MASTER OF COMPUTER APPLICATIONS

SEMESTER 1

DATA VISUALIZATION

Unit 3

Basic Chart Types in Excel

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1. INTRODUCTION

In the world of data analysis and presentation, Excel has emerged as an invaluable tool. It empowers users to transform raw data into meaningful visualisations, making complex information accessible and understandable. At the heart of Excel's data visualisation capabilities lie two fundamental chart types: The Pie Chart and the Bar Chart. These chart types are essential tools for anyone seeking to convey data effectively, whether you are a business analyst, researcher, student, or professional in any field.

The Pie Chart: A Slice of Clarity

The Pie Chart is a powerful visual tool designed to represent data as a circular graph divided into slices or sectors. Each slice corresponds to a category or data point, and the size of each slice is proportional to the value it represents. Pie charts are excellent for displaying data with a relatively small number of categories (usually up to five or six). They excel at showcasing the distribution of a whole into its constituent parts, emphasising the relationship between each part and the whole.

This chapter will explore the intricacies of creating, customising, and interpreting Pie Charts in Excel. This will teach one to choose the correct data, create compelling labels, and adjust formatting to convey one's message effectively. Also, delve into when to use Pie Charts, best practices for their application, and common pitfalls to avoid.

The Bar Chart: Scaling Heights of Information

Conversely, bar charts are versatile graphical representations that use rectangular bars to display data. Each bar's length or height is proportional to the value it represents, making it an ideal choice for visualising data with multiple categories or comparing quantities. Bar Charts come in various forms, including vertical bar charts (column charts) and horizontal bar charts (bar graphs), each offering unique advantages for data representation.

This chapter unravels the art of creating Bar Charts in Excel, exploring the diverse settings and styles available for customisation. Learn how to choose the right type of Bar Chart for different scenarios, manage data sources, and enhance the visual appeal of the charts. Know the strategies for effectively presenting and interpreting Bar Charts, ensuring that the audience gains valuable insights from the data visualisations.

By the end of this chapter, students will have a comprehensive understanding of Pie and Bar Charts in Excel and the confidence to leverage these essential chart types to convey their data-driven narratives effectively. Whether the aim is to showcase market share percentages with a Pie Chart or compare sales figures with a Bar Chart, Excel's versatile charting capabilities will empower them to transform the data into compelling stories.

1.1 Learning Objectives

- *Define and differentiate between Pie Charts and Bar Charts in Excel.*
- *Interpret Pie Charts and Bar Charts*
- *Select the appropriate chart type (Pie or Bar) based on the data's nature and purpose.*
- *Compare Pie Charts and Bar Charts regarding their strengths and weaknesses for different data analysis tasks.*
- *Develop innovative approaches to data visualisation that go beyond standard chart types to enhance data-driven decision-making.*

2. DEFINITION

Pie Chart: A Pie Chart is a circular graphical representation used to display data as a "pie," where each slice represents a portion or percentage of the whole. It is a popular choice for visualising categorical data and showing the distribution of a dataset into various categories or components. Here are the key elements and characteristics of a Pie Chart:

Slices: The Pie Chart is divided into slices, each representing a specific category or data point. The size of each slice is proportional to the quantity it means.

Categories: Pie Charts are ideal for displaying data with a relatively small number of categories, usually up to five or six. Each category is labelled and corresponds to a slice of the pie.

Total: The entire Pie Chart represents 100% of the data, making it easy to visualise the relative proportions of different categories to the whole.

Use Case: Pie Charts are commonly used to show market share, budget allocation, and any scenario where one wants to emphasise the distribution of data parts within a whole.

Advantages: Pie Charts provide a clear visual representation of the relationship between categories and the whole, making it easy to identify the most significant and minor components.

Limitations: They may become less effective when dealing with many categories or when comparing categories that are close in size. Additionally, they do not convey precise values as accurately as other chart types.

Bar Graph (Bar Chart): A Bar Graph, also known as a Bar Chart, is a graphical representation that displays data using rectangular bars or columns. Each bar represents a category, and the length or height of the bar is proportional to the value it represents. Bar Graphs are versatile and suitable for various types of data visualisation. Here are the key components and characteristics of a Bar Graph:

Bars: The central feature of a Bar Graph is its bars or columns, each corresponding to a category. The bars can be vertical (column chart) or horizontal (bar chart).

Categories: Bar Graphs are particularly effective for displaying data with multiple categories or comparing quantities across categories. Each category is labelled on the axis.

Values: Each bar's length (in vertical Bar Graphs) or height (in horizontal Bar Graphs) represents the value or quantity associated with the respective category.

Axis: Bar Graphs have two axes—the horizontal axis (x-axis) and the vertical axis (y-axis). The horizontal axis typically represents categories, while the vertical axis represents values.

Use Cases: Bar Graphs are widely used to compare data across categories, track changes over time, and illustrate ranking or frequency distributions.

Advantages: They effectively display precise values, make comparisons between categories straightforward, and accommodate a wide range of data types.

Limitations: Bar Graphs can become cluttered and challenging to interpret when dealing with many categories or complex data structures.

In summary, Pie Charts are best suited for displaying data distribution into categories as parts of a whole. At the same time, Bar Graphs excel at comparing data across categories or showing changes over time. The choice between these chart types depends on the nature of the data and the specific goals of data visualisation.

3. PIE CHART

Excel offers diverse pre-built charts and graphs, providing users with an effective means of visually representing the data. Crafting a pie chart in Excel is a fantastic way to present numerical data visually intuitively, eliminating the need for in-depth analysis of raw data. Moreover, creating pie charts in Excel is remarkably straightforward, requiring just a few simple clicks. Although a wide array of charts is available, generating pie charts in Excel is slightly more intricate (though it remains pretty easy). Pie charts find frequent use in presentations, newspapers, and magazines, serving as a convenient tool for conveying essential information to the audience. In Excel, pie charts rely on a single data series, illustrating the individual contributions of each data point as a slice within the overall "pie."

A pie chart, also referred to as a circle graph, histogram, pie diagram, or scatter diagram, is a graphical representation that employs a circular format to visualise data. The chart segments correspond to the percentage of each category within the total dataset. Essentially, the size of each pie slice is directly proportional to the size of the category it represents within the whole dataset. The entire "pie" chart symbolises 100% of the total, while the individual "slices" represent specific proportions of that whole. Pie charts offer a quick and intuitive way to grasp the distribution of various components within a dataset. They find widespread use in business presentations and educational contexts to illustrate proportions across diverse categories, such as expenses, demographic groups, or survey responses.

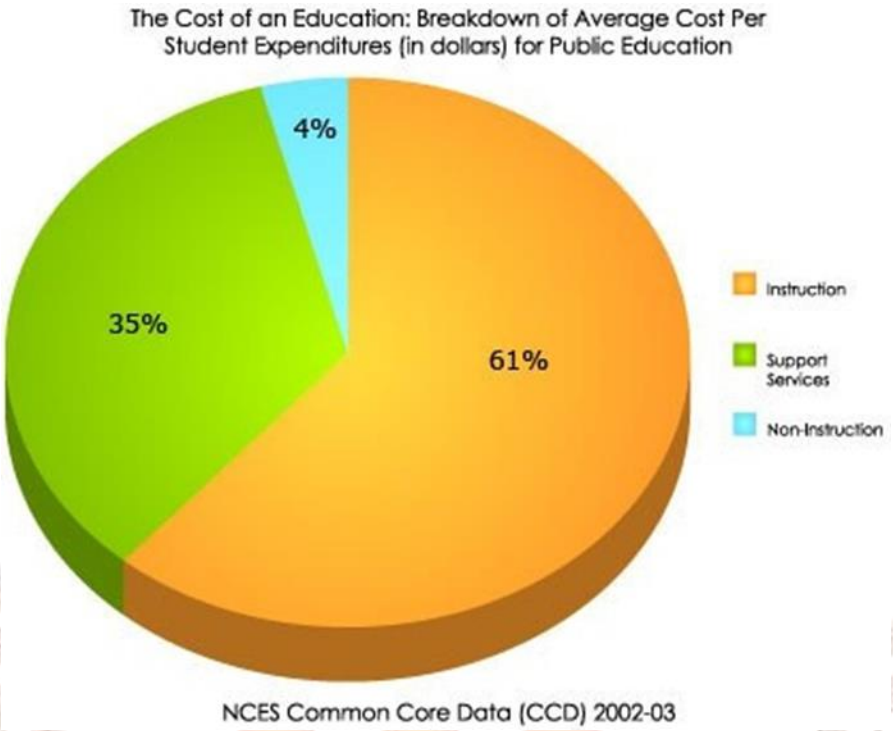


Fig 3. 1 Education Cost Breakdown Per Student

3.1 History

Pie charts have visualised numerical data and geographical information since the 1800s. Florence Nightingale, who drew attention to the significant death toll resulting from inadequate sanitation during the Crimean War, is credited with popularising pie charts as a compelling statistical instrument.

3.2 Advantages of Pie Charts

After understanding what a pie chart is, let's explore its benefits:

1. Simplicity and Ease of Comprehension: A pie chart offers a straightforward and easily understandable data representation.
2. Visual Fraction of a Whole: It visually presents data as a fraction of a whole, making it an effective communication tool, even for less experienced audiences.
3. Quick Data Comparison: Viewers can instantly compare data in a pie chart, enabling swift analysis and easy comprehension.
4. Eliminating the Need for Detailed Numbers: Pie charts eliminate readers' need to delve into or quantify underlying numerical data.

5. Data Manipulation: The chart allows for data manipulation to emphasise specific points.
6. Visual Appeal: Pie charts are visually appealing, capturing viewers' attention effectively.

3.3 Disadvantages of Pie Charts

While there are numerous advantages, pie charts also come with drawbacks:

1. Ineffectiveness with Many Data Points: When a pie chart contains numerous data points, its effectiveness diminishes.
2. Potential for Confusion with Abundant Data: Excessive data slices can lead to confusion and difficulty reading, even when adding data labels and numbers.
3. Limited for Comparing Multiple Data Sets: Pie charts represent only one dataset, making it challenging to compare different data sets effectively.
4. Hindrance to Efficient Data Analysis: Complex pie charts can hinder readers' efficient analysis and assimilation of information.
5. Difficulty in Data Slice Comparison: Comparing data slices can be cumbersome for readers, requiring assessing angles and non-adjacent segments.
6. Potential for Misleading Visual Impact: Relying on visual impact rather than thorough data analysis can lead readers to draw incorrect conclusions.
7. Unsuitability for Negative Data: Pie charts are not well-suited for representing negative data effectively.

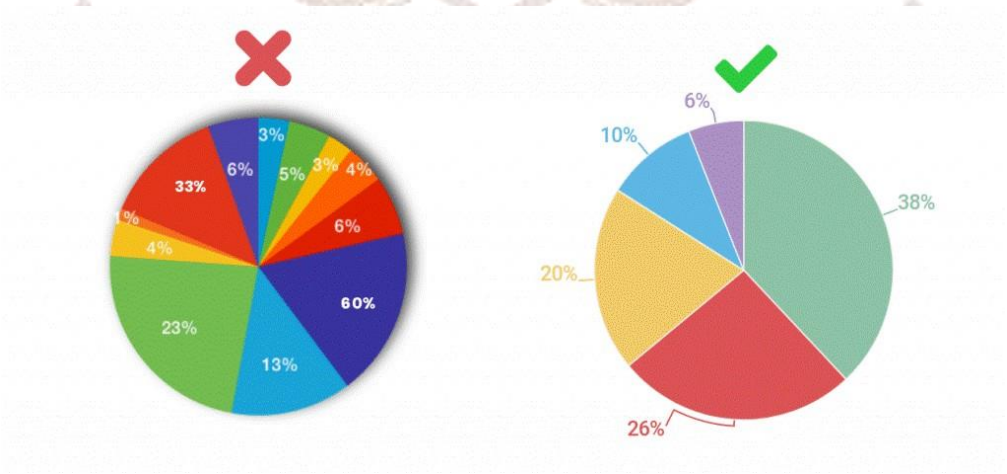


Fig 3. 2 Effective vs. Ineffective Pie Charts

When to use a pie chart? Pie charts are most valuable when it needs to be analysed as a whole composition. They excel in portraying categorical data, where each slice can symbolise a distinct category. Here's an exemplary pie chart for reference.

Furthermore, pie charts can effectively assess various aspects of business growth, such as sales, profits, and market exposure. A pie chart is a circular graph with segments removed (resembling pie slices). These segments represent the contributions of each category to the whole. The data must align with this structure. The contribution of each category to the display of parts of a whole is represented by these segments. Ensure the data represents likewise.

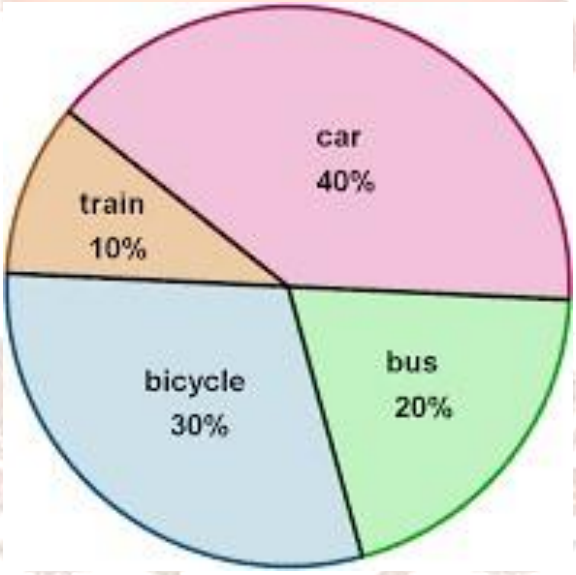


Fig 3. 3 Modes of Transportation Usage Percentage

3.4 Types of Pie Charts

Based on the graph's dimensions, pie charts are divided into two forms: a 2D pie chart and a 3D pie chart.

1. *2D Pie Chart*

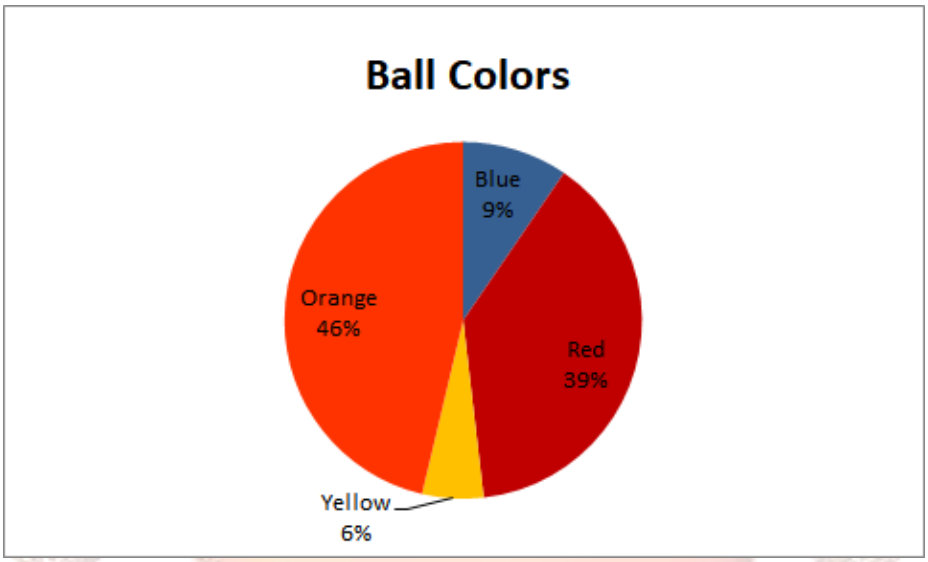


Fig 3. 4 Ball Colors Distribution Chart

A two-dimensional pie chart is a circular graph that depicts the percentage of variables in a dataset. This pie chart shows the pie chart's entries in two dimensions. Based on how the variables are visualised on the pie chart, the 2D pie chart is further divided into four forms:

I. Simple Pie Chart

II. Exploded Pie Chart

III. Pie of Pie

IV. Bar of Pie

2. *3D Pie Chart*

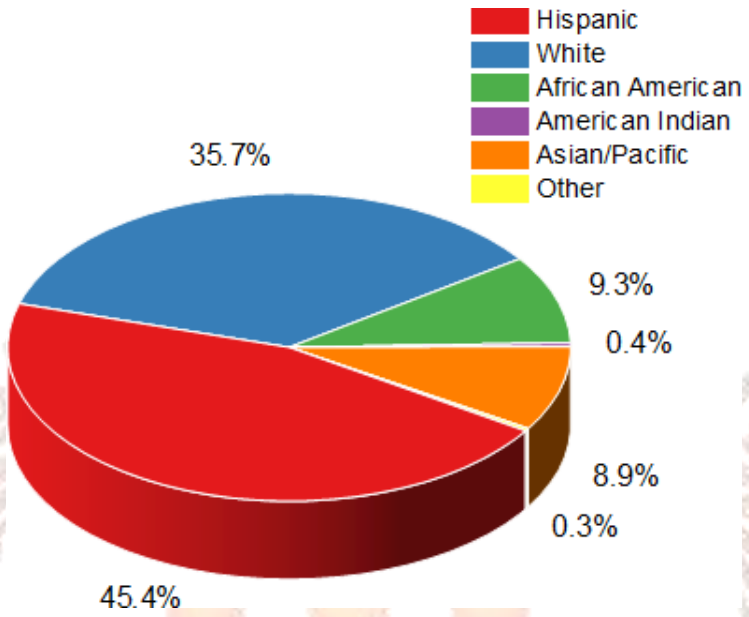


Fig 3. 5 Ethnicity Demographics Pie Chart

A 3-dimensional representation of a pie chart is a 3D pie chart. It's mostly used for decorative purposes and doesn't help with data visualisation on a pie chart. On the opposite, it causes the graph to be distorted and difficult to decipher. The 3D pie chart is further split into two parts:

I. Simple 3D chart

II. exploded 3D chart

3.5 Constructing a 2D pie chart

When constructing a pie chart, each segment's label is referred to as the category, while the numerical figure associated with that category is termed the value. These categories collectively represent 100% of the data being charted, and the size of each segment reflects its proportion relative to the whole. It's essential to ensure that categories do not overlap to avoid double-counting. For instance, if one category is "Women" and another is "People Over Fifty," it's likely that some individuals fall into both categories, which would result in duplicate counting.

