TEAM ACADEMY

Visualize Data in Power BI

Module 4

Introduction

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- Power BI visuals are attractive charts and graphics that you can use to revitalize your data.
- Visuals allow you to share data insights more effectively and increase comprehension, retention, and appeal.
- Visuals are a fundamental part of your report because they help your report audience connect and interact with the information to make informed decisions quickly.

Add visualization items to reports

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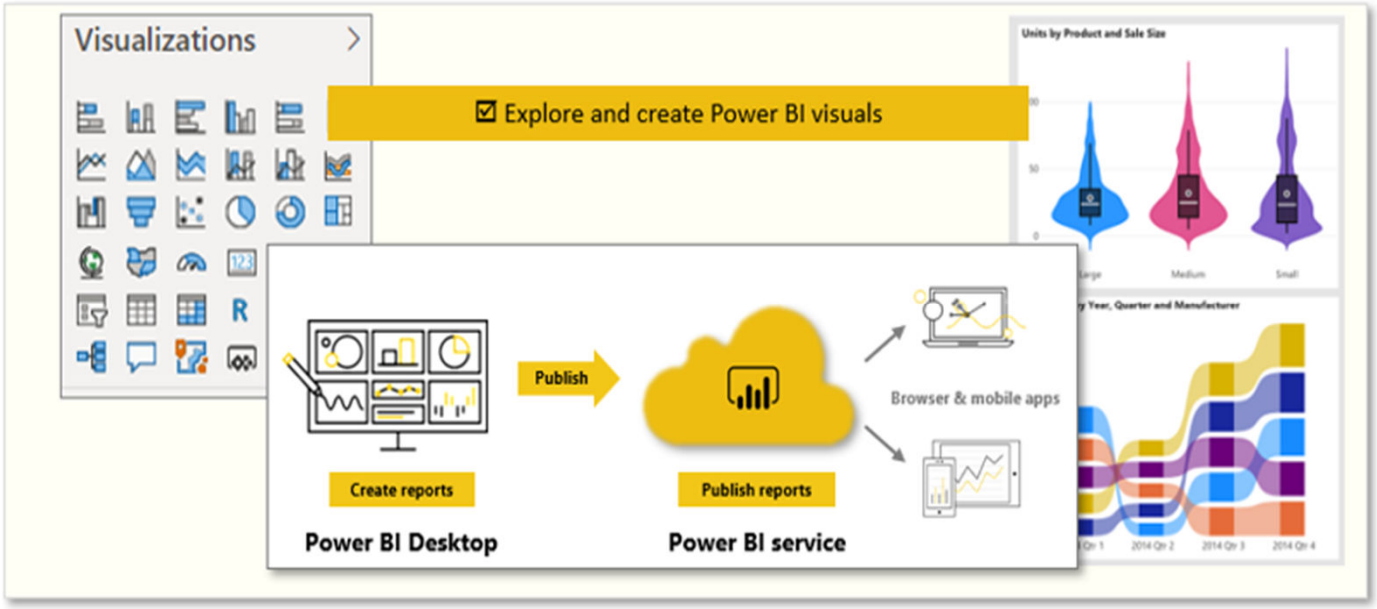
- Power BI has a variety of visuals that you can use to report on the data in your data model.
- Visuals allow you to present the important information and insights that you discovered in the data in a compelling and insightful way.
- The report consumers rely on these visualizations as a gateway to the underlying data.



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- In Power BI Desktop, each visual is represented by an icon in the **Visualizations** pane.
- The types of visuals that are available include charts, maps, cards, a table, a matrix, and many more.

Example:

- you want to add a visualization to the report that displays sales data by category name.
- You start by selecting the **Category** and **Revenue** fields in the **Fields** pane.
- Power BI Desktop then automatically selects a visualization for you, depending on the data type of the fields that you selected.
- In this case, the default visualization type is a table.

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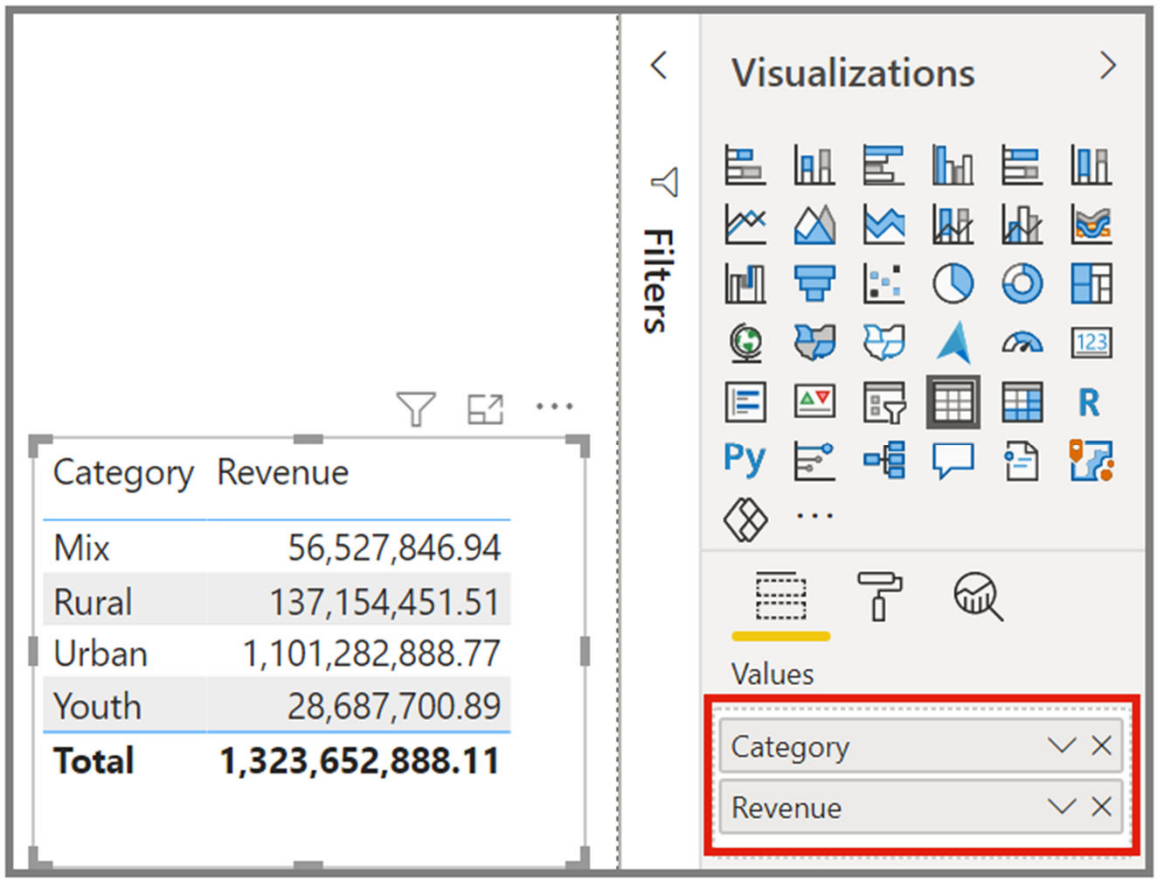

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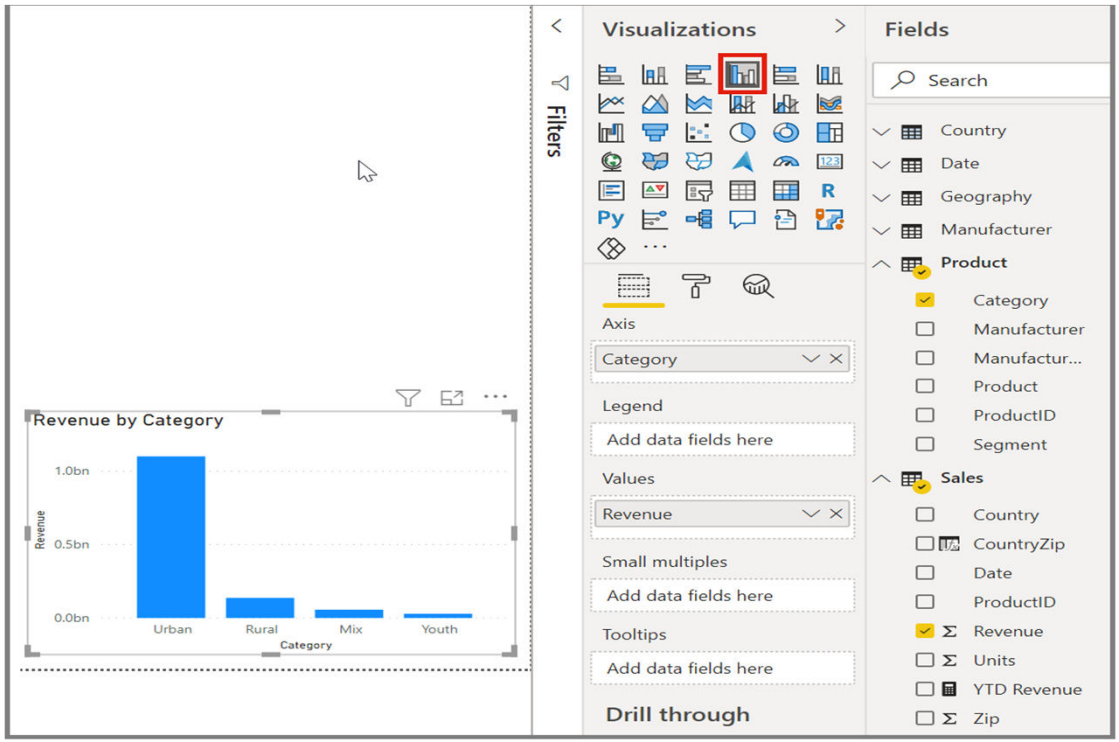
- While the visual is selected, you can change the visualization type by selecting a different visual from the **Visualizations** pane.



Choose an effective visualization

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- Power BI Desktop offers a range of out-of-the-box visualization options that are available directly from the **Visualizations** pane.
- When you select the fields that you want to display in a visualization, you can experiment with all the different visualization types to find the one that best suits your needs.
- If you can't find a visual that meets your needs, you can download other visuals from Microsoft AppSource or import your own custom visuals.
- Depending on the type of data in your selected fields, one or more visualizations might not be suitable.
- **For example**, geographic data will not display well as a funnel chart or line chart visualization.

Table and Matrix visualization

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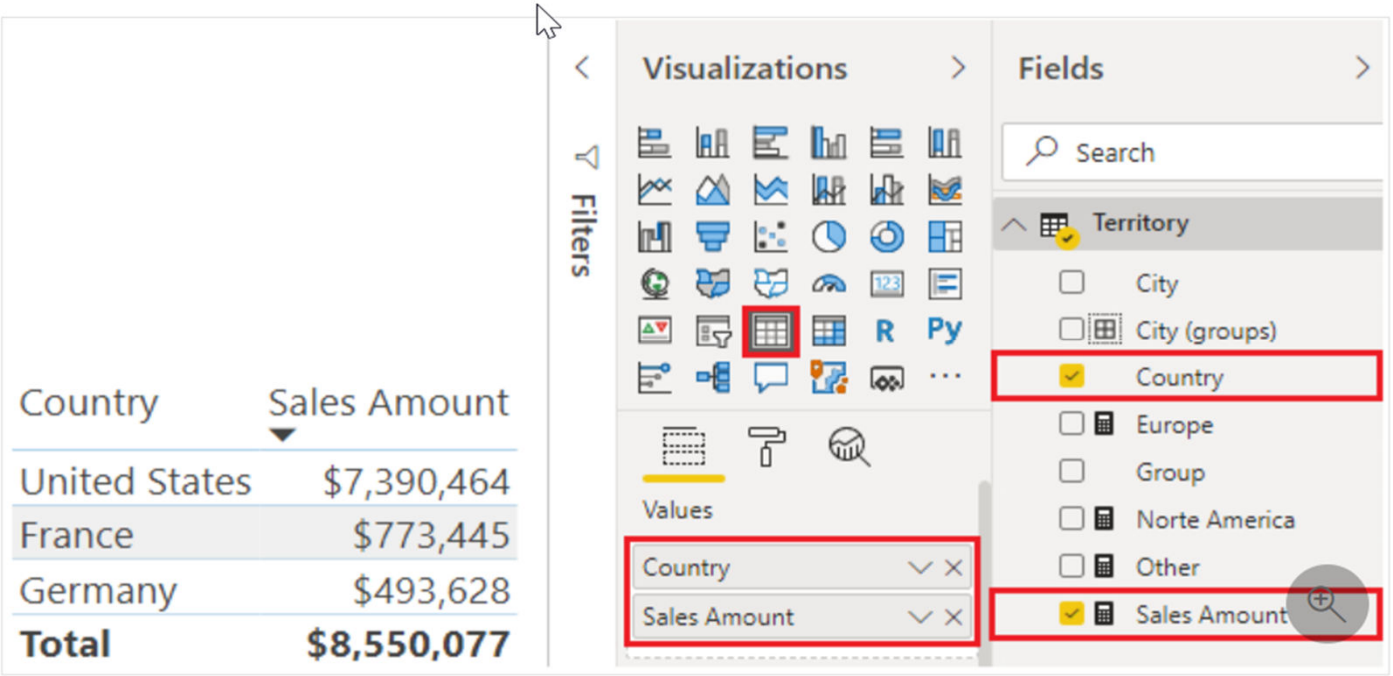
- The table is a grid that contains related data in a logical series of rows and columns.
- The table supports two dimensions and it can also contain headers and a row for totals.



