BUSINESS INTELLIGENCE

By Kushal P Wade

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DATA ANALYTICS LIFE CYCLE

By Kushal P Wade

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Data Analytics Life Cycle

- Data Analytics Life Cycle is a systematic approach used to analyze and extract insights from data to make informed decisions and predictions.
- It involves various stages that ensure the data is processed, analyzed, and transformed into actionable information.
- Let's dive into each stage in detail:

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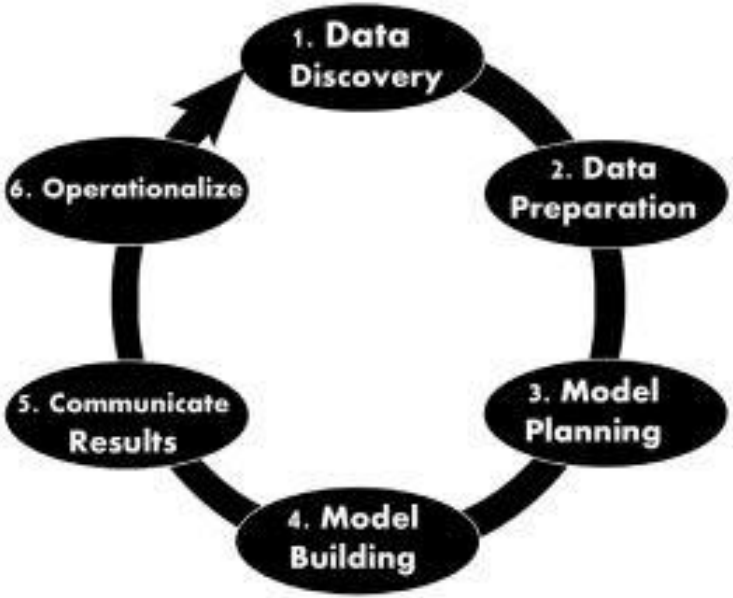
Data Analytics Life Cycle



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DATA DISCOVERY

- In the discovery phase, the goals and objectives of the data analytics project are defined.
- The key stakeholders collaborate to identify the business problem or question that needs to be addressed.
- This stage involves understanding the requirements, determining the scope of the project, and setting clear expectations for the outcomes.

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DATA DISCOVERY

- This is the initial phase to set your project's objectives and find ways to achieve a complete data analytics lifecycle.
- Start with defining your business domain and ensure you have enough resources (time, technology, data, and people) to achieve your goals.
- The biggest challenge in this phase is to accumulate enough information. You need to draft an analytic plan, which requires some serious leg work.

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Data Discovery

Benefits

- ✓ Enables data visualization
- ✓ As part of business intelligence
- ✓ Aid behavioral analysis
- ✓ Understand the full life cycle
- ✓ Predictive analytics

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How does data discovery help?

- **Discover new opportunities**
  It helps uncover new insights for methods of business value creation.

- **Replicate success**
  Can drive similar high-value business outcomes where data was the catalyst of a modern business' operations success story.

- **Secure data**
  Can apply data protection to lower the risk of its exposure and prevent abuse, theft, and leaks.

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How does data discovery help?

- **Achieve compliance**

  Businesses can keep track of their data and its security to make sure they understand how safe it is to ensure they are compliant with industry standards.

- **Adopt the cloud**

  In cases where a move to the cloud (or further expansion) is needed, data discovery tools gather all the digital assets in an ecosystem. This helps ensure that not a single piece of data is overlooked.

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What makes for a good data discovery tool?

- **Ease of use**

  1) A great tool is always easy to set up and start using.

  2) Likewise, a data discovery tool needs to be simple enough for non-technical users to create the dashboards and insights they need straight out of the box.

- **Deep discovery capabilities**

  Should also be able to track data regardless of its location – be it in the cloud or on-premises; as long as it belongs to the organization, the data should be displayed in its dashboards.

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What makes for a good data discovery tool?

- **Ability to process big data**

1) Most companies need the help of data discovery tools because they have large amounts of data.

2)Therefore, a good data discovery tool should be able to find data, process it, and present it with ease and in the shortest time possible.

- **Recognition of data types**

The tool should also identify data types in whatever format they may be stored in, and even if it has been corrupted or is missing attributes.

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What makes for a good data discovery tool?

- **Display data in insightful dashboards**

  The reports and dashboards created from discovered data should help with easy and informed decision-making.

- **Collaboration features**

  It is rare that only one user creates a dashboard and then uses it Therefore, a good data discovery tool should allow dashboards and reports to be easily shared among stakeholders.

- **The price**

  Cost-effectiveness and a positive return on investments (ROI) will always be at the fore of any product

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Data Discovery Tools

1. Informatica
2. Qlik Sense
3. Tableau
4. SyncSpider
5. Nightfall
6. Atlan
7. PowerBI
8. Tibco
9. Grow

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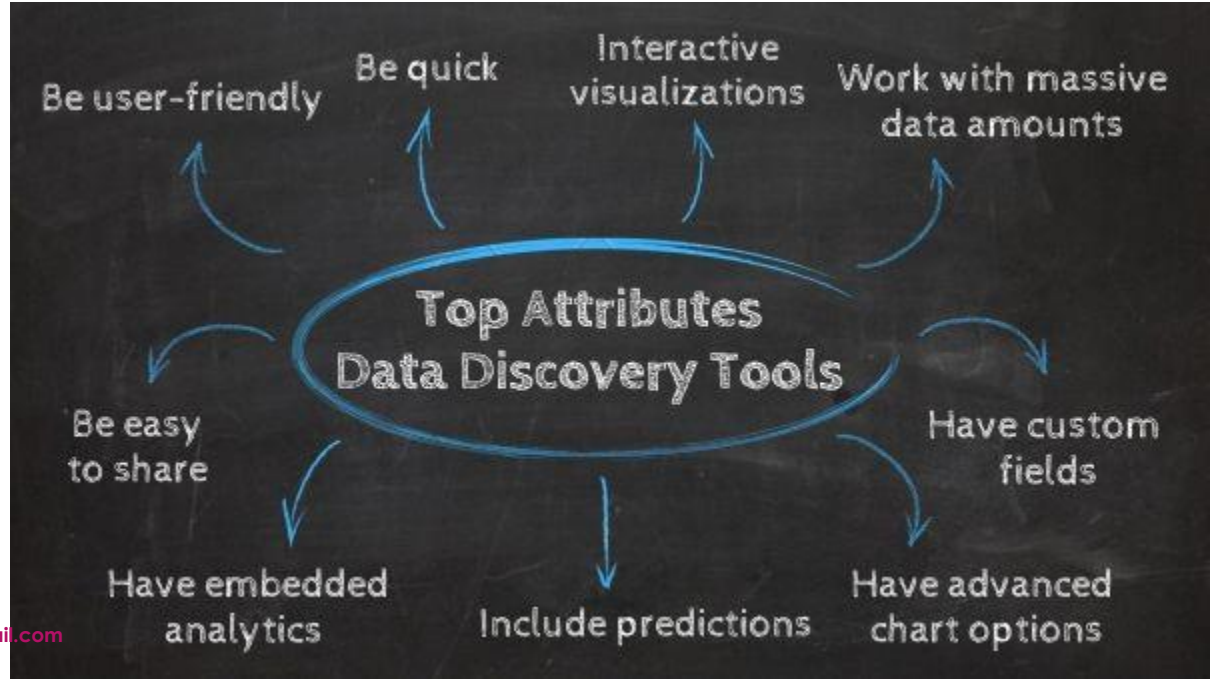
Attributes:



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DATA PREPARATION

- Data preparation is a critical phase where raw data is collected from various sources and transformed into a suitable format for analysis.
- This process includes data cleaning, data integration, data transformation, and data enrichment.
- The data is cleansed to remove any inconsistencies, errors, or duplicates, ensuring that the dataset is accurate and reliable.

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DATA PREPARATION

- Data preparation is the process of getting raw data ready for analysis and processing.
- This can mean restructuring the data at hand, merging sets for a more complete view, and even making corrections to data that isn't recorded properly.
- While this sort of work is highly time-consuming, it is essential for any job that involves working with large amounts of complex data.

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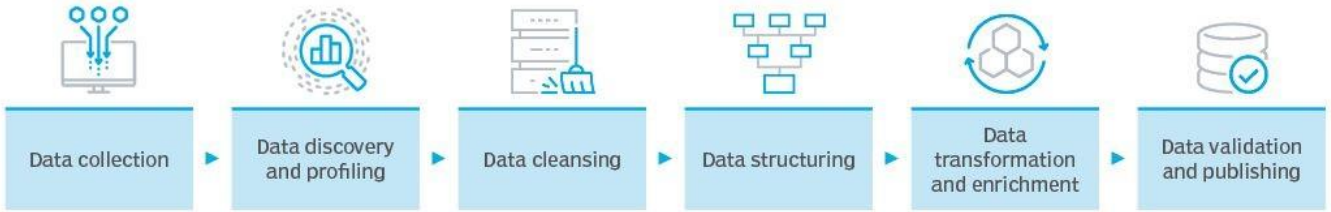
Key data preparation steps



ICONS FROM LEFT: PRIYANKA GUPTA/GETTY IMAGES, TIM_IURII/GETTY IMAGES, ENIS AKSOY/GETTY IMAGES, FINGERMEDIUM/GETTY IMAGES, ENOTMAKS/GETTY IMAGES, BROWNDOGSTUDIOS/GETTY IMAGES

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DATA PREPARATION

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Steps in the data preparation process

1) Data collection.

- Relevant data is gathered from operational systems, data warehouses, data lakes, and other data sources.

- During this step, data scientists, members of the BI team, other data professionals, and end users who collect data should confirm that it's a good fit for the objectives of the planned analytics applications.

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Steps in the data preparation process

2) Data discovery and profiling.

- The next step is to explore the collected data to better understand what it contains and what needs to be done to prepare it for its intended uses.

- To help with that, data profiling identifies patterns, relationships, and other attributes in the data, as well as inconsistencies, anomalies, missing values, and other issues so they can be addressed.

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Steps in the data preparation process

3) Data cleansing.

- Next, the identified data errors and issues are corrected to create complete and accurate data sets.

- For example, as part of cleansing data sets, faulty data is removed or fixed, missing values are filled in and inconsistent entries are harmonized.

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Steps in the data preparation process

4) Data structuring.

- At this point, the data needs to be modeled and organized to meet the analytics requirements.
- For example, data stored in comma-separated values (CSV) files or other file formats has to be converted into tables to make it accessible to BI and analytics tools.

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Steps in the data preparation process

5) Data transformation and enrichment. I

- n addition to being structured, the data typically must be transformed into a unified and usable format.
- For example, data transformation may involve creating new fields or columns that aggregate values from existing ones.
- Data enrichment further enhances and optimizes data sets as needed, through measures such as augmenting and adding data.

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Steps in the data preparation process

6) Data validation and publishing.

- In this last step, automated routines are run against the data to validate its consistency, completeness, and accuracy.

- The prepared data is then stored in a data warehouse, a data lake or another repository and either used directly by whoever prepared it or made available for other users to access.

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Benefits of Data Preparation And The Cloud

- **Fix Errors Quickly:** Fixing errors before processing data is much faster than doing it after the fact.

- **High-Quality Data:** With errors being fixed so quickly, your data will always see a quality increase after preparation.

- **More Usable Data:** Higher quality data will be easier to read and make use of, making this process well worth it.

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Benefits of Data Preparation And The Cloud

- **Easy Collaboration:** Storing all of your data on the cloud will make it easier for the whole team to access, aiding collaboration.

- **Future Proof:** Unlike having your own servers, cloud options can scale with your business, securing your future without forcing you to constantly upgrade.

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MODEL PLANNING

- In the model planning stage, the data analysts or data scientists define the analytical approach and select appropriate models or algorithms to be used for analysis.
- This step involves understanding the nature of the data and choosing the most suitable techniques for addressing the business problem.
- The team outlines the steps required to implement the selected models effectively.

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MODEL BUILDING

- In this phase, the selected models are implemented and applied to the prepared dataset.
- Data scientists and analysts may use various tools and programming languages to create models, perform analysis, and extract insights.
- The process may involve machine learning, statistical analysis, and other data analysis techniques.

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MODEL BUILDING

- In this phase, the data science team needs to develop data sets for training, testing, and production purposes.
- These data sets enable data scientists to develop an analytical method and train it while holding aside some of the data for testing the model.

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MODEL BUILDING

- The team develops datasets for testing, training, and production purposes. In addition, in this phase, the team builds and executes models based on work done in the model planning phase.

- The team also considers whether its existing tools will suffice for running the models, or if it will need the more robust environment for executing models and workflows (For example – fast hardware and parallel processing).

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MODEL BUILDING : LIFECYCLE

- Select variables
- Balance data
- Build models
- Validate
- Deploy
- Maintain
- Define success
- Explore data
- Condition data

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COMMUNICATING RESULTS

- Quality Assurance
- Documentation
- Management Approval
- Installation Begin

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COMMUNICATION AND PUBLICATION

- This is the phase where you have to communicate the data analysis with your clients. It requires several intricate processes where you how to present information to clients in a lucid manner.

- Your clients don't have enough time to determine which data is essential. Therefore, you must do an impeccable job to grab the attention of your clients.

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COMMUNICATION AND PUBLICATION

- **Check the data accuracy**

Does the data provide information as expected? If not, then you have to run some other processes to resolve this issue. You need to ensure the data you process provides consistent information. This will help you build a convincing argument while summarizing your findings.

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- **Highlight important findings**

Well, each data holds a significant role in building an efficient project. However, some data inherits more potent information that can truly serve your audience's benefits. While summarizing your findings, try to categorize data into different key points.

- **Determine the most appropriate communication format**

How you communicate your findings tells a lot about you as a professional. We recommend you to go for visuals presentation and animations as it helps you to convey information much faster. However, sometimes you also need to go old-school as well. For instance, your clients may have to carry the findings in physical format. They may also have to pick up certain information and share them with others.

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QUALITY ASSURANCE

- Quality assurance is a crucial step to ensure the accuracy and reliability of the analysis results.
- During this stage, the team validates the models, checks for any errors, and assesses the performance of the analytics process.
- Rigorous testing and validation procedures are conducted to identify and rectify any discrepancies or issues in the analysis.

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DOCUMENTATION

- Documenting the entire data analytics life cycle is essential for transparency, knowledge sharing, and future reference.
- It involves documenting each step, methodology, assumptions, and results obtained during the analysis.
- Well-documented procedures make it easier for others to understand and reproduce the analysis.

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MANAGEMENT APPROVAL

- Before moving forward with the implementation of the data analytics insights, management approval is sought.
- The documented results and proposed actions are presented to the relevant stakeholders for review and decision-making.
- This step ensures that the analysis aligns with the business objectives and meets the organization's requirements.

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INSTALLATION

- Once management approves the analytics results and proposed solutions, the necessary changes or implementations are made based on the findings.

- This may involve integrating the data analytics results into existing systems or processes.

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ACCEPTANCE & OPERATION

- After installation, the data analytics solution is accepted into the operational environment.
- Users start utilizing insights and recommendations to make informed decisions.
- Continuous monitoring and evaluation are conducted to ensure that the analytics solution is effective and meets the desired outcomes.

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OPERATIONS

- As soon you prepare a detailed report including your key findings, documents, and briefings, your data analytics life cycle almost comes close to the end.

- The next step remains the measure the effectiveness of your analysis before submitting the final reports to your stakeholders.

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OPERATIONS

- In this process, you have to move the sandbox data and run it in a live environment.
- Then you have to closely monitor the results, ensuring they match your expected goals. If the findings fit perfectly with your objective, then you can finalize the report.
- Otherwise, you have to take a step back in your data analytics lifecycle and make some changes.

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CHARTS IN EXCEL

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CHARTS

- THE CHARTS GROUP IS FORMATTED IN SUCH A WAY THAT –
  - TYPES OF CHARTS ARE DISPLAYED.
  - THE SUBGROUPS ARE CLUBBED TOGETHER.
  - IT HELPS YOU fiND A CHART SUITABLE TO YOUR DATA WITH THE BUTTON RECOMMENDED CHARTS.

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CHARTS

- In Microsoft Excel, charts are used to make a graphical representation of any set of data.

- A chart is a visual representation of data, in which the data is represented by symbols such as bars in a bar chart or lines in a line chart.

