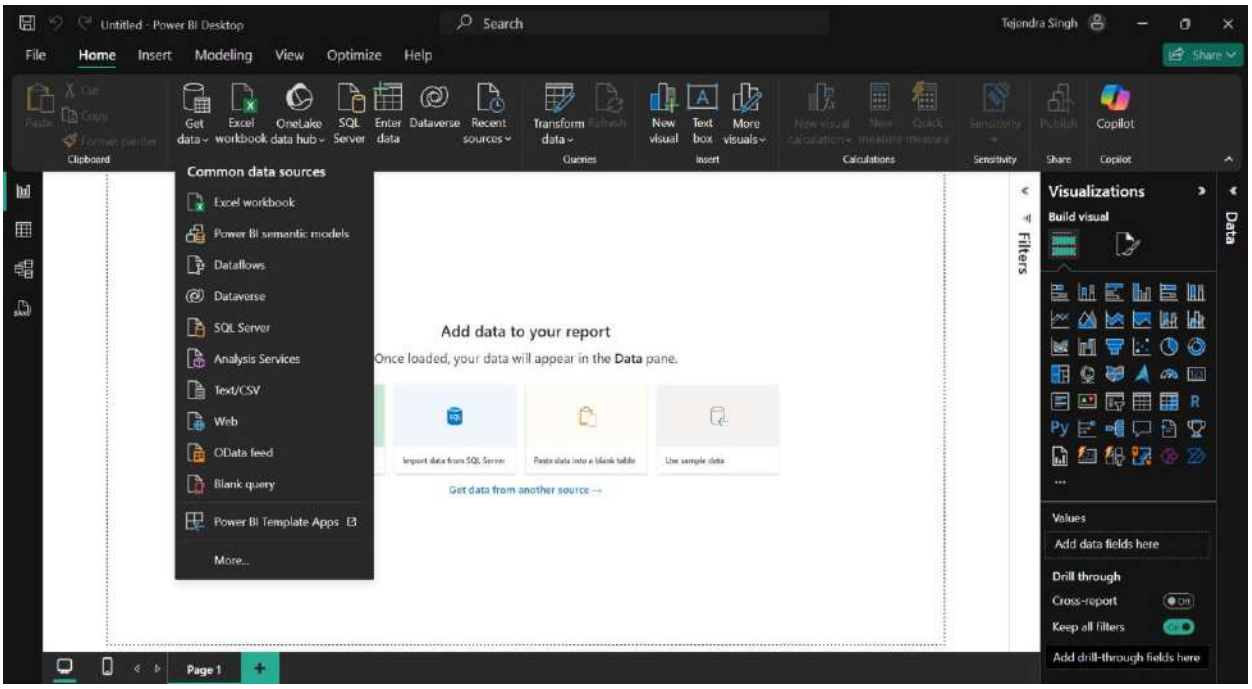
Business Intelligence Tools:- These tools allows us to connect to a data to clean and transform it , to model it and lastly create visualization that ultimately helps to grow business. One of the tool is PowerBI which is very similar to excel and have various libraries that helps us to analyze data. "**extension for powerbi file is .pbyx**"

DataConnectors in Power BI:- Whenever you have to bring data into power bi for analysis and creation of report data connectors are used. For example :- mySql , Azure etc…



Data Transformation (Cleaning):- It is an another word for data mining i.e extracting hidden insights from a data or identifying useful information. In PowerBI we have **power query editor** by using it we can easily transform data and can find hidden insights.

https://www.kaggle.com/datasets/nextmillionaire/pizza-sales-dataset?resource=download (dataset used) " import pizzasales csv in powerbi from get data option and click on transform data.. right click on dataset and select add query option"

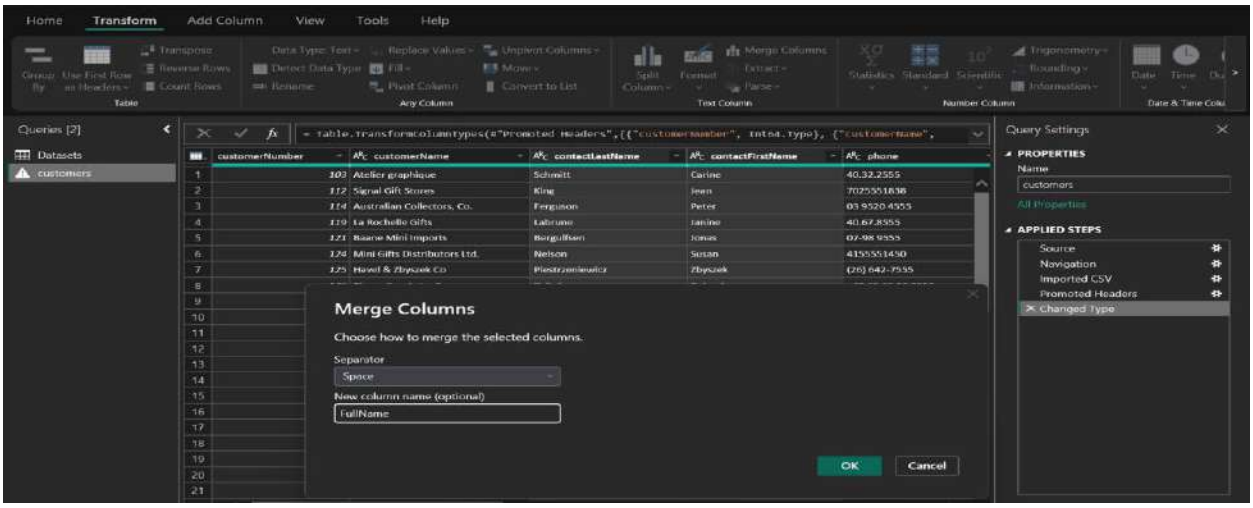
-> You can perform various types of transformations such as:-

- Extracting out year from date section of a column to find out in which year the sale is high .
- Transforming dates into name of months.
- **Transform column** means updating existing column and **add column** means creating new column form existing one.

You can also reverse the property using Applied Steps section:-

Using Text tools inside text column to Transform or clean data

- For example if we have two columns named contactFirstname and contactLastname we can easily combine them into single column using text tool “merge column”.



-Another example is removing white spaces You can go to **Format text** tool and select trim option.

-Another example is splitting a column data on the basic of spaces you can use **split column** option and then select the splitting parameter.

-Another example is extracting charaters that are before @ symbol in an email and adding them into a new column named password. You can select the column and select **add column** and than select **Extract option** and then select the criteria.

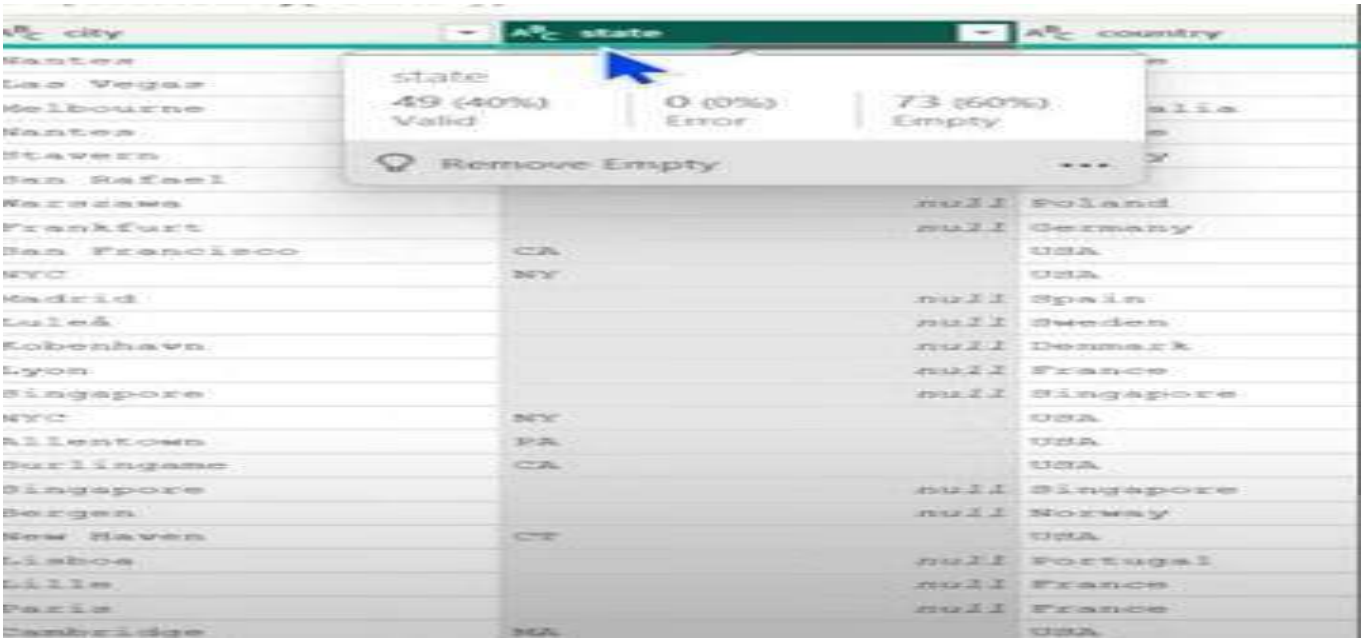
-Another example is setting first row as header.

Dealing with unwanted and Null values:-

->Searching for unwanted columns that have no use. Select the column for example phone,address,postalcode column from customer table **right click and select remove option**.

->Removing **duplicate** data you can check for duplicate value by arranging column data in ascending order. Eg.. deleting duplicate customerid.

->Removing **Null values** or **Filling Null values**. Remember “null” is considered to be a null value you can transform “NULL” to ”null” by Going to **transform column** and select **Replace Values option.** You can also view percentage of data that is filled and empty.



->Replacing null values using **fill option** selecting **fill down** means null value will be replaced by the next column value.

->You can also **change the type of data** in a column by clicking on small arrow on the column and then selecting the type of data.

->Remember **sometimes null values are important** for example a sales representative can report to someone but president doesn’t reports to anyone another example is suppose if the order is not shipped then it will show null in the ship date column so we can create new column representing data not shipped.

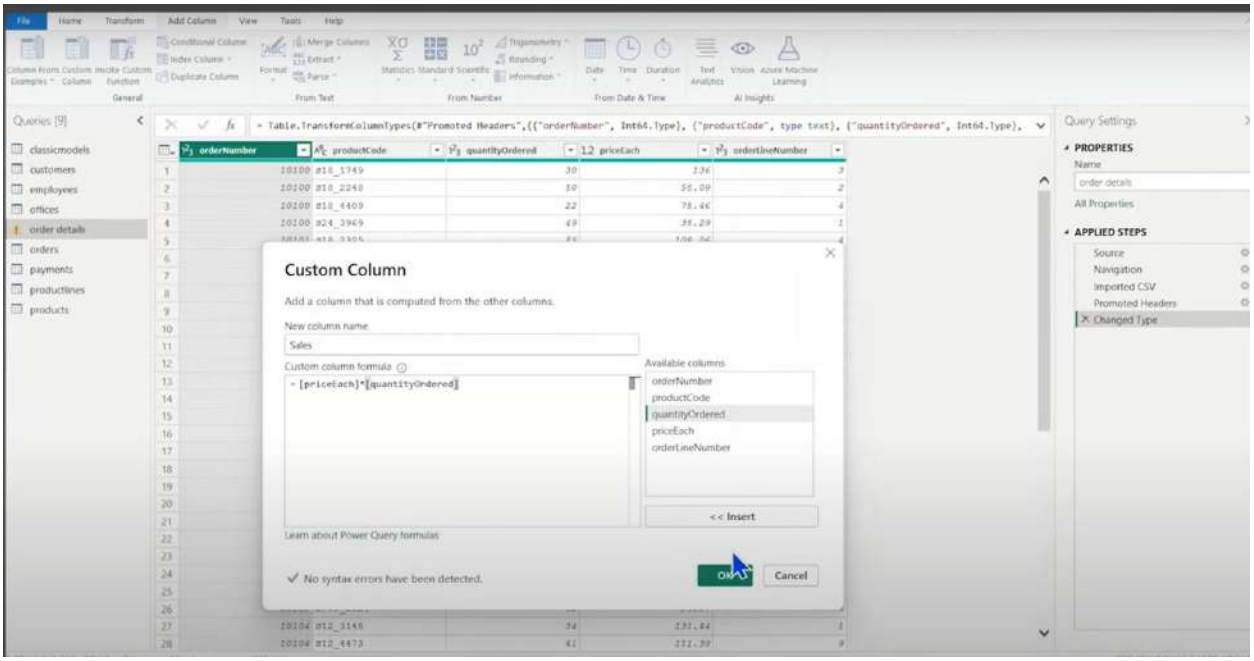
->We can also use **remove blank rows** option in **remove rows** option.

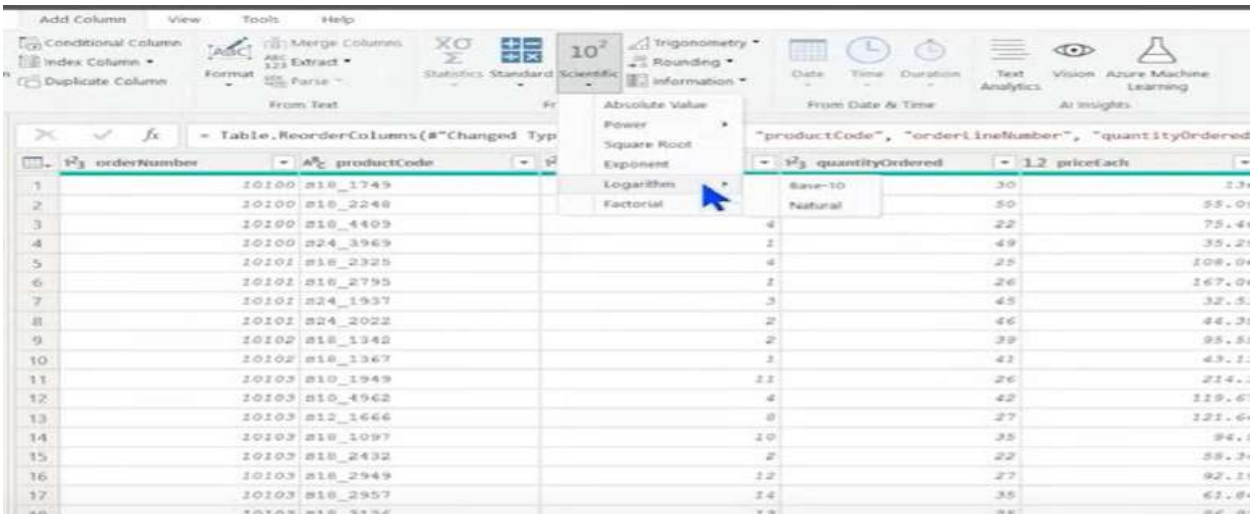
->you can also remove data having error using **Remove error** option.

Numerical tools in PowerBI:-

Numeric tools are mostly used outside the power query editor.

For example selecting a column with numeric type of data and then calculating average , sum , median , adding two columns etc…

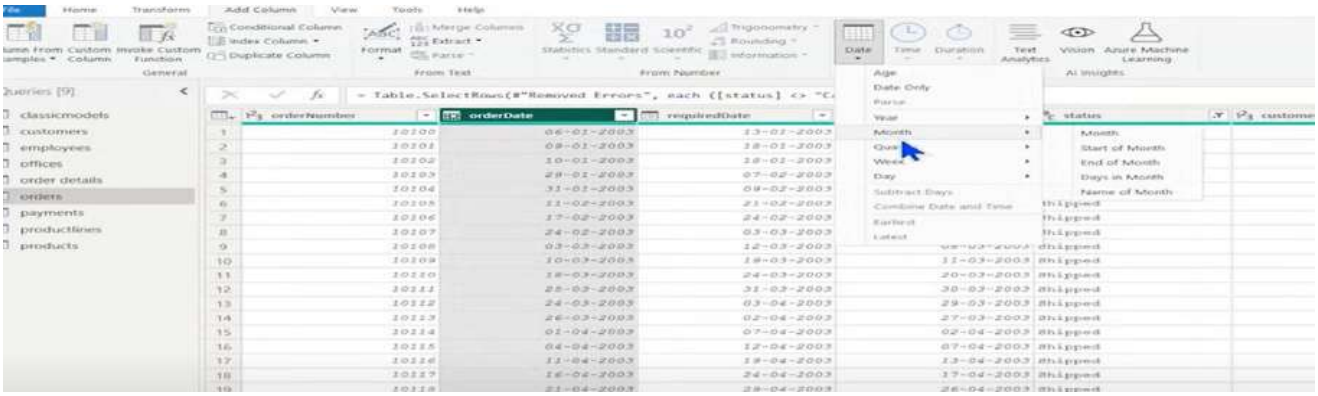




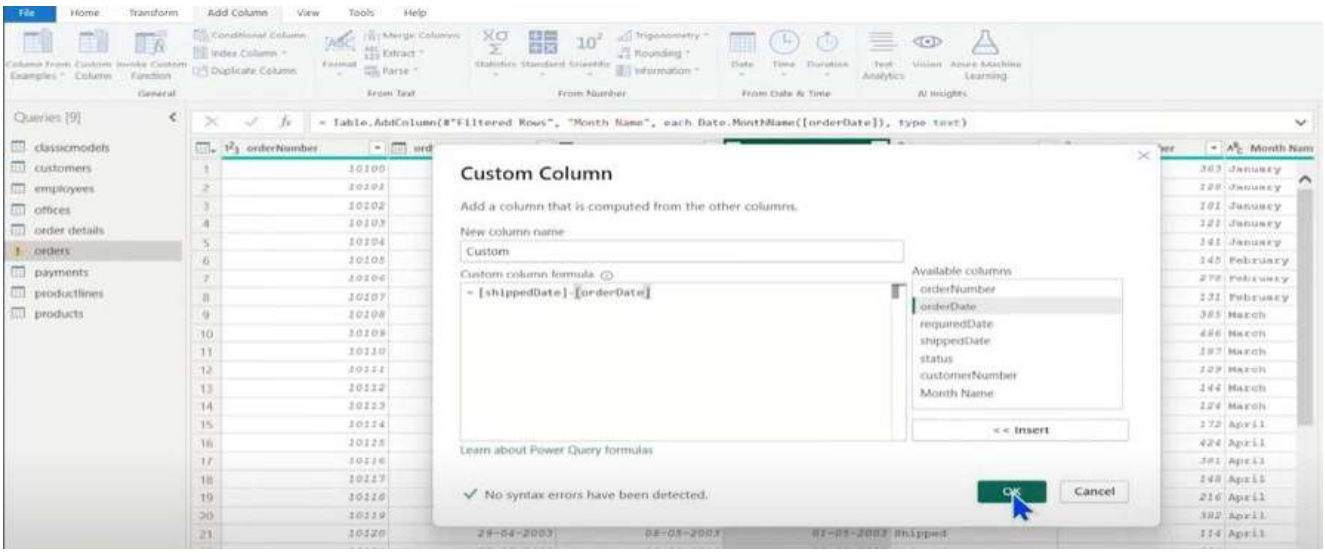
Date and time Tools in PowerBI:-

If you own a business keeping track of date and time becomes essential such as keeping track of order and on the basic of these date and time we can easily figure out various insights that can help our business to grow. For example by knowing the date we can calculate weeks or months in which maximum orders are received.

->Extracting months using orderdate



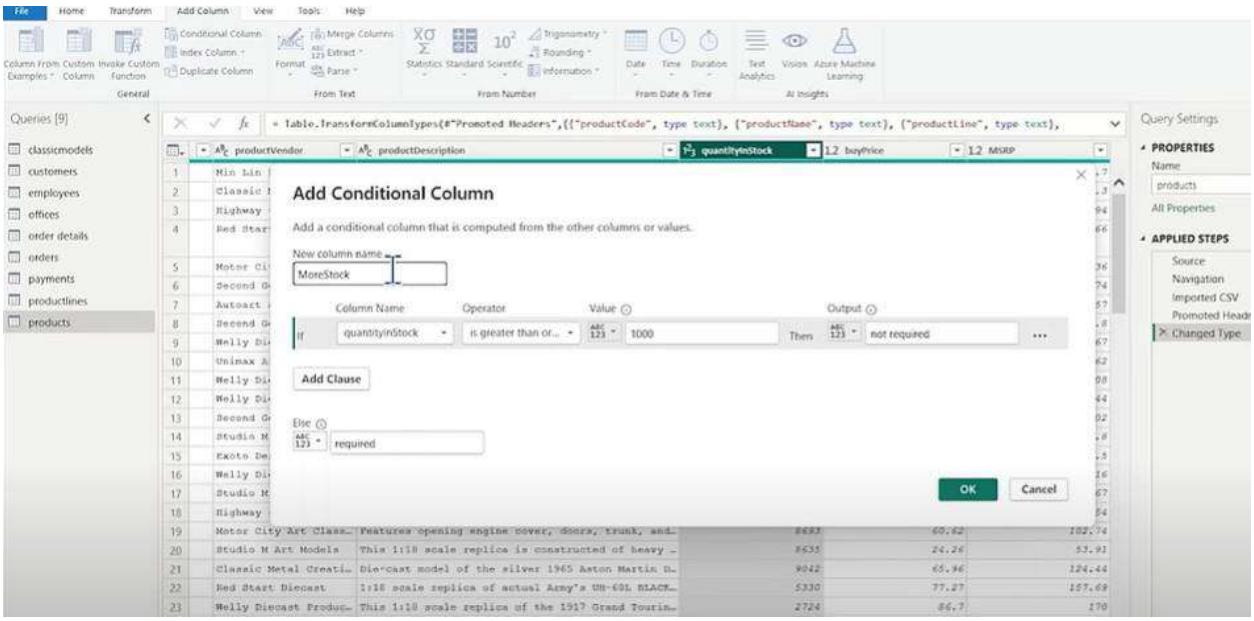
->calculating number of shipping days



Adding Conditional Columns to Power BI:-

Let us consider a dataset containing various products having a column named quantityInStock and we need to create two columns named needmoreStock and notRequired.

->Go **to add column** and select **conditional column.**



->Another example is suppose you have given a column showing shipping days than you can derive a conditional column showing if shipping days are > 5 then show improvement required.

