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Computer Applications

Advanced Data Analysis Functions in Microsoft Excel

Dragana Radosavljević

UPKM

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Advanced Data Analysis Functions

- Advanced tools for working with tables
- Conditional formatting
- Sorting and filtering
- Conditional analysis functions (SUMIF, COUNTIF…)

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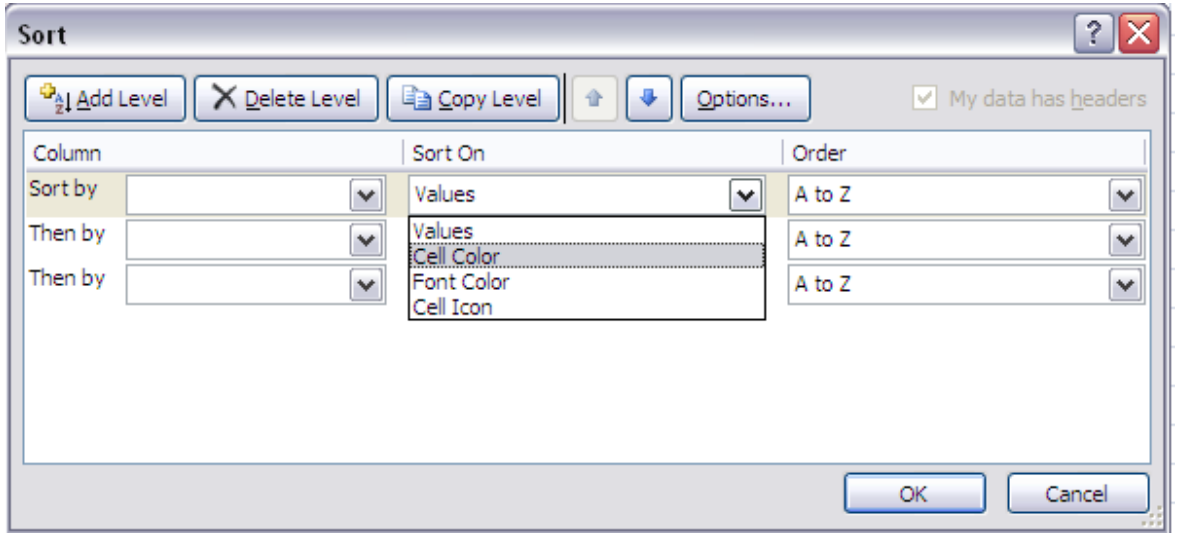
Advanced Data Analysis Functions

For advanced data analysis, it is necessary that:

- one table = one logical data set
- the first row = clear column headers
- each column = one data type (number, date, text)
- no empty rows and columns inside the table
- no merged cells (Merge) inside the data
- without a well-structured table, neither analysis (nor charts, nor PivotTables) will work properly

Advanced Data Analysis Functions

Sorting (Sort) – multiple levels

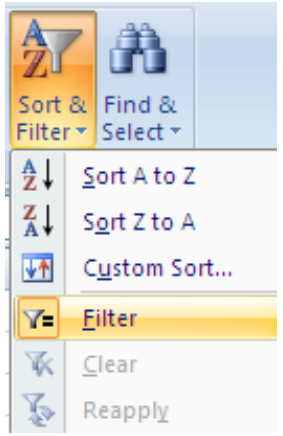


- Home / Data → Sort & Filter → Sort…
- You can sort by:
  - text (A→Z, Z→A)
  - numbers (smallest→largest)
  - dates (oldest→newest)
- Multiple levels of sorting:
  - e.g. first by “Product group”, then within the group by “Total sales” in descending order

The entire range has to be selected (or Excel has to recognize the table) so that rows do not get “broken apart”.

Advanced Data Analysis Functions

Filtering data



Apply to the table

- Data → Filter, or
- Format as Table → automatic filter

Types of filters:

- Text Filters (Contains, Begins With, Equals…)
- Number Filters (>, ≥, Between, Top 10…)
- Date Filters (This Month, Last Year, Between…)

Filtering is used for

- quick selection of a subset of data
- checking extreme values
- focusing on a specific category/period

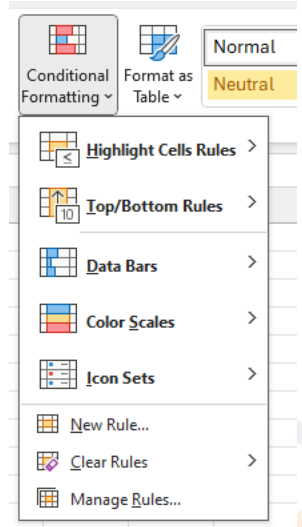
Advanced Data Analysis Functions

Conditional Formatting

Conditional formatting = the format (color, icon, etc.) depends on the value in the cell