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CHART GROUPS

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CHARTS IN EXCEL

- Column or Bar Graph
- Hierarchy Chart
- Waterfall Chart
- Line or Area Chart
- Statistics Chart
- Combo Chart
- Pie Chart
- Scatter Chart

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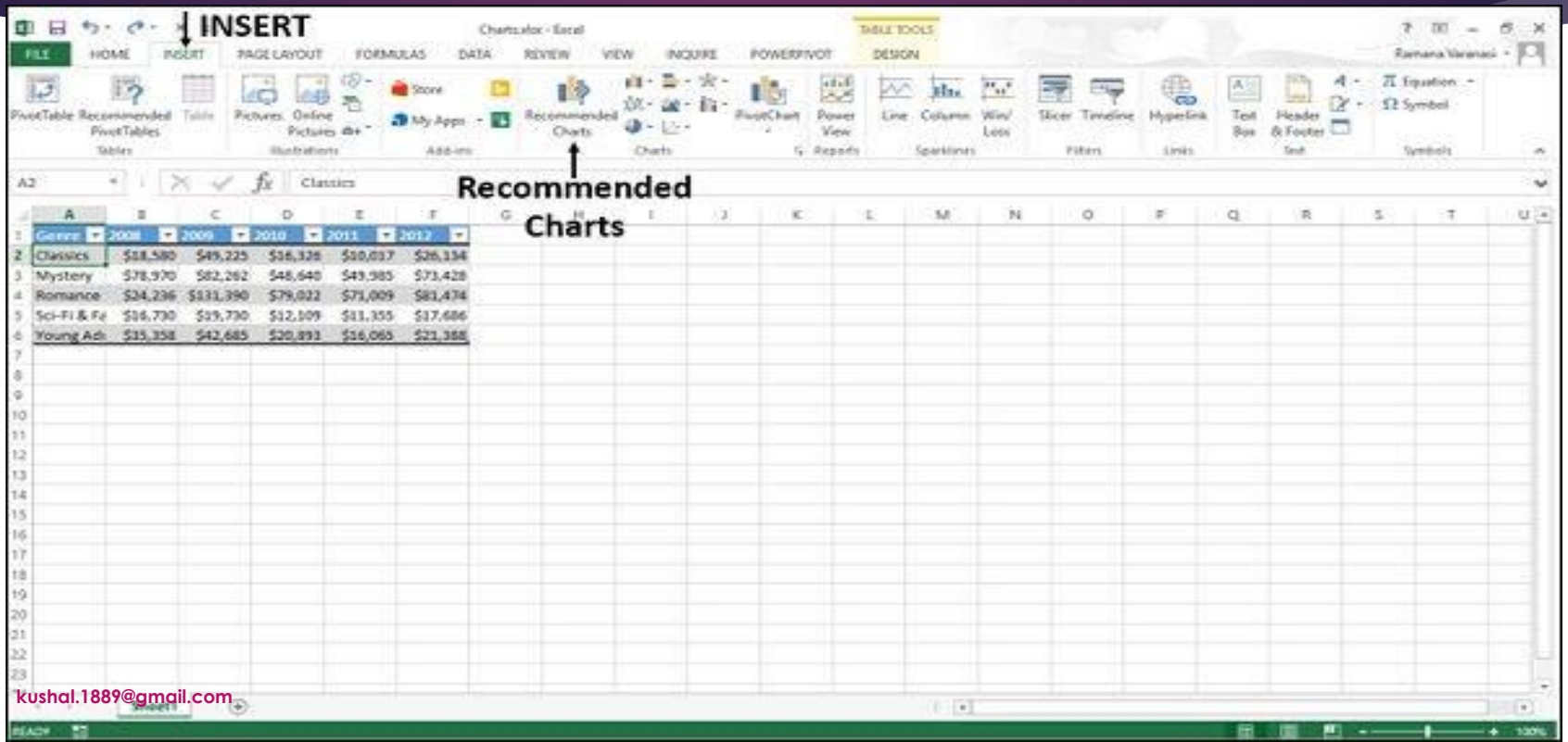
RECOMMENDED CHARTS



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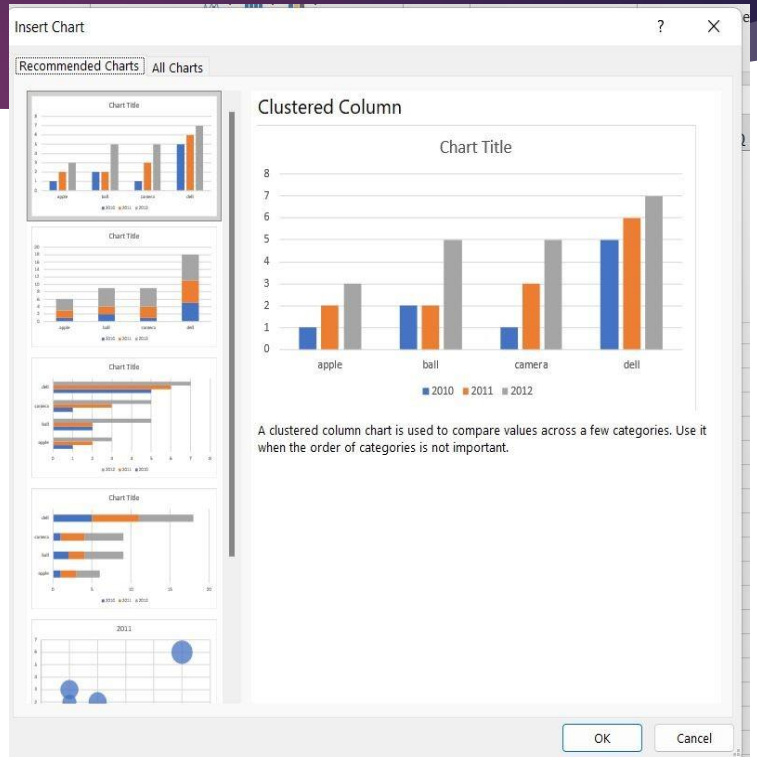
RECOMMENDED CHARTS

- To use Recommended charts –

  Step 1 – Select the data.

  Step 2 – Click Recommended Charts.

- A window displaying the charts that suit your data will be displayed.



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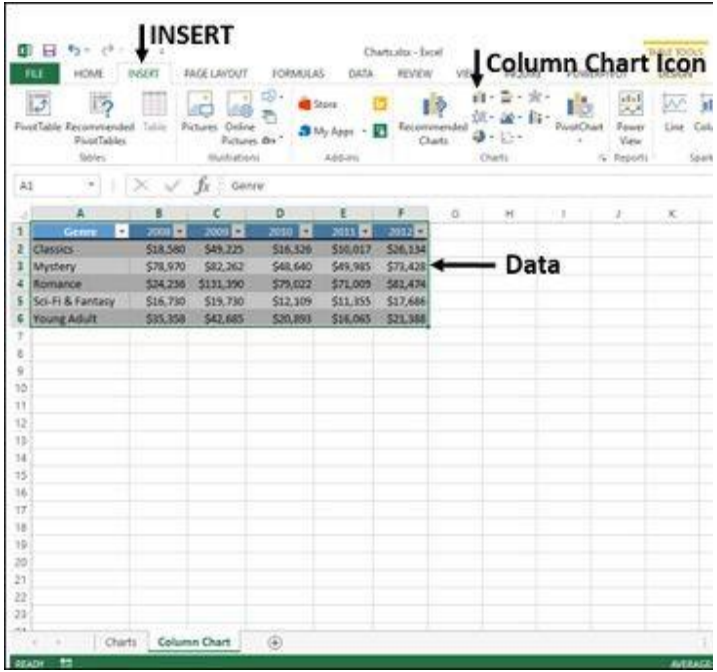
To create charts using the Insert Chart tab, follow the steps given below.

Step 1 − Select the data.

Step 2 − Click the Insert tab on the Ribbon.

Step 3 − Click the Insert Column Chart on the Ribbon.



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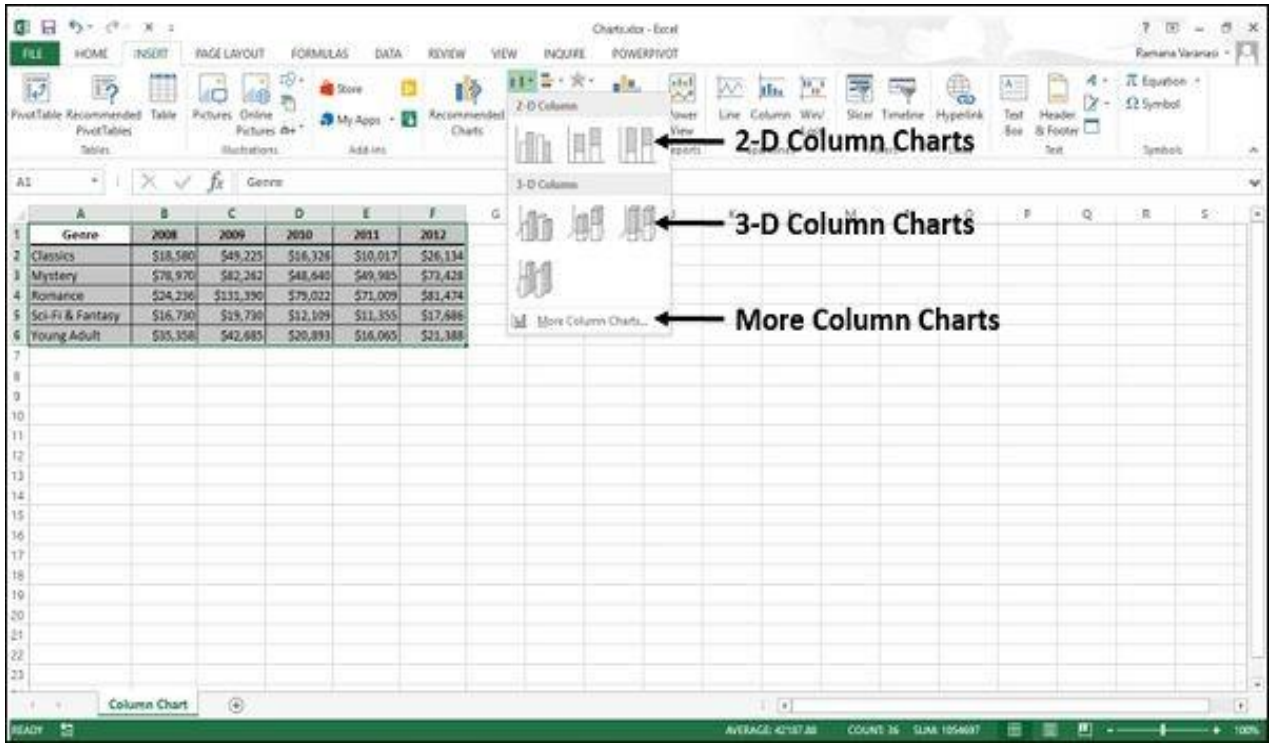
The 2-D column and 3-D Column chart options are displayed. Further, the More Column Charts… option is also displayed.



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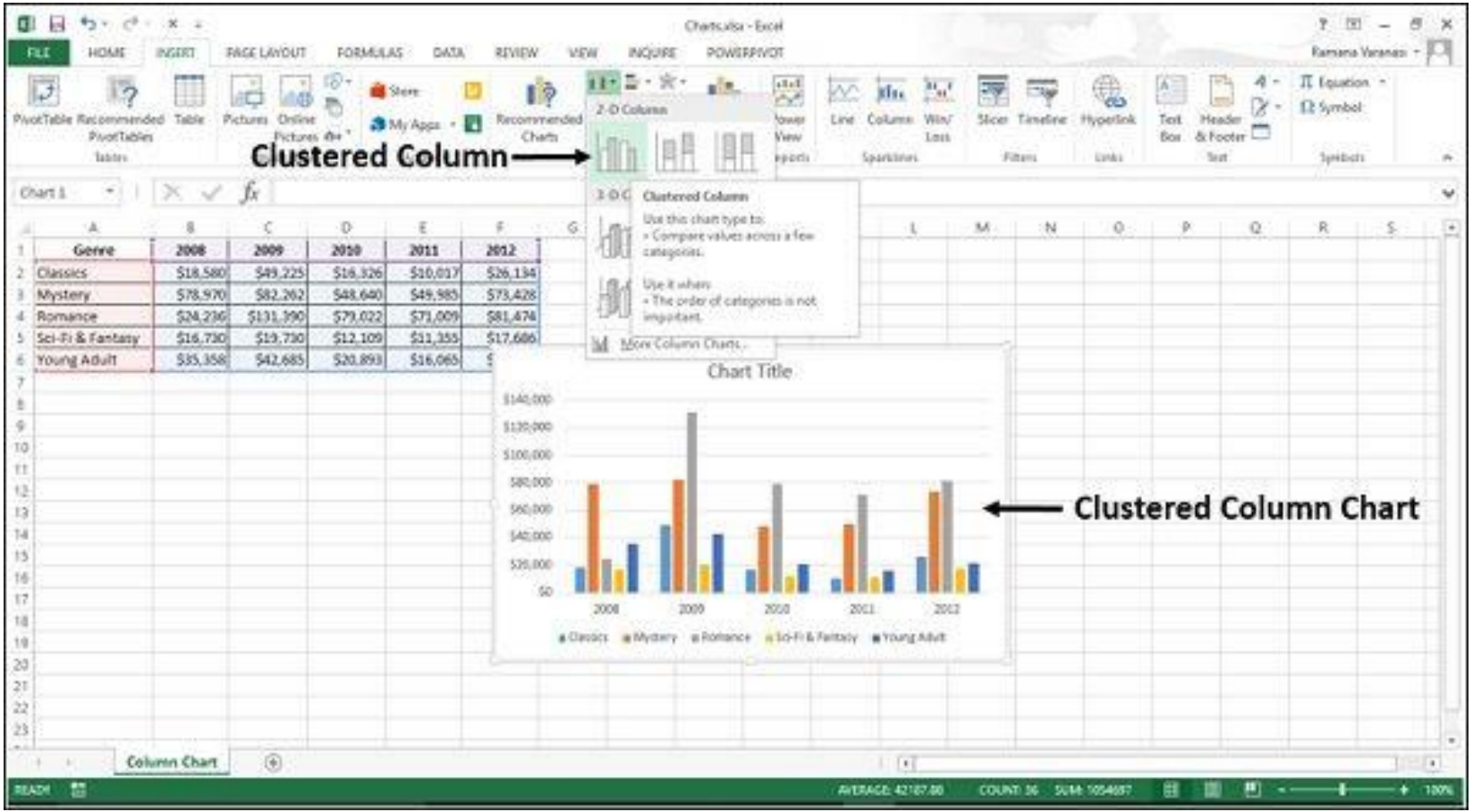

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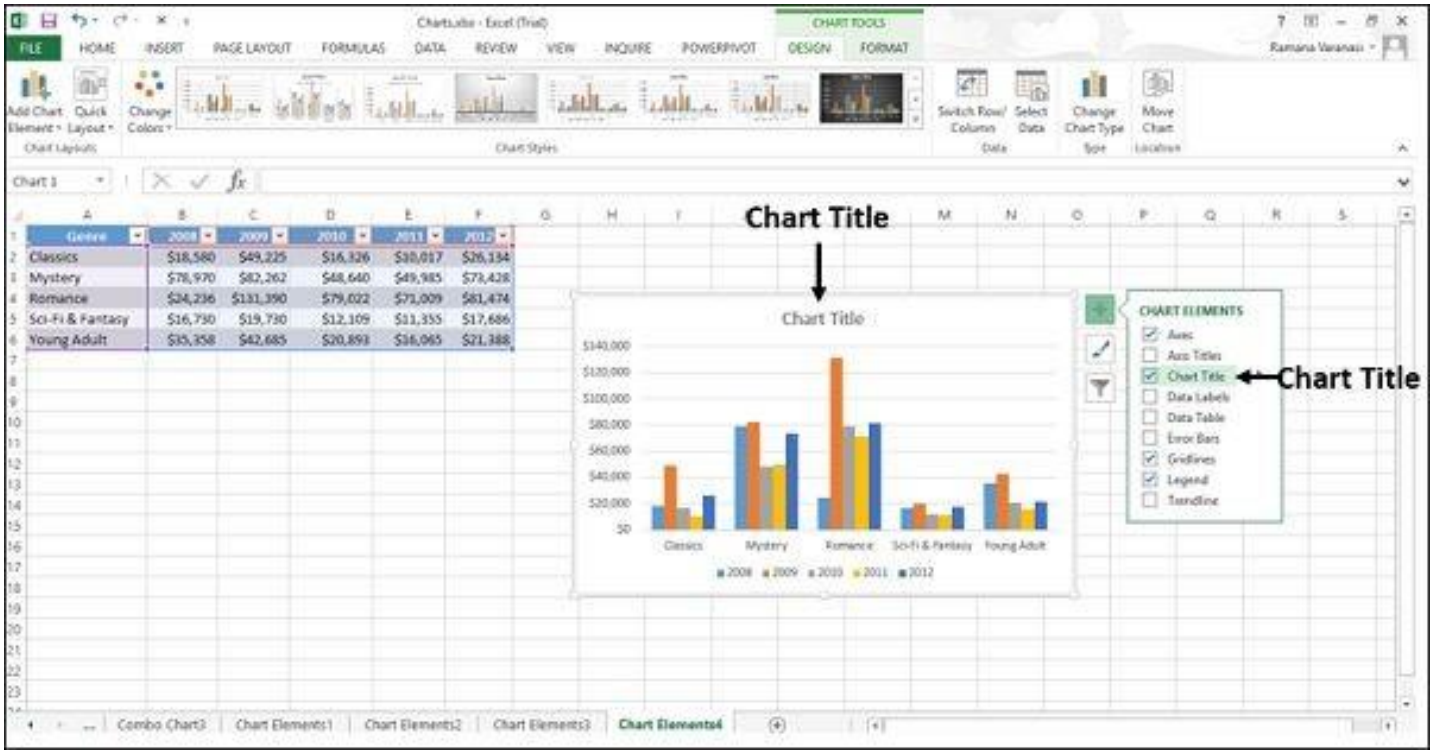
Step 6 – Give a meaningful title to the chart by editing Chart Title.