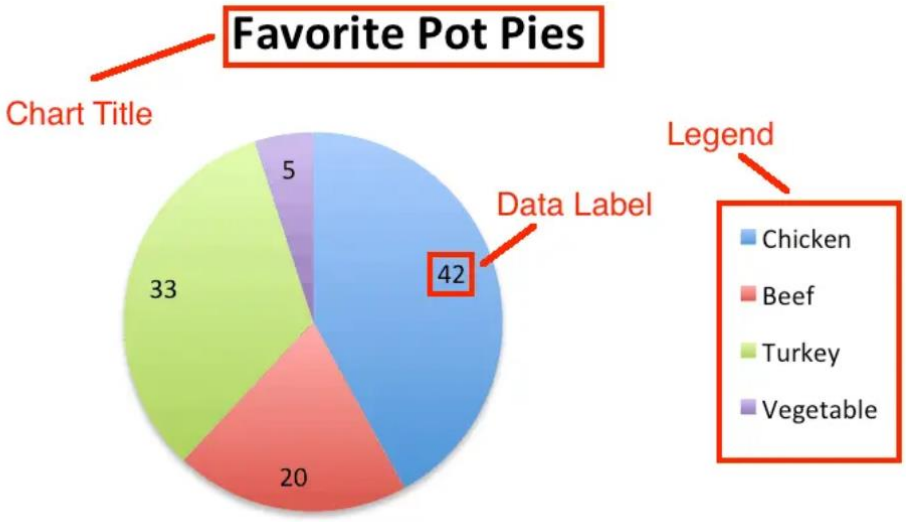


Fig 3. 6 Favorite Pot Pies

Pie charts tend to lose effectiveness when there are more than seven categories, although certain variations can accommodate a few additional categories. Some professionals are critical of pie charts because accurately comparing angles can be challenging, but this problem can be mitigated by incorporating data labels. Excel provides various options beyond the standard pie chart to address these considerations.

Creating a pie chart in Excel is a straightforward process involving just a few clicks. The crucial step is appropriately structuring the source data in the worksheet and selecting the most suitable pie chart type. Below are the steps to prepare a pie chart

1. Prepare the source data for the pie chart: Unlike other graphs, Excel's pie charts require arranging one's source data in one column or row. This restriction exists because a pie chart represents only a single data series.

One can include a column or row containing category names, which should be the selection's first column or row. These category names will appear in the pie chart's legend and data labels.

In general, an Excel pie chart is most visually appealing when:

- It represents only one data series in the chart.
- All data values are greater than zero.

- There are no empty rows or columns in the data.
- The number of data categories does not exceed 7 to 9, as too many pie slices can clutter the chart and hinder comprehension.

For this chapter on creating an Excel pie chart, let's generate a pie chart using the following dataset:

	A	B
1	**Recommended Diet**	
2	Food	Percentage
3	Fruit	36%
4	Vegetables	14%
5	Dairy	13%
6	Protein	28%
7	Grains	9%

Fig 3. 7 Source Dataset

2. Add a pie chart to the current worksheet: Once the source data is organised as needed, highlight it, navigate to the Insert tab, and select the desired chart type.

In this instance, the standard 2-D pie chart is created:

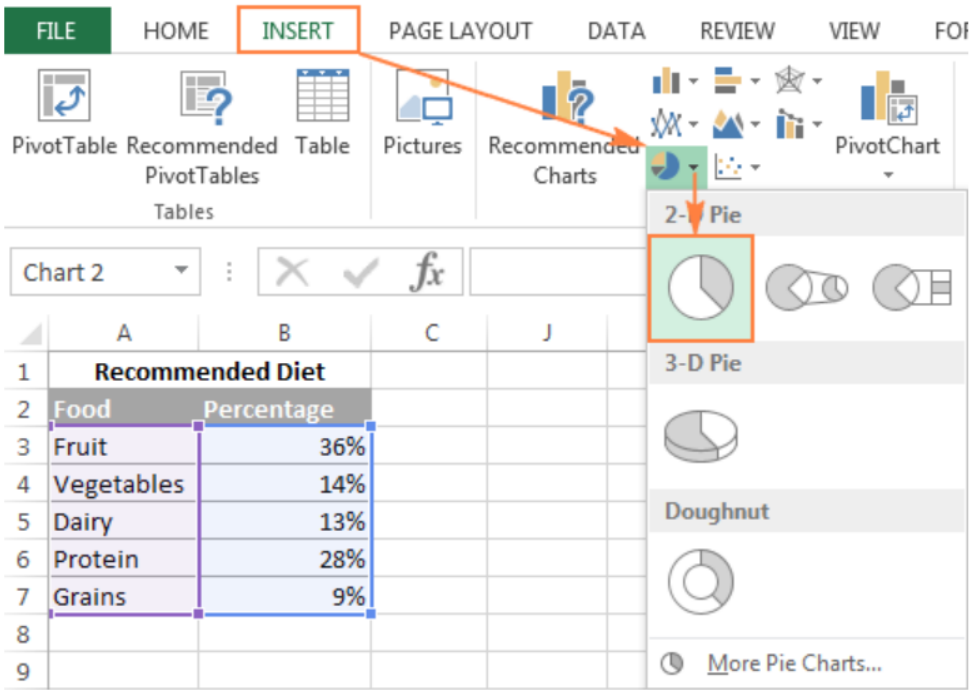


Fig 3. 8 Creating a 2-D Pie Chart for Recommended Dataset in Excel

Note: Include the column or row headings in the selection if one wants the heading of the value column / row to automatically appear in the title of the pie chart.

3. Select a pie chart style (if desired): After inserting the pie chart into the worksheet, go to the Design tab within the Charts group. Here, one can explore various pie chart styles to pick the one that complements the data most effectively.

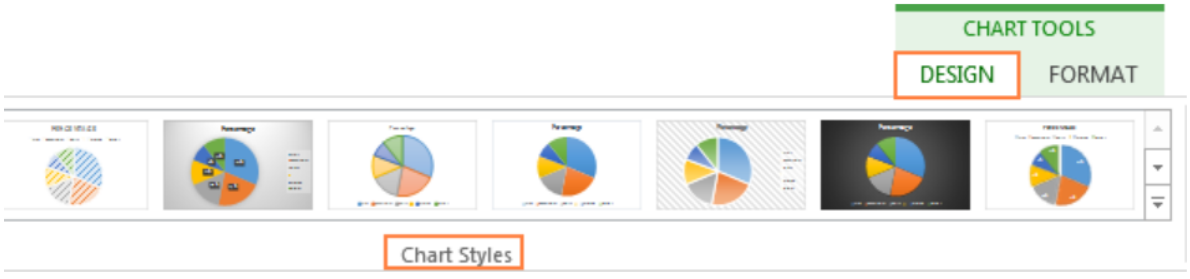


Fig 3. 9 Chart Styles

The default pie graph (Style 1) inserted in an Excel worksheet looks as follows:

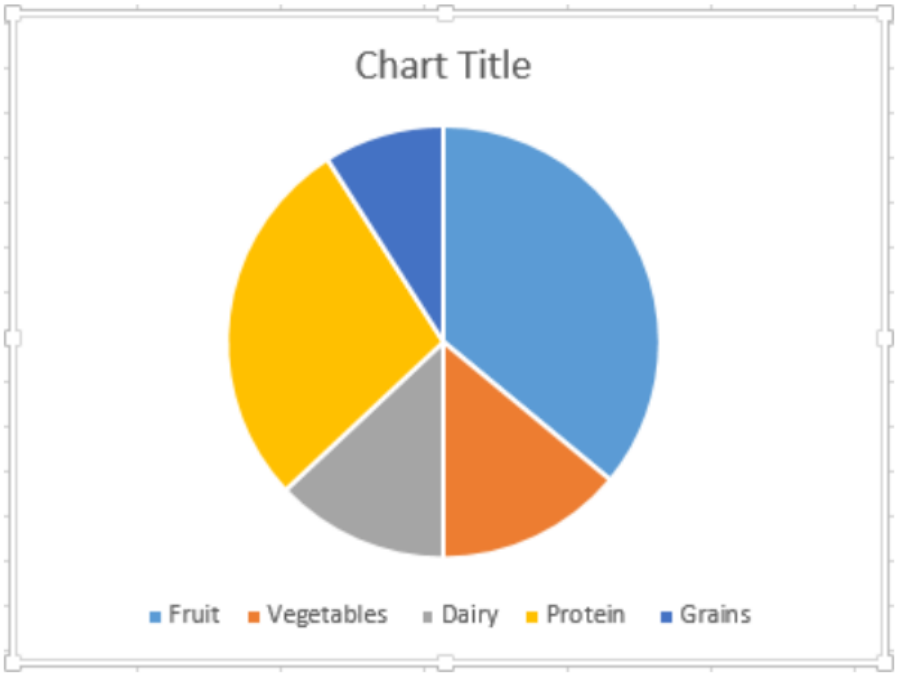


Fig 3. 10 Style 1 Pie Chart

This pie chart appears somewhat essential and could benefit from enhancements like including a chart title, data labels, and potentially using more visually appealing colours. Discuss these improvements in more detail later. For now, let's take a brief overview of the different types of pie charts that Excel offers.

When a pie chart is made in Excel, one can choose the following subtypes:

- 2-D pie chart
- 3-D pie chart
- Pie of Pie or Bar of Pie
- Doughnut chart

Excel 2-D pie charts

This is the most popular Excel pie chart that would probably used most often. It is created by clicking the 2-D pie chart icon on the Insert tab > Charts group.

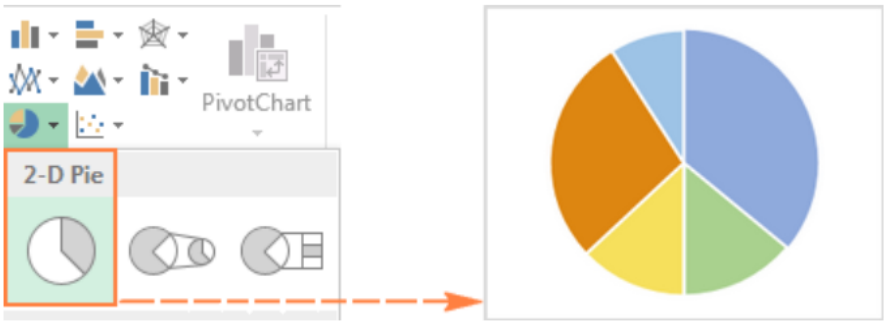


Fig 3. 11 Inserting a 2-D Pie Chart in Excel

Excel 3-D pie charts

A 3-D pie chart is similar to a 2-D pie but displays data on a third *depth axis* (perspective).

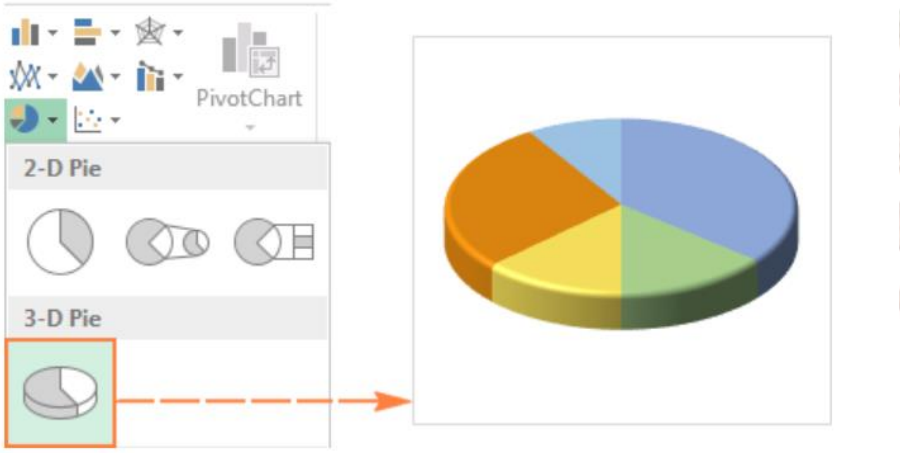


Fig 3. 12 Creating a 3-D Pie Chart in Excel

When 3-D pie charts are created in Excel, additional capabilities like 3-D Rotation and Perspective adjustments are accessible. Furthermore, Excel offers specialised chart types known as "Pie of Pie" and "Bar of Pie" charts. These are particularly useful when a pie chart contains numerous small slices, representing those small slices in a secondary pie chart or a bar chart, which serves as a subsection of the main pie chart.

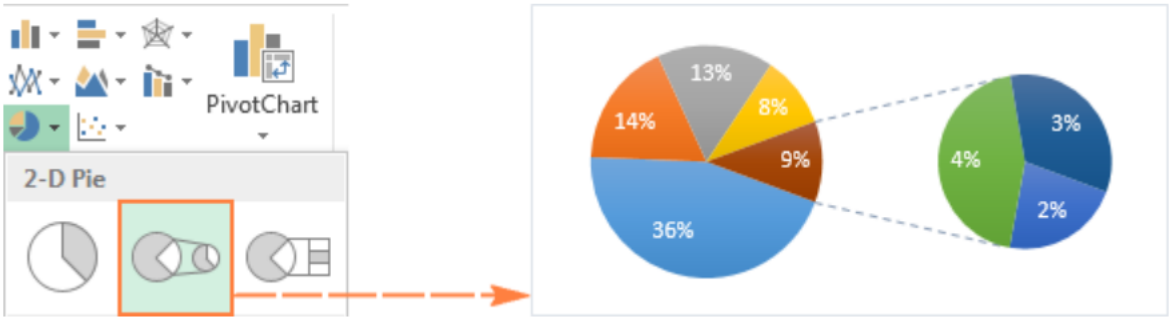


Fig 3. 13 Exploded 2-D Pie Chart in Excel

Bar of Pie chart

It is similar to the Pie of Pie graph, except the selected slices are displayed on a secondary bar chart.

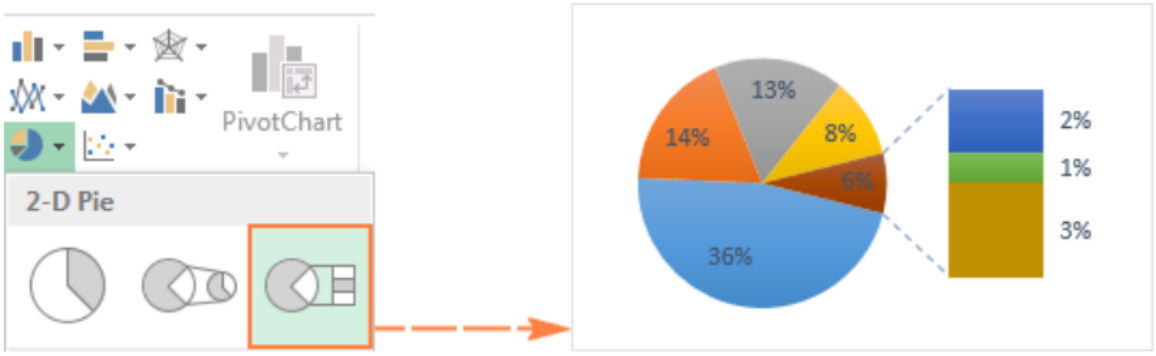


Fig 3. 14 Exploded Section 2-D Pie Chart in Excel

When one generates a "Pie of Pie" or "Bar of Pie" chart in Excel, the default behaviour is to move the last three data categories to the second chart, regardless of their size (even if they are the most significant categories). However, since the default option may not always be suitable, two alternatives are available as mentioned below:

1. Rearrange the source data in your worksheet in descending order so that the least significant items are placed in the secondary chart or
2. Manually select which data categories to relocate to the second chart.

To manually select which data categories should be transferred to the secondary chart, follow these steps:

1. Right-click on any segment within your pie chart and choose "Format Data Series..." from the context menu.
2. In the Format Data Series pane, within the Series Options section, choose one of the following options from the "Split Series By" drop-down menu:
   - Position: This option allows to specify the number of categories to move to the secondary chart.
   - Value: A threshold (minimum value) can be set under which data categories will be moved to the additional chart.
   - Percentage value: Similar to the "Value" option, a percentage threshold is specified here.
   - Custom: This option enables one to manually select any slice on the pie chart in the worksheet and decide whether to place it in the primary or secondary chart.

In most cases, setting the percentage threshold is the most practical choice, but the choice ultimately depends on your source data and personal preferences. The screenshot below illustrates the process of splitting the data series by the "Percentage value" option:

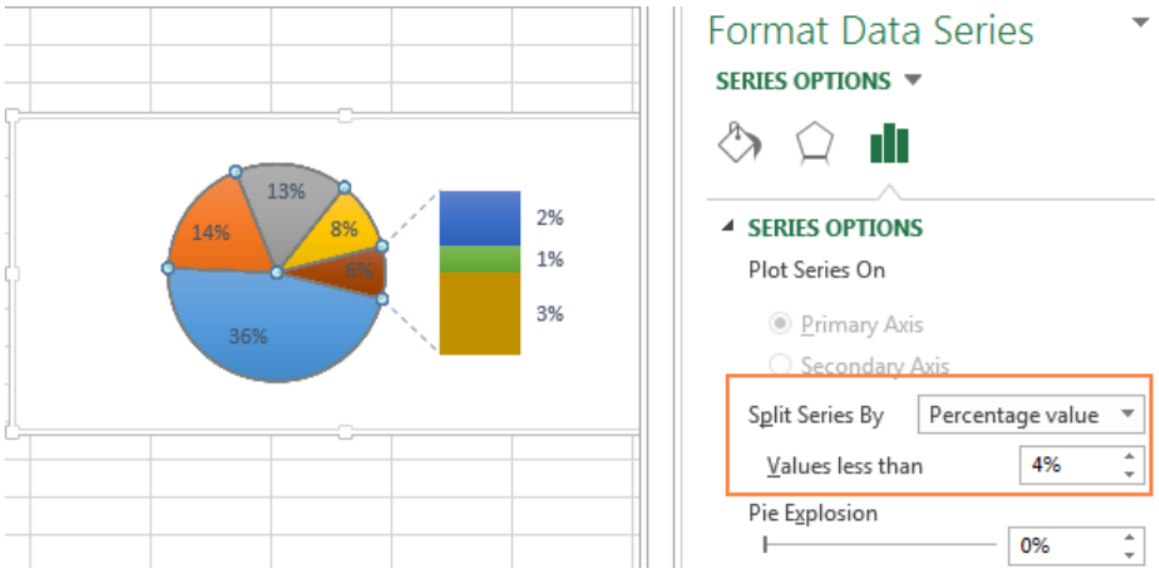


Fig 3. 15 Formatting Data Series for Pie Chart in Excel

Furthermore, there are options to customise the following settings:

1. Adjust the gap between the two charts: The value displayed under "Gap Width" signifies the gap width as a percentage of the secondary chart's width. One can modify this gap by dragging the slider or entering the desired percentage in the box.
2. Alter the size of the secondary chart: This is controlled by the number provided under the "Second Plot Size" box, indicating the size of the secondary chart as a percentage relative to the main chart's size. One can also resize the second chart by dragging the slider to increase or decrease its size or entering your preferred percentage value in the box.

Donut Charts

When multiple data series contribute to the whole, a doughnut chart can be utilised instead of a pie chart. However, it's important to note that accurately gauging the proportions between elements in different series can be challenging in doughnut charts. Consequently, it often makes more sense to consider alternative chart types like bar charts or column charts when dealing with such data scenarios.