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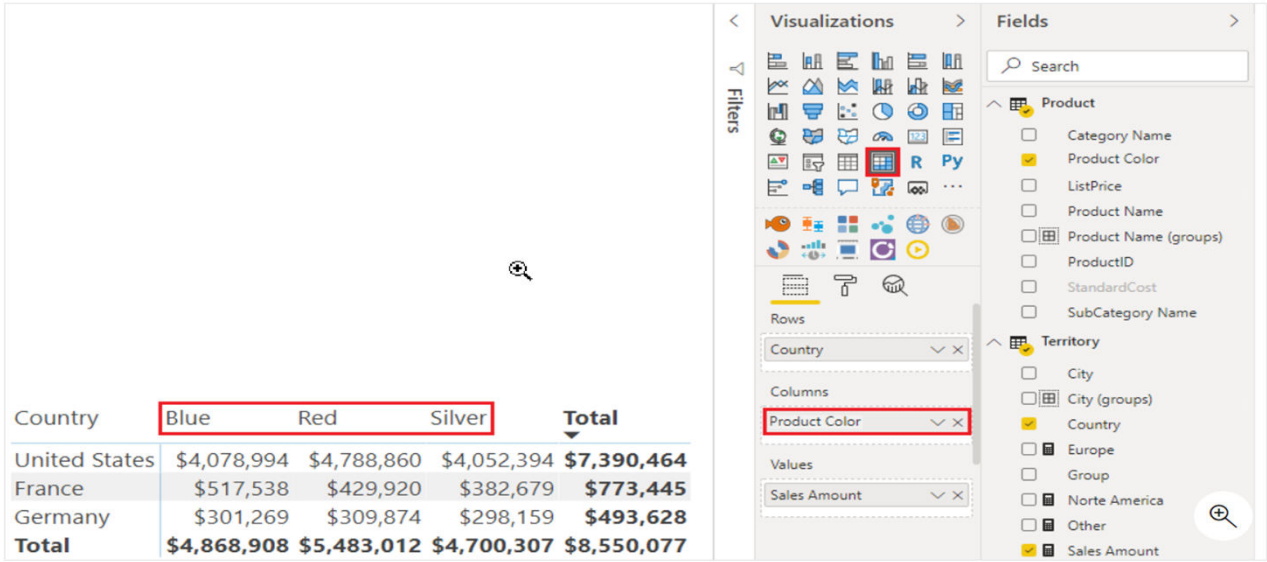
- The **Matrix** visualization looks similar to the table visualization.
- It allows you to select one or more elements (rows, columns, values) in the matrix to cross-highlight other visuals on the report page.
- The new field called **Product Color** was added to the columns, and the available colors are now spanning across the table, with the categories listed in rows.



Bar and column charts

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- Power BI Desktop has a variety of bar and column chart visualizations that present specific data across different categories in a stacked or clustered format.
- The stacked format will stack the information items on top of each other.
- **For example:** The following clustered column chart shows a single column with total sales for each country, whereas the stacked column chart shows data for sales by country, by product name.
- All sales data is stacked into one column to show you the total sales by country, broken down by how much each product contributed to the overall total sales.

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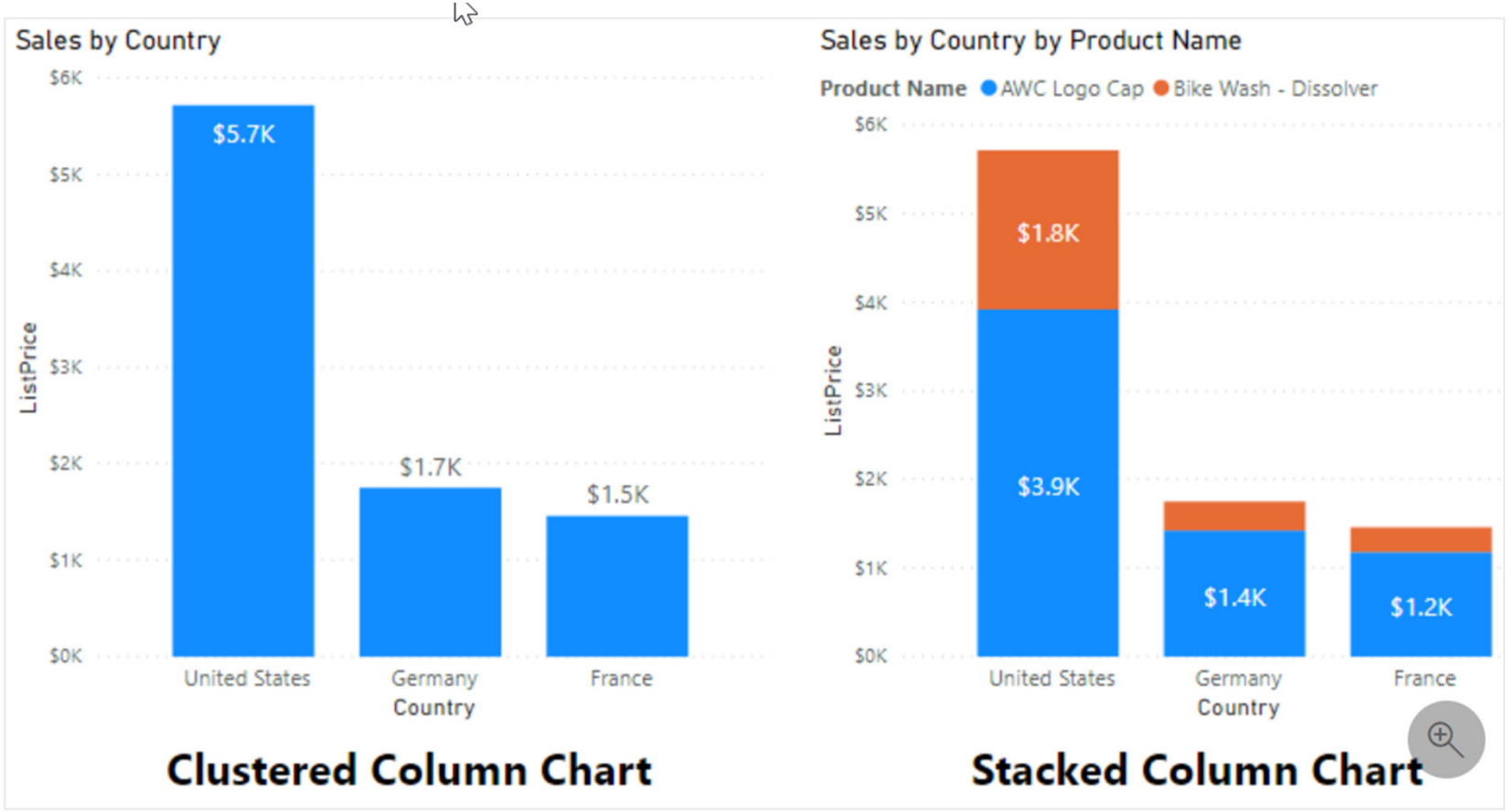

Line and area charts

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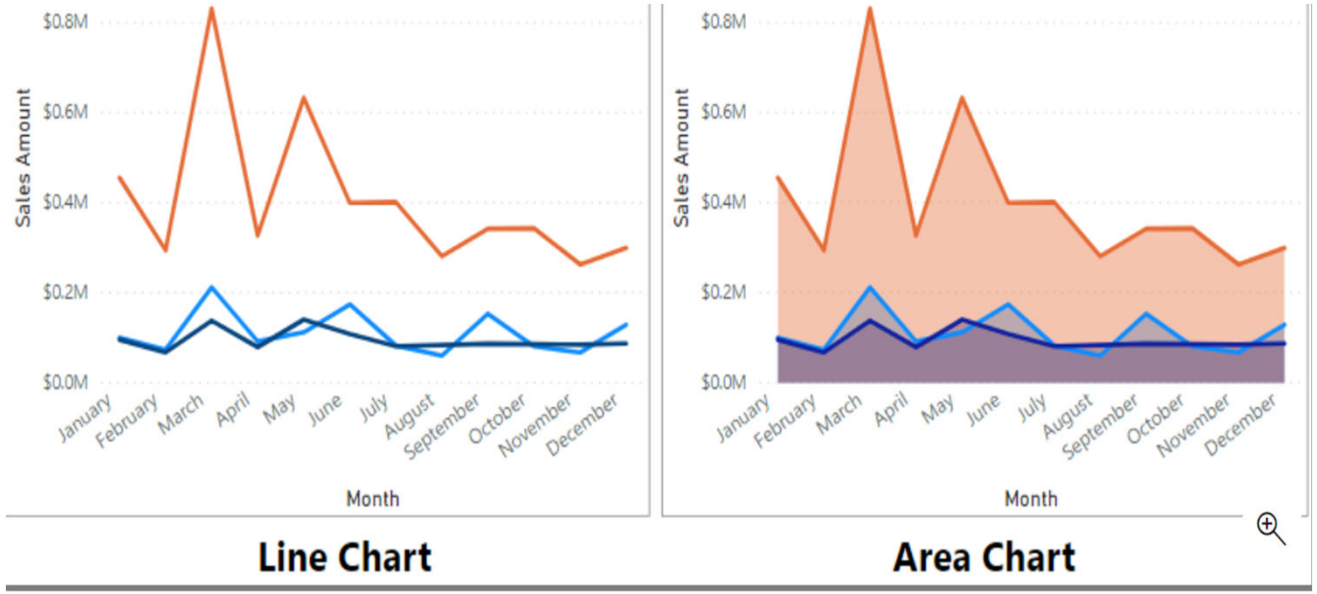
- The **line chart** and **area chart** visualizations are beneficial in helping you present trends over time.
- The basic area chart is based on the line chart, with the area between axis and line filled in.
- he main difference between these two chart types is that the area chart highlights the magnitude of change over time.



Pie chart, Donut chart and Tree maps

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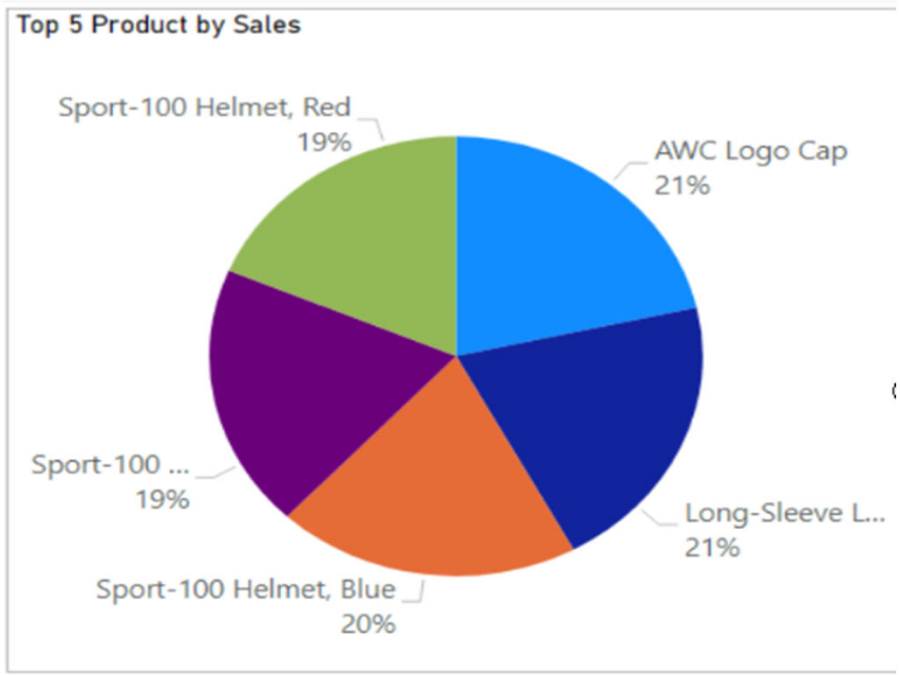
- The **pie chart**, **donut chart**, and **Tree map** visualizations show you the relationship of parts to the whole by dividing the data into segments.
- These charts are best suited for illustrating percentages, such as the top five sales by product or country, or any other available categories.
- The pie chart is a solid circle, whereas the donut chart has a center that is blank and allows space for a label or icon.