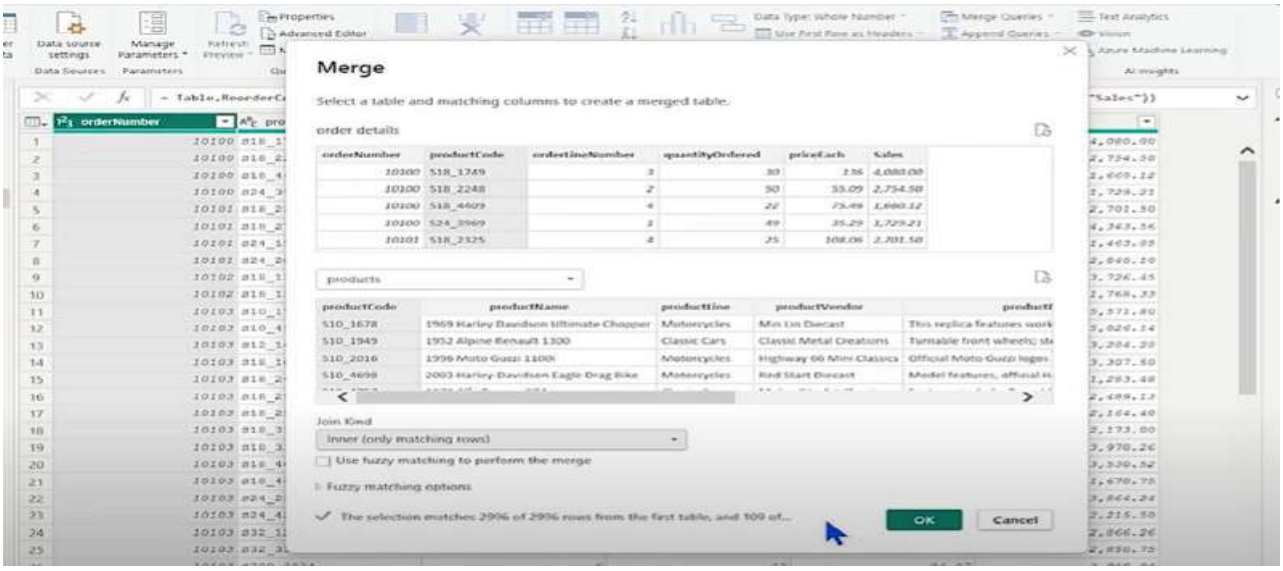
Merge and Append Queries in PowerBI:-

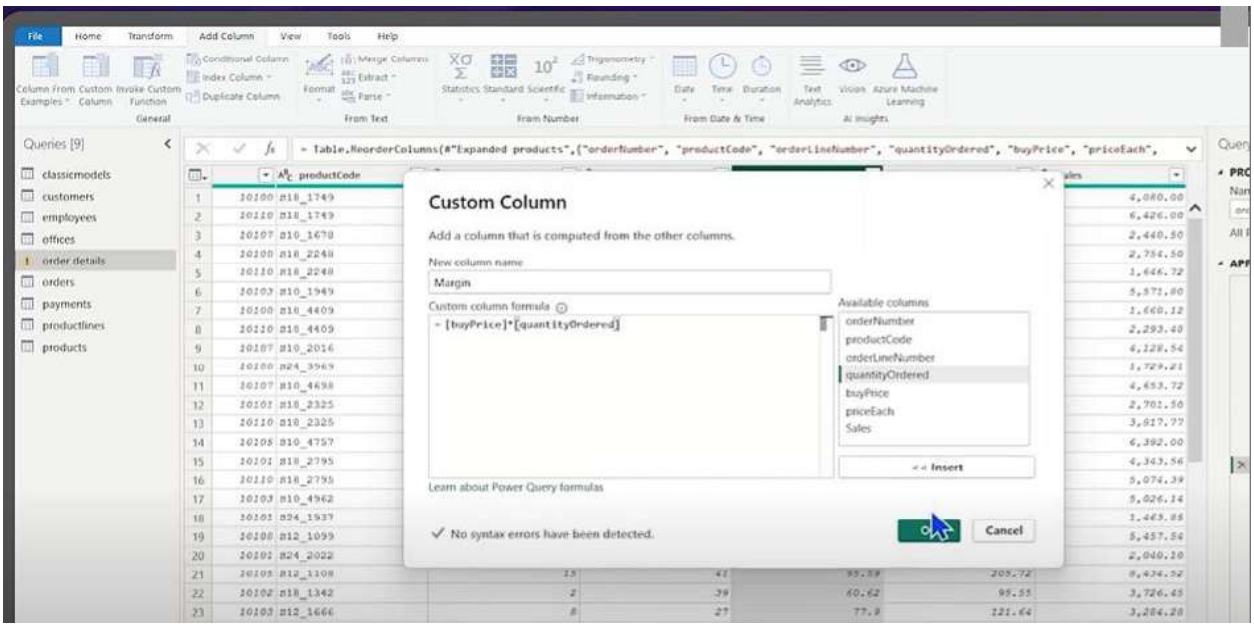
Merge:- use to merge data of one dataset with another.

->Consider an example in which we have one dataset named orderdetails containg two columns (priceEach,sales) and another dataset products containg column(buyprice) we can bring buyprice into

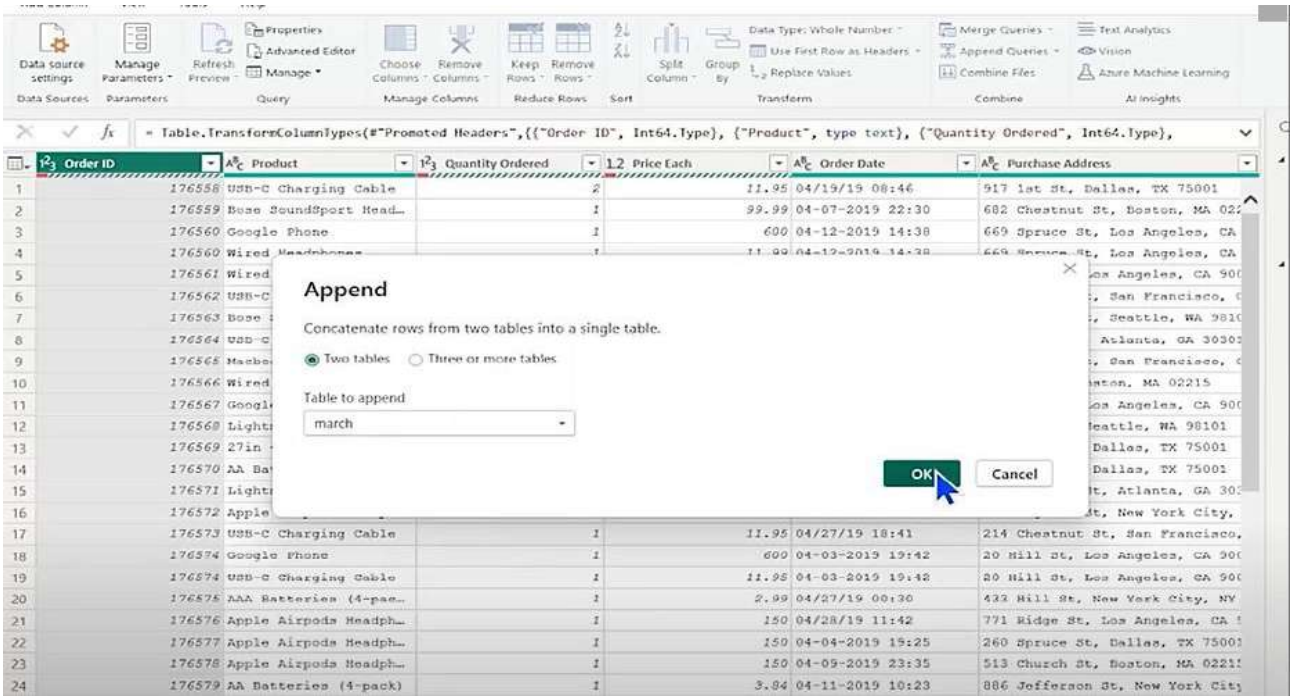
orderDetails dataset to calculate the profit. Both datasets must containing a common attribute that can be used as **foreign key.** IN above code suppose product code column is common in both dataset.

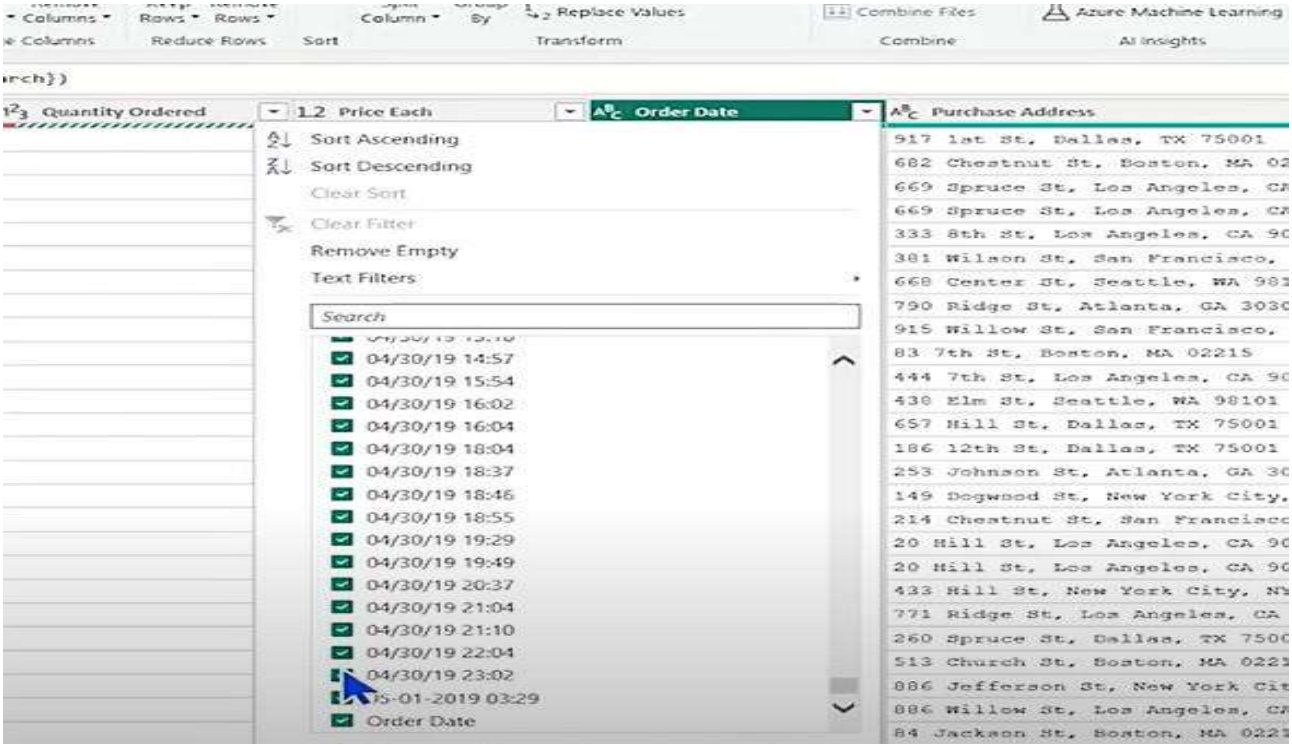
->Click on **merge queries** option and enter required conditions.





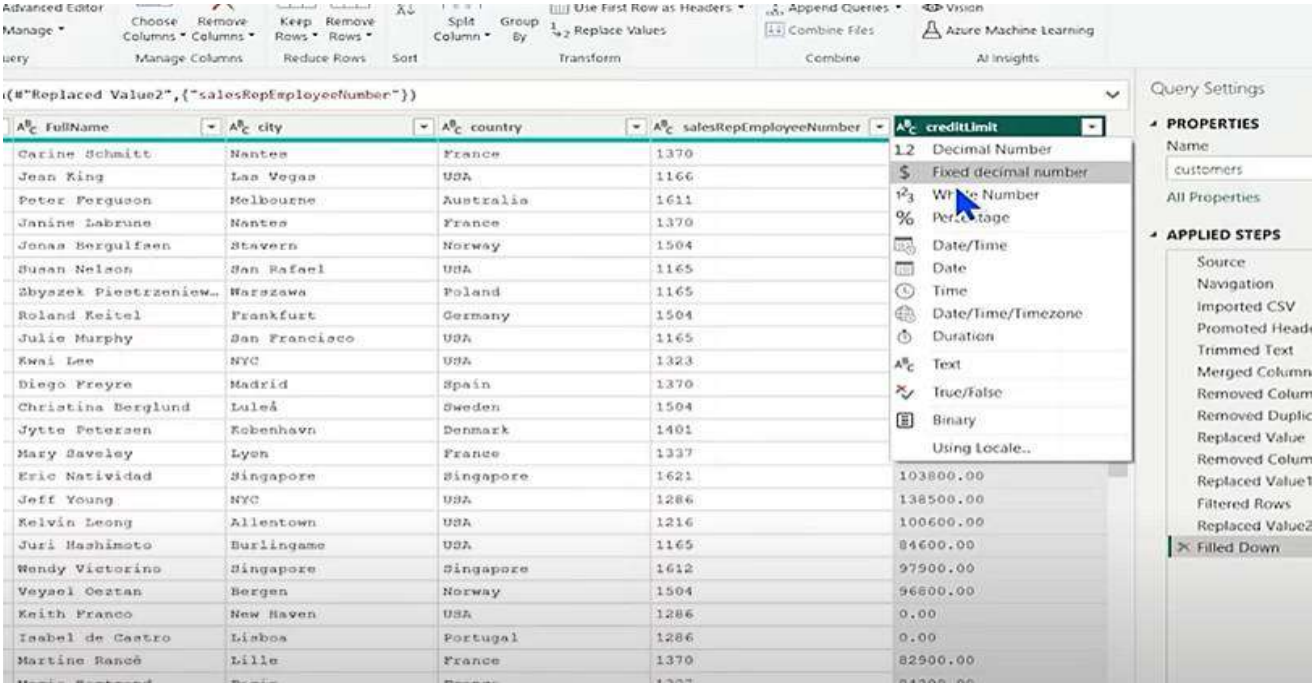
Append:- Adding extra data in existing dataset. It is used when we have similar type of dataset having similar columns such as company sales for various months. There is also another way i.e when you are opening query editor instead of choosing transform data you can choose combine option.



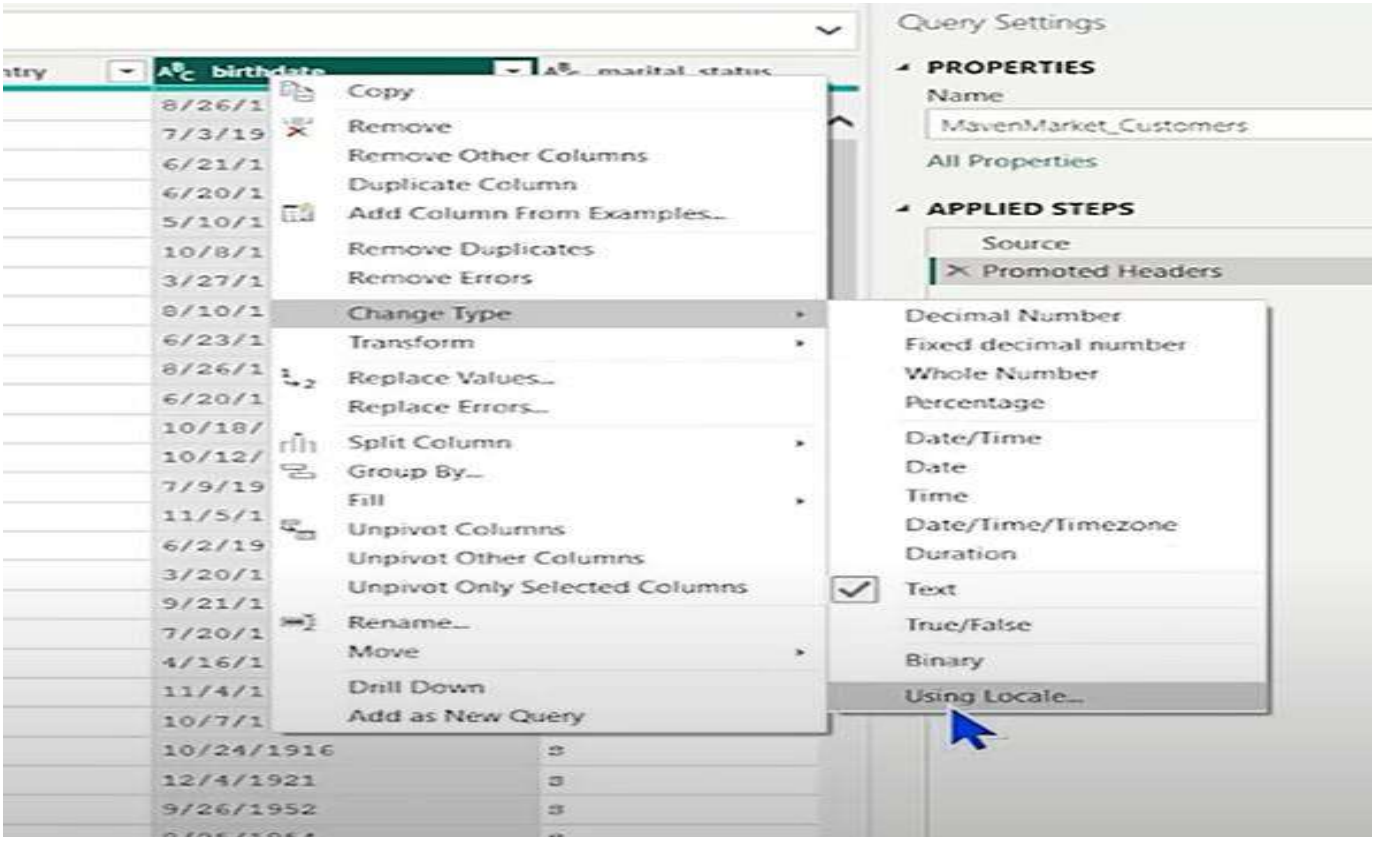


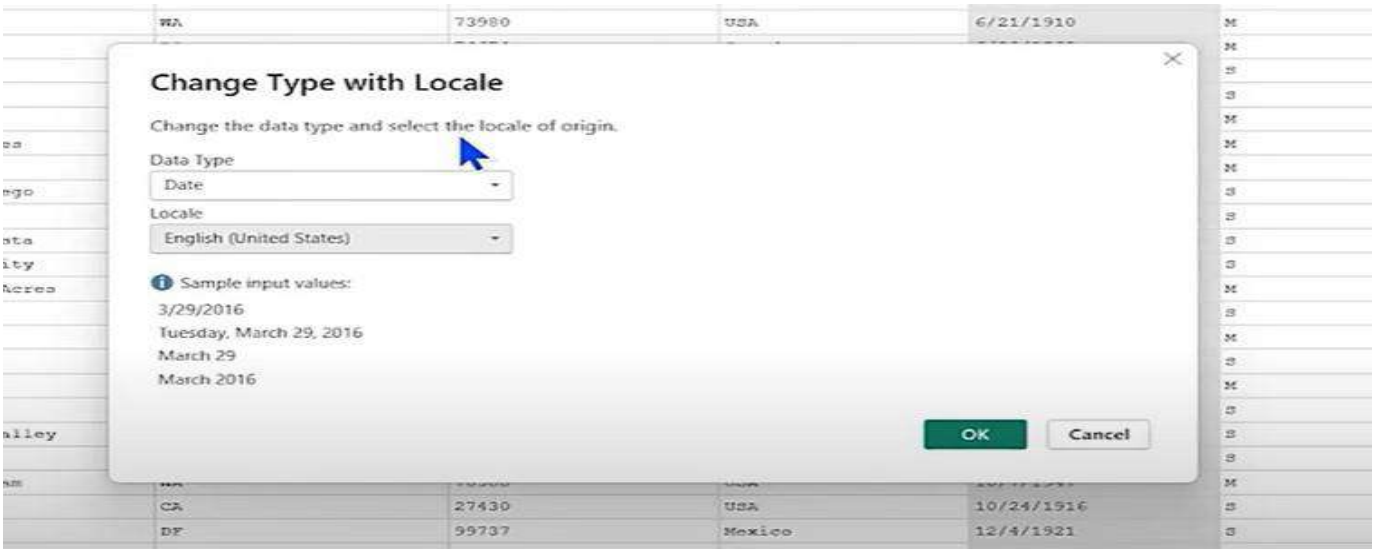
Changing column Formats in PowerBi:-

->Suppose we have a dataset containing column named creditLimit and we need to convert that amount into currency.



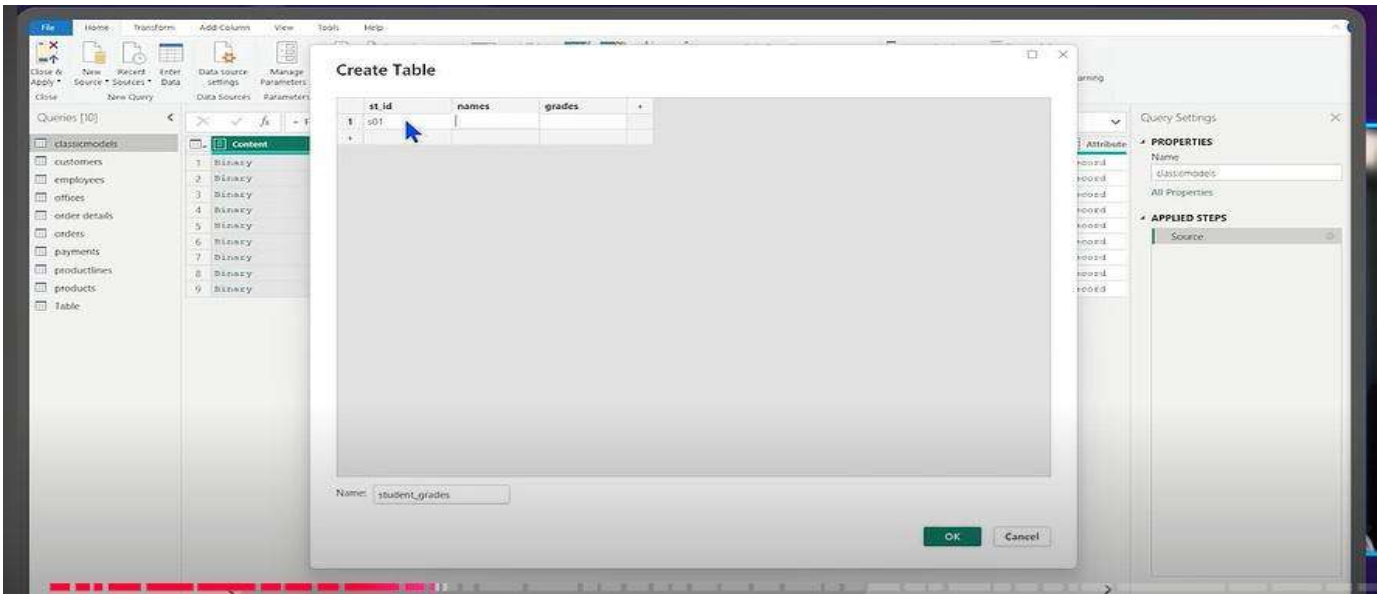
->Another example is suppose we have given a column with date format year-month-day and we need to convert it into day-month-year.





