

آموزش نرم افزار Power BI با رویکرد مدیریت پروژه

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Power BI

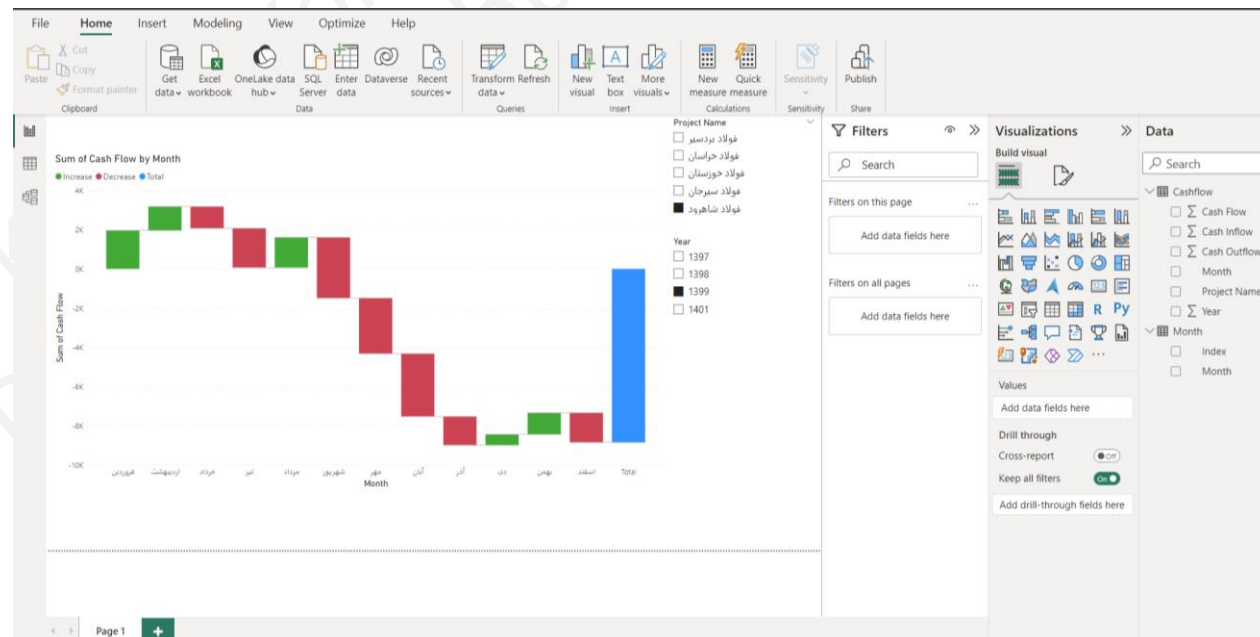


Third Session

Project Management Scenarios

S03-E01: Cash Flow Statement

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DAX is NOT X:

- DAX is not Excel
- DAX is not SQL
- DAX is not MDX
- DAX is painful if you don't get this
- The concepts are harder than the syntax

There are two types of business logic:

- Calculated columns
- Measures

Calculated columns

Represents a single value per row

Computed at time of creation/refresh

Results are materialized and stored with the table

Attached to a specific table

Normally can only see the row they exist in

- Relates to the idea of row context
- More on this later

Can be used in filters or values/results areas

Example Calculated Column

GrossMargin = Sales[Price] – Sales[Cost]

[GrossMargin] ▼		$f_x = \text{Sales[Price]} - \text{Sales[Cost]}$					
▲	Category ▼	Product ▼	Color ▼	Price ▼	Cost ▼	Quantity ▼	GrossMargin ▼
1	Unknown	Tomato	Red	2	1	5	1
2	Fruit	Apple	Red	4	2	3	2
3	Fruit	Apple	Green	6	2	2	4
4	Vegetable	Cucumber	Green	1	0.5	7	0.5

Measures

Represents a single value per data model

Computed at run time

Results are dynamic, based on filters

- This is called the filter context

Not attached to any table

Sees all the data at once

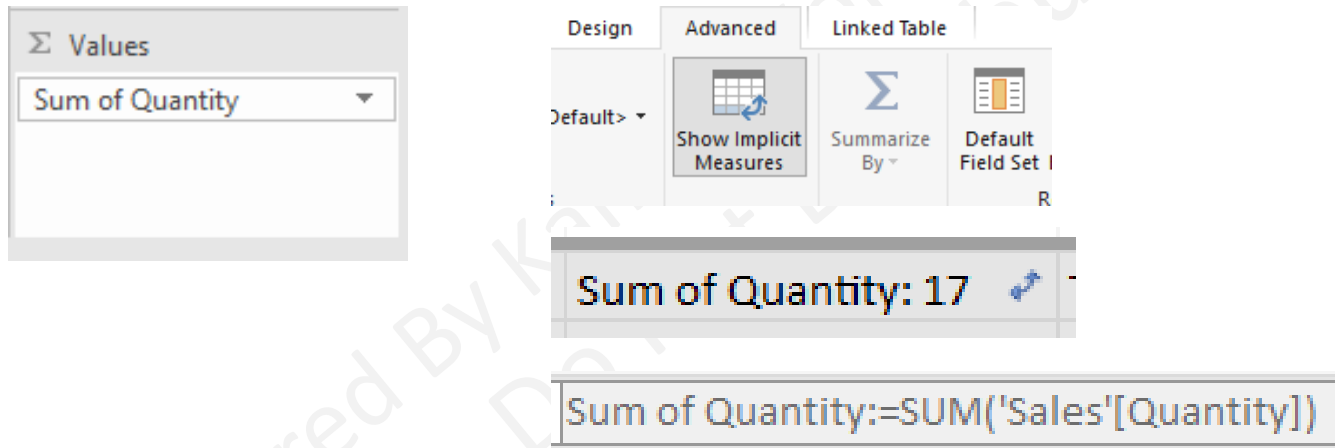
Example Measure

TotalQuantity := SUM(Sales[Quantity])

TotalQuantity:=SUM(Sales[Quantity])				
Color	Price	Cost	Quantity	GrossMargin
Red	2	1	5	1
Red	4	2	3	2
Green	6	2	2	4
Green	1	0.5	7	0.5
				TotalQuantity: 17

Implicit measures

If you use a calculated column as a value/result it creates an implicit measure



The screenshot illustrates the concept of implicit measures in Power BI. On the left, the 'Values' pane shows 'Sum of Quantity' selected. In the center, the 'Advanced' tab of the ribbon is active, with the 'Show Implicit Measures' button highlighted. Below the ribbon, a summary card displays 'Sum of Quantity: 17'. At the bottom, the DAX formula bar shows the underlying measure: `Sum of Quantity:=SUM('Sales'[Quantity])`.

DAX is good at two things

1. Aggregations
2. Filtering

What is an aggregation?

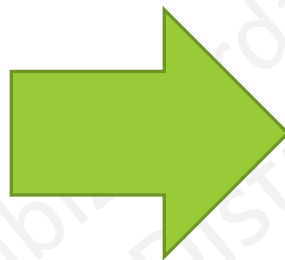
Aggregation is combining a group of values into one value

Examples

- SUM
- AVERAGE
- MIN
- MAX
- DISTINCTCOUNT

Introduction to DAX

Quantity
4
1
3
2
7
5
1



SUM(Quantity)
23

DAX stores data as columns

Super efficient for simple aggregations

Many aggregate functions take columns as parameters

DAX is optimized for single-column operations

Columns are the fundamental unit of measure

Basic units of measure

1. Column
2. Table
 - A set of columns with the same length and sort order
3. Scalar Value
4. Row
 - A table filtered down to a single row
 - Also called a row context