Pie Chart

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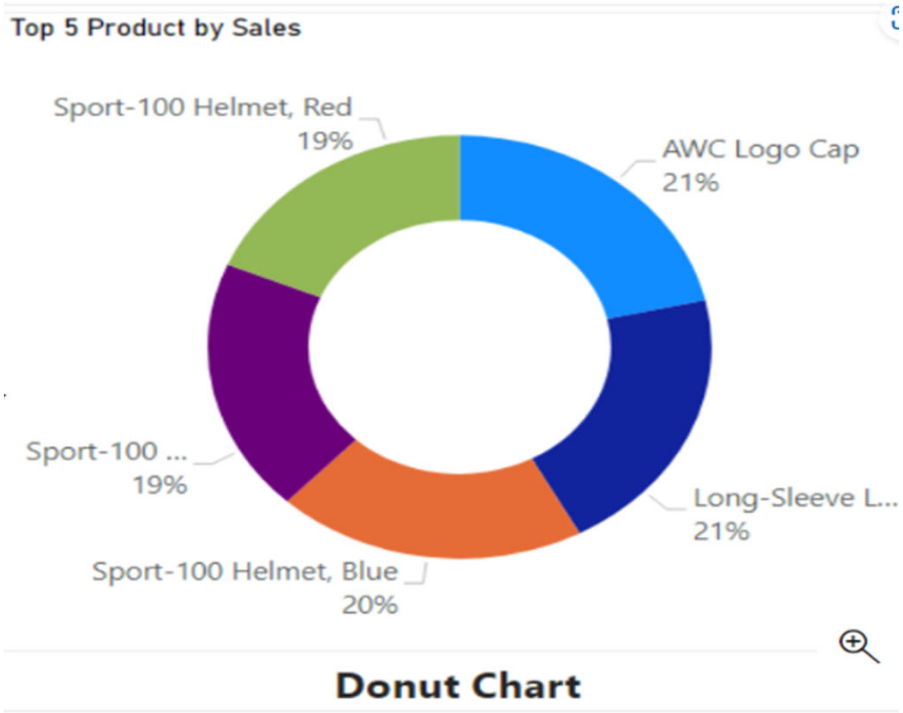
- Pie charts and donut charts present data by dividing it into slices, while the **Tree map** visualization displays data as a set of nested rectangles.
- Each level of the hierarchy is represented by a colored rectangle (branch) containing smaller rectangles (leaves).
- The space inside each rectangle is allocated based on the value that is being measured.
- The rectangles are arranged in size from top left (largest) to bottom right (smallest).



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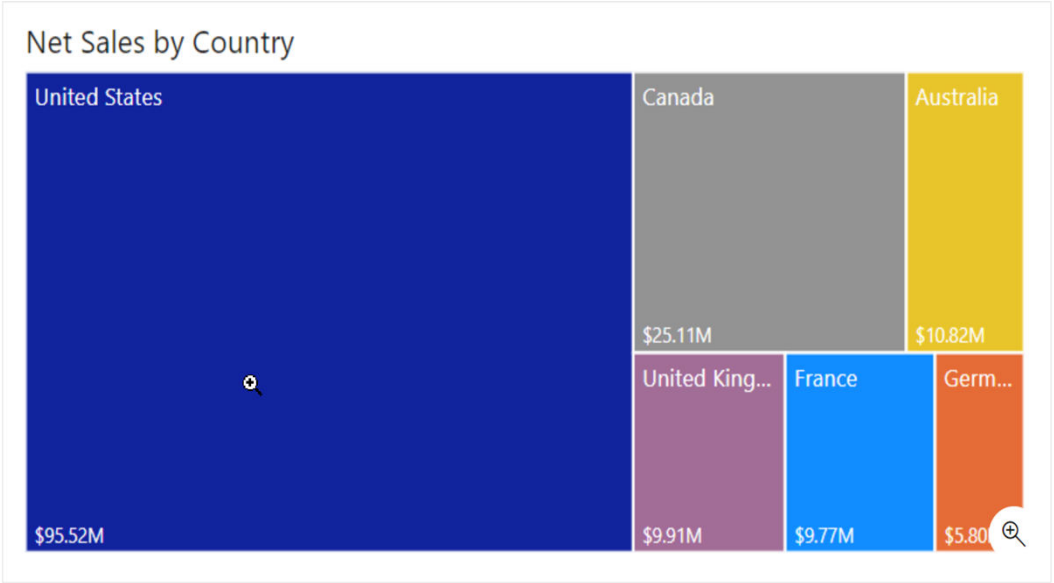
A **Tree map** is ideal to visualize:

1. Large amounts of hierarchical data when a bar chart can't effectively handle the large number of values.
2. Proportions between each part and the whole.
3. The distribution pattern of the measure across each level of categories in the hierarchy.
4. Attributes, by using size and color coding.
5. Spot patterns, outliers, most-important contributors, and exceptions.



Combo charts

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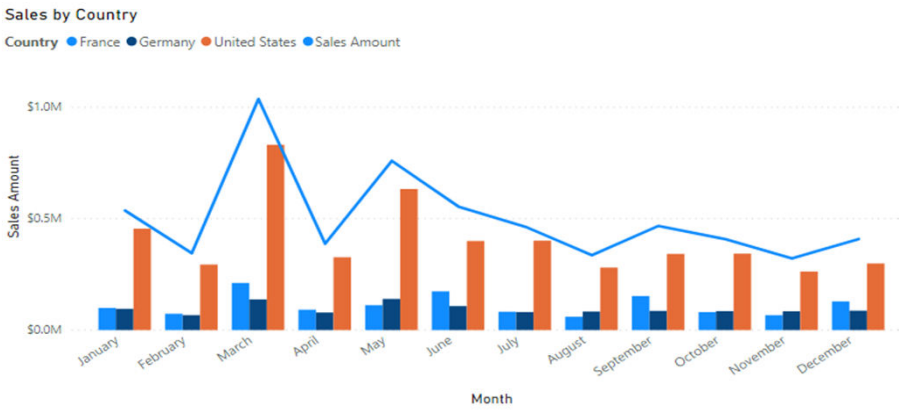
- The **combo** chart visualization is a combination of a column chart and a line chart that can have one or two Y axes.
- The combination of the two charts into one lets you:
  1. Compare multiple measures with different value ranges.
  2. Illustrate the correlation between two measures in one visual.
  3. Identify whether one measure meets the target that is defined by another measure.
  4. Conserve space on your report page.



Card Visualization

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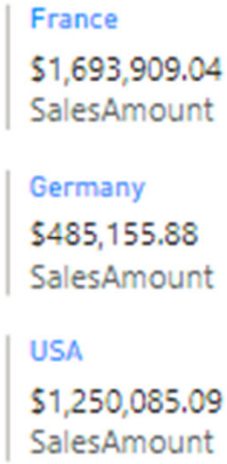
- The **card** visualization displays a single value: a single data point.
- This type of visualization is ideal for visualizing important statistics that you want to track on your Power BI dashboard or report, such as total value, YTD sales, or year-over-year change.
- The **multi-row** card visualization displays one or more data points, with one data point for each row.



Funnel visualization

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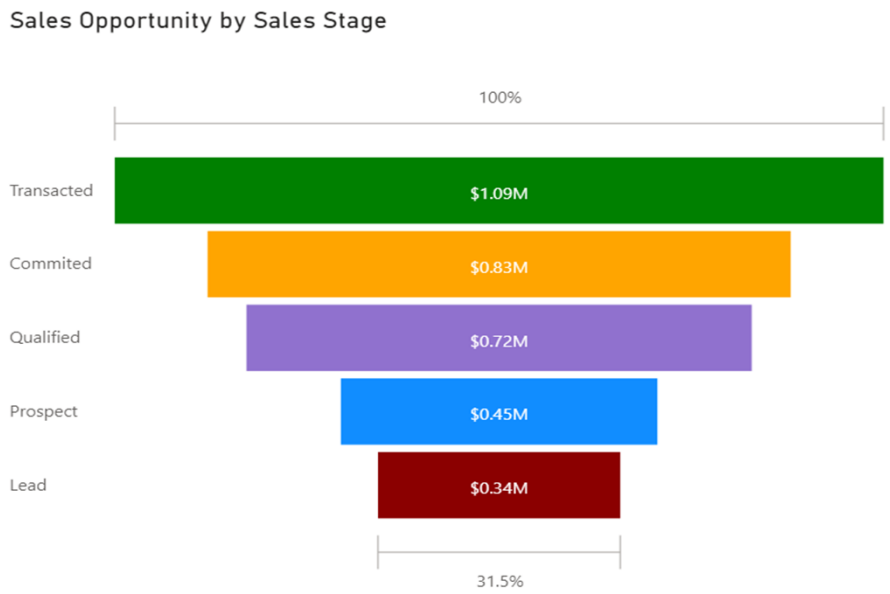
- The **funnel** visualization displays a linear process that has sequential connected stages, where items flow sequentially from one stage to the next.
- Funnel charts are most often seen in business or sales contexts.



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Funnel charts are great options in the following contexts:

1. When the data is sequential and moves through at least four stages.
2. When the number of items in the first stage is expected to be greater than the number of items in the final stage.
3. To calculate a potential outcome (revenue, sales, deals, and so on) by stages.
4. To calculate and track conversion and retention rates.
5. To reveal bottlenecks in a linear process.

Gauge chart

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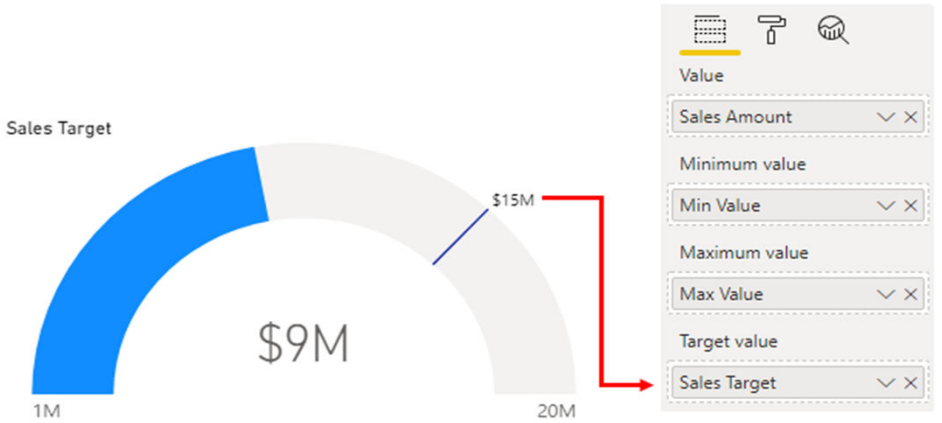
- A radial gauge chart has a circular arc and displays a single value that measures progress toward a goal or target.
- The value at the end of the arc represents the defaulted maximum value, which will always be double the actual value.
- To create a realistic visual, you should always specify each of the values.
- You can accomplish this task by dropping the correct field that contains an amount into the **Target value**, **Minimum value**, and **Maximum value** fields on the **Visualization** pane.



Waterfall visualization

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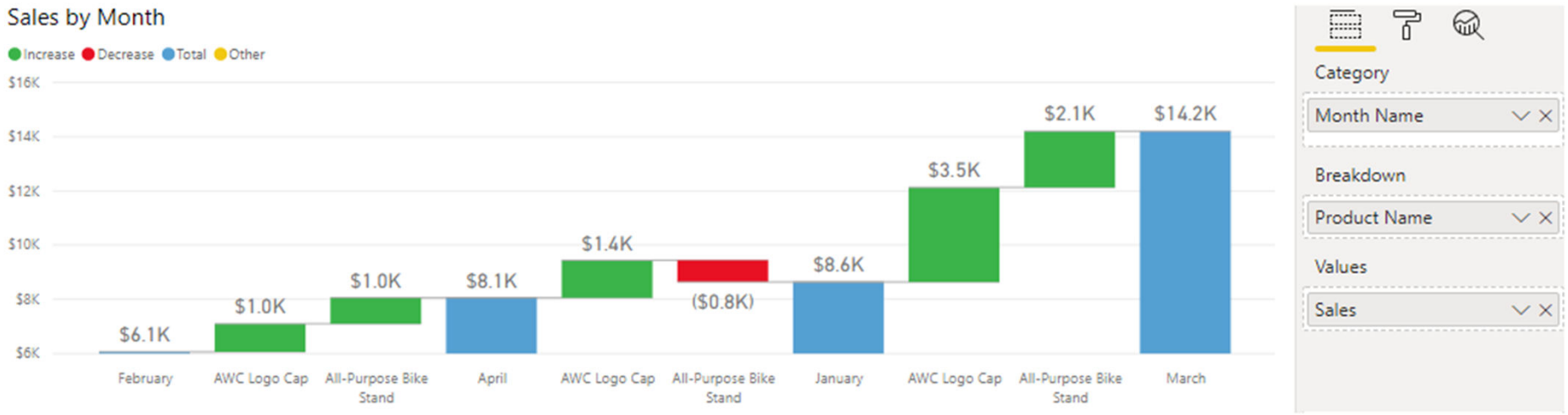
- The **waterfall** visualization (also known as a bridge chart) shows a running total as values are added or subtracted, which is useful in displaying a series of positive and negative changes.
- The chart consists of color-coded columns, so you can quickly identify increases and decreases.
- The initial and the final value columns often start on the horizontal axis, while the intermediate values are floating columns.



