# VLOOKUP

## Understanding VLOOKUP in Excel

The **VLOOKUP** function in Excel is a powerful tool used to find data in a table or a range by searching for a value in the first column. The "V" in VLOOKUP stands for "vertical," because it searches down the first column of your table to find the value you specify.

Think of it like this: You have a large list of employees with their names, IDs, departments, and salaries. If you only have an employee's ID number and you need to quickly find their salary, you would use VLOOKUP.

## How VLOOKUP Works

The basic syntax for VLOOKUP is:

=VLOOKUP (lookup\_value, table\_array, col\_index\_num, [range\_lookup])

Let's break down each of these arguments:

1. **lookup\_value**: This is the value you want to find. In our example, this would be the employee ID number.
2. **table\_array**: This is the range of cells where the data is located. It should include both the column you're searching in and the column that contains the data you want to retrieve.
3. **col\_index\_num**: This is the column number in the table\_array that contains the value you want to return. The first column in your table\_array is always 1, the second is 2, and so on. If the employee salaries are in the fourth column of your table, you would enter 4 here.
4. **[range\_lookup]**: This is an optional argument that determines whether you want an exact match or an approximate match.
   * **TRUE** or **1**: Finds an approximate match. This is useful for things like finding a tax bracket based on a salary range.
   * **FALSE** or **0**: Finds an **exact match**. This is the most common use of VLOOKUP. You should almost always use FALSE unless you have a specific reason to find an approximate match.

**A Simple Example**

Let's say you have the following data in a spreadsheet:

|  |  |  |  |
| --- | --- | --- | --- |
| ID | Name | Department | Salary |
| 101 | John Doe | Sales | 50,000 |
| 102 | Jane Smith | Marketing | 60,000 |
| 103 | Peter Jones | HR | 55,000 |
| 104 | Mary White | Sales | 52,000 |

You want to find the salary for the employee with ID **102**.

In a new cell, you would enter the following formula:

=VLOOKUP (102, A2:D5, 4, FALSE)

Here's what this formula does:

* **102**: This is our lookup\_value. We are searching for this ID.
* **A2:D5**: This is our table\_array. It's the entire data table.
* **4**: This is the col\_index\_num. The "Salary" column is the 4th column in our table.
* **FALSE**: We want an exact match for the ID.

After pressing Enter, the formula will return **60,000**, which is Jane Smith's salary.

## Important Things to Remember

* **First Column Rule**: VLOOKUP can only search in the **first column** of your table\_array. If the data you're looking for isn't in the first column, VLOOKUP won't work. For example, you can't use VLOOKUP to search for a "Name" and return an "ID".
* **Case Insensitive**: VLOOKUP is not case-sensitive. "John" and "john" are treated as the same.
* **Alternative Functions**: While VLOOKUP is widely used, newer and more flexible functions like **INDEX** with **MATCH** or **XLOOKUP** (available in newer versions of Excel) are often better alternatives because they don't have the "first column" limitation.

# HLOOKUP

## Understanding HLOOKUP in Excel

The **HLOOKUP** function in Excel is used to search for a value in the **top row** of a data table and return a corresponding value from a specified row in the same column. The "H" in HLOOKUP stands for "horizontal," because it searches across a row instead of down a column.

HLOOKUP is useful when your data is arranged horizontally, with headers in the first row and related data in the rows below.

## HLOOKUP Syntax

The basic formula for HLOOKUP is:

=HLOOKUP (lookup\_value, table\_array, row\_index\_num, [range\_lookup])

Let's break down each argument:

* **lookup\_value**: The value you want to find. It can be a number, text, or a cell reference. HLOOKUP will search for this value in the top row of your table.
* **table\_array**: The range of cells that contains your data. The first row of this range must contain the values you are searching for.
* **row\_index\_num**: The row number within the table\_array that contains the value you want to retrieve. The top row of your table\_array is considered 1, the next row is 2, and so on.
* **[range\_lookup]**: An optional argument that specifies whether you need an exact or approximate match.
  + **FALSE** (or 0): This is for an **exact match**. HLOOKUP will only return a value if it finds an exact match for the lookup\_value. This is the most common setting.
  + **TRUE** (or 1): This is for an **approximate match**. It's used when you want to find the closest value, which is helpful for things like finding a tax rate based on an income range. For this to work correctly, the top row of your data must be sorted in ascending order.

## A Simple Example

## Imagine you have a table showing quarterly sales for different regions:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Argument | Q1 | Q2 | Q3 | Q4 |
| North | $100 | $150 | $120 | $180 |
| South | $90 | $110 | $140 | $160 |
| East | $120 | $130 | $150 | $170 |

You want to find the sales for the **North** region in **Q3**.

The formula would be:

=HLOOKUP ("Q3", B1:E4, 2, FALSE)

Here's why:

* **"Q3"**: This is the lookup\_value. We are searching for "Q3" in the first row.
* **B1:E4**: This is the table\_array, which includes all the data.
* **2**: This is the row\_index\_num. The sales for the "North" region are in the second row of the table array.
* **FALSE**: We need an exact match for "Q3".

The formula will return **$120**.

## HLOOKUP vs. VLOOKUP

The main difference between HLOOKUP and VLOOKUP is the direction of the search.

