

How to Calculate Ratios in Excel: A Step-by-Step Guide

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November 30, 2025

RECOMMENDED CITATION

stats writer (2025). *How to Calculate Ratios in Excel: A Step-by-Step Guide*.

PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=102403>

Calculating financial, statistical, or comparative ratios in Excel is a fundamental skill for data analysis. While a ratio fundamentally compares two numbers, the method used for calculation depends entirely on the desired output format--specifically whether you need a decimal or a percentage comparison, or a simplified fractional comparison (e.g., 4:1). The simplest approach involves dividing the numerator by the denominator and subsequently formatting the resulting numerical value as a percentage.

For instance, imagine needing to calculate the comparison of apples to oranges in a large fruit basket. If you have 40 apples and 10 oranges, you would typically divide the number of apples (40) by the number of oranges (10). To achieve this in the spreadsheet, you would input the formula `"=A2/B2"` into a designated blank cell, assuming that cell A2 holds the count of apples and cell B2 holds the count of oranges. This calculation yields a decimal value, 4 in this specific case, which is mathematically equivalent to 400%.

After entering the division formula, the final step involves proper formatting. By selecting the cell containing the result and clicking the Percent Style button, usually located in the Number group on the Home ribbon of the Excel interface, the output transforms from a decimal (4) into a percentage (400%). This represents the ratio of apples to oranges, indicating that the count of apples is 400% of the count of oranges. While effective for comparison, this method does not yield the traditional "A:B" ratio format often required for formal reporting.

Understanding Ratios and Why They Matter

A ratio is a mathematical tool used specifically to compare the relative size of two or more numerical values. Ratios are essential across fields like finance, engineering, and statistics because they provide immediate context, allowing us to understand precisely how large one value is in relation to another. For example, knowing that a company has \$100,000 in assets tells us less than knowing its Debt-to-Equity ratio is 0.5:1, which immediately implies a strong financial standing compared to its liabilities.

When two numbers, A and B, are compared, the ratio is typically expressed in its simplest integer form, A:B. The goal of simplification is to ensure that A and B share no common factors other than 1. Consider a simple example where A equals 40 and B equals 10. While the ratio 40:10 is technically correct, it is not simplified. Simplification is crucial for clear communication and standardization in mathematical contexts, especially when dealing with large comparative figures.

The process of simplification is systematic and involves identifying the Greatest Common Divisor (GCD) of the two numbers. This division process transforms complex or large figures into their most reduced form. In our example (A=40, B=10), the steps to find the simplified ratio are clearly defined and follow standard mathematical principles:

Step 1: Identify the Greatest Common Divisor (GCD): This involves finding the largest integer that will divide exactly into both values (40 and 10).

The largest value that will divide into both 40 and 10 is **10**.

Step 2: Divide and Express: Divide each initial value by the calculated GCD and then write the result in the standard ratio format (A:B).

Dividing 40 by 10 yields 4, and dividing 10 by 10 yields 1. Therefore, the simplified ratio of 40 to 10 would be written as **4:1**.

The Challenge of Displaying Ratios in Simplest Form

Unlike calculating a ratio as a decimal or percentage--which only requires simple division--calculating and displaying the ratio in its simplified integer format (e.g., 4:1 instead of 40:10) requires a more sophisticated approach within Excel. Excel does not have a native "Ratio" formatting option that automatically reduces the comparison to its lowest terms. Therefore, we must leverage mathematical functions and text concatenation to dynamically create the required output string. This methodology ensures that even if input values change, the ratio remains correctly calculated and displayed in its reduced form.

The key challenge lies in automating the identification of the Greatest Common Divisor for any pair of numbers. Manually identifying the GCD for dozens or hundreds of ratio pairs is tedious, inefficient, and highly prone to human error. Fortunately, Excel provides a dedicated function specifically designed for this purpose, simplifying the entire process into a single, comprehensive formula. This function is the cornerstone of generating clean, simplified ratio displays directly from raw data sets.

To successfully automate the calculation and display of the simplified ratio between any two numbers in Excel, we must combine three distinct elements: the value of the first number divided by the GCD, the colon text separator, and the value of the second number divided by the GCD. This combination is achieved using the ampersand (&) operator, which is used for concatenating strings and numerical values within Excel formulas, allowing us to combine mathematical outputs with custom text formatting.

Introducing the GCD Function in Excel

The core component enabling simplified ratio calculation is the built-in GCD function, which stands for Greatest Common Divisor. This function takes two or more positive integers as arguments and returns the largest integer that divides those numbers evenly. Without this function, calculating simplified ratios for large datasets would require complex, multi-step array formulas or manual

calculation, defeating the purpose of efficient spreadsheet analysis.

The syntax for the GCD function is straightforward: **GCD(number1, , ...)**. While it can accept up to 255 numbers, for calculating a standard binary ratio, we only need to input the two cells containing the values being compared. This makes the implementation simple and highly readable, even for users who are new to advanced Excel formulas and complex data manipulations.

By integrating the GCD function, we effectively embed the mathematical simplification process directly into our output cell. The function dynamically finds the common factor, and the surrounding formula uses that factor to reduce both the numerator and denominator simultaneously. This automatic process ensures mathematical accuracy regardless of the input size, allowing analysts to quickly derive standardized comparative metrics from raw data.