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Waterfall charts can be used to:

1. Visualize changes over time or across different categories.
2. Audit the major changes that contribute to the total value.
3. Plot your organization's annual profit by showing various sources of revenue to help determine the total profit (or loss).
4. Illustrate the beginning and ending headcount for your organization in a year.
5. Visualize how much money you earn and spend each month and the running balance for your account.

Scatter chart

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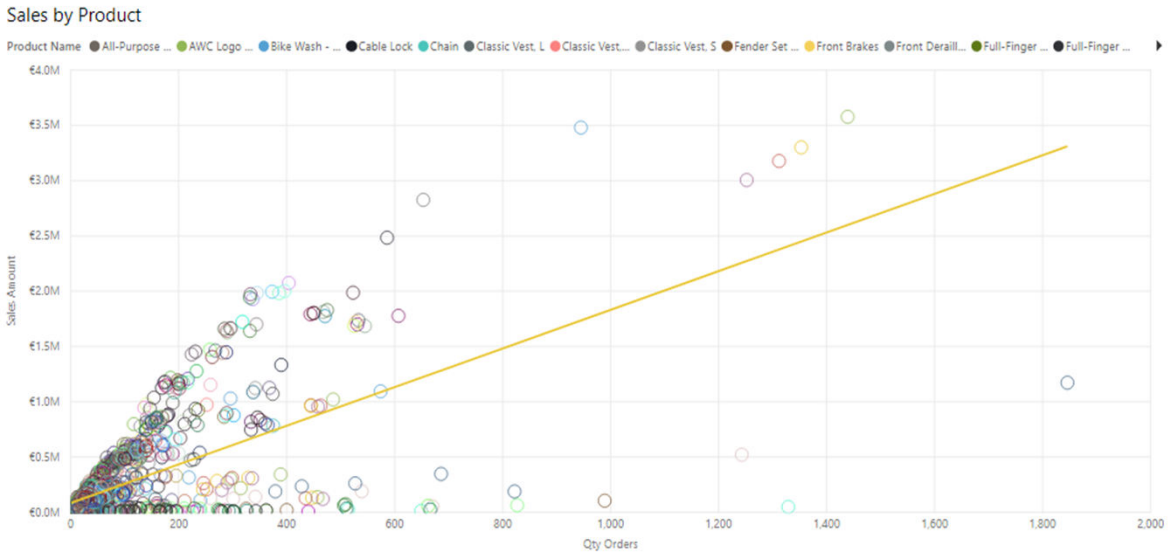
- The **scatter** chart visualization is effective when you are comparing large numbers of data points without regard to time.
- The chart displays points at the intersection of an X and Y numerical value, combining these values into single data points.
- These data points might be distributed evenly or unevenly across the horizontal axis, depending on the data.
- You can set the number of data points, up to a maximum of 10,000.



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Scatter charts also allow you to:

1. Show relationships between two numerical values.
2. Plot two groups of numbers as one series of x and y coordinates.
3. Turn the horizontal axis into a logarithmic scale.
4. Display worksheet data that includes pairs or grouped sets of values.
5. Show patterns in large sets of data, for example, by showing linear or non-linear trends, clusters, and outliers.
6. Compare large numbers of data points without regard to time. The more data that you include in a scatter chart, the better the comparisons that you can make.

Maps

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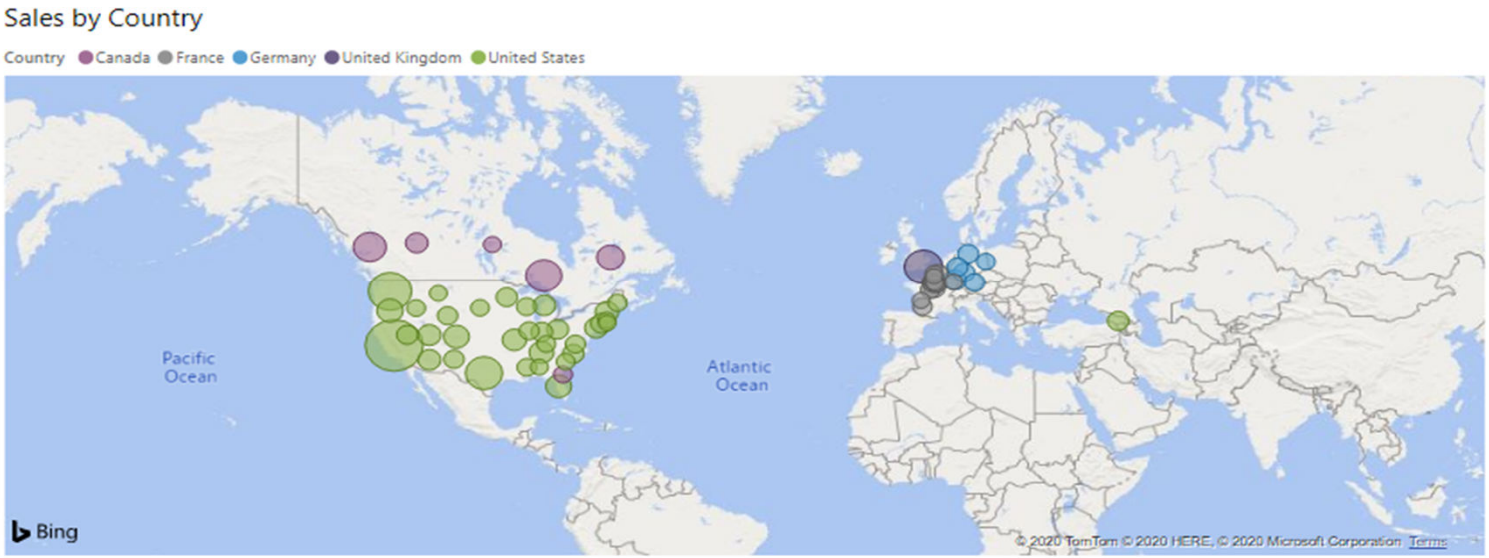
- Power BI integrates with Bing Maps to provide default map coordinates (a process called geocoding), so you can create maps.
- Together, they use algorithms to identify the correct location.
- This type of map visual displays precise geographical locations of data points on a map, as illustrated in the following image.



Slicer visualization

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- The **slicer** visualization is a standalone chart that can be used to filter the other visuals on the page.
- Slicers provide a more advanced and customized way of filtering, in comparison to the **Filters** pane, which is suited to more basic filtering operations.
- Slicers are ideal to:

1. Visualize commonly used or important filters on the report canvas for easier access.
2. Simplify your ability to see the current filtered state without having to open a drop-down list.
3. Filter by columns that are unneeded and hidden in the data tables.
4. Create more focused reports by putting slicers next to important visuals.

Q&A visualization

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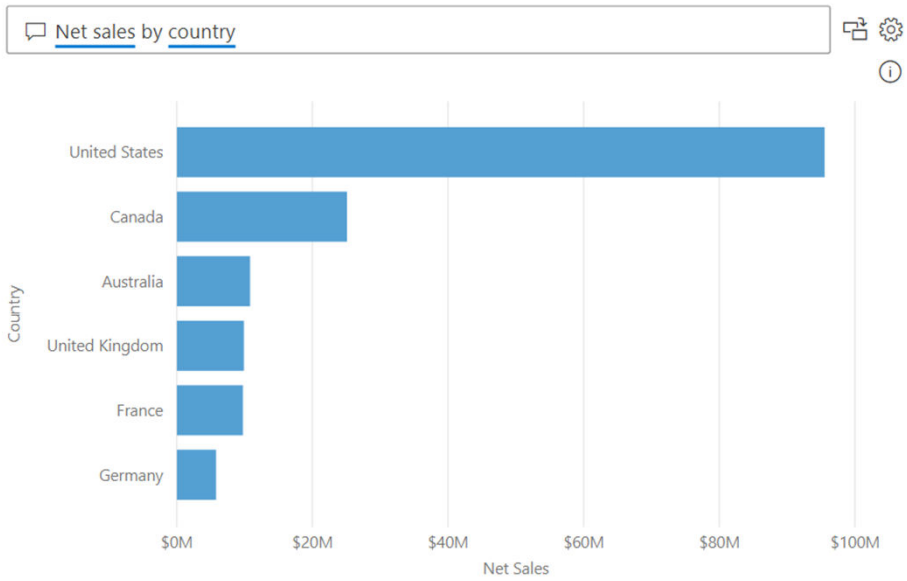
- The **Q&A** visualization allows you to ask natural language questions and get answers in the form of a visual.
- This ability to ask questions is valuable to consumers and to you, the report author.
- This visualization type can help you create visuals in the report, and it can also be used as a tool for consumers to get answers quickly.



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- The Q&A visualization consists of the following four core components:

1. The question box, where users enter their question and are shown suggestions to help them complete the question.
2. A pre-populated list of suggested questions.
3. An icon that users can select to convert the Q&A visual into a standard visual.
4. An icon that users can select to open Q&A tooling, which allows designers to configure the underlying natural language engine.
5. When entering natural language queries with Power BI Q&A, you can specify the visual type in your query. The following example illustrates how to implement **Net sales by country**.

Format and configure visualizations

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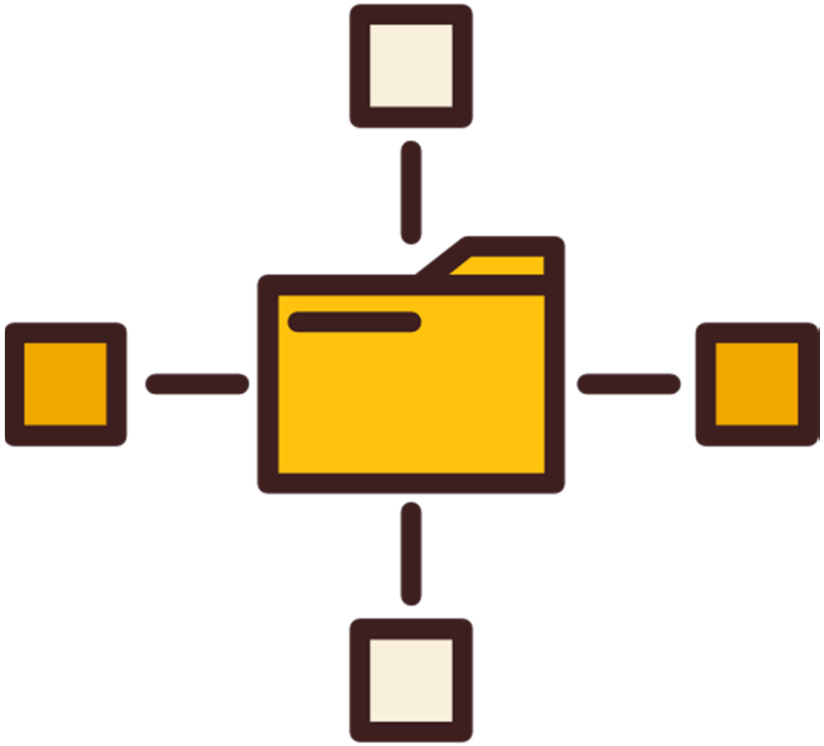
- Power BI Desktop gives you a variety of options for customizing how your selected visualizations look, such as the colors and format of the text that they contain.
- You should take time to explore the options to determine what impact they each have on a visual.

Example: You will format and configure the default clustered column chart visualization to better meet the needs of your report requirements.

- Start by selecting the visualization on the canvas, and then select the **Format** button (paint roller icon) to display the **Format** pane.
- The formatting options that are available will depend on the type of visualization that you selected.