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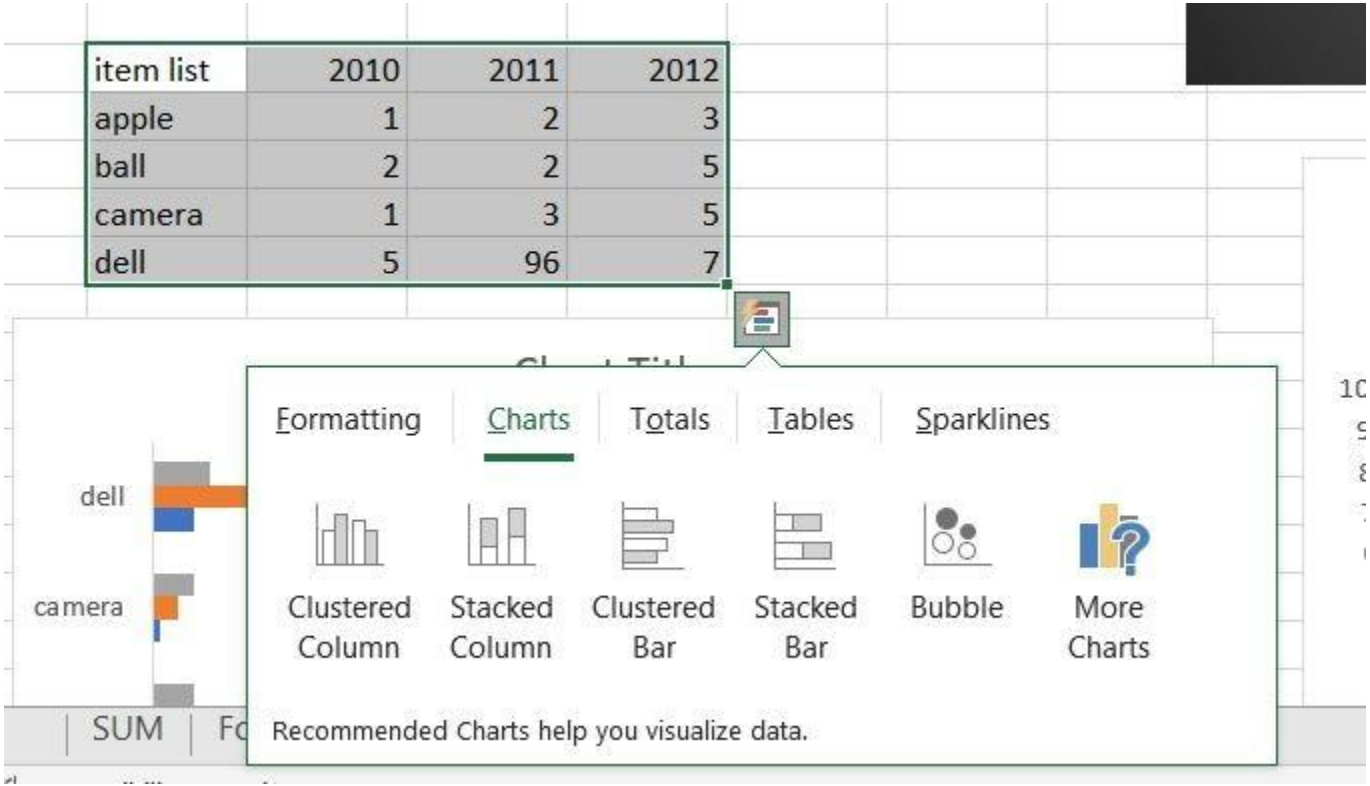
Creating Charts with Quick Analysis



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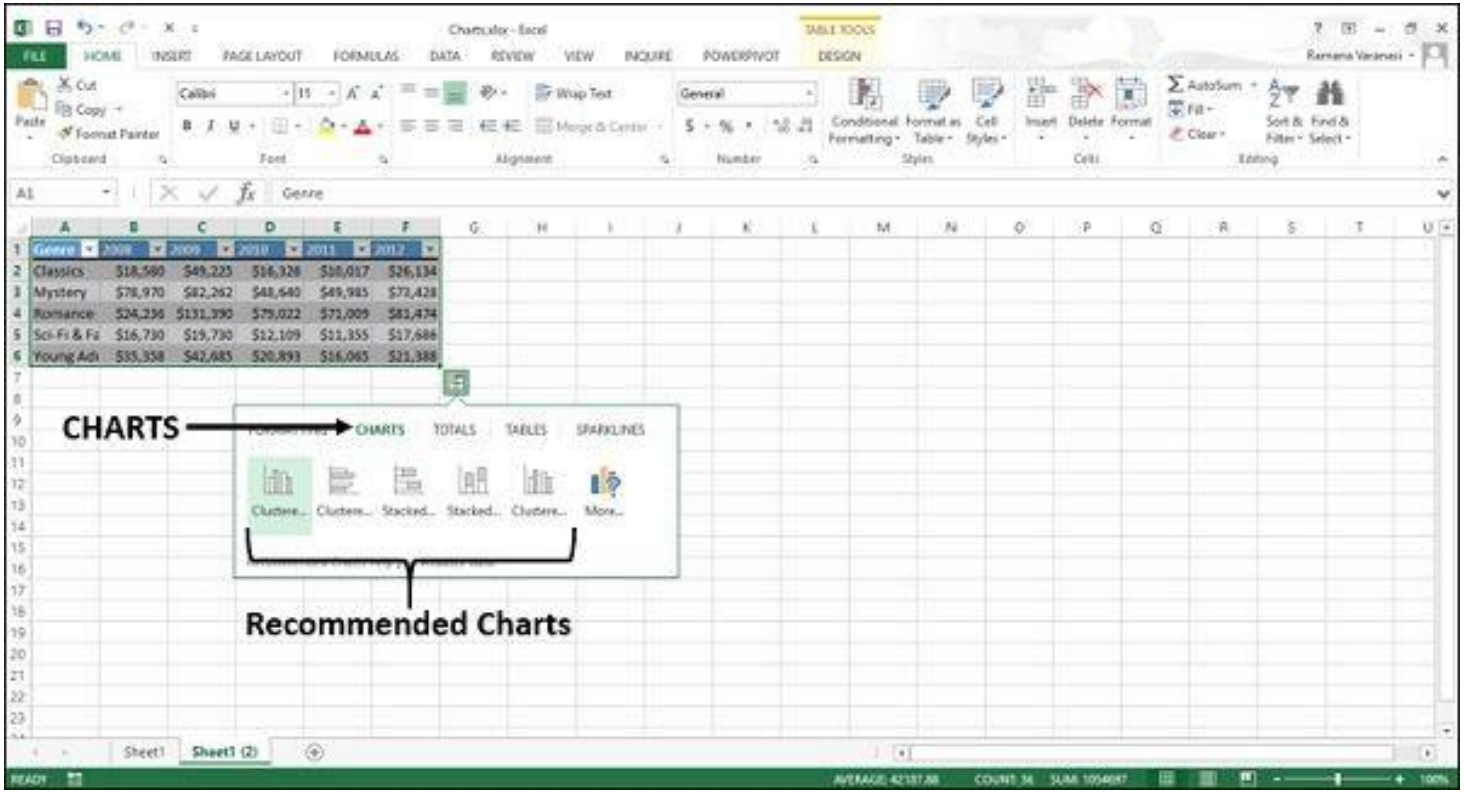

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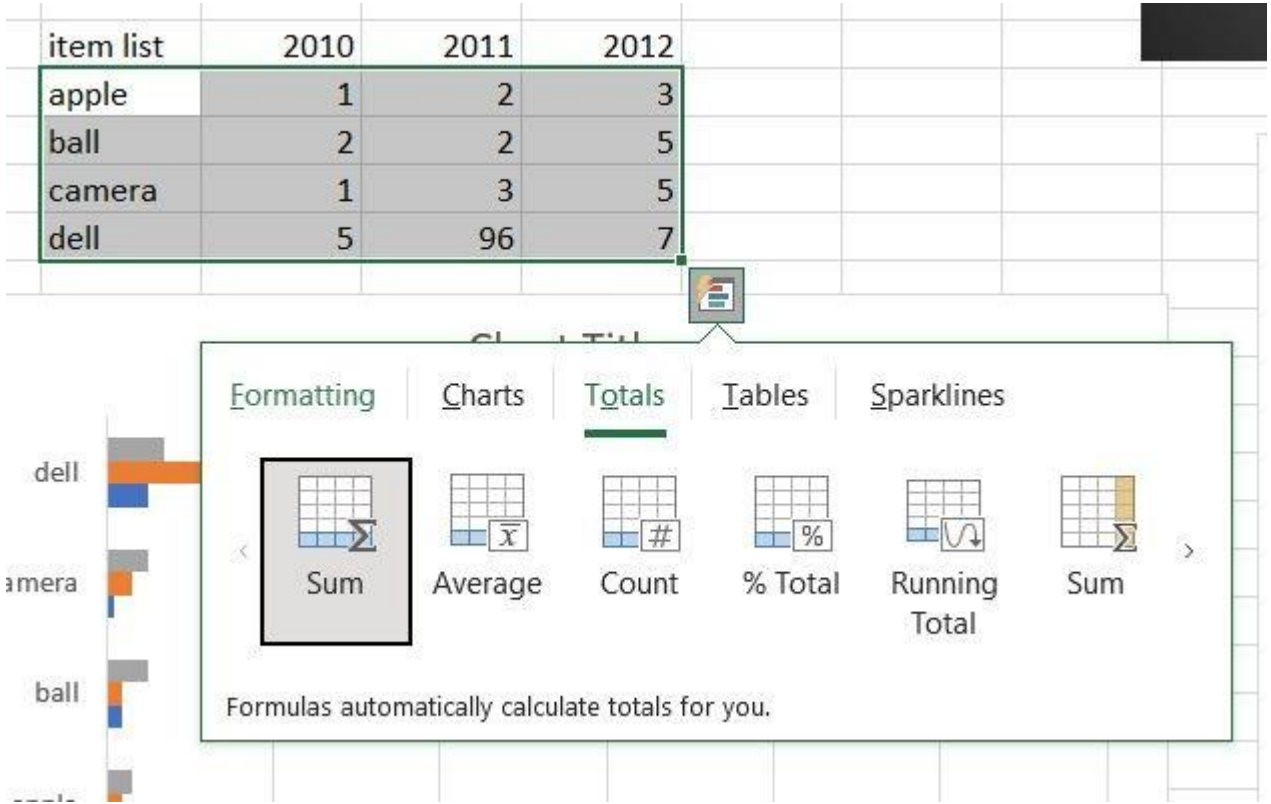
Totals



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Excel Charts Type

- Column Chart
- Line Chart
- Pie Chart
- Doughnut Chart
- Bar Chart
- Area Chart
- XY (Scatter) Chart
- Bubble Chart
- Stock Chart
- Surface Chart
- Radar Chart
- Combo Chart

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Column Chart

A Column Chart typically displays the categories along the horizontal (category) axis and values along the vertical (value) axis. To create a column chart, arrange the data in columns or rows on the worksheet.

A column chart has the following sub-types −

- Clustered Column.
- Stacked Column.
- 100% Stacked Column.
- 3-D Clustered Column.
- 3-D Stacked Column.
- 3-D 100% Stacked Column.
- 3-D Column.

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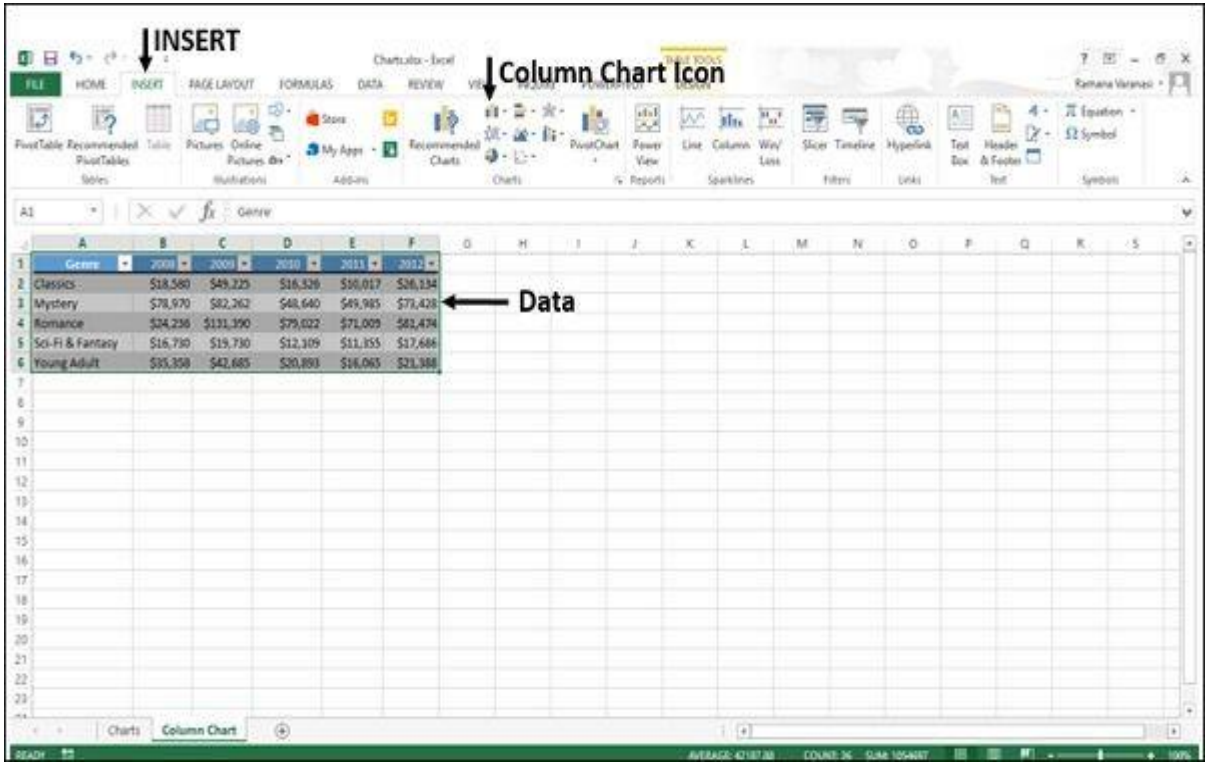
Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Select the data.

Step 3 − On the INSERT tab, in the Charts group, click the Column chart icon on the Ribbon.



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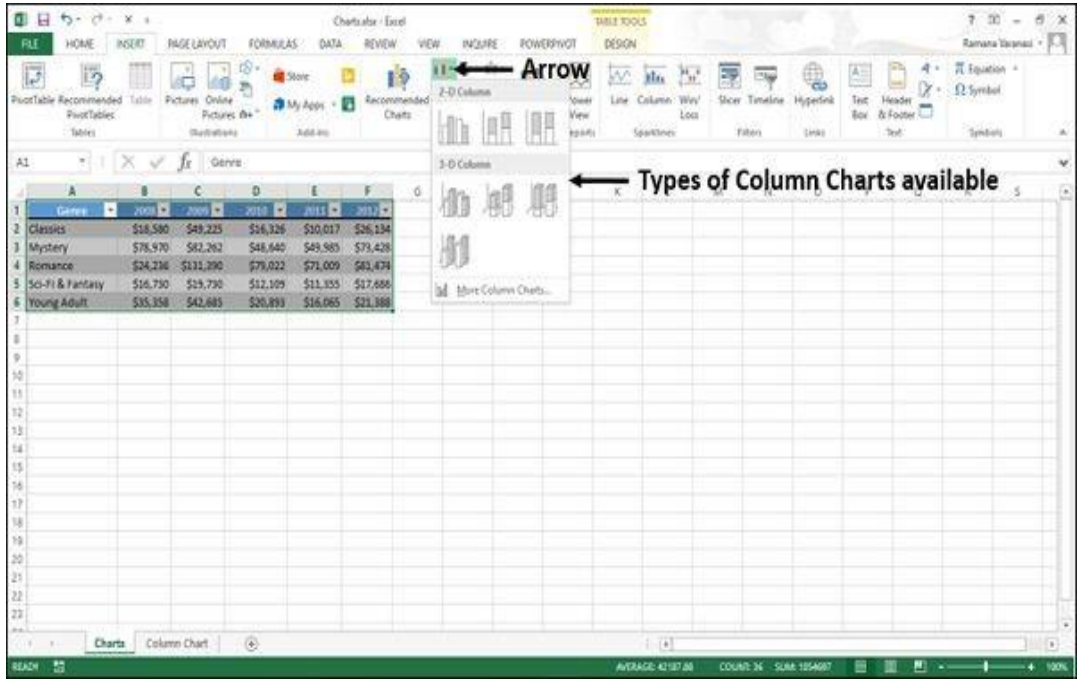
You will see the different options available for Column Charts.

A Column Chart has the following sub-types −

- **2-D Column Charts**
  - **Clustered Column**
  - **Stacked Column**
  - **100% Stacked Column**
- **3-D Column Charts**
  - **3-D Clustered Column**
  - **3-D Stacked Column**
  - **3-D 100% Stacked Column**
  - **3-D Column**



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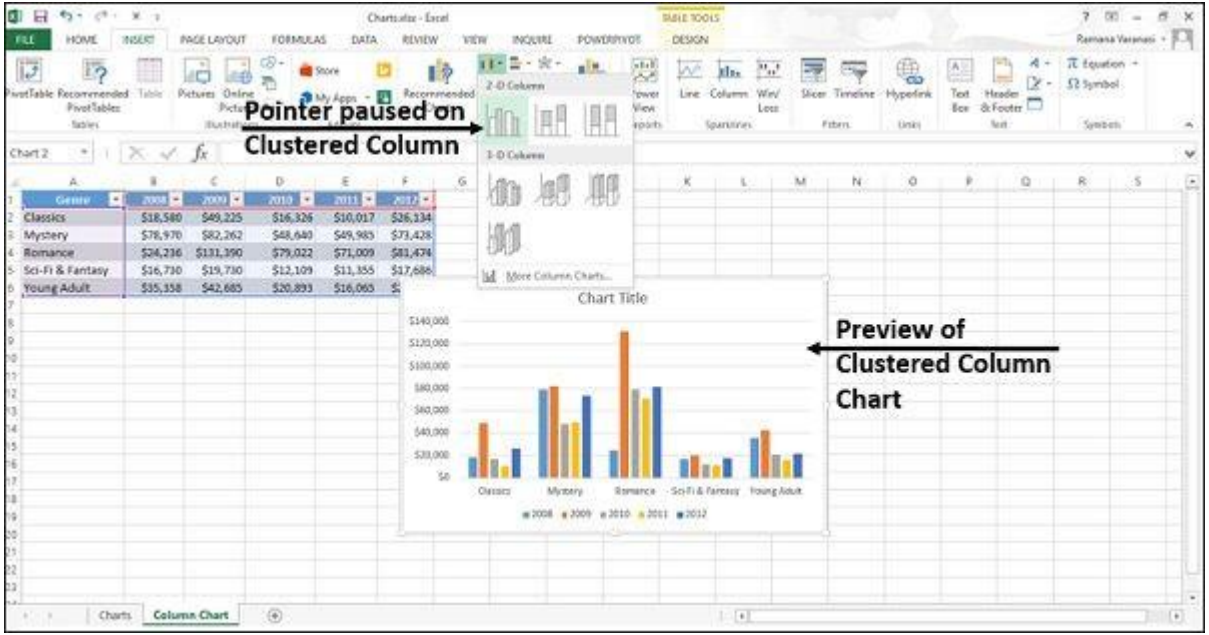
Step 4 − Point your mouse on each of the icons. You will see a preview of the chart type.



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Step 5 − Double-click the chart type that suits your data.

Clustered Column and 3-D Clustered Column

These chart types are useful to compare the values across a few categories, when the order of the categories is not important.