Applications

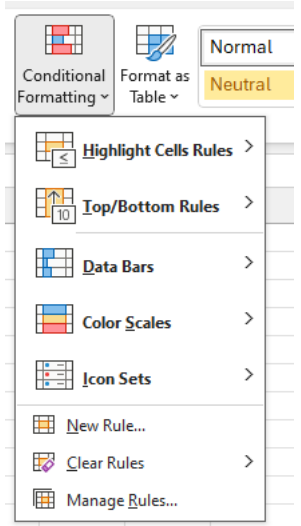
- highlighting values greater than a threshold (e.g. points ≥ 50)
- marking the top 10% of values
- coloring cells with a negative result
- color scale (from lowest to highest values)



Home → Conditional Formatting

Advanced Data Analysis Functions

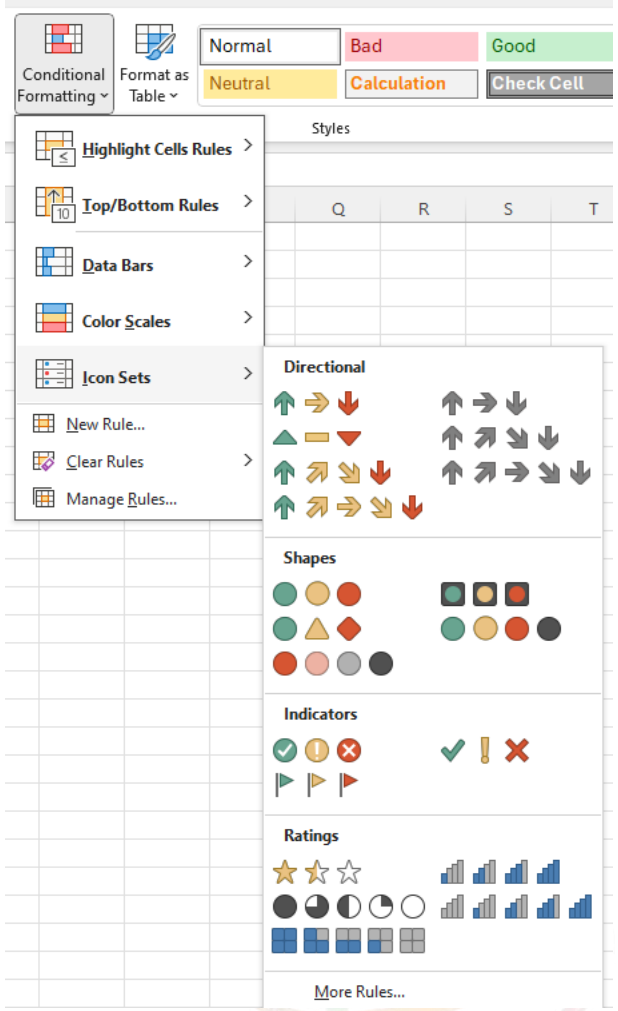
Basic rules of conditional formatting



- Highlight Cells Rules
  - Greater Than… / Less Than…
  - Between…
  - Equal To…
  - Text that Contains…
  - A Date Occurring…
- Top/Bottom Rules
  - Top 10 Items, Top 10%
  - Bottom 10 Items
  - Above/Below Average
- Example
  - in the “Total points” column, color in green all values ≥ 50 (passed)
  - highlight the Top 5 sales by value

Advanced Data Analysis Functions

Advanced conditional formatting – visual display



- Data Bars
  - horizontal “bars” in cells (like a mini-chart)
- Color Scales
  - color gradient (e.g. red = low, green = high)
- Icon Sets
  - arrows, traffic lights, stars…
- Examples
  - Data Bars = “heat” of sales by item
  - Color Scales = visual map of grades/points
  - Icon Sets = quick indication of whether a value is above/below normal

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Advanced Data Analysis Functions

Managing rules (Manage Rules)

- Home → Conditional Formatting → Manage Rules…

- From here we can
  - see all rules on the active sheet
  - change a condition (Edit Rule)
  - change “Applies to” (the range the rule applies to)
  - change the order of rules and the Stop If True option

- Typical mistakes
  - applying a rule to the wrong range
  - overlapping rules that produce an unclear result

Exercise

Initial table: “Prodaja” (“Sales”)

- columns: Date, Item, Group, Quantity, Price, Total

Task

- Apply a Custom Sort
  - by “Product group”
  - by “Total sales” in descending order
- Filter to show only sales in the last 30 days
  - Date Filter → This Month / Custom
- Apply conditional formatting to the “Total” column
  - green – values above the average
  - red – values below the average
- Apply Data Bars to the “Total” column to get a visual impression of the distribution

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Advanced Data Analysis Functions

Conditional analysis functions

- When working with data, it is often necessary to analyze them so that you see logical “filters + calculation” in a single step
  - sum by category
  - number of records that satisfy a condition
  - average only for a certain group

- Excel offers the functions:
  - SUMIF / SUMIFS
  - COUNTIF / COUNTIF
  - AVERAGEIF / AVERAGEIFS