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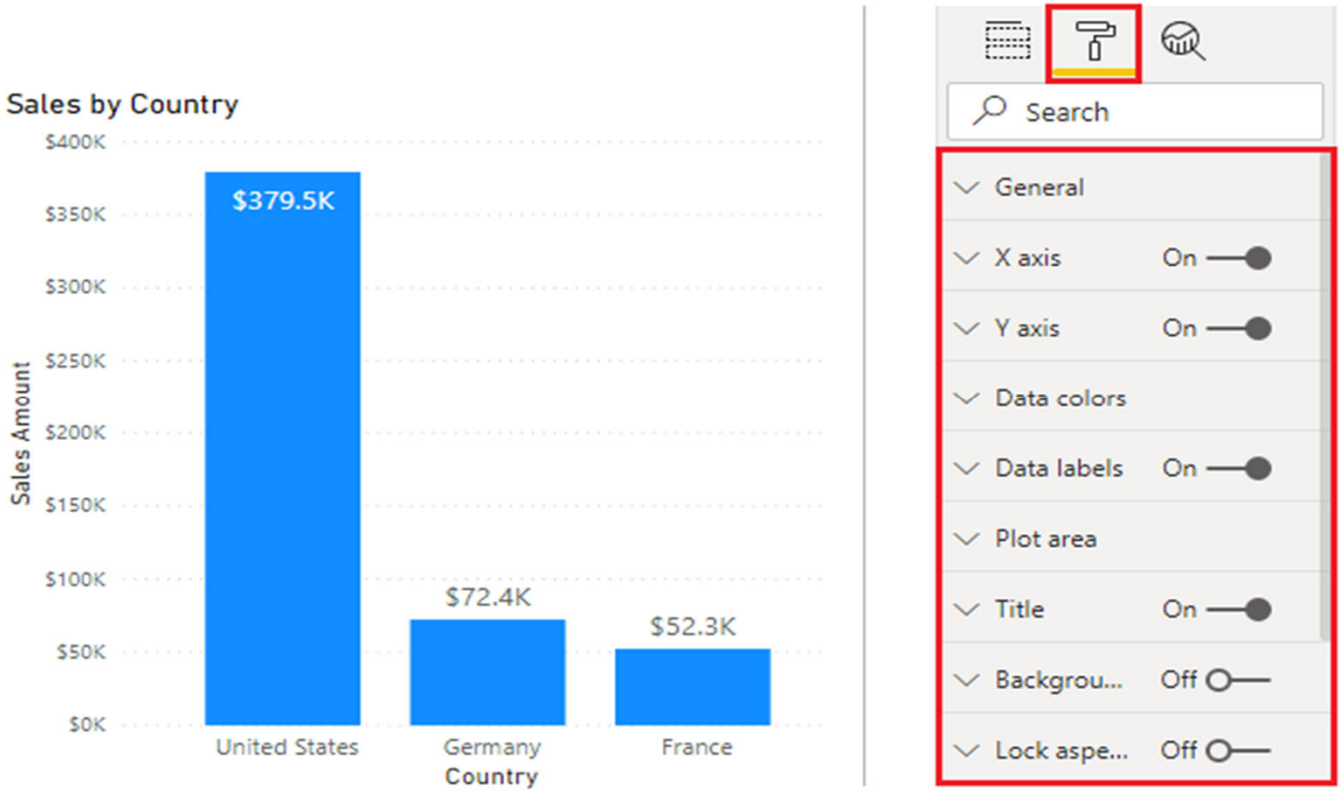
Common formatting options include the **Title**, **Background**, and **Border**.



Title

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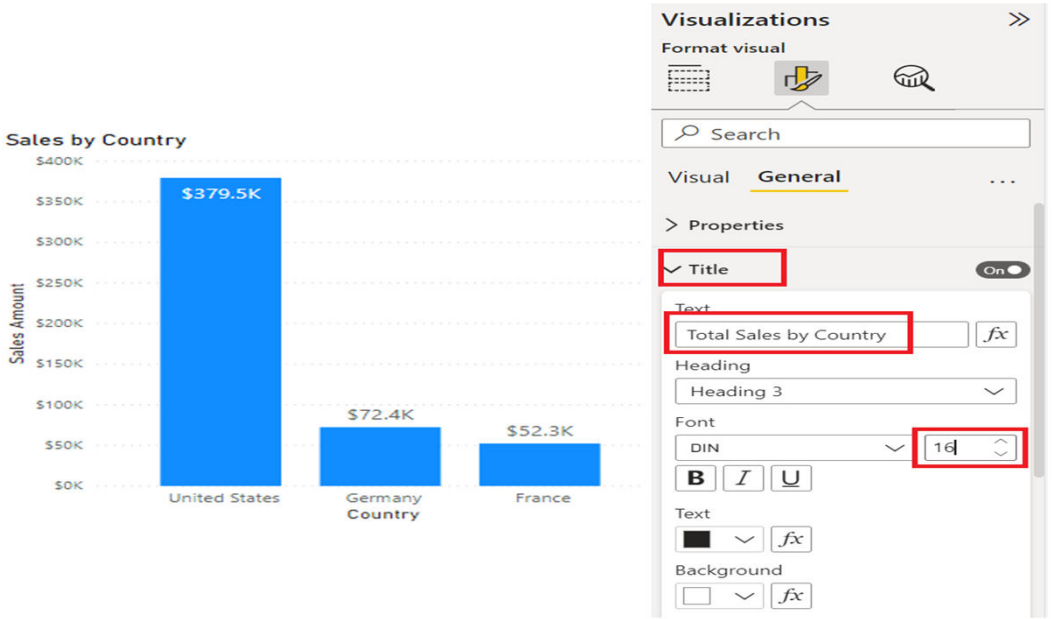
- You can edit a default title and add a title, if you don't have one.

  Example: You will select the column chart visualization and then, in the **Format** pane, scroll down and expand the **Title** section.

- Edit the current title by changing it to **Total Sales by Country**, and then increase the font size to 16 points.



Background

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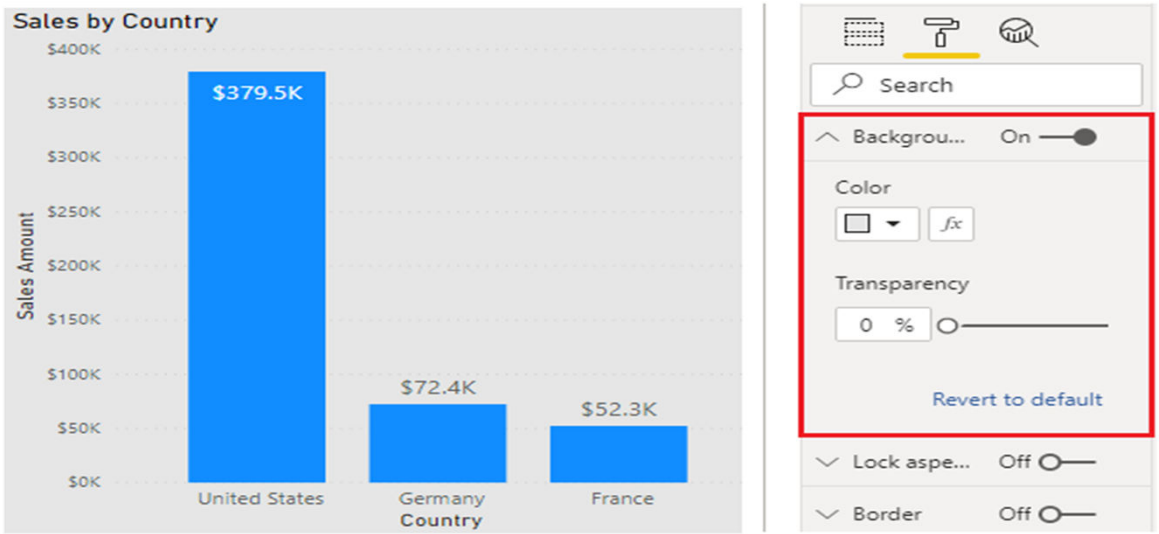
- It is best practice to keep the default white background so the presented data can be clearly seen.
- you can change the default background color to make a visualization more colorful and easier to read or to match a particular color scheme.

Example: Continue with the column chart that is selected and then, in the **Format** pane, expand the **Background** section and change the color to light grey.



Tooltip

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- Using tooltips is a clever way of providing more contextual information and detail to data points on a visual.
- When you add a visual, the default tooltip displays the data point's value and category, but you can customize this information to suit your needs.
- To expand on the data points that are displayed in the default tooltip, you can drag a field from the **Fields** panel into the **Tooltips** bucket.
- You should not add many more fields to the tooltips because adding too many fields can introduce performance issues and slow down your visuals.

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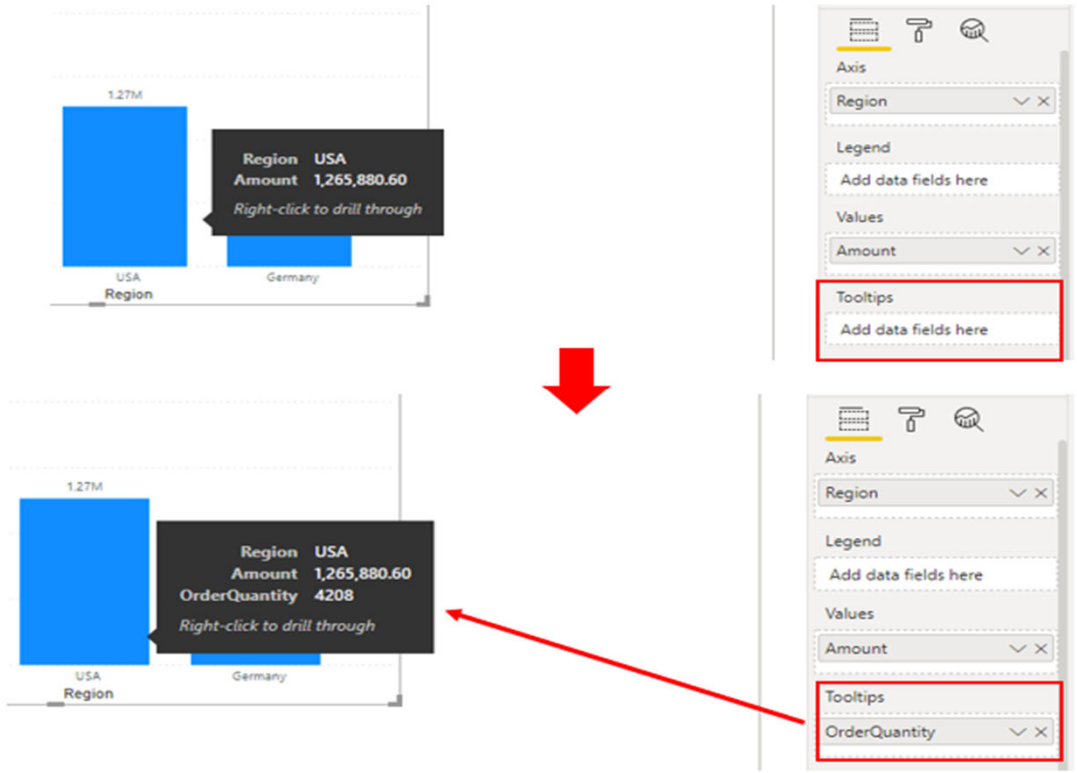
- The following image shows the default tooltip first and then the customized tooltip that displays additional data.



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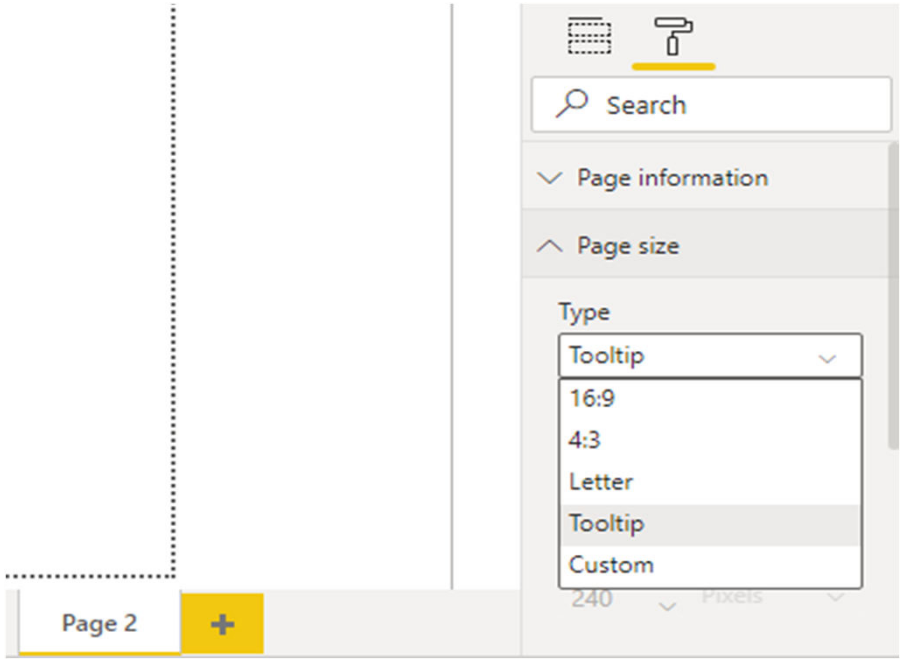
- Another way to use tooltips is to display graphical information.
- The process of adding this type of tooltip is not as straightforward, but it is worthwhile.
- You would begin by creating a new page in the report.
- Open the new page and then open the **Format** pane.
- Expand the **Page Size** section and then select **Tooltip** from the **Type** list.