Compression and encoding

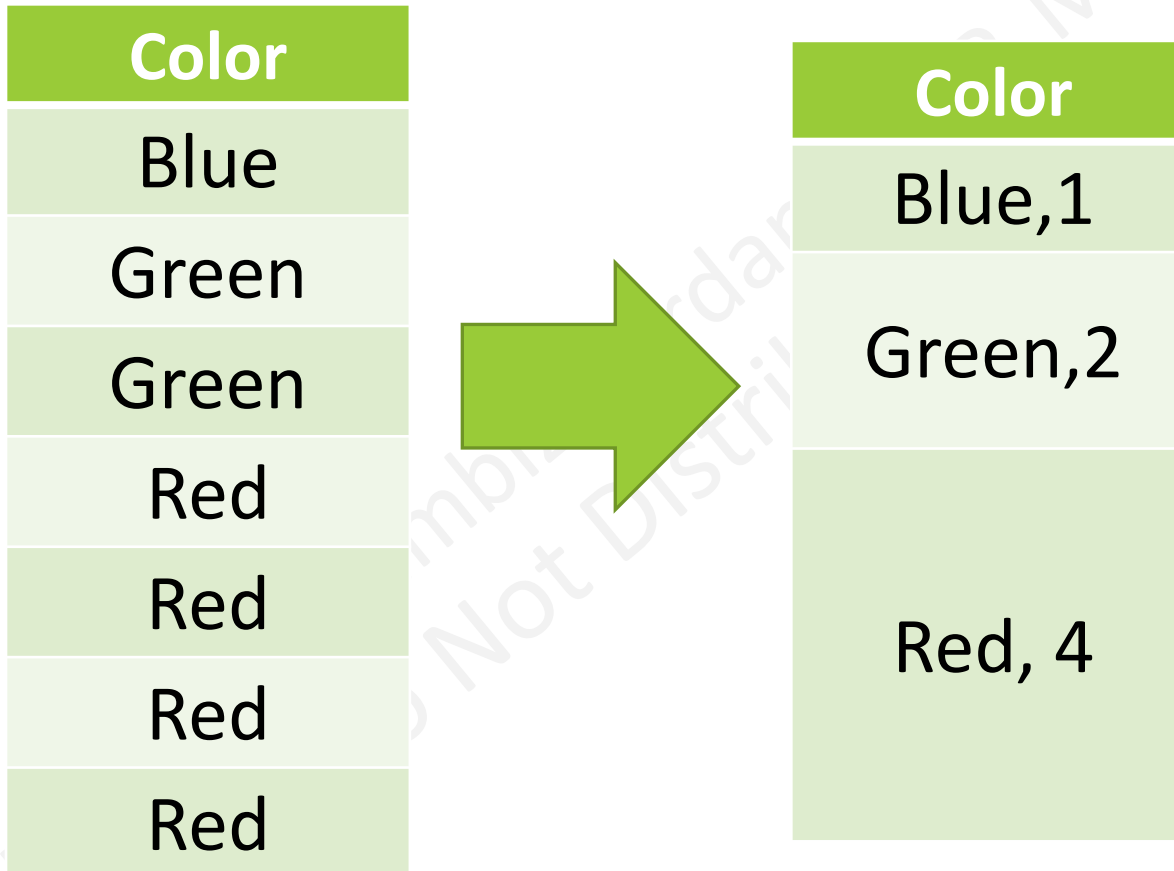
Value Encoding

Dictionary Encoding

Run-length encoding

- Sorting

Introduction to DAX



DAX is good at two things

1. Aggregations
2. **Filtering**

Two types of Filtering

Implicit filtering

Explicit filtering

Implicit Filtering

Slicers

TotalQuantity
8

Color

Green

Red

Row Labels	TotalQuantity	
Green	9	Sales[Color] = "Green"
Red	8	Sales[Color] = "Red"
Grand Total	17	

Explicit Filtering

GreenQuantity := CALCULATE(SUM(Sales[Quantity]),
Sales[Color]="Green")

- Explicit filtering supersedes implicit filtering

Row Labels ▼	TotalQuantity	GreenQuantity
Green	9	9
Red	8	9
Grand Total	17	9

Filtering Context

A combination of all the user filters

Basic filters are associated with specific, individual columns

CALCULATE allows you to overwrite the filter context

Removing Filtering

The ALL() function removes filters

Can be used on a whole table, or specific columns

AllColors:=CALCULATE(SUM(Sales[Quantity]), ALL(Sales[Color]))

Row Labels ▼	TotalQuantity	AllColors	Row Labels ▼	TotalQuantity	AllColors
Green	9	17	Fruit	5	5
Red	8	17	Unknown	5	5
Grand Total	17	17	Vegetable	7	7
			Grand Total	17	17

Applying complex filtering

This causes an error:

- `CALCULATE(SUM(Sales[Quantity]), Sales[Price] - Sales[Cost] <= 1)`

Semantic Error: The expression contains multiple columns, but only a single column can be used in a True/False expression that is used as a table filter expression.

Need to use something called an “iterator”

`FILTER()` takes in a table and an expression

- Returns a filtered table

Example FILTER()

LowMargin:=CALCULATE(SUM(Sales[Quantity]),FILTER(Sales, Sales[Price] - Sales[Cost] <= 1))

LowMargin				
Category	Product	Color	GrossMargin	Total
Unknown	Tomato	Red	1	5
Vegetable	Cucumber	Green	0.5	7
Grand Total				12

Locations for a DAX Expression

- In a calculated column

1 Order Product Wt = 'Orders'[Sales in Units] * 'Orders'[Product Wt]

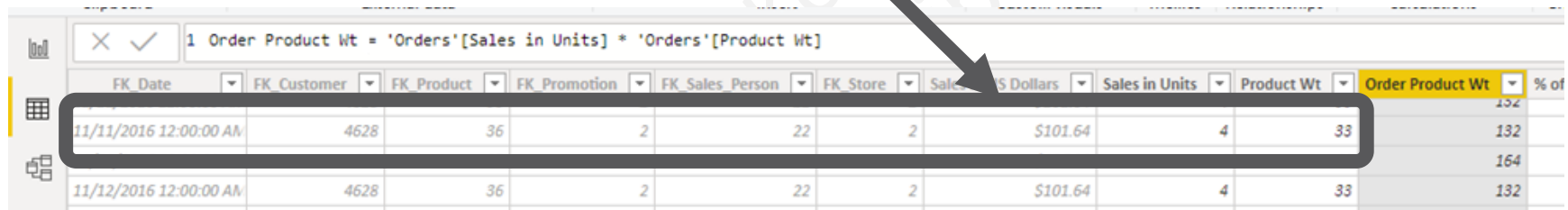
FK_Date	FK_Customer	FK_Product	FK_Promotion	FK_Sales_Person	FK_Store	Sales in US Dollars	Sales in Units	Product Wt	Order Product Wt	% of
11/11/2016 12:00:00 AM	4628	36	2	22	2	\$101.64	4	33	132	
11/11/2016 12:00:00 AM	4628	36	2	22	2	\$101.64	4	33	132	
11/11/2016 12:00:00 AM	4628	37	2	22	2	\$126.28	4	41	164	
11/12/2016 12:00:00 AM	4628	36	2	22	2	\$101.64	4	33	132	

1 Total Order Product Wt = SUM([Order Product Wt])

Total Order Product Wt
440,016,764

Default Context in a Calculated Column

Default Context is the row



1 Order Product Wt = 'Orders'[Sales in Units] * 'Orders'[Product Wt]

FK Date	FK Customer	FK Product	FK Promotion	FK Sales Person	FK Store	Sales US Dollars	Sales in Units	Product Wt	Order Product Wt	% of
11/11/2016 12:00:00 AM	4628	36	2	22	2	\$101.64	4	33	132	
11/12/2016 12:00:00 AM	4628	36	2	22	2	\$101.64	4	33	132	

Aggregate in a Calculate Column

Context is the entire table

1 % of Avg Order Wt = 'Orders'[Order Product Wt] / AVERAGE('Orders'[Order Product Wt])

FK_Date	FK_Customer	FK_Product	FK_Promotion	FK_Sales_Person	FK_Store	Sales in US Dollars	Sales in Other Currencies	Product Wt	Order Product Wt	% of Avg Order Wt
5/6/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
5/6/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
5/7/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
5/7/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
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5/7/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
5/8/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
5/8/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
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5/8/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
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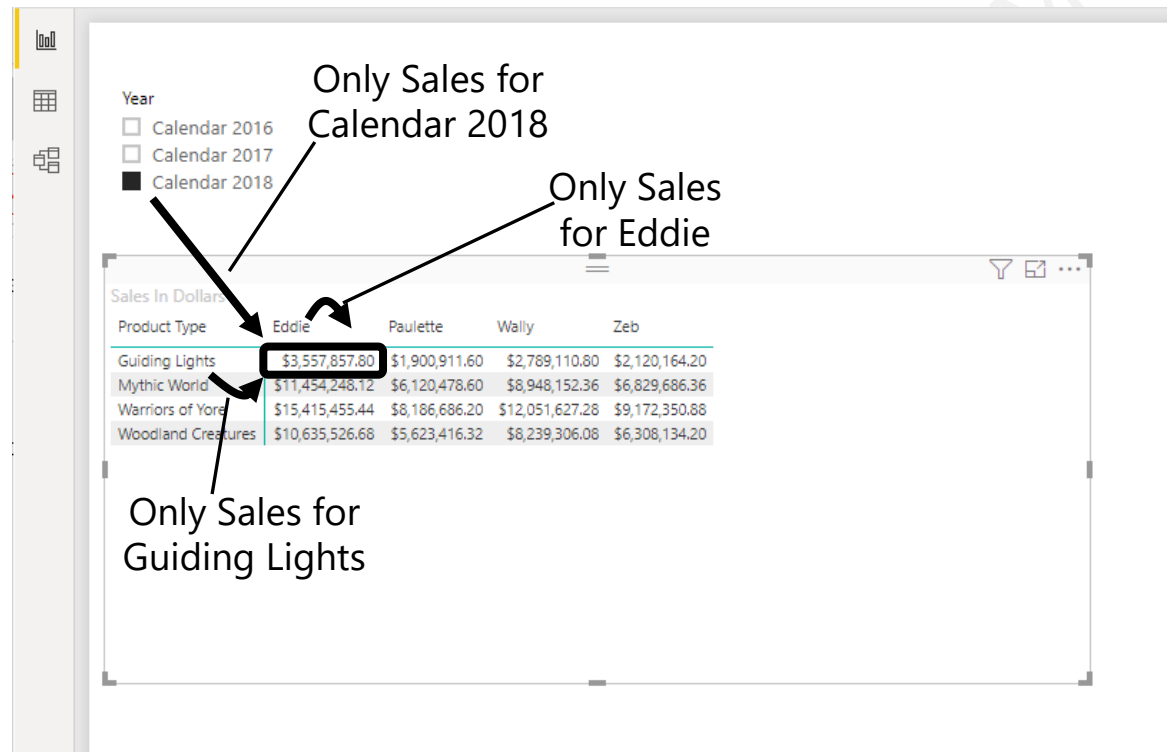
Default Context in a Measure

