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Computer Applications

Formulas and Basic Functions in Microsoft Excel

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Formulas and Basic Functions

- What is a formula in Excel
- Structure of a formula and operators
- Cell addressing
  - relative references
  - absolute references

Formulas and Basic Functions

- A formula is an expression that Excel calculates
  - It always begins with the = sign
  - It can contain:
  - references to cells (A1, B5…)
  - constants (numbers, text)
  - operators (+, -, *, /, ^)
  - functions (SUM, AVERAGE…)
- Examples
  - =A1+B1
  - =C2*0,2
  - =SUM(A1:A10)

Formulas and Basic Functions

- Formula
  - an expression we write ourselves
    - =A1*B1 + C1

- Function
  - a predefined formula with a name
    - =SUM(A1:A10) – adds all values in the range

- *Every function is written inside a formula, but some formulas do not need to contain functions*

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Operators and precedence

- Basic operators
  - + addition
  - - subtraction
  - * multiplication
  - / division
  - ^ exponentiation
- Order of evaluation
  - Parentheses ()
  - Exponentiation ^
  - Multiplication and division * and /
  - Addition and subtraction + and –
- Examples
  - =2+3*4 → 14
  - =(2+3)*4 → 20

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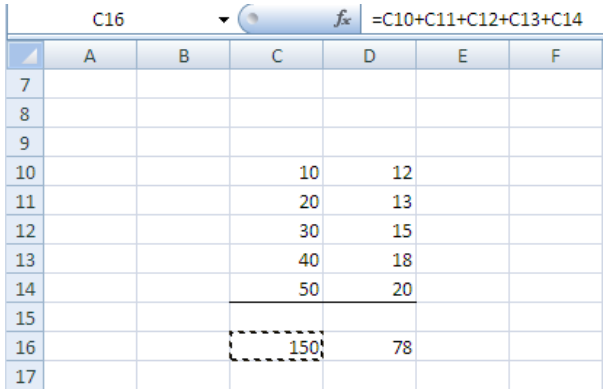
Cell references

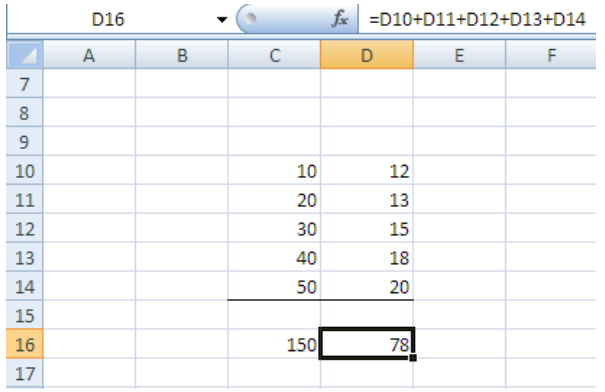
- Single cell
  - A1
  - C5
  - D10
- Range in one column
  - A1:A10 (from A1 to A10)
- Range across multiple columns
  - A1:C10 (rectangular block)
- Separate ranges
  - A1:A5; C1:C5 (in functions often separated by a semicolon)

- Example formulas
  - =A1+A2+A3
  - =SUM(A1:A3)
  - =AVERAGE(B2:B10)

Cell references

Relative cell references



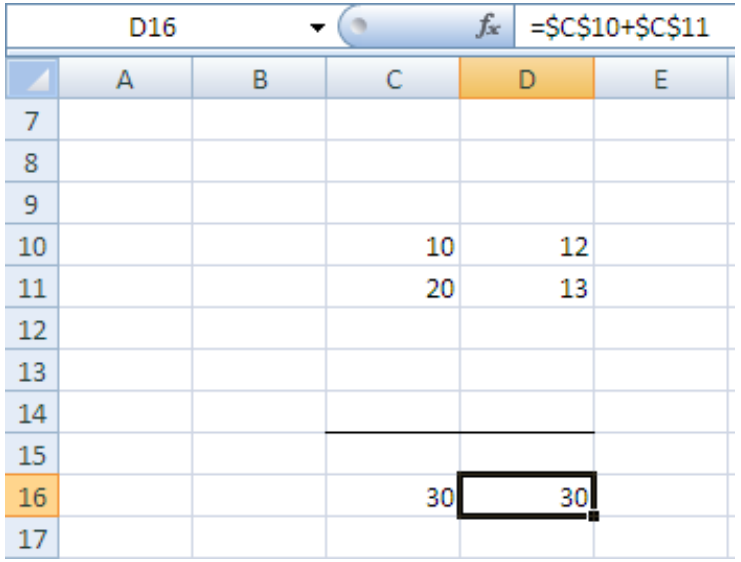


- Form
  - A1, B3, C5 (without $)
- When copying a formula, the addresses change according to position
  - if we copy the formula =A1+B1 from cell C1 to C2, we get =A2+B2
- Default addressing type in Excel
- Practical example
  - Total price calculation: in row 2 =B2*C2, then copy down for all rows