* **HLOOKUP** searches **horizontally** across the top row of a table.
* **VLOOKUP** searches **vertically** down the first column of a table.

Because most datasets are organized vertically, VLOOKUP is generally used more often than HLOOKUP.

**INDEX Function, MATCH Function and INDEX−MATCH Combination**

The INDEX and MATCH functions are incredibly powerful tools in Excel for performing data lookups, often considered more flexible and robust than VLOOKUP. Since you're a fresher, let's break down each function and how they work together.

**1. INDEX Function**

The INDEX function is like a **GPS for your data**. You give it a map (an array or range of cells), and coordinates (a row number and an optional column number), and it returns the value found at that exact location.

**INDEX Syntax (Formula Structure)**

=INDEX (array, row\_num, [column\_num])

|  |  |  |
| --- | --- | --- |
| Argument | Description | Required/Optional |
| array | The range of cells or table where you want to look for a result. | Required |
| row\_num | The row number within the **array** from which to return a value. | Required (unless column\_num is used alone) |
| column\_num | The column number within the **array** from which to return a value. | Optional (unless row\_num is omitted) |

**INDEX Example**

Imagine you have a table in cells A1:C5.

* If you enter the formula: **=INDEX (A1:C5,3,2)**
* A1:C5 is your **array** (the table).
* **3** is the **row\_num**, so it looks at the 3rd row *of the array*.
* **2** is the **column\_num**, so it looks at the 2nd column *of the array*.
* The function will return the value at the intersection of the 3rd row and 2nd column of that selected range.

**2. MATCH Function**

The MATCH function is like a **scanner** that finds the position of an item in a list. It tells you *where* in a single row or column a specific value is located.

**MATCH Syntax (Formula Structure)**

=MATCH (lookup\_value, lookup\_array, [match\_type])

|  |  |  |
| --- | --- | --- |
| Argument | Description | Required/Optional |
| lookup\_value | The value you are searching for (e.g., a name, a product ID). | Required |
| lookup\_array | A single column or a single row of cells where you want to search for the lookup\_value. | Required |
| match\_type | Specifies how Excel matches the value. **0** is almost always used for exact match. | Optional (default is **1**) |

|  |  |
| --- | --- |
| match\_type Value | Behaviour |
| **0** (Exact Match) | Finds the **first value exactly equal** to lookup\_value. The lookup\_array can be in any order. **This is what you'll use 99% of the time.** |
| 1 (or omitted) | Finds the largest value less than or equal to lookup\_value. lookup\_array must be sorted in **ascending order**. |
| -1 | Finds the smallest value greater than or equal to lookup\_value. lookup\_array must be sorted in **descending order**. |

**MATCH Example**

Imagine a list of names in cells A1:A5.

* If you enter the formula: **=MATCH ("David", A1:A5,0)**
* "David" is the **lookup\_value**.
* A1:A5 is the **lookup\_array** (the list to search).
* **0** ensures an **exact match**.
* If "David" is the 4th name in the list, the function will return the number **4**.

**3. INDEX−MATCH Combination**

The real power comes when you combine INDEX and MATCH. The MATCH function finds the row/column position, and INDEX uses that position to retrieve the data.

**Concept: MATCH Feeds INDEX**

Think of the combination as:

=INDEX (return\_range, row\_position, [column\_position])

Where:

* **return\_range** is the range of cells containing the data you want to get back.
* **row\_position** is calculated by a MATCH function: MATCH (lookup\_value, lookup\_array,0)
* **column\_position** is calculated by another MATCH function (for 2-way lookups), or is manually entered.

**Standard INDEX−MATCH (1-Way Lookup)**

This is a direct alternative to VLOOKUP and is used to look up a value in one column and return a value from a corresponding column.

**Goal:** Find the **Salary** for an **Employee ID**.

=INDEX (Salary\_Column, MATCH (Employee\_ID, ID\_Column,0))

**Detailed Example:**

|  |  |  |
| --- | --- | --- |
| ID | Name | Salary |
| 101 | Alice | 50000 |
| 102 | Bob | 60000 |
| 103 | Charlie | 70000 |

To get the salary for ID 102 (which is in cell B5), you would enter the following formula in cell B6:

1. **Find the row number:** MATCH (B5, A2:A4,0)
   * Finds 102 in the ID column A2:A4. It returns **2** (because 102 is the 2nd item in that array).
2. **Get the value:** INDEX (C2:C4,2)
   * Returns the 2nd value from the **Salary** column C2:C4, which is **$60,000**.

**Final Formula in B6:**

=INDEX (C2:C4, MATCH (B5, A2:A4,0))

**Key Advantages over VLOOKUP**

|  |  |  |
| --- | --- | --- |
| Feature | VLOOKUP | INDEX−MATCH |
| Lookup Direction | Can **only** look up values in the **first column** of the table and return values from columns to the **right**. | Can look up values in **any column** and return values from any other column (left or right). This is called a **"left lookup."** |
| Column Reference | Uses a **fixed column index number** (e.g., 2, 3). If you insert or delete a column, the formula breaks. | References a **range** (e.g., C2:C4). Inserting or deleting columns won't break the formula. |
| 2-Way Lookup | Cannot easily look up both a row and a column. | Can easily use two MATCH functions (one for the row, one for the column) to look up a value in a table. |