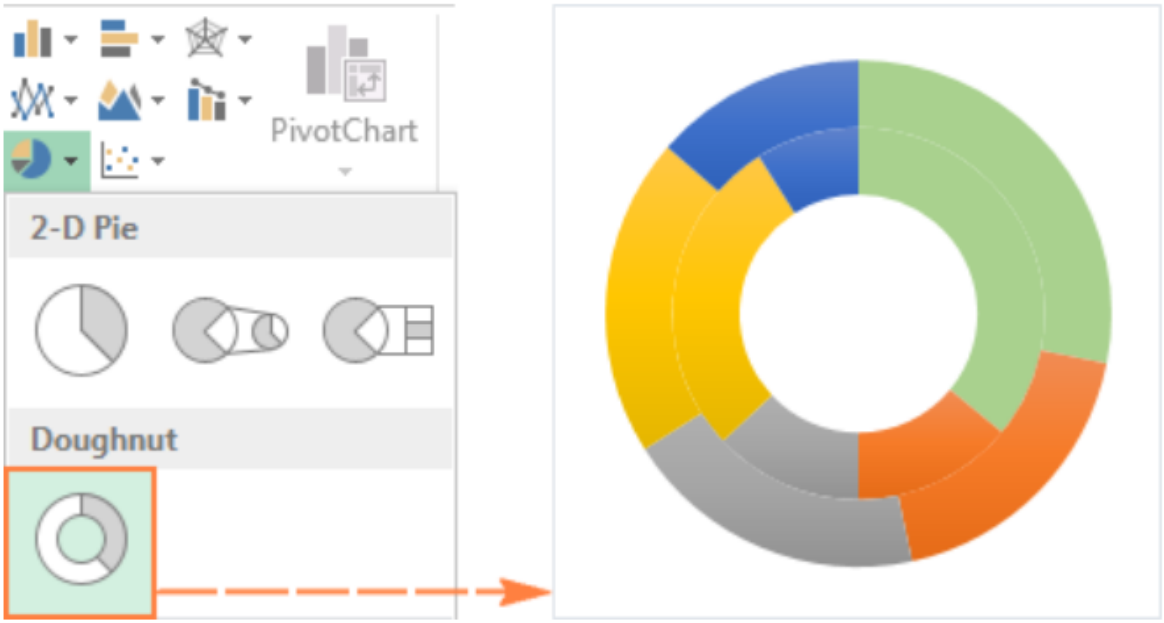


Fig 3. 16 Inserting a Doughnut Chart in Excel

To adjust the size of the central hole in a doughnut chart when working with Excel, make the following modifications:

1. Right-click on any data series within the doughnut chart and choose the "Format Data Series" option from the contextual menu.
2. In the "Format Data Series" pane, navigate to the "Series Options" tab and resize the central hole by either using the slider beneath "Doughnut Hole Size" or by directly entering the desired percentage into the provided box.

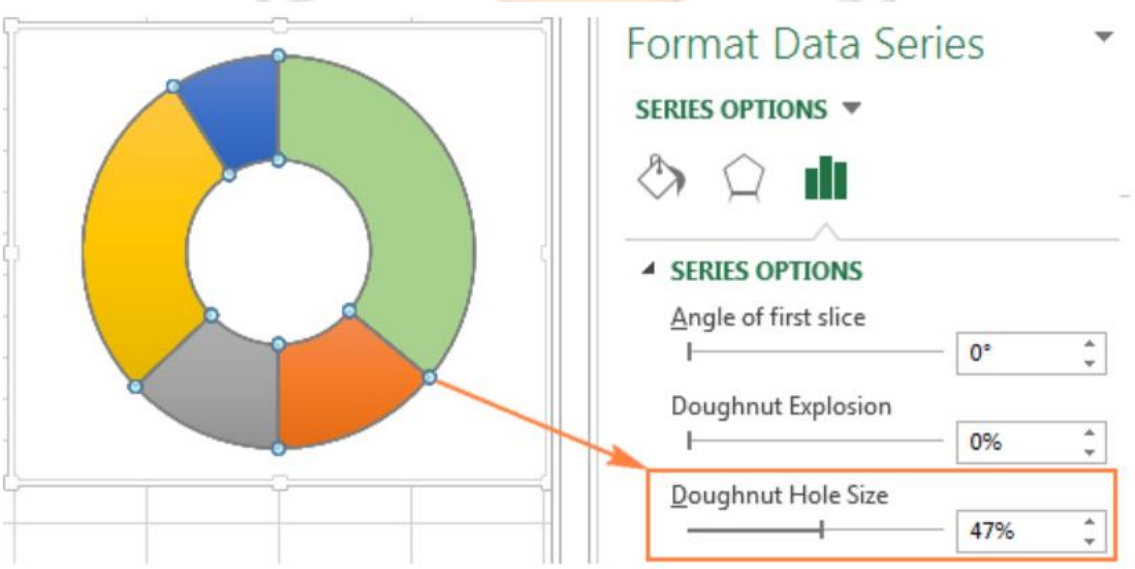


Fig 3. 17 Adjusting Doughnut Hole Size in Excel Chart

When a pie chart in Excel is generated primarily to analyse data trends quickly, the default chart settings might be adequate. However, if an aesthetically pleasing graph is required for presentations or similar purposes, it's a good idea to enhance and refine it. The fundamentals of Excel chart customisation are discussed below.

Labelling a PIE Chart in Excel: The labels are included for all the data points in this specific pie chart example. To achieve this, click the "Chart Elements" button in the upper-right corner of the pie chart, and then choose the "Data Labels" option.

Furthermore, if one wishes to adjust the placement of the labels in the Excel pie chart, one can do so by clicking the arrow next to "Data Labels." Pie charts offer a more comprehensive range of label placement options compared to other chart types in Excel.

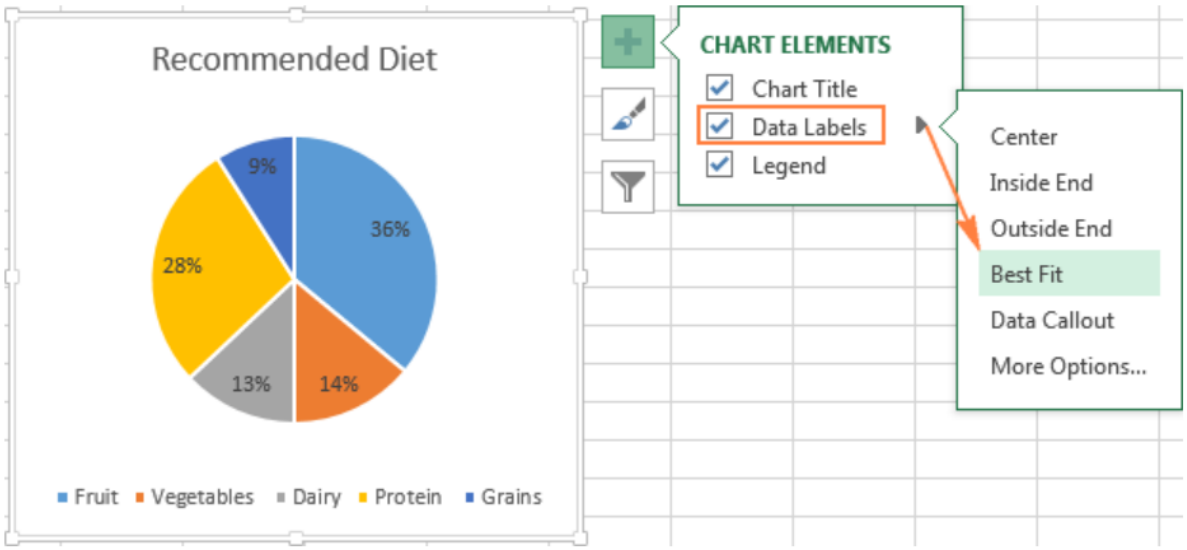


Fig 3. 18 Customising Data Labels in an Excel Pie Chart

If the data labels are to be shown inside **bubble shapes**, select *Data Callout*:

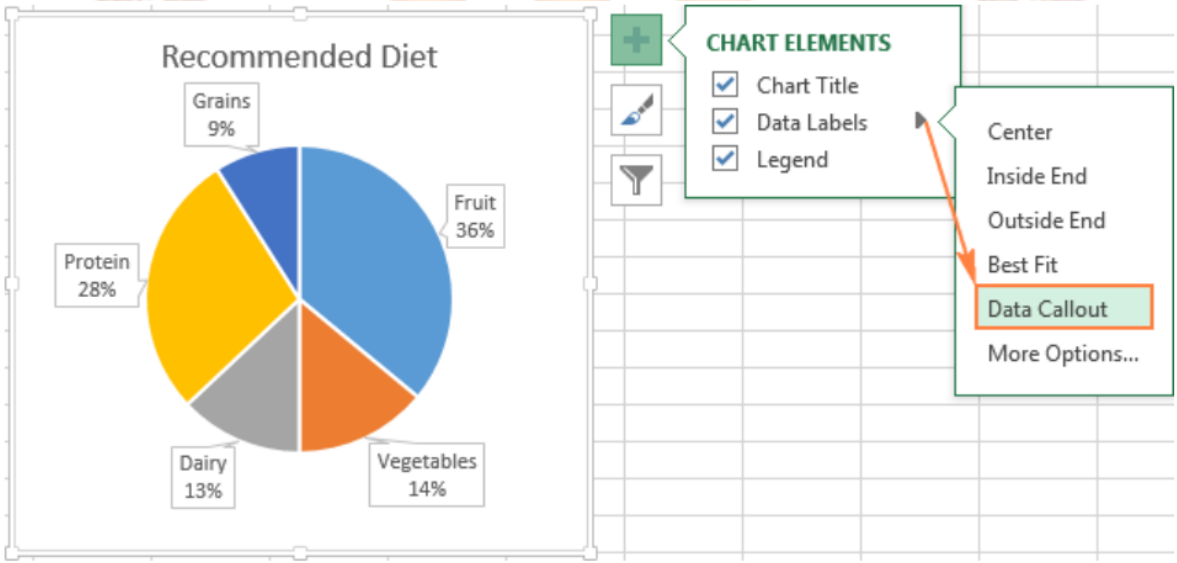


Fig 3. 19 Recommended Pie Chart with Data Callouts in Excel

Note: If chosen to put the labels inside slices, the default black text may be difficult to read on dark slices like the dark blue slice in the pie chart above. For better readability, one may change the labels font colour to white (click on the labels, go to the *Format* tab > **Text Fill**). Alternatively, the colour of individual pie chart slices can be changed.

3.6 Showing Data Categories on the Table:

When dealing with an Excel pie chart containing more than three slices, displaying labels directly on the slices themselves can be more user-friendly, rather than requiring users to refer back and forth between the legend and the chart to identify each slice.

The quickest method to achieve this is by selecting one of the pre-made chart layouts on the Design tab within the Chart Styles group, specifically within the Quick Layout options. Layouts 1 and 4 are the ones that include data category labels for easier reference.

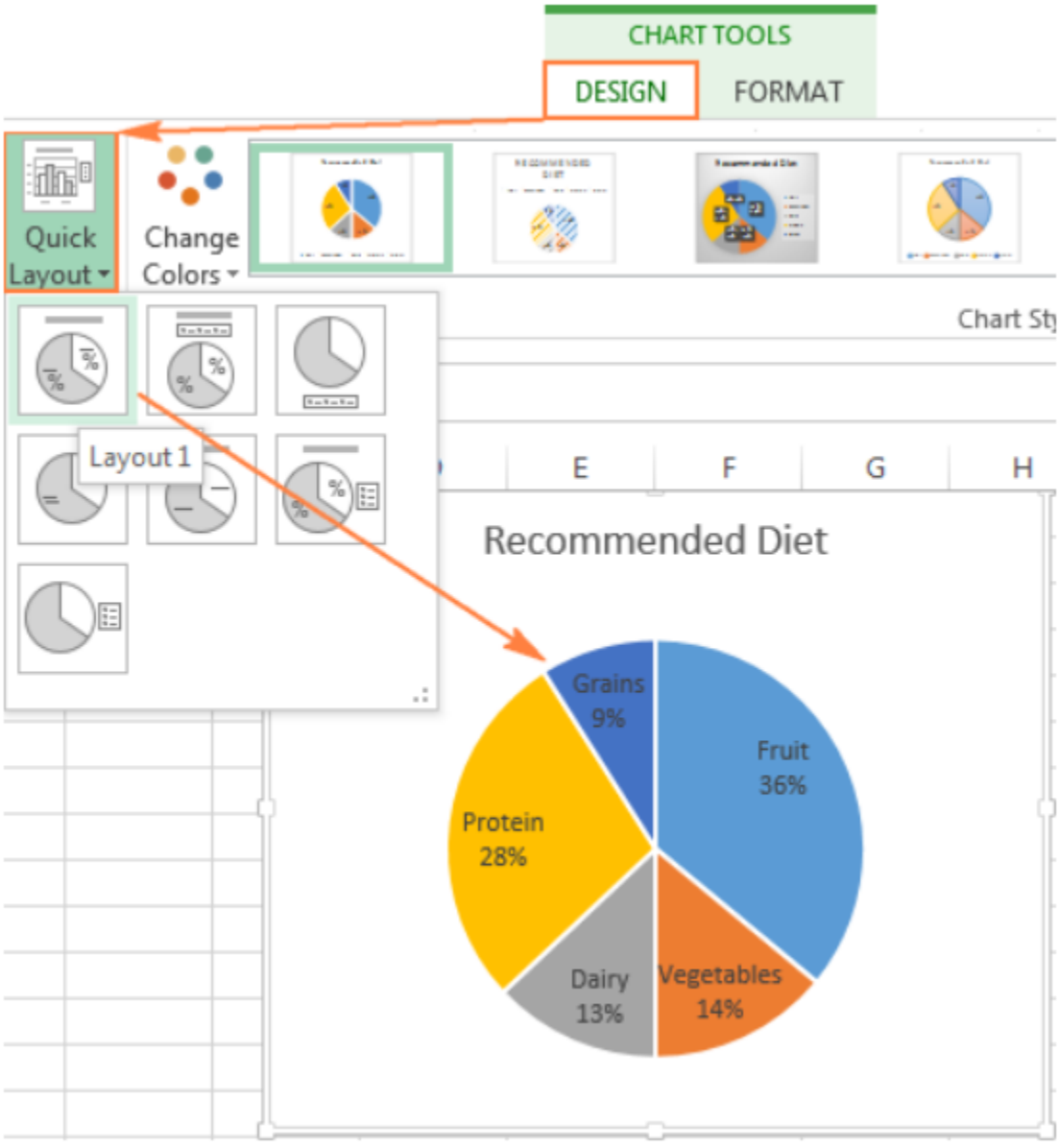


Fig 3. 20 Changing Chart Layout in Excel

The Chart Elements button (represented by a green cross) can be accessed in the upper-right corner of the pie chart for additional customisation choices. Then, click the arrow next to "Data Labels" and opt for "More options" from the menu that appears. This action will open the "Format Data Labels" pane on the right side of your worksheet.

Switch to the "Label Options" tab within this pane, and check the "Category Name" box.

Furthermore, the following options can be considered as handy:

- In the "Label Contains" section, specify the data that is to be displayed on the labels (for example, "Category Name" and "Value").
- In the "Separator" drop-down menu, choose how to separate the data displayed on the labels (for instance, "New Line").
- Under "Label Position," select where to position the data labels (for instance, "Outside End", as demonstrated in this sample pie chart).

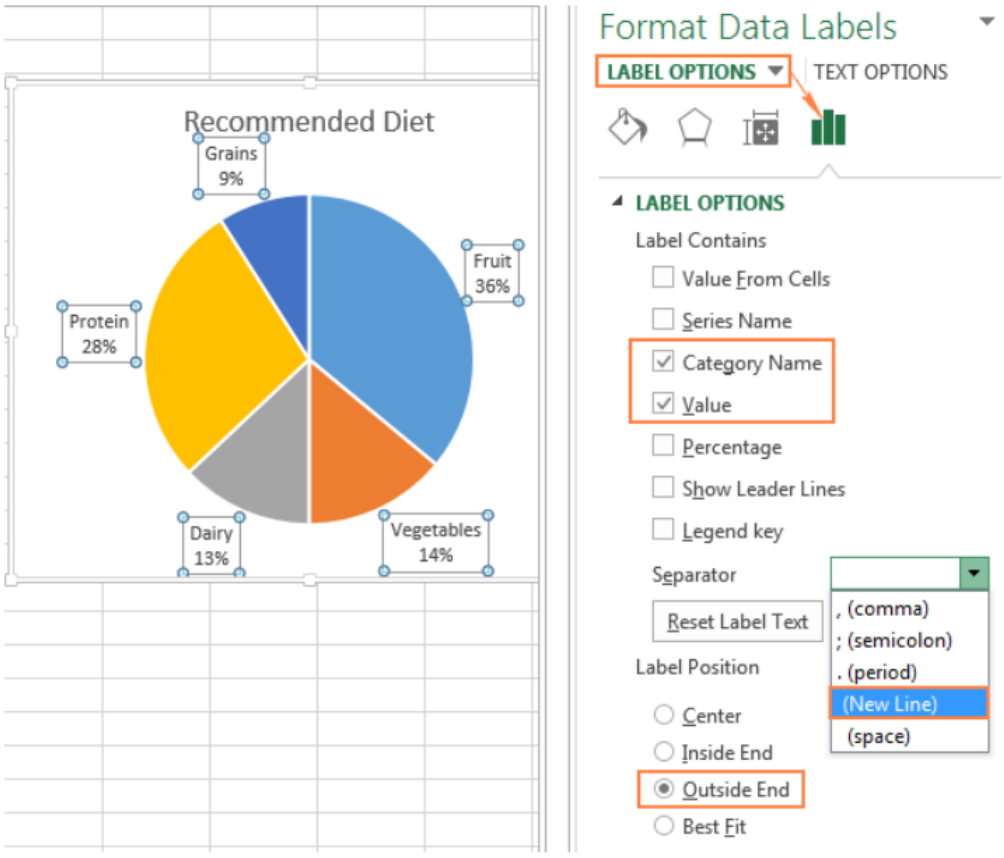


Fig 3. 21 Formatting Pie Chart Data Labels in Excel

Note: Now that the data labels are added to the Excel pie chart, the legend has become redundant. and remove it by clicking the *Chart Elements* button and unchecking the Legend box.

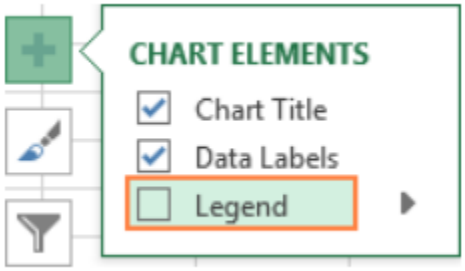


Fig 3. 22 Chart Elements

To display percentages on a pie chart in Excel, the process varies depending on the type of source data:

1. If the source data is already in percentages, Excel will automatically display "%" on the data labels when the Data Labels option under Chart Elements is enabled or select the Value option in the Format Data Labels pane. This happens as demonstrated in the previous pie chart example.

