# DAX (Data Analysis Expressions) in Excel and Power BI

**DAX** is a formula language used in **Power Pivot**, **Power BI**, and **Analysis Services** to create custom calculations on data models.

**1. What is DAX?**

* DAX = **Excel-like formulas** but built for **relational data models**
* Used to:
  + Create **calculated columns**
  + Build **measures (KPIs, totals, percentages)**
  + Filter, aggregate, and perform time-based analysis

**2. DAX vs Excel Formulas**

| **Feature** | **Excel Formula** | **DAX** |
| --- | --- | --- |
| Row-based logic | Yes | Yes (calculated columns) |
| Aggregation logic | Manual (e.g., SUMIF) | Measures (SUM, CALCULATE) |
| Relationship aware | No | Yes (tables can be linked) |
| Time intelligence | Basic | Built-in advanced support |

**3. Types of DAX Calculations**

**a. Calculated Column**

* Adds a column to your table

Profit = Sales[Revenue] - Sales[Cost]

**b. Measure**

* Aggregates data (for use in PivotTables or visuals)

Total Sales = SUM(Sales[Revenue])

**4. Most Common DAX Functions**

**Aggregation**

SUM(Sales[Amount])

AVERAGE(Sales[Quantity])

MIN(Sales[Date])

MAX(Sales[Revenue])

**Logical**

IF(Sales[Amount] > 1000, "High", "Low")

SWITCH(Sales[Region], "North", 1, "South", 2, 0)

**Filter & CALCULATE**

SalesNorth = CALCULATE(SUM(Sales[Amount]), Sales[Region] = "North")

CALCULATE() modifies the filter context of a calculation.

**Time Intelligence (only if date table is present)**

YTD Sales = TOTALYTD(SUM(Sales[Amount]), Dates[Date])

Previous Month Sales = CALCULATE(SUM(Sales[Amount]), PREVIOUSMONTH(Dates[Date]))

**5. Example Measures**

**➤ Total Sales**

Total Sales = SUM(Sales[Quantity] \* Sales[UnitPrice])

**➤ Profit Margin %**

Profit Margin = DIVIDE(SUM(Sales[Profit]), SUM(Sales[Revenue]))

**➤ % of Grand Total**

% of Total =

DIVIDE(

[Total Sales],

CALCULATE([Total Sales], ALL(Sales))

)

**6. Context in DAX**

| **Context Type** | **Meaning** |
| --- | --- |
| Row Context | Current row (used in calculated columns) |
| Filter Context | Filters applied from slicers or visual selection |
| Evaluation Context | Result of combining all other contexts |

**7. DAX Best Practices**

* Use **Measures** instead of calculated columns when possible (more efficient).
* Use DIVIDE() instead of / to avoid divide-by-zero errors.
* Always create a **Date table** for time functions.
* Keep DAX expressions readable and organized.

**8. Real-World Use Case Example**

You have a Sales table and a Product table. You want to:

* Calculate Total Sales = Quantity × Unit Price
* Group by Product Category
* Compare monthly sales

Use:

Total Sales = SUMX(Sales, Sales[Quantity] \* Sales[UnitPrice])

Then create a PivotTable in Excel using this Measure from the Data Model.

DAX Formula Sheet

| **Function Name** | **Example Formula** |
| --- | --- |
| SUM | SUM(Sales[Amount]) |
| AVERAGE | AVERAGE(Sales[Quantity]) |
| MIN / MAX | MIN(Sales[Date]), MAX(Sales[Revenue]) |
| DIVIDE | DIVIDE(Sales[Profit], Sales[Revenue]) |
| IF | IF(Sales[Amount] > 1000, "High", "Low") |
| SWITCH | SWITCH(Sales[Region], "North", 1, "South", 2, 0) |
| CALCULATE | CALCULATE(SUM(Sales[Amount]), Sales[Region] = "North") |
| ALL | CALCULATE([Total Sales], ALL(Sales)) |
| FILTER | CALCULATE([Total Sales], FILTER(Sales, Sales[Amount] > 500)) |
| SUMX | SUMX(Sales, Sales[Quantity] \* Sales[UnitPrice]) |
| RELATED | RELATED(Products[ProductName]) |
| TOTALYTD | TOTALYTD(SUM(Sales[Amount]), Dates[Date]) |
| PREVIOUSMONTH | CALCULATE(SUM(Sales[Amount]), PREVIOUSMONTH(Dates[Date])) |
| % of Total | DIVIDE([Total Sales], CALCULATE([Total Sales], ALL(Sales))) |