



Macro Programming

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Advanced Excel Functions and Formulas: Array Formulas

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Advanced Excel functions and formulas

- Advanced functions are essential tools for:
 - Performing complex calculations
 - Conducting data analysis
 - Automating tasks in Excel
- They go beyond basic operations and enhance both productivity and data-handling capabilities.



Advanced Excel functions and formulas

- **Lookup Functions**
 - VLOOKUP() → Vertical search
 - HLOOKUP() → Horizontal search
- **Logical Functions**
 - IF() → Applies conditional logic
 - IFERROR() → Handles errors in formulas
- **Mathematical Functions**
 - SUM() → Adds numbers
 - SUMIF() → Adds numbers based on condition



Advanced Excel functions and formulas

- **Text Function**
 - `CONCATENATE()` → Joins multiple text strings
- **Date Functions**
 - `TODAY()` → Returns the current date
 - `NOW()` → Returns the current date and time



Introduction to Array Formulas

Array Formulas

- An array formula in Excel can perform multiple calculations on one or more items in an array.
- An array is a collection of items (numbers, text, or both), arranged in:
 - Rows
 - Columns
 - Or multiple dimensions
- Unlike regular formulas that work on a single value, array formulas can process multiple values at once.
- They are powerful tools for complex calculations and data manipulation.



Introduction to Array Formulas

Array Formulas

Example:

A basic array formula to sum the lengths of text strings in a range:





Introduction to Array Formulas

How do Array Formulas Differ from Regular Formulas?

Aspect	Array Formulas	Regular Formulas
Calculations	Perform calculations on a range of cells simultaneously.	Typically work with one value or range.
Entry Method	Entered using Ctrl + Shift + Enter; displayed with curly braces {}.	Entered with just Enter.
Output	Can return a single result or multiple results.	Generally return a single result.

Example: Regular formula: =SUM(A1:A10) (returns one value).

Array formula: {=SUM(A1:A10 * B1:B10)} (can process multiple values).



Introduction to Array Formulas

Why Array Formulas Are Considered Advanced

- Complex Calculations
 - Handle intricate tasks like conditional sums and matrix operations in a single formula.
- Efficiency
 - Reduce the need for helper columns, streamlining data analysis and saving space.
- Powerful Analysis
 - Perform sophisticated data processing beyond the capabilities of regular formulas.



Introduction to Array Formulas

Why Array Formulas Are Considered Advanced

- Learning Curve
 - Require a deeper understanding of Excel functions, making them more challenging to master.

Example:

Array formula: {=SUM(LEN(B2:B11))} counts the total characters in the range B2:B11.



Introduction to Array Formulas

How to Enter an Array Formula

Steps to Enter an Array Formula:

1. Select the Cell: Click on the cell where you want to enter the formula.
2. Type the Formula: Enter the formula as usual
3. Press Ctrl + Shift + Enter: Instead of pressing Enter, press Ctrl + Shift + Enter. This tells Excel that you are entering an array formula. Excel will add curly braces {} around the formula automatically.

Example: If you type `=SUM(A1:A10 * B1:B10)` and press Ctrl + Shift + Enter, it will show as `{=SUM(A1:A10 * B1:B10)}`.



Array Formulas

Types of Array Formulas

Array formulas in Excel can be categorized into two main types:

1. Single-cell Array Formulas: These formulas perform multiple calculations but return only a single result in one cell.

- Entered in a single cell
- Perform operations on arrays of data
- Return a single value as the result

Example: {=SUM(A1:A10*B1:B10)}



Array Formulas

Types of Array Formulas

Array formulas in Excel can be categorized into two main types:

2. Multi-cell Array Formulas: These formulas return multiple results across a range of cells.

- Entered into multiple cells at once
- Perform calculations on arrays and return arrays
- Each cell in the output range contains part of the result

Example: {=A1:A10*B1:B10}



Array Formulas

Common Array Functions

1. SUM

- Adds up a range of numbers.
- Can sum the results of multiple calculations in one formula.