Remember that −

- **A Clustered Column chart shows values in 2-D rectangular columns.**
- **A 3-D Clustered Column chart shows Columns in 3-D perspective, but it does not use a third value axis (depth axis).**

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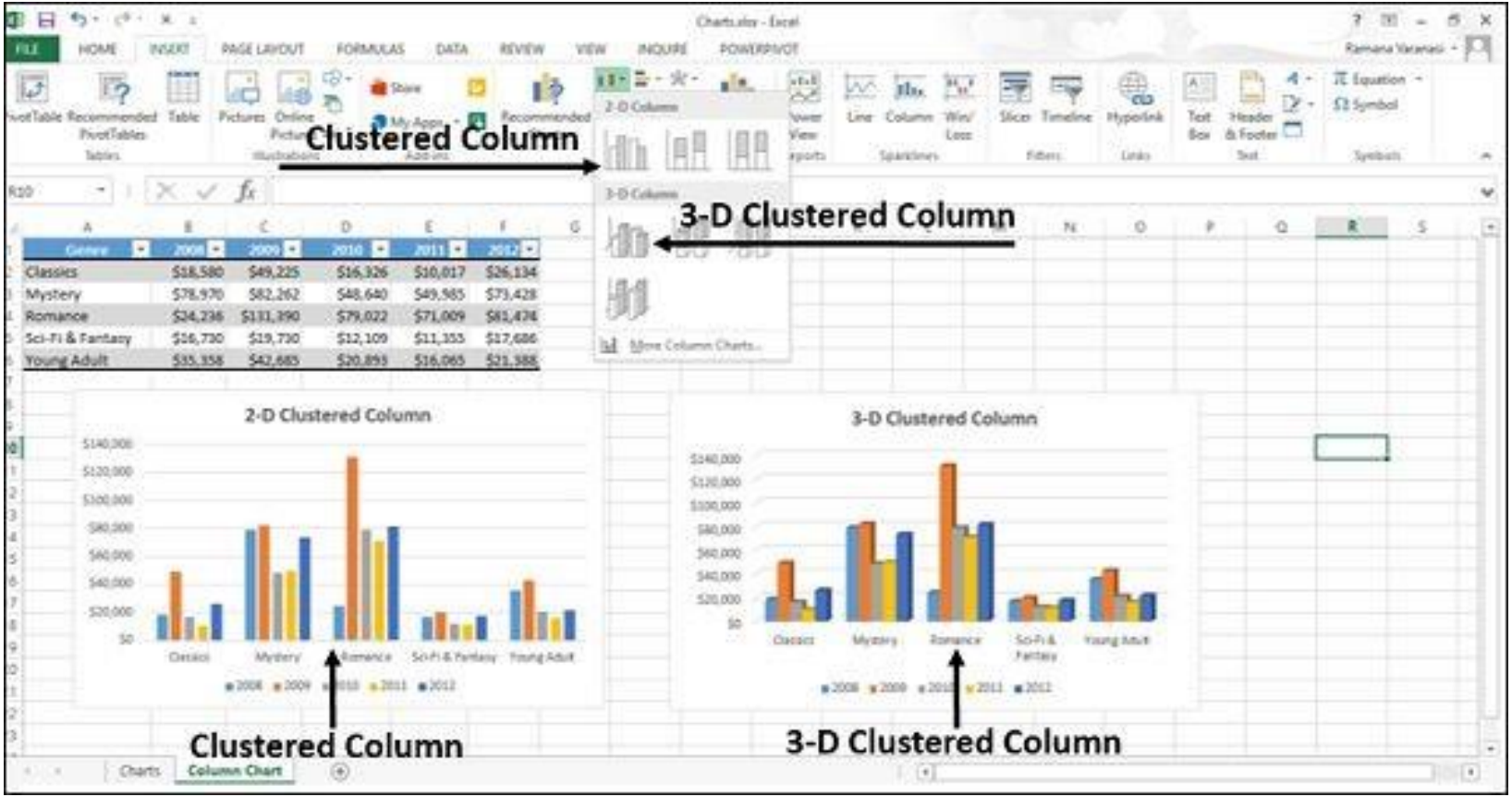

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You can use Clustered Column charts when you have multiple data series with categories that represent −

- Ranges of values (e.g. item counts).
- Specific scale arrangements (e.g. a Likert scale with entries like Strongly agree, Agree, Neutral, Disagree, Strongly disagree).
- Names that are not in any specific order (e.g. item names, geographic names, or the names of people).

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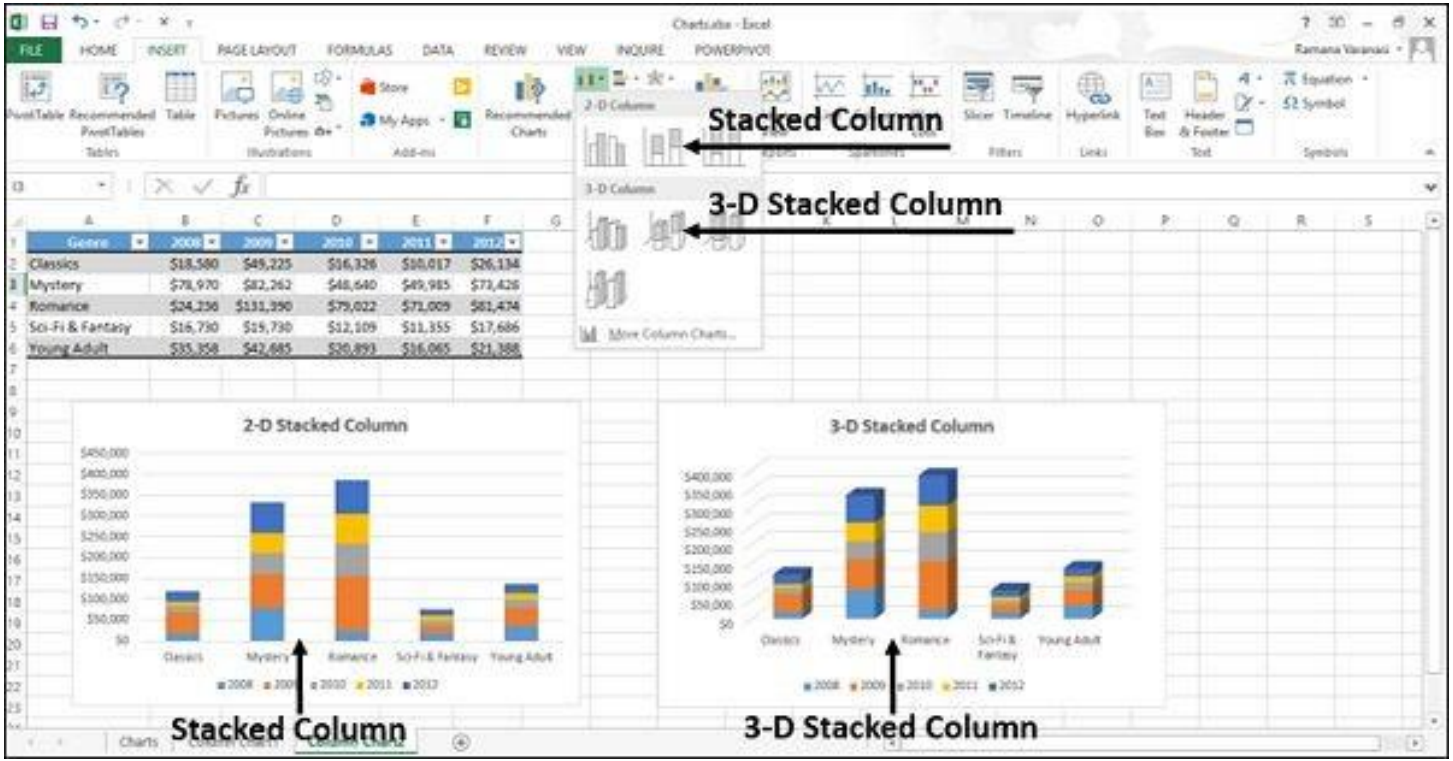
Stacked Column and 3-D Stacked Column



A Stacked Column chart displays values in 2-D vertical stacked rectangles. A 3-D Stacked Column chart displays the data by using a 3-D perspective, but it does not use a third value axis (depth axis).

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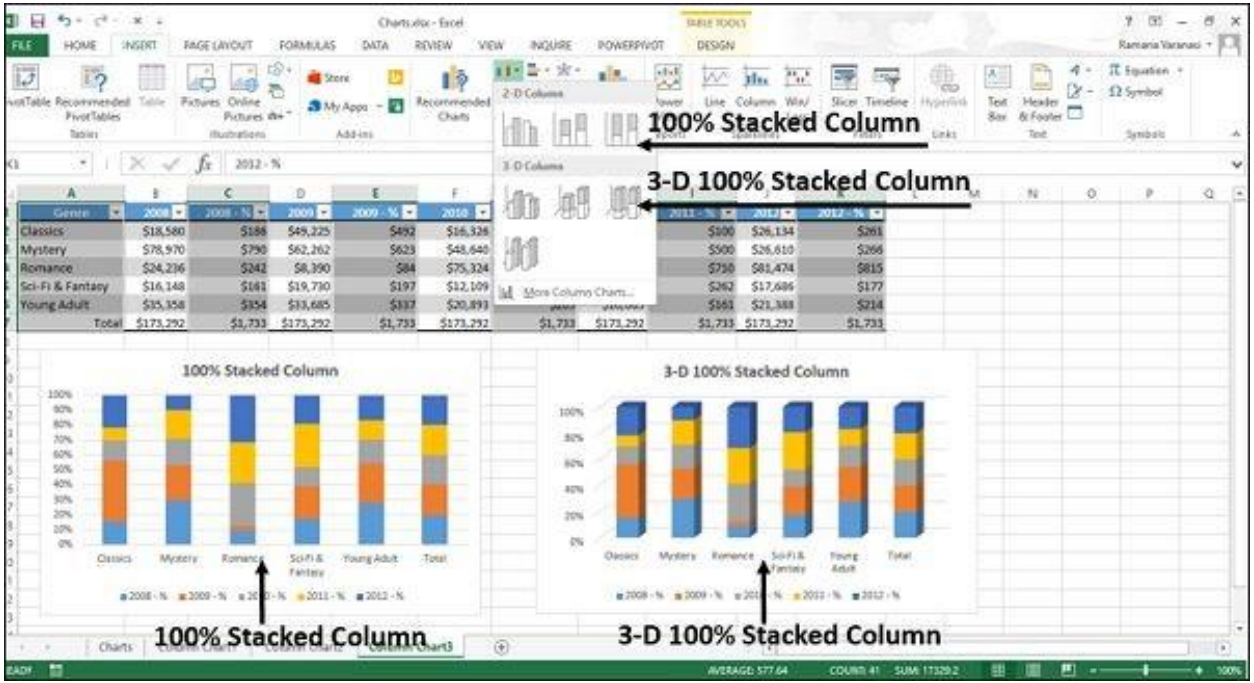
100% Stacked Column and 3-D 100% Stacked Column



A 100% Stacked Column chart shows values in 2-D columns that are stacked to represent 100%. A 3-D 100% Stacked Column chart shows the columns using a 3-D perspective, but it does use a third value axis (depth axis).

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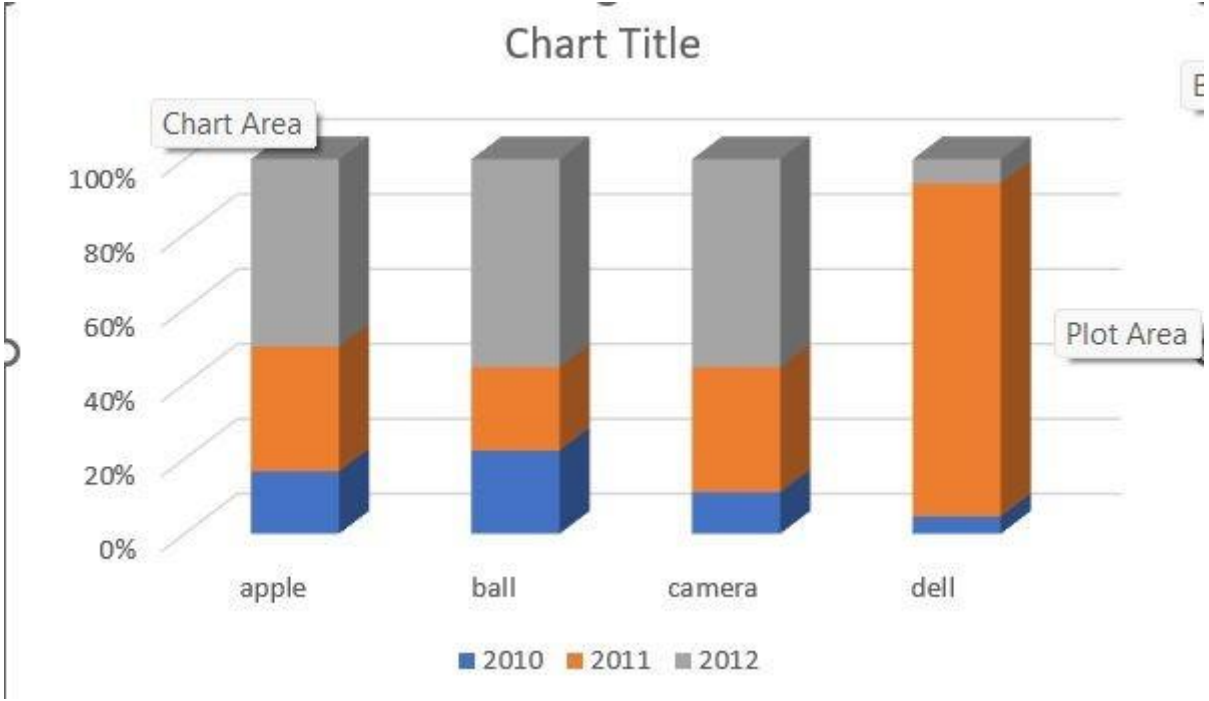

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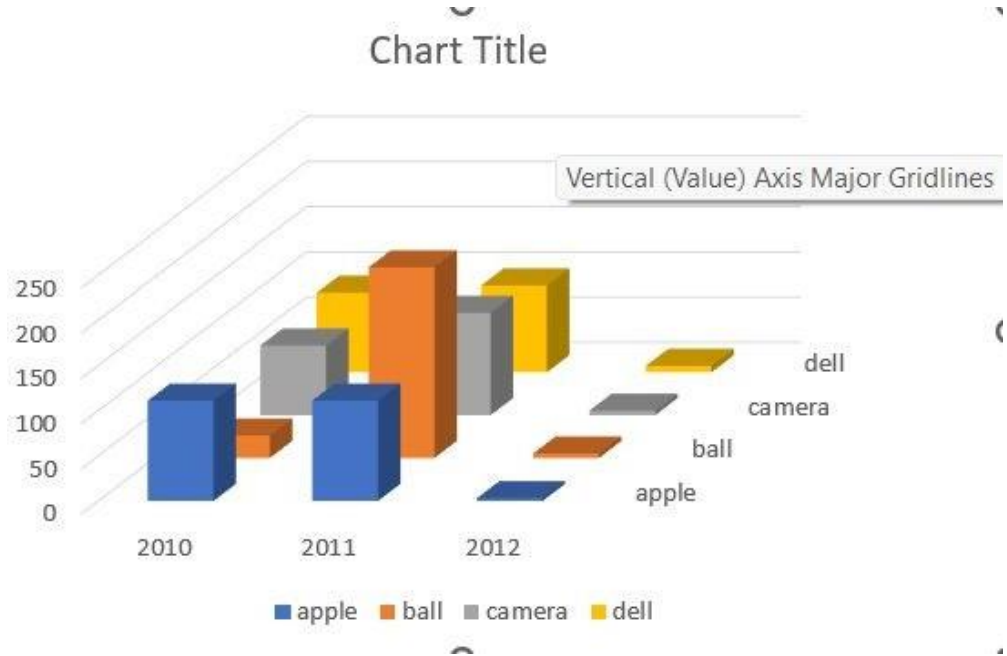
3-D Column

3-D Column charts use three axes that you can modify (a horizontal axis, a vertical axis, and a depth axis), and they compare data points along the horizontal and the depth axes.



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Line Chart

Line charts can show continuous data over time on an evenly scaled Axis. Therefore, they are ideal for showing trends in data at equal intervals, such as days, months, quarters or years.

In a Line chart –

- **Category data is distributed evenly along the horizontal axis.**
- **Value data is distributed evenly along the vertical axis.**

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Follow the steps given below to insert a Line chart in your worksheet.

Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Select the data.

Step 3 − On the INSERT tab, in the Charts group, click the Line chart icon on the Ribbon.

Step 4 − Point your mouse on each of the icons. A preview of that line type will be shown on the worksheet.

Step 5 − Double-click the chart type that suits your data.

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- **2-D Line charts**
  - **Line**
  - **100% Stacked Line**
  - **Line with Markers**
  - **Stacked Line with Markers**
  - **100% Stacked Line with Markers**
- **3-D Line charts**
  - **3-D Line**

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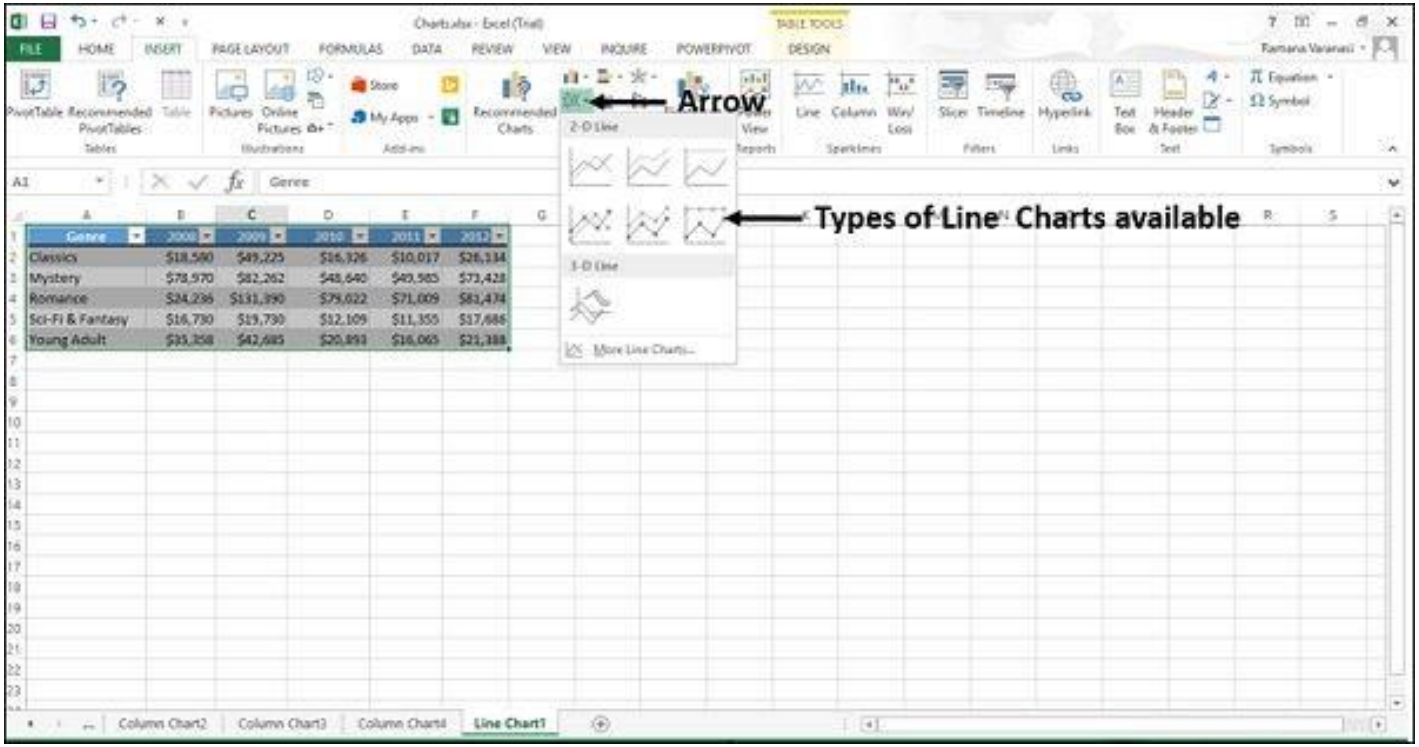