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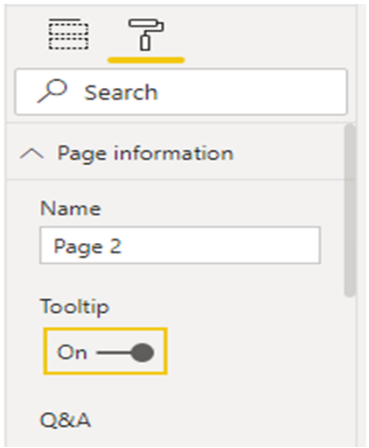
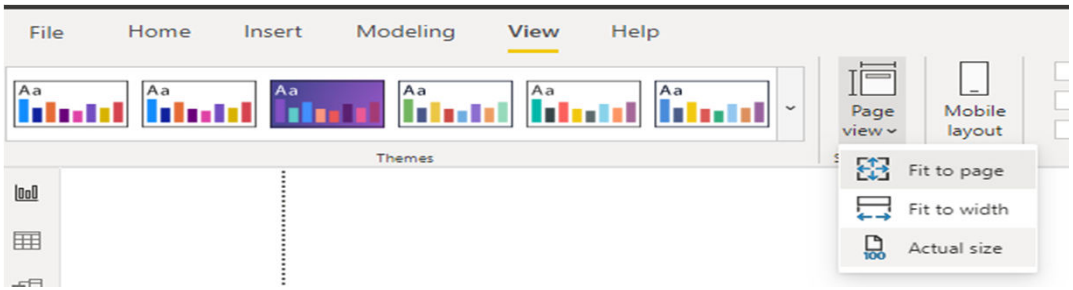
- In the **Page information** section, turn the **Tooltip** slider to **On** so that Power BI registers this page as a tooltip page
- Tooltips have limited canvas space, so to ensure that your visuals appear in the tooltip, on the **View** tab, set the **Page view** option to **Actual size**.





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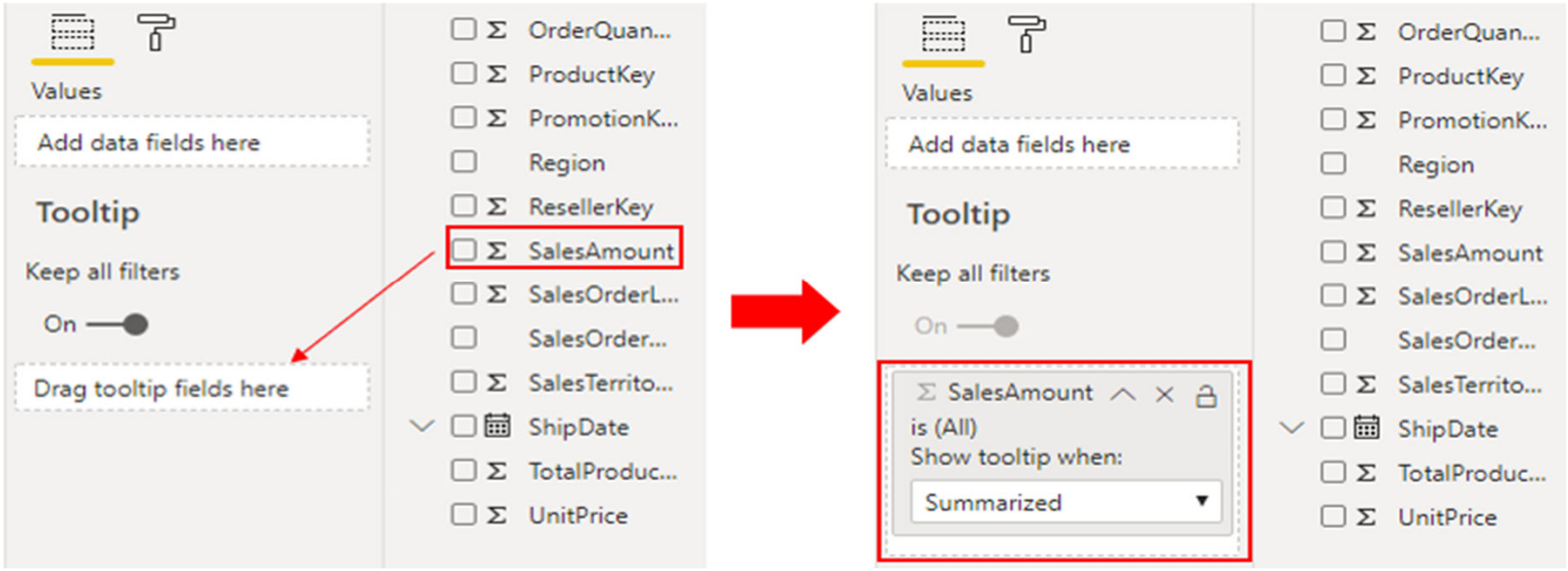
- Next, add one or more visuals to the tooltip page, in the same way that you would on
- Now, you need to specify the fields for which you want the tooltip to display.
- Select the tooltip page and then select the **Values** tab in the **Visualizations** pane.
- Drag the fields from the **Fields** pane into the **Tooltip** bucket.



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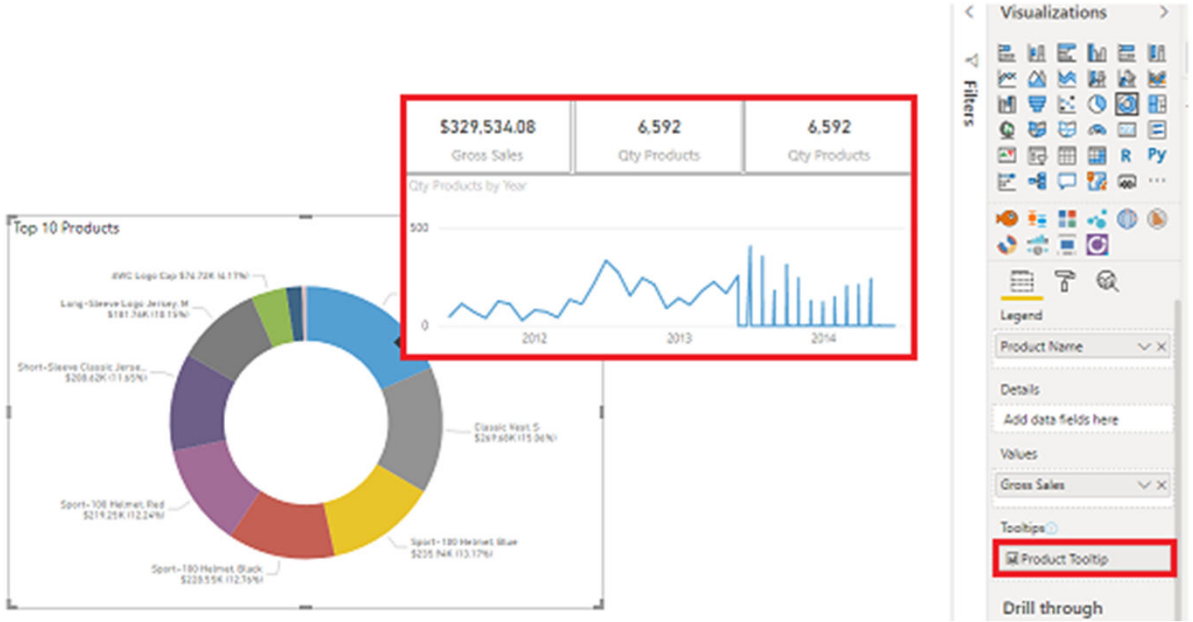
- Return to the report page and apply the tooltip to one or more visuals on that page.
- Select a visual and then, in the **Format** pane, scroll down to the **Tooltip** section.
- Turn the tooltip option **On** and then select your tooltip page from the **Page** list.



Import a custom visual

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- If you have a specific visual in mind, you can likely find it in the marketplace.
- If you can't find it, Power BI makes it possible for you to build your own.
- The custom visuals that are available in Microsoft AppSource are created by Microsoft and Microsoft partners.
- If you want to create your own custom visual, you can use the custom visual software development kit (SDK), which is an open-source tool based on NodeJS (JavaScript programming language) that is available on GitHub.
- The custom visual is packaged as a single Power BI Visual Tools (.pbiviz) file that you can import into Power BI Desktop.

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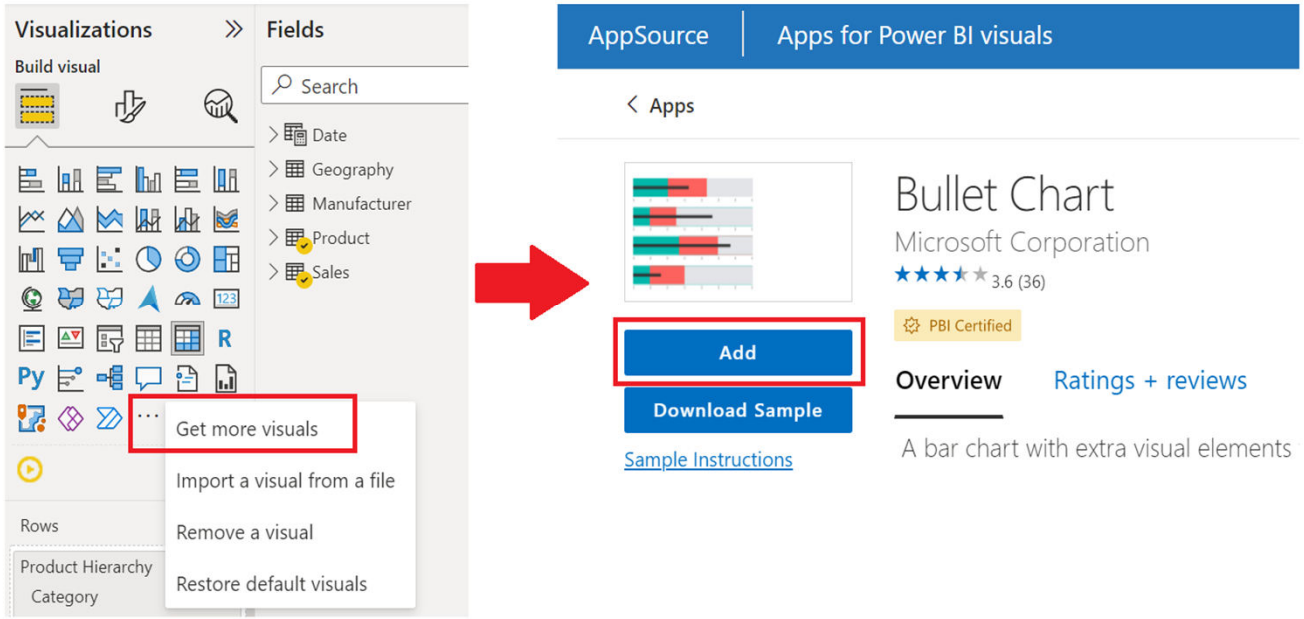
- In the **Visualizations** pane, select the **Get more visuals** icon and then select **Get more visuals**.
- On the window that displays, locate and select the visual that you want to import and then select **Add**.



