

# CSE 2027-Fundamental of Data Analysis

## **Module: 4: Data Visualization and Charting**

Types of charts and their significance, Organize data interactively with tables , Visualizing data with charts, Analyzing data with pivot tables, Build presentation ready dashboards and turn real world data into business insights, Tracking trends and making forecasts, Interpretation and report writing.



# Introduction to Excel Data Visualization

- Excel is widely used for data analysis owing to the excellent data visualization features that it offers. The data visualization capability of Excel allows building insightful visualizations.



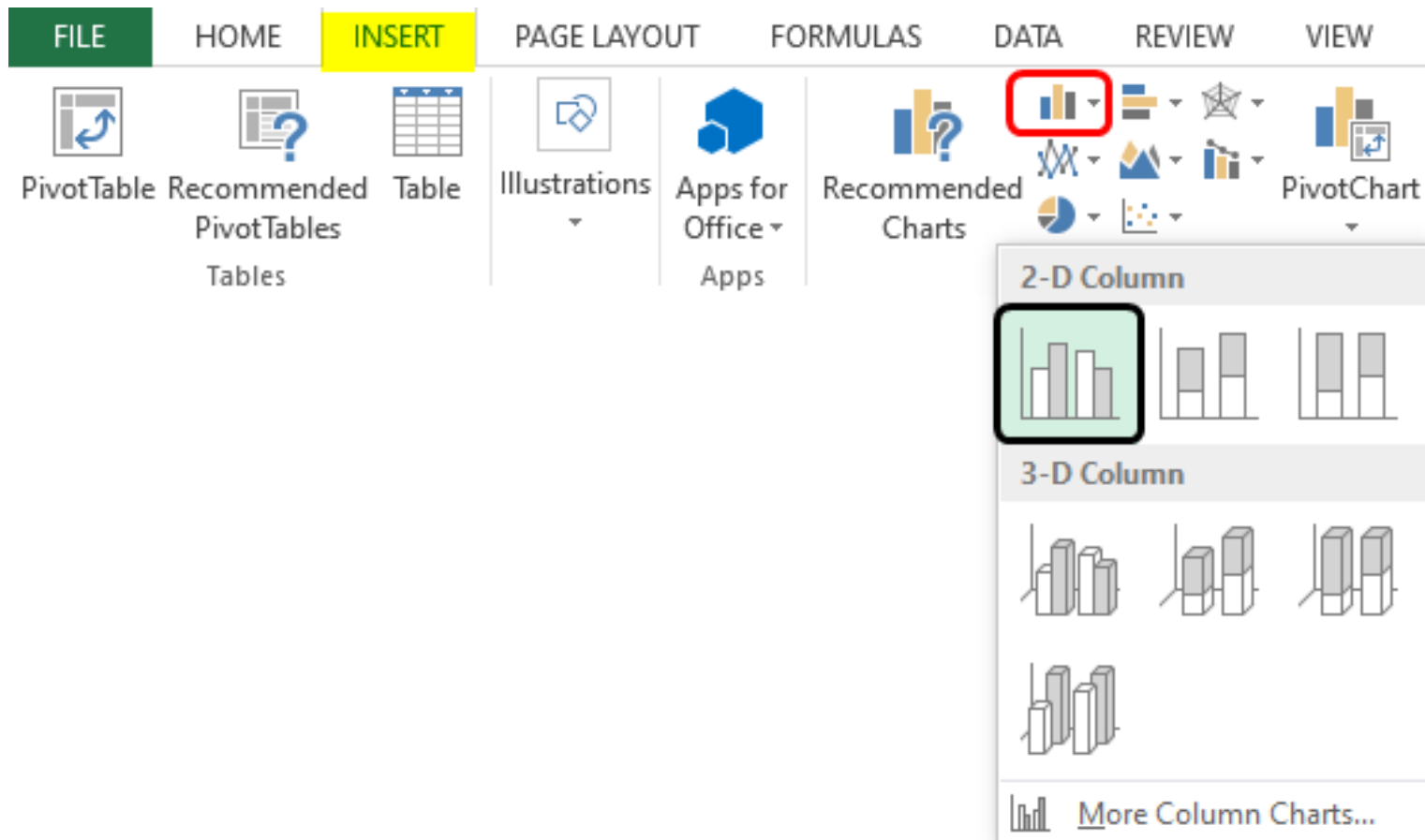
# Various Types of Visualizations in Excel

Every chart in Excel has its own significance. Excel provides a good number of built-in charts, which can be beautifully leveraged so as to make the right use of data.

