meaning 25% of the values are above this point.

By establishing these three quartile markers, we create four distinct quarters of the data distribution. The IQR specifically measures the distance between the first and third markers (Q3 - Q1), thereby isolating the central majority of the observations and providing a clear measure of central spread. This segmentation is foundational to constructing visualizations like the box plot, where the box itself represents the IQR.

Manual Calculation Illustration

To solidify this concept, let us consider a small dataset and manually derive the IQR. Suppose we have the following ordered sequence of 20 scores:

To calculate the IQR, we first need to identify Q1 and Q3. Since this dataset contains 20 observations (an even number), we use standard methods for interpolation or percentile calculation. Through formal statistical methods (which Excel simplifies significantly), we determine the following values:

The **Third Quartile (Q3)**, or the 75th percentile, is found to be **91**. This means 75% of the scores are 91 or less.

The **First Quartile (Q1)**, or the 25th percentile, is found to be **75.5**. This means 25% of the scores are 75.5 or less.

The final step involves computing the difference between these two points. Thus, the Interquartile Range (IQR) for this dataset is calculated as $91 - 75.5 = 15.5$. This result (15.5) precisely informs us about the range spanning the middle half of the dataset, illustrating the variability inherent in the core values, independent of the lowest and highest 25% of observations.

Leveraging Excel's Statistical Functions

While manual calculation is feasible for small datasets, it becomes tedious and prone to error when dealing with large volumes of data. Fortunately, Microsoft Excel offers robust statistical functions to handle these computations effortlessly. It is important to note that Excel does not feature a single,

dedicated function named "IQR()". Instead, we rely on the **QUARTILE()** function, which is designed to return specific quartiles or percentiles of a dataset.

The **QUARTILE()** function is exceptionally useful because it directly addresses the components needed for IQR calculation: Q1 and Q3. This function requires two essential arguments to operate successfully:

`QUARTILE(array, quart)`

The arguments are defined as follows:

array: This is the mandatory input argument referring to the range of numerical data for which you wish to calculate the quartile. This typically corresponds to a column or row range in your spreadsheet (e.g., A2:A17).

quart: This mandatory input argument specifies which quartile value you intend to retrieve. The input is an integer ranging from 0 to 4, where 1 corresponds to Q1, 2 corresponds to Q2 (the median), and 3 corresponds to Q3.

For modern versions of Excel (2010 and later), it is generally recommended to use the enhanced functions **QUARTILE.INC** or **QUARTILE.EXC**, as they offer greater precision and adherence to different statistical definitions of quartile calculation. However, for compatibility and simplicity across most versions, the basic **QUARTILE()** function remains a highly effective tool for calculating the IQR components.

Practical Example: Finding IQR in Excel

Let us apply this knowledge to a practical scenario within an Excel spreadsheet. Suppose we have a column of data representing scores, starting from cell A2 and extending down to A17. We aim to find the IQR for this specific range of scores. The data is structured as shown in the image below:

	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						

To systematically calculate the Interquartile Range (IQR), we will follow a three-step process: calculating Q1, calculating Q3, and finally, subtracting Q1 from Q3. This phased approach allows for clear visualization and verification of the intermediate results.

Step 1: Calculate the First Quartile (Q1)

The first step is to locate the 25th percentile of our data array (A2:A17). In any empty cell of your choosing (e.g., cell C2), enter the following formula. We use '1' as the second argument to specify the first quartile:

=QUARTILE(A2:A17, 1)

Upon pressing Enter, Excel returns the numerical value that represents Q1. In this specific dataset, the result is **23.5**. This point marks the boundary below which the lowest 25% of the data lies.

	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: Calculate the Third Quartile (Q3)

Next, we determine the 75th percentile. This is the upper boundary of the middle 50% of the data. In another empty cell (e.g., cell C3), we input the formula, substituting the second argument with '3' to denote the third quartile:

=QUARTILE(A2:A17, 3)

Executing this formula yields the value for Q3, which in this example is **39.5**. This value signifies the boundary above which the highest 25% of the data points reside.

	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: Determine the Interquartile Range (IQR)

The final calculation involves taking the difference between the Q3 result and the Q1 result. If Q3 is in cell C3 and Q1 is in cell C2, we can simply subtract the cells in a new location (e.g., cell C4):

=C3 - C2

This operation, $39.5 - 23.5$, results in an IQR of **16**. This singular value provides a concise summary of the spread of the central data, excluding the extremities. This measure is fundamental for identifying potential anomalies or for comparing the variability between different datasets.

	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						

The visual confirmation in the spreadsheet, as demonstrated below, validates that the range of the middle 50% of our data spans 16 units.

	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 the Process: The Single Formula Approach

While the three-step approach detailed above is excellent for clarity and debugging, statistical analysis often demands efficiency. For users who prefer a streamlined workflow and do not require the explicit values for Q1 and Q3 displayed in separate cells, the entire Interquartile Range calculation can be consolidated into one powerful formula.

By nesting the two QUARTILE functions within a subtraction operation, we instruct Excel to calculate Q3 and Q1 simultaneously and immediately return their difference. Using the same data range (A2:A17) from our previous example, the combined formula is constructed as follows:

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

This single-line command performs all necessary computations instantaneously. Running this formula in any cell will result in the direct output of the IQR value, which, consistent with our previous steps, is **16**. This method is highly recommended for large-scale analysis or integration into complex dashboards where computational speed and simplicity are prioritized.

Why IQR Matters: Advantages Over Other Measures of Spread

The Interquartile Range represents just one method of measuring the dispersion, or "spread," of a dataset. Other well-known measures of spread include the standard deviation, the variance, and the simple range (maximum minus minimum). However, the IQR possesses a crucial advantage that makes it indispensable in robust statistical analysis: its resistance to outliers.

Because the IQR is defined by the difference between the 75th and 25th percentiles, it inherently ignores the top and bottom quarters of the data distribution. This means that if a dataset contains unusually small or large values--statistically defined as outliers--these extreme points will not influence the IQR calculation. Measures like the standard deviation and, especially, the range are highly sensitive to these extremes, potentially leading to a distorted view of the typical variability within the majority of the data.

This resistance makes the IQR the preferable measure of dispersion when analyzing data drawn from skewed distributions or when the presence of measurement errors or unusual events is suspected. It provides a more accurate representation of the variability experienced by the core population of the data points, offering stability that the range, which depends solely on the two most extreme points, cannot provide.

Conclusion and Further Statistical Exploration

The Interquartile Range is a cornerstone of descriptive statistics, providing an elegant and robust measure of data spread that minimizes the influence of extreme values. Utilizing Microsoft Excel's powerful **QUARTILE()** function allows for rapid and precise calculation of this metric, whether through the sequential calculation of Q1 and Q3 or through the efficient single-formula approach.

Mastering the IQR calculation in Excel enhances your ability to analyze data distributions critically, allowing you to quickly identify central tendencies and assess data variability for better reporting and decision-making. Furthermore, understanding IQR is essential groundwork for more advanced statistical techniques, such as the construction of box plots and formal outlier detection procedures.

To further expand your statistical toolkit in Excel, consider exploring related methods: How to Calculate the Midrange in Excel, or detailed tutorials on calculating the standard deviation and variance, which offer alternative perspectives on data dispersion.