Data analysis and visualization with Power BI Desktop

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Introduction

Power BI is a Data Visualization and Business Intelligence tool that converts data from different data sources to interactive dashboards and BI reports. Power BI suite provides multiple software, connector, and services - Power BI desktop, Power BI service based on Saas, and mobile Power BI apps available for different platforms. These set of services are used by business users to consume data and build BI reports.

Power BI desktop app is used to create reports, while Power BI Services (Software as a Service - SaaS) is used to publish the reports, and Power BI mobile app is used to view the reports and dashboards.

Power BI Desktop is available in both 32-bit and 64-bit versions. To download the latest version, you can use the following link –
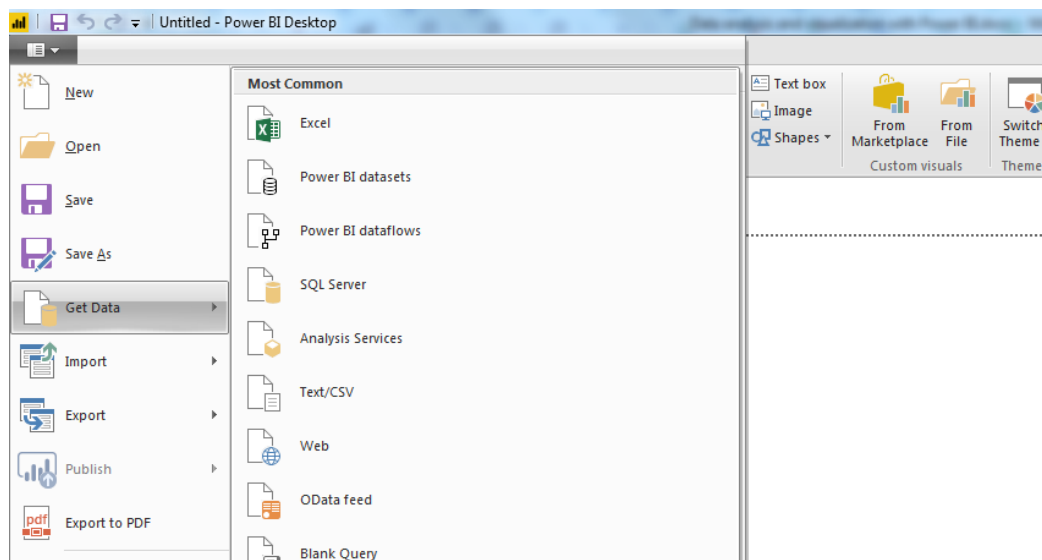
https://powerbi.microsoft.com/en-us/downloads/

Task 1. Data import

In this exercise, we import data from Excel to Power BI desktop. Please, follow the screenshots

From the top menu choose "Get Data" -> Excel

Open the file: Sample Dataset Cars.xlsx

Choose "Cars" worksheet (you will see the preview of the worksheet) and click "Load".

To see your data imported choose the icon on the left side of the screen.

Task 2. Data preparation

Task 2.1. Setting data types

Data preparation is the act of manipulating (or pre-processing) raw data into a form that can readily and accurately be analyzed.

On the right side of the screen there is a data structure of the table "Cars". Some of the data fields are marked with the symbol Σ. This means that the field is treated as number (other fields can be text or date).

We need to change the type of some fields that should be numbers, these are:

- Year_resale_value
- Curb_weight
- Engine_size
- Fuel_capacity
- Length
- Price_in_thousands
- Sales_in_thousands
- Width

To change the type of the fields, click the icon of three dots, and choose "Edit query"

This will switch to the edit mode, where you can change the types of the fields.

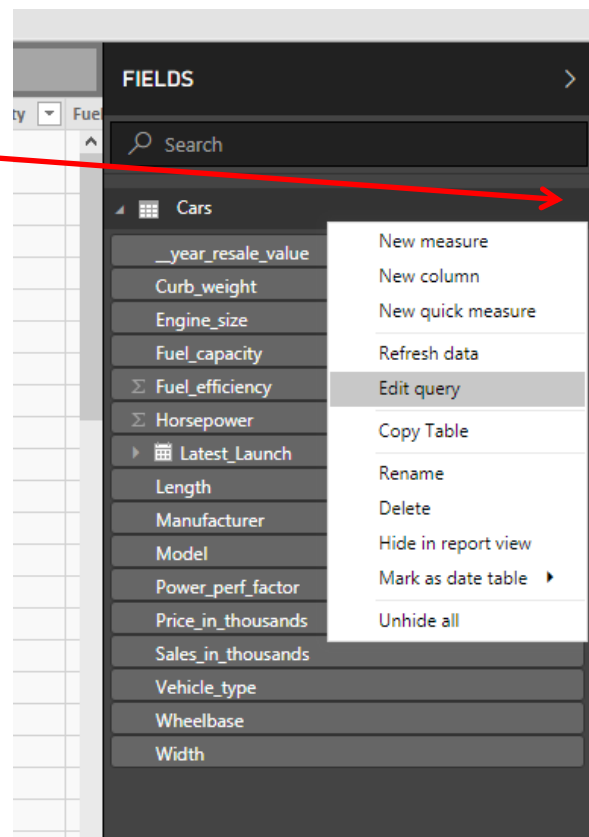Choose the ribbon "Transform", where you can find the options of changing field type.
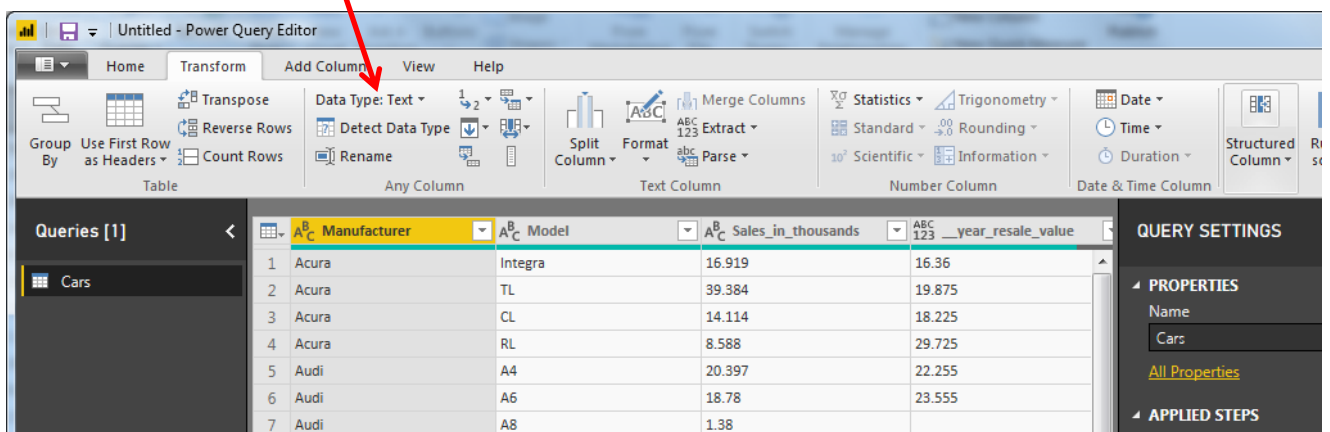