FK_Date	FK_Customer	FK_Product	FK_Promotion	FK_Sales_Person	FK_Store	Sales in US Dollars	Sales in Units	Product Wt	Order Product Wt	% of Avg Order Wt
5/6/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
5/6/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
5/7/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
5/7/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/7/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
5/7/2018 12:00:00 AM	4516	59	1	20	2	\$132.44	4	43	172	90.50%
5/8/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
5/8/2018 12:00:00 AM	4516	55	1	20	2	\$126.28	4	41	164	86.29%
5/8/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%
5/8/2018 12:00:00 AM	4516	57	1	20	2	\$190.96	4	62	248	130.49%

1	Total Order Product Wt =	SUM([Order Product Wt])
---	--------------------------	-------------------------

Total Order Product Wt	440,016,764
------------------------	-------------

Measures Respond to Filters and Slicers



New functions of DAX

Function	Description
<u>MATCHBY</u>	Define the columns that are used to to match data and identify the current row, in a window function expression.
<u>RANK</u>	Returns the ranking for the current context within the specified partition, sorted by the specified order.
<u>ROWNUMBER</u>	Returns the unique ranking for the current context within the specified partition, sorted by the specified order.
<u>LINEST</u>	Uses the Least Squares method to calculate a straight line that best fits the given data.
<u>LINESTX</u>	Uses the Least Squares method to calculate a straight line that best fits the given data. The data result from expressions evaluated for each row in a table.
<u>INDEX</u>	Returns a row at an absolute position, specified by the position parameter, within the specified partition, sorted by the specified order or on the specified axis.
<u>OFFSET</u>	Returns a single row that is positioned either before or after the <i>current row</i> within the same table, by a given offset.
<u>ORDERBY</u>	Defines the columns that determine the sort order within each of a window function's partitions.
<u>PARTITIONBY</u>	Defines the columns that are used to partition a window function's <relation> parameter.
<u>WINDOW</u>	Returns multiple rows which are positioned within the given interval.
<u>EVALUATEANDLOG</u>	Returns the value of the first argument and logs it in a DAX Evaluation Log profiler event.
<u>TOCSV</u>	Returns a table as a string in CSV format. This function applies to Power BI Desktop only.
<u>TOJSON</u>	Returns a table as a string in JSON format. This function applies to Power BI Desktop only.
<u>NETWORKDAYS</u>	Returns the number of whole workdays between two dates.

Aggregation functions



Function	Description
<u>APPROXIMATEDISTINCTCOUNT</u>	Returns an <i>estimated</i> count of unique values in a column.
<u>AVERAGE</u>	Returns the average (arithmetic mean) of all the numbers in a column.
<u>AVERAGEA</u>	Returns the average (arithmetic mean) of the values in a column.
<u>AVERAGEX</u>	Calculates the average (arithmetic mean) of a set of expressions evaluated over a table.
<u>COUNT</u>	Counts the number of rows in the specified column that contain non-blank values.
<u>COUNTA</u>	Counts the number of rows in the specified column that contain non-blank values.
<u>COUNTAX</u>	Counts non-blank results when evaluating the result of an expression over a table.
<u>COUNTBLANK</u>	Counts the number of blank cells in a column.
<u>COUNTROWS</u>	Counts the number of rows in the specified table, or in a table defined by an expression.
<u>COUNTX</u>	Counts the number of rows that contain a number or an expression that evaluates to a number, when evaluating an expression over a table.
<u>DISTINCTCOUNT</u>	Counts the number of distinct values in a column.
<u>DISTINCTCOUNTNOBLANK</u>	Counts the number of distinct values in a column.
<u>MAX</u>	Returns the largest numeric value in a column, or between two scalar expressions.
<u>MAXA</u>	Returns the largest value in a column.

Date and time functions

Function	Description
<u>CALENDAR</u>	Returns a table with a single column named "Date" that contains a contiguous set of dates.
<u>CALENDARAUTO</u>	Returns a table with a single column named "Date" that contains a contiguous set of dates.
<u>DATE</u>	Returns the specified date in datetime format.
<u>DATEDIFF</u>	Returns the number of interval boundaries between two dates.
<u>DATEVALUE</u>	Converts a date in the form of text to a date in datetime format.
<u>DAY</u>	Returns the day of the month, a number from 1 to 31.
<u>EDATE</u>	Returns the date that is the indicated number of months before or after the start date.
<u>EOMONTH</u>	Returns the date in datetime format of the last day of the month, before or after a specified number of months.
<u>HOUR</u>	Returns the hour as a number from 0 (12:00 A.M.) to 23 (11:00 P.M.).
<u>MINUTE</u>	Returns the minute as a number from 0 to 59, given a date and time value.
<u>MONTH</u>	Returns the month as a number from 1 (January) to 12 (December).
<u>NETWORKDAYS</u>	Returns the number of whole workdays between two dates.
<u>NOW</u>	Returns the current date and time in datetime format.
<u>QUARTER</u>	Returns the quarter as a number from 1 to 4.
<u>SECOND</u>	Returns the seconds of a time value, as a number from 0 to 59.
<u>TIME</u>	Converts hours, minutes, and seconds given as numbers to a time in datetime format.

Date and time functions

Function	Description
<u>TIMEVALUE</u>	Converts a time in text format to a time in datetime format.
<u>TODAY</u>	Returns the current date.
<u>UTCNOW</u>	Returns the current UTC date and time
<u>UTCTODAY</u>	Returns the current UTC date.
<u>WEEKDAY</u>	Returns a number from 1 to 7 identifying the day of the week of a date.
<u>WEEKNUM</u>	Returns the week number for the given date and year according to the return_type value.
<u>YEAR</u>	Returns the year of a date as a four digit integer in the range 1900-9999.
<u>YEARFRAC</u>	Calculates the fraction of the year represented by the number of whole days between two dates.

Filter functions

Function	Description
<u>ALL</u>	Returns all the rows in a table, or all the values in a column, ignoring any filters that might have been applied.
<u>ALLCROSSFILTERED</u>	Clear all filters which are applied to a table.
<u>ALLEXCEPT</u>	Removes all context filters in the table except filters that have been applied to the specified columns.
<u>ALLNOBLANKROW</u>	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.
<u>ALLSELECTED</u>	Removes context filters from columns and rows in the current query, while retaining all other context filters or explicit filters.
<u>CALCULATE</u>	Evaluates an expression in a modified filter context.
<u>CALCULATETABLE</u>	Evaluates a table expression in a modified filter context.
<u>EARLIER</u>	Returns the current value of the specified column in an outer evaluation pass of the mentioned column.
<u>EARLIEST</u>	Returns the current value of the specified column in an outer evaluation pass of the specified column.
<u>FILTER</u>	Returns a table that represents a subset of another table or expression.

Filter functions

Function	Description
<u>INDEX</u>	Returns a row at an absolute position, specified by the position parameter, within the specified partition, sorted by the specified order or on the specified axis.
<u>KEEPFILTERS</u>	Modifies how filters are applied while evaluating a CALCULATE or CALCULATETABLE function.
<u>LOOKUPVALUE</u>	Returns the value for the row that meets all criteria specified by search conditions. The function can apply one or more search conditions.
<u>MATCHBY</u>	In window functions, defines the columns that are used to determine how to match data and identify the <i>current row</i> .
<u>OFFSET</u>	Returns a single row that is positioned either before or after the <i>current row</i> within the same table, by a given offset.
<u>ORDERBY</u>	Defines the columns that determine the sort order within each of a WINDOW function's partitions.
<u>PARTITIONBY</u>	Defines the columns that are used to partition a WINDOW function's <relation> parameter.
<u>RANK</u>	Returns the ranking of a row within the given interval.
<u>REMOVEFILTERS</u>	Clears filters from the specified tables or columns.
<u>ROWNUMBER</u>	Returns the unique ranking of a row within the given interval.
<u>SELECTEDVALUE</u>	Returns the value when the context for columnName has been filtered down to one distinct value only. Otherwise returns alternateResult.
<u>WINDOW</u>	Returns multiple rows which are positioned within the given interval.