2. However, if the source data consists of numbers, configure the data labels to show either the original values, percentages, or both. Here's how:
   a. Right-click any segment in the pie chart and choose "Format Data Labels" from the context menu.
   b. On the Format Data Labels pane, one can select either the "Value" box, the "Percentage" box, or both, as shown in the following example. Excel automatically calculates the percentages, assuming the pie represents 100%.

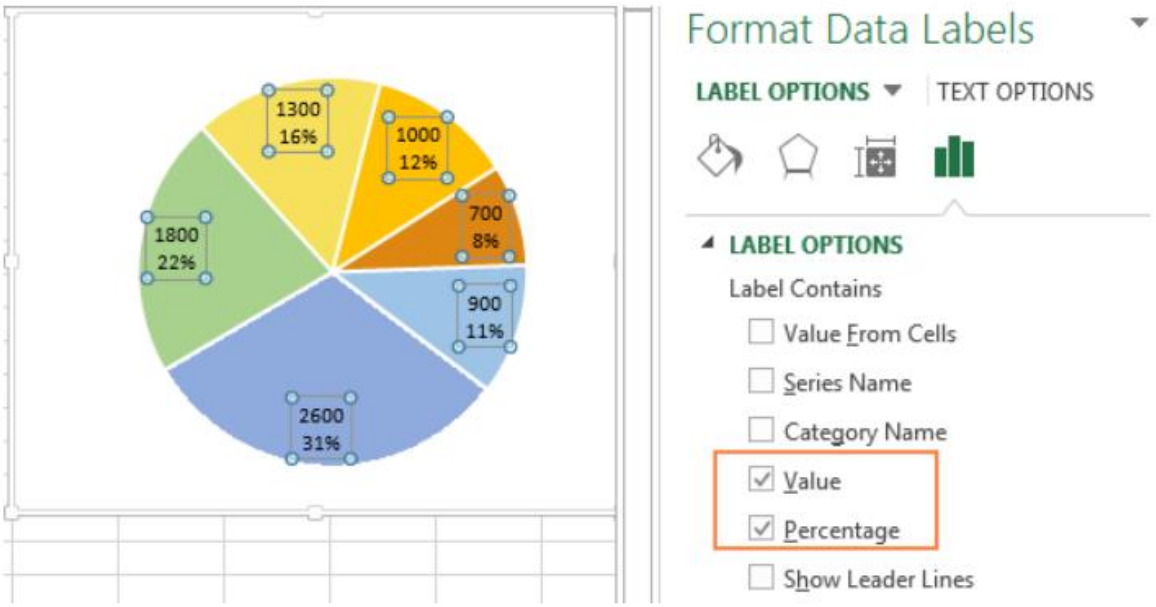


Fig 3. 23 Displaying Values and Percentages on Pie Chart in Excel

3.7 Explode a Chart Pie or Pull Out Individual Slices

To emphasise individual values in the Excel pie chart, one can "explode" it, i.e. move **all the slices** away from the centre of the pie. Or, emphasise **individual slices** by pulling them out from the rest of the pie graph.

- Exploding the entire pie chart
- Pulling out individual slice(s) of a pie

Exploded pie charts in Excel can be displayed in 2-D and 3-D formats and can also explode doughnut graphs:

Fig 3. 24 Variations of Pie Charts in Excel

Exploding the entire pie chart in Excel

The quickest way to explode the entire pie chart in Excel is to click it so that **all of the slices are selected,** then drag them away from the centre of the chart using the mouse.

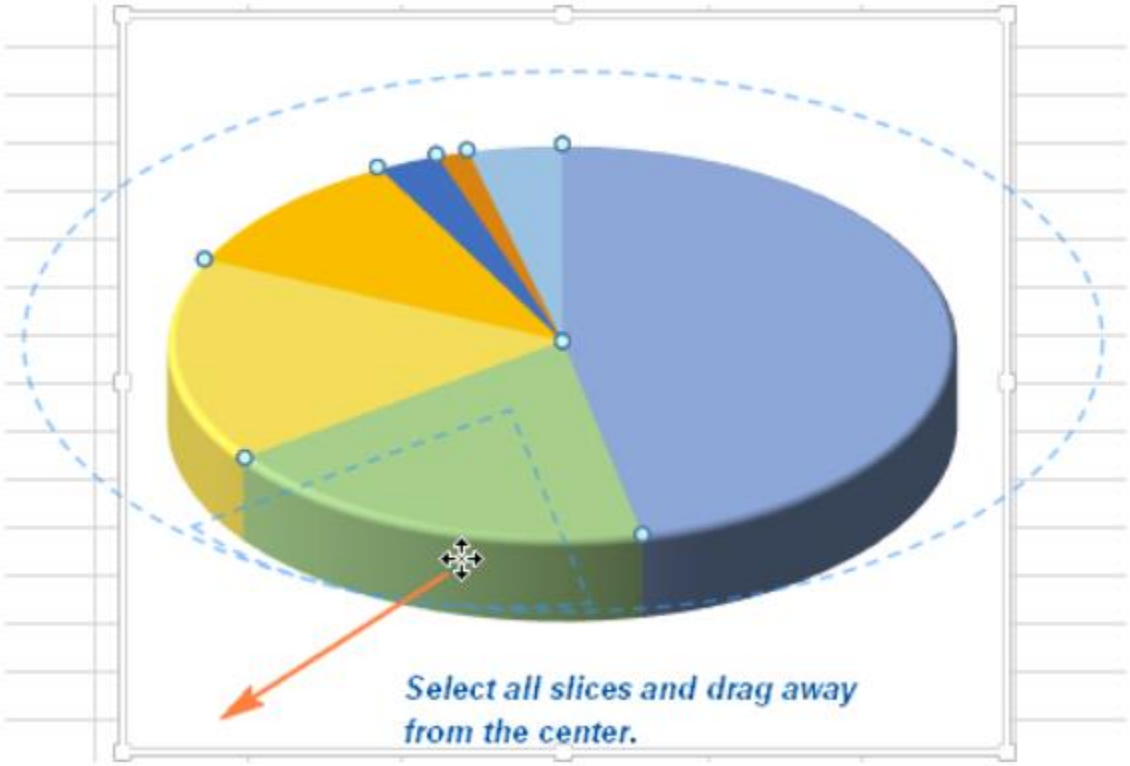


Fig 3. 25 Exploding a Pie Chart in Excel

For more precise control of the pie chart separation, do the following:

1. Right-click any slice within your Excel pie graph, and select **Format Data Series** from the context menu.
2. Switch to the Series Options tab on the Format Data Series pane, and drag the **Pie Explosion** slider to increase or decrease gaps between the slices. Or, type the desired number directly in the percentage box:

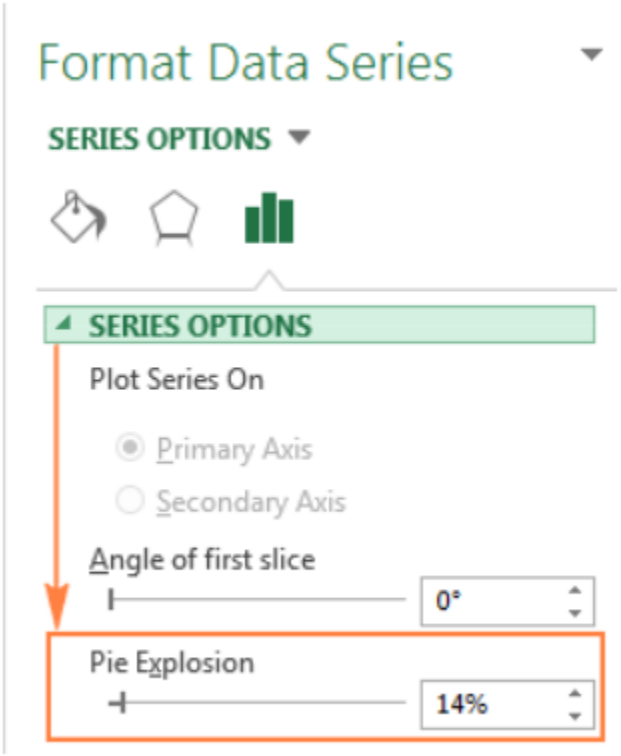


Fig 3. 26 Format Data Series

If a specific pie chart segment is to be emphasised to make it stand out, one can visually pull it out.

The easiest method to achieve this is by selecting the desired slice and dragging it away from the centre using the mouse. To select a single slice, click on it, and then click it again to ensure only that particular slice is chosen.

Alternatively, one can select the slice they wish to move out, right-click it, and choose "Format Data Series" from the context menu. Afterwards, go to "Series Options" within the

"Format Data Series" pane and adjust the "Point Explosion" setting to achieve the desired effect.

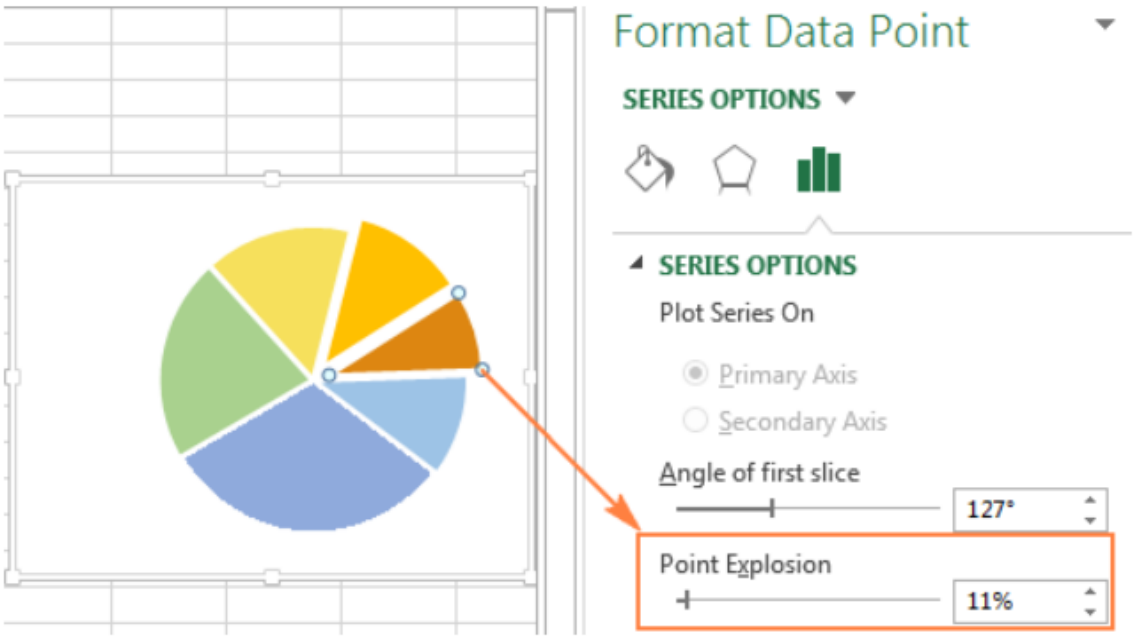


Fig 3. 27 Formatting Individual Data Point Explosion in Pie Chart

3.8 Rotate an Excel Pie Chart for Different Perspectives

While crafting a pie chart in Excel, the arrangement of data categories is initially based on the order of the data in the worksheet. Nonetheless, there is flexibility to rotate the pie chart within the complete 360-degree circle to obtain various perspectives. Typically, Excel pie charts appear more visually appealing when the smaller slices are positioned at the forefront.

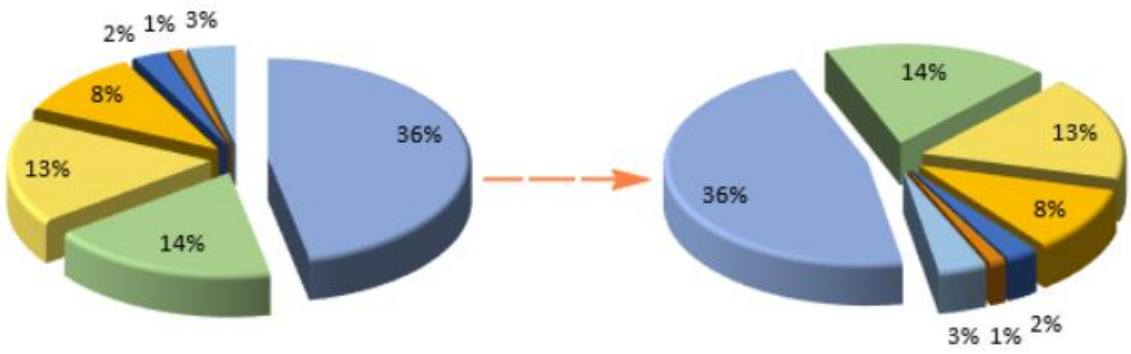


Fig 3. 28 Pie Chart Comparison with Exploded Slices

To rotate a pie chart in Excel, do the following:

1. Right-click any slice of the pie graph and click *Format Data Series*.
2. On the *Format Data Point* pane, drag the Angle of the first slice slider away from zero under Series Options to rotate the pie clockwise. Or, type the number directly in the box.

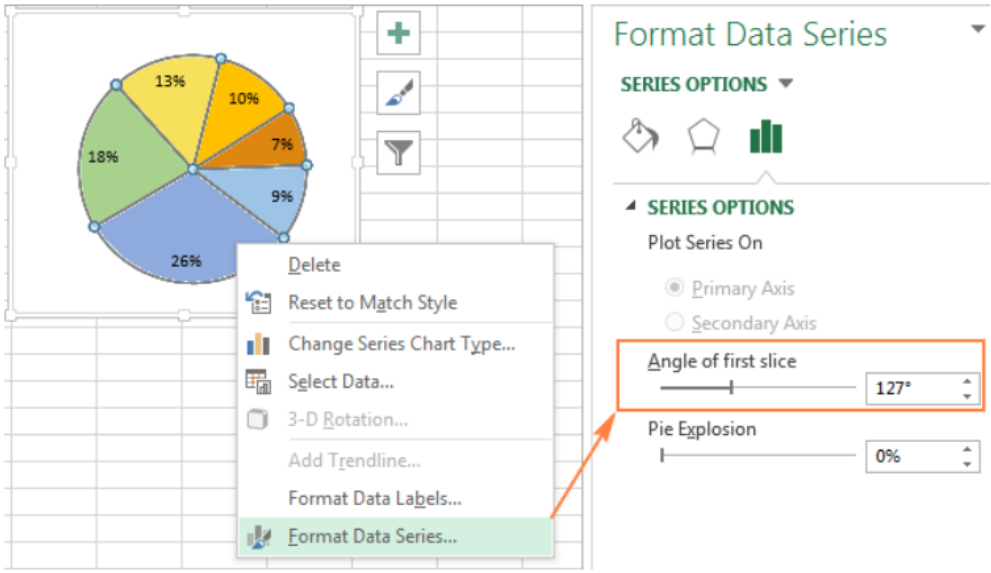


Fig 3. 29 Adjusting Pie Chart Slice Angle

3-D Rotation options for 3-D pie graphs

For 3-D pie charts in Excel, more rotation options are available. To access the 3-D rotation features, right-click any slice and select **3-D Rotation** from the context menu.

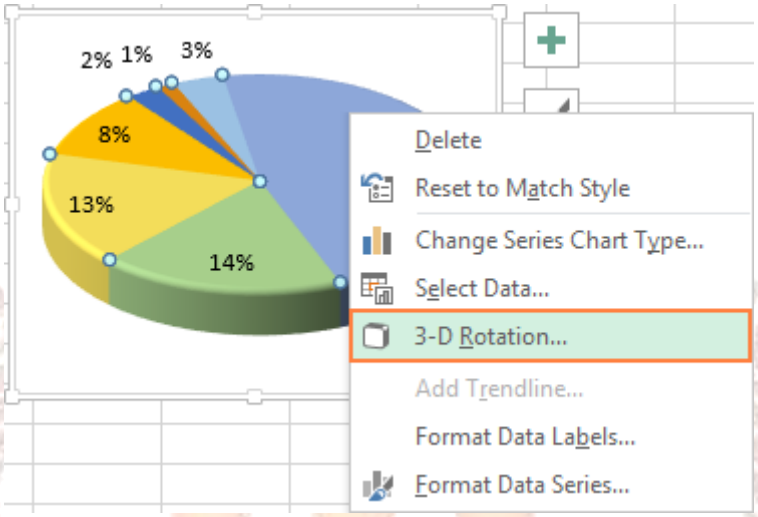


Fig 3. 30 Applying 3-D Rotation to a Pie Chart

This will bring up the *Format Chart Area* pane, where the following **3-D Rotations** options can be configured:

- Horizontal Rotation in the **X Rotation**
- Vertical Rotation in the **Y Rotation**
- The degree of perspective (the field of view on the chart) in the **perspective**

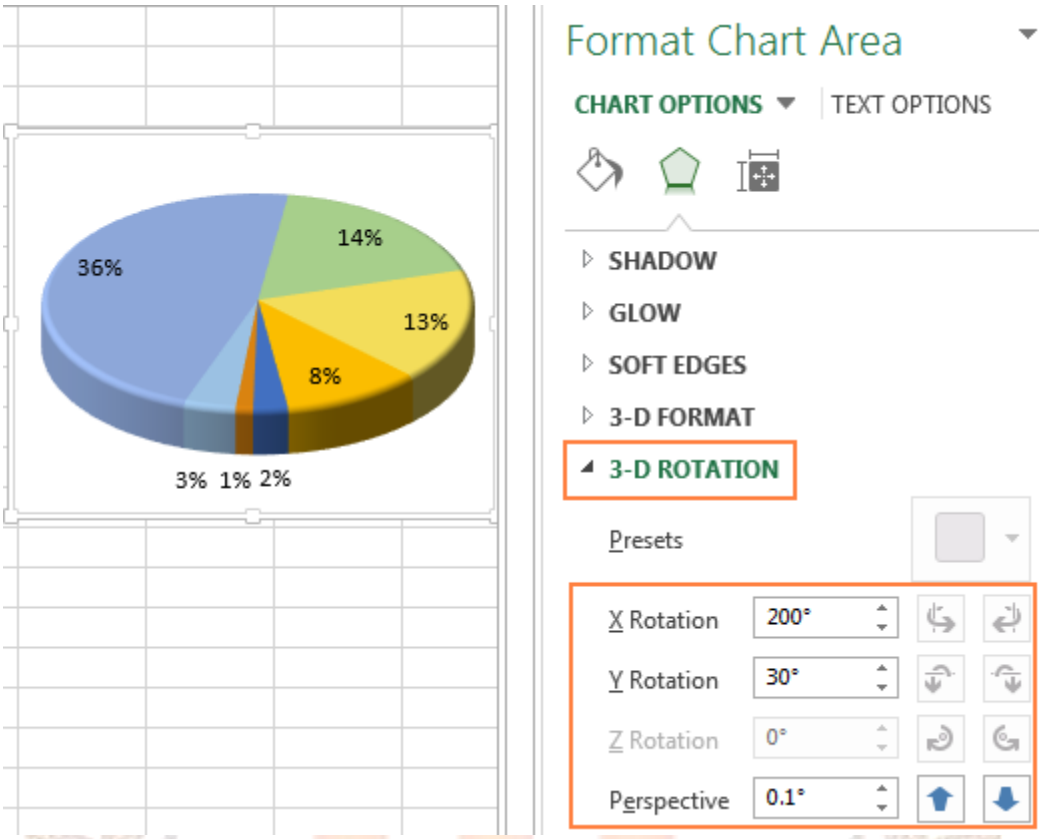


Fig 3. 31

When the up and down arrows in the rotation boxes are clicked, the pie chart will rotate immediately to reflect the changes. So, one can keep clicking the arrows to shift the pie in small increments until it is in the correct position.