**Figure List of fields in the table**

Click on the column header to select data type from the drop-down menu. For the fields that should be in currency format choose "Using Locale.." option. Choose "English United States"

Do the same for other fields that should be in currency format.

For other fields choose accordingly Decimal Number or Whole Number.

The errors can appear depending on your system local settings (dot or comma as decimal separator).
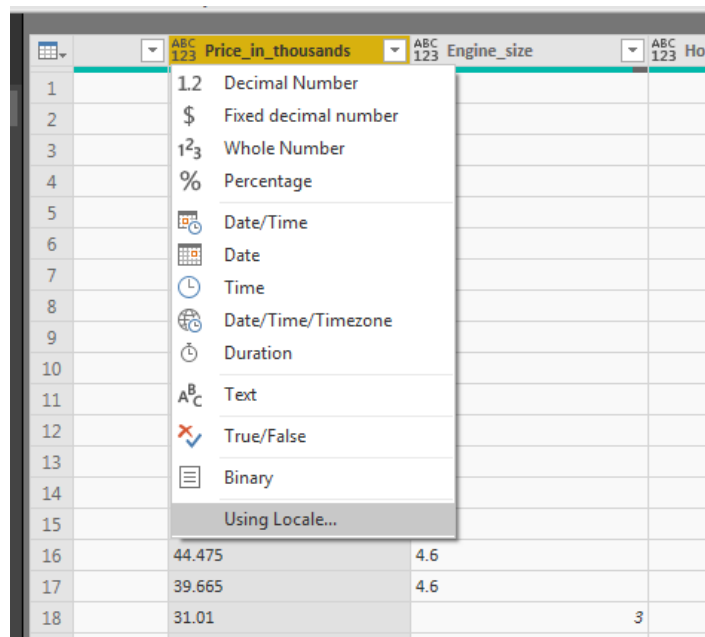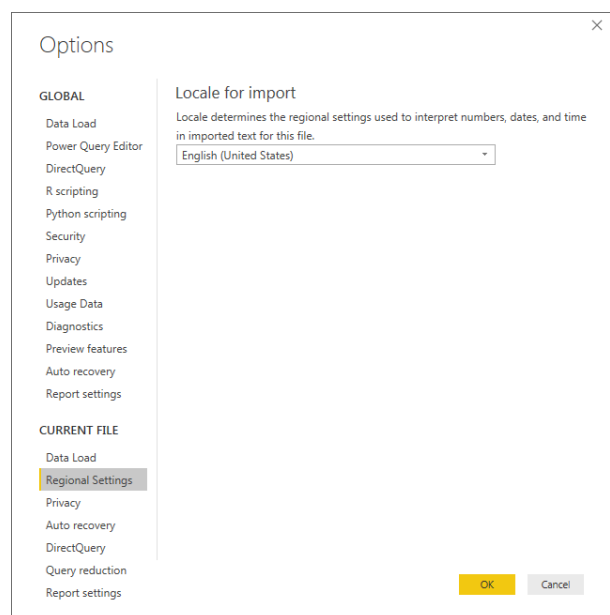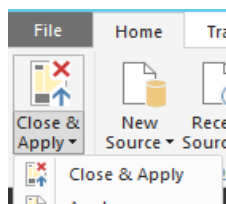
In the case of errors, go to Options and Settings (the button on the left top corner of the screen)

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Change the regional settings to "English (United States)"

When you set the correct type for all the fields, click Close and Apply button (left top of the screen).
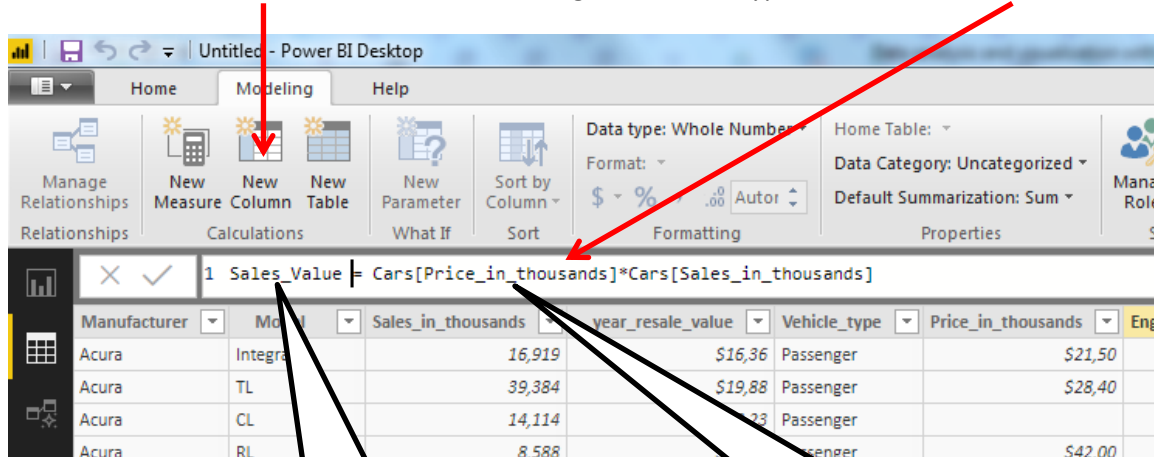
If the wrong currency symbol is displayed you can change it in Modelling Tab.

Task 2.2. Adding calculated columns

In our example of sales analysis of cars there is no column with sales value (which could be useful in reports and visualization). But we can easily add the new column it by multiplying the price and the number of cars sold.