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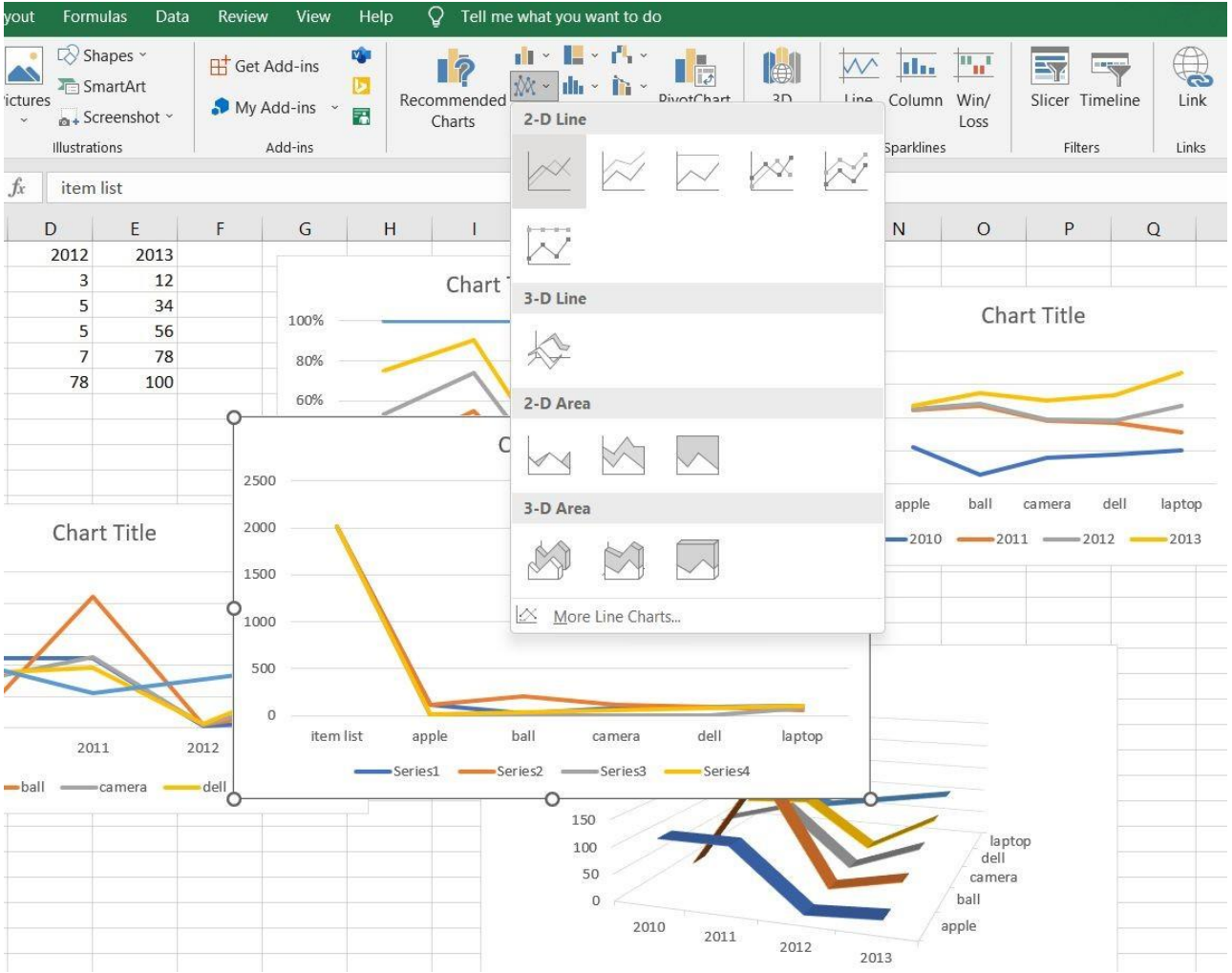

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Line and Line with Markers

Line charts indicate individual data values. Line charts work best when you have multiple data series in your chart.

Line charts can show trends over –

- **Time (days, months, quarters or years), or**
- **Evenly spaced Categories.**

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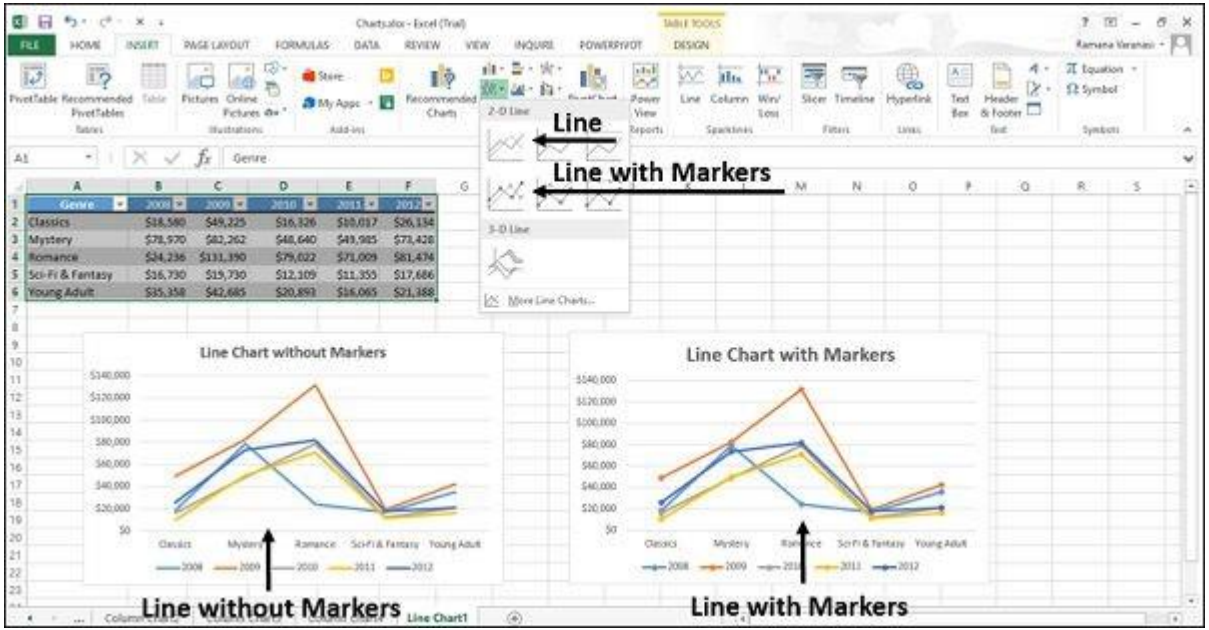
Line and Line with Markers



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You can use a Line chart without markers when −

- **The order of categories is important.**
- **There are many categories or if the values are approximate.**

You can use a Line chart with Markers when −

- **The order of categories is important.**
- **There are only a few categories.**

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Stacked Line and Stacked Line with Markers

Stacked Line charts indicate individual data values. Stacked Line Charts can show the trend of the contribution of each value over –

- **Time, or**
- **Evenly spaced Categories.**

Stacked Line charts can be with or without markers.

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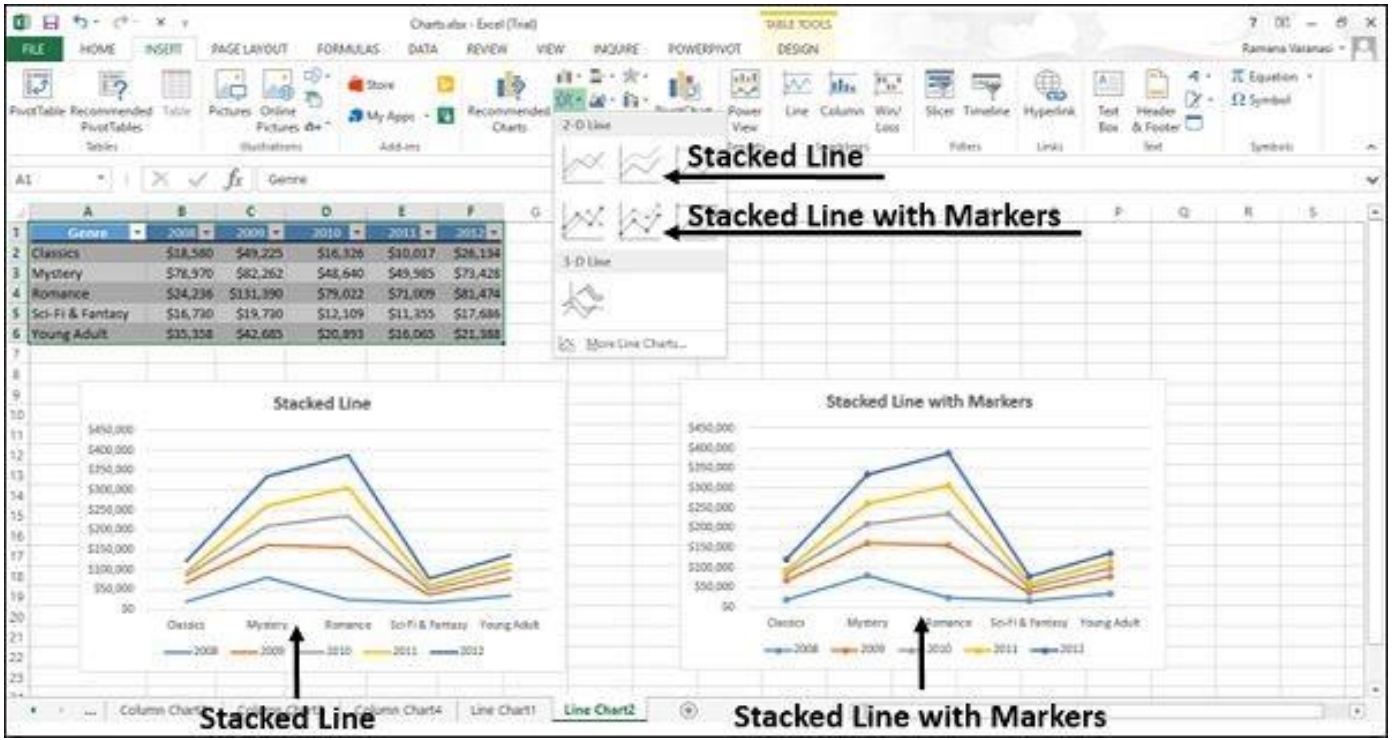
Stacked Line and Stacked Line with Markers



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Stacked Line and Stacked Line with Markers

You can use a stacked line chart without markers when there are many categories or if the values are approximate. You can use a stacked line chart with markers when there are only a few categories.

Reading Stacked Line charts can be difficult as −

- They sum the data, which might not be the result you want.
- It might not be easy to see that the lines are stacked.

To overcome the difficulties, you can use a Stacked Area chart instead.

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100% Stacked Line and 100% Stacked Line with Markers

100% Stacked Line charts indicate individual data values. 100% Stacked Line charts can show the trend of the percentage of each value over −

- Time, or
- Evenly spaced Categories

100% Stacked Line chart can be with or without Markers.

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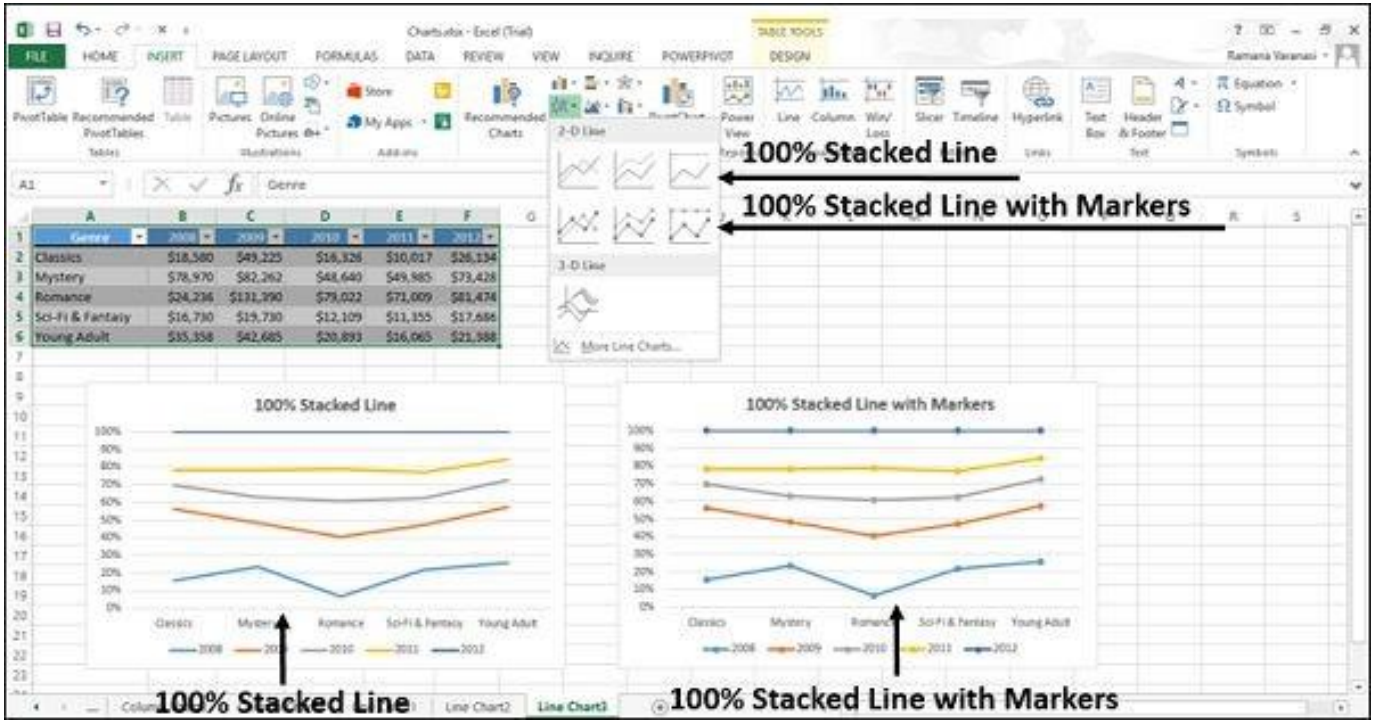

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3-D Line

D. Line charts show each row or column of data as a 3-D Ribbon. 3-D Line charts can show trends over –

- **Time (days, months, quarters or years), or**
- **Categories.**

A 3-D Line chart has horizontal, vertical, and depth axes that you can change. The third axis can show some lines in front of others.

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Pie Chart

Pie charts show the size of the items in one data series, proportional to the sum of the items. The data points in a Pie chart

are shown as a percentage of the whole Pie.

Follow the steps given below to insert a pie chart in your worksheet.

Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Select the data.

Step 3 − On the INSERT tab, in the Charts group, click the Pie chart icon on the Ribbon.

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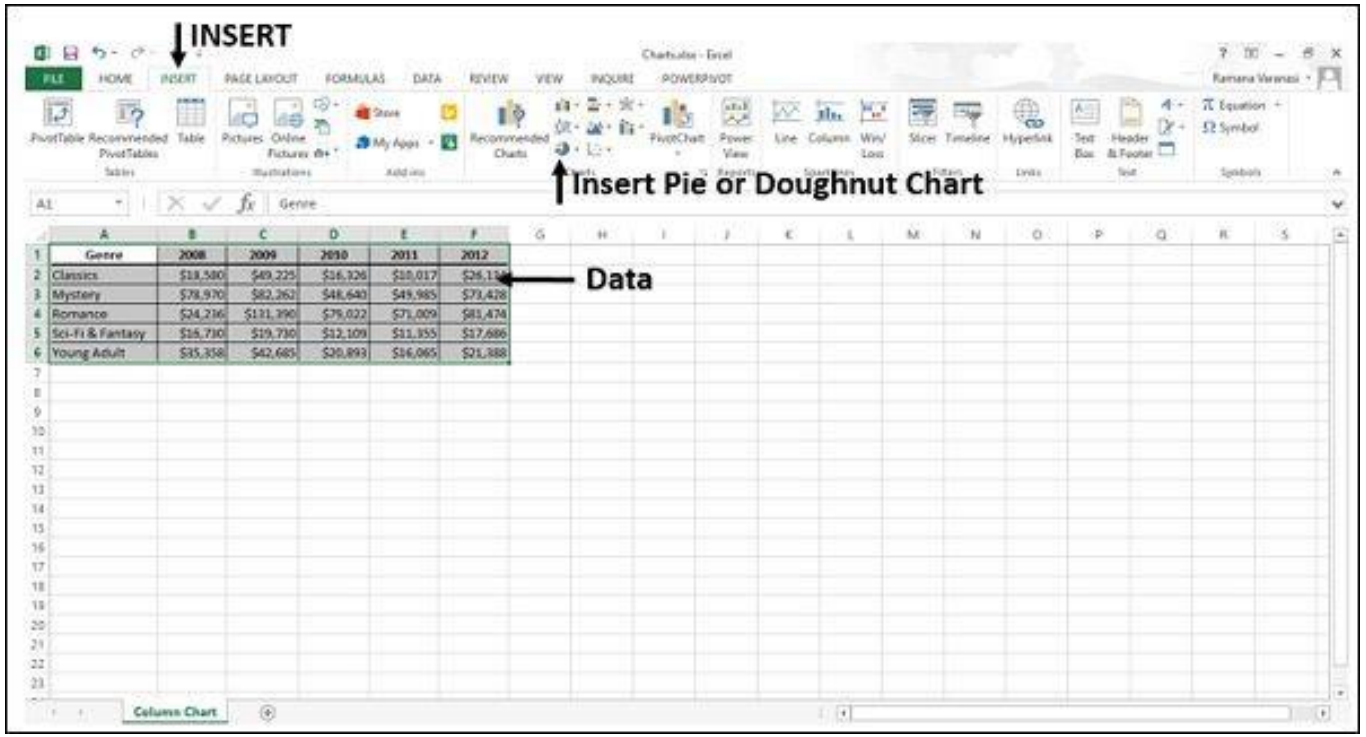