3.9 Sorting the Pie Chart Slices by Size

Generally, pie charts are easier to understand when slices are sorted from largest to smallest. The fastest way to do this is to sort the source data on the worksheet. If sorting the source data is not an option, you can rearrange the slices in your Excel pie chart in the following way.

1. Create a Pivot Table from your source table.

2. Put the category names in the *Row* field and numerical data in the *Values* field. The resulting PivotTable would look similar to this:

1	Food	Recommended diet
2	Fruit	36%
3	Vegetables	14%
4	Dairy	13%
5	Protein	28%
6	Grain	9%
7		

Row Labels	Sum of Recommended diet
Dairy	13%
Fruit	36%
Grain	9%
Protein	28%
Vegetables	14%
Grand Total	**100%**

Fig 3. 32 Inserting the category names

3. Click the *AutoSort* button next to Row Labels, then click **More Sort Options**

4. In the *Sort* dialog window, choose to sort the data in the **Values** field either in ascending or descending order:

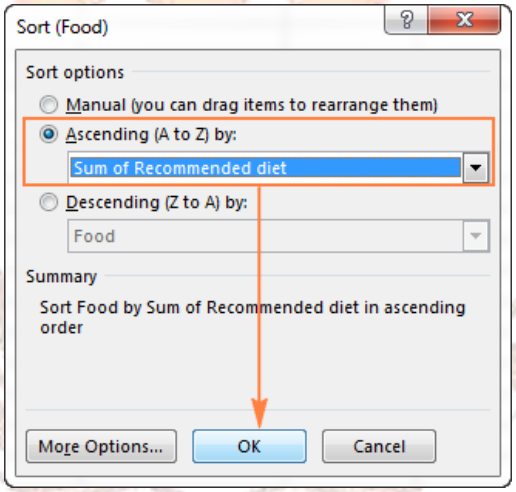


Fig 3. 33 *Sorting Operation*

1. Make a pie chart from the Pivot Table and refresh it whenever necessary.

Food	Recommended diet
Fruit	36%
Vegetables	14%
Dairy	13%
Protein	28%
Grain	9%

Row Labels	Sum of Recommended diet
Grain	9%
Dairy	13%
Vegetables	14%
Protein	28%
Fruit	36%
Grand Total	**100%**

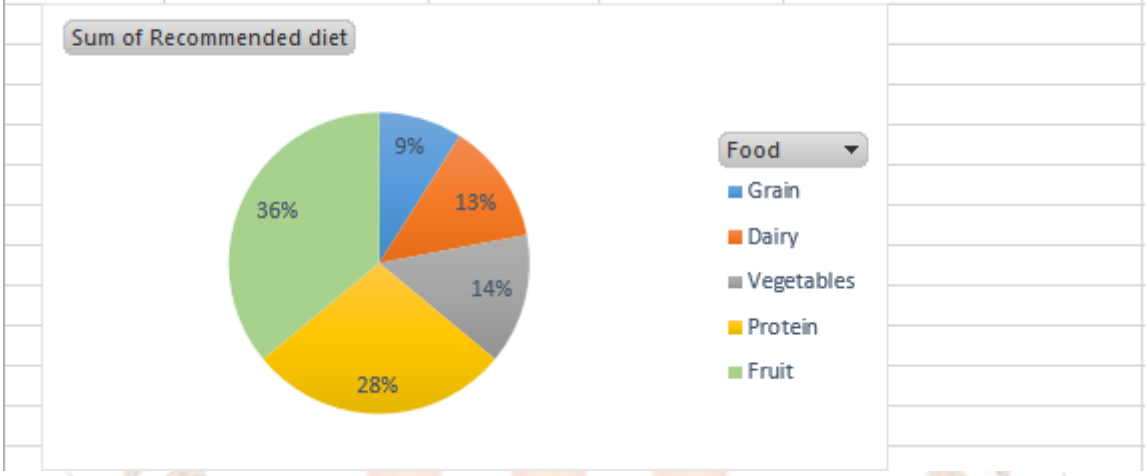


Fig 3. 34 PivotChart after Sorting

3.10 Changing the Pie Chart Colours

If one is not happy with the default colours of the Excel pie graph, one can either:

- Change the colour theme
- Choose colours for individual slices

Changing the colour of the pie chart in Excel

To choose another colour theme for the pie graph, click the *Chart Styles* button  , go to the *Color* tab and select the theme. Alternatively, click anywhere within the pie chart to activate the *Chart Tools* tabs on the ribbon, go to the *Design* tab > *Chart Styles* group and click the **Change Colors** button:

Fig 3. 35 Colour Palette

Choosing colours for each slice individually:

As seen in the screenshot above, the choice of colour themes for Excel charts is quite limited, and if one is aiming to make a stylish and attractive pie graph, one may want to choose each slice colour individually. For example, if desired to place data labels inside the slices, the black text may be challenging to read in dark colours.

To change the colour of a particular slice, click that slice and then click it again so that only this one slice is selected. Go to the *Format* tab, click **Shape Fill** and choose a colour.

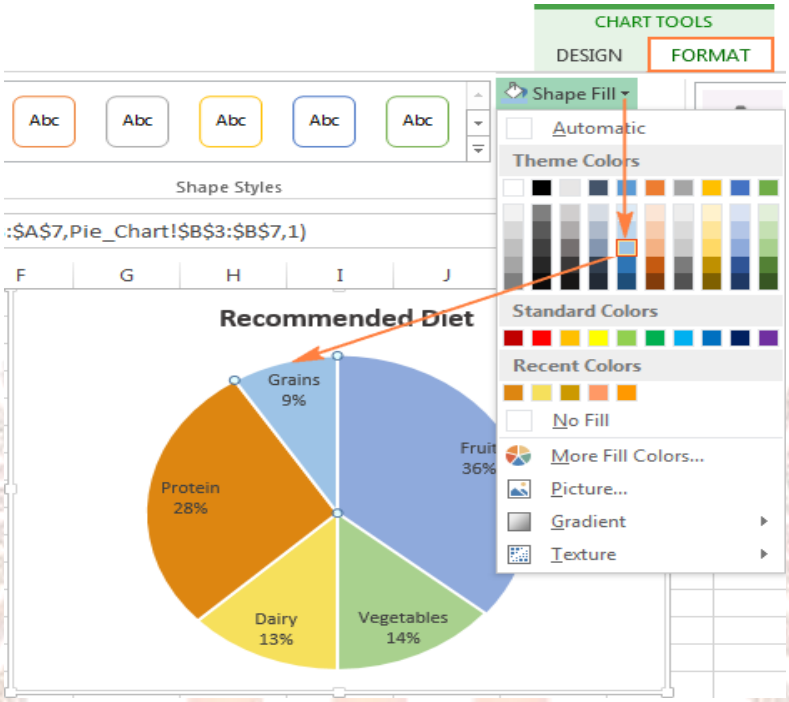


Fig 3. 36 Formatting Pie Chart Colours

3.11 Formatting a Pie Graph in Excel

When you build a pie chart in Excel for presentation or export to other applications, you may want to give it a polished, eye-catching look.

To access the formatting features, right-click any slice of your Excel pie chart and select *Format Data Series* from the context menu. The *Format Data Series* pane will appear on the right of your worksheet; you switch to the **Effects** tab (the second one) and play

with different *Shadow*, *Glow* and *Soft Edges* options.

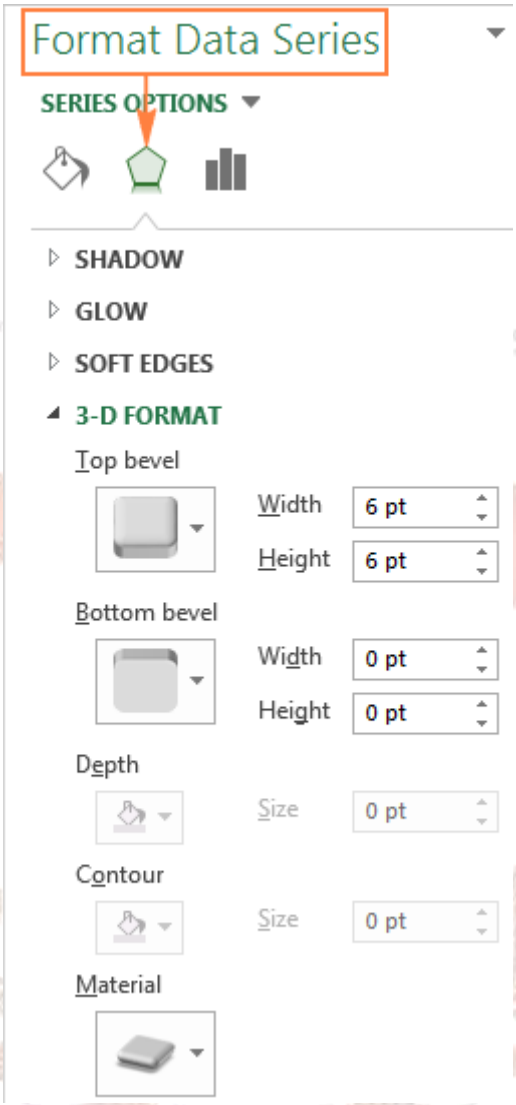


Fig 3. 37 Format Data Series

More available options are available on the **Format** tab, such as:

- Changing the pie chart size (height and width)
- Changing the Shape fill and outline colors
- Using different shape effects
- Using WordArt styles for text elements

To use these formatting features, select the element of the pie graph that requires formatting (e.g. pie chart legend, data labels, slices or chart title) and switch to the *Format* tab on the ribbon. The relevant formatting features will get activated, and non-relevant ones will be

greyed out.

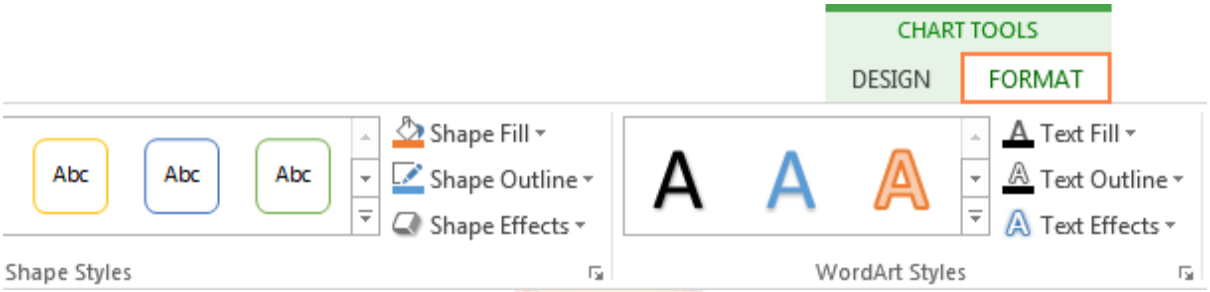


Fig 3. 38

Excel pie chart tips

Here's a compilation of essential dos and don'ts to ensure that the pie charts in Excel are not only visually appealing but also convey meaningful information effectively:

Do's:

1. Sort by Size: Arrange the slices in the pie chart from largest to smallest or vice versa. This makes it easier for viewers to estimate percentages.
2. Group Slices: When dealing with numerous slices, group them into meaningful categories, assign specific colours, and use shades to distinguish individual slices within each group.
3. Grey Out Small Slices: If the pie chart contains many small slices (e.g., below 2%), consider greying them out or creating an "Other" category to streamline the chart.
4. Rotate for Emphasis: Rotate the pie chart to bring smaller slices to the front, enhancing their visibility.

Don'ts:

1. Avoid Excessive Categories: Limit the data categories in the pie chart. Too many slices can clutter the chart and make it challenging to interpret. If there are more than 7 data categories, consider using a pie or bar pie chart and relocate smaller categories to the secondary chart.
2. Skip the Legend: Directly label the pie chart slices instead of using a legend. This eliminates the need for viewers to switch between the legend and the chart for information.

3. Minimise 3-D Effects: Avoid overusing 3-D effects in the chart, as they can distort the intended message. Keep the visual effects simple and meaningful to maintain clarity.

4. BAR CHARTS

Bar charts are a widely used chart type, much like pie charts, known for their simplicity and ease of comprehension. They are particularly well-suited for various numeric data comparisons, including numbers, percentages, temperatures, frequencies, or other measurements. Typically, bar graphs are created to assess and compare individual values across different data categories. In project management, a specialised bar chart type known as a Gantt chart is frequently employed for tracking project timelines and tasks.

A bar graph, also called a bar chart, is a graphical representation that presents various data categories using rectangular bars. The length of each bar is proportionate to the size of the corresponding data category it represents. Bar graphs can be created in either vertical or horizontal orientations. In Excel, a vertical bar graph is considered a distinct chart type, known as a column bar chart.

The illustration below depicts a standard 2-D clustered bar chart featuring three data series (grey, green, and blue) and four data categories (Jan, Feb, Mar, and Apr).

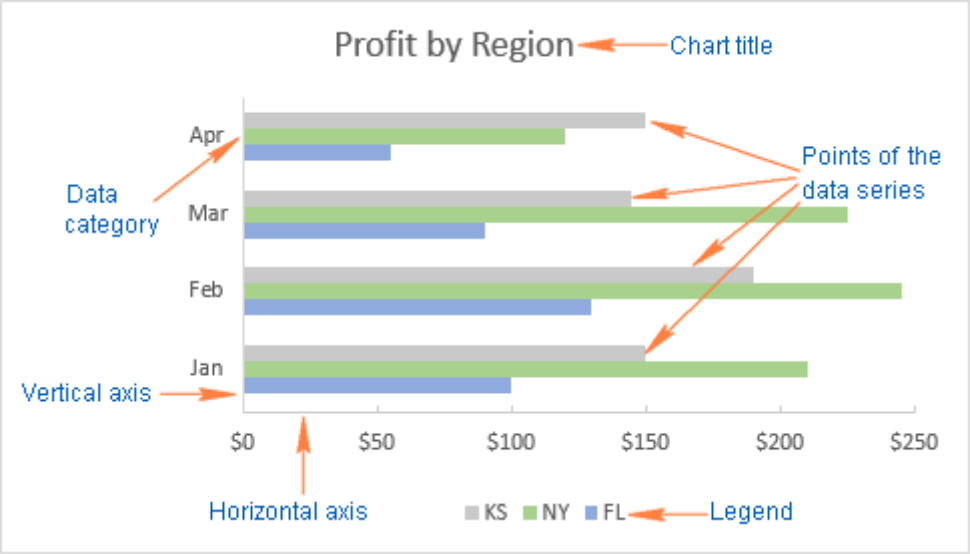


Fig 3. 39 Standard 2-D Clustered Bar Chart

4.1 Making a Bar Graph in Excel

Making a bar graph in Excel is as easy as it could be. Select the data that is to be plotted in the chart, go to the *Insert* tab > *Charts* group on the ribbon, and click the bar chart type to insert.

In this example, the standard 2-D Bar chart is created:

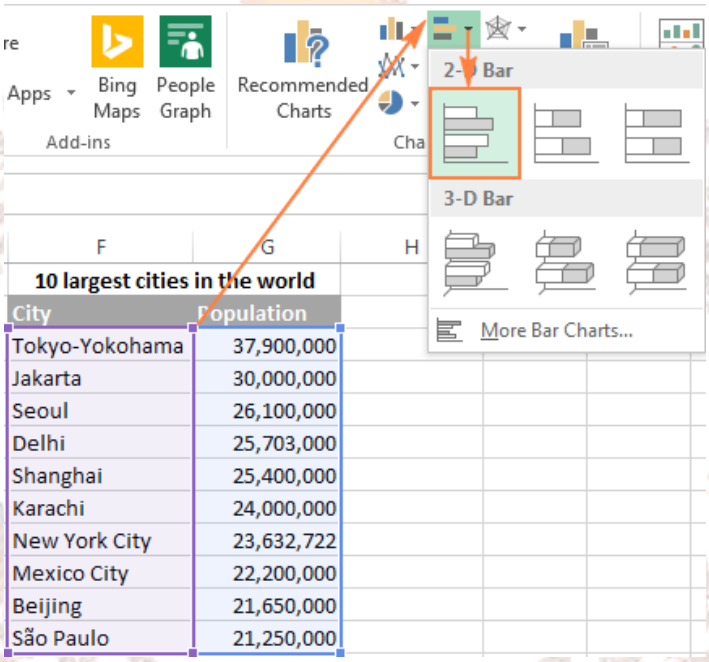


Fig 3. 40 Creating a Bar Chart for the 10 Largest Cities in the World

The default 2-D clustered bar graph inserted in the worksheet will look something like this:

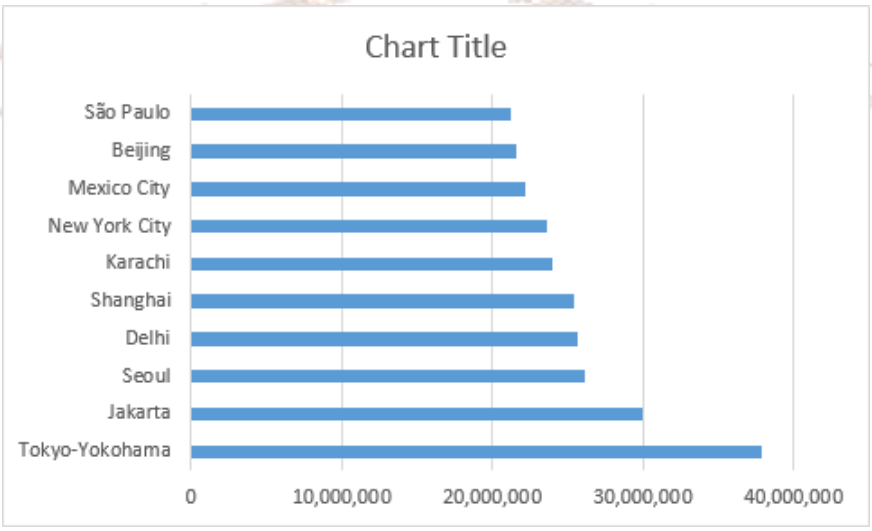
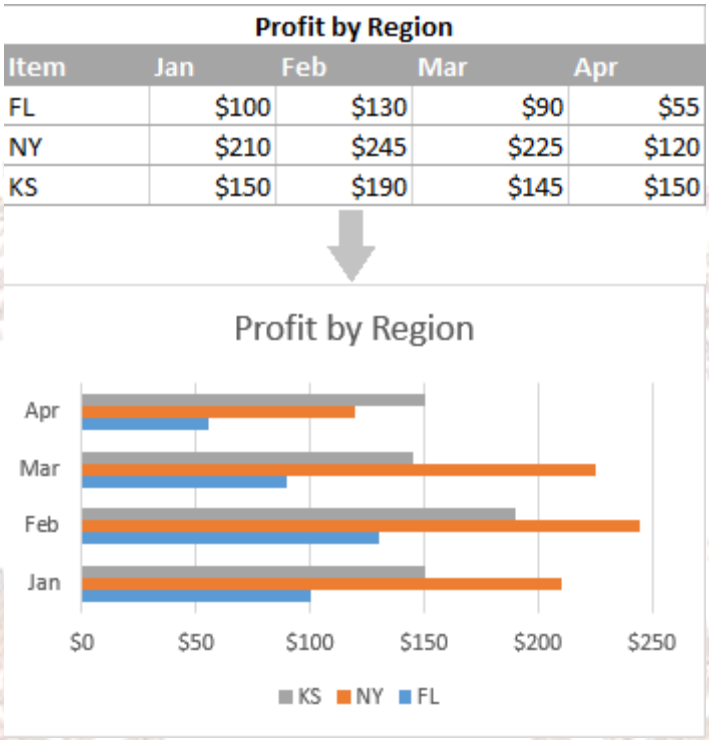


Fig 3. 41 Population of the World's Largest Cities Bar Chart

The Excel bar graph above displays **one data series** because our source data contains just one column of numbers.