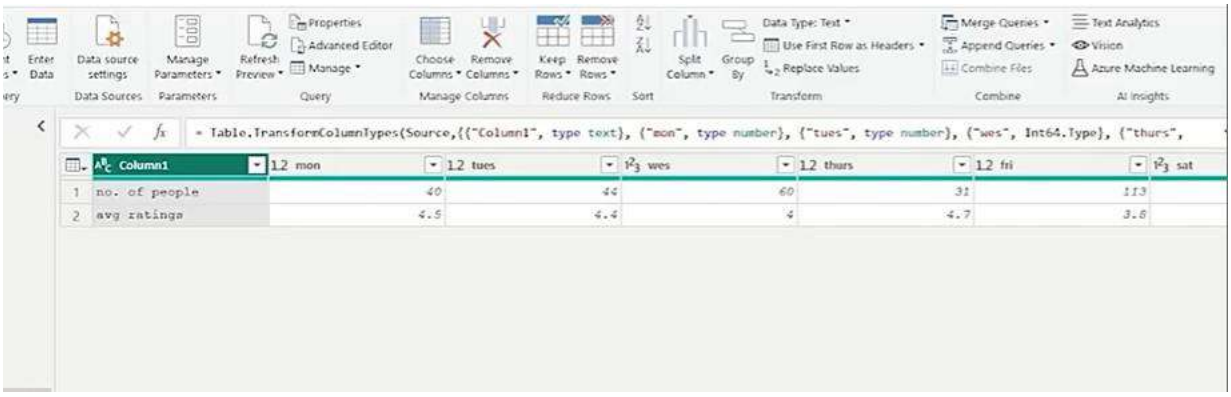
CREATE Table using PowerBi:-

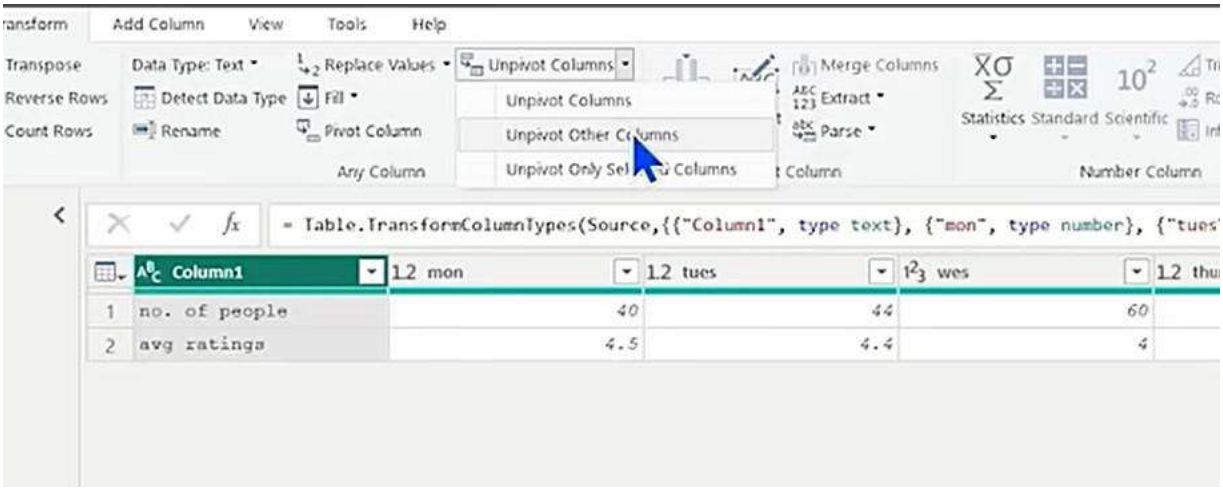
->On the top click on **Enter data** option and then create your table.

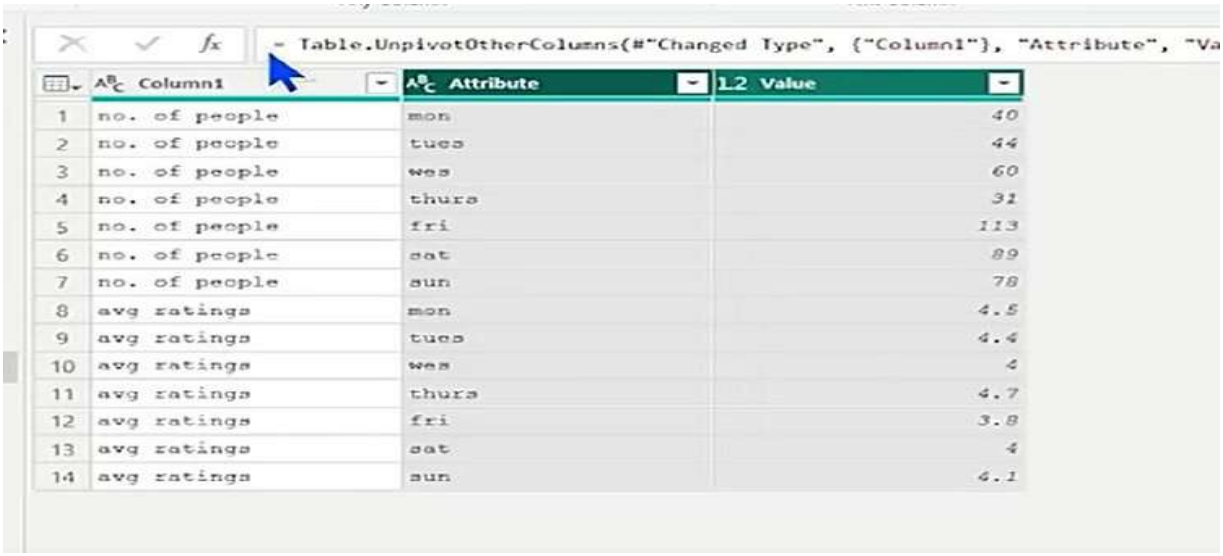


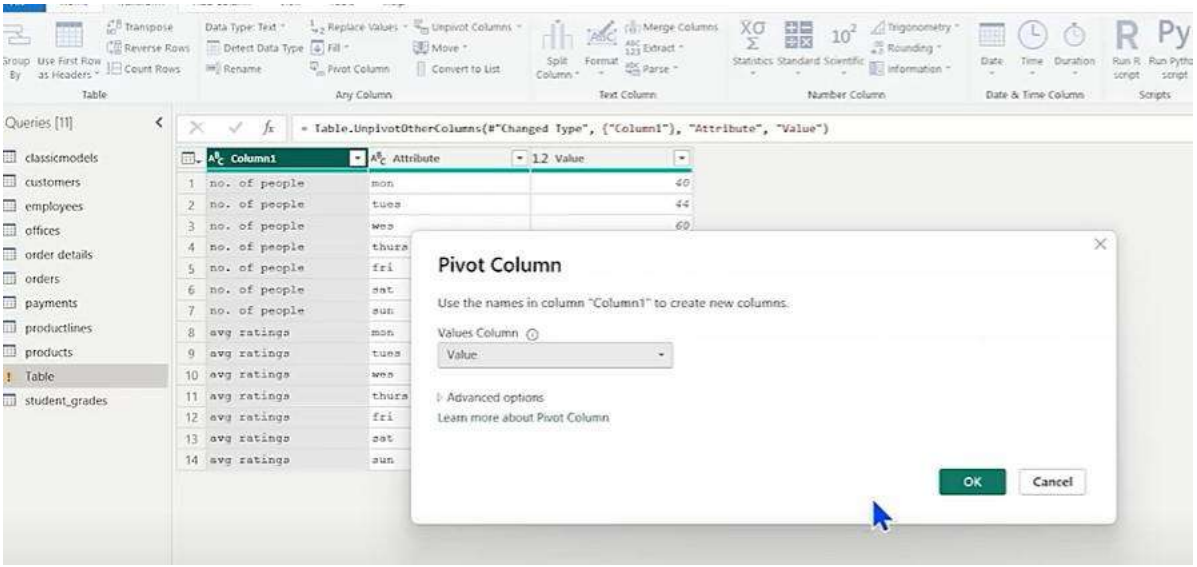
PIVOTING AND UNPIVOTING DATA:-

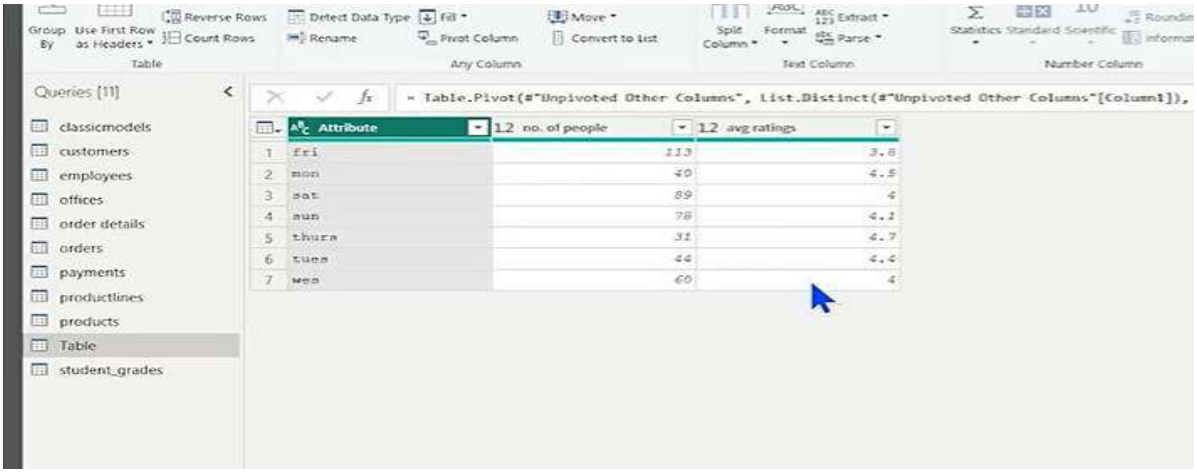
There might be scenarios in which we have horizontal table instead of vertical table . We cant perform transformation in horizontal table. Hence if we have horizontal table we can convert it into vertical table.




Transform
Add Column
View
Tools
Help
Transpose
Reverse Rows
Count Rows
Data Type: Text
Detect Data Type
Rename
Replace Values
Fill
Pivot Column
Unpivot Columns
Unpivot Columns
Unpivot Other Columns
Unpivot Only Selected Columns
Any Column
Merge Columns
Extract
Parse
Statistics
Standard
Scientific
Number Column
= Table.TransformColumnTypes(Source,{{"Column1", type text}, {"mon", type number}, {"tues"
Column1
1.2 mon
1.2 tues
1.2 wes
1.2 thu
1 no. of people 40 44 60
2 avg ratings 4.5 4.4 4


= Table.UnpivotOtherColumns(#"Changed Type", {"Column1"}, "Attribute", "Va
Column1
Attribute
1.2 Value
1 no. of people mon 40
2 no. of people tues 44
3 no. of people wes 60
4 no. of people thurs 31
5 no. of people fri 113
6 no. of people sat 89
7 no. of people sun 78
8 avg ratings mon 4.5
9 avg ratings tues 4.4
10 avg ratings wes 4
11 avg ratings thurs 4.7
12 avg ratings fri 3.8
13 avg ratings sat 4
14 avg ratings sun 4.1

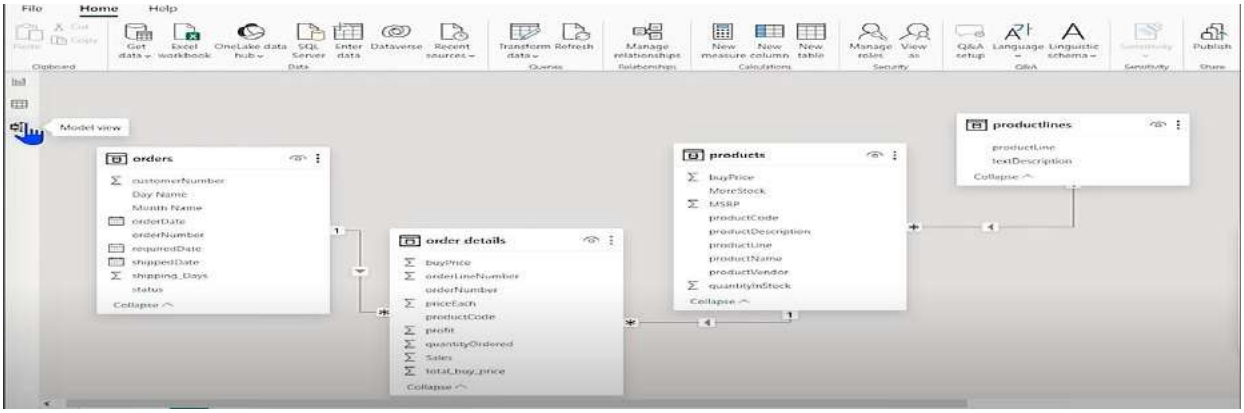

Queries [11]
classicmodels
customers
employees
offices
order details
orders
payments
productlines
products
Table
student_grades
= Table.UnpivotOtherColumns(#"Changed Type", {"Column1"}, "Attribute", "Value")
Pivot Column
Use the names in column "Column1" to create new columns.
Values Column
Value
Advanced options
Learn more about Pivot Column
OK
Cancel



Data Modelling:-

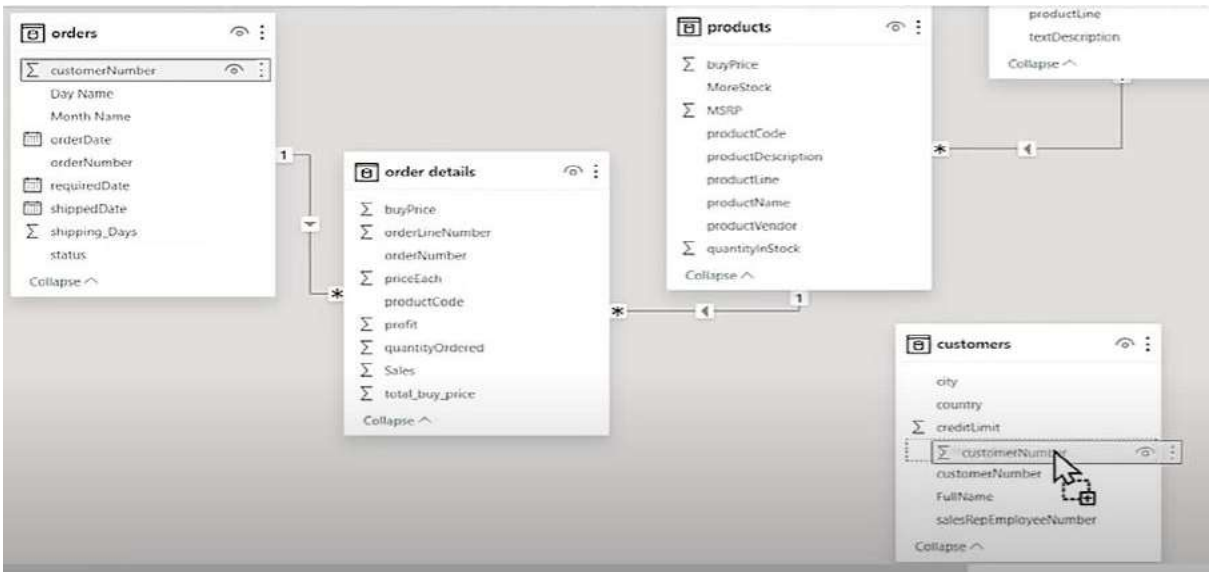
Whenever we are working on a data , whether it is sales data , business data or any other data like inside sales data we have products data, customer data , orders data ,payment data etc.. so inside one folder we have many files. So to establish relationship between different tables we use data modeling to create and manage these relationships such as one to one , many to many etc… for example we have two tables one storing products data and other orders data and we want to find out sales on the basis of products.(Manage data relationship in power bi)

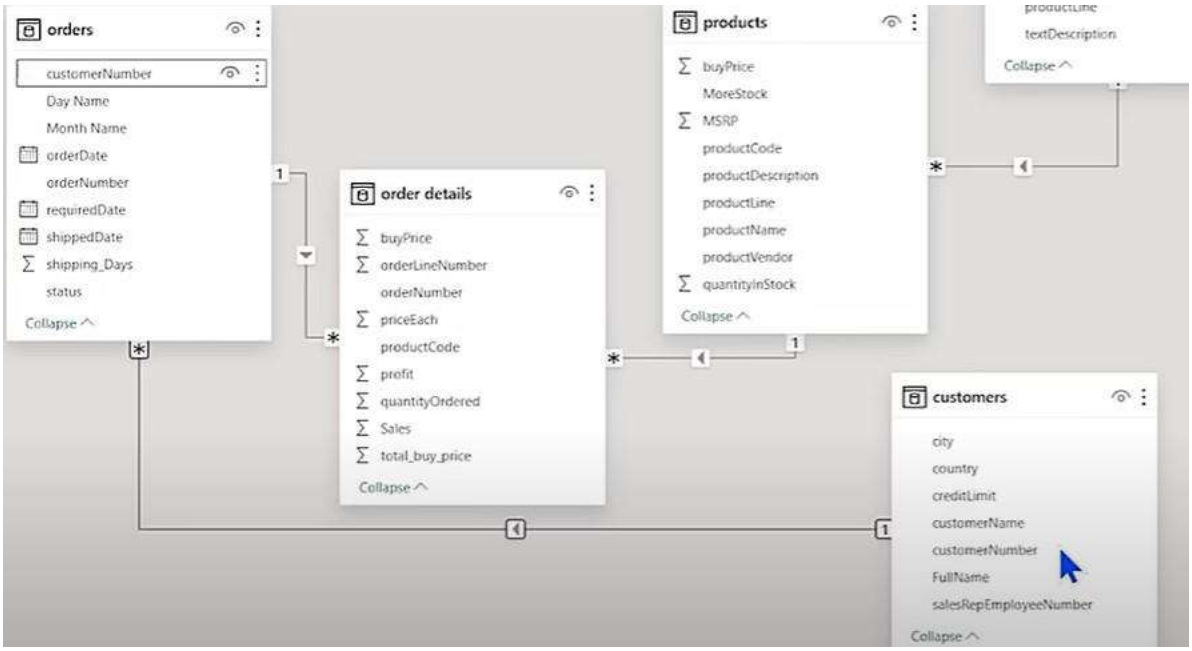
->Click on **Model view**

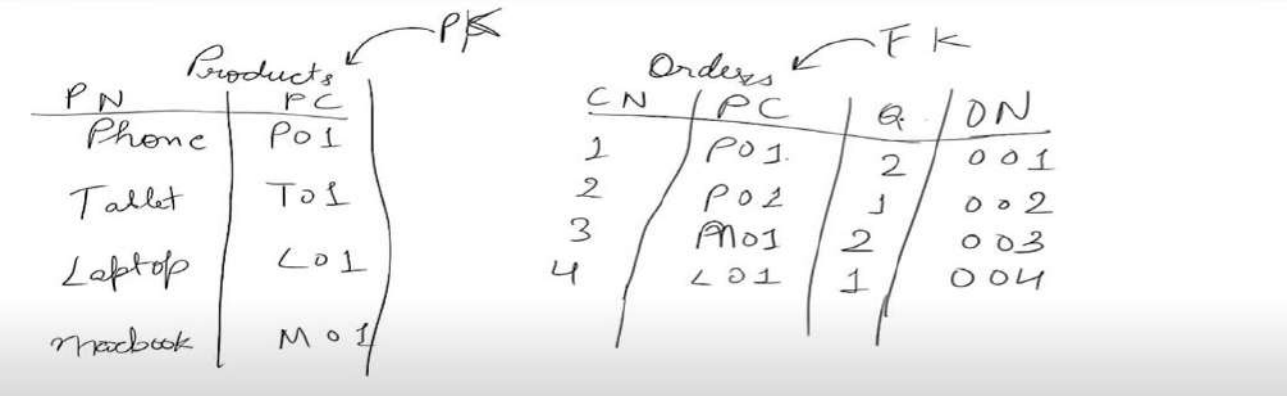


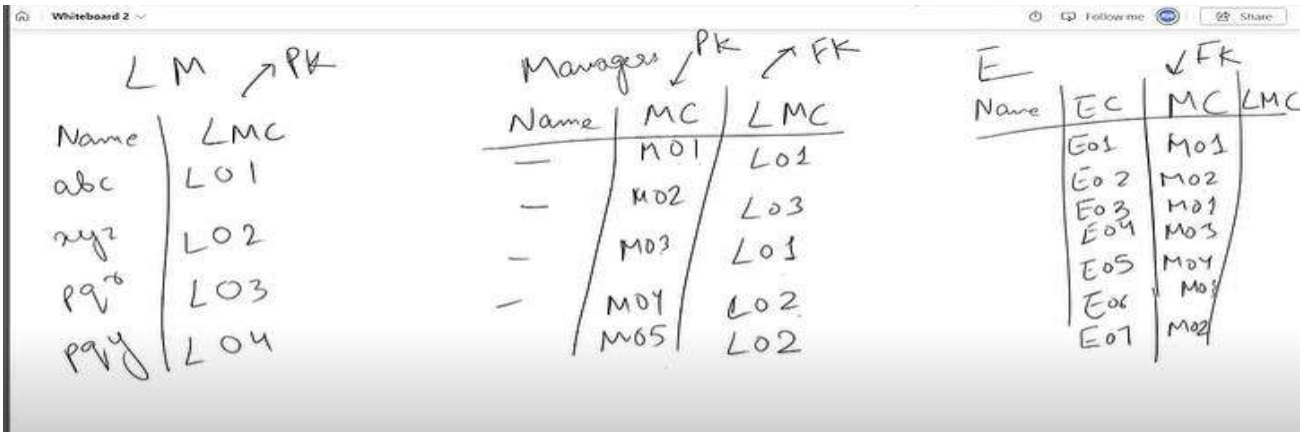
->Example of creating one to many relationship between orders and customer tables.

->In most of the cases the powerbi automatically detects relationships between different tables. But sometimes if not detected than you can drag property of one table over another in order to create create relationship as illustrated below:-









CARDINALITY AND CROSS-FILTER DIRECTION:-

Cardinality:- It means Relationship between two tables.

->One to One :- Primary key to Primary key relation.

->One to Many:- Primary key to Foreign key relation.

->Many to one:- Foreign key to primary key relation.

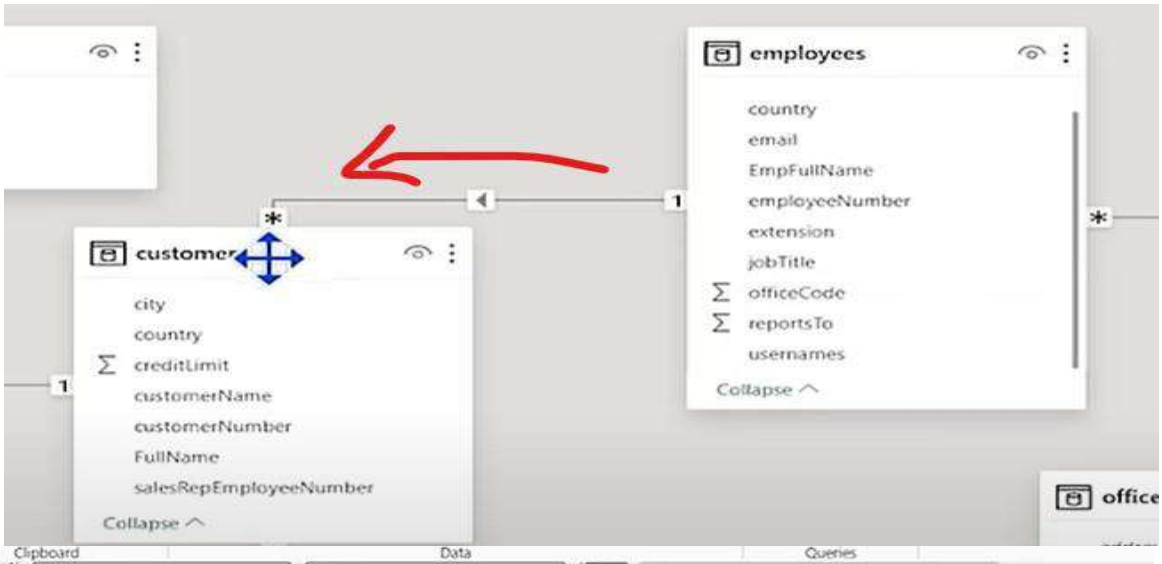
->Many to Many :- Foreign key to Foreign key relation.