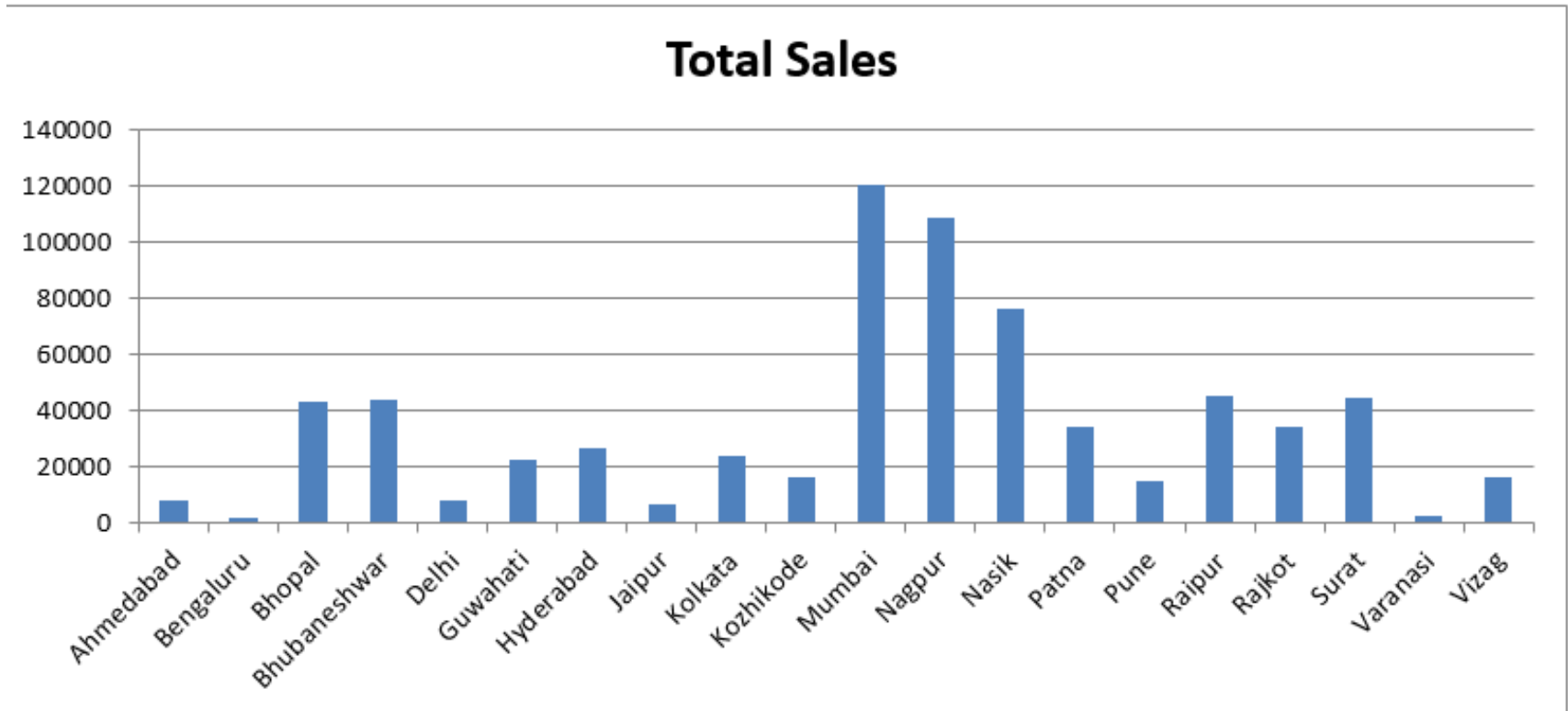


- **1. Column Chart**

It is a very simple chart type that presents data in the form of vertical bars. First, to build a column chart, select the data, and then select the required option from the Column chart option, as can be seen below. As we can see, various options are there in the Column chart, and the requisite one should be selected.