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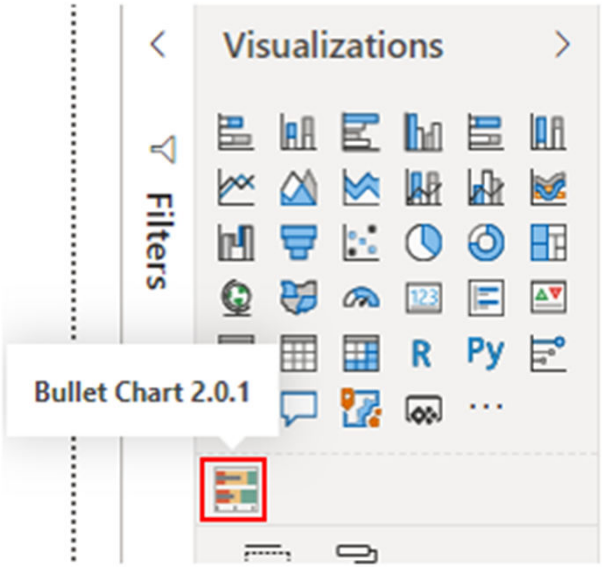
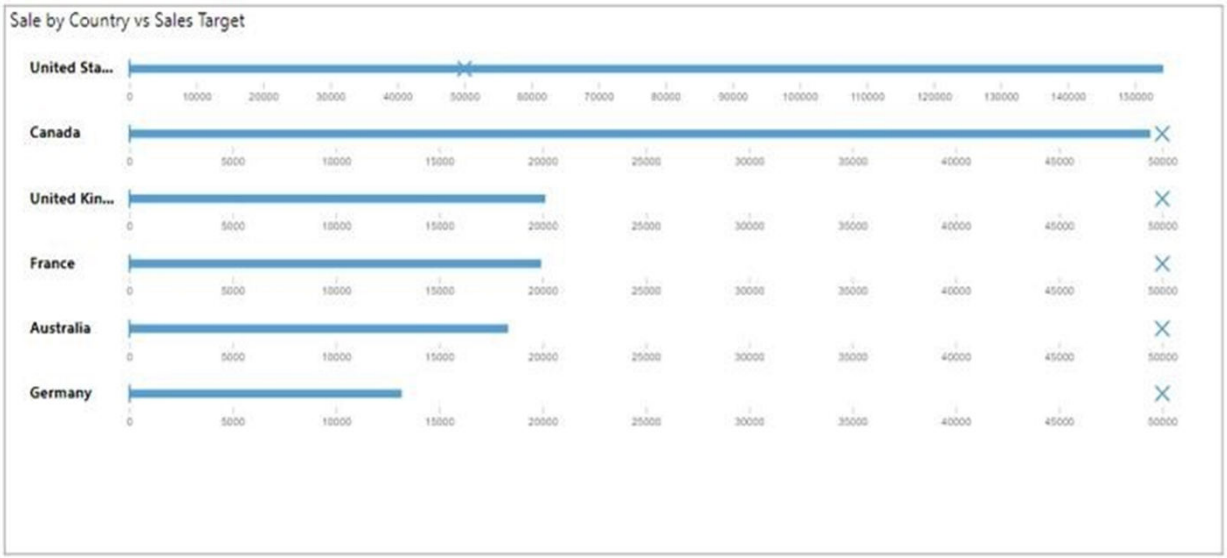
- The new visual will appear under the other visuals in the **Visualizations** pane.
- To add the visual to your report, select its icon.
- You can then add fields to the visual and customize its formatting, just like you would for any other visual.





Add an R or Python visual

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- If you decide to use an R or Python visual, and you want to refresh the data in Power BI service, you'll need to use a personal gateway.
- Power BI Desktop has an out-of-the-box visualization option for both R and Python that you can access on the **Visualizations** pane, and the process for creating these visuals is almost the same.

Create an R visual

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- Before you create the R visual, you must install R on your local computer so that Power BI Desktop can run R scripts.
- You can download and install R for free from many locations, including the Microsoft R Application Network and the CRAN Repository.
- When you have downloaded and installed R, Power BI enables it automatically, but you should verify that it has been enabled in the correct location.
- In Power BI Desktop, select **File > Options and settings > Options** and then select **R scripting** in the **Global** options list.
- Verify that your local R installation is specified in the **Detected R home directories** drop-down menu and that it properly reflects the local R installation that you want Power BI Desktop to use.

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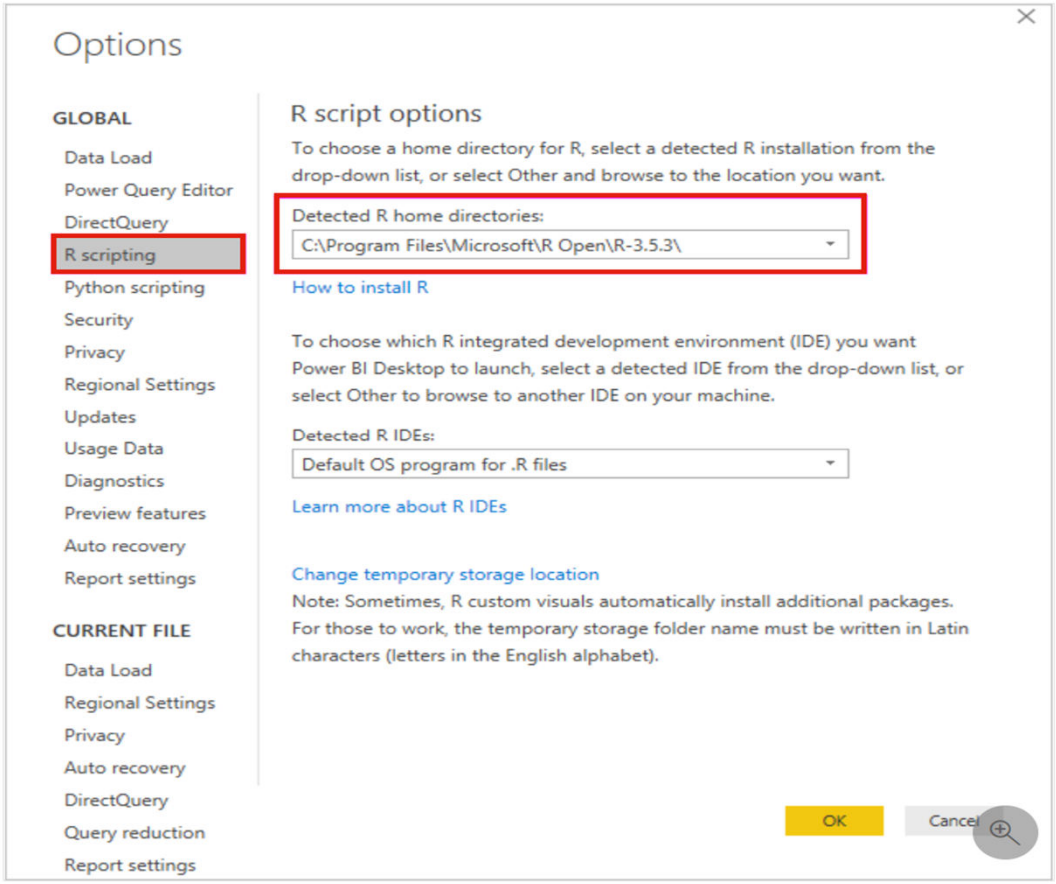
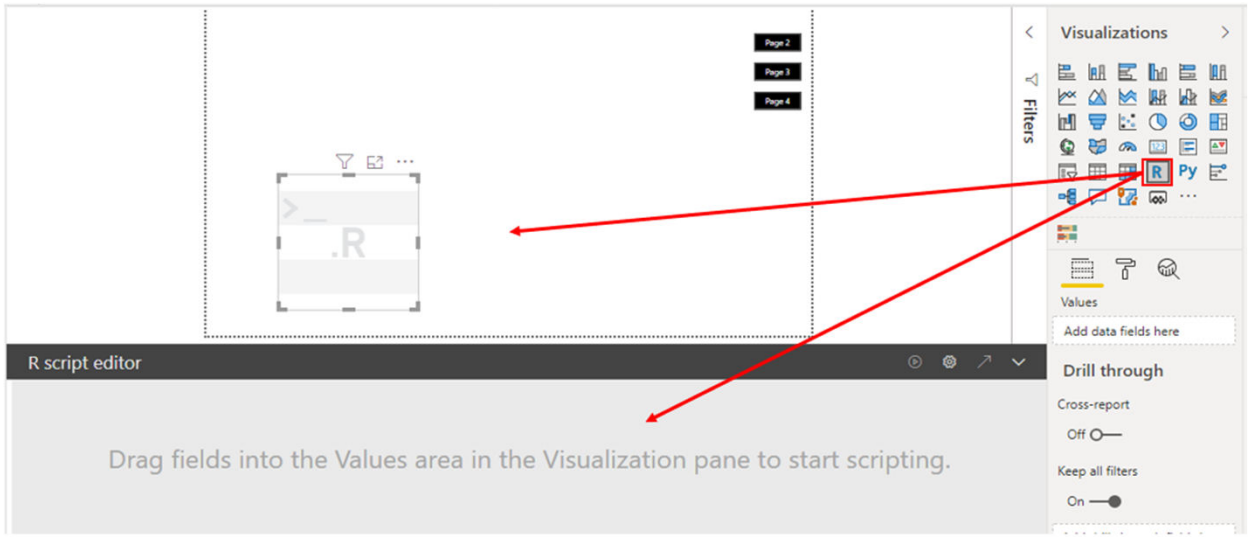


Continue ...

TEAM ACADEMY

- When you've verified your R installation, you can create the R visual.
- Select the **R visual** icon in the **Visualizations** pane and then select **Enable** on the window that displays.
- You'll then see a placeholder R visual image on the report canvas, with the **R script editor** underneath.



Continue ...

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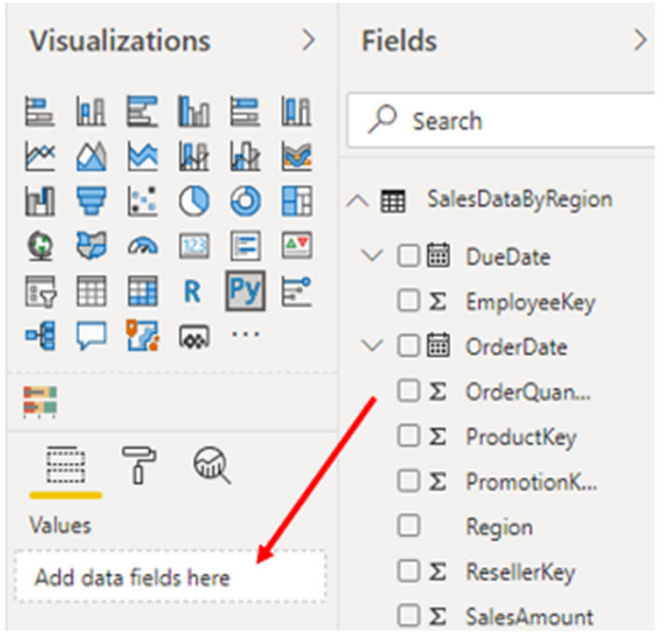
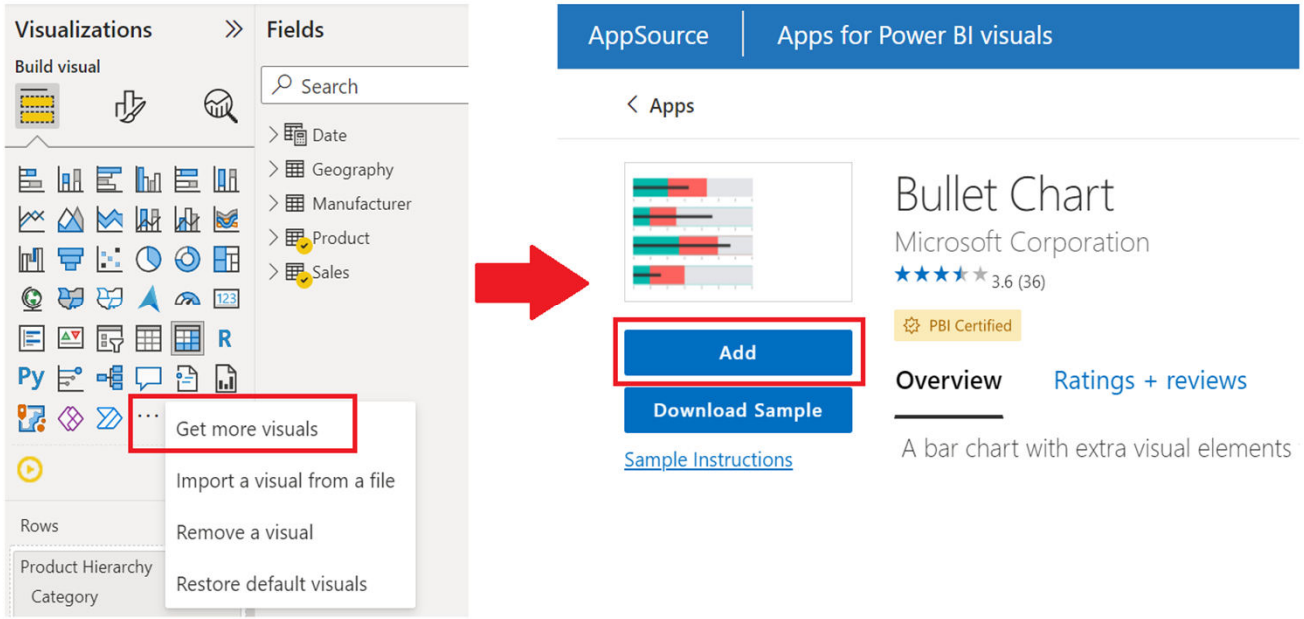
- Next, in the **Field** panel, select the fields that you want to use in your script.
- They will display in the **Values** section in the **Visualizations** pane. You'll use the data in these fields to create a plot.