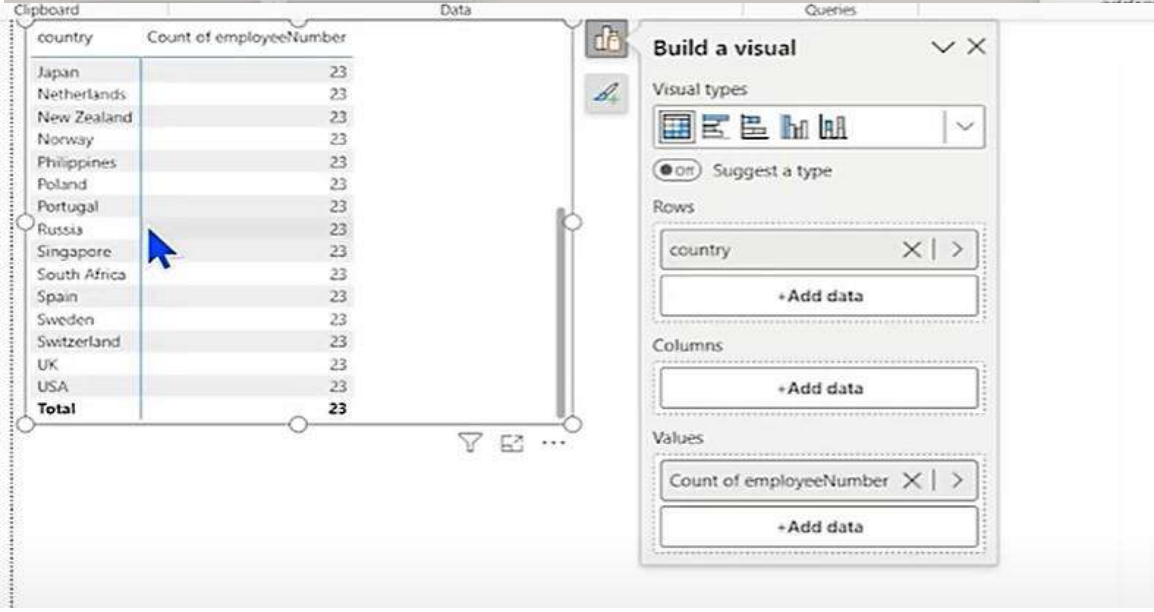
Cross Filter Direction in Power BI:

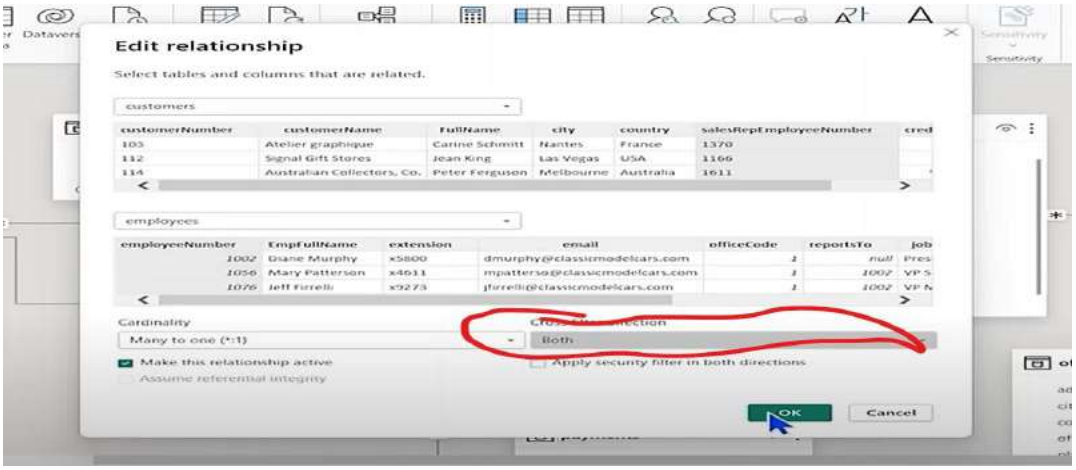
- In Power BI, cross-filtering refers to the way that one visual element can affect the data displayed in another visual element. The cross-filter direction determines which direction the filtering will occur. There are two types of cross-filter directions in Power BI:

- Single Direction: Filtering occurs in only one direction. For example, if a user selects a specific category in a visual element, only the data related to that category will be displayed in the other visual elements. This type of cross-filtering can be set to either "Filter from the selected visual" or "Filter to the selected visual".

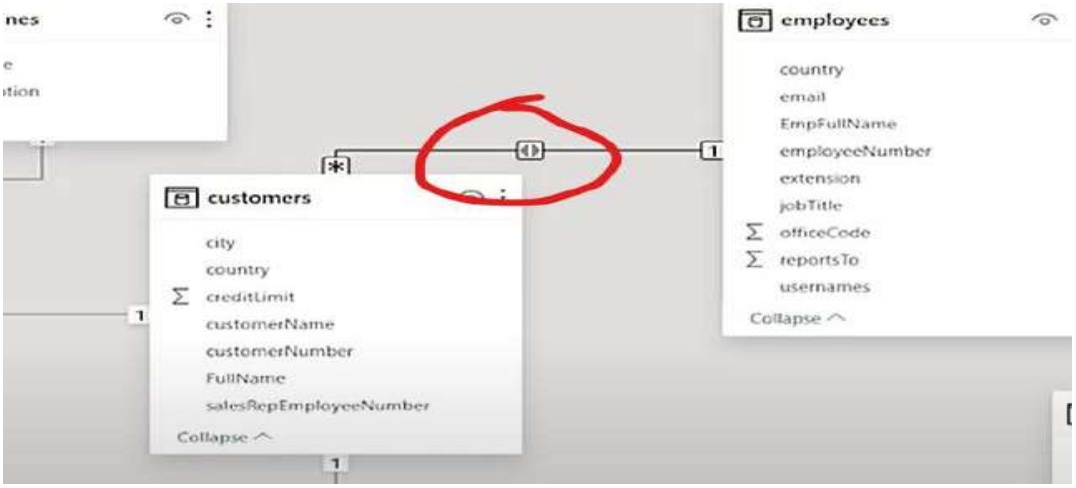
- Both Directions: Filtering occurs in both directions. This means that when a user selects a value in one visual element, it will filter the data in both the selected visual and other visuals.

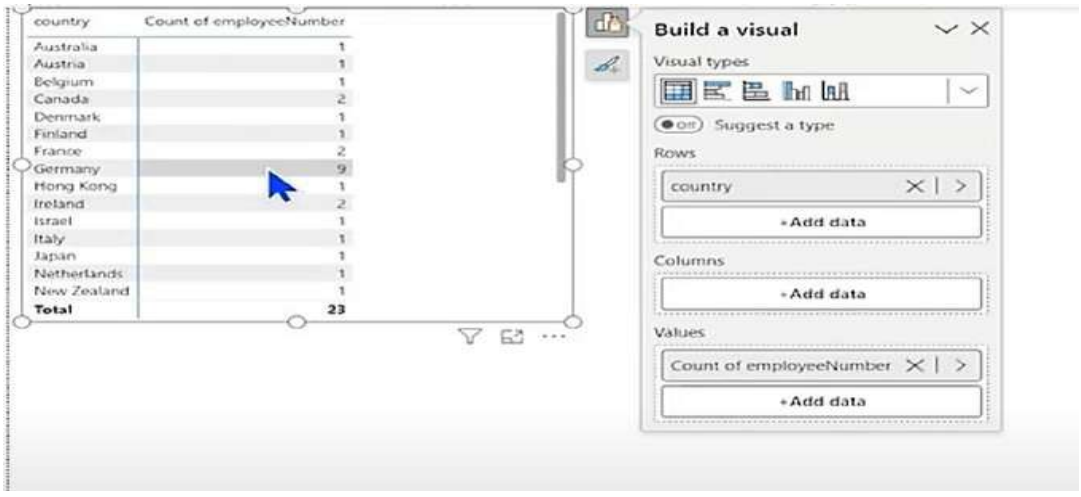






If we want to derive employees data from customer





DATA ANALYSIS EXPRESSION:-

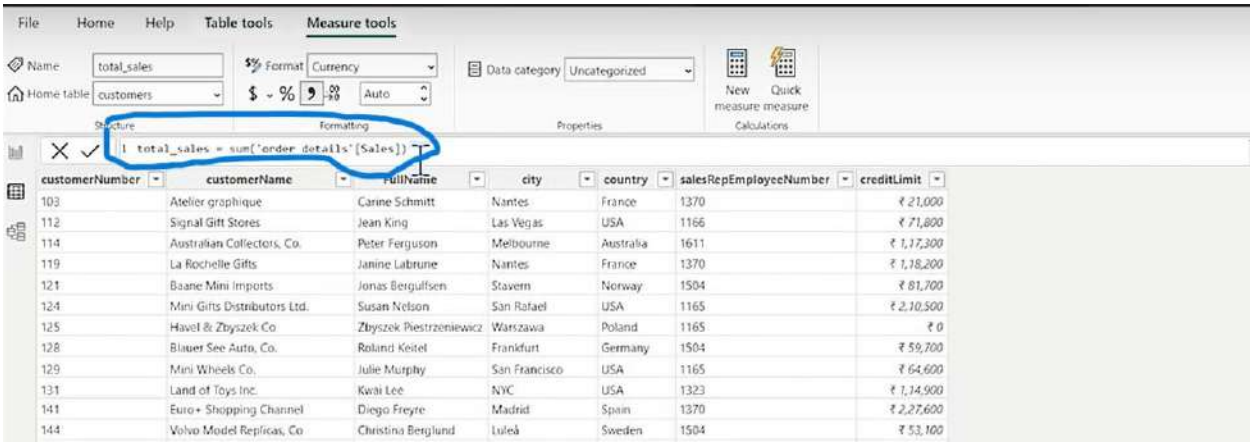
USED when we want to create new columns , new tables from existing data. So to perform any calculations we use DAEx. It contains various functions and operators which we can put inside formula bars to create new columns. So in short DAEx are used to create calculated columns and measures.

->Calculating complex formulas and measures.

->Creating Custom aggregations

->Dynamic grouping and Time Intelligence function.

->Custom Grouping

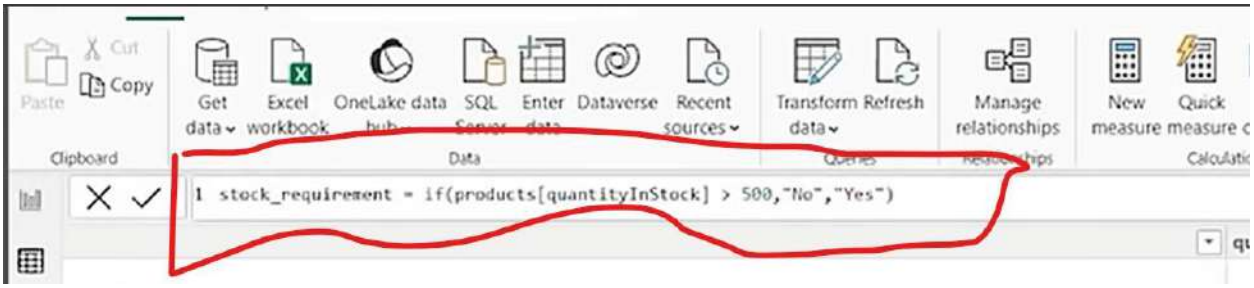


customerNumber	customerName	FullName	city	country	salesRepEmployeeNumber	creditLimit
103	Atelier graphique	Carine Schmitt	Nantes	France	1370	₹ 21,000
112	Signal Gift Stores	Jean King	Las Vegas	USA	1166	₹ 71,800
114	Australian Collectors, Co.	Peter Ferguson	Melbourne	Australia	1611	₹ 1,17,300
119	La Rochelle Gifts	Janine Labrune	Nantes	France	1370	₹ 1,18,200
121	Baane Mini Imports	Jonas Bergulfsen	Stavern	Norway	1504	₹ 81,700
124	Mini Gifts Distributors Ltd.	Susan Nelson	San Rafael	USA	1165	₹ 2,10,500
125	Havel & Zbyszek Co	Zbyszek Piestrzeniewicz	Warszawa	Poland	1165	₹ 0
128	Blauer See Auto, Co.	Roland Keitel	Frankfurt	Germany	1504	₹ 59,700
129	Mini Wheels Co.	Julie Murphy	San Francisco	USA	1165	₹ 64,600
131	Land of Toys Inc.	Kwai Lee	NYC	USA	1323	₹ 1,14,900
141	Euro+ Shopping Channel	Diego Freyre	Madrid	Spain	1370	₹ 2,27,600
144	Volvo Model Replicas, Co	Christina Berglund	Luleå	Sweden	1504	₹ 53,100

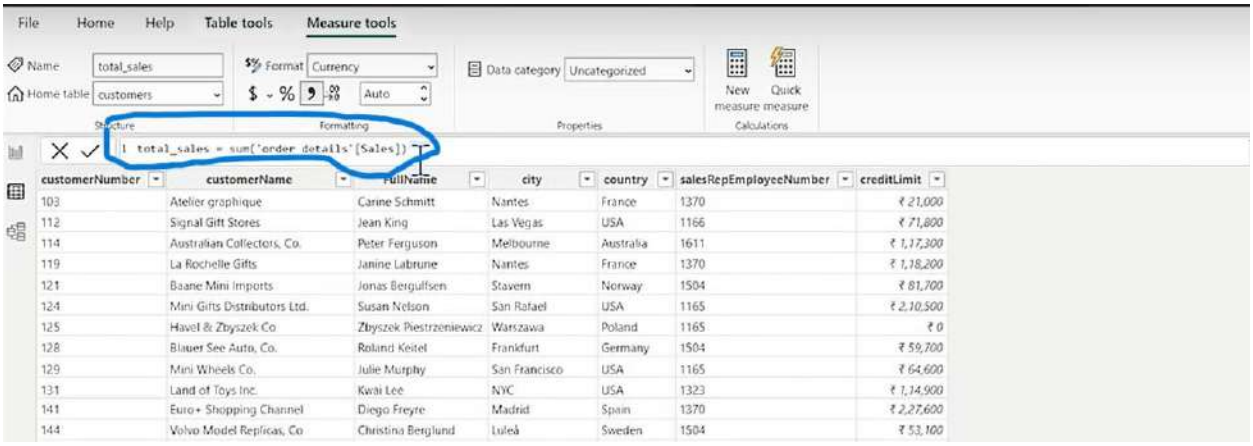
Steps to create calculated columns in DAX:-

For example if we have a column named quantity stock and we want to create new column saying that stock required if it is less than a particular value or not required.

->Go to home tab and click on new column.



Creation of measures in powerbi and its types:-



customerNumber	customerName	FullName	city	country	salesRepEmployeeNumber	creditLimit
103	Atelier graphique	Carine Schmitt	Nantes	France	1370	₹ 21,000
112	Signal Gift Stores	Jean King	Las Vegas	USA	1166	₹ 71,800
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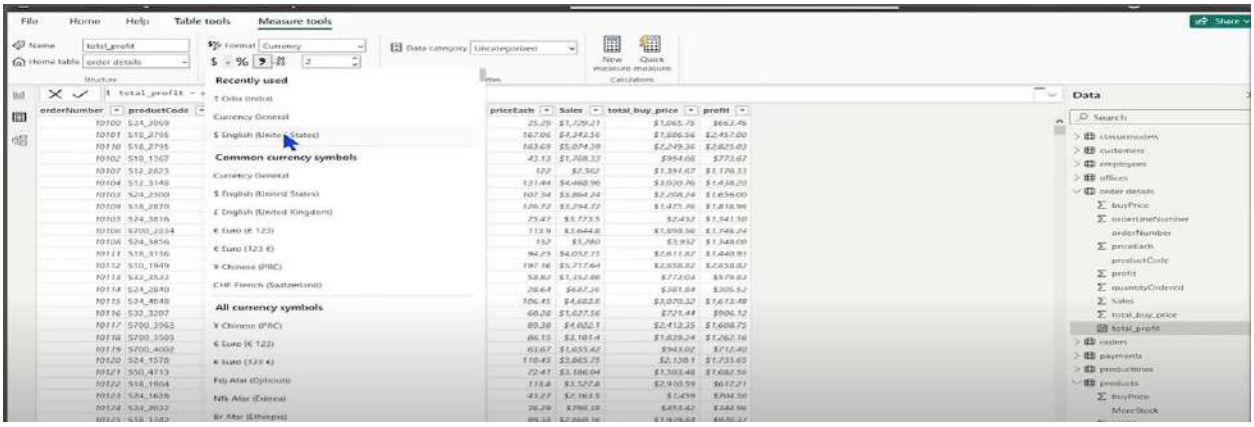
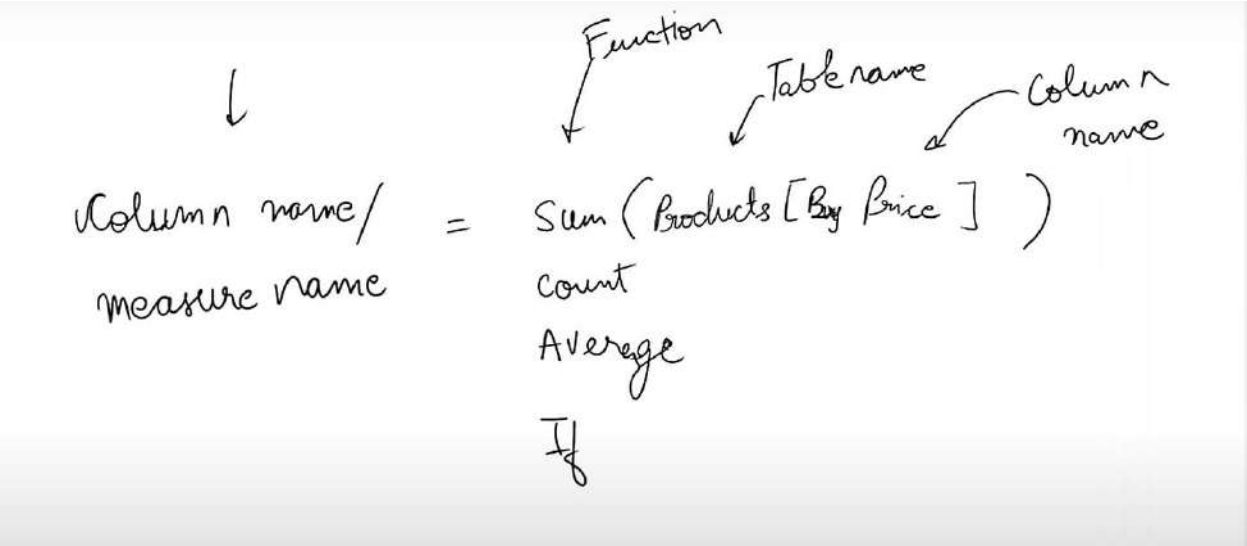
125	Havel & Zbyszek Co	Zbyszek Piestrzeniewicz	Warszawa	Poland	1165	₹ 0
128	Blauer See Auto, Co.	Roland Keitel	Frankfurt	Germany	1504	₹ 59,700
129	Mini Wheels Co.	Julie Murphy	San Francisco	USA	1165	₹ 64,600
131	Land of Toys Inc.	Kwai Lee	NYC	USA	1323	₹ 1,14,900
141	Euro+ Shopping Channel	Diego Freyre	Madrid	Spain	1370	₹ 2,27,600
144	Volvo Model Replicas, Co	Christina Berglund	Luleå	Sweden	1504	₹ 53,100

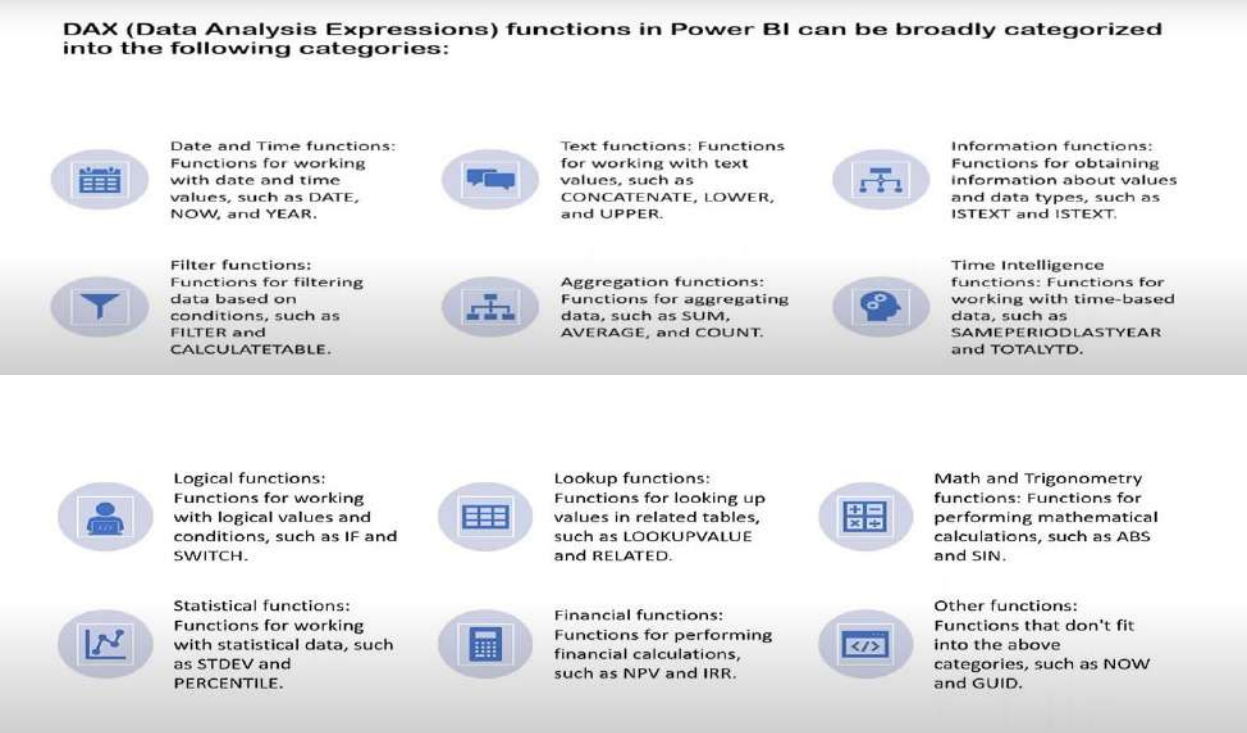
You can also convert the type of data such as changing currency type