Financial functions



Function	Description
<u>ACCRINT</u>	Returns the accrued interest for a security that pays periodic interest.
<u>ACCRINTM</u>	Returns the accrued interest for a security that pays interest at maturity.
<u>AMORDEGRC</u>	Returns the depreciation for each accounting period. Similar to AMORLINC, except a depreciation coefficient is applied depending on the life of the assets.
<u>AMORLINC</u>	Returns the depreciation for each accounting period.
<u>COUPDAYBS</u>	Returns the number of days from the beginning of a coupon period until its settlement date.
<u>COUPDAYS</u>	Returns the number of days in the coupon period that contains the settlement date.
<u>COUPDAYSNC</u>	Returns the number of days from the settlement date to the next coupon date.
<u>COUPNCD</u>	Returns the next coupon date after the settlement date.
<u>COUPNUM</u>	Returns the number of coupons payable between the settlement date and maturity date, rounded up to the nearest whole coupon.
<u>COUPPCD</u>	Returns the previous coupon date before the settlement date.
<u>CUMIPMT</u>	Returns the cumulative interest paid on a loan between start_period and end_period.
<u>CUMPRINC</u>	Returns the cumulative principal paid on a loan between start_period and end_period.
<u>DB</u>	Returns the depreciation of an asset for a specified period using the fixed-declining balance method.
<u>DDB</u>	Returns the depreciation of an asset for a specified period using the double-declining balance method or some other method you specify.
<u>DISC</u>	Returns the discount rate for a security.

Financial functions



Function	Description
<u>DOLLARDE</u>	Converts a dollar price expressed as an integer part and a fraction part, such as 1.02, into a dollar price expressed as a decimal number.
<u>DOLLARFR</u>	Converts a dollar price expressed as an integer part and a fraction part, such as 1.02, into a dollar price expressed as a decimal number.
<u>DURATION</u>	Returns the Macauley duration for an assumed par value of \$100.
<u>EFFECT</u>	Returns the effective annual interest rate, given the nominal annual interest rate and the number of compounding periods per year.
<u>FV</u>	Calculates the future value of an investment based on a constant interest rate.
<u>INTRATE</u>	Returns the interest rate for a fully invested security.
<u>IPMT</u>	Returns the interest payment for a given period for an investment based on periodic, constant payments and a constant interest rate.
<u>ISPMT</u>	Calculates the interest paid (or received) for the specified period of a loan (or investment) with even principal payments.
<u>MDURATION</u>	Returns the modified Macauley duration for a security with an assumed par value of \$100.
<u>NOMINAL</u>	Returns the nominal annual interest rate, given the effective rate and the number of compounding periods per year.
<u>NPER</u>	Returns the number of periods for an investment based on periodic, constant payments and a constant interest rate.
<u>ODDFPRICE</u>	Returns the price per \$100 face value of a security having an odd (short or long) first period.
<u>ODDFYIELD</u>	Returns the yield of a security that has an odd (short or long) first period.

Financial functions

Function	Description
<u>ODDLPRICE</u>	Returns the price per \$100 face value of a security having an odd (short or long) last coupon period.
<u>ODDLYIELD</u>	Returns the yield of a security that has an odd (short or long) last period.
<u>PDURATION</u>	Returns the number of periods required by an investment to reach a specified value.
<u>PMT</u>	Calculates the payment for a loan based on constant payments and a constant interest rate.
<u>PPMT</u>	Returns the payment on the principal for a given period for an investment based on periodic, constant payments and a constant interest rate.
<u>PRICE</u>	Returns the price per \$100 face value of a security that pays periodic interest.
<u>PRICEDISC</u>	Returns the price per \$100 face value of a discounted security.
<u>PRICEMAT</u>	Returns the price per \$100 face value of a security that pays interest at maturity.
<u>PV</u>	Calculates the present value of a loan or an investment, based on a constant interest rate.
<u>RATE</u>	Returns the interest rate per period of an annuity.
<u>RECEIVED</u>	Returns the amount received at maturity for a fully invested security.
<u>RRI</u>	Returns an equivalent interest rate for the growth of an investment.
<u>SLN</u>	Returns the straight-line depreciation of an asset for one period.
<u>SYD</u>	Returns the sum-of-years' digits depreciation of an asset for a specified period.
<u>TBILLEQ</u>	Returns the bond-equivalent yield for a Treasury bill.

Financial functions

Function	Description
<u>TBILLPRICE</u>	Returns the price per \$100 face value for a Treasury bill.
<u>TBILLYIELD</u>	Returns the yield for a Treasury bill.
<u>VDB</u>	Returns the depreciation of an asset for any period you specify, including partial periods, using the double-declining balance method or some other method you specify.
<u>XIRR</u>	Returns the internal rate of return for a schedule of cash flows that is not necessarily periodic.
<u>XNPV</u>	Returns the present value for a schedule of cash flows that is not necessarily periodic.
<u>YIELD</u>	Returns the yield on a security that pays periodic interest.
<u>YIELDDISC</u>	Returns the annual yield for a discounted security.
<u>YIELDMAT</u>	Returns the annual yield of a security that pays interest at maturity.

Information functions

Function	Description
<u>COLUMNSTATISTICS</u>	Returns a table of statistics regarding every column in every table in the model.
<u>CONTAINS</u>	Returns true if values for all referred columns exist, or are contained, in those columns; otherwise, the function returns false.
<u>CONTAINSROW</u>	Returns TRUE if a row of values exists or contained in a table, otherwise returns FALSE.
<u>CONTAINSSTRING</u>	Returns TRUE or FALSE indicating whether one string contains another string.
<u>CONTAINSSTRINGEXACT</u>	Returns TRUE or FALSE indicating whether one string contains another string.
<u>CUSTOMDATA</u>	Returns the content of the CustomData property in the connection string.
<u>HASONEFILTER</u>	Returns TRUE when the number of directly filtered values on <i>columnName</i> is one; otherwise returns FALSE.
<u>HASONEVALUE</u>	Returns TRUE when the context for <i>columnName</i> has been filtered down to one distinct value only. Otherwise is FALSE.
<u>ISAFTER</u>	A boolean function that emulates the behavior of a Start At clause and returns true for a row that meets all of the condition parameters.
<u>ISBLANK</u>	Checks whether a value is blank, and returns TRUE or FALSE.
<u>ISCROSSFILTERED</u>	Returns TRUE when <i>columnName</i> or another column in the same or related table is being filtered.
<u>ISEMPTY</u>	Checks if a table is empty.

Information functions

Function	Description
<u>ISEVEN</u>	Returns TRUE if number is even, or FALSE if number is odd.
<u>ISFILTERED</u>	Returns TRUE when <i>columnName</i> is being filtered directly.
<u>ISINSCOPE</u>	Returns true when the specified column is the level in a hierarchy of levels.
<u>ISLOGICAL</u>	Checks whether a value is a logical value, (TRUE or FALSE), and returns TRUE or FALSE.
<u>ISNONTTEXT</u>	Checks if a value is not text (blank cells are not text), and returns TRUE or FALSE.
<u>ISNUMBER</u>	Checks whether a value is a number, and returns TRUE or FALSE.
<u>ISODD</u>	Returns TRUE if number is odd, or FALSE if number is even.
<u>ISONORAFTER</u>	A boolean function that emulates the behavior of a Start At clause and returns true for a row that meets all of the condition parameters.
<u>ISSELECTEDMEASURE</u>	Used by expressions for calculation items to determine the measure that is in context is one of those specified in a list of measures.
<u>ISSUBTOTAL</u>	Creates another column in a SUMMARIZE expression that returns True if the row contains subtotal values for the column given as argument, otherwise returns False.
<u>ISTEXT</u>	Checks if a value is text, and returns TRUE or FALSE.
<u>NONVISUAL</u>	Marks a value filter in a SUMMARIZECOLUMNS expression as non-visual.

Information functions

Function	Description
<u>SELECTEDMEASURE</u>	Used by expressions for calculation items to reference the measure that is in context.
<u>SELECTEDMEASUREFORMATSTRING</u>	Used by expressions for calculation items to retrieve the format string of the measure that is in context.
<u>SELECTEDMEASURENAME</u>	Used by expressions for calculation items to determine the measure that is in context by name.
<u>USERCULTURE</u>	Returns the locale for the current user.
<u>USERNAME</u>	Returns the domain name and username from the credentials given to the system at connection time.
<u>USEROBJECTID</u>	Returns the current user's Object ID or SID.
<u>USERPRINCIPALNAME</u>	Returns the user principal name.

Logical functions



Function	Description
<u>AND</u>	Checks whether both arguments are TRUE, and returns TRUE if both arguments are TRUE.
<u>BITAND</u>	Returns a bitwise 'AND' of two numbers.
<u>BITLSHIFT</u>	Returns a number shifted left by the specified number of bits.
<u>BITOR</u>	Returns a bitwise 'OR' of two numbers.
<u>BITRSHIFT</u>	Returns a number shifted right by the specified number of bits.
<u>BITXOR</u>	Returns a bitwise 'XOR' of two numbers.
<u>COALESCE</u>	Returns the first expression that does not evaluate to BLANK.
<u>FALSE</u>	Returns the logical value FALSE.
<u>IF</u>	Checks a condition, and returns one value when TRUE, otherwise it returns a second value.
<u>IF.EAGER</u>	Checks a condition, and returns one value when TRUE, otherwise it returns a second value. Uses an <i>eager</i> execution plan which always executes the branch expressions regardless of the condition expression.
<u>IFERROR</u>	Evaluates an expression and returns a specified value if the expression returns an error
<u>NOT</u>	Changes FALSE to TRUE, or TRUE to FALSE.
<u>OR</u>	Checks whether one of the arguments is TRUE to return TRUE.
<u>SWITCH</u>	Evaluates an expression against a list of values and returns one of multiple possible result expressions.
<u>TRUE</u>	Returns the logical value TRUE.