To do this click "New Column" on the "Modeling" ribbon and type in the formula bar:

Change the default name *Column* on *Sales_Value*

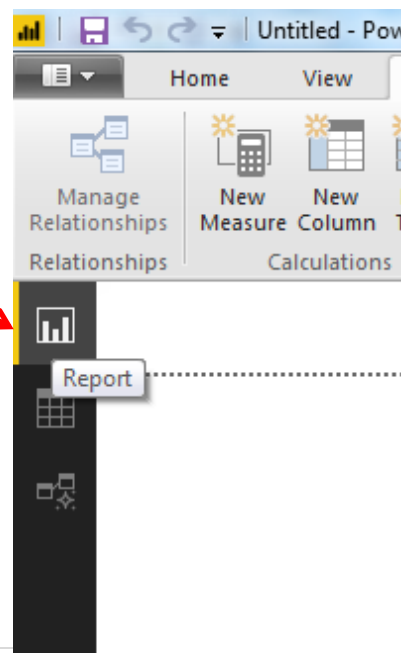Prompts will be shown while typing so you can just start writing and choose the field name ☺

The new column with calculated value should appear as the last one in the dataset.

Task 3. Visualizing data in charts and tables

Now our task is to get some knowledge from the dataset.

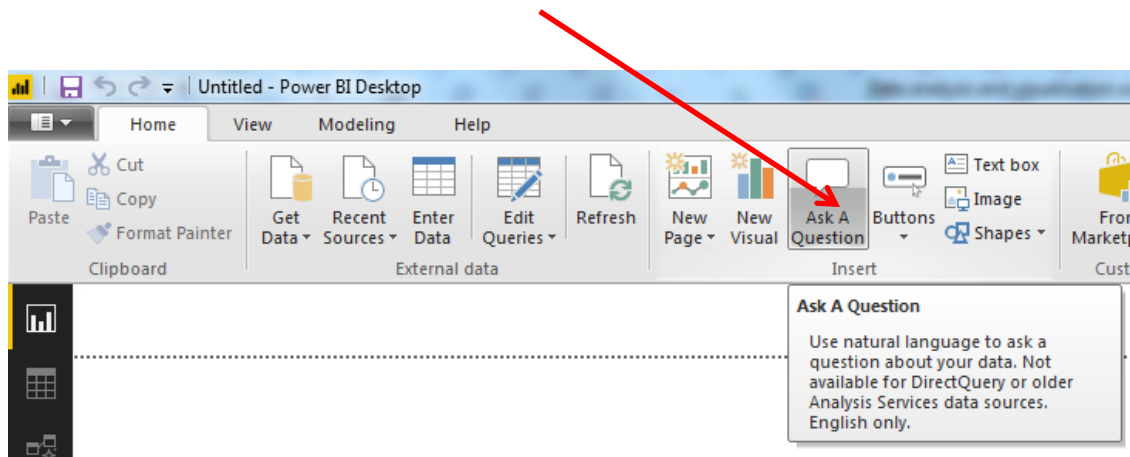Switch to the Report view.

Here we can make new tables and charts.
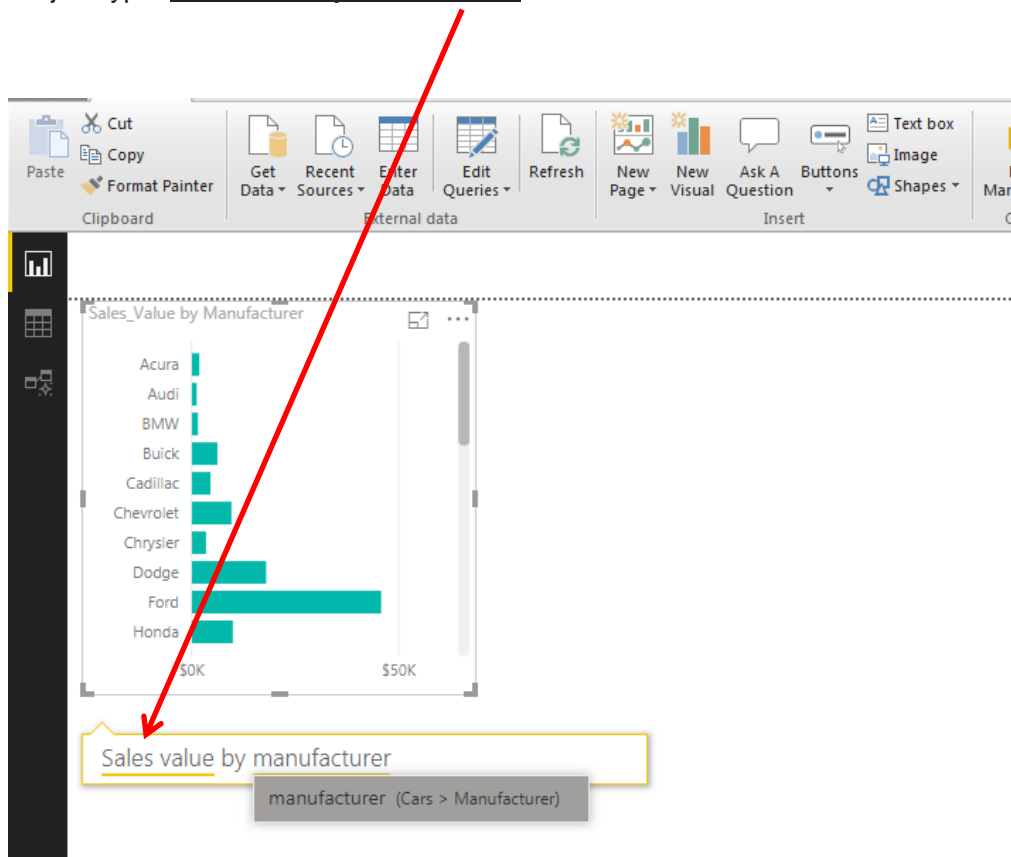
Task 3.1. Natural language queries

In Power BI we can ask (not very sophisticated) queries in natural language. It is useful feature that saves time.