Cell references

Absolute cell references

- Form
  - A1, C5 – the $ sign “fixes” the column and row
- When copying the formula, the address does not change
- We use them when we always refer to the same cell
  - (e.g. a constant – VAT rate, exchange rate, fixed coefficient)



- Example
  - In cell F1 enter 0,2 (VAT 20%)
  - In G2 formula: =F2*F1
  - When copying to G3, G4… the address F2 becomes F3, F4…
  - F1 always stays the same

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Cell references

Mixed cell references

- Only the column fixed
  - $A1 – when copying down, the row changes (1→2→3…), but the column stays A
- Only the row fixed
  - A$1 – when copying to the right, the column changes (A→B→C…), but the row stays 1
- Useful for
  - tables of coefficients (rows and columns have meaning)
  - calculating “multiplication tables” or discount tables
  - (rows = quantity, columns = discount type)

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Exercise

Basic formulas and addressing

- Create a table “Prodaja” (“Sales”) with columns:
  - A: Item
  - B: Unit price
  - C: Quantity
  - D: Total price
- In rows 2–11 enter at least 10 products
- In cell D2 enter the formula: =B2*C2
- Copy the formula down to D11 (use AutoFill)
- In F1 enter the VAT rate, e.g. 0,2
- In column E (VAT) calculate =D2*F1 and copy down
- What happens if you omit the $ in the F1 reference?

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Functions

- A function is a predefined formula that:
  - has a name (e.g. SUM, AVERAGE…)
  - has arguments – values or ranges
  - It is written in the form:
    - =FUNCTION_NAME(argument1; argument2; …)

- Examples:
  - =SUM(A1:A10)
  - =AVERAGE(B2:B20)

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Functions

Basic statistical functions

- SUM(range) – sum of values
- AVERAGE(range) – arithmetic mean
- MIN(range) – smallest value
- MAX(range) – largest value

- Examples
  - =SUM(D2:D11) – total sales revenue
  - =AVERAGE(D2:D11) – average total price
  - =MIN(C2:C11) – minimum quantity sold
  - =MAX(B2:B11) – highest unit price

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Functions

Counting values

- COUNT(range) – counts cells that contain numbers
- COUNTA(range) – counts non-empty cells (any data type)

- Examples
  - =COUNT(D2:D100) – how many rows have a total price entered
  - =COUNTA(A2:A100) – how many products/students are listed

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Functions

Rounding and percentages

- ROUND(number; num_digits) – rounding
  - =ROUND(D2; 2) – round to two decimal places
- Percentages
  - Percentage = part / whole
- Example
  - share of one product in total sales → =D2 / SUM(D2:D11)
  - Format the cell as %

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Functions

IF function – conditional logic

- Syntax
  - =IF(logicali_test; value_if_TRUE; value_if_FALSE)

- Examples:
  - Pass/fail classification:
    - =IF(D2>=50; "Положио"; "Није положио")
  - Discount for large purchase:
    - =IF(C2>=10; D2*0,9; D2) (10% discount if quantity ≥ 10)

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Functions

Common errors and messages

- #DIV/0! – division by zero (or an empty cell)
- #VALUE! – incompatible type (e.g. adding text and a number)
- #NAME? – Excel does not recognize the name of a function or range (typo)
- #REF! – invalid reference (deleted cell that the formula points to)

- Tips
  - check that all required cells are filled
  - check that the function name is spelled correctly
  - use the Formula Bar and Evaluate Formula

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Exercise

SUM, AVERAGE, MIN, MAX, COUNT

On the “Prodaja” table from Exercise 1

- In cell D12 calculate total revenue
  - =SUM(D2:D11)
- In D13 calculate the average total price
  - =AVERAGE(D2:D11)
- In B13 find the lowest unit price
  - =MIN(B2:B11)
- In B14 calculate the highest unit price
  - =MAX(B2:B11)
- In A13 count how many items are entered
  - =COUNTA(A2:A11)

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Exercise

Conditional labels (IF)

On the “Prodaja” table from Exercise 1:

- Add column F: “Large purchase” (Yes/No)
- In F2 enter the formula:
  - =IF(C2>=10; " Yes "; “No")
- Copy the formula down to F11
- Add column G: “Client category”
  - e.g. =IF(D2>=10000; "Premium"; "Standard")
- Copy down

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Exercise

- Create a table “Results” with columns
  - A: Student
  - B: Points test 1
  - C: Points test 2
  - D: Total points
  - E: Average of tests
  - F: Status
- In column D: =B2+C2 (copy down)
- In column E: =AVERAGE(B2:C2) (copy down)
- In column F: =IF(D2>=50; "Положио"; "Није положио")
- Calculate:
  - total number of students
  - how many passed (COUNTIF)
  - minimum, maximum and average total result

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Questions & Answers

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