Math and Trig functions



Function	Description
<u>ABS</u>	Returns the absolute value of a number.
<u>ACOS</u>	Returns the arccosine, or inverse cosine, of a number.
<u>ACOSH</u>	Returns the inverse hyperbolic cosine of a number.
<u>ACOT</u>	Returns the arccotangent, or inverse cotangent, of a number.
<u>ACOTH</u>	Returns the inverse hyperbolic cotangent of a number.
<u>ASIN</u>	Returns the arcsine, or inverse sine, of a number.
<u>ASINH</u>	Returns the inverse hyperbolic sine of a number.
<u>ATAN</u>	Returns the arctangent, or inverse tangent, of a number.
<u>ATANH</u>	Returns the inverse hyperbolic tangent of a number.
<u>CEILING</u>	Rounds a number up, to the nearest integer or to the nearest multiple of significance.
<u>CONVERT</u>	Converts an expression of one data type to another.
<u>COS</u>	Returns the cosine of the given angle.
<u>COSH</u>	Returns the hyperbolic cosine of a number.
<u>COT</u>	Returns the cotangent of an angle specified in radians.
<u>COTH</u>	Returns the hyperbolic cotangent of a hyperbolic angle.
<u>CURRENCY</u>	Evaluates the argument and returns the result as currency data type.

Math and Trig functions



Function	Description
<u>DEGREES</u>	Converts radians into degrees.
<u>DIVIDE</u>	Performs division and returns alternate result or BLANK() on division by 0.
<u>EVEN</u>	Returns number rounded up to the nearest even integer.
<u>EXP</u>	Returns e raised to the power of a given number.
<u>FACT</u>	Returns the factorial of a number, equal to the series $1*2*3*...*$, ending in the given number.
<u>FLOOR</u>	Rounds a number down, toward zero, to the nearest multiple of significance.
<u>GCD</u>	Returns the greatest common divisor of two or more integers.
<u>INT</u>	Rounds a number down to the nearest integer.
<u>ISO.CEILING</u>	Rounds a number up, to the nearest integer or to the nearest multiple of significance.
<u>LCM</u>	Returns the least common multiple of integers.
<u>LN</u>	Returns the natural logarithm of a number.
<u>LOG</u>	Returns the logarithm of a number to the base you specify.
<u>LOG10</u>	Returns the base-10 logarithm of a number.
<u>MOD</u>	Returns the remainder after a number is divided by a divisor. The result always has the same sign as the divisor.
<u>MROUND</u>	Returns a number rounded to the desired multiple.

Math and Trig functions



Function	Description
<u>ODD</u>	Returns number rounded up to the nearest odd integer.
<u>PI</u>	Returns the value of Pi, 3.14159265358979, accurate to 15 digits.
<u>POWER</u>	Returns the result of a number raised to a power.
<u>QUOTIENT</u>	Performs division and returns only the integer portion of the division result.
<u>RADIANS</u>	Converts degrees to radians.
<u>RAND</u>	Returns a random number greater than or equal to 0 and less than 1, evenly distributed.
<u>RANDBETWEEN</u>	Returns a random number in the range between two numbers you specify.
<u>ROUND</u>	Rounds a number to the specified number of digits.
<u>ROUNDDOWN</u>	Rounds a number down, toward zero.
<u>ROUNDUP</u>	Rounds a number up, away from 0 (zero).
<u>SIGN</u>	Determines the sign of a number, the result of a calculation, or a value in a column.
<u>SIN</u>	Returns the sine of the given angle.
<u>SINH</u>	Returns the hyperbolic sine of a number.
<u>SQRT</u>	Returns the square root of a number.
<u>SQRTPI</u>	Returns the square root of (number * pi).
<u>TAN</u>	Returns the tangent of the given angle.
<u>TANH</u>	Returns the hyperbolic tangent of a number.
<u>TRUNC</u>	Truncates a number to an integer by removing the decimal, or fractional, part of the number.

Other functions

Function	Description
<u>BLANK</u>	Returns a blank.
<u>ERROR</u>	Raises an error with an error message.
<u>EVALUATEANDLOG</u>	Returns the value of the first argument and logs it in a DAX Evaluation Log profiler event.
<u>TOCSV</u>	Returns a table as a string in CSV format.
<u>TOJSON</u>	Returns a table as a string in JSON format.

Parent and Child functions



Function	Description
<u>PATH</u>	Returns a delimited text string with the identifiers of all the parents of the current identifier.
<u>PATHCONTAINS</u>	Returns TRUE if the specified <i>item</i> exists within the specified <i>path</i> .
<u>PATHITEM</u>	Returns the item at the specified <i>position</i> from a string resulting from evaluation of a PATH function.
<u>PATHITEMREVERSE</u>	Returns the item at the specified <i>position</i> from a string resulting from evaluation of a PATH function.
<u>PATHLENGTH</u>	Returns the number of parents to the specified item in a given PATH result, including self.

Relationship functions

Function	Description
<u>CROSSFILTER</u>	Specifies the cross-filtering direction to be used in a calculation for a relationship that exists between two columns.
<u>RELATED</u>	Returns a related value from another table.
<u>RELATEDTABLE</u>	Evaluates a table expression in a context modified by the given filters.
<u>USERELATIONSHIP</u>	Specifies the relationship to be used in a specific calculation as the one that exists between columnName1 and columnName2.

Table manipulation functions

Function	Description
<u>ADDCOLUMNS</u>	Adds calculated columns to the given table or table expression.
<u>ADDMISSINGITEMS</u>	Adds combinations of items from multiple columns to a table if they do not already exist.
<u>CROSSJOIN</u>	Returns a table that contains the Cartesian product of all rows from all tables in the arguments.
<u>CURRENTGROUP</u>	Returns a set of rows from the table argument of a GROUPBY expression.
<u>DATATABLE</u>	Provides a mechanism for declaring an inline set of data values.
<u>DETAILROWS</u>	Evaluates a Detail Rows Expression defined for a measure and returns the data.
<u>DISTINCT column</u>	Returns a one-column table that contains the distinct values from the specified column.
<u>DISTINCT table</u>	Returns a table by removing duplicate rows from another table or expression.
<u>EXCEPT</u>	Returns the rows of one table which do not appear in another table.
<u>FILTERS</u>	Returns a table of values directly applied as filters to <i>columnName</i> .
<u>GENERATE</u>	Returns a table with the Cartesian product between each row in <i>table1</i> and the table that results from evaluating <i>table2</i> in the context of the current row from <i>table1</i> .
<u>GENERATEALL</u>	Returns a table with the Cartesian product between each row in <i>table1</i> and the table that results from evaluating <i>table2</i> in the context of the current row from <i>table1</i> .
<u>GENERATESERIES</u>	Returns a single column table containing the values of an arithmetic series.

Table manipulation functions



Function	Description
<u>GROUPBY</u>	Similar to the SUMMARIZE function, GROUPBY does not do an implicit CALCULATE for any extension columns that it adds.
<u>IGNORE</u>	Modifies SUMMARIZECOLUMNS by omitting specific expressions from the BLANK/NULL evaluation.
<u>INTERSECT</u>	Returns the row intersection of two tables, retaining duplicates.
<u>NATURALINNERJOIN</u>	Performs an inner join of a table with another table.
<u>NATURALLEFTOUTERJOIN</u>	Performs a join of the LeftTable with the RightTable.
<u>ROLLUP</u>	Modifies the behavior of SUMMARIZE by adding rollup rows to the result on columns defined by the groupBy_columnName parameter.
<u>ROLLUPADDISSUBTOTAL</u>	Modifies the behavior of SUMMARIZECOLUMNS by adding rollup/subtotal rows to the result based on the groupBy_columnName columns.
<u>ROLLUPISSUBTOTAL</u>	Pairs rollup groups with the column added by ROLLUPADDISSUBTOTAL within an ADDMISSINGITEMS expression.
<u>ROLLUPGROUP</u>	Modifies the behavior of SUMMARIZE and SUMMARIZECOLUMNS by adding rollup rows to the result on columns defined by the the groupBy_columnName parameter.
<u>ROW</u>	Returns a table with a single row containing values that result from the expressions given to each column.
<u>SELECTCOLUMNS</u>	Adds calculated columns to the given table or table expression.

Table manipulation functions

Function	Description
<u>SUBSTITUTEWITHINDEX</u>	Returns a table which represents a left semijoin of the two tables supplied as arguments.
<u>SUMMARIZE</u>	Returns a summary table for the requested totals over a set of groups.
<u>SUMMARIZECOLUMNS</u>	Returns a summary table over a set of groups.
<u>Table Constructor</u>	Returns a table of one or more columns.
<u>TOPN</u>	Returns the top N rows of the specified table.
<u>TREATAS</u>	Applies the result of a table expression as filters to columns from an unrelated table.
<u>UNION</u>	Creates a union (join) table from a pair of tables.
<u>VALUES</u>	Returns a one-column table that contains the distinct values from the specified table or column.

