Introduction to Power BI-DAX

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DAX Overview

- DAX or Data Analysis Expressions is a formula expression language used in Analysis Services, Power BI, and Power Pivot in Excel.

- DAX include functions, operators, and values to perform advanced calculations and queries on data in related tables and columns in tabular data models.

- DAX are used in measures, calculated columns, calculated tables, etc.

DAX Calculation (Measures)

- Measures are dynamic calculation formulas where the results change depending on context.

- A formula in a measure can use standard aggregation functions automatically created by using the Autosum feature, such as COUNT or SUM, or you can define your own formula by using the DAX formula bar.

    - e.g., Total Sales = SUM([Sales Amount])

DAX Calculation (Calculated columns)

- **A calculated column** is a column that you add to an existing table (in the model designer) and then create a DAX formula that defines the column's values,
  - e.g., D&G = [Department Name] & " -" & [Graduate country]

DAX Calculation (Calculated tables)

- **A calculated table** is a computed object, based on a formula expression, derived from all or part of other tables in the same model. Instead of querying and loading values into your new table's columns from a data source, a DAX formula defines the table's values.

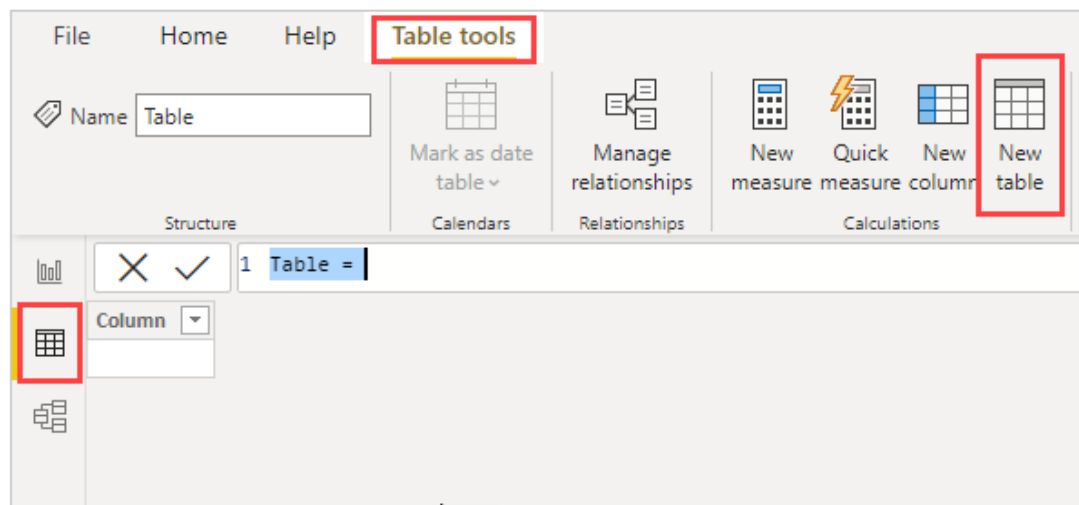 - e.g., Western Region Employees = UNION('Northwest Employees', 'Southwest Employees')

Northwest Employees

Employee	City	State	Tenure
Allen, Kerry	Eugene	OR	1
Baker, Cameron	Portland	OR	15
Morin, Max	Redmond	WA	10
Ramirez, Riley	Portland	OR	3
Rocha, Kim	Redmond	WA	15
Smith, Avery	Redmond	WA	15

Southwest Employees

Employee	City	State	Tenure
Connors, Morgan	San Diego	CA	10
Irwin, Jesse	Phoenix	AZ	3
Nguyen, Rory	Los Angeles	CA	3
Torres, Devon	Los Angeles	CA	2

In Report View or Data View of Power BI Desktop, in the **Calculations** group of the **Modeling** tab, select **New table**. It's a bit easier to do in **Table tools** in the Data View, because then you can immediately see your new calculated table.

```
1 Western Region Employees = UNION('Northwest Employees', 'Southwest Employees')
```

Employee	City	State	Tenure
Allen, Kerry	Eugene	OR	1
Baker, Cameron	Portland	OR	15
Morin, Max	Redmond	WA	10
Ramirez, Riley	Portland	OR	3
Rocha, Kim	Redmond	WA	15
Smith, Avery	Redmond	WA	15
Connors, Morgan	San Diego	CA	10
Irwin, Jesse	Phoenix	AZ	3
Nguyen, Rory	Los Angeles	CA	3
Torres, Devon	Los Angeles	CA	2

Fields >

🔍 Search

∨ ⊞ Northwest Employees
∨ ⊞ Southwest Employees
∧ ⊞ Western Region Employees
    City
    Employee
    State
  Σ Tenure

DAX formula (Aggregation)

- Calculate a (scalar) value such as **count**, **sum**, **average**, **minimum**, or **maximum** for all rows in a column or table as defined by the expression.