If the source data has two or more columns of numerical values, the bar graph will contain **several data series**, each shaded in a different colour:



Profit by Region

Item	Jan	Feb	Mar	Apr
FL	$100	$130	$90	$55
NY	$210	$245	$225	$120
KS	$150	$190	$145	$150

Fig 3. 42 Monthly Profit by Region Bar Chart

View all available bar chart types. To see all bar graph types available in Excel, click the *More Column Charts* link and choose one of the bar chart sub-types that are displayed

at the top of the *Insert Chart* window:

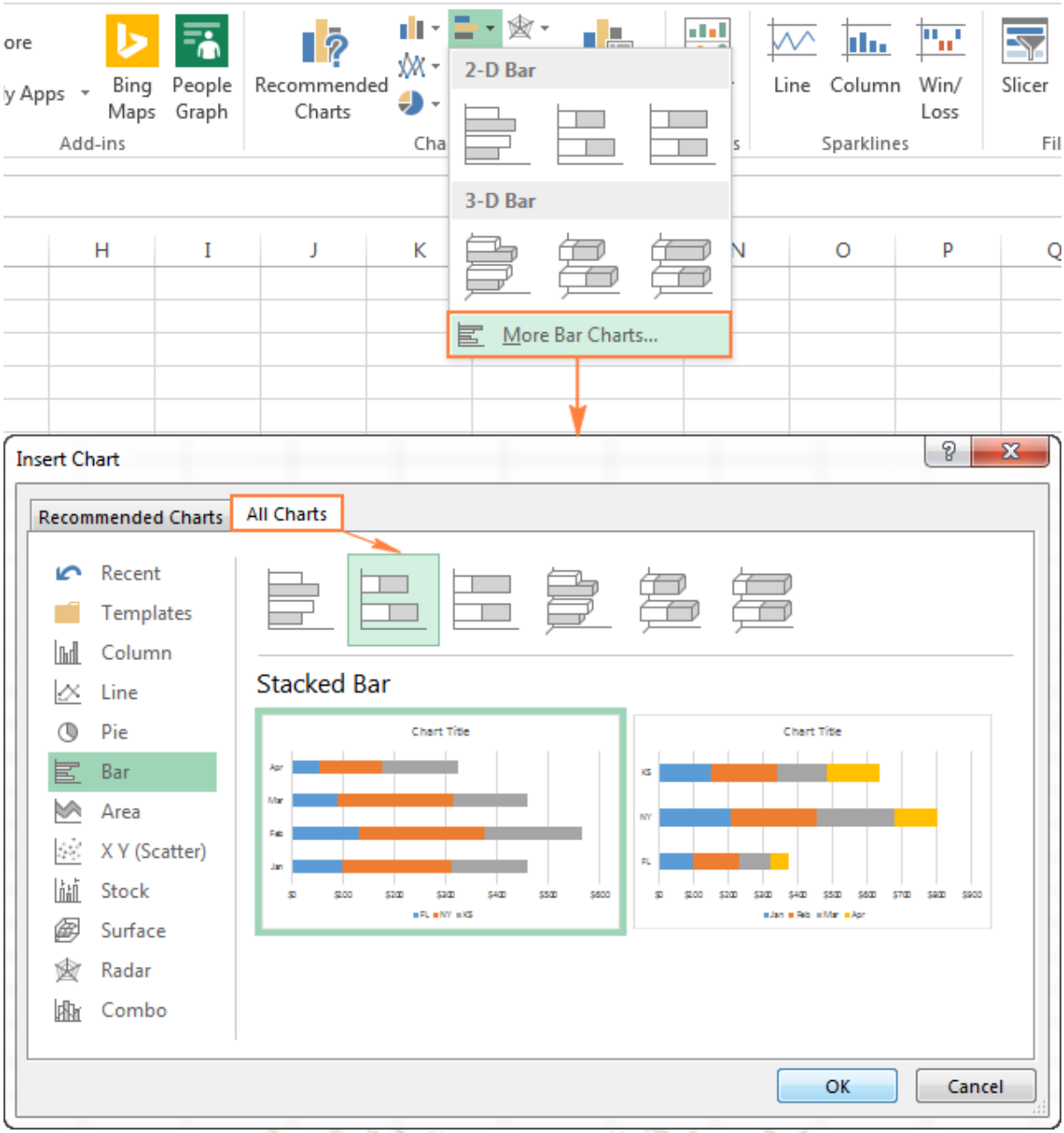


Fig 3. 43 Inserting a Stacked Bar Chart

If the default layout or appearance of the bar graph in the sheet doesn't meet one's preferences, then the adjustments are to be done. Simply select the chart to activate the Chart Tools tabs in the ribbon. Then, navigate to the Design tab and choose from the following options:

1. Explore alternative bar graph layouts by clicking the Quick Layout button within the Chart Layouts group.
2. Experiment with different bar chart styles in the Chart Styles group.

Fig 3. 44 Chart Design and Formatting Options

4.2 Excel Bar Chart Types

When creating a bar chart in Excel, select from various sub-types of bar graphs. One of these subtypes is the clustered bar chart.

A clustered bar chart in Excel, whether in 2-D or 3-D, compares values across different data categories. Typically, in a clustered bar graph, the categories are arranged along the vertical axis (Y-axis), while the values are represented along the horizontal axis (X-axis). A 3-D clustered bar chart doesn't introduce a third axis but presents the data as horizontal rectangles in a 3-D format.

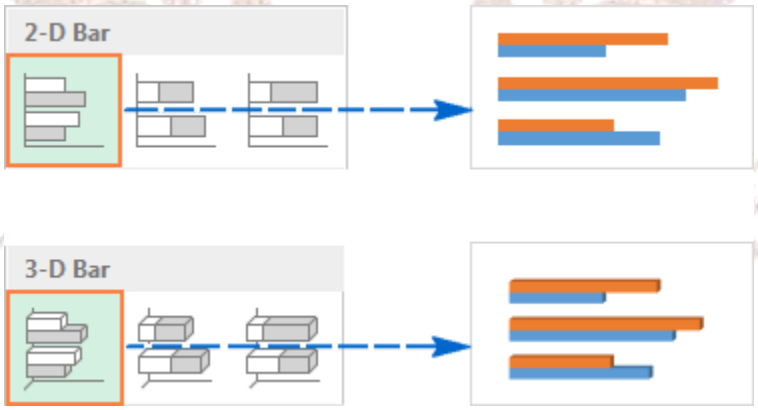


Fig 3. 45 Choosing Between 2-D and 3-D Bar Charts

a. Stacked bar charts:

A stacked bar graph in Excel shows the proportion of individual items to the whole. As well as clustered bar graphs, a stacked bar chart can be drawn in 2-D and 3-D format:

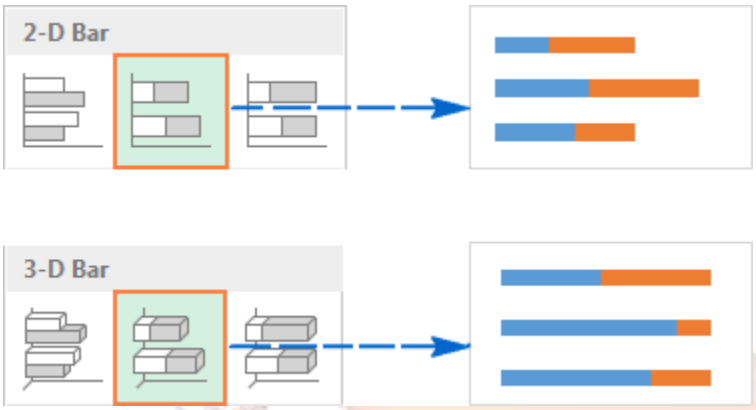


Fig 3. 46 Stacked Bar Charts

b. 100% stacked bar charts:

This type of bar graph is similar to the above type, but it displays the percentage that each value contributes to a total in each data category.

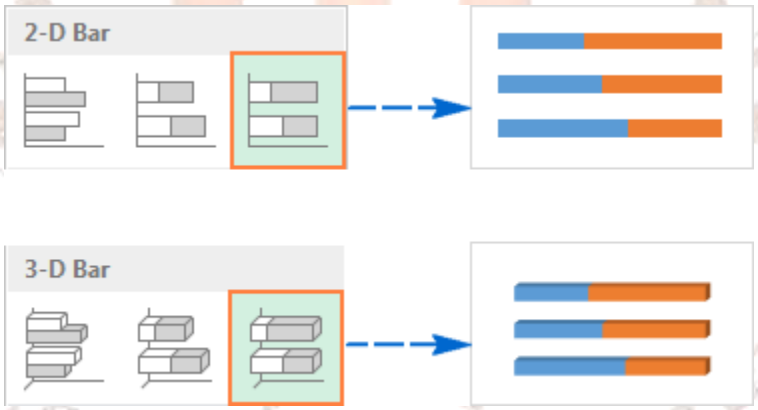


Fig 3. 47 100% Stacked Bar Charts

c. Cylinder, cone and pyramid charts

Like standard rectangular Excel bar charts, cone, cylinder and pyramid graphs are available in clustered, stacked, and 100% stacked types. The only difference is that these chart types represent data series in the form of cylinder, cone, and pyramid shapes instead of bars.

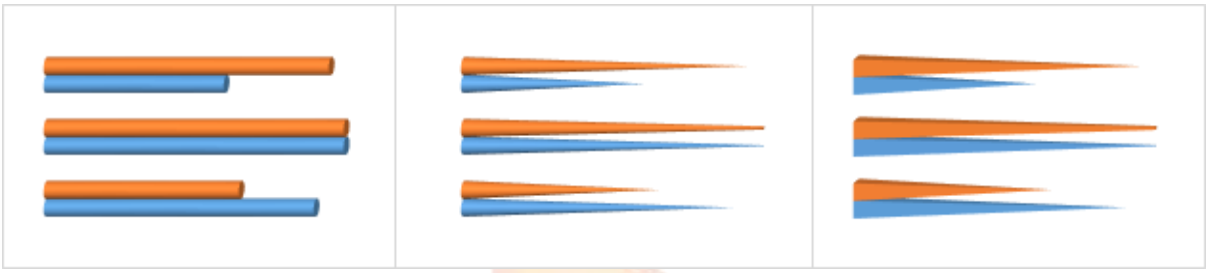


Fig 3. 48 Cylinder, Cone and Pyramid Chart

In earlier versions of Excel, like Excel 2010 and previous iterations, it was easy to create cylinder, cone, or pyramid charts by selecting the corresponding chart type from the Charts group on the Insert tab.

However, in Excel 2013 and Excel 2016, one won't find these cylinder, cone, or pyramid chart options on the ribbon in the Charts group. Microsoft removed these chart types because numerous chart choices were already available in earlier Excel versions, making it challenging for users to select the appropriate chart type.

Nonetheless, it is still possible to create cylinder, cone, or pyramid graphs in modern versions of Excel, although it requires a few extra steps:

1. Start by making a 3-D bar chart of the desired type (clustered, stacked, or 100% stacked) in the usual way.
2. Then, modify the shape type of the chart by following these steps:
   - Select all the bars in your chart.
   - Right-click them and choose "Format Data Series" from the context menu, or double-click the bars.
   - On the Format Data Series pane, navigate to Series Options and select the preferred column shape.

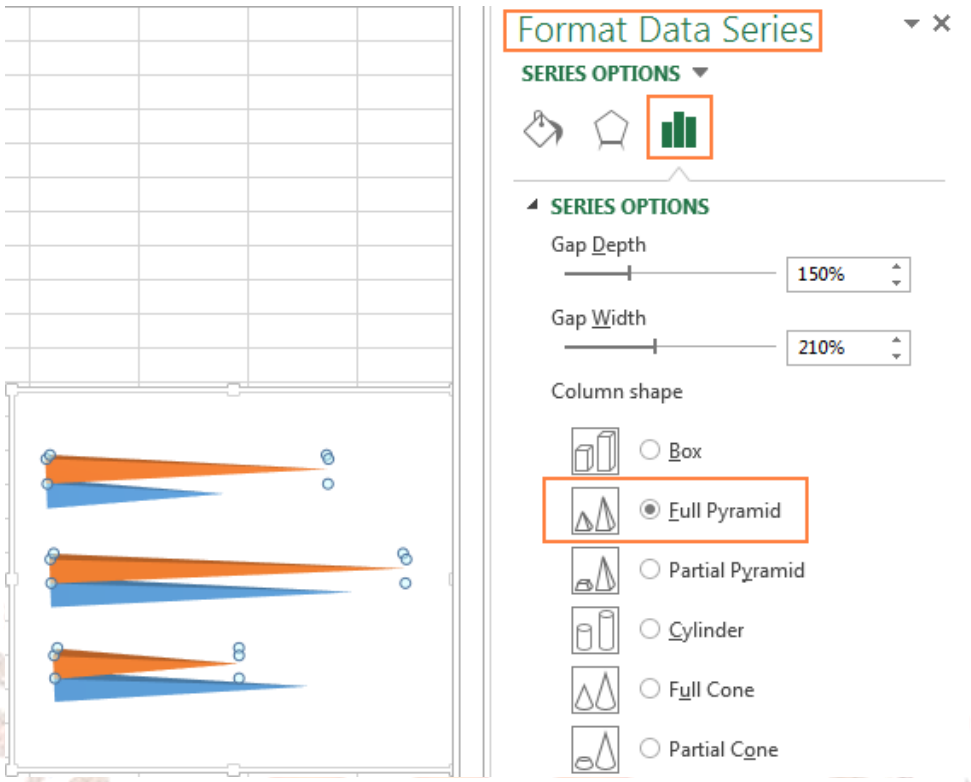


Fig 3. 49 Customizing Column Shape in Excel Chart Series Options

Note. If several data series are plotted in the Excel bar chart, one might need to repeat the above steps for each series.

4.3 Customising Bar Graphs in Excel

Like other Excel chart types, bar graphs allow for many customisations about the chart title, axes, data labels, etc. The following resources explain the detailed steps:

- Adding the chart title
- Customising chart axes
- Adding data labels
- Adding, moving and formatting the chart legend
- Showing or hiding the gridlines
- Editing data series
- Changing the chart type and styles
- Changing the default chart colours

And now, let's have a closer look at a couple of specific techniques for Excel bar charts.

When working with a bar graph in Excel, one might notice that the default settings leave significant space between the bars. Follow these steps to adjust the bar width to make them wider or narrower and control the spacing between them. This method can either widen the bars and decrease the spacing or make them thinner and increase the gap between them. In 2-D bar charts, it's even possible for the bars to overlap.

1. Start by right-clicking any data series representing the bars in the Excel bar chart. From the context menu that appears, select "Format Data Series..."
2. On the Format Data Series pane, within the Series Options section, there are a couple of choices:
   – For both 2-D and 3-D bar graphs, to adjust the bar width and the spacing between data categories, the "Gap Width" slider can be used. Alternatively, enter a percentage value from 0 to 500 in the provided box. A lower value will reduce the gap between the bars, making them thicker and vice versa.