Advanced Data Analysis Functions

Conditional sum – SUMIF and SUMIFS

- SUMIF(range; criteria; [sum_range])
  - range – range for checking the condition
  - criteria – condition (e.g. "Voće", ">1000")
  - sum_range – range whose values are summed (if different from range))
- Example
  - total sales for products in the “Voće” (“Fruit”) group
    - =SUMIF(C2:C100; "Voće"; F2:F100)
- SUMIFS(sum_range; criteria_range1; criteria1; …)
    - multiple conditions
- Example
    - total sales for “Voće” in January
    - =SUMIFS(F2:F100; C2:C100; "Voće"; A2:A100; ">=2025-01-01"; A2:A100; "<=2025-01-31")

Advanced Data Analysis Functions

Counting records by condition – COUNTIF and COUNTIFS

- COUNTIF(range; criteria)
  - counts how many cells in range meet the condition
- Examples
  - number of sales above 10,000
    - =COUNTIF(F2:F100; ">10000")
  - number of sales of a specific product
    - =COUNTIF(B2:B100; "Šećer")
- COUNTIFS(range1; criteria1; range2; criteria2; …)
  - multiple conditions
- Example
  - number of transactions for the product “Šećer” in February
    - =COUNTIFS(B2:B100; "Šećer"; A2:A100; ">=2025-02-01"; A2:A100; "<=2025-02-28")

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Advanced Data Analysis Functions

Conditional average – AVERAGEIF and AVERAGEIFS

- AVERAGEIF(range; criteria; [average_range])
  - average for values that satisfy the condition
- Example – average sales for the “Voće” group
    - =AVERAGEIF(C2:C100; "Voće"; F2:F100)

- AVERAGEIFS(average_range; criteria_range1; criteria1; …)
  - multiple conditions
- Example – average sales of “Voće” in 2025 in a specific region

- *Note: this function is sensitive to empty cells and errors – make sure to clean the data well before analysis*

Advanced Data Analysis Functions

Absolute references and working in Excel tables

- When copying formulas with conditional functions
  - references to ranges often need to be absolute ($A$2:$A$100)
  - the condition (criteria) can be stored in a separate cell

- Example
  - =SUMIF($C$2:$C$100; H2; $F$2:$F$100)

- If the range is already an Excel table (Format as Table), you can use structured references
  - formulas are easier to read
  - =SUMIF(Tabela1[Grupa]; "Voće"; Tabela1[Ukupno])

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Advanced Data Analysis Functions

Pivot tables

- a top-down view of the data (summary overview)
- When there are many rows (hundreds/thousands), SUMIFS and COUNTIFS become hard to maintain
- A Pivot table allows
  - quick grouping by categories
  - summing, counting, averaging
  - detailed and fast changes in how data is displayed
- A Pivot is a “dynamic report” on top of a table.

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Advanced Data Analysis Functions

How to create a Pivot table

- Select any cell in the data table (or the whole Table)
- Insert → PivotTable
- Choose
  - “Select a table or range” – confirm the range
  - “New Worksheet” – Pivot on a new sheet
- Pivot Table Field List
  - Rows – categories (e.g. product, group, month)
  - Columns – additional categories (year, region)
  - Values – SUM/COUNT/AVERAGE of “Total”
  - Filters – e.g. year, region

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Advanced Data Analysis Functions

Basic operations in a Pivot table

- Changing the aggregate function
  - Value Field Settings → Sum, Count, Average, Max, Min…
- Sorting and filtering directly in the Pivot (arrows next to Row/Column labels)
- Grouping (Group)
  - group dates by months/years
    - group numbers by intervals (0–100, 101–200…)
- Refresh – updating the Pivot table after changing the “source” data

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Exercise

Initial table: “Prodaja” (“Sales”)

- Using SUMIFS
  - calculate total turnover by “Product group”
  - calculate turnover by “Month”
- Create a Pivot table with
  - Rows: Product group
  - Columns: Month
  - Values: SUM(Total)
- Compare
  - which approach is faster to set up
  - which is more readable
  - where it is easier to add a new analysis (e.g. by region)

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Exercise

- Create a table with at least 100 rows
  - e.g.: sales transactions, records of website visits by day, students' results by subject
- Do the following
  - at least 2 examples with SUMIFS (e.g. total by year and by group)
  - at least 2 examples with COUNTIFS (e.g. how many records satisfy 2 conditions)
  - at least 1 example with AVERAGEIF/AVERAGEIFS
- Create a Pivot table that
  - in Rows has the main category (e.g. product, subject)
  - in Columns the secondary category (e.g. year, semester)
  - in Values at least one SUM and one COUNT
- Apply one conditional formatting rule to the resulting Pivot table (e.g. highlight cells with the highest values)
- Write a short text (5–6 sentences) with conclusions
  - what you discovered about the data
  - what was easier to do with functions, and what was easier with the Pivot table

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Questions & Answers

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