To try this feature click on "Ask a Question"

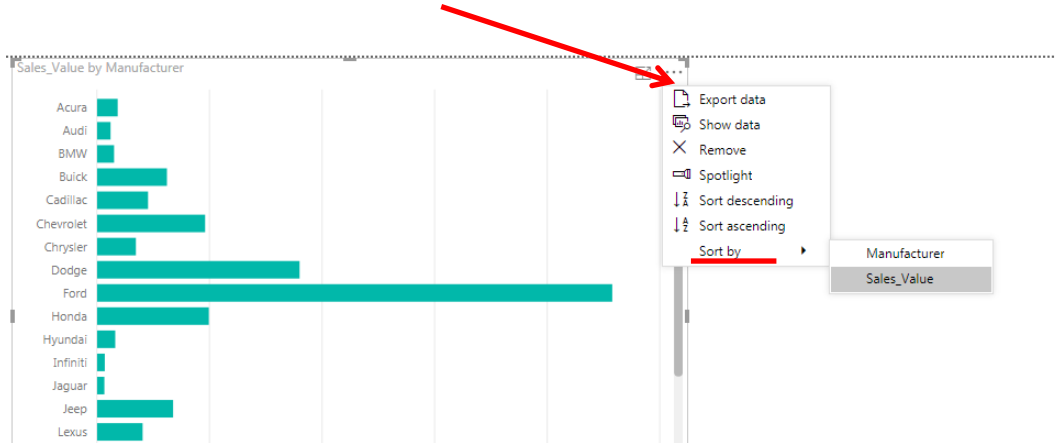Our aim is to get sales value achieved by each of the manufacturers.

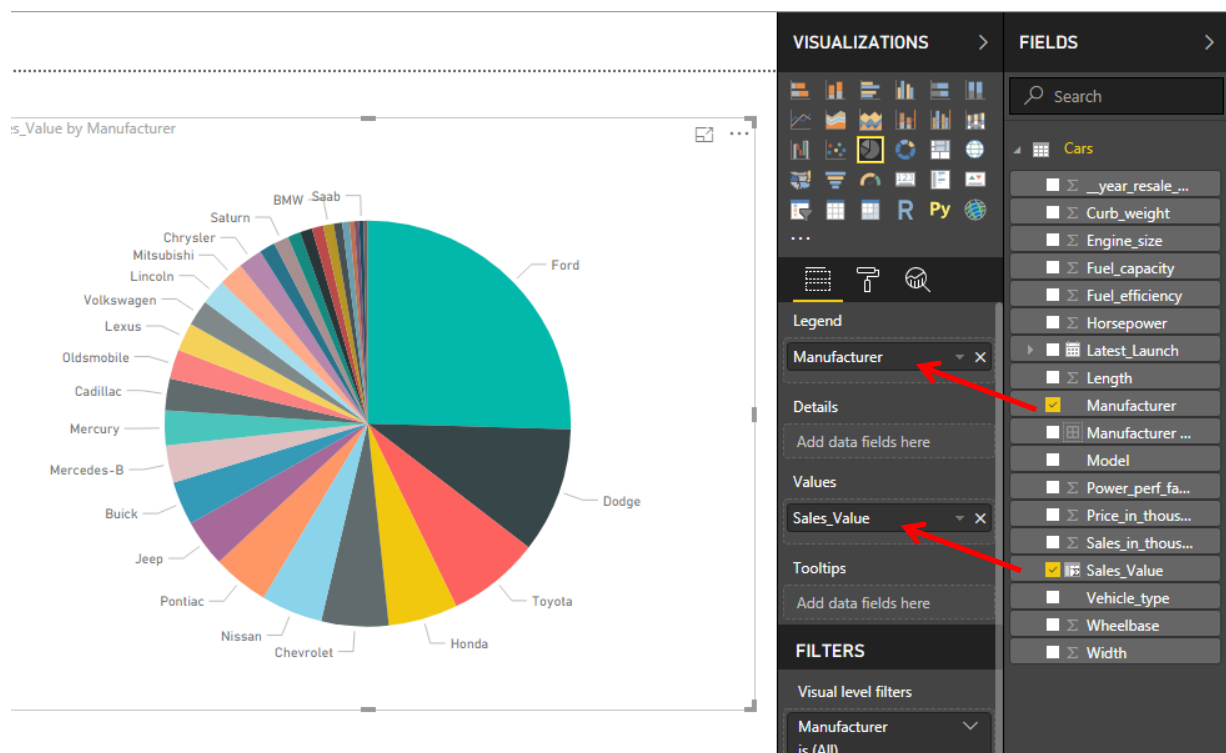So just type: *sales value by manufacturer* and see the results!

Try to ask other questions in natural language, for example *Average fuel efficiency by manufacturer*
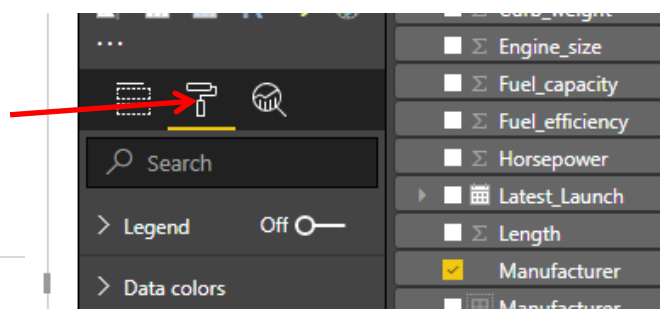
Task 3.2. Changing the layout and format

You can sort the data on the chart by sales value or manufacturer.

Try to add a pie chart to your report. Use the right side of the screen (drag&drop the fields)
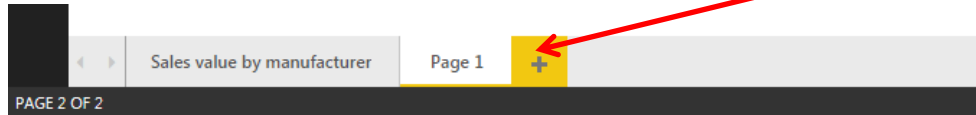

You can format the chart and any element of your report (font size, color, etc.) by clicking on painting tool
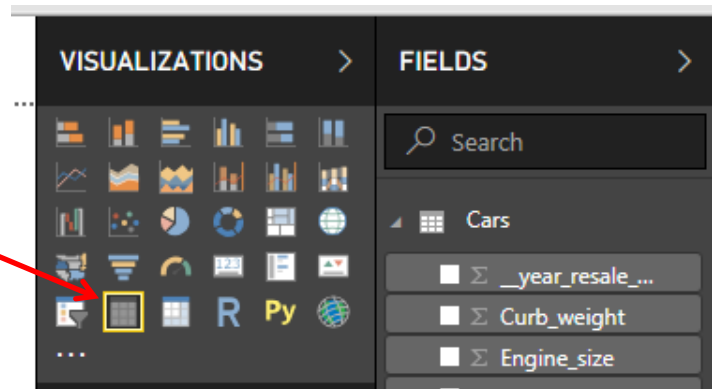
Try some options, feel free to choose colors and fonts, add a legend…

Task 3.3. Adding tables and charts

We can compose our report on many pages. To add another page click on the yellow + at the bottom of the screen. You can name your new page.