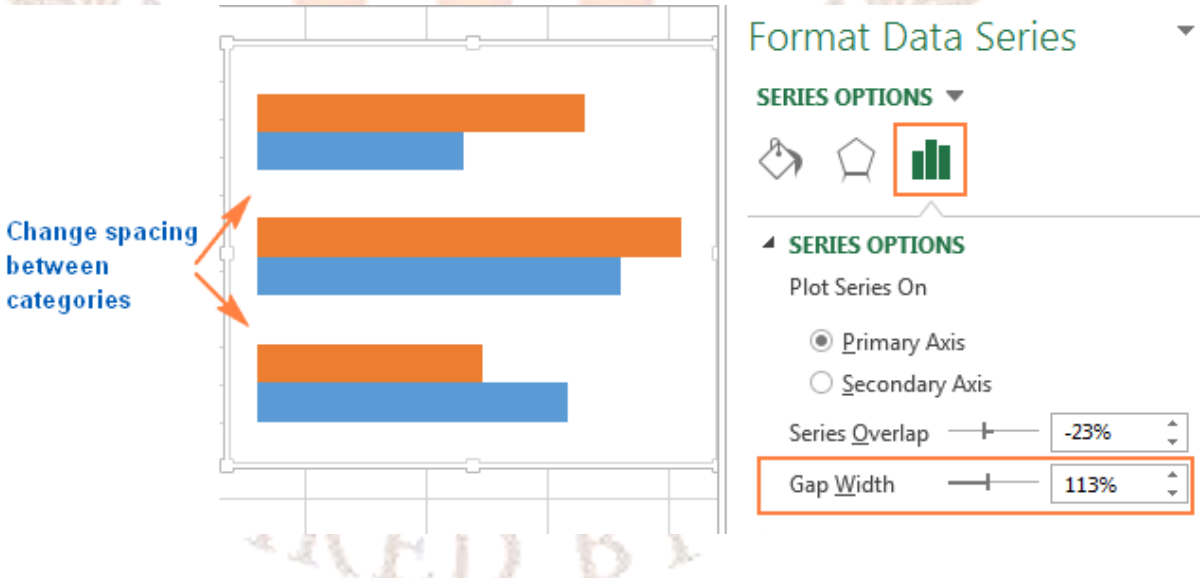


Fig 3. 50 Adjusting Bar Chart Spacing

- In 2-D bar charts, to change the **spacing between data series** within a data category, drag the *Series Overlap* slider or enter a percentage between -100 and 100 in the box. The higher the value, the greater the bars overlap. A negative number will result in a

spacing between the data series, like in the following screenshot:

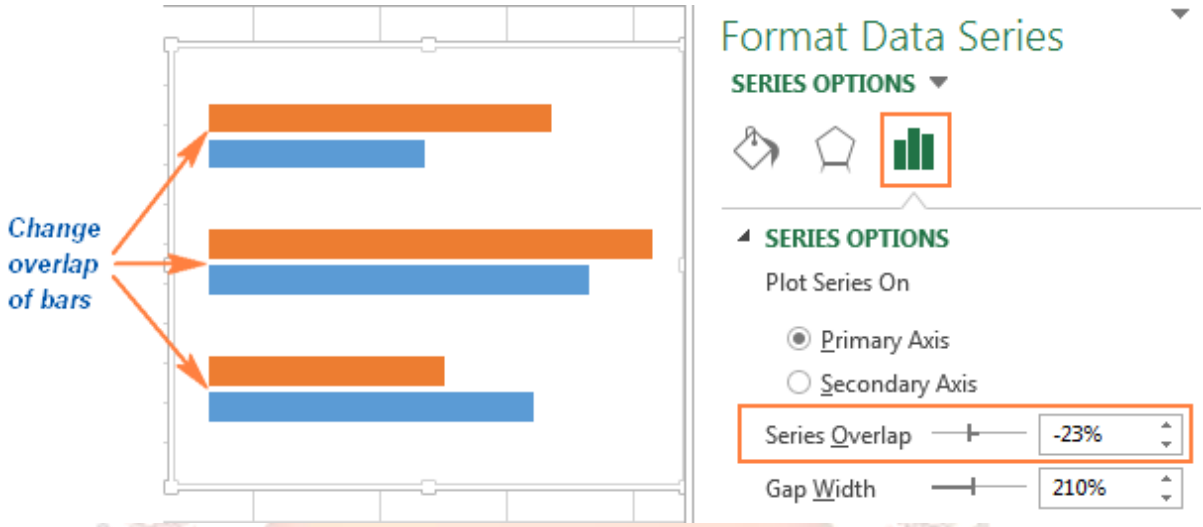


Fig 3. 51 Modifying Series Overlap in Bar Charts

- In 3-D charts, drag the Gap Depth slider or enter a percentage between 0 and 500 in the box to change the spacing between data series. The higher the value, the greater the gap between the bars. In practice, changing the gap depth does have a visual effect in most Excel bar chart types, but it does make a noticeable change in a 3-D column chart, as shown in the following image:

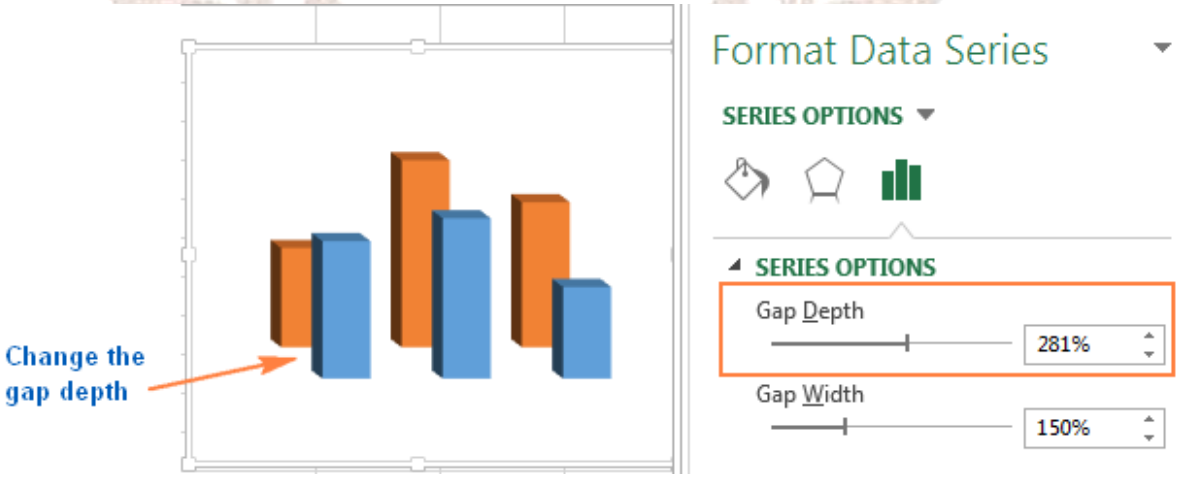


Fig 3. 52 Adjusting Gap Depth in 3-D Bar Charts

4.4 Create Excel Bar Charts with Negative Values

When a bar graph is made in Excel, the source values do not necessarily need to be greater than zero. Generally, Excel has no difficulty displaying negative numbers on a standard bar

graph. However, the default chart inserted in the worksheet might leave much to be desired in terms of layout and formatting:

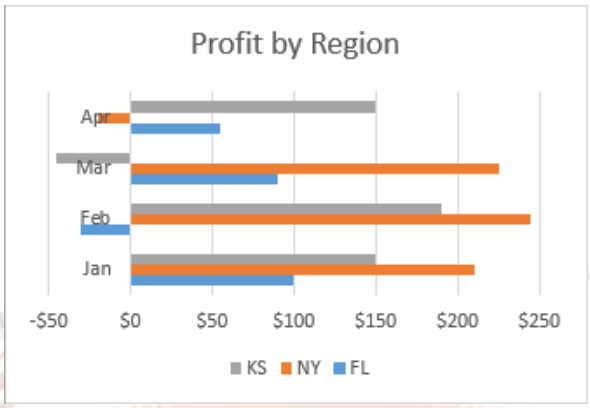


Fig 3. 53 Profit by Region Bar chart

For the above bar chart to look better, firstly, move the vertical axis labels to the left so they won't overlay the negative bars. Secondly, one can consider using different colours for negative values.

a. Modifying the vertical axis labels

To format the vertical axis, right-click any labels and select Format Axis from the context menu (or double-click the axis labels). This will make the *Format Axis* pane appear on the right side of the worksheet.

On the pane, go to the *Axis Options* tab (the rightmost one), expand the *Labels* node, and set the **Label Position** to **Low**:

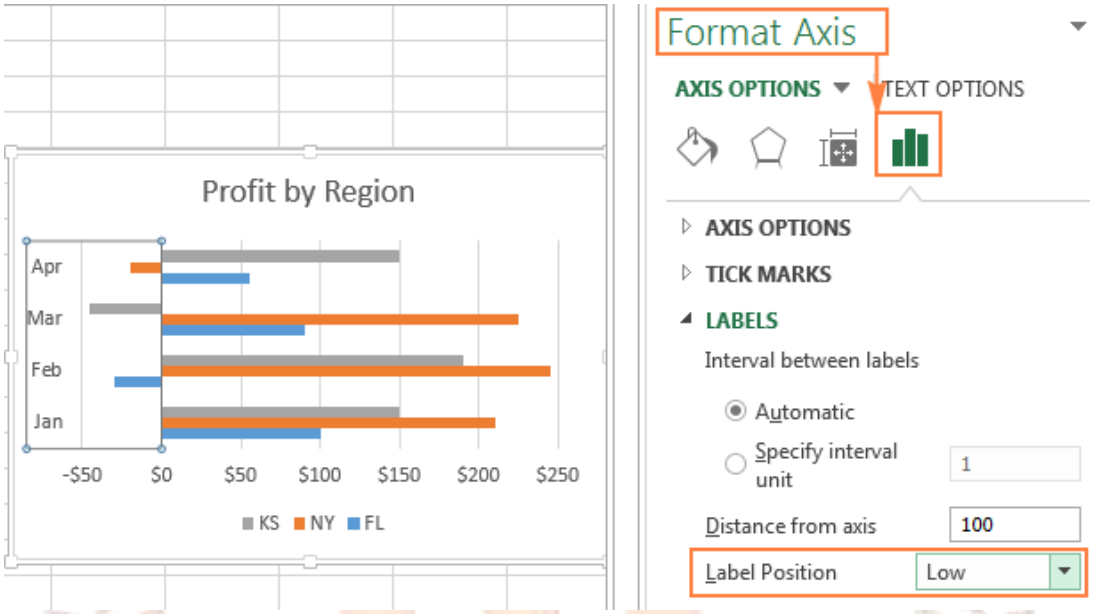


Fig 3. 54 Modify the Vertical Axis Labels

b. Changing the fill colour for negative values:

One can modify the fill colour of the negative bars to highlight negative values in the bar chart and make them more noticeable.

If the bar chart comprises only one data series, shade negative values in the standard colour, typically red. However, if the bar graph contains multiple data series, one must shade negative values in each series with distinct colours. For instance, retain the original colours for positive values and apply lighter shades of the same colours for negative values.

To change the colour of negative bars, follow these steps:

1. Right-click on any bar within the data series for which one needs to adjust the colour (for instance, the orange bars in this example). Then, select "Format Data Series" from the context menu.
2. On the Format Data Series pane, navigate to the "Fill & Line" tab and check the "Invert if Negative" box.

3. Once the "Invert if Negative" option is enabled, two fill colour choices will be noticed—one for positive and one for negative values. Customise the colour for negative values accordingly.

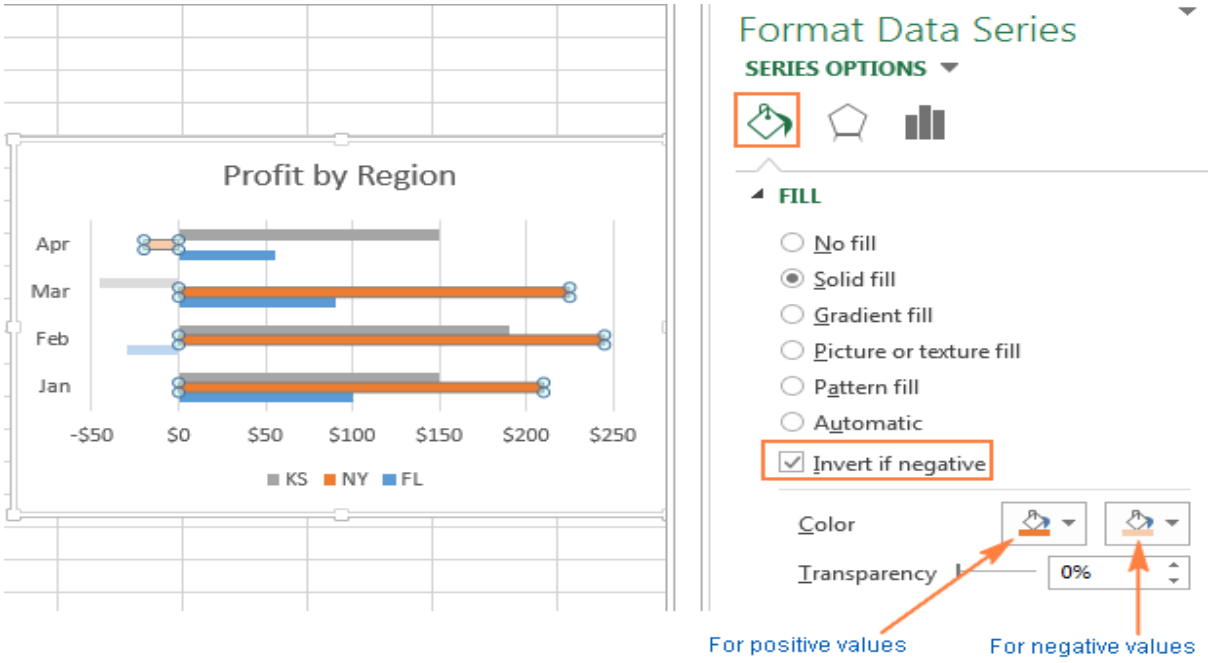


Fig 3. 55 Inverting Colors for Negative Values in Excel Chart

Note: If the second fill box does not show up, click the little black arrow in the only colour option you see, and choose any colour for positive values (One can select the same colour as was applied by default). Once this is done, the second colour option for negative values will appear.

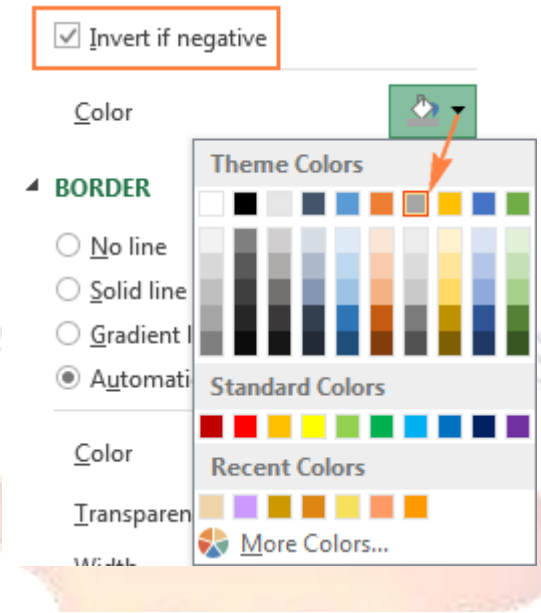


Fig 3. 56 Setting Color Options for Negative Values in Excel Chart

4.5 Sorting Data on Bar Charts in Excel

When a bar chart is created in Excel, one might notice that the default presentation of data categories appears in reverse order on the chart. In other words, if the data is sorted from A to Z in the spreadsheet, Excel's bar chart will display it in a Z to A order. The reason behind this default behaviour remains unknown, but fortunately, there's a straightforward solution to correct it.

The easiest way to reverse the order of data categories on a bar chart is to perform the opposite sorting action on the worksheet.

To illustrate this, let's consider a simple example. In a worksheet, you have a list of the world's ten largest cities sorted by population in descending order from the highest to the lowest. However, the bar chart shows the data ascending from the lowest to the highest.

10 Largest Cities in the World	
City	Population
Tokyo-Yokohama	37,900,000
Jakarta	30,000,000
Seoul	26,100,000
Delhi	25,703,000
Shanghai	25,400,000
Karachi	24,000,000
New York City	23,632,722
Mexico City	22,200,000
Beijing	21,650,000
São Paulo	21,250,000

Descending

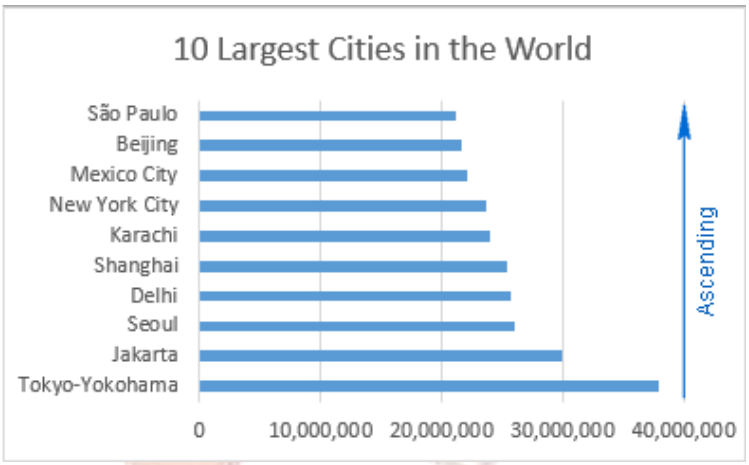


Fig 3. 57 Bar Chart in Ascending order

To have the bar graph sorted from the top down, simply arrange the source data in the opposite way, i.e. from smallest to largest:

10 Largest Cities in the World	
City	Population
São Paulo	21,250,000
Beijing	21,650,000
Mexico City	22,200,000
New York City	23,632,722
Karachi	24,000,000
Shanghai	25,400,000
Delhi	25,703,000
Seoul	26,100,000
Jakarta	30,000,000
Tokyo-Yokohama	37,900,000

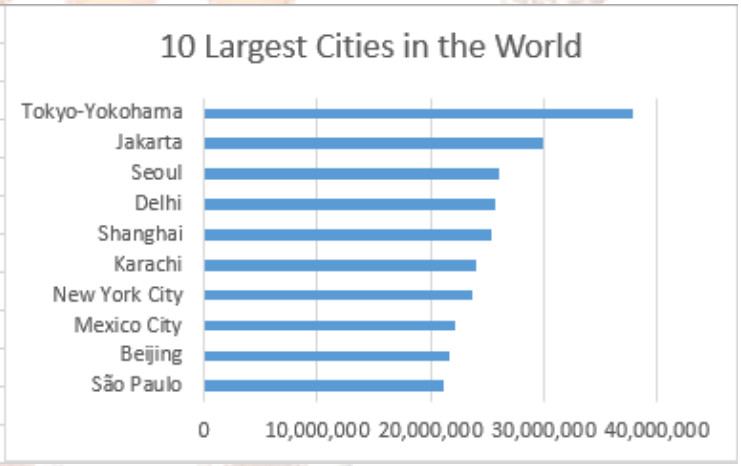


Fig 3. 58 Bar Chart in Descending order

If rearranging the data on the worksheet is not feasible or desirable, one can still adjust the sort order on the bar chart without altering the source data. This can be done quickly by selecting a couple of checkbox options:

1. start by right-clicking any vertical axis labels on the bar chart. From the context menu that appears, choose "Format Axis..." Or, simply double-click the vertical axis labels to open the Format Axis pane.

2. Within the Format Axis pane, under Axis Options, make the following selections:
   – Under "Horizontal axis crosses," tick the "At maximum category" option.

– Under "Axis position," check the "Categories in reverse order" box.

These adjustments will ensure that the bars on the chart appear in the same order as specified without modifying the original data source.