Example: {=SUM(IF(A1:A10>5,A1:A10))}

2. SUMPRODUCT

- Multiplies corresponding components in given arrays and returns the sum of those products.
- Naturally works as an array formula without needing Ctrl+Shift+Enter.

Example: {=SUMPRODUCT((A1:A10>5)*(B1:B10))}



Array Formulas

Common Array Functions(Continued)

3. INDEX

- Returns a value or the reference to a value from within a table or range.
- Can return an array of values when used with array arguments.

Example: {=INDEX(A1:C10,{1,3,5},{2,3})}

4. MATCH

- Looks for a specified item in a range of cells and returns the relative position.
- Can perform multiple lookups simultaneously when used in an array formula.

Example: {=MATCH({"apple","banana"},A1:A10,0)}



Array Formulas

Advantages:

1. Efficiency
2. Consistency
3. Powerful Calculations
4. Dynamic Results
5. Memory Optimization
6. Formula Protection
7. Advanced Filtering
8. Simplified Maintenance
9. Versatility
10. Time Saving



Array Formulas

Disadvantages:

1. Complexity
2. Performance Issues
3. Limited Flexibility
4. Debugging Challenges
5. Compatibility Concerns
6. Resource Intensive
7. Editing Restrictions
8. Potential for Overuse
9. Limited User Accessibility
10. Calculation Mode Limitations



Practical Activity

1. Enter sales data for multiple products.

Product Name	Sales Q1	Sales Q2	Sales Q3	Sales Q4
Apple	100	150	200	250
Banana	80	120	160	200
Cherry	60	90	120	150



Practical Activity

2. Using Array Formulas:

- Calculate Total Sales for Each Product:
- In cell F2, enter the array formula `{=SUM(B2:E2)}` to calculate the total sales for Apple.
- Press Ctrl + Shift + Enter to enter the formula as an array formula.
- Use AutoFill to copy the formula down to calculate the total sales for Banana and Cherry.



Practical Activity

3. Example Dataset in Excel

Product Name	Sales Q1	Sales Q2	Sales Q3	Sales Q4	Total Sales
Apple	100	150	200	250	{=SUM(B2:E2)}
Banana	80	120	160	200	{=SUM(B3:E3)}
Cherry	60	90	120	150	{=SUM(B4:E4)}



THANK YOU

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Nested Functions

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Introduction to Nested Functions

What are Nested Functions?

Nested functions in Excel occur when you use a function as an argument within another function. This technique allows you to perform multiple operations in a single formula, enabling more sophisticated calculations and logical operations.

Example





Introduction to Nested Functions

Why is Nesting Useful?

- Complex Calculations: Nesting allows you to combine multiple functions to create complex formulas that can perform a series of calculations in one step.
- Enhanced Decision-Making: By nesting logical functions like IF, AND, and OR, you can evaluate multiple conditions simultaneously.
- Streamlined Workflows: Nesting functions can help streamline workflows by reducing the number of formulas you need to manage.
- Dynamic Data Analysis: With nested functions, you can create dynamic formulas that automatically adjust to changes in your data.



Nested IF Functions

Nested IF Functions:

Nested IF functions in Excel are used to evaluate multiple conditions in a sequence. By embedding one IF function within another, you can test various criteria and return different outcomes based on the results.

Example

✗ ✓ *fx* | =IF(B2>=90, "A", IF(B2>=80, "B", IF(B2>=70, "C", IF(B2>=60, "D", "F"))))



Practical Activity

Calculating Commissions

Scenario: Sales Commissions Based on Sales Thresholds

In this scenario, we'll calculate sales commissions for employees based on their sales figures. The commission structure is as follows:

Sales of ₹10,000 or more earn a 5% commission.

Sales between ₹5,000 and ₹9,999 earn a 2% commission.

Sales below ₹5,000 earn no commission.

Example

✗ ✓ f_x | `=IF(B2>=10000, 0.05*B2, IF(B2>=5000, 0.02*B2, 0))`



Practical Activity

Calculating Commissions

Employee	Sales (₹)
Alice	12,000
Bob	7,500
Charlie	4,800
David	10,500
Eva	3,200



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