To add a table to your report choose from the visualizations menu on the right.

Add a table presenting AVERAGE fuel efficiency by manufacturer. Format the table (change colors and font size, sort the data)

Add the column chart and do the formatting as well.

| Manufacturer	Fuel_efficiency
Jaguar	21
Infiniti	25
Saab	46
Subaru	49
Jeep	56
Lincoln	58
Porsche	66
Audi	70
BMW	75
Hyundai	83
Buick	97
Acura	101

Add new page to your report. Make a line chart and table showing Prices and year resale value by car model. Do some formatting to your chart.

Sort the data on the chart by year resale value.
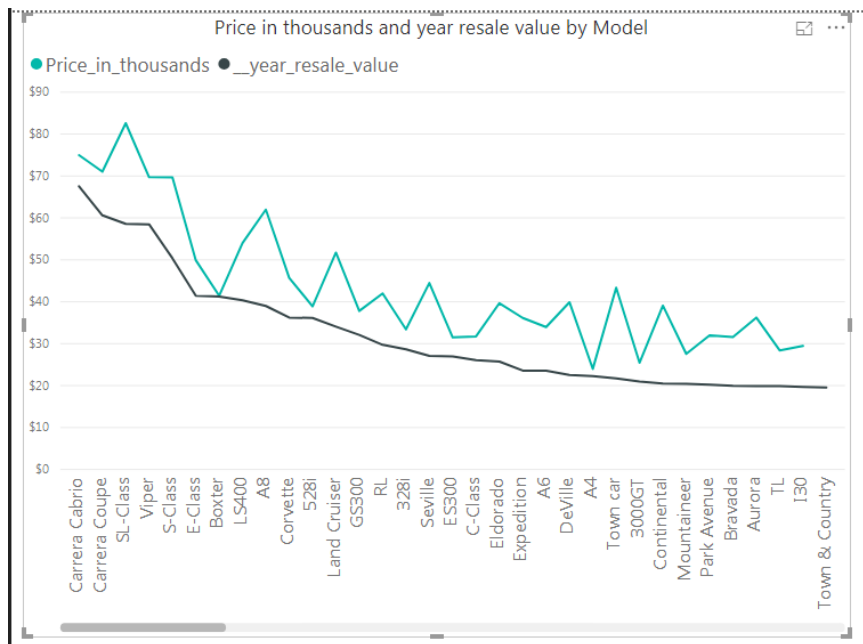
Use scatter chart to visualize horse power and price of cars.

Add a funnel control to the chart to change the range of variables displayed
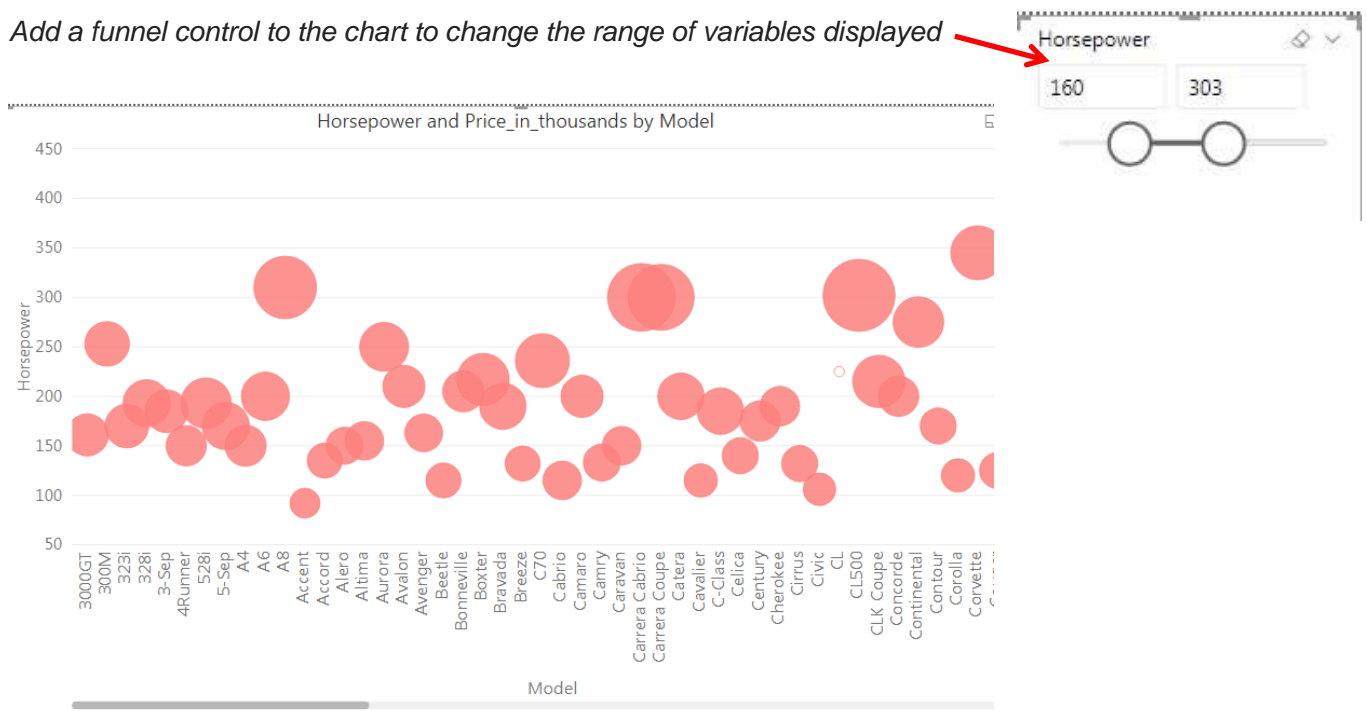


Task 4. Relationships in tables

Task 4.1. Adding another table

As the name suggests, Relationship in Power BI is used to define the connections or the relation between two or more tables. The relationship is used when we want to perform an analysis based on multiple tables. Relationship helps us to display the data and correct information between multiple tables. It is used to calculate the accurate results also.