UNDERSTANDING DAX FUNCTIONS:-

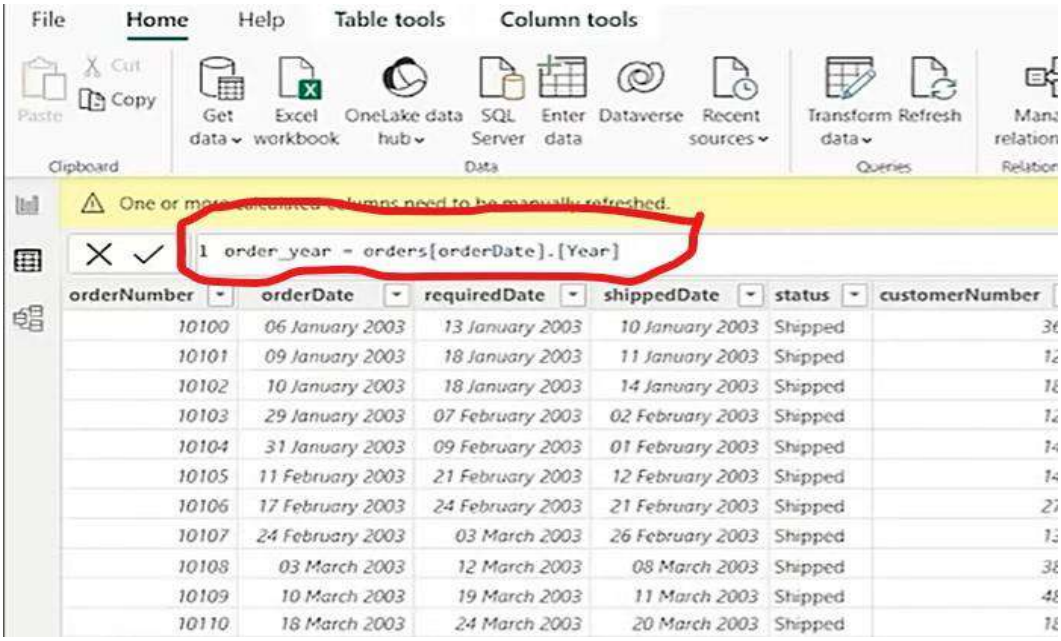


DAX FUNCTIONS:-



Example of Date and Time Function:-

->Suppose we want to know the year in which orders are placed from orderDate.



orderNumber	orderDate	requiredDate	shippedDate	status	customerNumber
10100	06 January 2003	13 January 2003	10 January 2003	Shipped	36
10101	09 January 2003	18 January 2003	11 January 2003	Shipped	12
10102	10 January 2003	18 January 2003	14 January 2003	Shipped	18
10103	29 January 2003	07 February 2003	02 February 2003	Shipped	12
10104	31 January 2003	09 February 2003	01 February 2003	Shipped	14
10105	11 February 2003	21 February 2003	12 February 2003	Shipped	14
10106	17 February 2003	24 February 2003	21 February 2003	Shipped	27
10107	24 February 2003	03 March 2003	26 February 2003	Shipped	13
10108	03 March 2003	12 March 2003	08 March 2003	Shipped	38
10109	10 March 2003	19 March 2003	11 March 2003	Shipped	48
10110	18 March 2003	24 March 2003	20 March 2003	Shipped	18

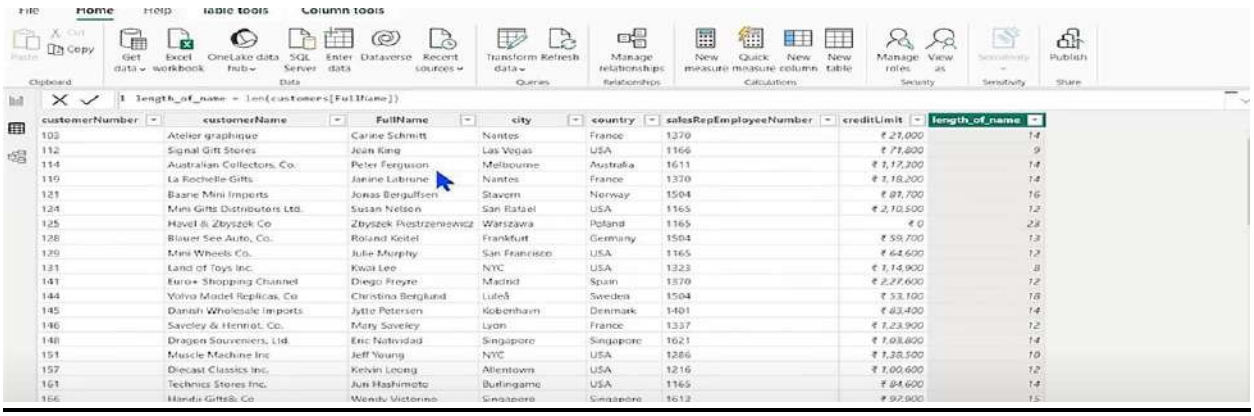
orderNumber	orderDate	requiredDate	shippedDate	status	customerNumber	Month Name	shipping_Days
10100	06 January 2003	13 January 2003	10 January 2003	Shipped	363	January	
10101	09 January 2003	18 January 2003	11 January 2003	Shipped	128	January	
10102	10 January 2003	18 January 2003	14 January 2003	Shipped	181	January	
10103	29 January 2003	07 February 2003	02 February 2003	Shipped	121	January	
10104	31 January 2003	09 February 2003	01 February 2003	Shipped	141	January	
10105	11 February 2003	21 February 2003	12 February 2003	Shipped	145	February	
10106	17 February 2003	24 February 2003	21 February 2003	Shipped	278	February	
10107	24 February 2003	03 March 2003	26 February 2003	Shipped	131	February	
10108	03 March 2003	12 March 2003	08 March 2003	Shipped	385	March	
10109	10 March 2003	19 March 2003	11 March 2003	Shipped	486	March	
10110	18 March 2003	24 March 2003	20 March 2003	Shipped	187	March	
10111	25 March 2003	31 March 2003	30 March 2003	Shipped	129	March	
10112	24 March 2003	03 April 2003	29 March 2003	Shipped	144	March	
10113	26 March 2003	02 April 2003	27 March 2003	Shipped	124	March	

Text Functions:-

FUNCTION	DESCRIPTION
LEFT	Returns the specified number of characters from the start of a text string.
LEN	Returns the number of characters in a text string.
LOWER	Converts all letters in a text string to lowercase.
MID	Returns a string of characters from the middle of a text string, given a starting position and length.
REPLACE	Replaces part of a text string with a different text string.
REPT	Repeats text a given number of times. Use REPT to fill a cell with a number of instances of a text string.
RIGHT	Returns the specified number of characters from the end of a text string.
SUBSTITUTE	Replaces existing text with new text in a text string.

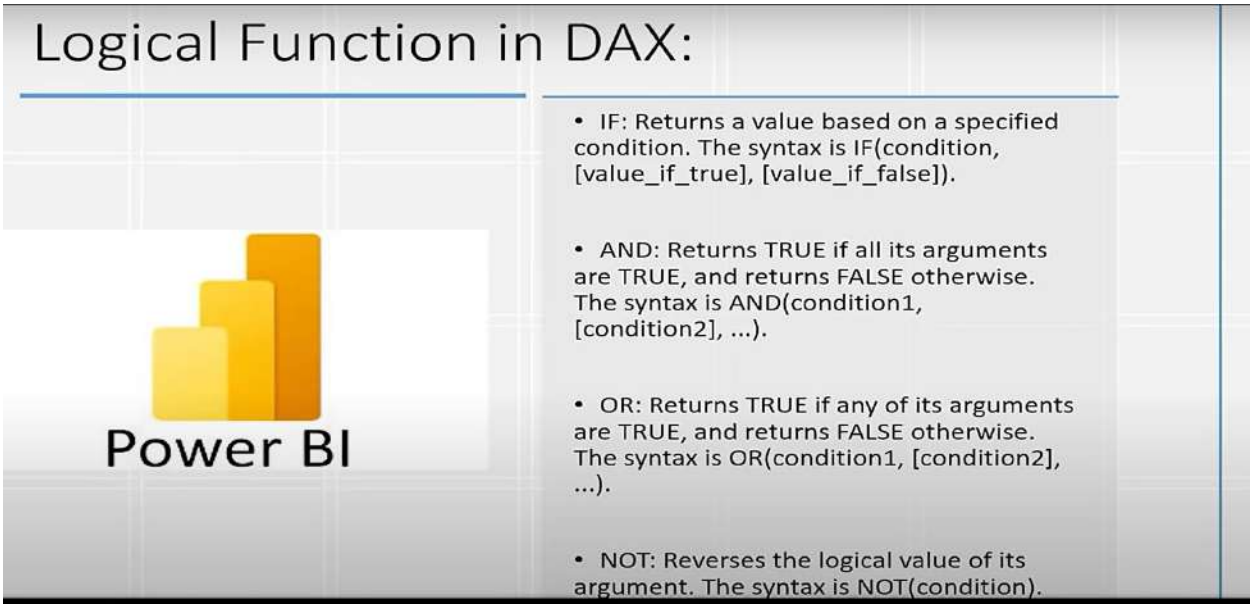
FUNCTION	DESCRIPTION
COMBINEVALUES	Combines the given set of operands using a specified delimiter.
CONCATENATE	Joins two text strings into one text string.
CONCATENATEX	Evaluates expression for each row on the table, then return the concatenation of those values in a single string result, seperated by the specified delimiter.
EXACT	Checks whether two text strings are exactly the same and return TRUE or FALSE. EXACT is case-sensitive.
FIND	Returns the starting position of one text string within another text string. FIND is case-sensitive and accent-sensitive.
FIXED	Rounds a number to the specified number of decimals and returns the result as text with optional commas.
FORMAT	Converts a value to text in the specified number format.

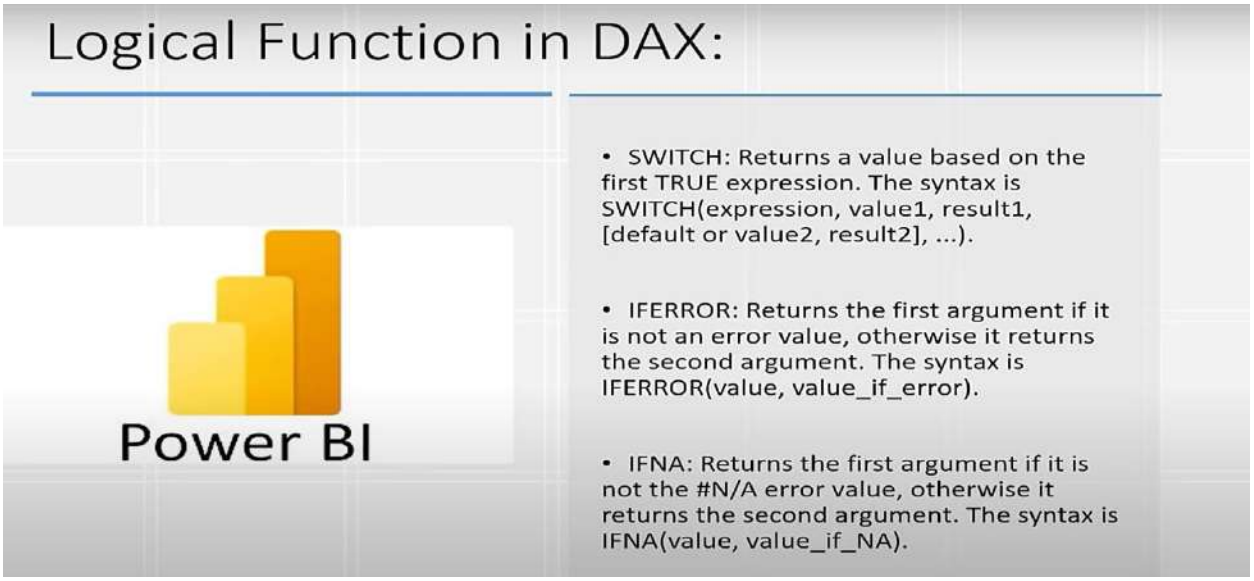
FUNCTION	DESCRIPTION
TOJSON	Converts the records of a table into a JSON text.
TRIM	Removes all spaces from a text string except for single spaces between words.
UNICHAR	Returns the Unicode character that is referenced by the given numeric value.
UNICODE	Returns the number (code point) corresponding to the first character of the text.
UPPER	Converts a text string to all uppercase letters.
VALUE	Converts a text string that represents a number to a number.
TOCSV	Converts the records of a table into a CSV (comma-separated values) text.

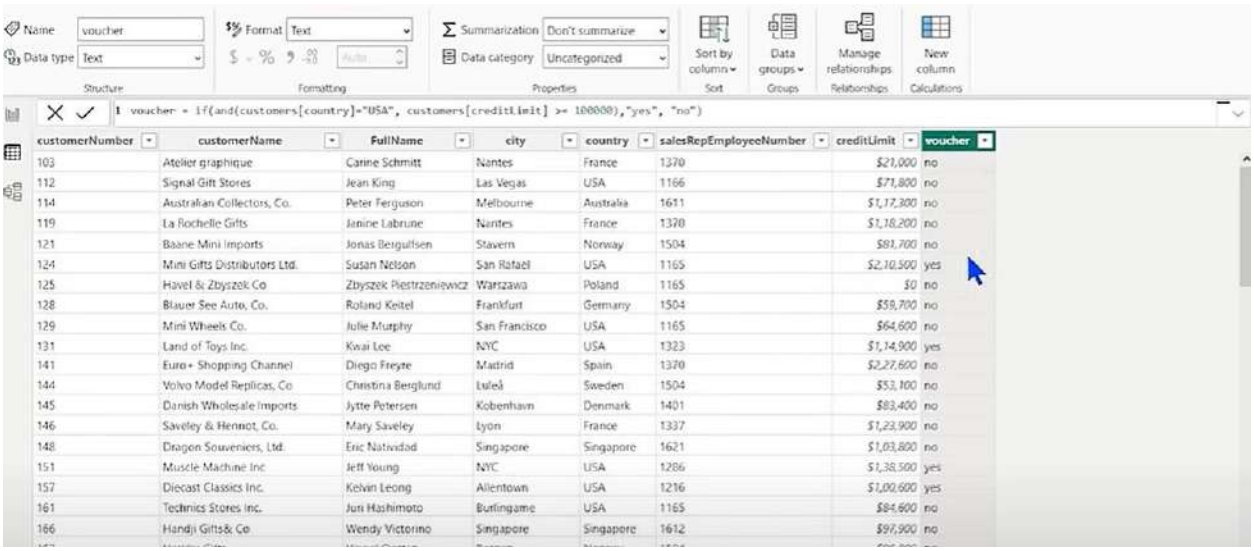


LOGICAL FUNCTIONS:-

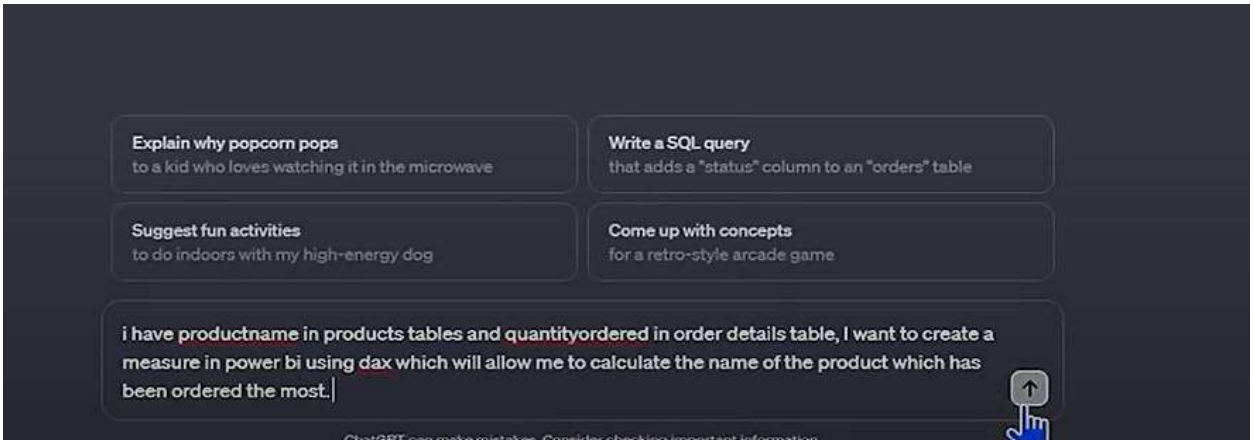
->Example we need to create column saying that if credit limit is greater than particular amount then only voucher will be granted.







Using chatgpt to create measures:-



OPERATORS

Types of Operators in DAX

- Arithmetic Operators: Used to perform arithmetic operations such as addition (+), subtraction (-), multiplication (*), and division (/).
- Comparison Operators: Used to compare values and return a logical result (TRUE or FALSE). These include equal to (=), not equal to (<>), greater than (>), less than (<), greater than or equal to (>=), and less than or equal to (<=).
- Logical Operators: Used to perform logical operations such as AND, OR, and NOT.

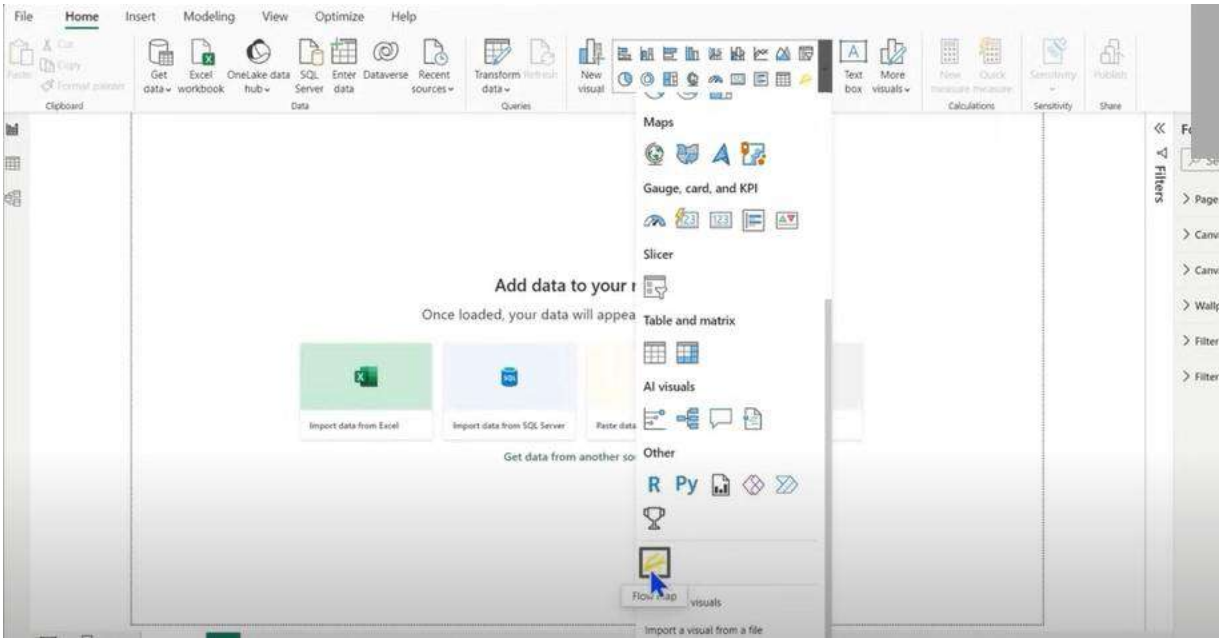
Types of Operators in DAX

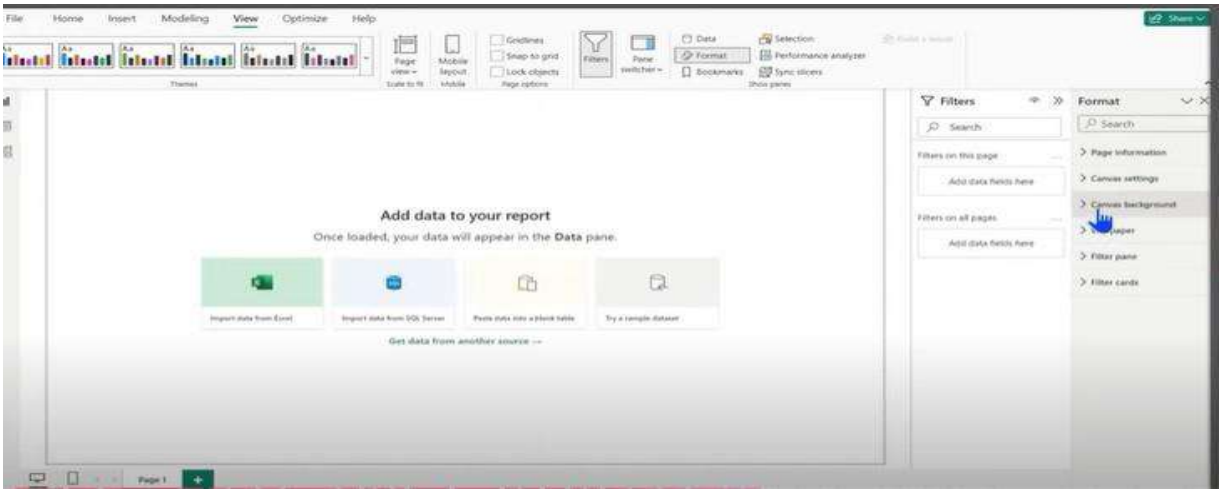
- Concatenation Operators: Used to combine text values, such as & and CONCATENATE.
- Reference Operators: Used to reference cells or ranges, such as [] and [].
- Parenthesis: Used to control the order of operations in a formula, such as () and [].
- Miscellaneous Operators: Used for various purposes, such as the colon (:) operator used in date and time functions and the semicolon (;) operator used in the SWITCH function.

