Topic 07: INDEX and MATCH Functions in Excel

Purpose:

INDEX and MATCH are two powerful functions that, when combined, can perform complex lookups. This combination is often used as an alternative to VLOOKUP and HLOOKUP because it provides more flexibility, especially when you need to look up values in any direction (not limited to left-to-right or top-to-bottom).

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1. INDEX Function

Syntax:

INDEX(array, row_num, [column_num])

- **array**: The range of cells from which to return a value.
- **row_num**: The row number in the array from which to return a value.
- **[column_num]**: Optional. The column number in the array from which to return a value (if you're working with a multi-column array).

Example:

Consider the following data:

A	**B**
Product	Price
Apple	1.5
Banana	1.0
Cherry	2.0

To return the price of the product in the second row (i.e., Apple), use:

=INDEX(B2:B4, 2)

Result: 1.5 (the price of Apple).

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2. MATCH Function

Syntax:

MATCH(lookup_value, lookup_array, [match_type])

- **lookup_value**: The value you want to search for.
- **lookup_array**: The range of cells that contains the value you're searching for.

- **[match_type]**: Optional. Set to:
  - 1 for an approximate match (default).
  - 0 for an exact match.
  - -1 for an approximate match, but looking for values less than the lookup value.

Example:

To find the position of "Banana" in the list (which is the second item), use:

```
=MATCH("Banana", A2:A4, 0)
```

Result: 2 (since Banana is the second item in the list).

Combining INDEX and MATCH

When combined, INDEX and MATCH can be used for more powerful lookups than VLOOKUP or HLOOKUP. Instead of requiring the lookup value to be in the first row/column, the MATCH function finds the position, and the INDEX function returns the value at that position.

Example:

To find the price of "Banana" using INDEX and MATCH, you can combine the two functions like this:

```
=INDEX(B2:B4, MATCH("Banana", A2:A4, 0))
```

Explanation:

- MATCH("Banana", A2:A4, 0) finds that "Banana" is in the 2nd row.
- INDEX(B2:B4, 2) returns the value in the second row of the price column (1.0).

Result: 1.0 (the price of Banana).

Advantages of INDEX & MATCH over VLOOKUP

- **Flexibility**: INDEX and MATCH can be used to look up values in any direction (left-to-right or right-to-left), while VLOOKUP can only search left-to-right.
- **Performance**: For large datasets, INDEX and MATCH can be faster than VLOOKUP because VLOOKUP must scan the entire table, while INDEX and MATCH only reference specific ranges.

Data Validation Lists in Excel

Purpose:

Data Validation in Excel is used to restrict the type of data that can be entered in a cell, helping to ensure data consistency. One common use is creating a dropdown list that restricts the input to predefined values.

How to Create a Data Validation List

1. **Step 1: Select the Cells**
   - Select the cells where you want the dropdown list.
2. **Step 2: Open Data Validation**
   - Go to the **Data** tab in the ribbon.
   - Click **Data Validation** in the **Data Tools** group.
3. **Step 3: Set the Validation Criteria**
   - In the Data Validation dialog, under the **Settings** tab:
     - Choose **List** from the **Allow** dropdown.
     - In the **Source** field, enter your list of options. If it's a small list, you can type the values directly (e.g., Apple, Banana, Cherry).
     - Alternatively, you can reference a range of cells (e.g., =$A$1:$A$3).
4. **Step 4: Optionally Set Input Message or Error Alert**
   - You can set an input message to guide users on what to enter, or an error alert if invalid data is entered.

Example:

If you have the following list in cells A1:A3:

A
Apple
Banana
Cherry

You can create a dropdown list in another range (e.g., B1:B5) by setting the source as =$A$1:$A$3.

This will allow users to select one of the fruits from the list, ensuring data consistency.

Two-Way Lookup in Excel

Purpose:

A two-way lookup allows you to find a value at the intersection of both a row and a column. It’s commonly used when you have a matrix or table, and you want to look up a value based on both a row and column criteria.

How to Perform a Two-Way Lookup Using INDEX and MATCH

The combination of INDEX and MATCH can be used for a two-way lookup by referencing both the row and column criteria.

Syntax:

```
=INDEX(return_array, MATCH(row_criteria, row_range, 0), MATCH(column_criteria, column_range, 0))
```

- **return_array**: The range of values you want to return a result from.
- **row_criteria**: The value to search for in the row.
- **column_criteria**: The value to search for in the column.
- **row_range**: The range of cells containing the row labels.
- **column_range**: The range of cells containing the column labels.

Example:

You have the following table:

A	**B**	**C**	**D**
	Jan	Feb	Mar
Apple	100	120	140
Banana	80	90	100
Cherry	60	70	80

To find the sales of **Banana** in **Feb**, you can use this two-way lookup formula:

```
=INDEX(B2:D4, MATCH("Banana", A2:A4, 0), MATCH("Feb", B1:D1, 0))
```

Explanation:

- MATCH("Banana", A2:A4, 0) returns 2 (the row number where "Banana" is located).
- MATCH("Feb", B1:D1, 0) returns 2 (the column number for "Feb").
- INDEX(B2:D4, 2, 2) returns the value at the intersection of the second row and second column (90).

Result: 90 (the sales of Banana in February).

Advantages of Using INDEX and MATCH for Two-Way Lookup:

- **Flexibility**: Unlike VLOOKUP, you can use any row or column for the lookup (not just the leftmost column or top row).
- **Efficiency**: The INDEX and MATCH combination is typically faster than using multiple VLOOKUP or HLOOKUP functions in large datasets.

Summary Table of Functions

Function	Purpose	Example Use Case
INDEX	Returns a value from a specific position in a range	Retrieve a value from a particular row/column in a table
MATCH	Returns the position of a value within a range	Find the position of a specific item in a list
INDEX & MATCH	Combine to perform flexible lookups (vertical or horizontal)	Lookup price based on product name in any column/row
Data Validation Lists	Restrict input to a list of predefined options	Create a dropdown list for consistent data entry (e.g., fruit names)
Two-Way Lookup	Lookup value at the intersection of a row and column	Find the sales of a product in a specific month in a sales table

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