Click "Get Data" on "Home" ribbon and add to your project the excel file CarManufacturersByCountry.xlsx
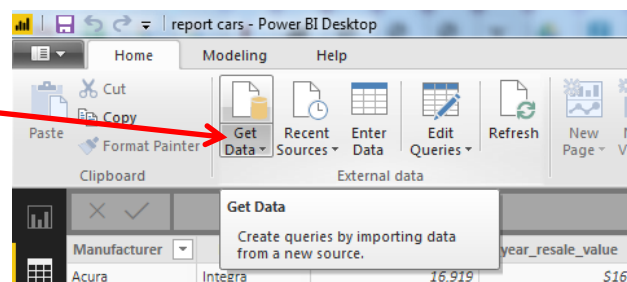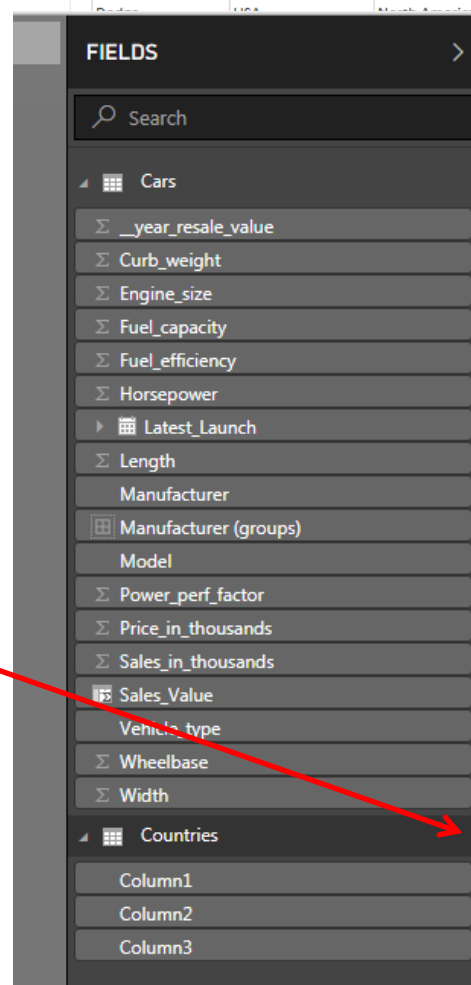

In the navigator select the "Countries" spreadsheet
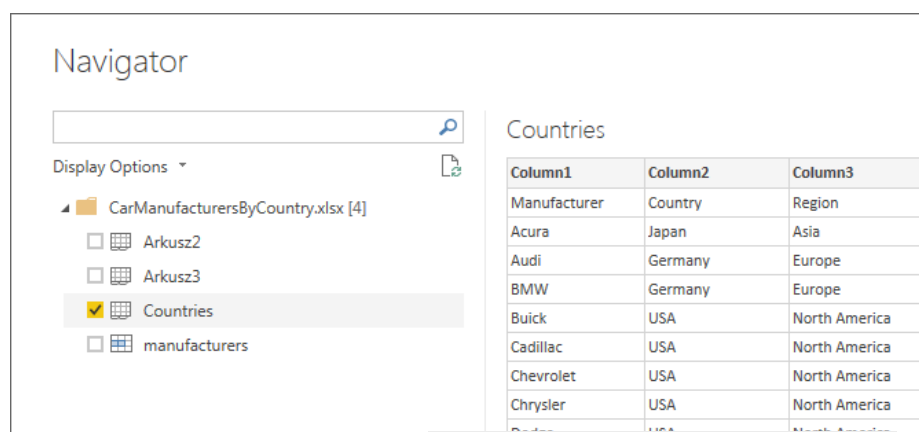
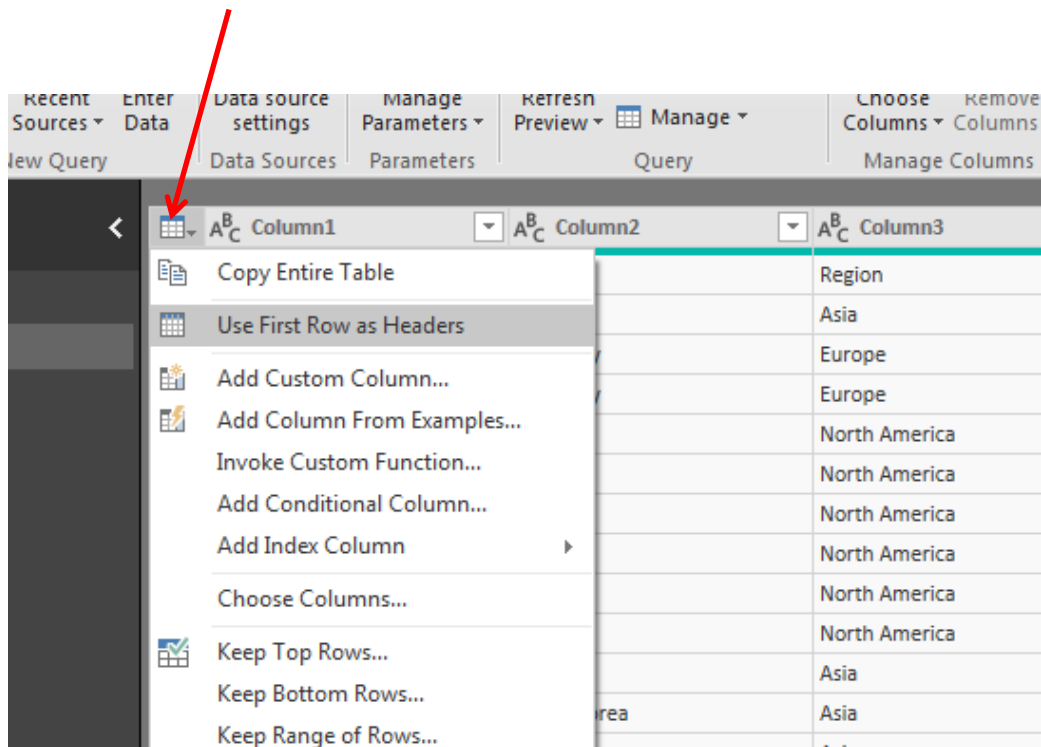**The structure of our new table appears on the right of the screen.**

As you can see the fields names are Column1, Column 2 and Column3.