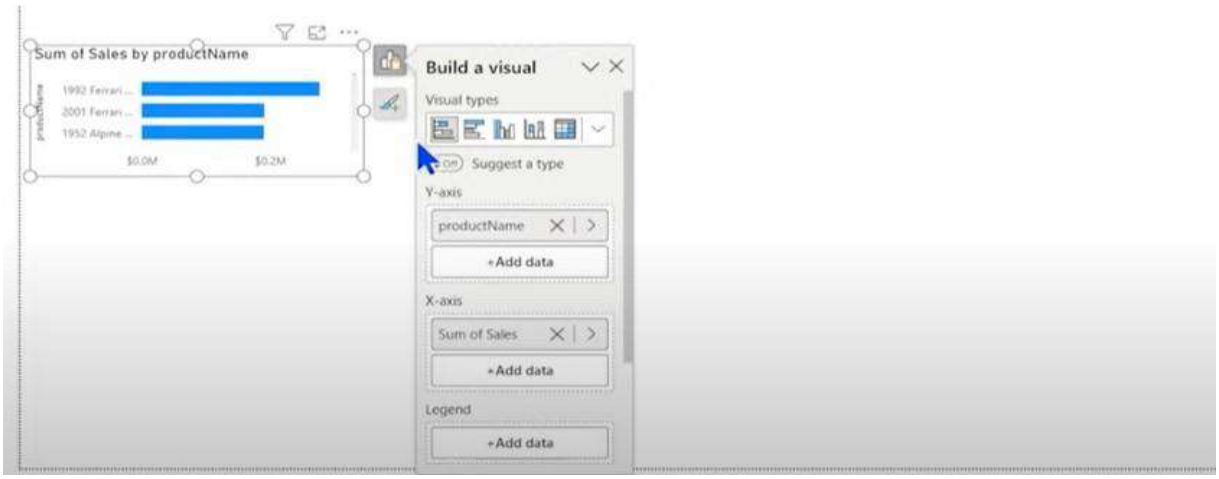
Visuals in PowerBI:-

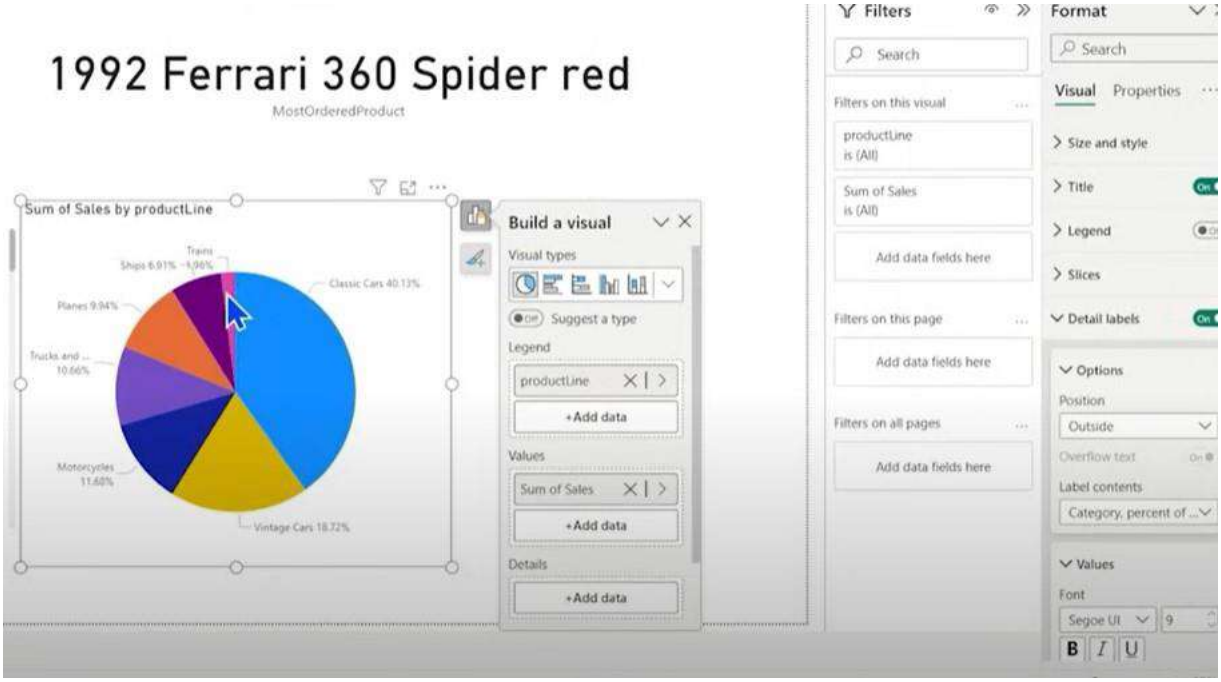
->Click on **Report view** to create visuals.

->Right click on chart and click format option to customize chart.



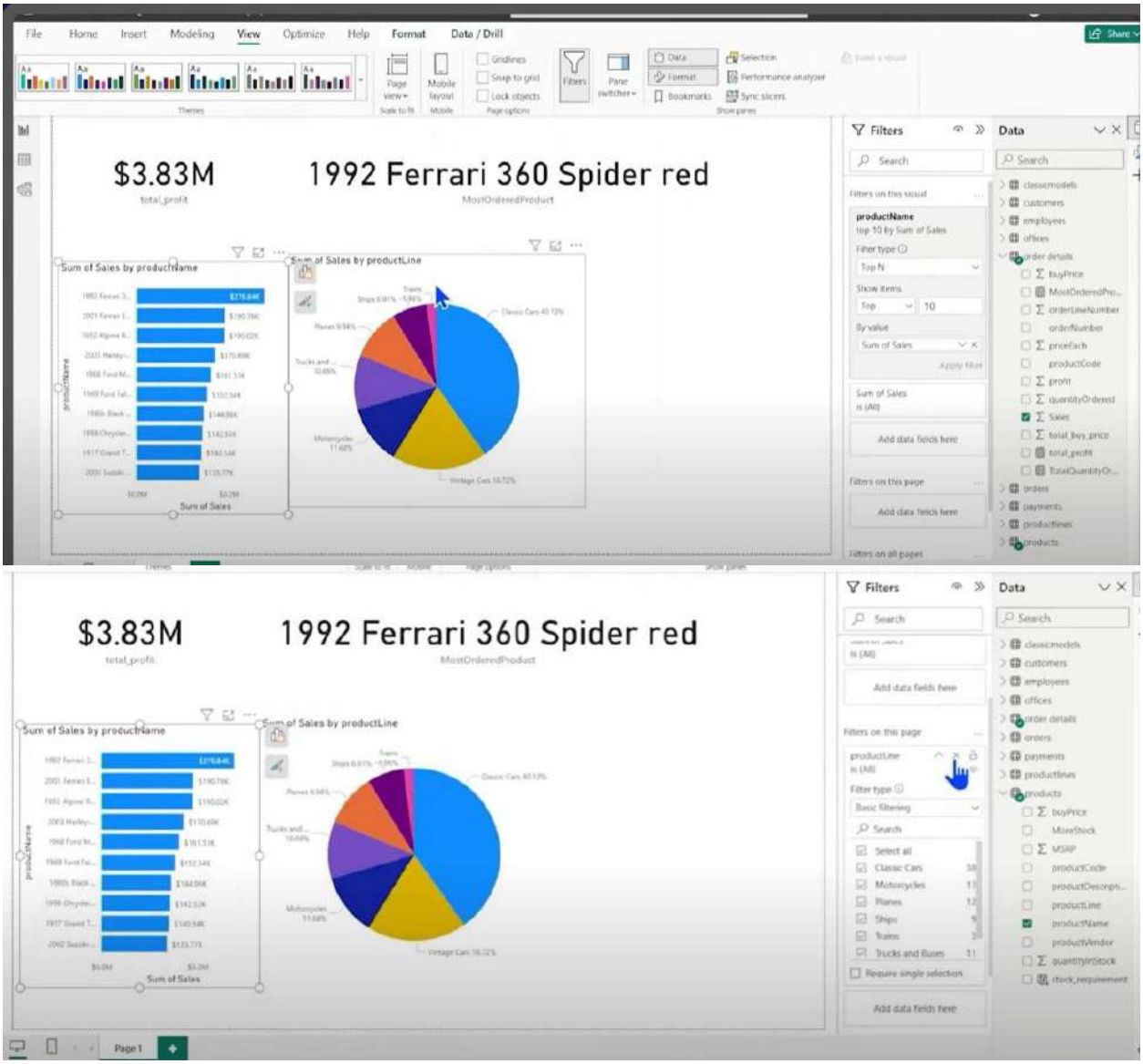



Sum of Sales by productName
1992 Ferrari ...
2001 Ferrari ...
1952 Alpine ...
productName
$0.0M
$0.2M
Build a visual
Visual types
Suggest a type
Y-axis
productName
+Add data
X-axis
Sum of Sales
+Add data
Legend
+Add data


1992 Ferrari 360 Spider red
MostOrderedProduct
Sum of Sales by productLine
Trains
Ships 6.91%
Classic Cars 40.13%
Planes 9.94%
Trucks and ... 10.66%
Motorcycles 11.60%
Vintage Cars 18.72%
Build a visual
Visual types
Suggest a type
Legend
productLine
+Add data
Values
Sum of Sales
+Add data
Details
+Add data
Filters
Search
Filters on this visual
productLine is (All)
Sum of Sales is (All)
Add data fields here
Filters on this page
Add data fields here
Filters on all pages
Add data fields here
Format
Search
Visual
Properties
Size and style
Title
Legend
Slices
Detail labels
Options
Position
Outside
Overflow text
Label contents
Category, percent of ...
Values
Font
Segoe UI
9
B
I
U

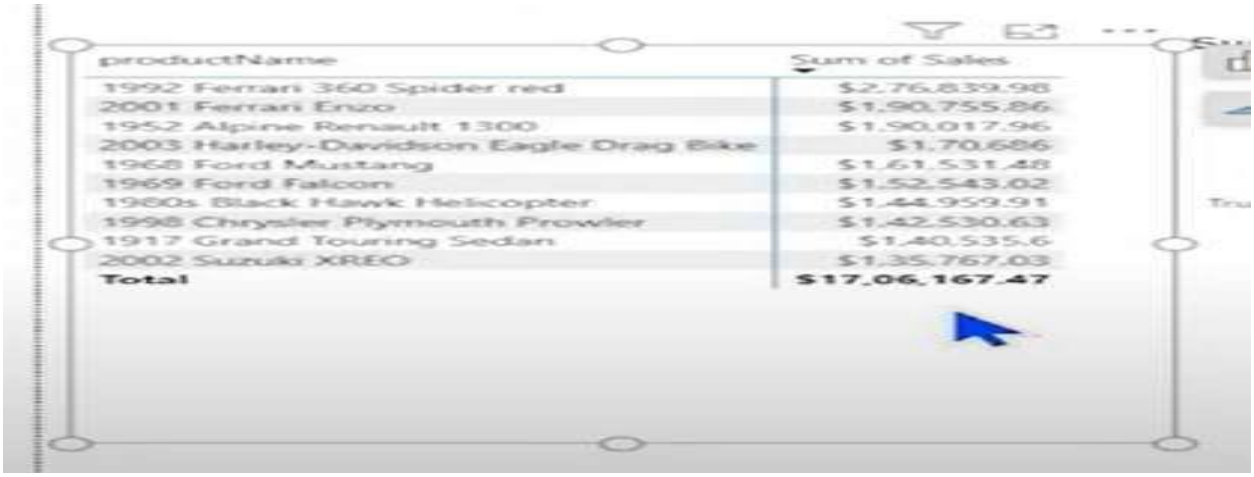
Filtering options in PowerBI:-

->Example suppose we want to find out information about only first 5 products from all the products list we can use filter options.

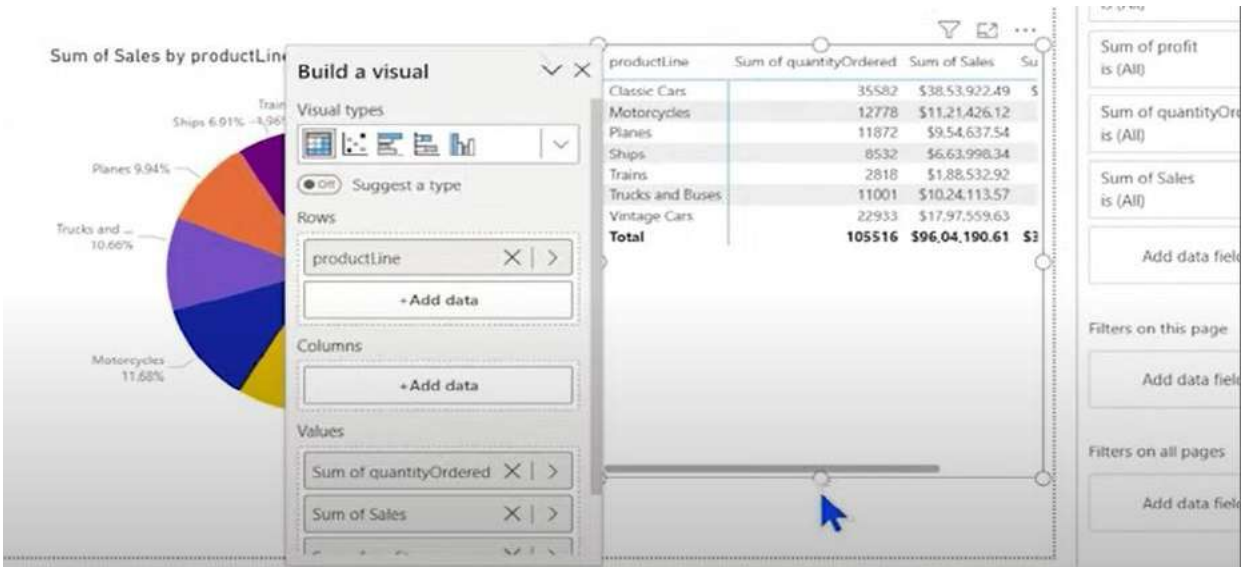


Matrix in PoweBI:-

->Converting existing graph into matrix

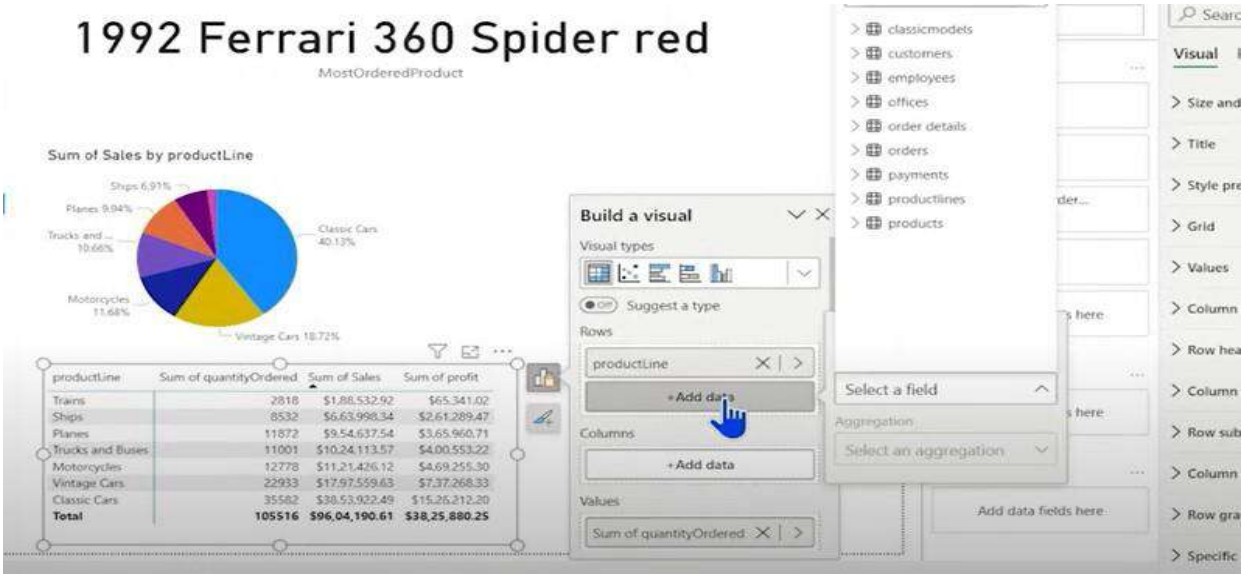


->Creating you own new matrix



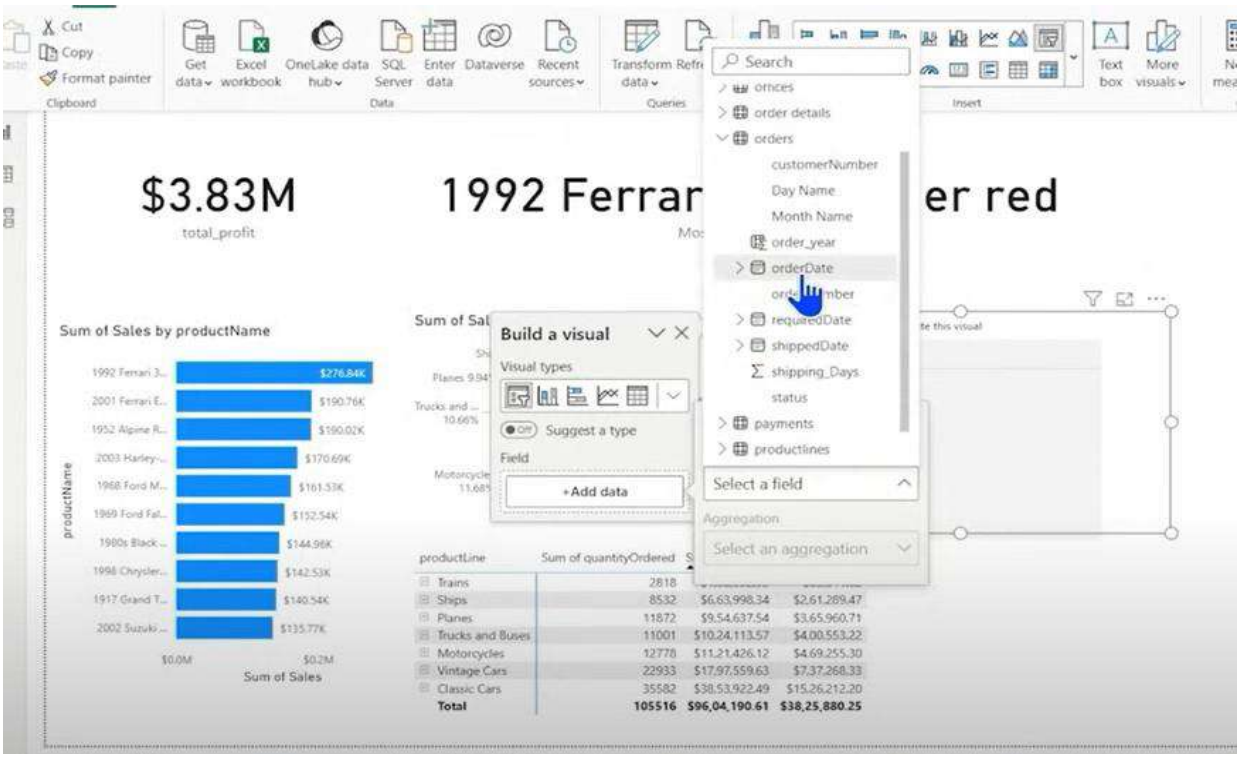
->You can also format matrix such as adding colors etc.. from format tab.

->Creating subcategory of a category.



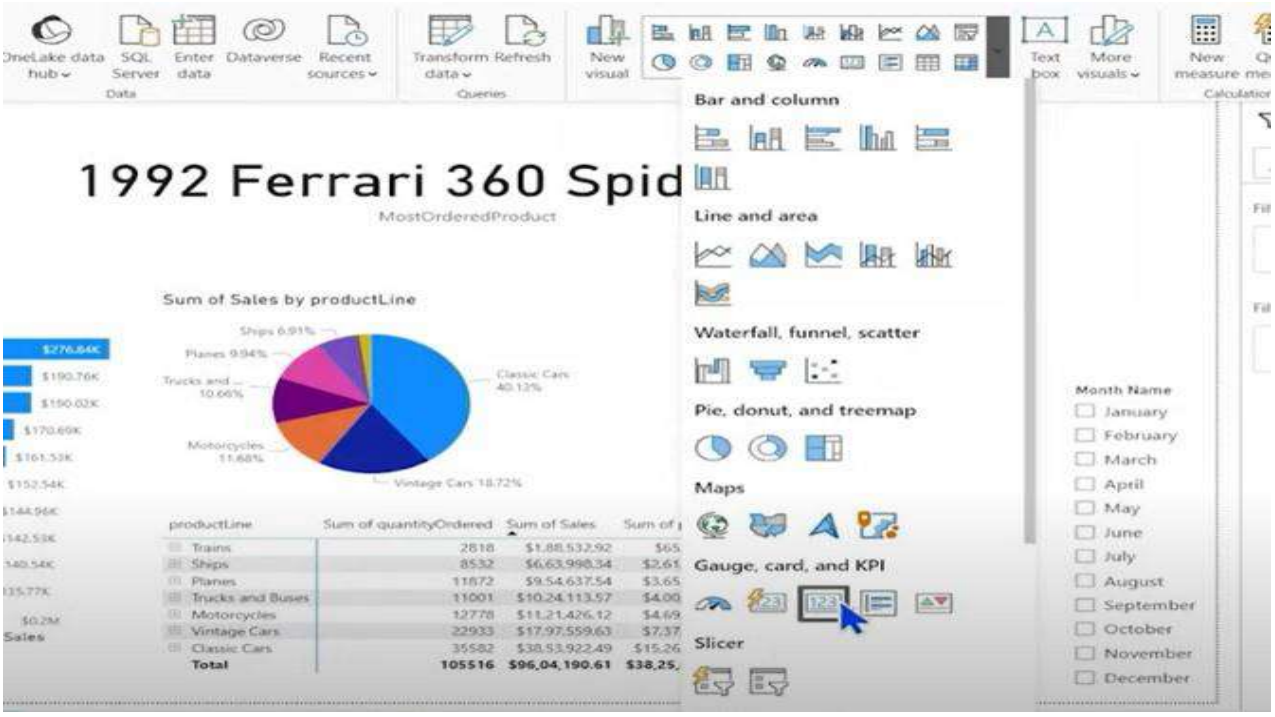
Using Slicers to filter Data:-

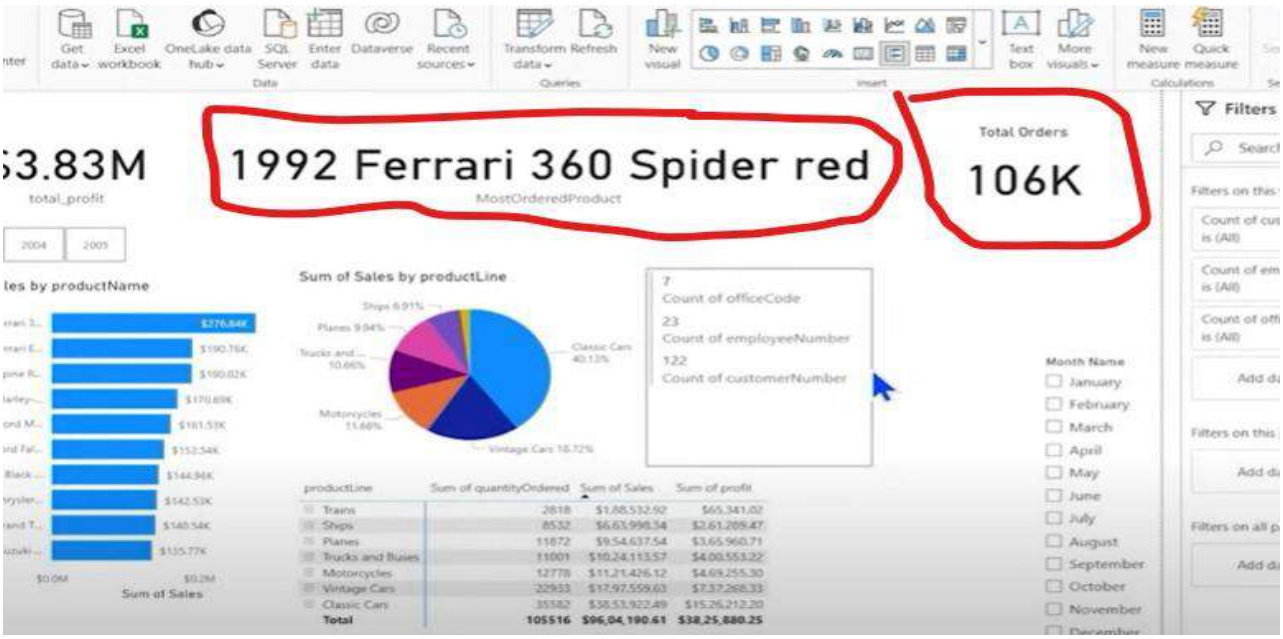
By using this feature you can filter data based on month , year etc…



Number cards and Text cards:-

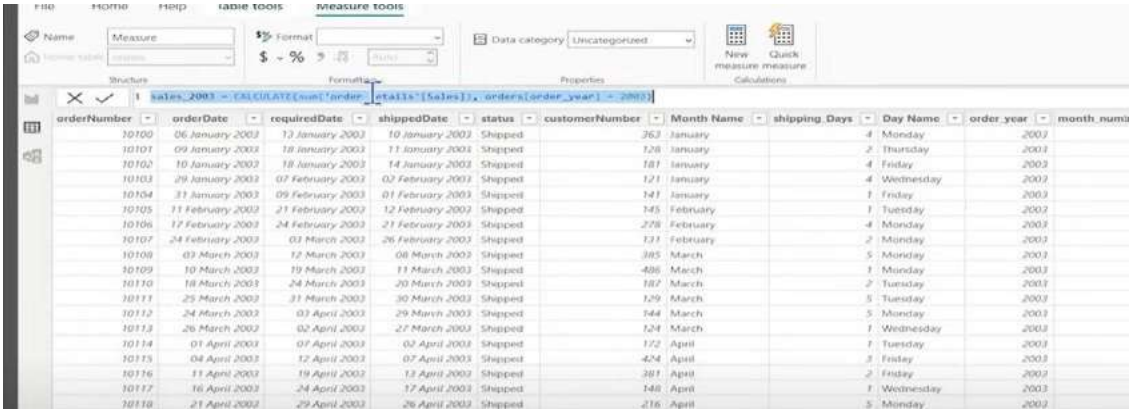
Cards are used to display things such as product that is ordered highest number of times.