Statistical functions

Function	Description
<u>BETA.DIST</u>	Returns the beta distribution.
<u>BETA.INV</u>	Returns the inverse of the beta cumulative probability density function (BETA.DIST).
<u>CHISQ.DIST</u>	Returns the chi-squared distribution.
<u>CHISQ.DIST.RT</u>	Returns the right-tailed probability of the chi-squared distribution.
<u>CHISQ.INV</u>	Returns the inverse of the left-tailed probability of the chi-squared distribution.
<u>CHISQ.INV.RT</u>	Returns the inverse of the right-tailed probability of the chi-squared distribution.
<u>COMBIN</u>	Returns the number of combinations for a given number of items.
<u>COMBINA</u>	Returns the number of combinations (with repetitions) for a given number of items.
<u>CONFIDENCE.NORM</u>	The confidence interval is a range of values.
<u>CONFIDENCE.T</u>	Returns the confidence interval for a population mean, using a Student's t distribution.
<u>EXPON.DIST</u>	Returns the exponential distribution.
<u>GEOMEAN</u>	Returns the geometric mean of the numbers in a column.
<u>GEOMEANX</u>	Returns the geometric mean of an expression evaluated for each row in a table.
<u>LINEST</u>	Uses the Least Squares method to calculate a straight line that best fits the given data.
<u>LINESTX</u>	Uses the Least Squares method to calculate a straight line that best fits the given data. The data result from expressions evaluated for each row in a table.
<u>MEDIAN</u>	Returns the median of numbers in a column.

Statistical functions

Function	Description
<u>MEDIANX</u>	Returns the median number of an expression evaluated for each row in a table.
<u>NORM.DIST</u>	Returns the normal distribution for the specified mean and standard deviation.
<u>NORM.INV</u>	The inverse of the normal cumulative distribution for the specified mean and standard deviation.
<u>NORM.S.DIST</u>	Returns the standard normal distribution (has a mean of zero and a standard deviation of one).
<u>NORM.S.INV</u>	Returns the inverse of the standard normal cumulative distribution.
<u>PERCENTILE.EXC</u>	Returns the k-th percentile of values in a range, where k is in the range 0..1, exclusive.
<u>PERCENTILE.INC</u>	Returns the k-th percentile of values in a range, where k is in the range 0..1, inclusive.
<u>PERCENTILEX.EXC</u>	Returns the percentile number of an expression evaluated for each row in a table.
<u>PERCENTILEX.INC</u>	Returns the percentile number of an expression evaluated for each row in a table.
<u>PERMUT</u>	Returns the number of permutations for a given number of objects that can be selected from number objects.
<u>POISSON.DIST</u>	Returns the Poisson distribution.
<u>RANK.EQ</u>	Returns the ranking of a number in a list of numbers.
<u>RANKX</u>	Returns the ranking of a number in a list of numbers for each row in the <i>table</i> argument.
<u>SAMPLE</u>	Returns a sample of N rows from the specified table.
<u>STDEV.P</u>	Returns the standard deviation of the entire population.
<u>STDEV.S</u>	Returns the standard deviation of a sample population.
<u>STDEVX.P</u>	Returns the standard deviation of the entire population.

Statistical functions

Function	Description
<u>STDEVX.S</u>	Returns the standard deviation of a sample population.
<u>T.DIST</u>	Returns the Student's left-tailed t-distribution.
<u>T.DIST.2T</u>	Returns the two-tailed Student's t-distribution.
<u>T.DIST.RT</u>	Returns the right-tailed Student's t-distribution.
<u>T.INV</u>	Returns the left-tailed inverse of the Student's t-distribution.
<u>T.INV.2t</u>	Returns the two-tailed inverse of the Student's t-distribution.
<u>VAR.P</u>	Returns the variance of the entire population.
<u>VAR.S</u>	Returns the variance of a sample population.
<u>VARX.P</u>	Returns the variance of the entire population.
<u>VARX.S</u>	Returns the variance of a sample population.

Text functions

Function	Description
<u>COMBINEVALUES</u>	Joins two or more text strings into one text string.
<u>CONCATENATE</u>	Joins two text strings into one text string.
<u>CONCATENATEX</u>	Concatenates the result of an expression evaluated for each row in a table.
<u>EXACT</u>	Compares two text strings and returns TRUE if they are exactly the same, FALSE otherwise.
<u>FIND</u>	Returns the starting position of one text string within another text string.
<u>FIXED</u>	Rounds a number to the specified number of decimals and returns the result as text.
<u>FORMAT</u>	Converts a value to text according to the specified format.
<u>LEFT</u>	Returns the specified number of characters from the start of a text string.
<u>LEN</u>	Returns the number of characters in a text string.
<u>LOWER</u>	Converts all letters in a text string to lowercase.
<u>MID</u>	Returns a string of characters from the middle of a text string, given a starting position and length.
<u>REPLACE</u>	REPLACE replaces part of a text string, based on the number of characters you specify, with a different text string.
<u>REPT</u>	Repeats text a given number of times.
<u>RIGHT</u>	RIGHT returns the last character or characters in a text string, based on the number of characters you specify.

Text functions

Function	Description
<u>SEARCH</u>	Returns the number of the character at which a specific character or text string is first found, reading left to right.
<u>SUBSTITUTE</u>	Replaces existing text with new text in a text string.
<u>TRIM</u>	Removes all spaces from text except for single spaces between words.
<u>UNICHAR</u>	Returns the Unicode character referenced by the numeric value.
<u>UNICODE</u>	Returns the numeric code corresponding to the first character of the text string.
<u>UPPER</u>	Converts a text string to all uppercase letters.
<u>VALUE</u>	Converts a text string that represents a number to a number.

Time intelligence functions

Function	Description
<u>CLOSINGBALANCEMONTH</u>	Evaluates the expression at the last date of the month in the current context.
<u>CLOSINGBALANCEQUARTER</u>	Evaluates the expression at the last date of the quarter in the current context.
<u>CLOSINGBALANCEYEAR</u>	Evaluates the expression at the last date of the year in the current context.
<u>DATEADD</u>	Returns a table that contains a column of dates, shifted either forward or backward in time by the specified number of intervals from the dates in the current context.
<u>DATESBETWEEN</u>	Returns a table that contains a column of dates that begins with a specified start date and continues until a specified end date.
<u>DATESINPERIOD</u>	Returns a table that contains a column of dates that begins with a specified start date and continues for the specified number and type of date intervals.
<u>DATESMTD</u>	Returns a table that contains a column of the dates for the month to date, in the current context.
<u>DATESQTD</u>	Returns a table that contains a column of the dates for the quarter to date, in the current context.
<u>DATESYTD</u>	Returns a table that contains a column of the dates for the year to date, in the current context.
<u>ENDOFMONTH</u>	Returns the last date of the month in the current context for the specified column of dates.
<u>ENDOFQUARTER</u>	Returns the last date of the quarter in the current context for the specified column of dates.
<u>ENDOFYEAR</u>	Returns the last date of the year in the current context for the specified column of dates.

Time intelligence functions



Function	Description
<u>FIRSTDATE</u>	Returns the first date in the current context for the specified column of dates.
<u>FIRSTNONBLANK</u>	Returns the first value in the column, column, filtered by the current context, where the expression is not blank
<u>LASTDATE</u>	Returns the last date in the current context for the specified column of dates.
<u>LASTNONBLANK</u>	Returns the last value in the column, column, filtered by the current context, where the expression is not blank.
<u>NEXTDAY</u>	Returns a table that contains a column of all dates from the next day, based on the first date specified in the dates column in the current context.
<u>NEXTMONTH</u>	Returns a table that contains a column of all dates from the next month, based on the first date in the dates column in the current context.
<u>NEXTQUARTER</u>	Returns a table that contains a column of all dates in the next quarter, based on the first date specified in the dates column, in the current context.
<u>NEXTYEAR</u>	Returns a table that contains a column of all dates in the next year, based on the first date in the dates column, in the current context.
<u>OPENINGBALANC EMONTH</u>	Evaluates the expression at the first date of the month in the current context.
<u>OPENINGBALANC EQUARTER</u>	Evaluates the expression at the first date of the quarter, in the current context.
<u>OPENINGBALANC EYEAR</u>	Evaluates the expression at the first date of the year in the current context.