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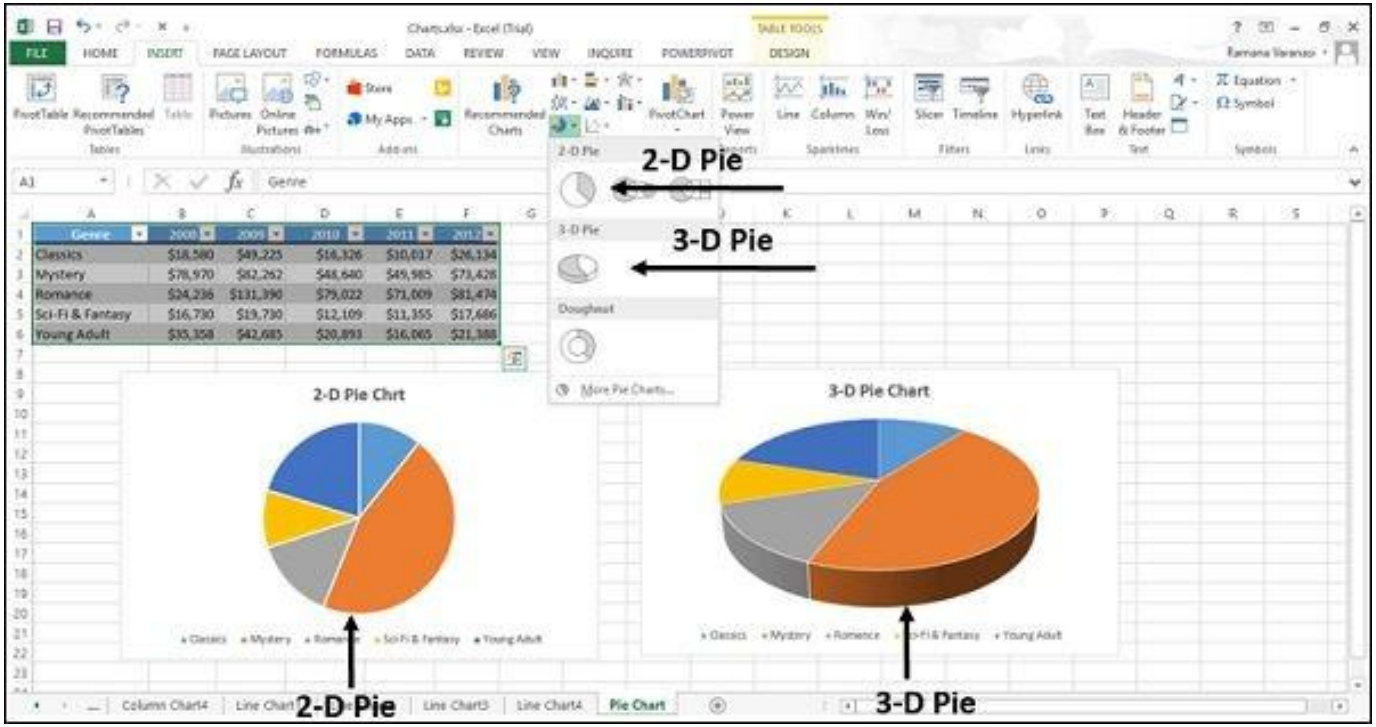

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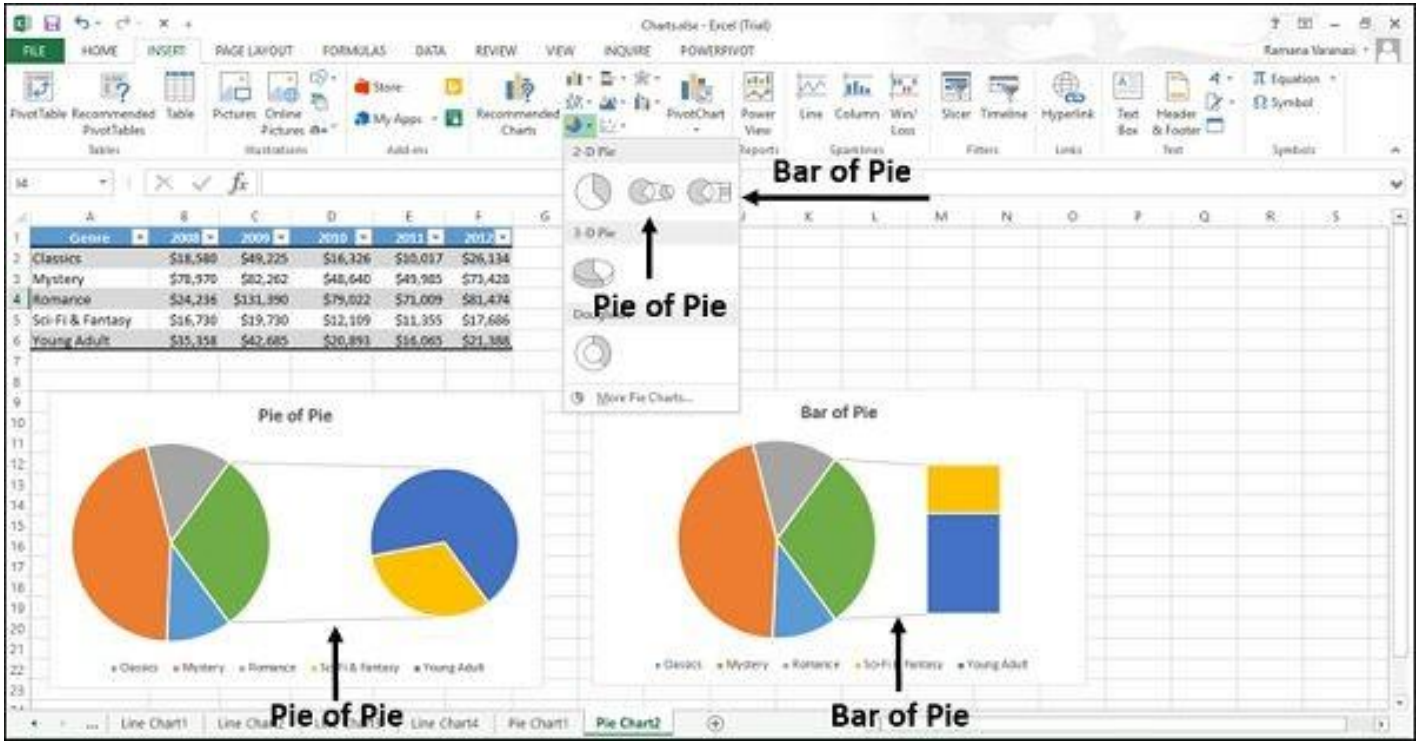
Pie of Pie or Bar of Pie charts show Pie charts with smaller values pulled out into a secondary Pie or Stacked Bar chart, which makes them easier to distinguish.



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Doughnut Chart

Doughnut charts show the size of items in a data series, proportional to the sum of the items. The doughnut chart is similar to a pie chart, but it can contain more than one data series.

Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Select the data.

Step 3 − On the INSERT tab, in the Charts group, click the Pie chart icon on the Ribbon. It is used to insert a Doughnut chart also.

Step 4 − Point your mouse on the Doughnut icon. A preview of that chart type will be shown on the worksheet.

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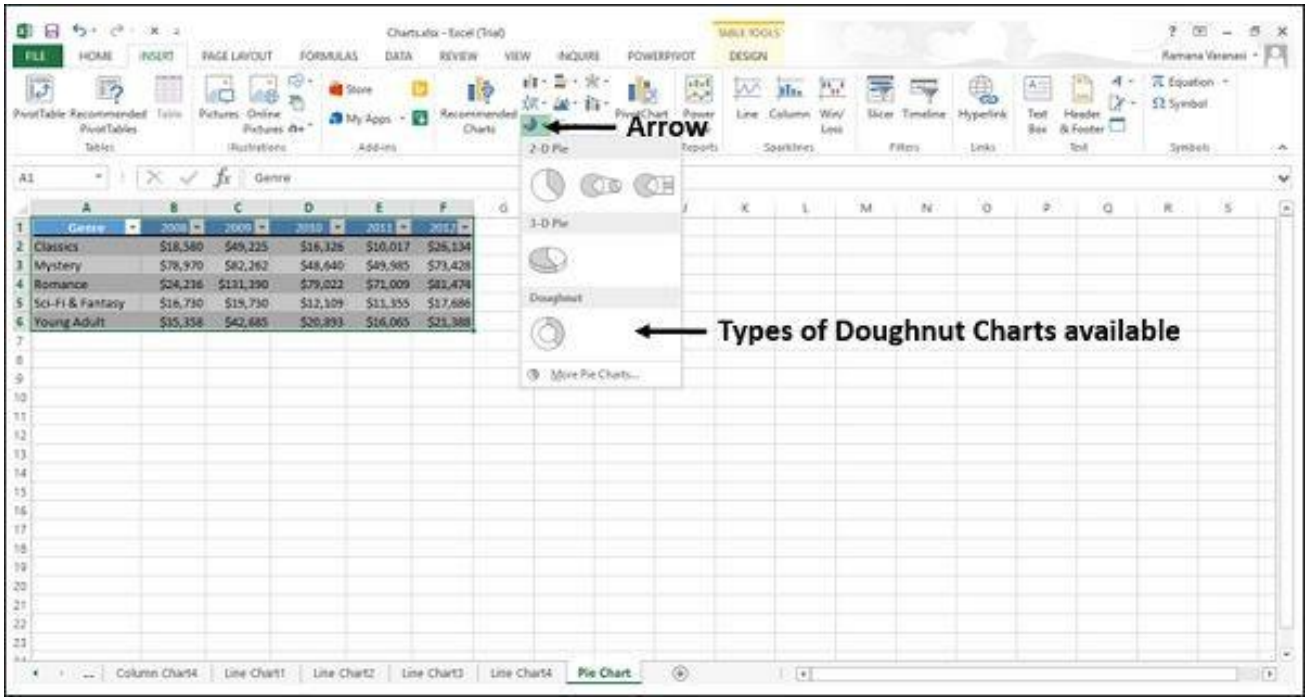
Doughnut charts



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Consider using a Doughnut chart when –

- **You have more than one data series.**
- **None of the values in your data are negative.**
- **Almost none of the values in your data series are zero values.**
- **You have no more than seven categories, all of which represent parts of the whole pie.**

- **Doughnut Charts show data in rings, where each ring represents a data series. If percentages are shown in data labels, each ring will total to 100%.**

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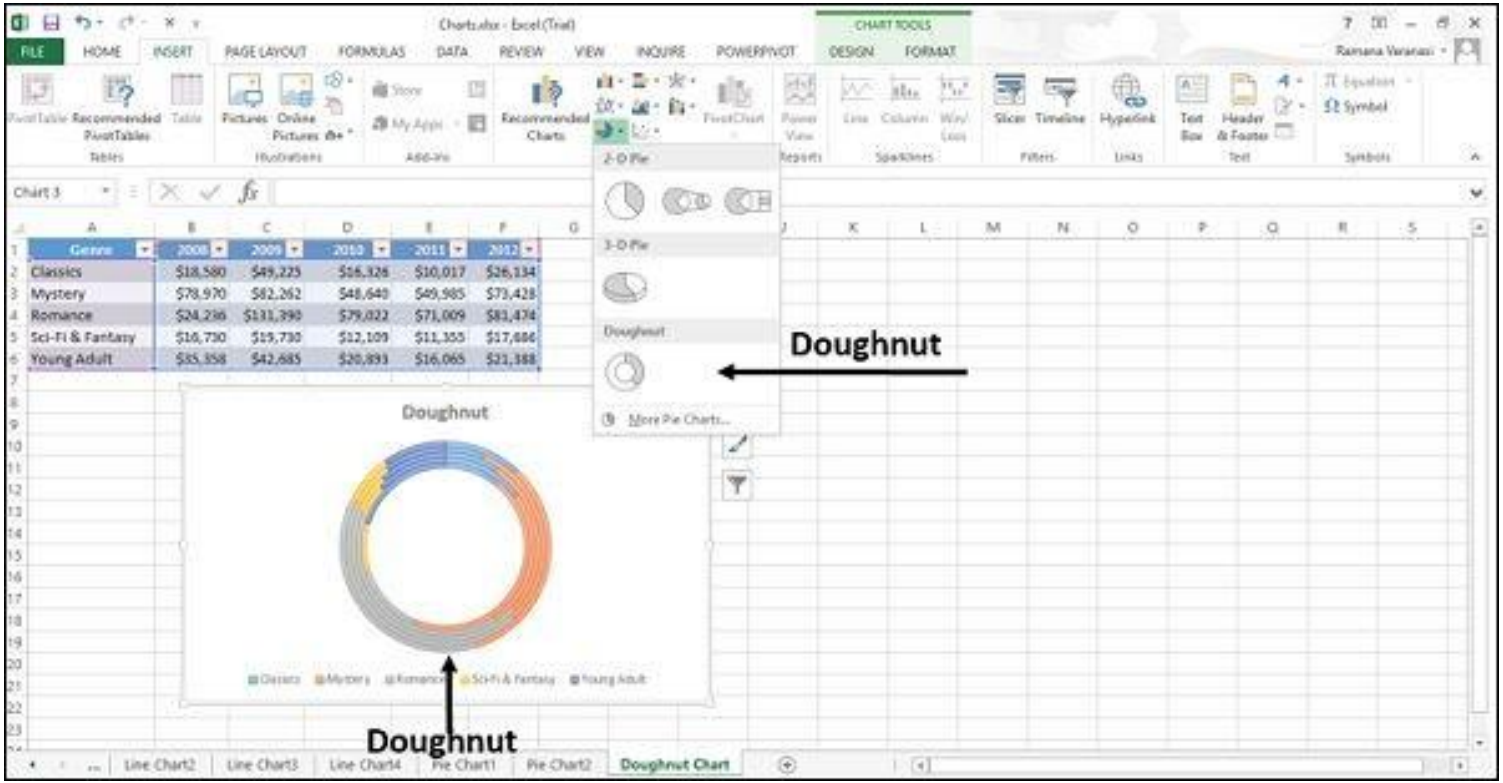

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Bar Chart

Bar charts illustrate the comparisons among individual items. A Bar chart typically displays categories along the vertical (category) axis and values along the horizontal (value) axis.

Follow the steps given below to use a Bar chart.

Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Select the data.

Step 3 − On the INSERT tab, in the Charts group, click the Bar chart icon on the Ribbon.

Step 4 − Point the mouse on each of the icons. A preview of that chart type will be shown on the worksheet.

Step 5 − Double-click the chart type that suits your data.

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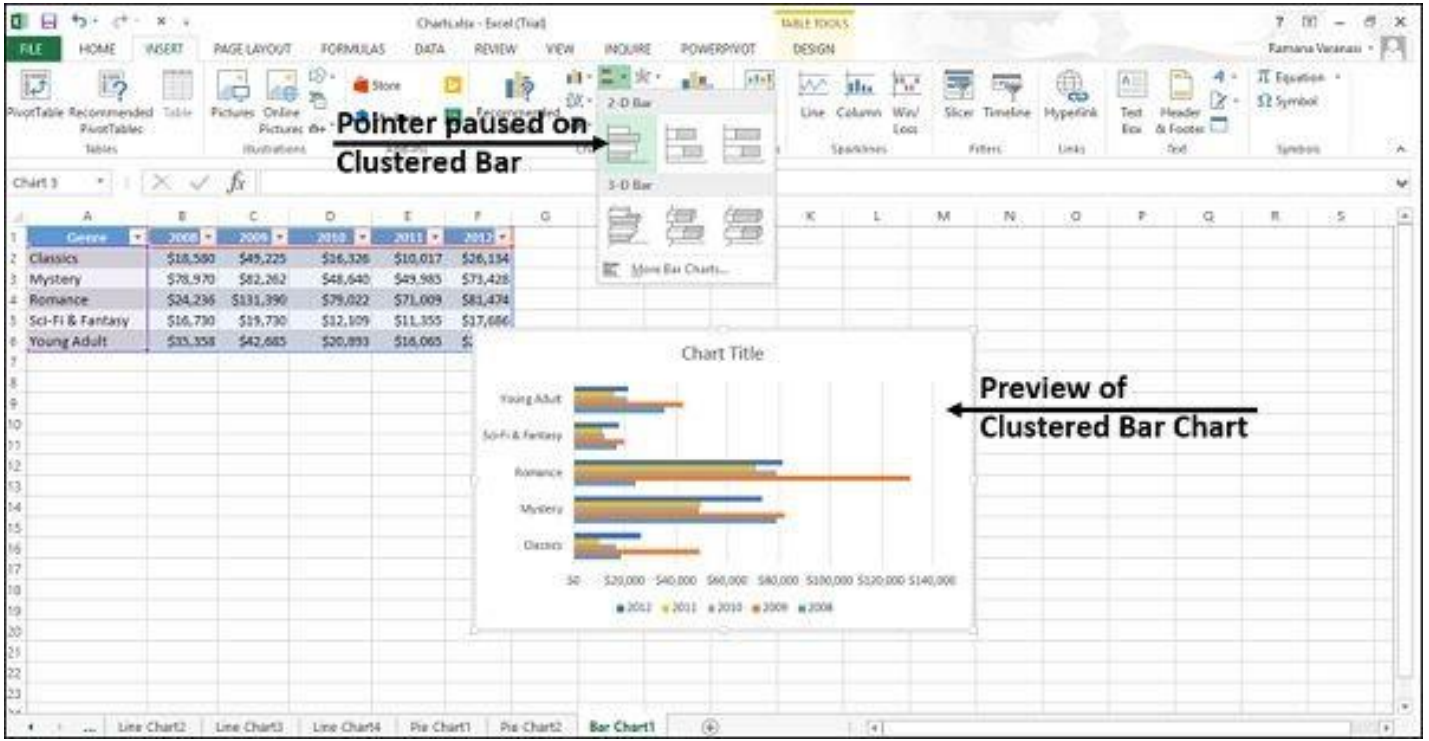