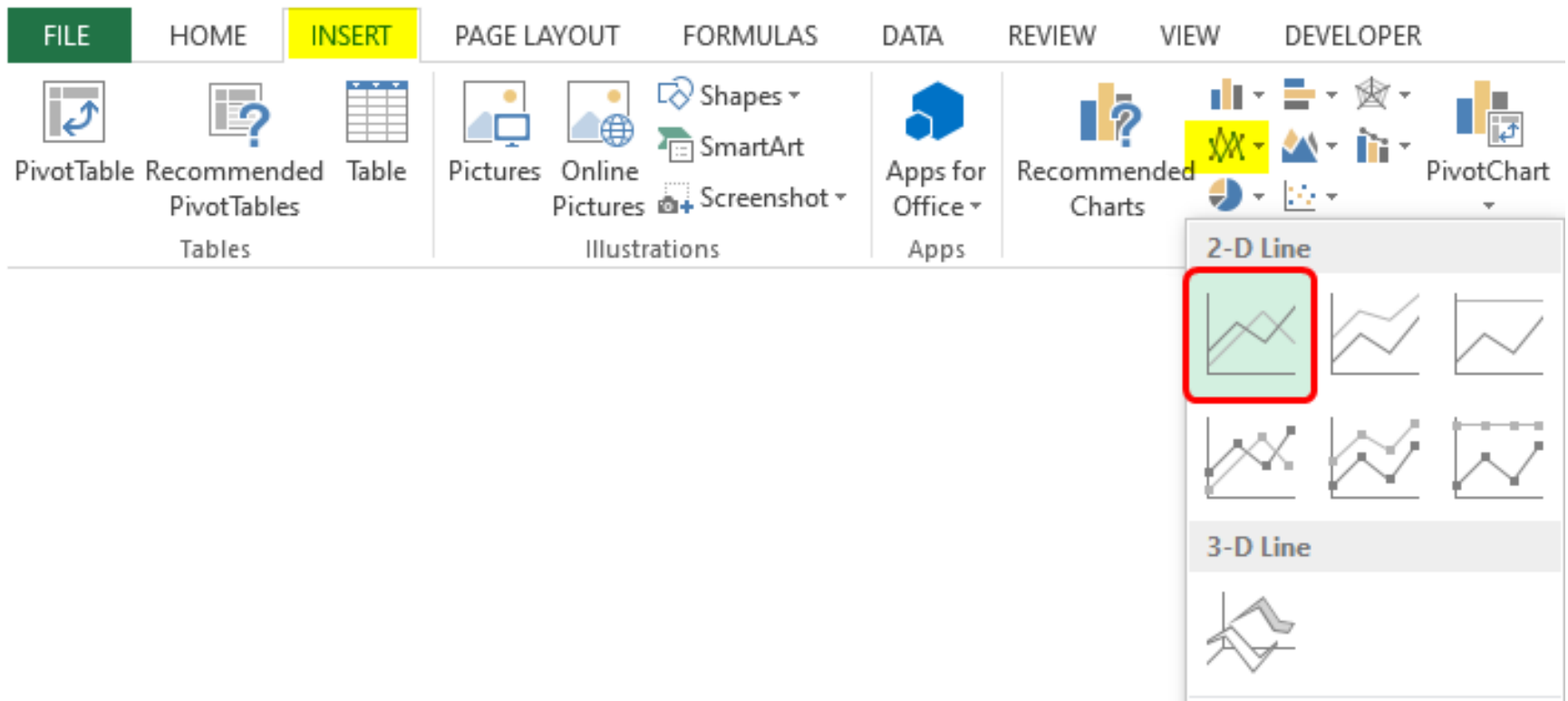


When we follow the above procedure, a column chart is created, as shown in the below screenshot. It is a very simple column chart that gives us region-wise total sales. The chart can be formatted as needed.



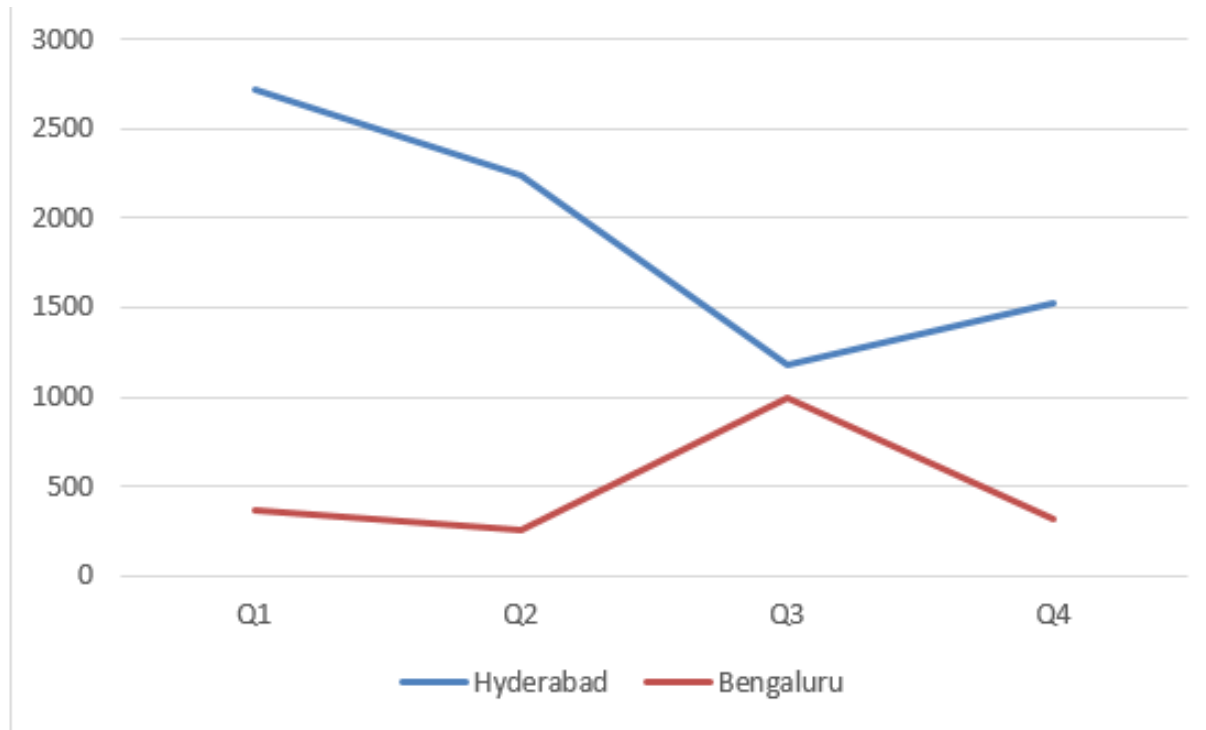
## 2. Line Chart

- This chart is useful for observing trends. E.g. in this case, we have quarter wise data for two cities, and we shall compare the sales trend over the quarters for these two cities. First, to build a line chart, select the data, and then select the requisite line chart option as shown below.