Constructing the Advanced Ratio Formula

The complete formula required to calculate and display the simplified ratio relies on the structure provided by the GCD calculation combined with text concatenation. If we assume the first value is in cell **A2** and the second value is in cell **B2**, the goal is to produce a single text string output (e.g., "4:1").

To calculate the ratio between any two numbers in Excel and display it in its reduced integer form, we use the following concatenation formula:

```
=A2/GCD(A2, B2)&":"&B2/GCD(A2, B2)
```

This powerful formula performs the following operations: First, it calculates the Greatest Common Divisor (GCD) between the values in A2 and B2. Next, the formula divides the value in **A2** by this GCD to get the simplified left side of the ratio. Simultaneously, it divides the value in **B2** by the same GCD to get the simplified right side of the ratio. Finally, the ampersand (&) operator is utilized twice: once to connect the left side to the colon (":") text string, and again to connect the colon to the right side, yielding the final, properly formatted ratio string. Because the output of this formula is a text string (due to the concatenation with the colon), it serves perfectly for visual reporting and data presentation.

Example: Calculate Ratios in Excel

To demonstrate the practical application of this formula, let us consider a scenario where we have two adjacent lists of values in an Excel sheet. We aim to calculate the simplified ratio of "Value 1" (Column A) to "Value 2" (Column B) for every corresponding row. Suppose our initial data, representing two different measurement sets, looks like the structure below, starting in row 2:

	A	B	C	D	E
1	Value 1	Value 2			
2	12	5			
3	40	10			
4	20	8			
5	25	5			
6	30	7			
7	60	12			
8	20	10			
9	15	6			
10	12	10			
11	10	15			
12					
13					
14					
15					
16					
17					
18					

Our objective is to populate Column C with the standardized, reduced ratio for each row. Beginning in cell **C2**, which corresponds to the comparison of 12 (A2) and 5 (B2), we input the complete formula described previously. Since this formula utilizes cell references (A2 and B2), it is relative and can be efficiently dragged down to apply to the entire dataset.

We specifically type the following expression into cell **C2**:

=A2/GCD(A2, B2)&":"&B2/GCD(A2, B2)

Upon execution, the calculation for the first row (12 and 5) proceeds as follows: It turns out that the Greatest Common Divisor of 12 and 5 is 1, as the numbers are relatively prime. Consequently, when the formula divides each value by 1, the result remains unchanged. The output displayed in cell C2 will therefore be **12:5**, as illustrated in the resulting spreadsheet view after calculation:

	A	B	C	D	E	F	G
1	Value 1	Value 2	Ratio				
2	12	5	12:5				
3	40	10					
4	20	8					
5	25	5					
6	30	7					
7	60	12					
8	20	10					
9	15	6					
10	12	10					
11	10	15					
12							
13							
14							
15							
16							
17							
18							

Interpreting the Calculated Ratio Results

Once the formula is correctly entered in cell **C2**, we can easily populate the rest of the column. We copy and paste this formula in cell **C2** down to every remaining cell in column C to calculate the ratio for the two values in each row. Excel automatically adjusts the relative references (A2 becomes A3, B2 becomes B3, and so on) to calculate the ratio for the corresponding values in each row.

	A	B	C	D	E	F	G
1	Value 1	Value 2	Ratio				
2	12	5	12:5				
3	40	10	4:1				
4	20	8	5:2				
5	25	5	5:1				
6	30	7	30:7				
7	60	12	5:1				
8	20	10	2:1				
9	15	6	5:2				
10	12	10	6:5				
11	10	15	2:3				
12							
13							
14							
15							
16							
17							

Reviewing the completed column C allows for immediate, clear interpretation of the relationships between the two value sets. The results clearly demonstrate how the GCD function correctly simplifies each comparison, providing the reduced integer ratio every time:

The ratio between 12 and 5 is **12:5** (GCD is 1).

The ratio between 40 and 10 is **4:1** (GCD is 10).

The ratio between 20 and 8 is **5:2** (GCD is 4).

The ratio between 15 and 9 is **5:3** (GCD is 3).

The ratio between 100 and 75 is **4:3** (GCD is 25).

This automated simplification process eliminates ambiguity and ensures that all comparisons are presented using the universally accepted, reduced integer format, significantly enhancing the clarity of the underlying data analysis and reporting.

Practical Applications of Ratio Calculations

Calculating simplified ratios in Excel extends far beyond simple classroom examples. In a professional setting, the ability to quickly derive standardized ratios is invaluable for comparative analysis across different business units, time periods, or experimental conditions. Common applications include financial statement analysis (e.g., calculating liquidity ratios, solvency ratios, or profitability margins), comparing experimental yields in scientific research, or optimizing resource

allocation in operations management.

For financial analysts, using the GCD function formula allows for the instant calculation of metrics like current ratio (Current Assets:Current Liabilities) across multiple time periods or subsidiaries. By ensuring the output is always in the simplest form, reporting becomes consistent and easier for stakeholders to interpret, regardless of the magnitude of the underlying assets or liabilities being compared.

Furthermore, understanding the mechanism behind this calculation reinforces crucial mathematical concepts, particularly the role of the Greatest Common Divisor in simplifying fractions and ratios. Mastering this technique transforms raw data comparison into actionable, standardized metrics.

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