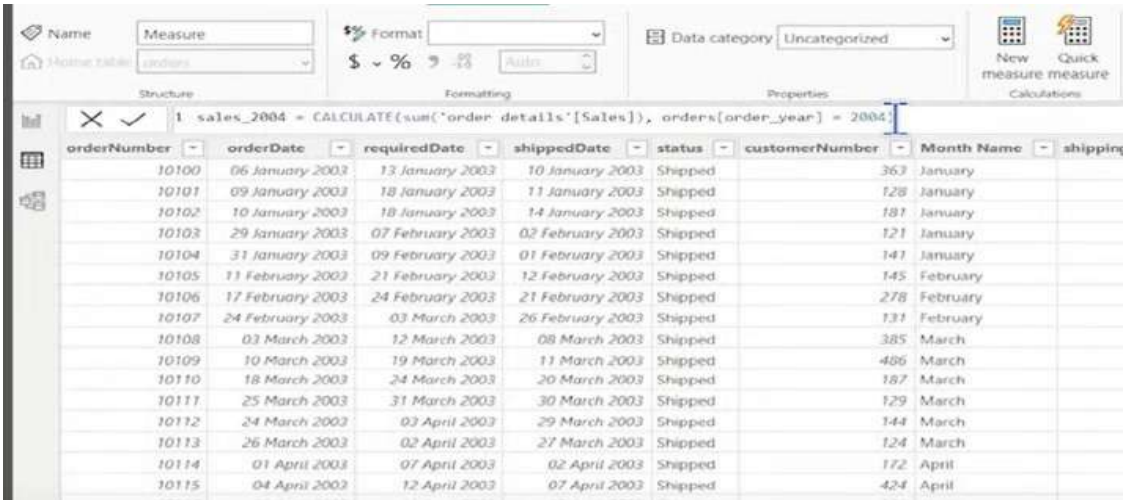




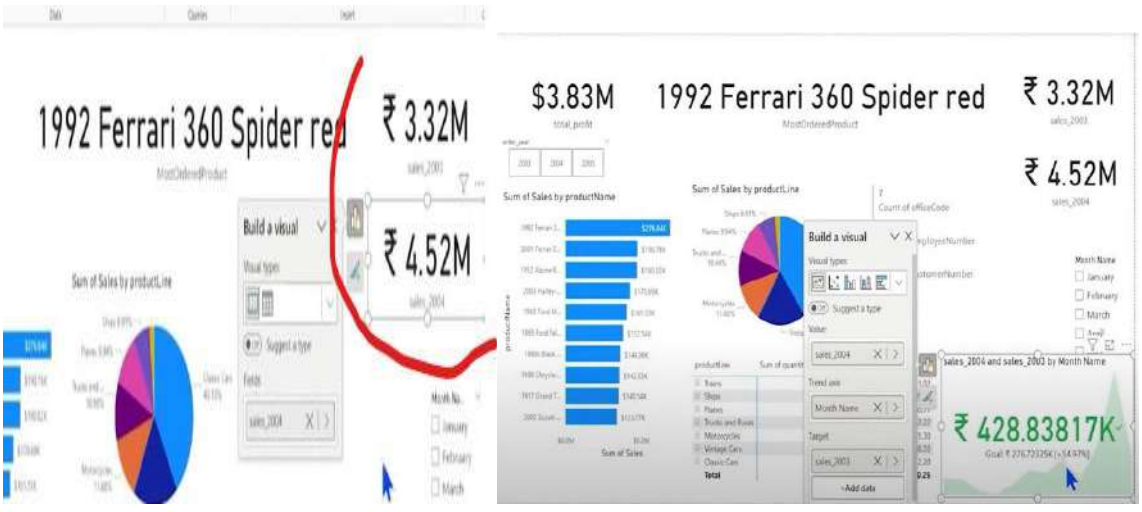
KPI VISUALS:-

->Used to handle cases such as it you want to find out how much sale is decreased or increased in comparison to previous years.

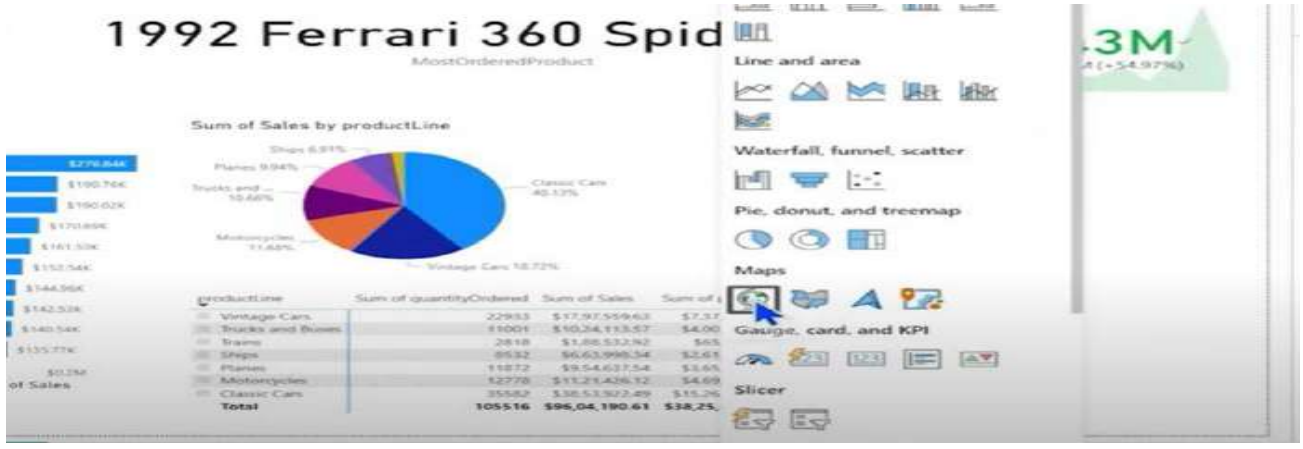




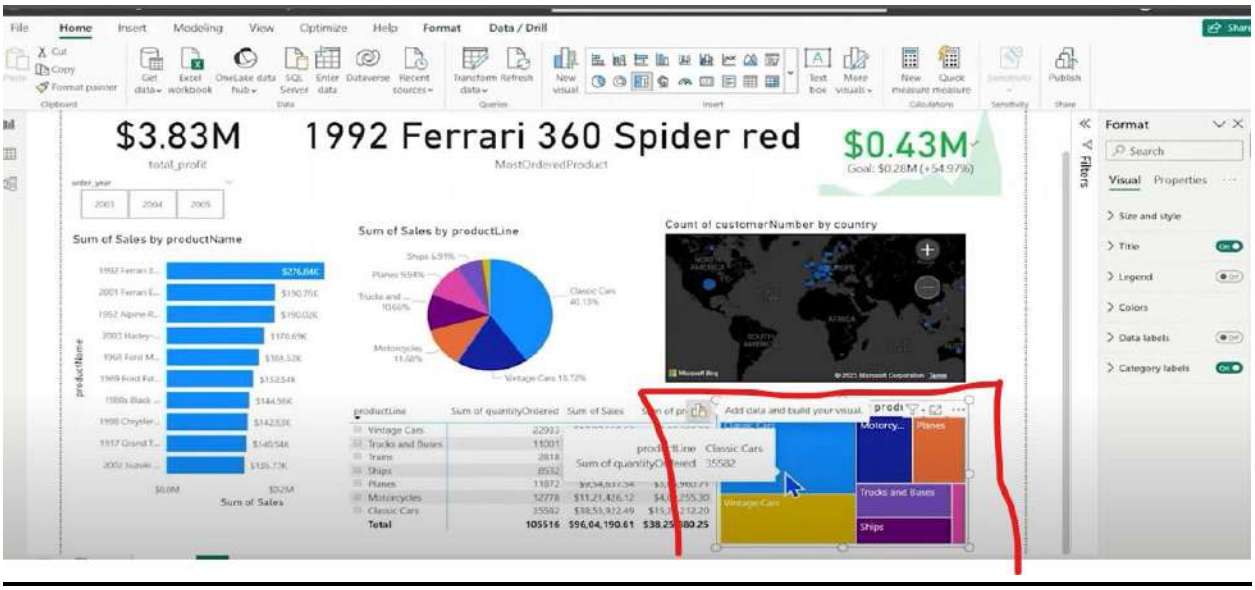
orderNumber	orderDate	requiredDate	shippedDate	status	customerNumber	Month Name	shipping_Days	Day Name	order_year	month_numb
10100	06 January 2003	13 January 2003	10 January 2003	Shipped	363	January	4	Monday	2003	
10101	09 January 2003	18 January 2003	11 January 2003	Shipped	128	January	2	Thursday	2003	
10102	10 January 2003	18 January 2003	14 January 2003	Shipped	181	January	4	Friday	2003	
10103	29 January 2003	07 February 2003	02 February 2003	Shipped	121	January	4	Wednesday	2003	
10104	31 January 2003	09 February 2003	01 February 2003	Shipped	141	January	1	Friday	2003	
10105	11 February 2003	21 February 2003	12 February 2003	Shipped	145	February	1	Tuesday	2003	
10106	17 February 2003	24 February 2003	21 February 2003	Shipped	278	February	4	Monday	2003	
10107	24 February 2003	03 March 2003	26 February 2003	Shipped	131	February	2	Monday	2003	
10108	03 March 2003	12 March 2003	08 March 2003	Shipped	385	March	5	Monday	2003	
10109	10 March 2003	19 March 2003	11 March 2003	Shipped	486	March	1	Monday	2003	
10110	18 March 2003	24 March 2003	20 March 2003	Shipped	187	March	2	Tuesday	2003	
10111	25 March 2003	31 March 2003	30 March 2003	Shipped	129	March	5	Tuesday	2003	
10112	24 March 2003	03 April 2003	29 March 2003	Shipped	144	March	5	Monday	2003	
10113	26 March 2003	02 April 2003	27 March 2003	Shipped	124	March	1	Wednesday	2003	
10114	01 April 2003	07 April 2003	02 April 2003	Shipped	172	April	1	Tuesday	2003	
10115	04 April 2003	12 April 2003	07 April 2003	Shipped	424	April	3	Friday	2003	
10116	11 April 2003	19 April 2003	13 April 2003	Shipped	381	April	2	Friday	2003	
10117	16 April 2003	24 April 2003	17 April 2003	Shipped	148	April	1	Wednesday	2003	
10118	21 April 2003	29 April 2003	26 April 2003	Shipped	216	April	5	Monday	2003	



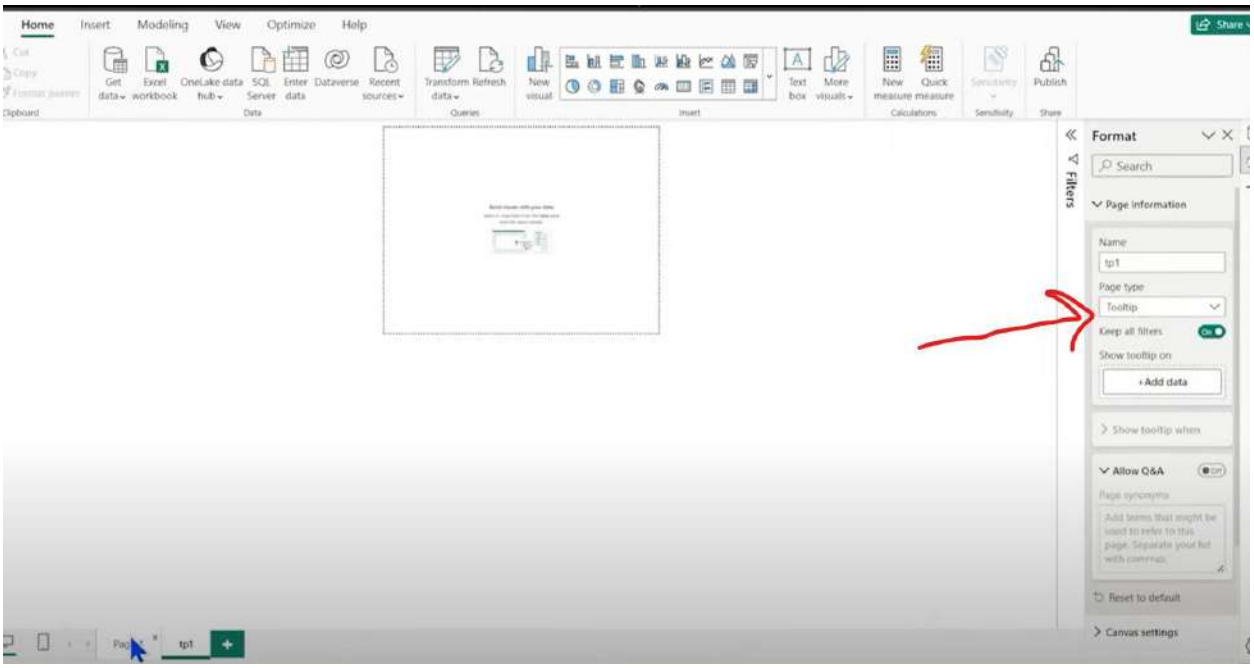
Visulization Maps in PowerBi:-



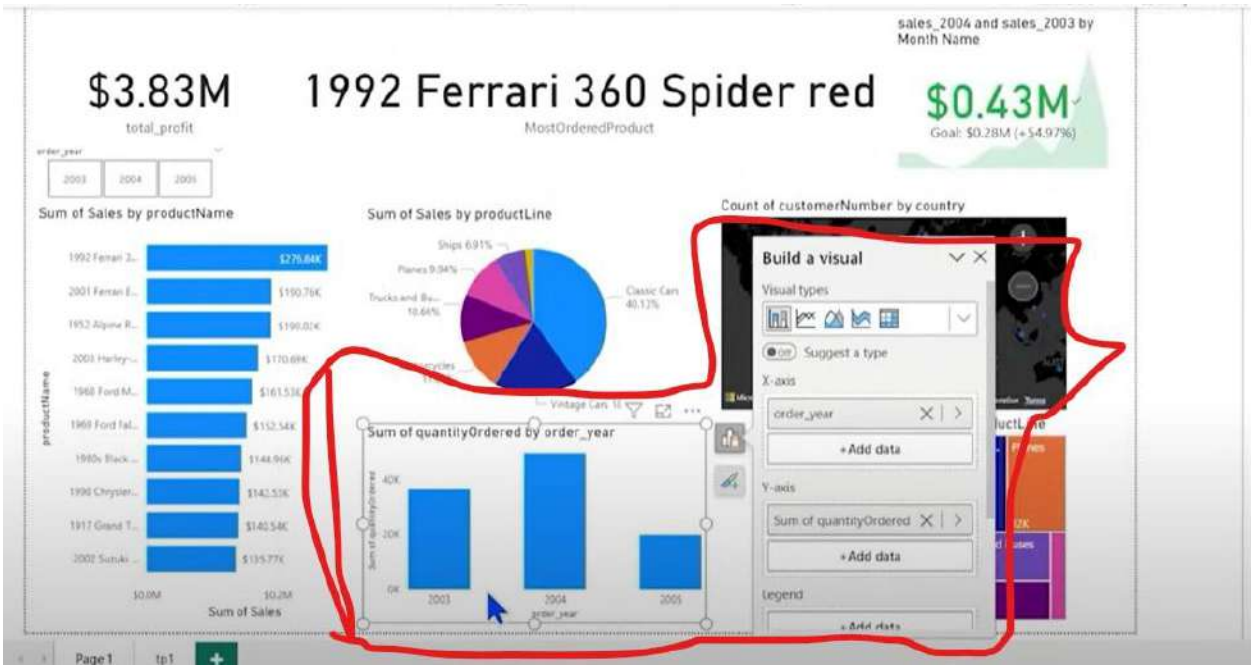
TREE MAP :-



ToolTip:-

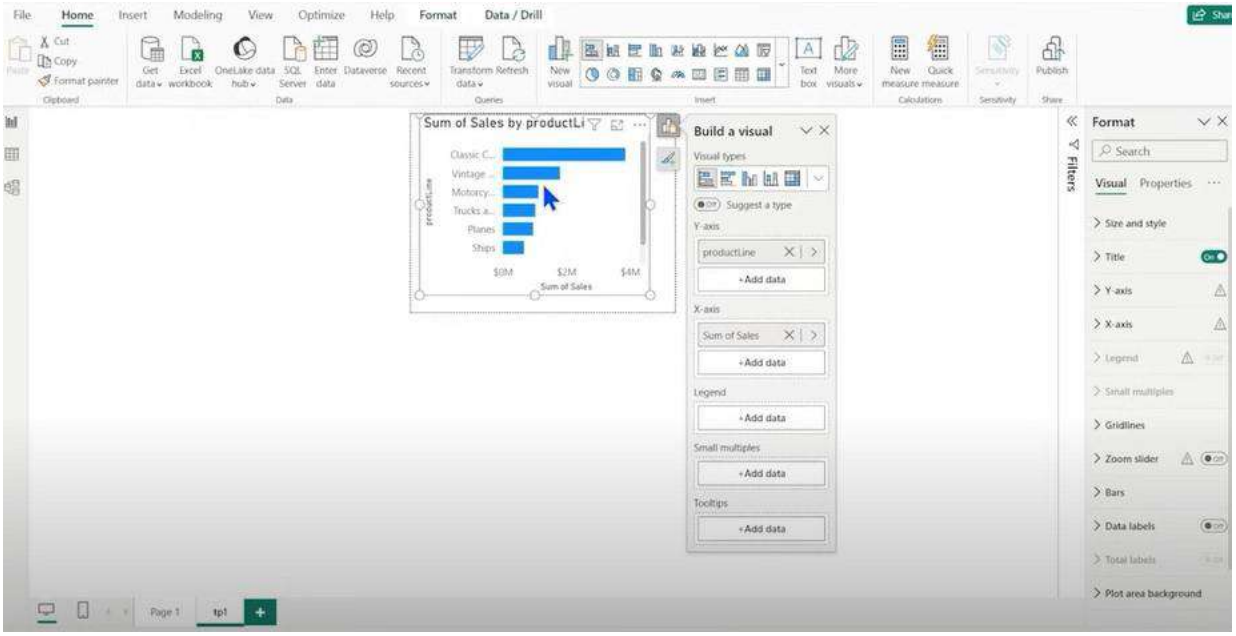


->Consider the graph below:-

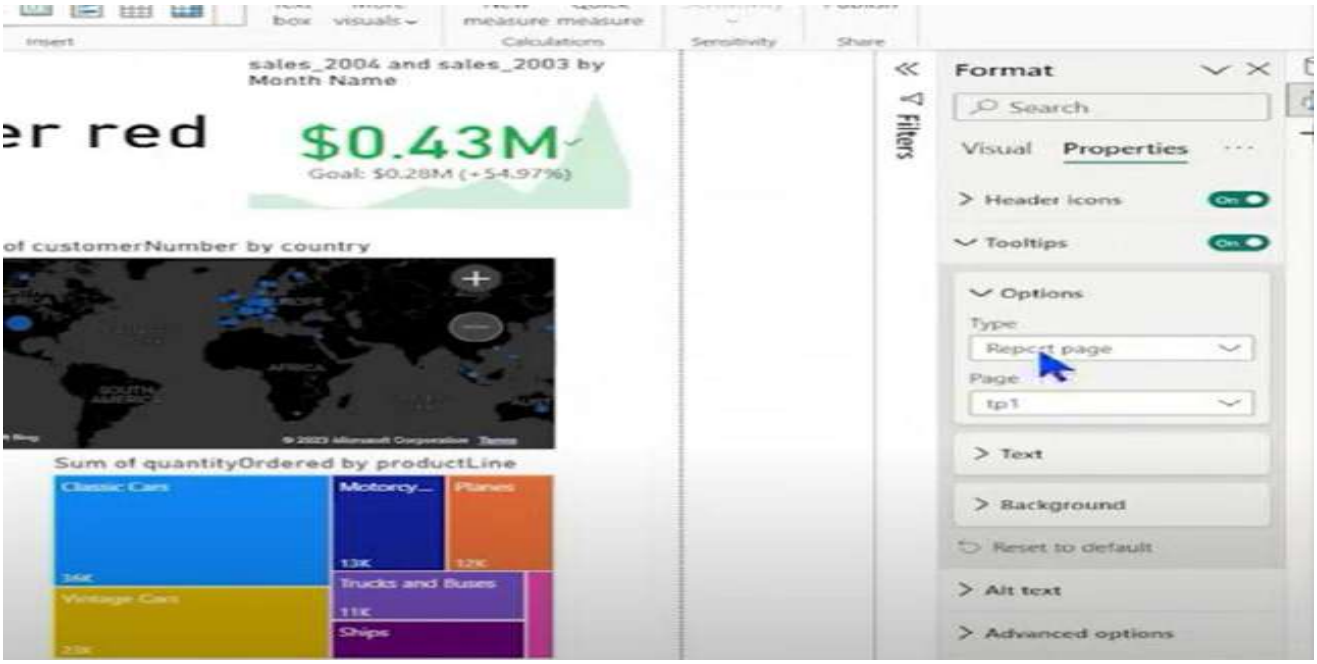


->Now what we want is , whenever we hover on 2003 then we should get a chart showing different categories sales for that year.