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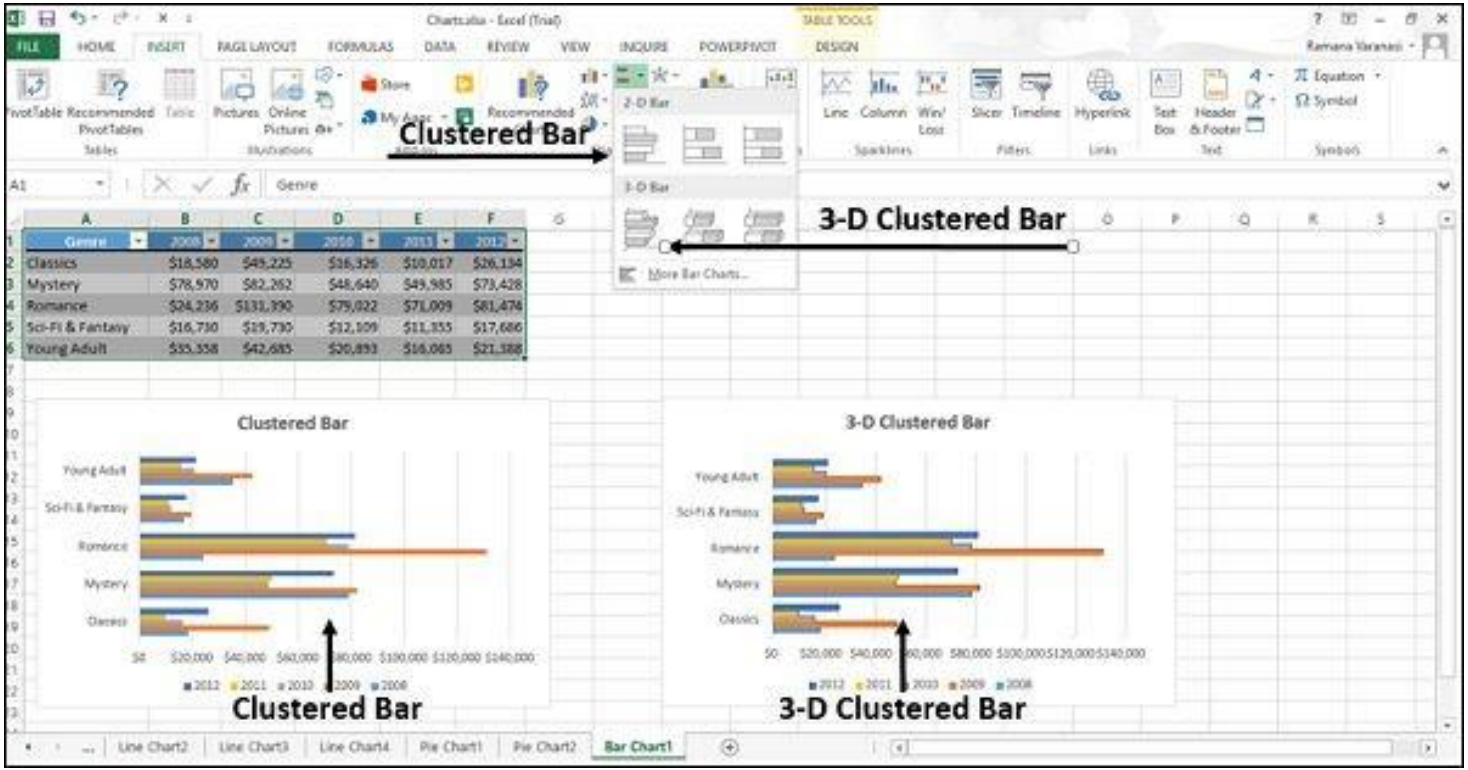
Clustered Bar and 3-D Clustered Bar



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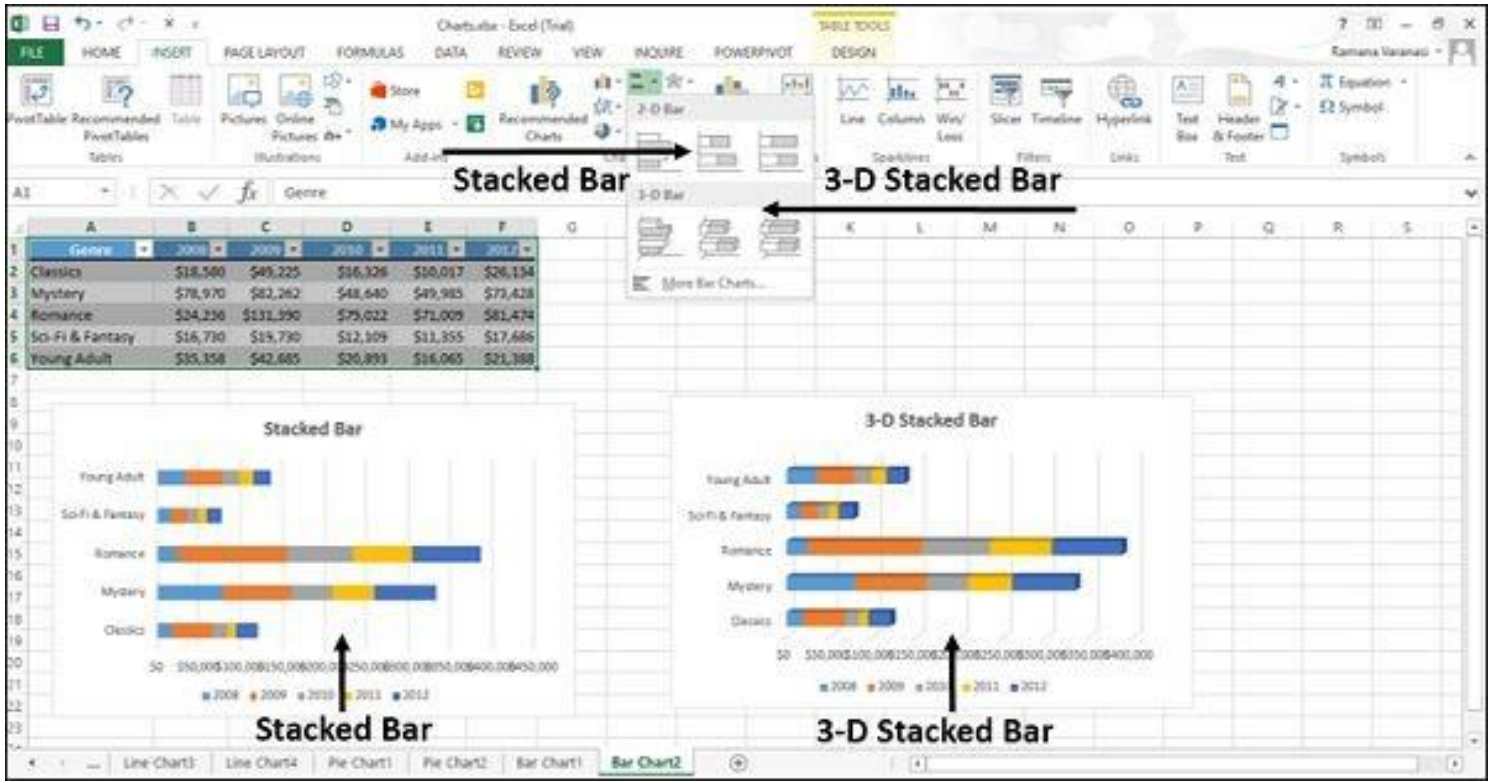
Stacked Bar and 3-D Stacked Bar



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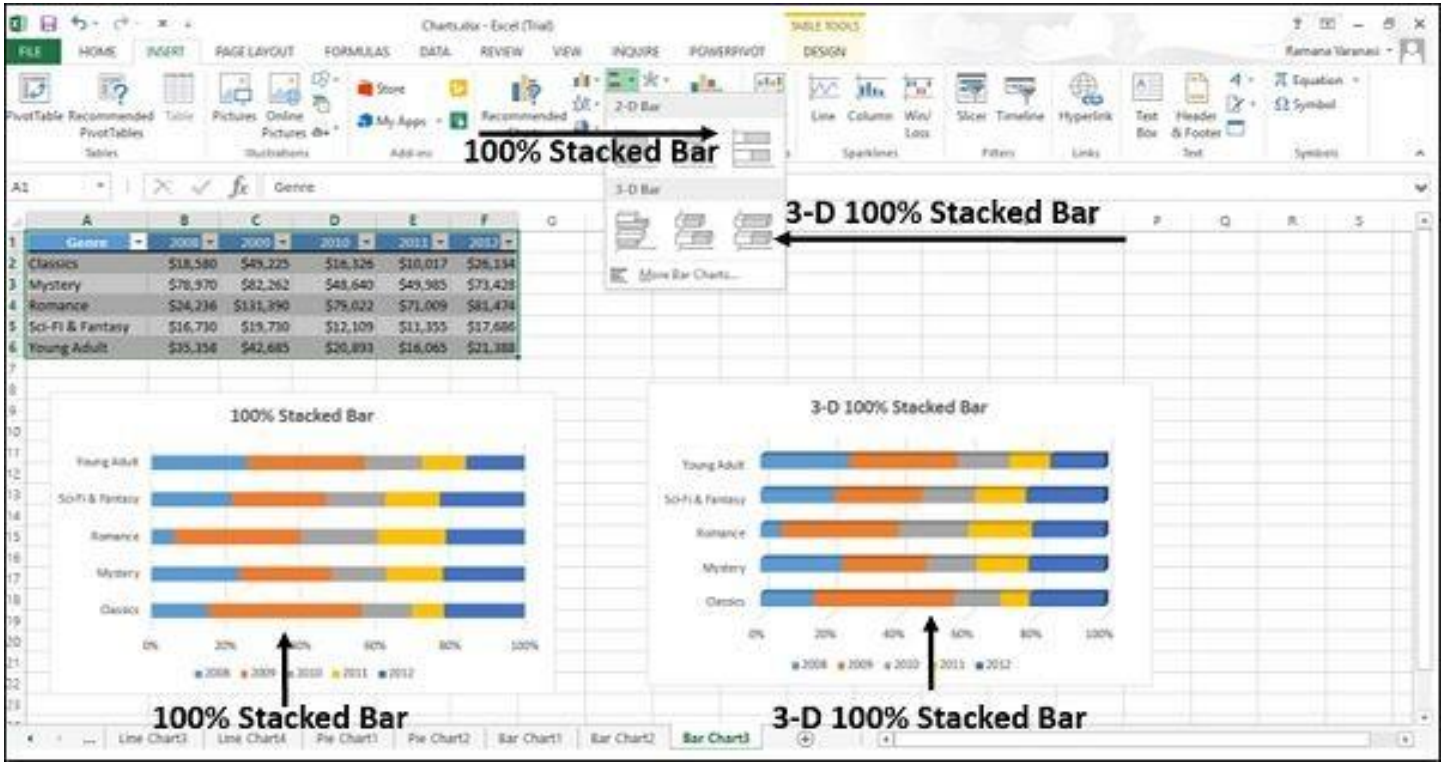
100% Stacked Bar and 3-D 100% Stacked Bar



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Area Chart

rea charts can be used to plot change over time (years, months and days) or categories and draw attention to the total value across a trend. By showing the sum of the plotted values, an Area chart also shows the relationship of parts to a whole.

You can use Area charts to highlight the magnitude of change over time.

Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Select the data.

Step 3 − On the INSERT tab, in the Charts group, click the Area chart icon on the Ribbon.

Step 4 − Point your mouse on each of the icons. A preview of that chart type will be shown on the worksheet.

Step 5 − Double-Click the chart type that suits your data. In this chapter, you will understand when each of the Area Chart Types is useful.

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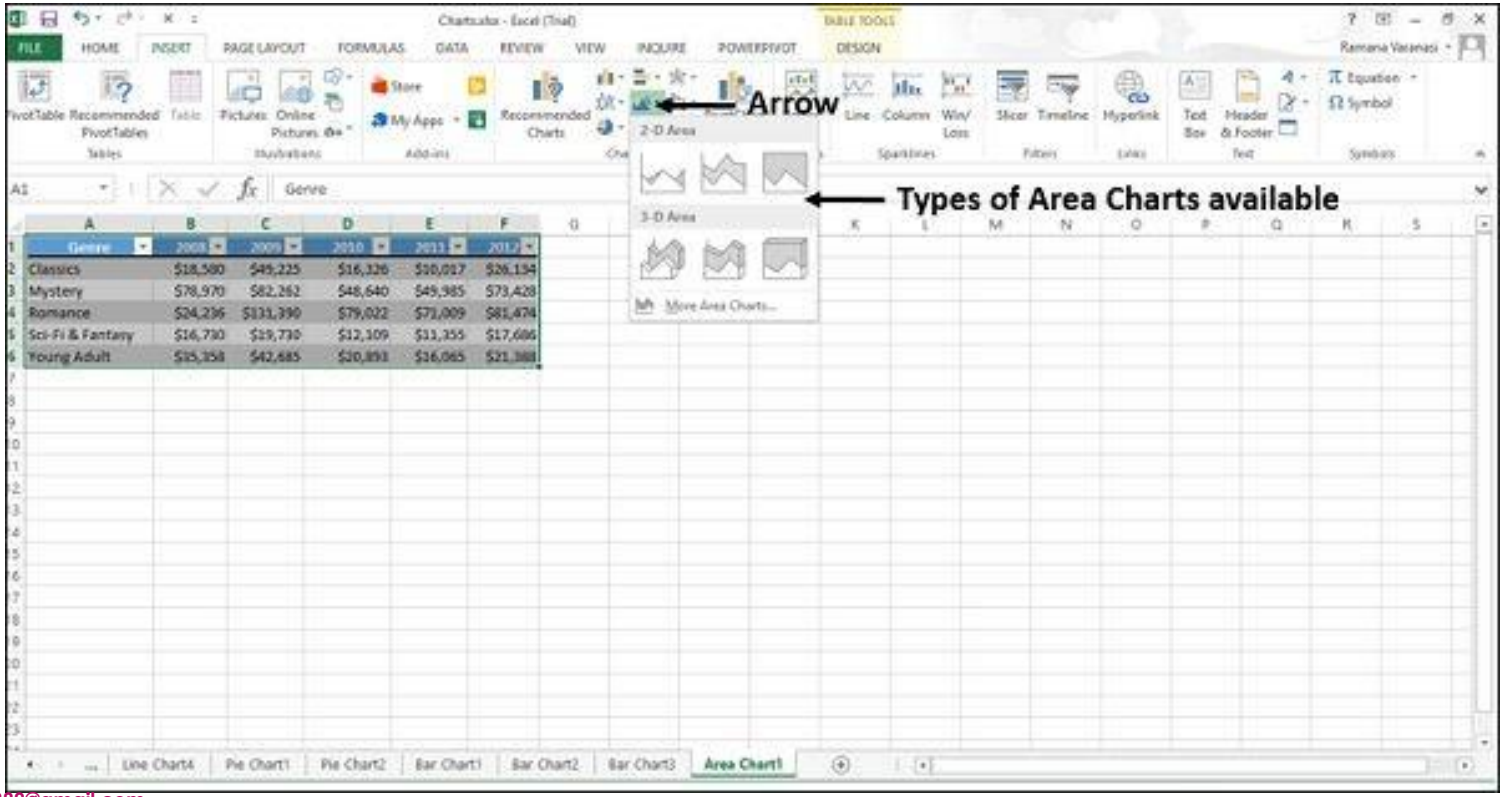

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These chart types are useful to show the trend of values over time or other category data.

An Area chart shows the values in 2-D format. A 3-D Area chart shows values in 3-D format. 3-D Area charts use three axes (horizontal, vertical, and depth) that you can change.

ou can use Area charts –

- When the category order is important.
- To highlight the magnitude of change over time.

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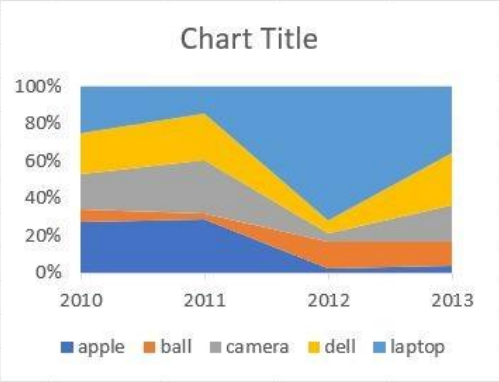
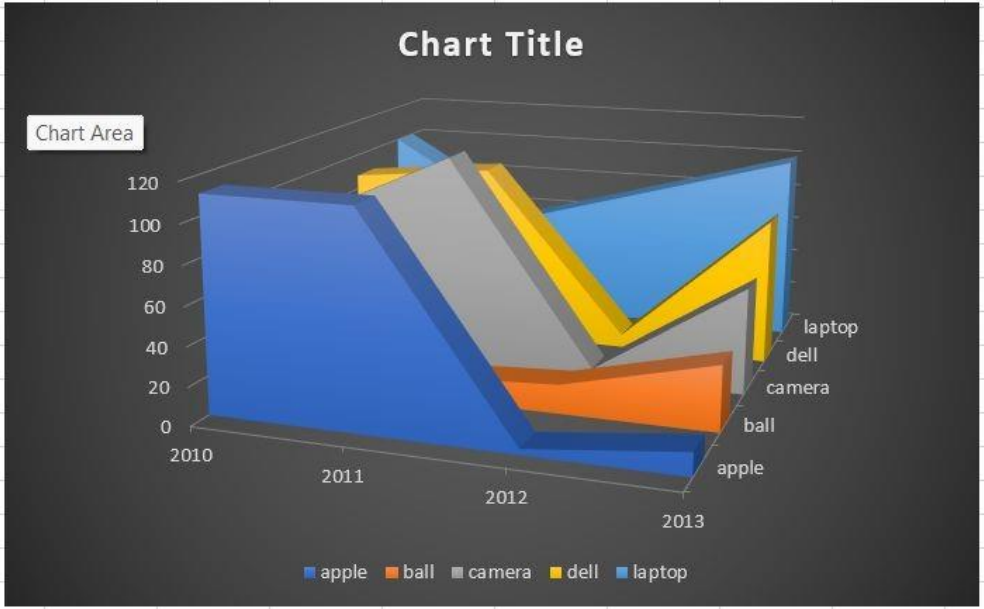
mera	77	113	5	56
ll	88	96	7	78
top	100	56	78	100





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Excel Charts - Scatter (X Y) Chart

Scatter (X Y) charts are typically used for showing and comparing numeric values, like scientific, statistical, and engineering data.

A Scatter Chart has two value axes –

- **Horizontal (x) value axis**
- **Vertical (y) value axis**

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It combines x and y values into single data points and shows them in irregular intervals, or clusters.

Consider using a Scatter chart when –

- You want to change the scale of the horizontal axis.
- You want to make that axis a logarithmic scale.
- Values for horizontal axis are not evenly spaced.
- There are many data points on the horizontal axis.
- You want to adjust the independent axis scales of a scatter chart to reveal more information about the data that includes pairs or grouped sets of values.
- You want to show similarities between large sets of data instead of the differences between the data points.
- You want to compare many data points regardless of the time.
    - The more data that you include in a Scatter chart, the better the comparisons.

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Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Place the x values in one row or column, and then enter the corresponding y values in the adjacent rows or columns.

Step 3 − Select the data.

Step 4 − On the INSERT tab, in the Charts group, click the Scatter chart icon on the Ribbon.

You will see the different types of available Scatter charts.