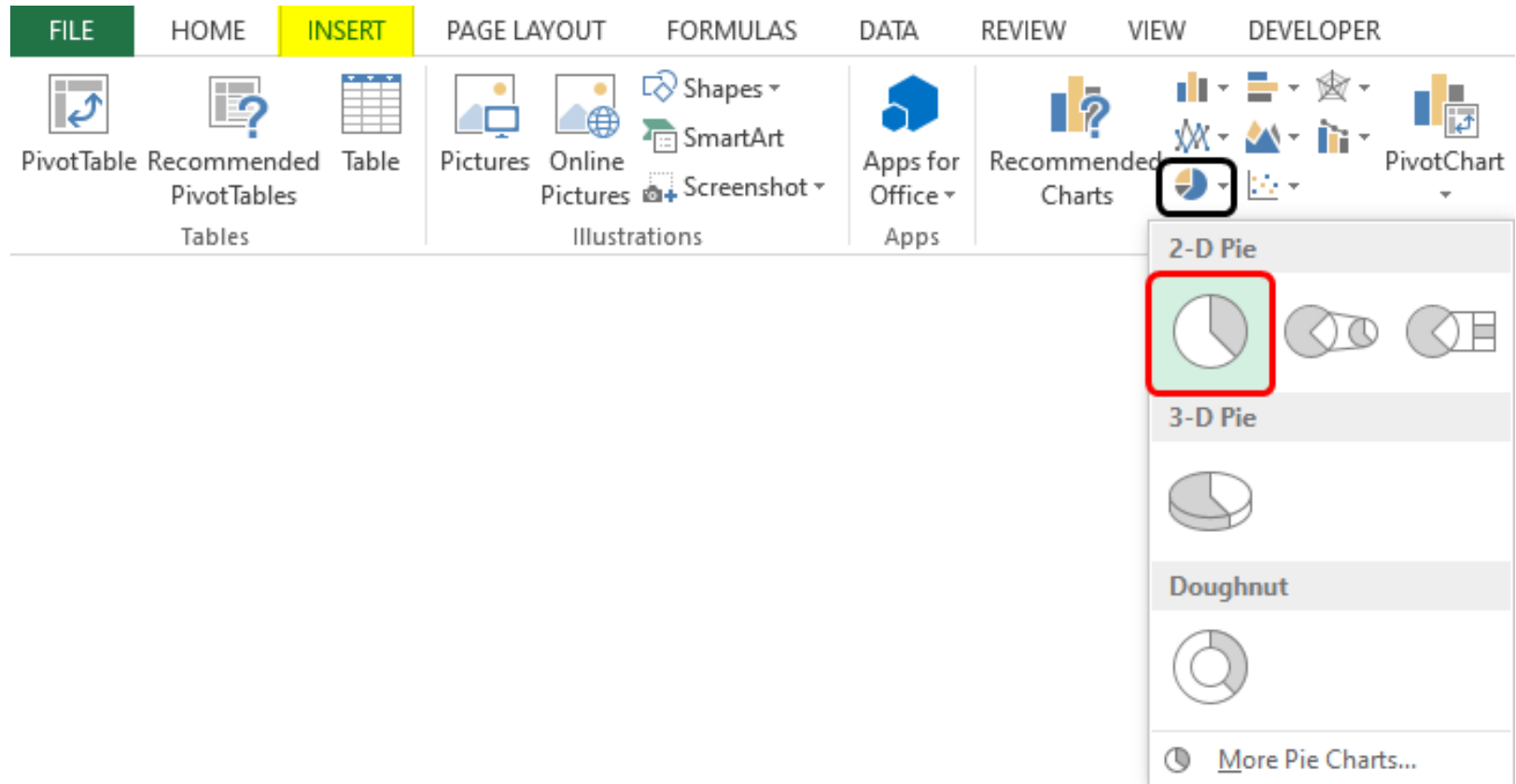


- Following the above procedure leads to the creation of a line chart, as shown below:

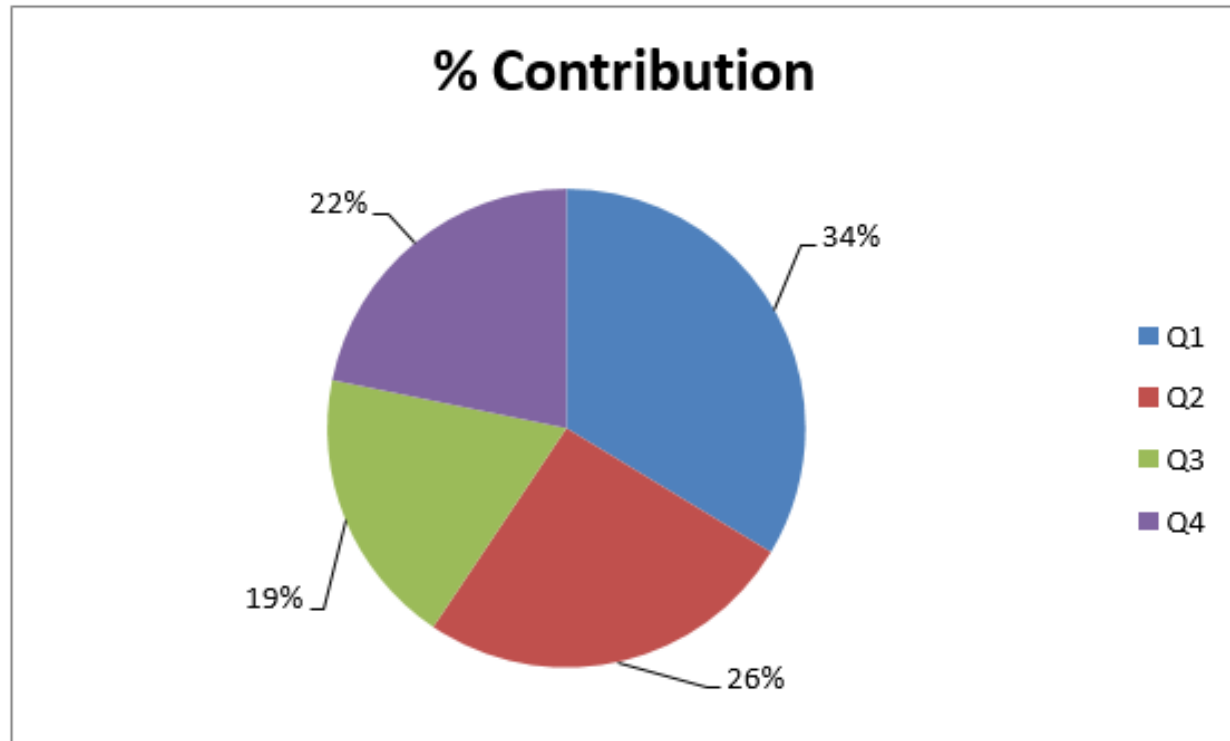


# 3. Pie Chart

- Pie Chart gives the contribution of a category, e.g., we shall build a pie chart to determine each quarter's percentage contribution in total sales. To create a pie chart, select the requisite columns, and click on the required pie chart option from the Pie option as shown below.



- As a result of following the above procedure, a pie chart is created, which can be seen below. The pie chart gives us a quick insight into the percentage contribution.



# 4. Bar Chart

- This chart type is no different than a column chart, only that here we have horizontal bars. In order to build a horizontal bar, select the requisite bar chart option from the Bar option as shown in the following screenshot.

FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER

PivotTable Recommended Table  
Tables

Pictures Online Pictures Illustrations

Shapes  
SmartArt  
Screenshot

Apps for Office  
Apps

Recommended Charts

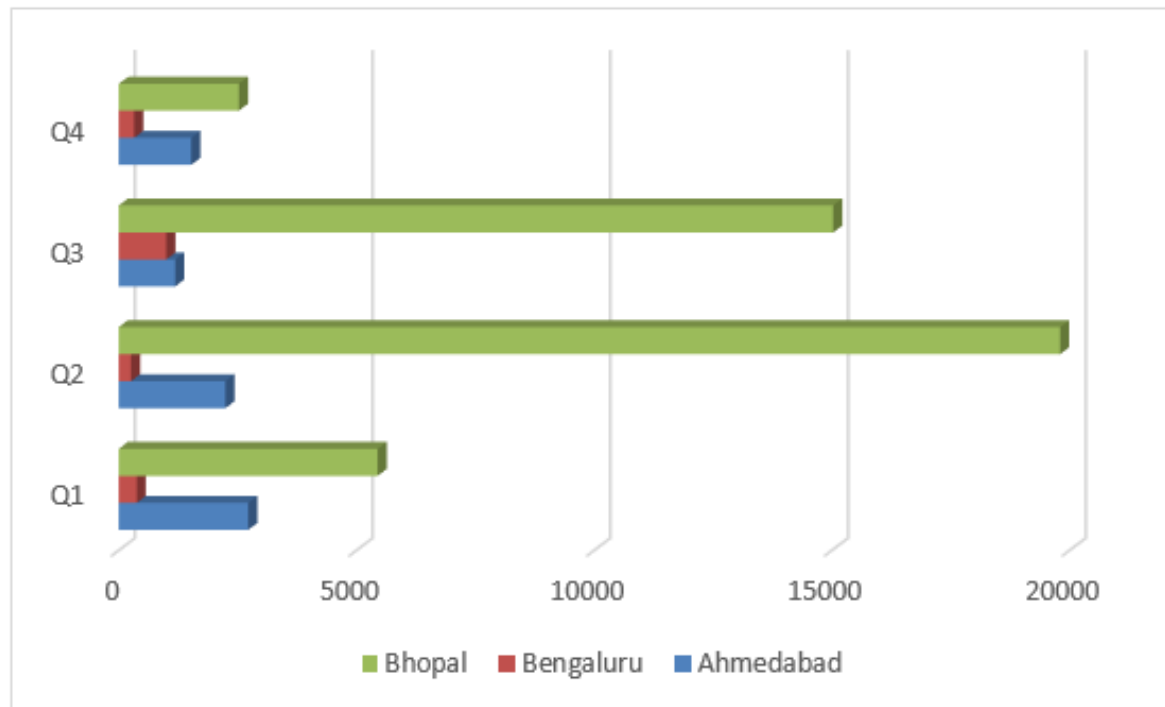
PivotChart

2-D Bar

3-D Bar

More Bar Charts...

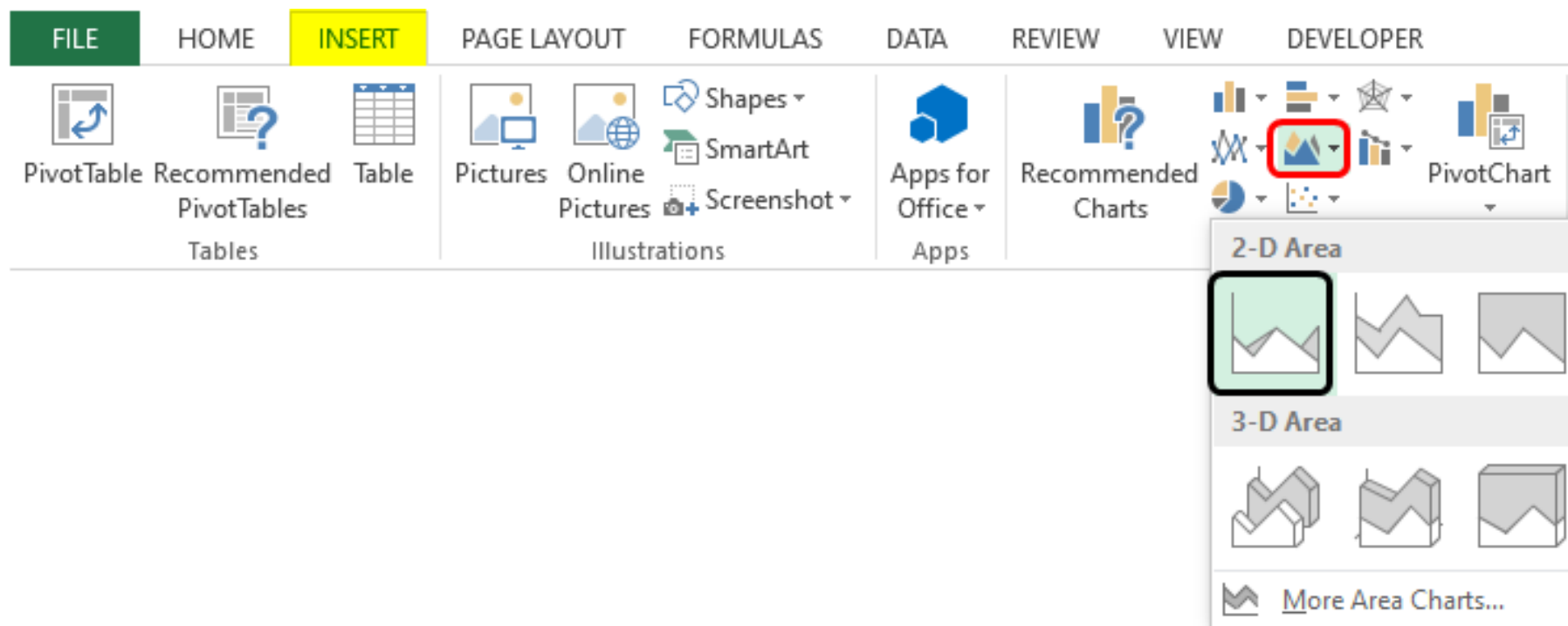
- As we can see in the above screenshot, we selected clustered bar in 3-D, which gave us a clustered 3-D bar graph, as shown in the following screenshot. Using this visualization, we can compare sales for three cities for four quarters.