The fields names should be taken from the first row of the table.

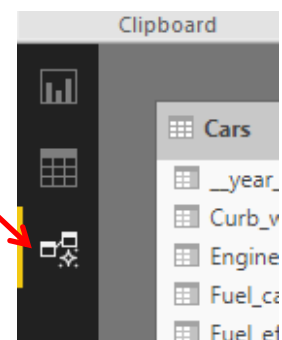**To edit our new table "Countries" click on three dots icon**

Then in editing mode, open the drop-down menu and select "Use the first row as headers".
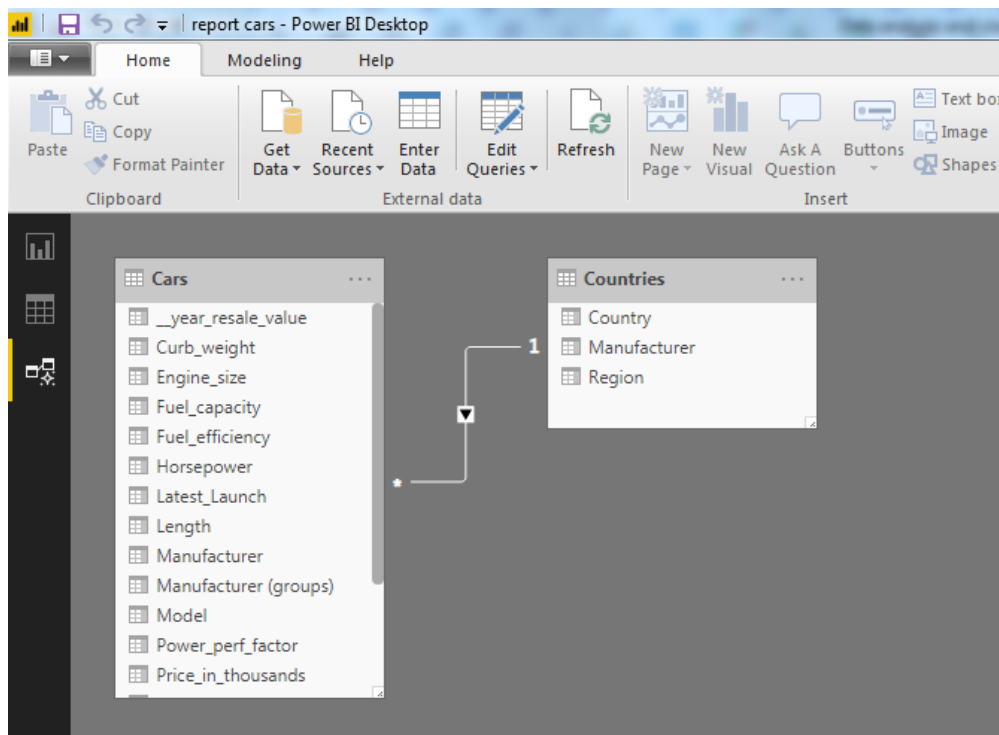

To apply changes to the table click on the button

"Close and Apply"

Now go to the Relationships editor by clicking the button

As you can see the relationship between our two tables was automatically recognized by Power BI. The relationship is one to many.
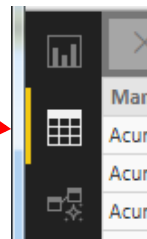
Task 4.2. Adding related columns

We are going to add another column to our "Cars" table which will be the name of the Country where the manufacturer's headquarters are located.

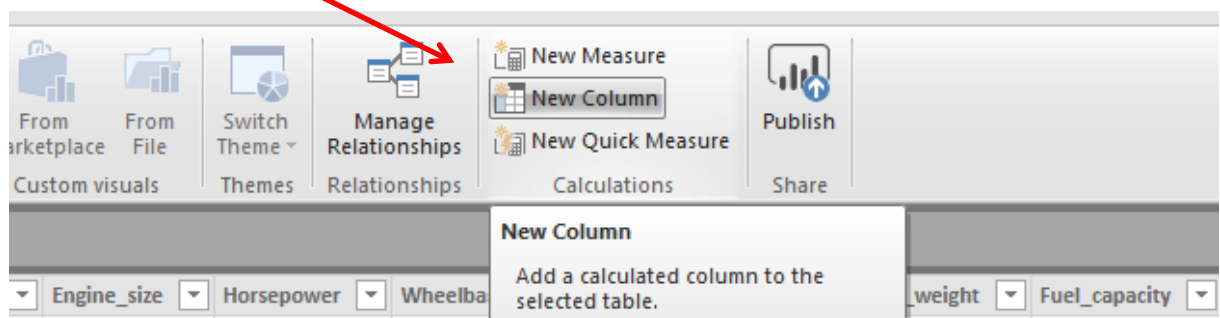To do this we use DAX[1] language command "Related"

Again switch to tables view

And display the table "Cars" (choose from the Fields on the   right of the screen.

The table "Cars" must be displayed because now we are going to add related column to it.

Click on "New Column" on the "Home" ribbon

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[1] DAX (Data Analysis Expressions) is a formula expression language and can be used in different BI and visualization tools.