A Scatter chart has the following sub-types −

- **Scatter**
- **Scatter with Smooth Lines and Markers**
- **Scatter with Smooth Lines**
- **Scatter with Straight Lines and Markers**
- **Scatter with Straight Lines**

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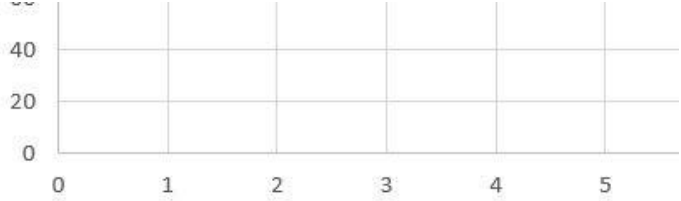

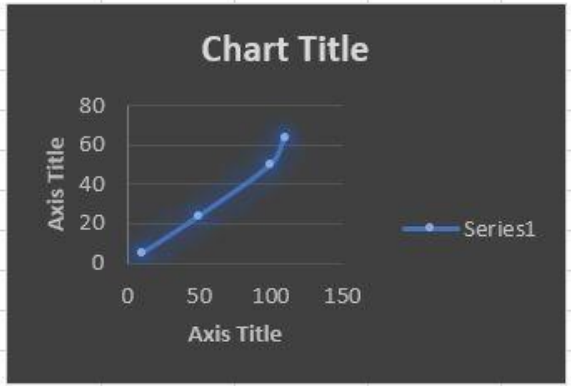

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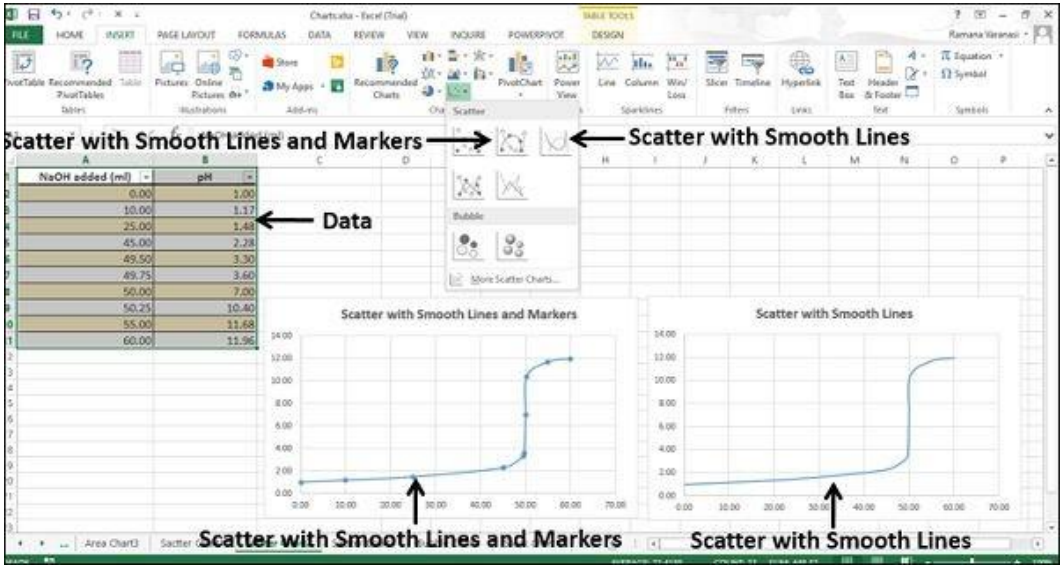
Types of Scatter Charts

The following section explains the different options available to display a Scatter chart.

Scatter with smooth lines and markers and scatter with smooth lines.

Scatter with Smooth Lines and Markers and Scatter with Smooth Lines display a smooth curve that connects the data points. Scatter with Smooth Lines and Markers and Scatter with Smooth Lines are useful to compare at least two sets of values or pairs of data.



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Use Scatter with Smooth Lines and Markers and Scatter with Smooth Lines charts when the data represents a set of x, y pairs based on a formula.

- **Use Scatter with Smooth Lines and Markers when there are a few data points.**
- **Use Scatter with Smooth Lines when there are many data points.**

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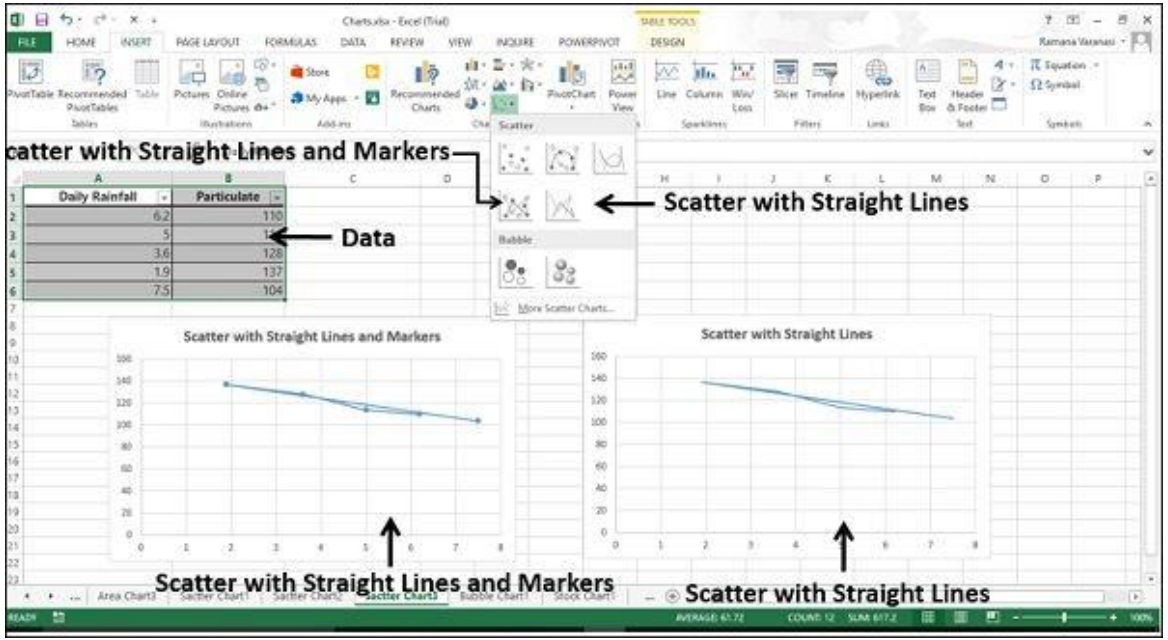
Scatter with Straight Lines and Markers and Scatter with Straight Lines

Scatter with Straight Lines and Markers and Scatter with Straight Lines connects the data points with straight lines. Scatter with Straight Lines and Markers and Scatter with Straight Lines are useful to compare at least two sets of values or pairs of data.



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Use Scatter with Straight Lines and Markers and Scatter with Straight Lines charts when the data represents separate measurements.

- **Use Scatter with Straight Lines and Markers when there are a few data points.**
- **Use Scatter with Straight Lines when there are many data points.**

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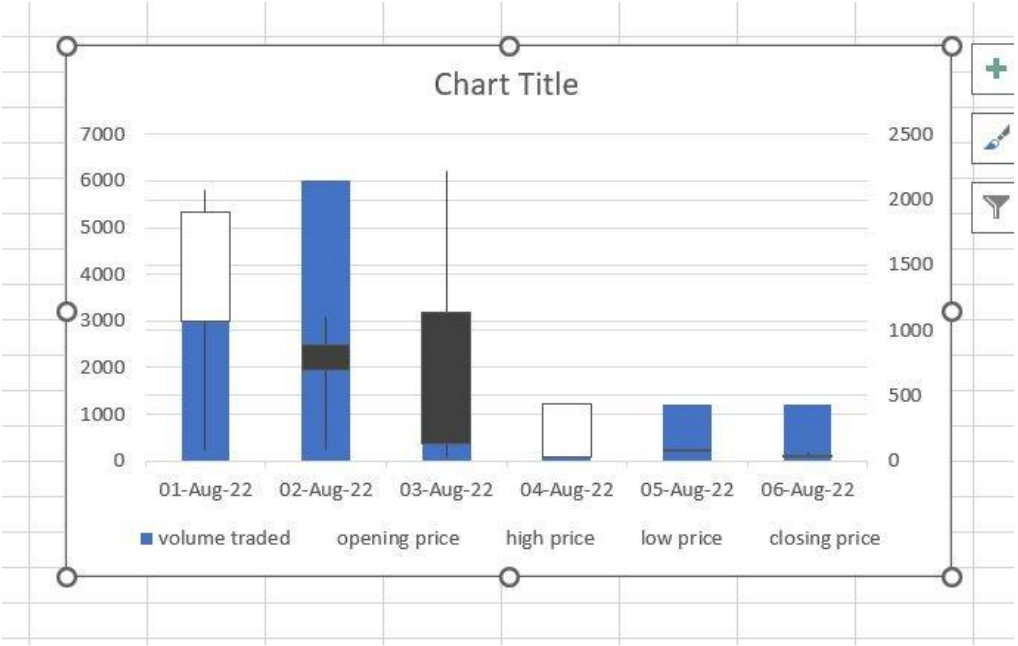
A Stock chart has the following sub-types –

- **High-Low-Close**
- **Open-High-Low-Close**
- **Volume-High-Low-Close**
- **Volume-Open-High-Low-Close**



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Surface Chart

Surface charts are useful when you want to find the optimum combinations between two sets of data. As in a topographic map, the colors and patterns indicate the areas that are in the same range of values.

To create a Surface chart, ensure that both the categories and the data series are numeric values.

Step 1 − Arrange the data in columns or rows on the worksheet.

Step 2 − Select the data.

Step 3 − On the INSERT tab, in the Charts group, click the Stock, Surface or Radar Chart icon on the Ribbon.

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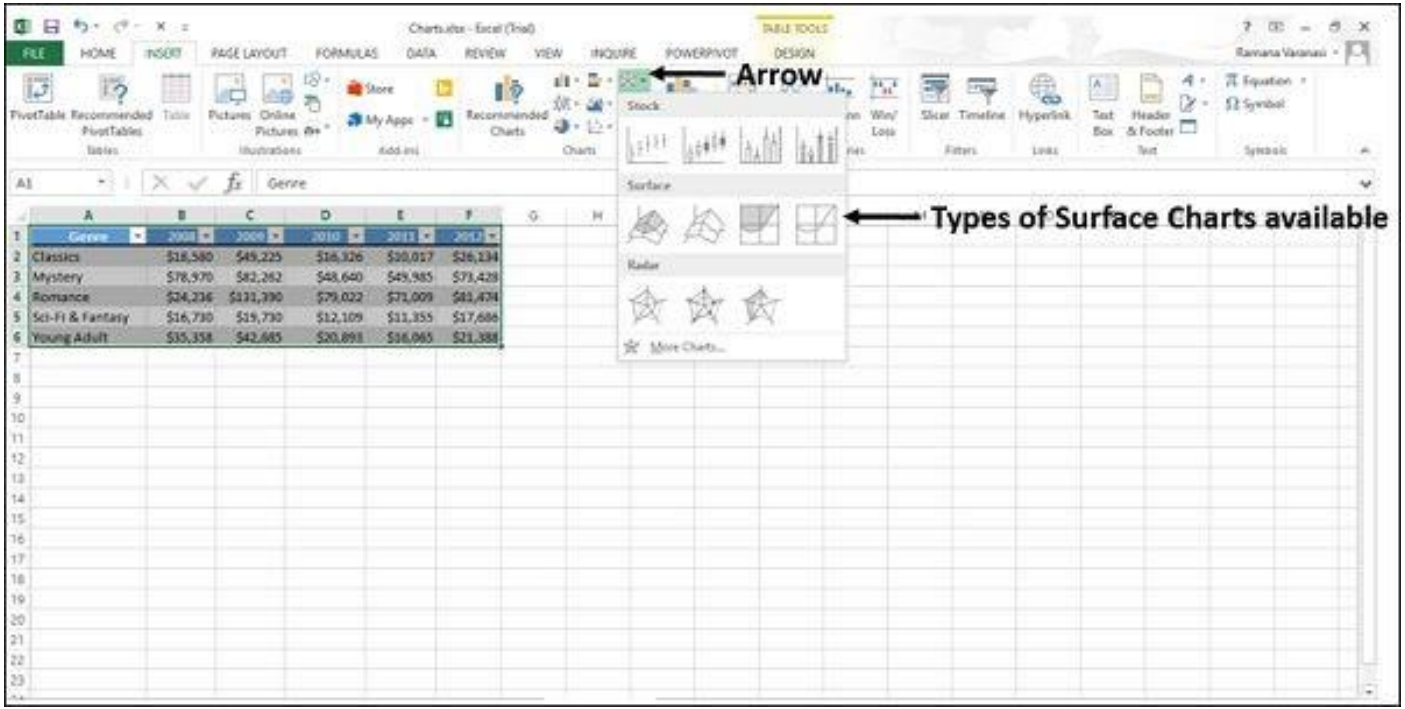

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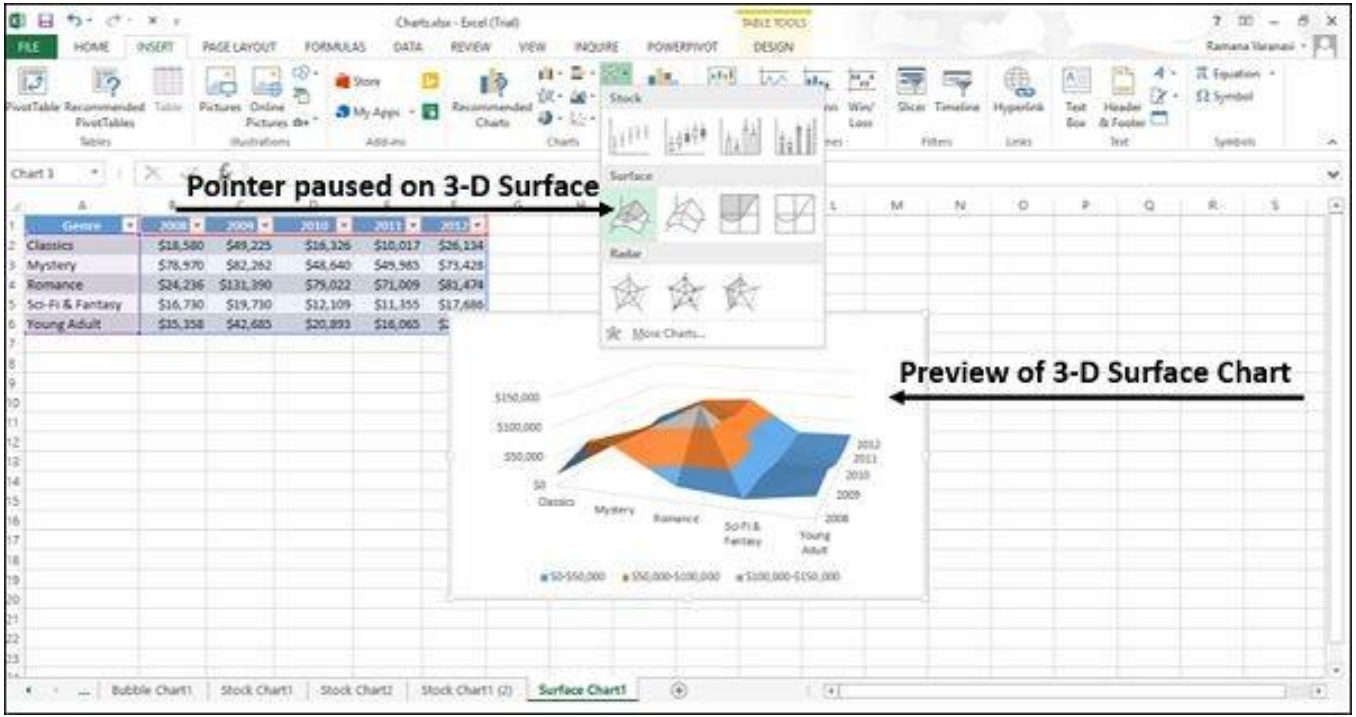

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RADAR

Radar charts compare the aggregate values of several data series.

To insert a Radar chart in your worksheet, follow the steps given below.

A Radar chart has the following sub-types −

- **Radar**
- **Radar with Markers**
- **Filled Radar**

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Sparklines

Sparklines are tiny charts placed in single cells, each representing a row of data in your selection. They provide a quick way to see trends.

Sparklines have the following types −

- **Line Sparkline**
- **Column Sparkline**
- **Win/Loss Sparkline**

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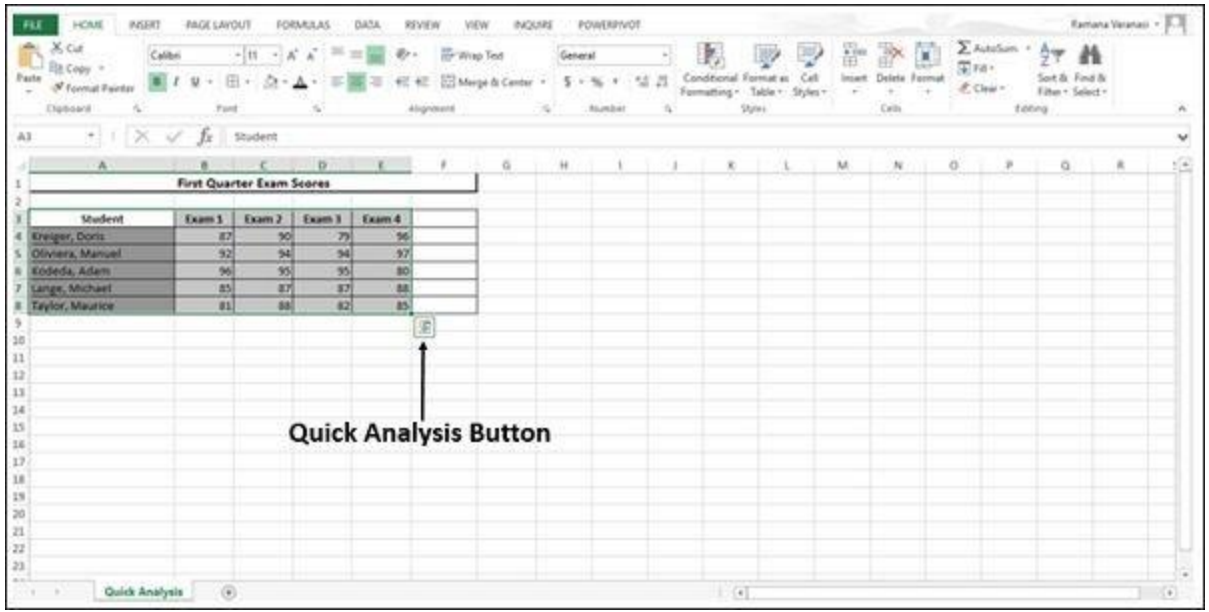

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