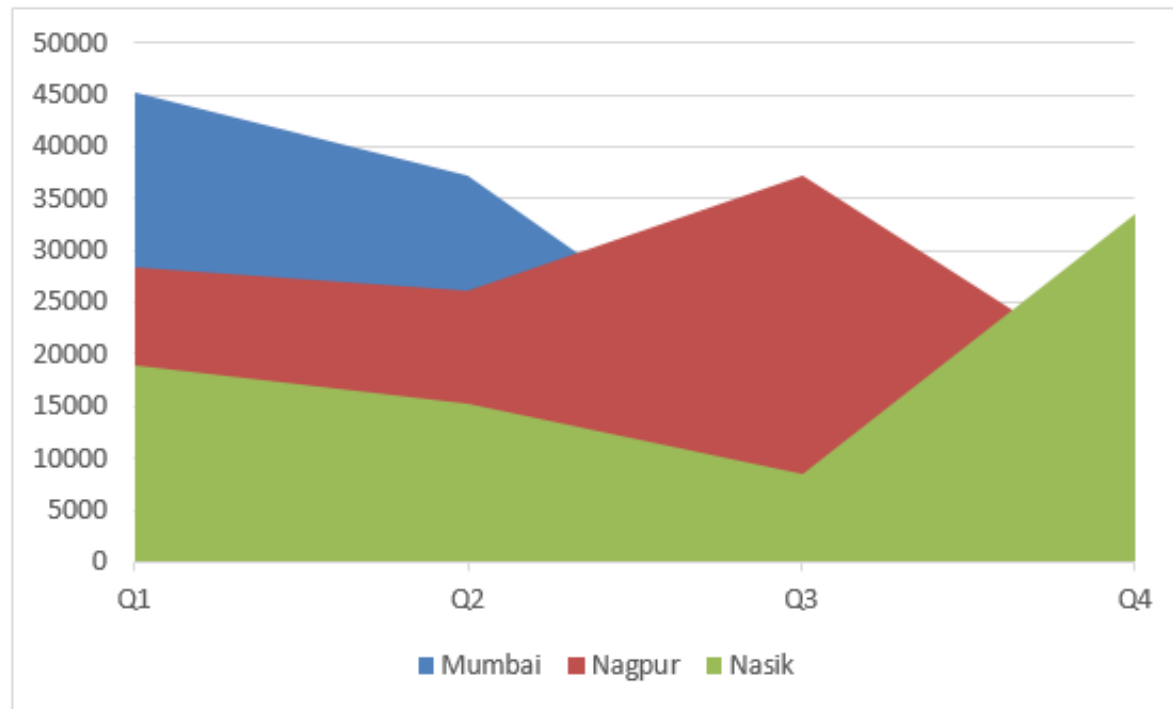
# 5. Area Chart

- This chart represents the trend of a measure for various categories over a period of time. The chart makes use of areas to present the data. In order to generate an area chart, we shall follow the steps as mentioned in the below screenshot.