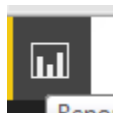**Start tying in the formula bar. Change the column name to "Country"**
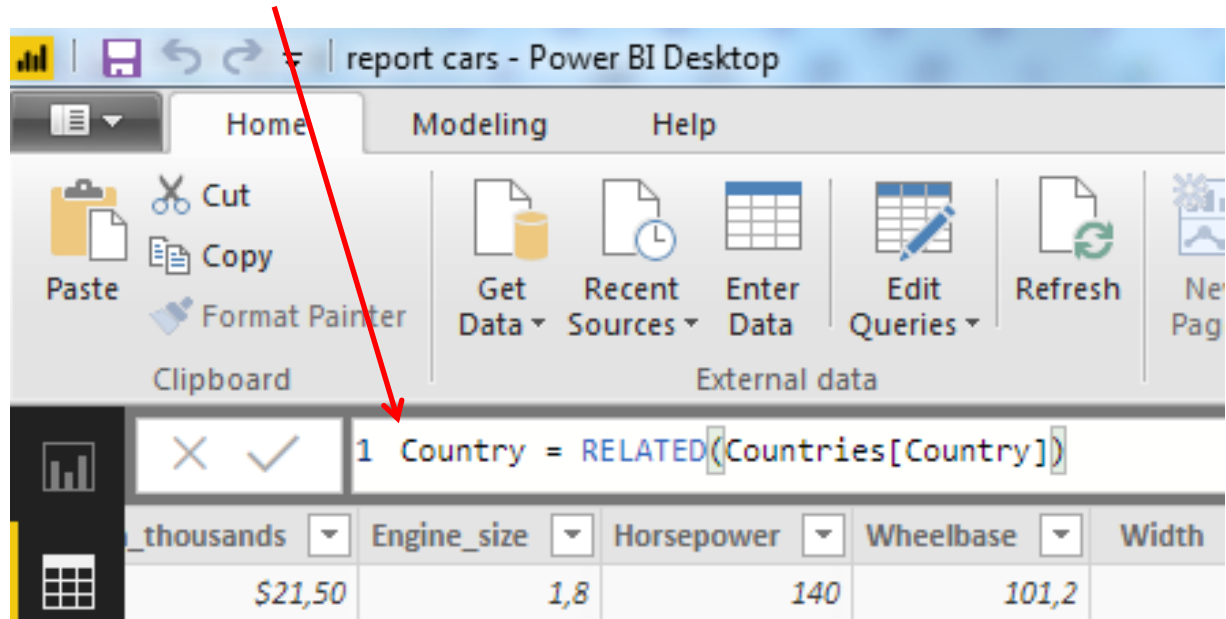
New column in the data set should appear as the last one, containing names of countries.

Add new column named "Region" in the same way.

Task 5. Spatial visualization

Since we have spatial data field in our dataset we can use maps for visualizations in our report.

Switch to the report view.

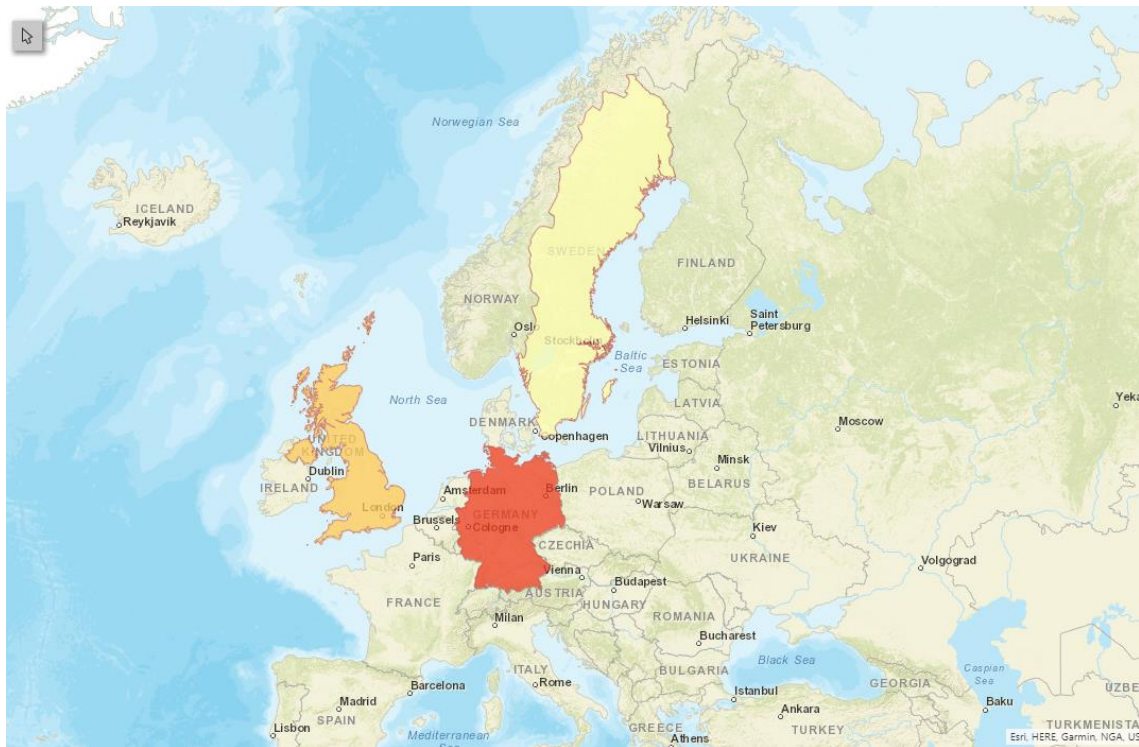Choose the ArcGis Map tool from the visualizations palette.

Make visualization of Sales Value by country.

Drag and drop "Country" as Location and "Sales_Value" as Color.

To change the style of the map click on three dots in the upper right corner of your map.
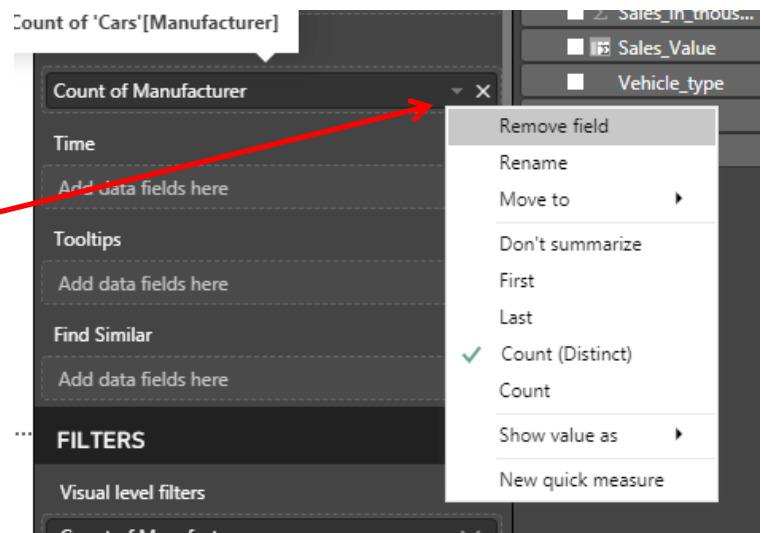

Try many different settings….

Add another map showing the number of distinct Manufacturers by Country (how many manufacturers there are in each country)

Use the dropdown menu to choose appropriate measure

After completing all of the tasks save your report as pdf and send it to the e-learning platform.