Function	Description
APPROXIMATEDISTINCTCOUNT	Returns the *approximate* number of rows that contain distinct values in a column.
AVERAGE	Returns the average (arithmetic mean) of all the numbers in a column.
AVERAGEA	Returns the average (arithmetic mean) of the values in a column.
AVERAGEX	Calculates the average (arithmetic mean) of a set of expressions evaluated over a table.
COUNT	Counts the number of cells in a column that contain numbers.
COUNTA	Counts the number of cells in a column that are not empty.

https://docs.microsoft.com/en-us/dax/aggregation-functions-dax

DAX formulas (Aggregation)

ame	Avg salary	$% Format General ∨
ome table	tbResearcher ∨	$ ∨ % 9 .00→.0 Auto ⌃⌄
	Structure	Formatting

Data category Uncategorized ∨	New measure Quick measure
Properties	Calculations

ⓘ Auto recovery contains some recovered files that haven't been opened.

✕ ✓ | 1 Avg salary = AVERAGE(tbResearcher[salary])

Researcher ID ▾	Researcher Name ▾	Department Name ▾	Graduate country ▾	salary ▾	Level ▾
1	Peter	Software	Japan	฿89,700	H
2	Denny	Hardware	Japan	฿47,700	L
3	Robert	Logistic	Hongkong	฿72,000	H
4	Mana	Logistic	Hongkong	฿54,400	H
5	Dan	Software	Hongkong	฿94,300	H
6	Don	Hardware	Thailand	฿65,800	H
7	John	Software	Thailand	฿38,600	L
8	Smith	Software	Thailand	฿39,900	L
9	David	Software	Usa	฿35,700	L
10	Bryan	Hardware	Usa	฿65,500	H

Exercise · Create Max Min of Salary
& show

DAX formula (Date and time)

- These functions help you create calculations based on *dates* and *time*. Many of the functions in DAX are similar to the Excel date and time functions. However, DAX functions use a *datetime* data type, and can take values from a column as an argument.

Function	Description
CALENDAR	Returns a table with a single column named "Date" that contains a contiguous set of dates.
CALENDARAUTO	Returns a table with a single column named "Date" that contains a contiguous set of dates.
DATE	Returns the specified date in datetime format.
DATEDIFF	Returns the count of interval boundaries crossed between two dates.
DATEVALUE	Converts a date in the form of text to a date in datetime format.
DAY	Returns the day of the month, a number from 1 to 31.

https://docs.microsoft.com/en-us/dax/date-and-time-functions-dax

DAX formula (Date and time)

Another example: Measure_week = DATEDIFF(MIN(April[Date]), MAX(April[Date]),
WEEK)

DAX formula (Filter)

- The filter and value functions in DAX are some of the most complex and powerful, and differ greatly from Excel functions. The ***lookup*** functions work by using tables and relationships, like a database. The filtering functions let you manipulate data context to create dynamic calculations.

Function	Description
ALL	Returns all the rows in a table, or all the values in a column, ignoring any filters that might have been applied.
ALLCROSSFILTERED	Clear all filters which are applied to a table.
ALLEXCEPT	Removes all context filters in the table except filters that have been applied to the specified columns.
ALLNOBLANKROW	From the parent table of a relationship, returns all rows but the blank row, or all distinct values of a column but the blank row, and disregards any context filters that might exist.
ALLSELECTED	Removes context filters from columns and rows in the current query, while retaining all other context filters or explicit filters.
CALCULATE	Evaluates an expression in a modified filter context.
CALCULATETABLE	Evaluates a table expression in a modified filter context.

Dax formula (Filter)

```
1  HK salary =
2  CALCULATE(
3      SUM(tbResearcher[salary]),
4      tbResearcher[ Graduate country] = "Hongkong"
5  )
```

Researcher ID	Researcher Name	Department Name	Graduate country	salary	Level
1	Peter	Software	Japan	฿89,700	H
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7	John	Software	Thailand	฿38,600	L
8	Smith	Software	Thailand	฿39,900	L
9	David	Software	Usa	฿35,700	L
10	Bryan	Hardware	Usa	฿65,500	H

221K
HK salary

DAX query

- A DAX query is a statement, similar to a SELECT statement in T-SQL. The most basic type of DAX query is an evaluate statement.
- DAX queries can be created and run in SQL Server Management Studio (SSMS) and open-source tools like DAX Studio.
- e.g.,

```
EVALUATE
 ( FILTER ( 'tbResearcher', [salary] < 40000 ) )
ORDER BY [Researcher Name] ASC
```

https://docs.microsoft.com/en-us/dax/dax-queries

DAX Studio

The ultimate tool for working with DAX queries

Download the latest release of DAX Studio here:

⬇ DAX Studio v2.17.3
(installer)

⬇ Size: 8.20Mb | 📅 16 Nov 2021 | downloads: 90,625

The details of the new features and fixes included in this release are available in the changelog

⬇ DAX Studio v2.17.3 (portable)

⬇ Size: 12.60Mb | 📅 16 Nov 2021 | downloads: 7,583

https://daxstudio.org/

What's next

- https://docs.microsoft.com/en-us/learn/paths/dax-power-bi/
- https://daxstudio.org/tutorials/writing-dax-queries/