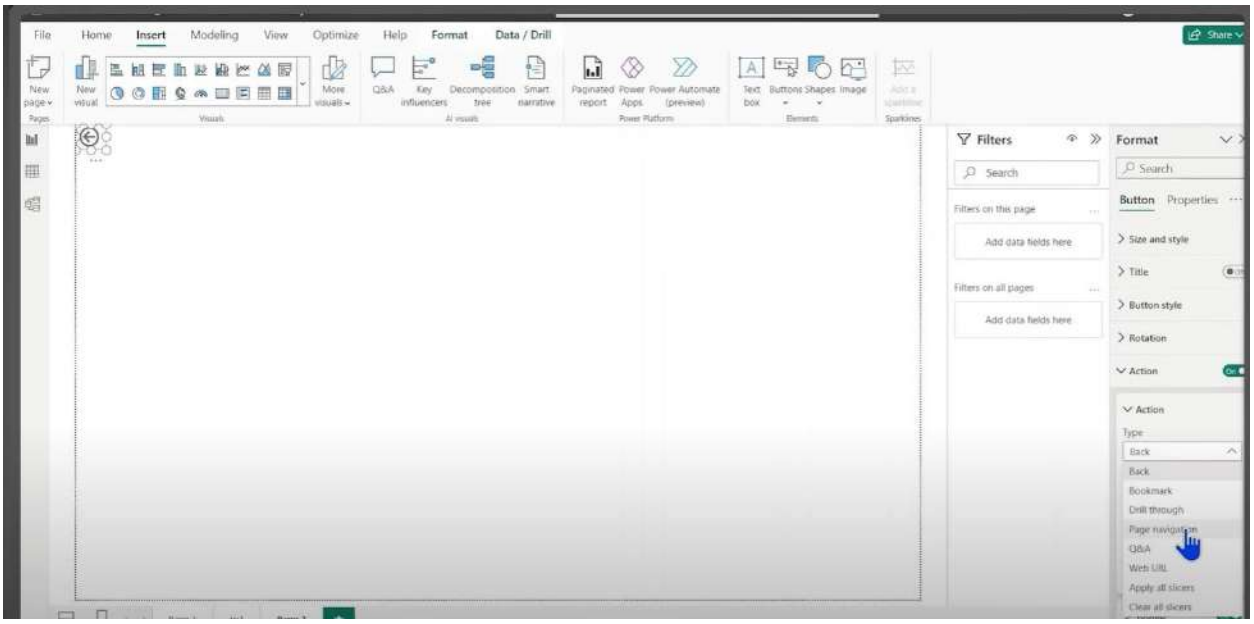
->Go to the “tp1 page” in first image and add a chart.



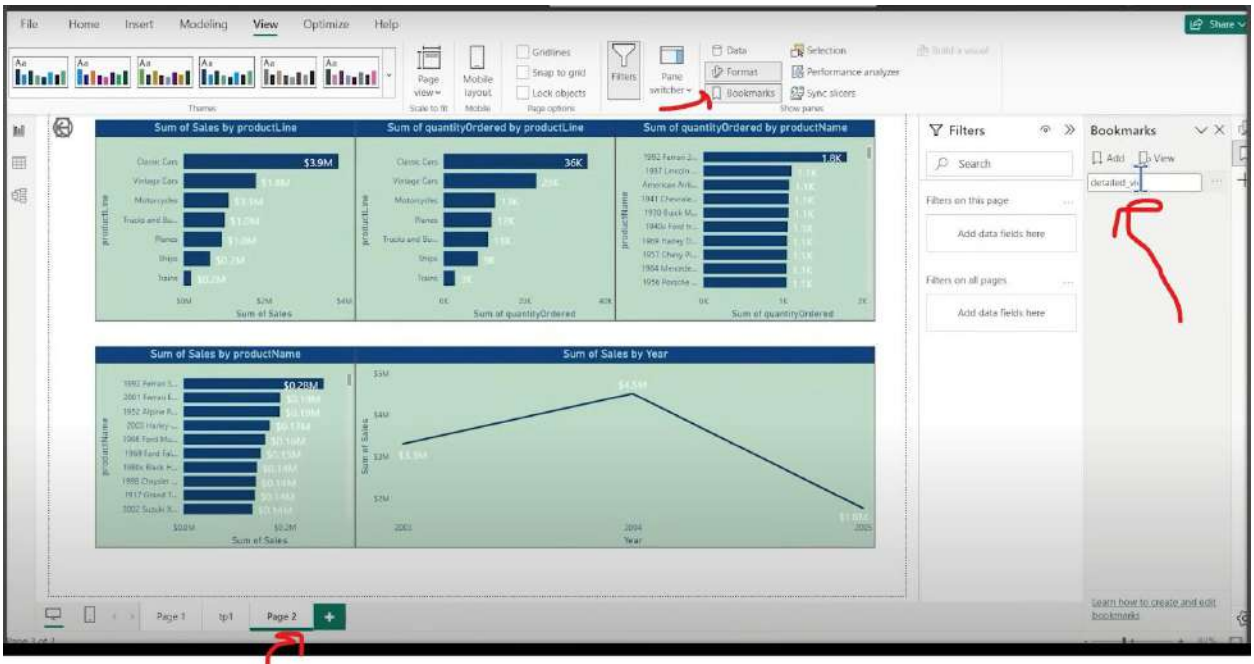
->Again go to page1 and select the chart , click on properties , click on tooltips and set page to tp1.

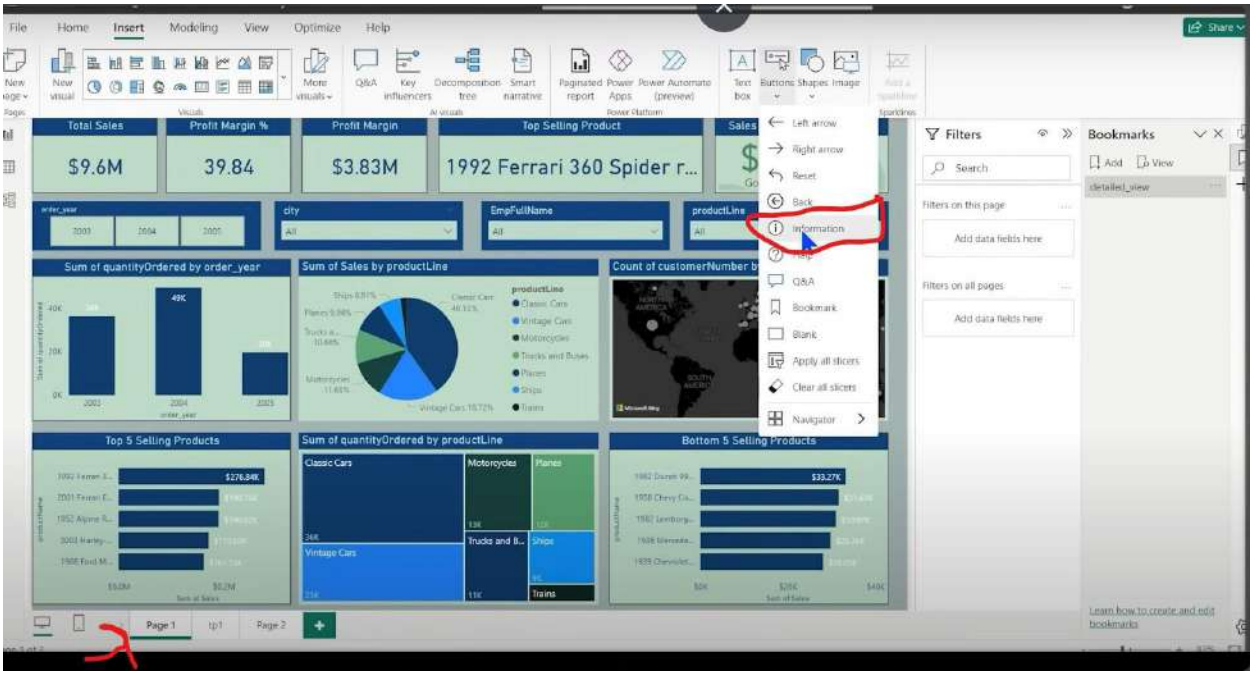


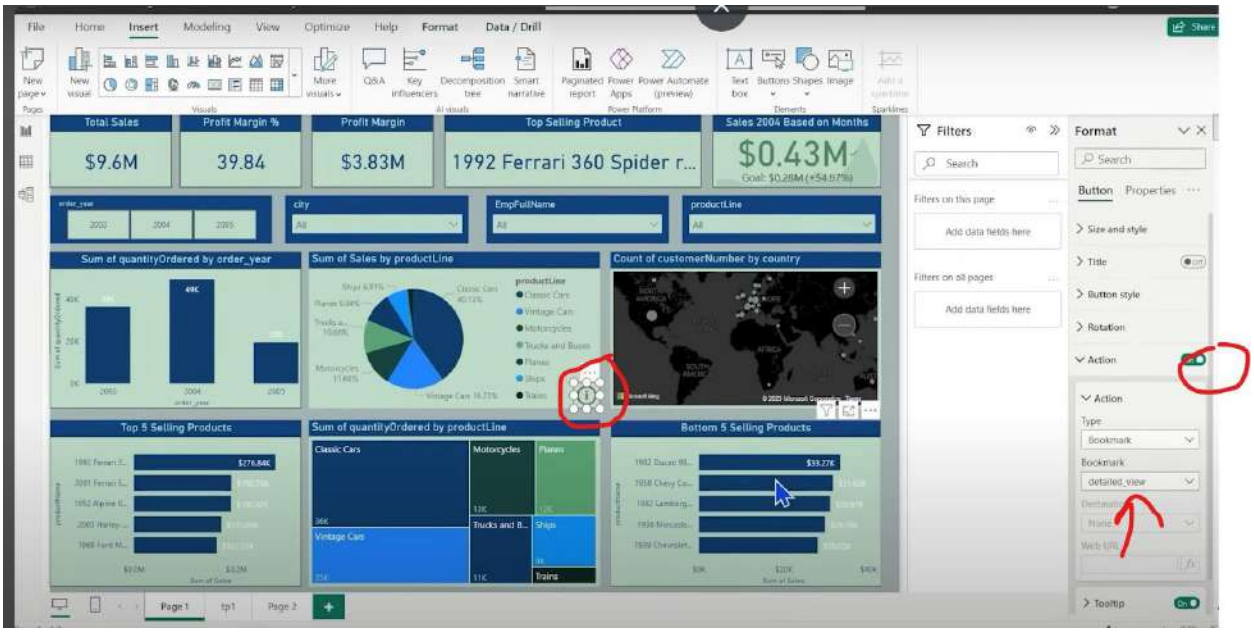
Adding Button:-



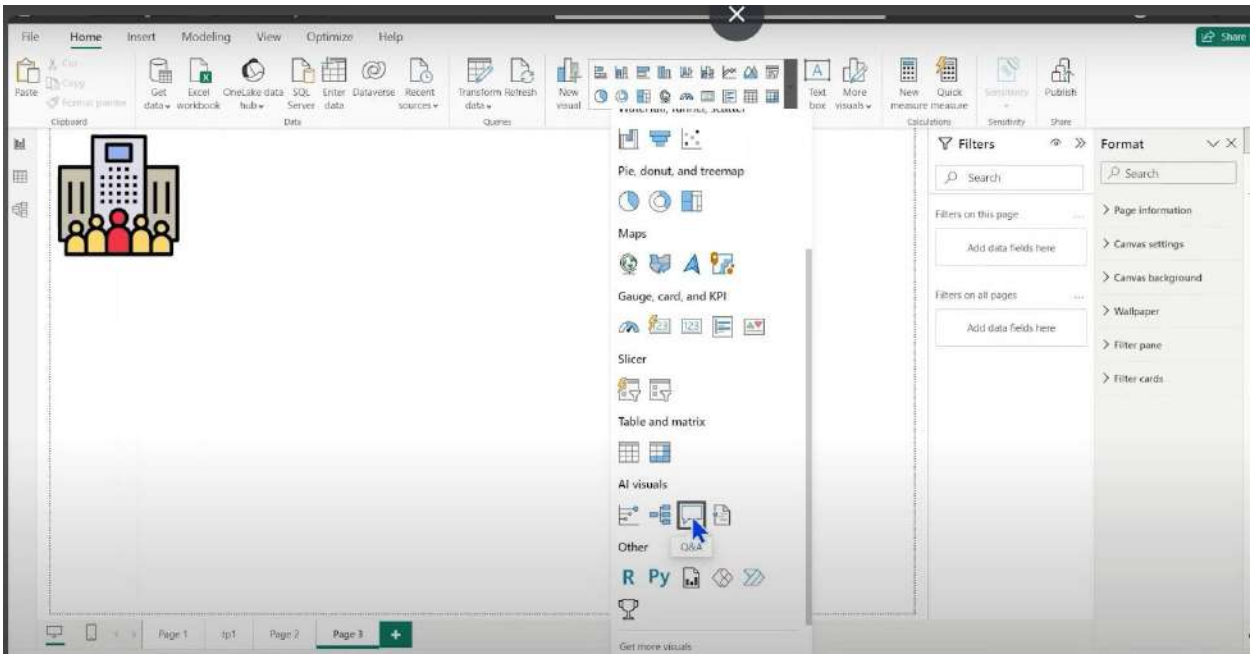
Adding bookmarks:-



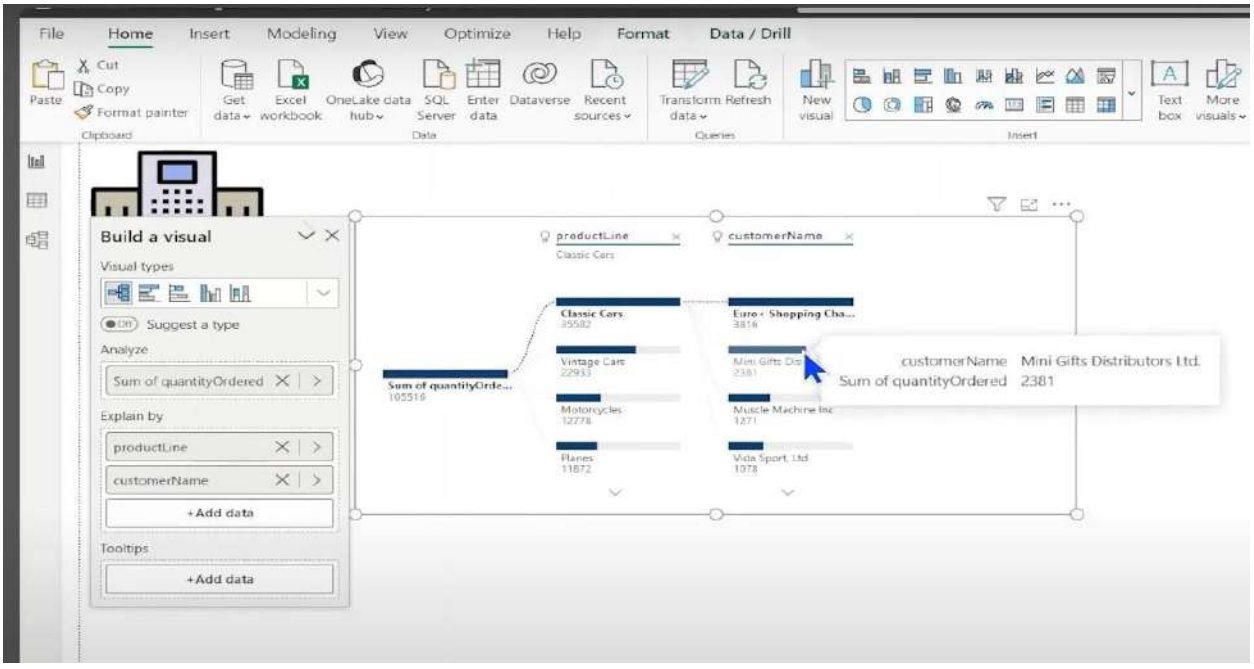

File
Home
Insert
Modeling
View
Optimize
Help
Total Sales
$9.6M
Profit Margin %
39.84
Profit Margin
$3.83M
Top Selling Product
1992 Ferrari 360 Spider r...
Left arrow
Right arrow
Reset
Back
Information
Help
Q&A
Bookmark
Blank
Apply all slicers
Clear all slicers
Navigator
Filters
Bookmarks
Sum of quantityOrdered by order_year
Sum of Sales by productLine
Count of customerNumber b
Top 5 Selling Products
Sum of quantityOrdered by productLine
Bottom 5 Selling Products
Page 1
Page 2


File
Home
Insert
Modeling
View
Optimize
Help
Format
Data / Drill
Total Sales
$9.6M
Profit Margin %
39.84
Profit Margin
$3.83M
Top Selling Product
1992 Ferrari 360 Spider r...
Sales 2004 Based on Months
$0.43M
Filters
Format
Button
Properties
Size and style
Title
Button style
Rotation
Action
Type
Bookmark
detailed_view
Tooltip
Sum of quantityOrdered by order_year
Sum of Sales by productLine
Count of customerNumber by country
Top 5 Selling Products
Sum of quantityOrdered by productLine
Bottom 5 Selling Products
Page 1
Page 2

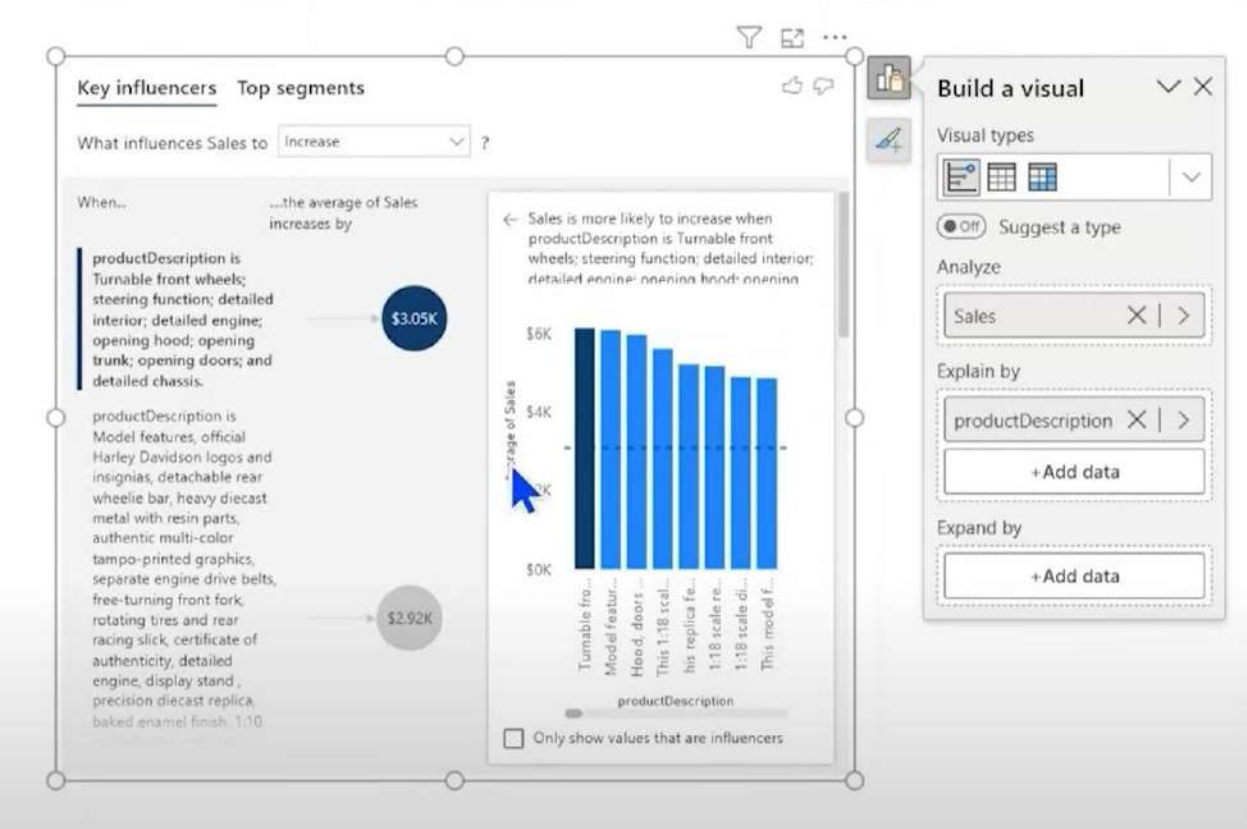
A.I Visuals in Powerbi:-



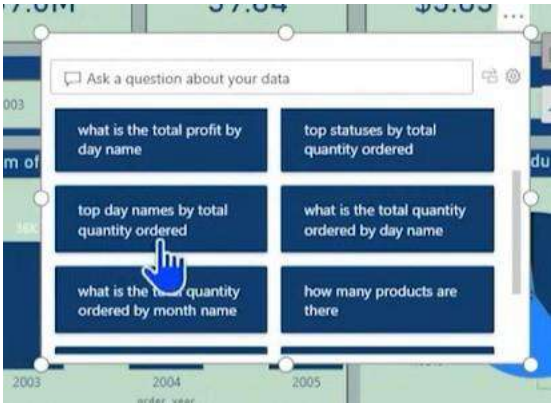
Decomposition tree



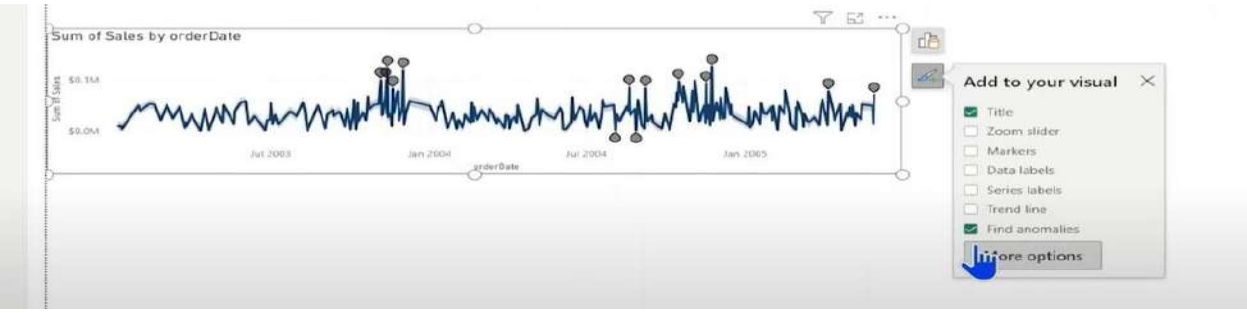
Smart Narrative visuals



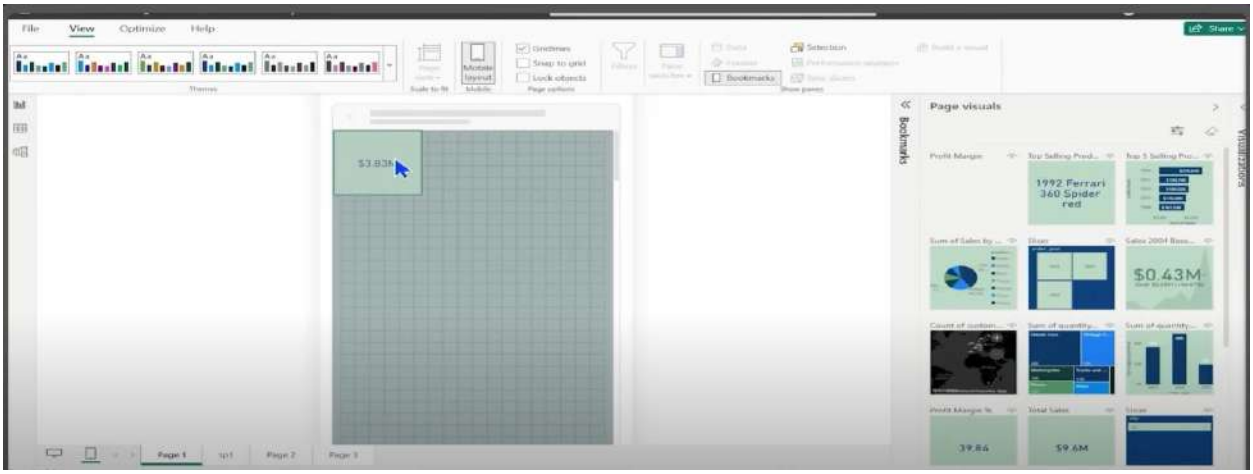
Q&A



Handling or Marking anonymous trends



Converting Desktop to Mobile Visuals



Publishing Reports