Continue …

TEAM ACADEMY

- In the **Visualizations** pane, select the **Get more visuals** icon and then select **Get more visuals**.
- On the window that displays, locate and select the visual that you want to import and then select **Add**.



Continue …

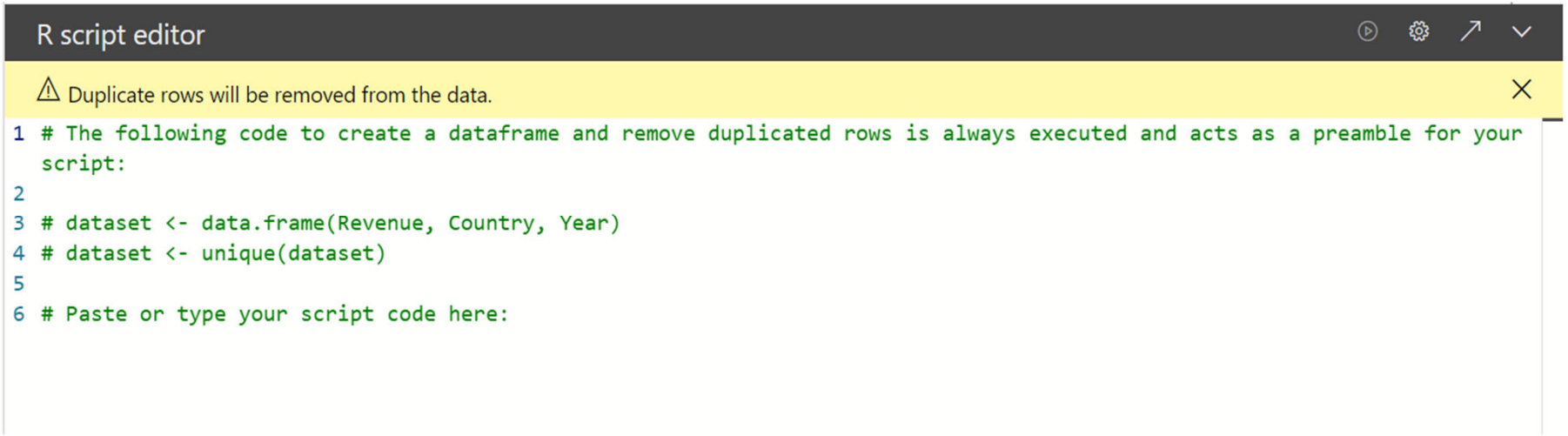
TEAM ACADEMY

- As you select or remove fields, supporting code in the **R script editor** is automatically generated or removed.
- Based on your selections, the **R script editor** generates the following binding code:
  1. The editor created a dataset data frame with the fields that you added.
  2. The default aggregation is: do not summarize.
  3. Similar to table visuals, fields are grouped and duplicate rows appear only once.

Continue ...

TEAM ACADEMY

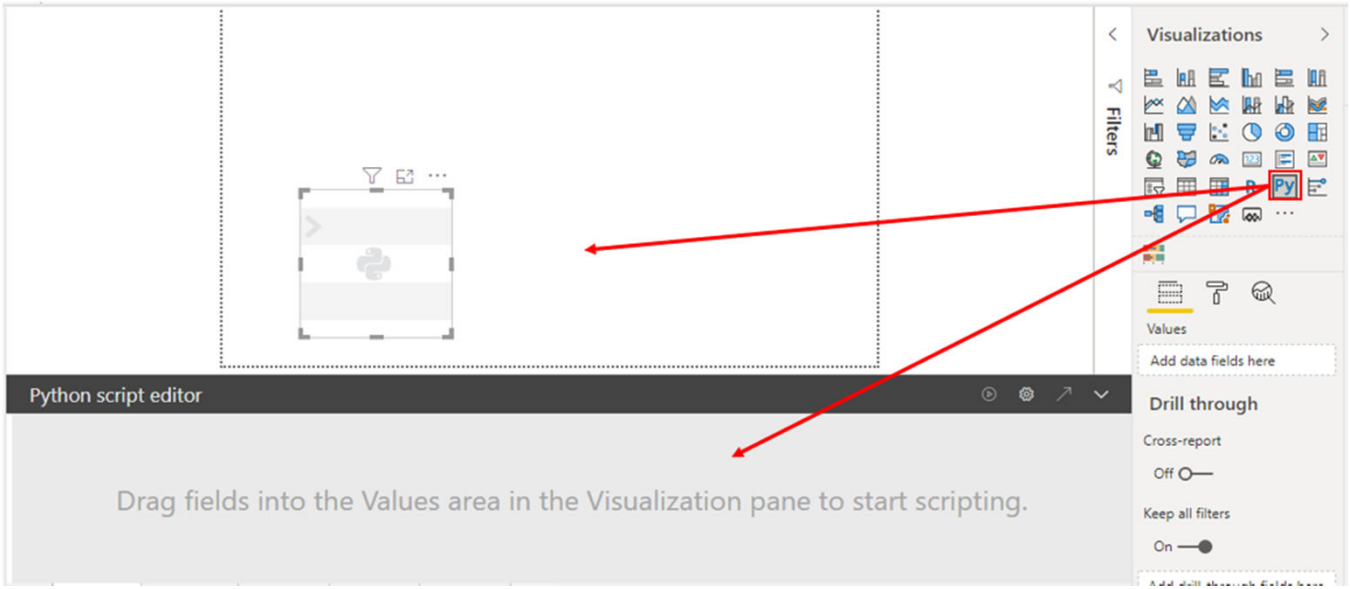
- When you have selected the fields, you're ready to write an R script that results in plotting to the R default device.
- When the script is complete, select **Run** from the **R script editor** title bar.
- Power BI Desktop identifies the plot and presents it on the canvas.



Create a Python visual

TEAM ACADEMY

- No prerequisites exist for creating a Python visual, so you can start right away in Power BI Desktop by selecting the **Python visual** icon in the **Visualizations** pane.
- Select **Enable** on the window that displays, and then you'll then see a placeholder Python visual image on the report canvas, with the **Python script editor** underneath.



Continue …

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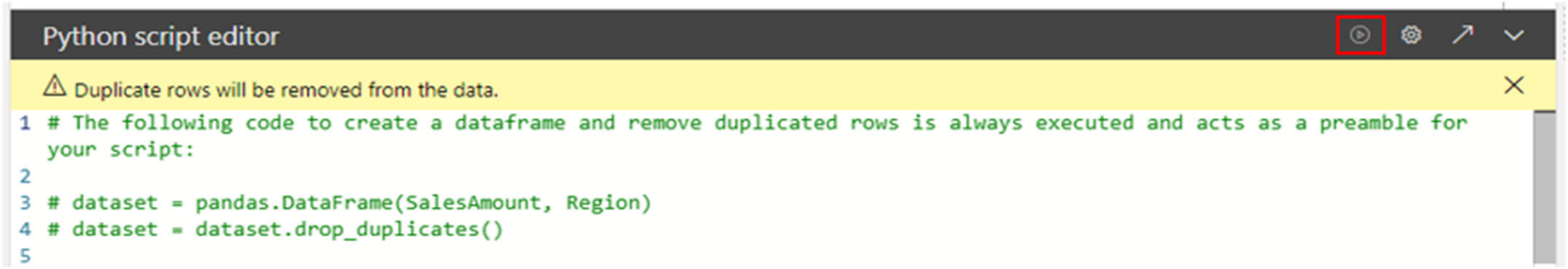
- You can continue creating a Python visual in the same way as you did when creating the R visual.
- In summary, you would select the fields, write the Python script, and then select **Run** from the **Python script editor** title bar.



Import an R or Python visual

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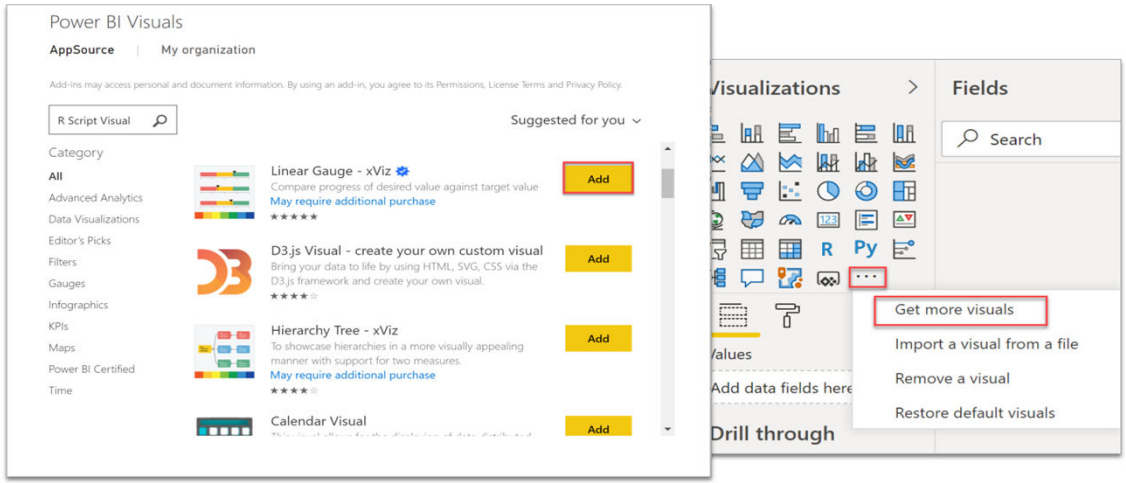
- To import an R or Python visual from AppSource, in the **Visualizations** pane, select the **Get more visuals** icon and then select **Get more visuals**.
- On the window that displays, locate and select the R or Python visual that you want to import and then select **Add**.
- The new visual icon will appear under the other visual icons in the **Visualizations** pane.



Work with key performance indicators

TEAM ACADEMY

- Key performance indicators (KPIs) are excellent in helping you track progress toward a specific goal over time.
- To use a KPI, you need three pieces of information:
  1. A unit of measurement that you want to track, for instance total sales, number of employee hires, number of loans serviced, or number of students enrolled.
  2. A goal for the measurement so that you can compare your progress with that goal.
  3. A time series, for instance daily, monthly, or yearly.

Continue …

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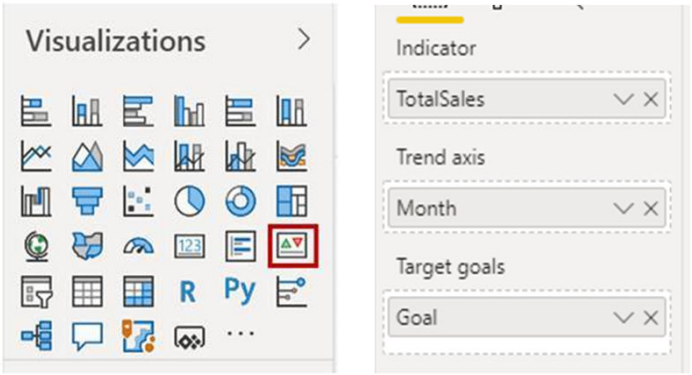
- Start by adding the KPI visual to the design service.
- The following screenshot shows the KPI icon in the **Visualizations** pane.



- When configuring the KPI visual, enter the unit of measurement that you are tracking in the **Indicator** prompt.
- Then, enter the goal under **Target goals** and select the time series from the **Trend axis** drop-down list, as shown in the following screenshot.

Continue …

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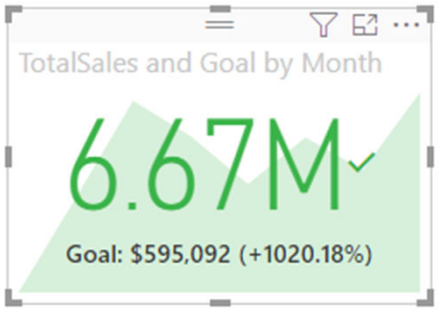
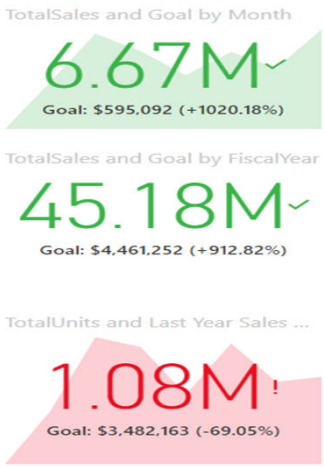
- This action will produce a KPI that looks similar to the following screenshot.



- KPIs work best in a series, for instance, showing the daily, monthly, and yearly goals in the section of a Power BI report.



Visit

teamacademy.qa

Contact us

info@teamacademy.net

+974 6623 0468

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