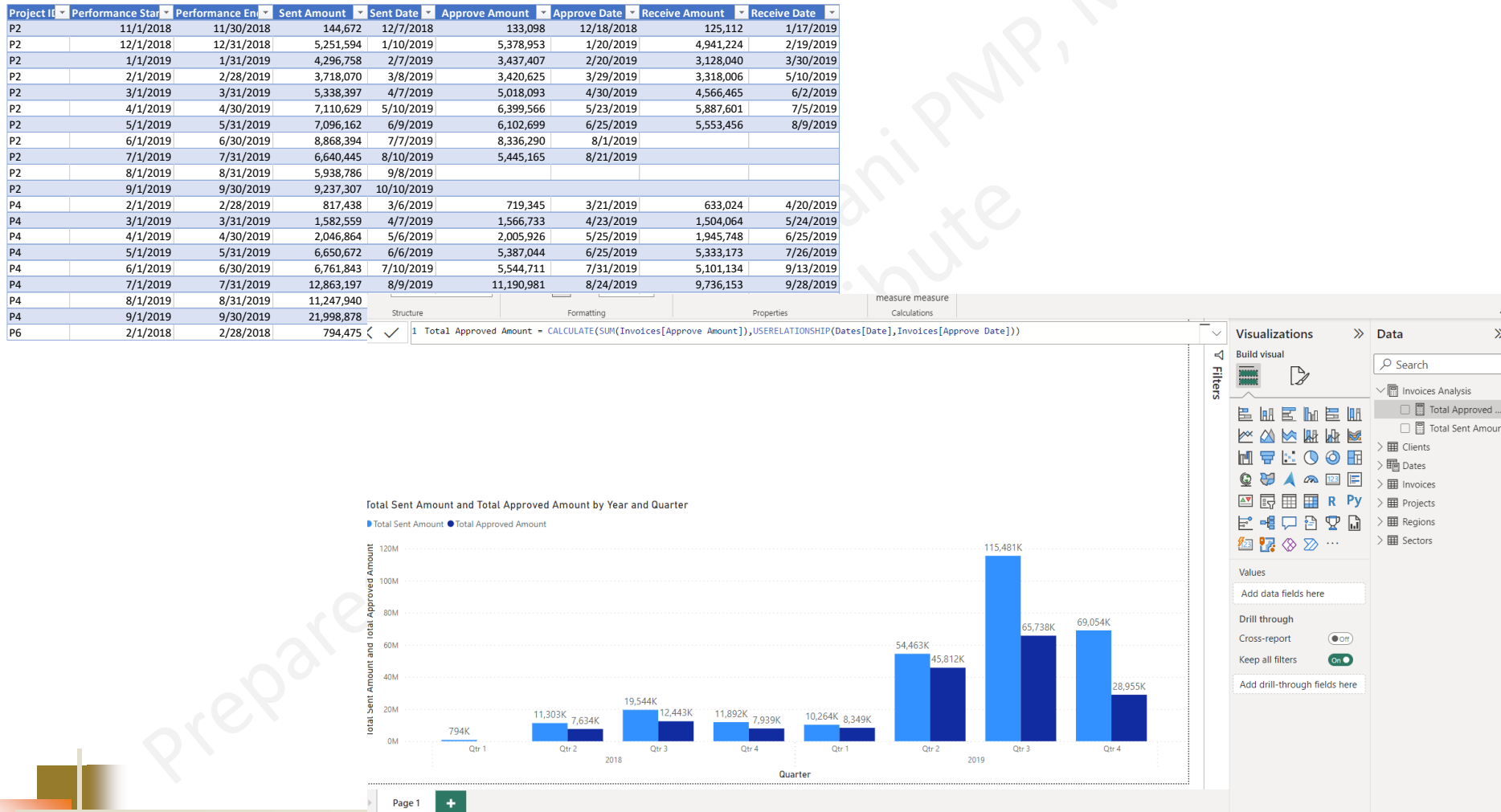
Time intelligence functions

Function	Description
<u>PARALLELPERIOD</u>	Returns a table that contains a column of dates that represents a period parallel to the dates in the specified dates column, in the current context, with the dates shifted a number of intervals either forward in time or back in time.
<u>PREVIOUSDAY</u>	Returns a table that contains a column of all dates representing the day that is previous to the first date in the dates column, in the current context.
<u>PREVIOUSMONTH</u>	Returns a table that contains a column of all dates from the previous month, based on the first date in the dates column, in the current context.
<u>PREVIOUSQUARTER</u>	Returns a table that contains a column of all dates from the previous quarter, based on the first date in the dates column, in the current context.
<u>PREVIOUSYEAR</u>	Returns a table that contains a column of all dates from the previous year, given the last date in the dates column, in the current context.
<u>SAMEPERIODLASTYEAR</u>	Returns a table that contains a column of dates shifted one year back in time from the dates in the specified dates column, in the current context.
<u>STARTOFMONTH</u>	Returns the first date of the month in the current context for the specified column of dates.
<u>STARTOFQUARTER</u>	Returns the first date of the quarter in the current context for the specified column of dates.
<u>STARTOFYEAR</u>	Returns the first date of the year in the current context for the specified column of dates.
<u>TOTALMTD</u>	Evaluates the value of the expression for the month to date, in the current context.
<u>TOTALQTD</u>	Evaluates the value of the expression for the dates in the quarter to date, in the current context.
<u>TOTALYTD</u>	Evaluates the year-to-date value of the expression in the current context.

Project Management Scenarios



S03-E02: Invoice Analysis



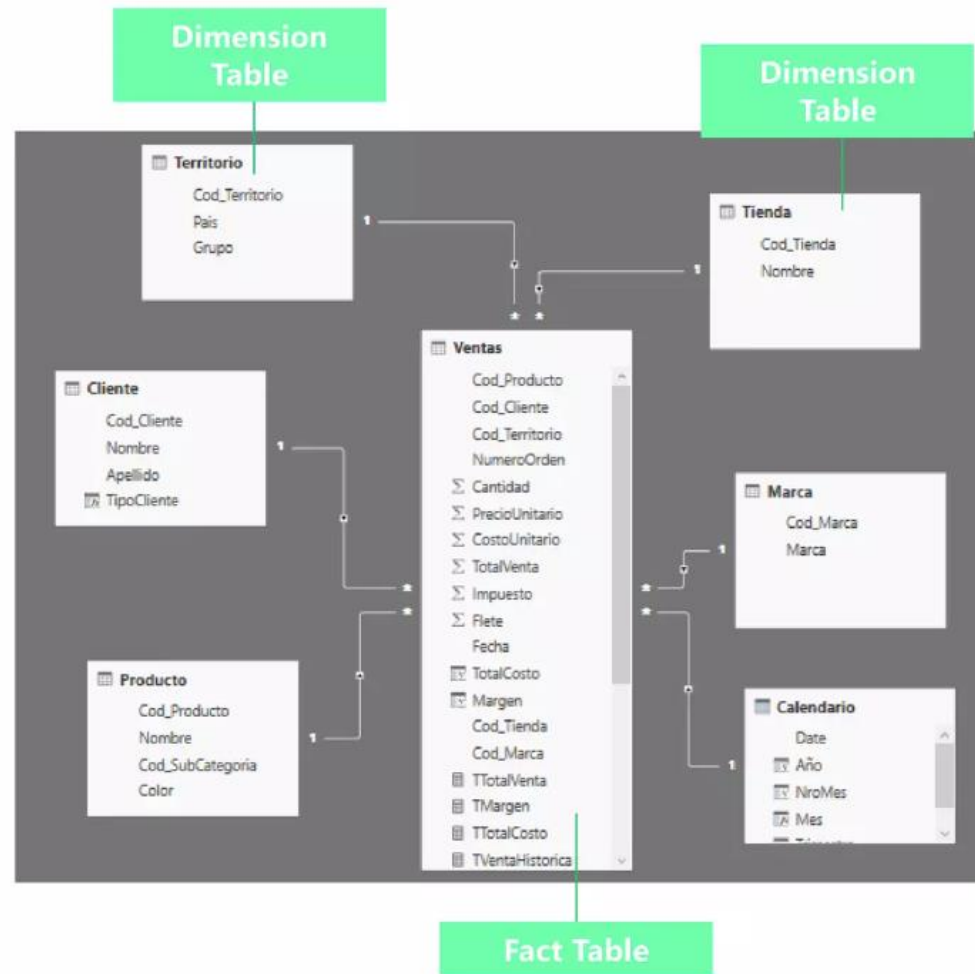
¿Why data modeling is important in Power BI?

The basic idea is always the same: enable the user to navigate data without rewriting a new query every time.