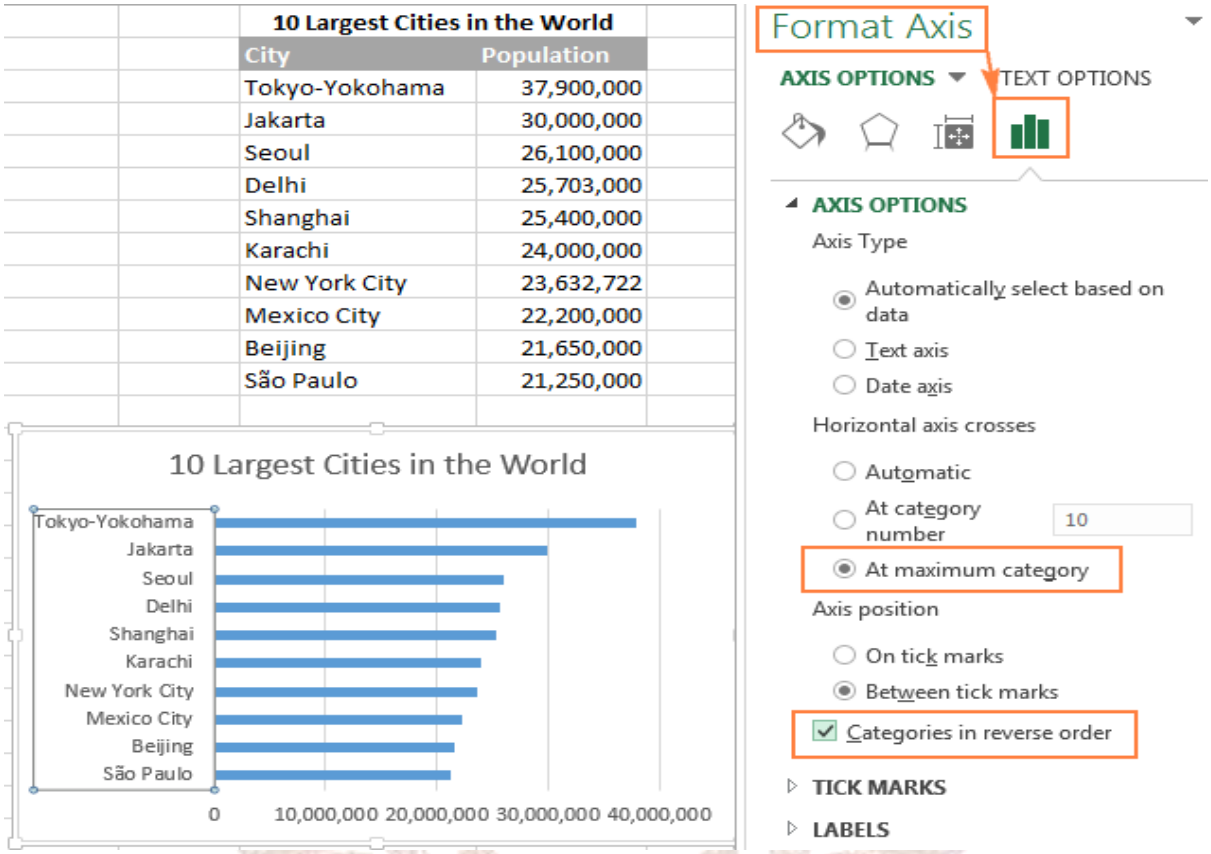


Fig 3. 59 Excel Chart Axis Formatting

Done! The bar graph will be immediately sorted like the data source, descending or ascending. When the sort order on the sheet changes, the bar chart will be re-sorted automatically.

4.6 Changing the Order of Data Series in a Bar Chart

If the bar graph contains several data series, it is plotted backwards by default. For example, notice the reverse order of regions on the worksheet and the bar chart:

Profit by Region				
Item	Jan	Feb	Mar	Apr
FL	$100	$130	$90	$55
NY	$210	$245	$225	$120
KS	$150	$190	$145	$150

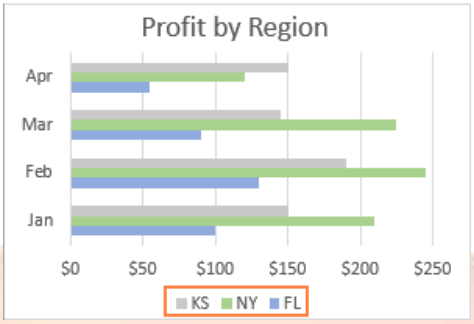


Fig 3. 60

To arrange the data series on the bar graph in the same order as they appear on the worksheet, one can check the **At maximum category** and **Categories in reverse order** options, as demonstrated in the previous example. This will also change the plot

order of data categories, as shown in the following screenshot:

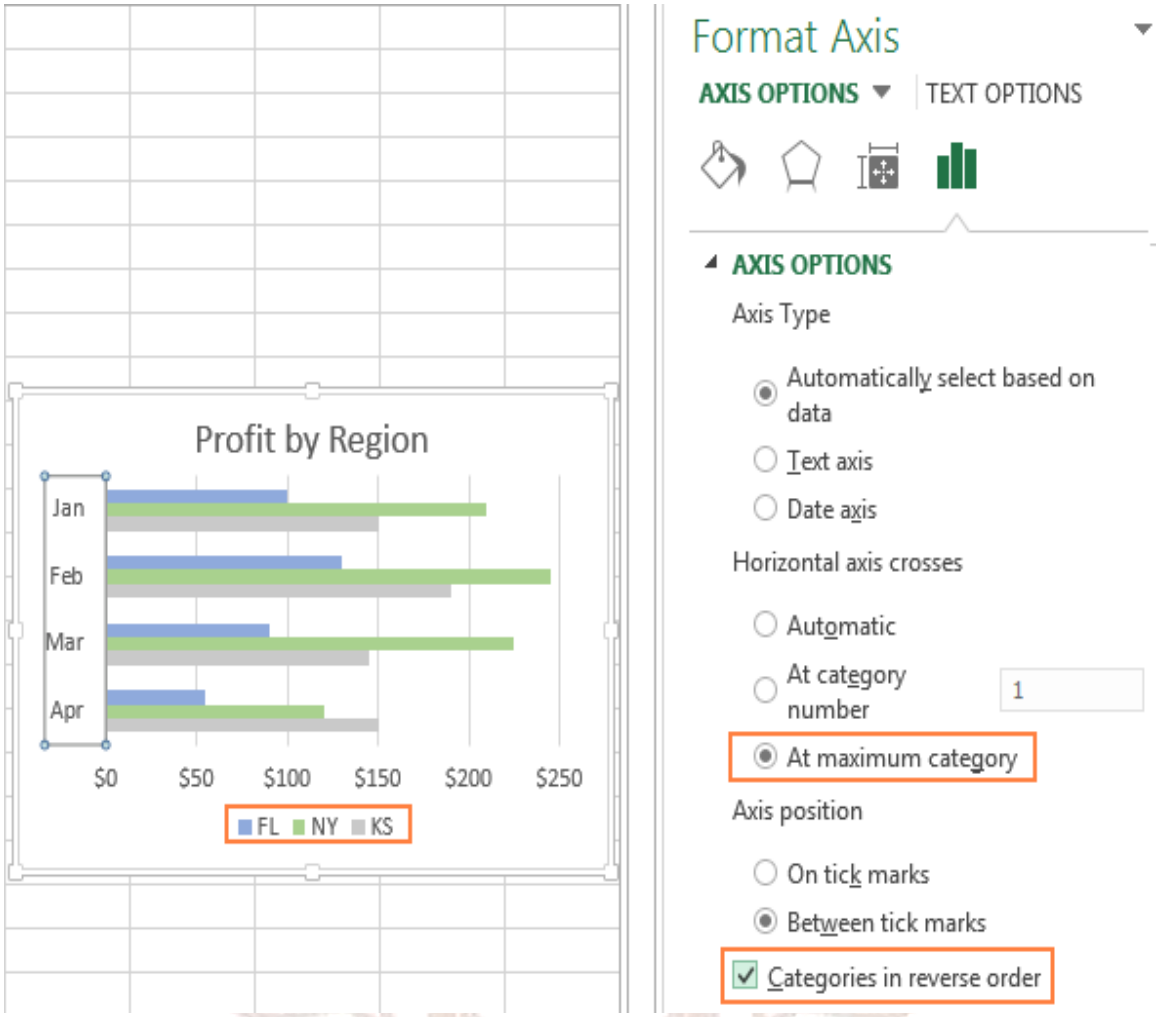


Fig 3. 61 Selecting Data for Profit by Region Bar Chart

To reorganise the data series on the bar chart differently from how it's organised on the worksheet, one can achieve this using two methods:

1. Select Data Source Dialog:

This approach allows adjusting the plotting order of each data series on a bar graph while preserving the original data arrangement in the worksheet.

Here's how to do it:

- Start by selecting the chart to access the Chart Tools tabs in the ribbon.
- Go to the Design tab within the Data group and click the "Select Data" button.

– Alternatively, click the "Chart Filters" button on the graph's right side and select the "Select Data" link at the bottom.

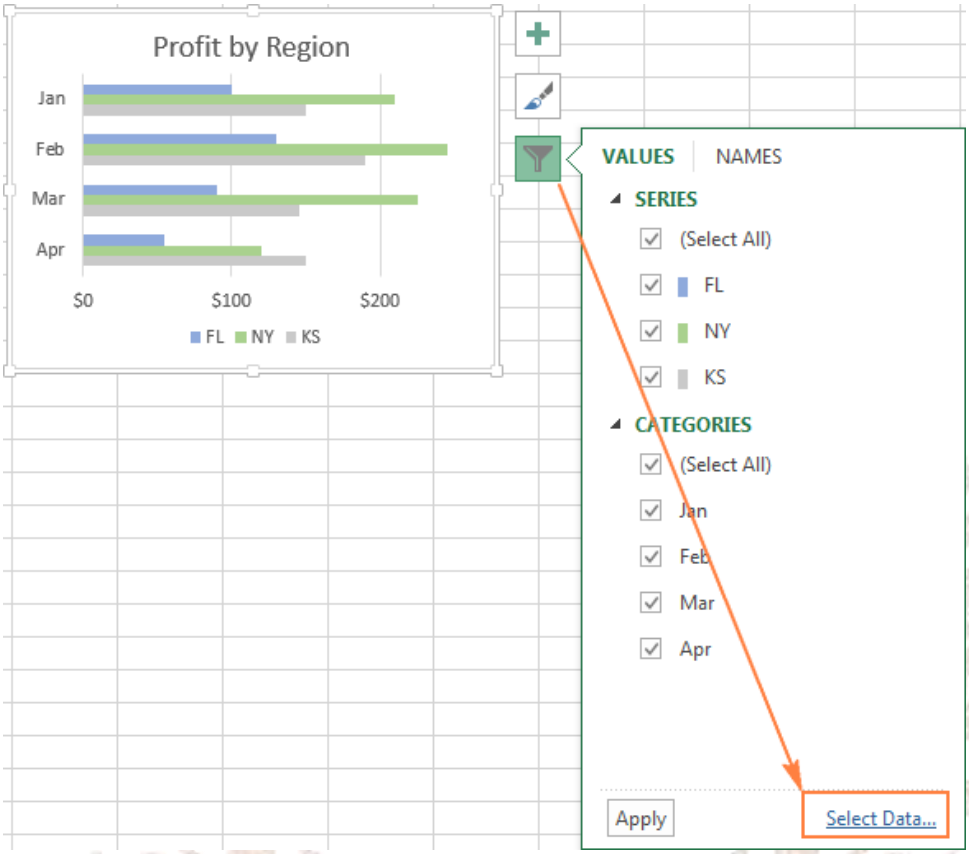


Fig 3. 62 Bar Chart of Monthly Profit by Region

1. In the *Select Data Source* dialog, select the data series whose plot order you want to change, and move it up or down by using the corresponding arrow:

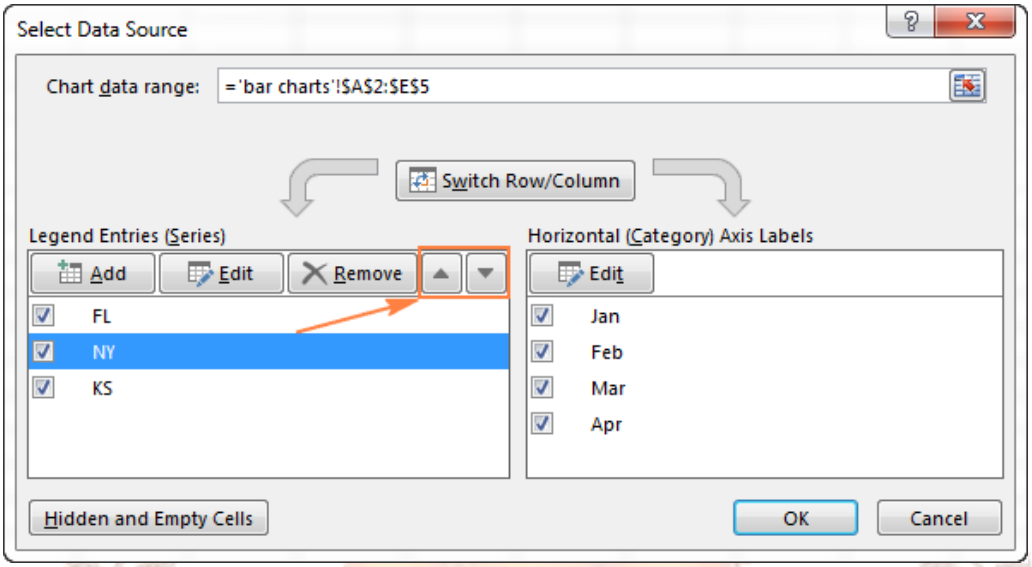


Fig 3. 63 Editing Series in the Select Data Source Dialog Box

Reorder data series by using formulas:

Each data series is defined by a formula in Excel charts, including bar graphs and other charts. There is the flexibility to alter the data series by adjusting the respective formula. Specifically, the focus is on the last argument within these formulas, which dictates the plotting order of the series. For example, the grey data series is plotted 3rd in the following

Excel bar chart:

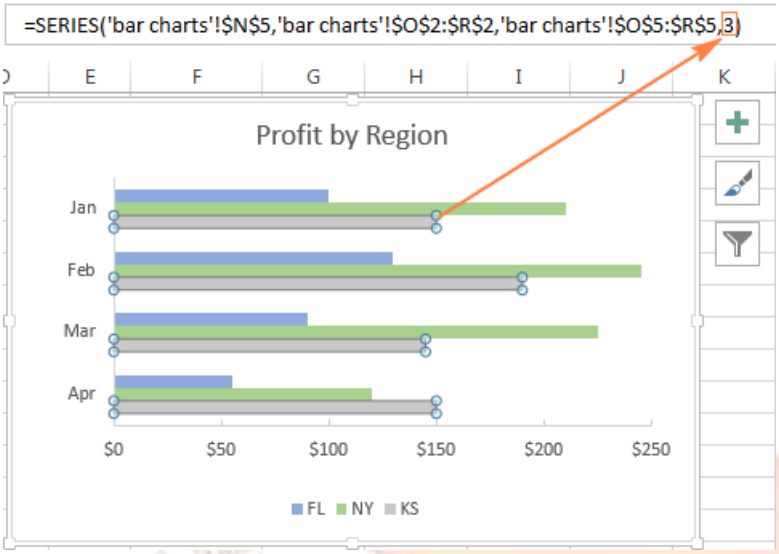


Fig 3. 64

To change the plotting order of a given data series, select it on the chart, go to the formula bar, and replace the last argument with some other number. In this bar chart example, to move the grey data series one position up, type 2, to make it the first series in the graph, type 1:

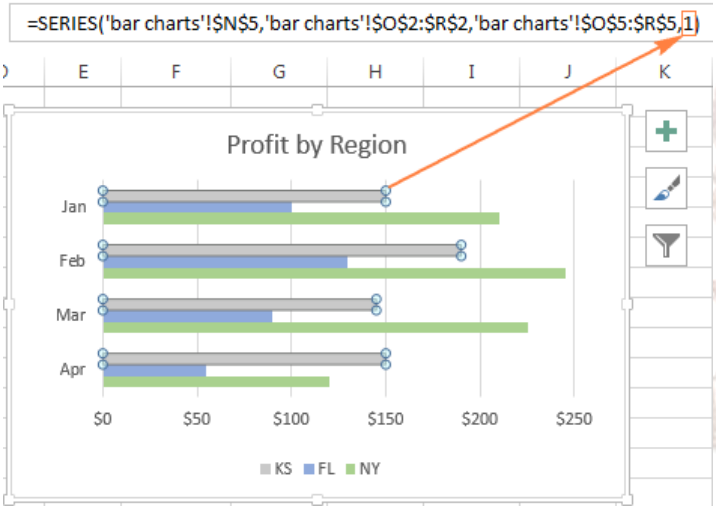


Fig 3. 65

As well as the Select Data Source dialog, editing the data series formulas changes the series order on the graph only; the source data on the worksheet remains intact.

5. SUMMARY

The fundamentals of constructing effective pie charts and bar graphs are covered in this chapter. The utilisation of pie charts is proposed to represent categorical data visually, emphasising the significance of organising source data appropriately and choosing appropriate chart types. The chapter elucidates the importance of reducing the number of categories to preserve the chart's clarity. It offers comprehensive instructions on generating and personalising pie charts in Excel. In the same way, bar graphs are deliberated upon as a flexible method of illustrating and contrasting numerical data. This highlights the significance of selecting suitable layouts and designs while guiding how to modify the width and spacing of bars.

Additionally, the chapter addresses fundamental procedures such as colour-coding bars to indicate negative values and sorting data for clarity. In conclusion, methods for modifying the order of data series in bar graphs are detailed, including utilising the Select Data Source dialog and adjusting data series formulas. In this chapter, students acquire the skills and knowledge to construct, modify, and interpret Excel pie charts and bar graphs efficiently.

6. QUESTIONS

SELF-ASSESSMENT QUESTIONS – 1

1. Pie Chart used for _____.
2. The Pie Chart's clarity with many small slices can be improved using _____.
3. What's the recommended maximum number of data categories for a Pie Chart?
4. What tab does one use in Excel to insert a Pie Chart?
5. Which Excel tool helps you change a Pie Chart's appearance?
6. What's the primary use of a Gantt Chart in project management?
7. What is the range for adjusting Gap Width in a bar chart?
8. How can you make negative bars stand out in a bar chart?
9. What does selecting "Categories in reverse order" do in Excel?
10. What determines the plotting order of data series in Excel charts?

TERMINAL QUESTIONS

1. Explain the fundamental principles for creating an effective pie chart. What should be considered when organising source data, and how does the number of data categories impact chart readability?
2. Describe the steps involved in customising a pie chart in Excel. Discuss the various options for enhancing a pie chart's appearance and clarity.
3. In what scenarios would you recommend using a pie of pie or bar of pie chart in Excel? How can you control which data categories are moved to the secondary chart?
4. Discuss bar graphs' primary purposes and suitability for different data comparisons. Explain the concept of a Gantt chart and its significance in project management.
5. How can you adjust the width of bars and the spacing between them in Excel bar graphs? What are the implications of changing these settings on the chart's visual presentation?

6. Explain the techniques for sorting data on a bar chart in Excel. Outline the steps to reverse the order of data categories on a chart without modifying the source data, both through the Select Data Source dialog and data series formulas.

7. ANSWERS

Self-Assessment Questions

1. Categories
2. Grouping
3. 7-9
4. Insert
5. Design
6. Timelines
7. 0-500%
8. Colour
9. Reverses
10. Formulas

Terminal Questions

1. Refer Section 4
2. Refer Section 4
3. Refer section 4
4. Refer Section 5
5. Refer Section 5
6. Refer section 5