Marco Russo, SQLBI

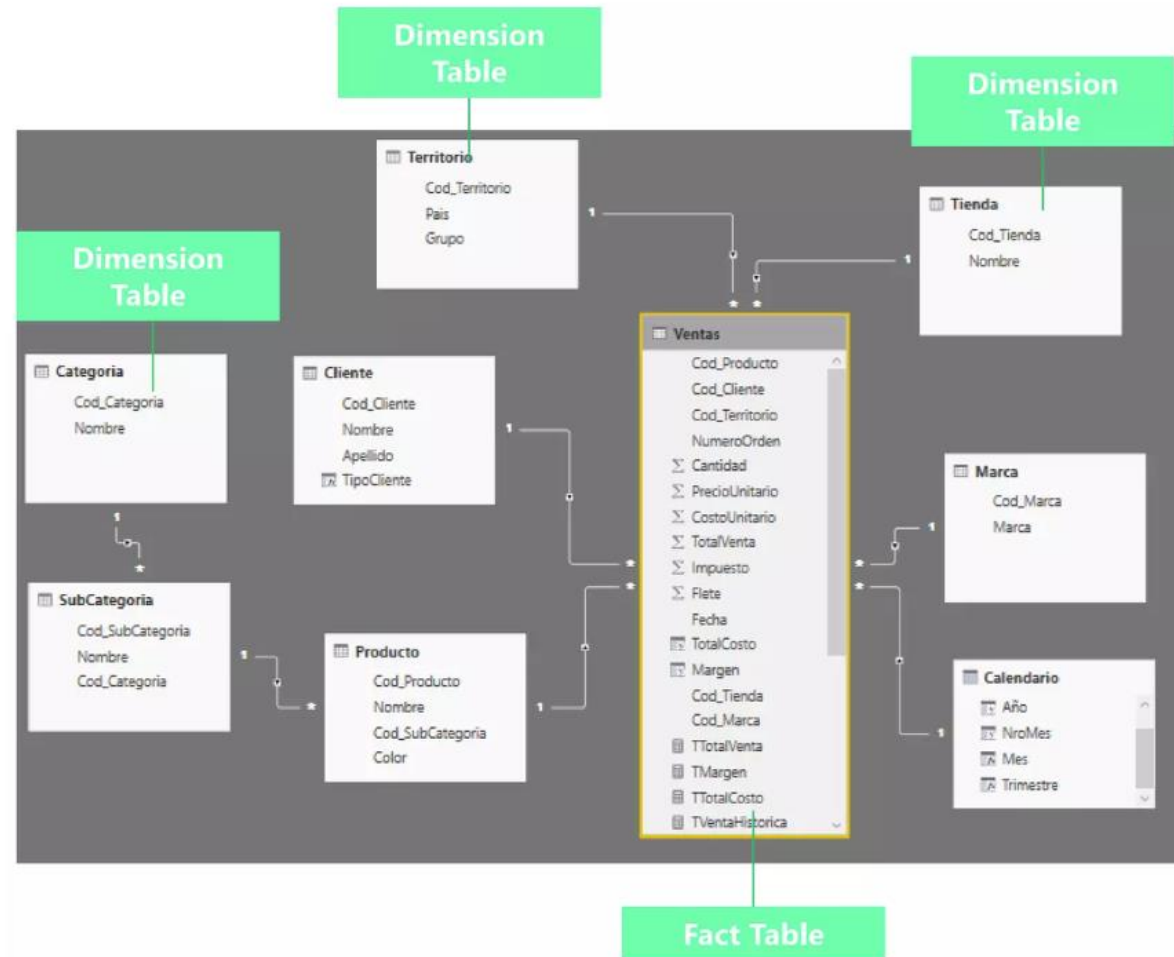
Relationships

Star Schema



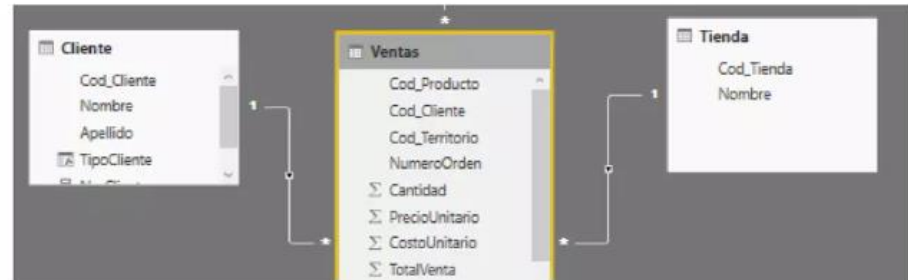
Data Modelling Introduction

Snowflake
Schema

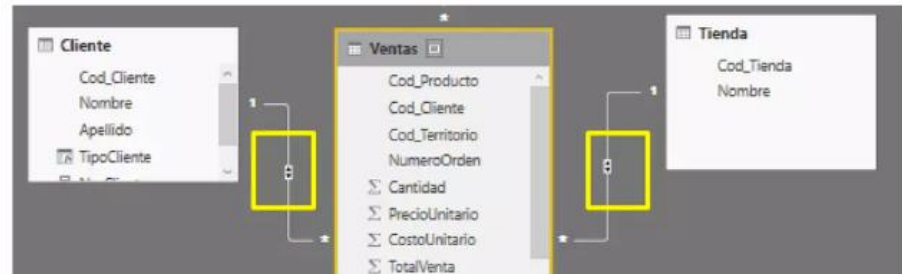


Cross Filtering

Single Cross Filtering



Both Cross Filtering



Data Modelling Introduction

Many to Many

Create relationship

Select tables and columns that are related.

Marca

Cod_Marca	Marca
1	Specialized
2	Trek
13	Scott

Ventas

Flete	FechaOrden	FechaEnvio	FechaVencimiento	Cod_Tienda	Cod_Marca
0.8748	5/01/2013 12:00:00 a. m.	12/01/2013 12:00:00 a. m.	17/01/2013 12:00:00 a. m.	100	1
0.8748	10/01/2013 12:00:00 a. m.	17/01/2013 12:00:00 a. m.	22/01/2013 12:00:00 a. m.	100	1
0.8748	10/01/2013 12:00:00 a. m.	17/01/2013 12:00:00 a. m.	22/01/2013 12:00:00 a. m.	100	1

Cardinality: Many to Many ("*")

Cross filter direction: Both

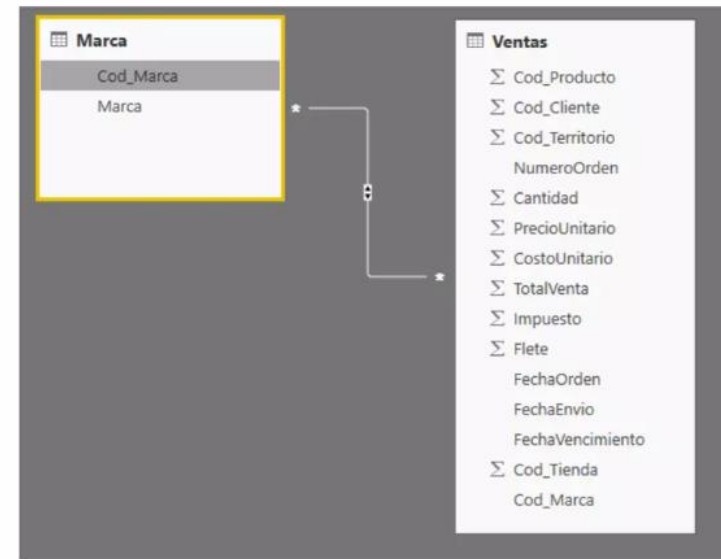
☒ Make this relationship active

☐ Assume referential integrity

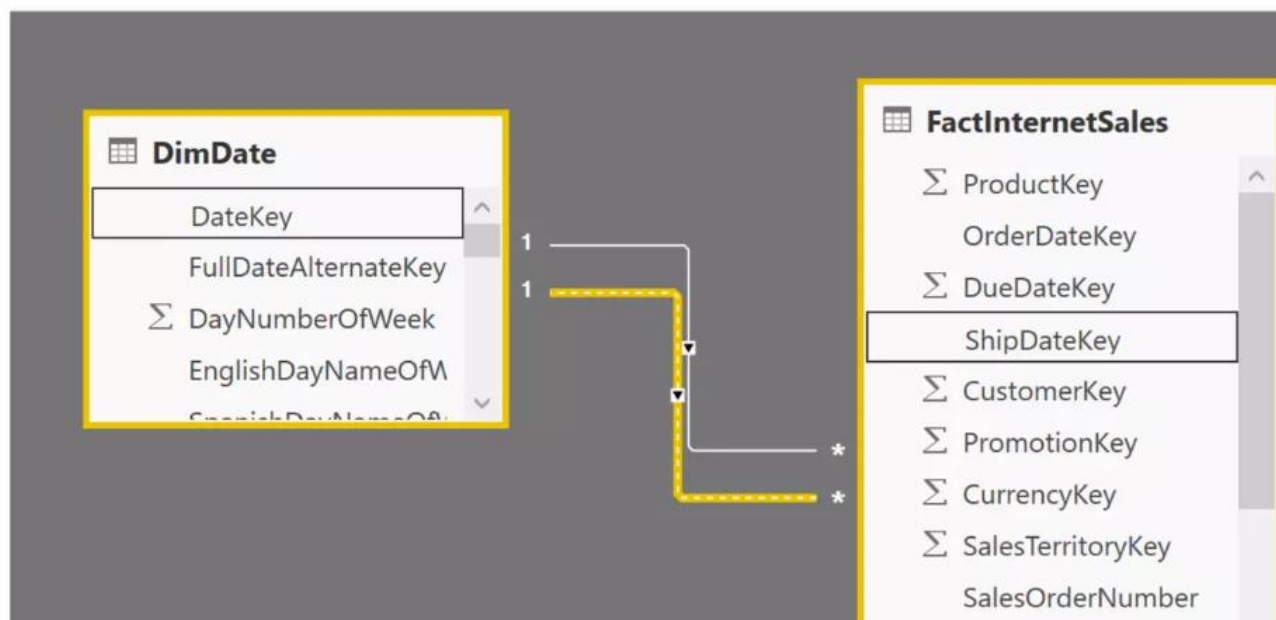
☐ Apply security filter in both directions

This relationship has cardinality Many-Many. This should only be used if it is expected that neither column (Cod_Marca and Cod_Marca) contains unique values, and that the significantly different behavior of Many-many relationships is understood. [Learn more](#)

OK Cancel



Role Playing



Time Table