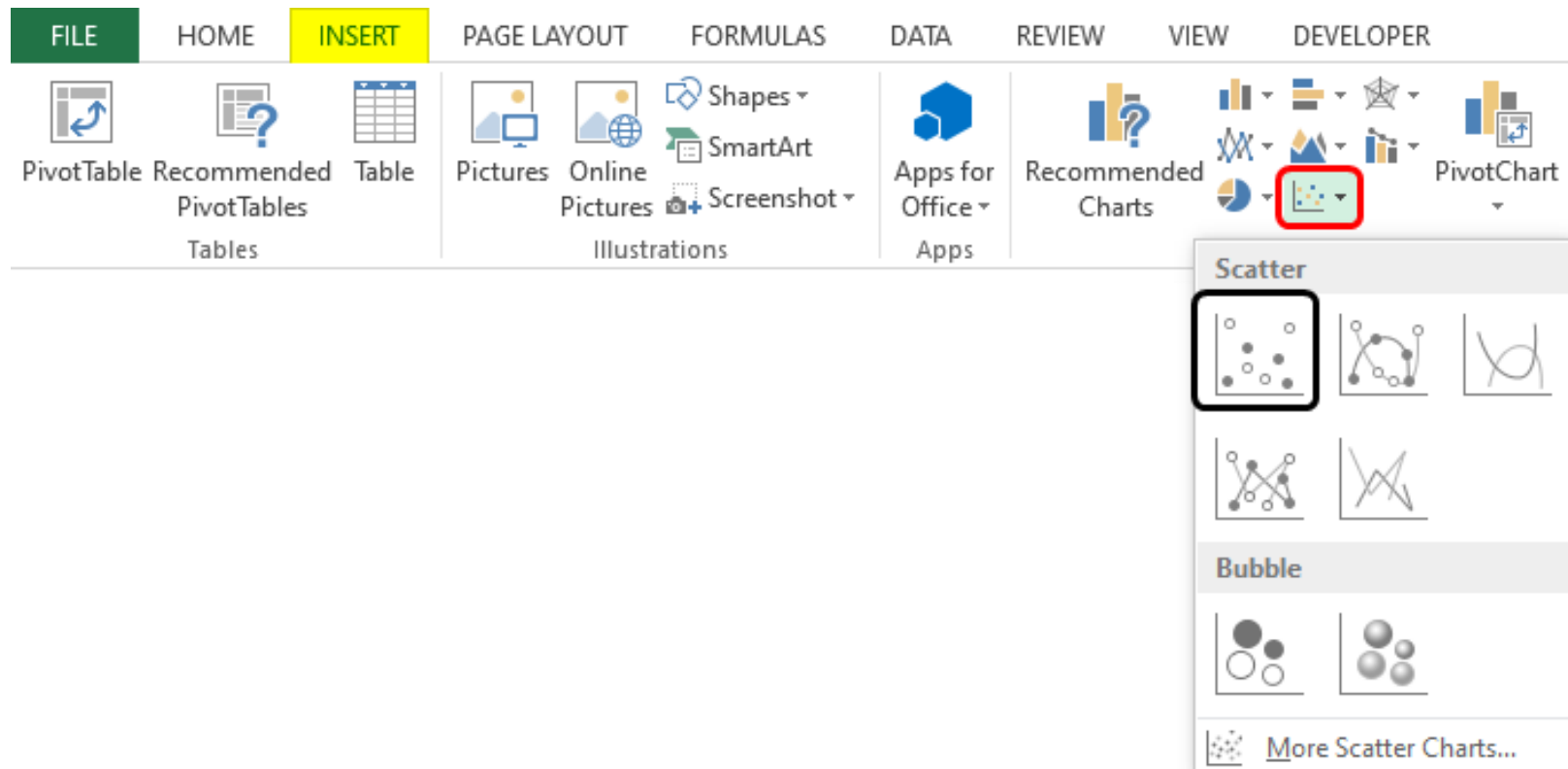


From the Area option, selected the requisite Area chart option. As a result, we got the following chart, as shown by the following screenshot. The area chart gives us a quick insight into the sales trend over the quarters for the three cities.

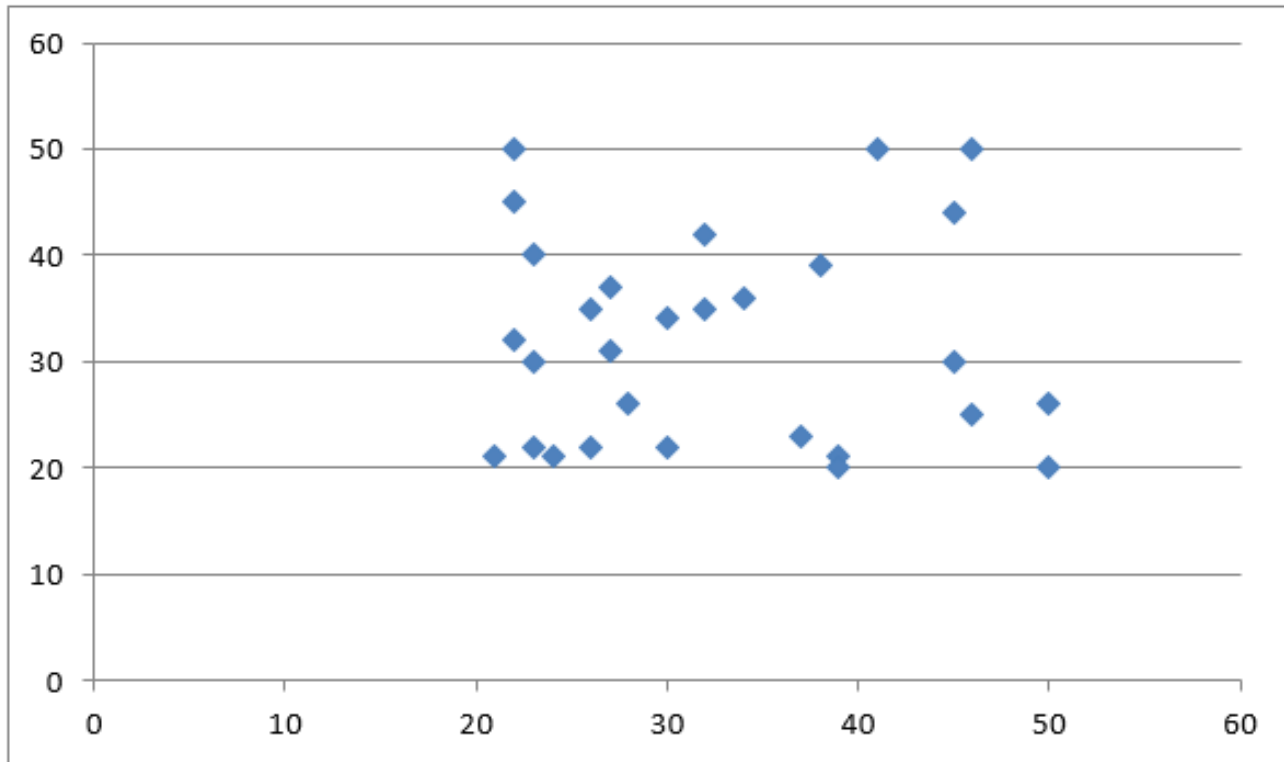


# 6. Scatter Chart

- This chart helps in determining the relation between two variables. It is also referred to as the X-Y chart. The chart requires two series and takes individual corresponding values as x and y coordinates. In order to build a scatter plot, first, select the data and then select the requisite scatter plot option, as can be seen in the following screenshot.

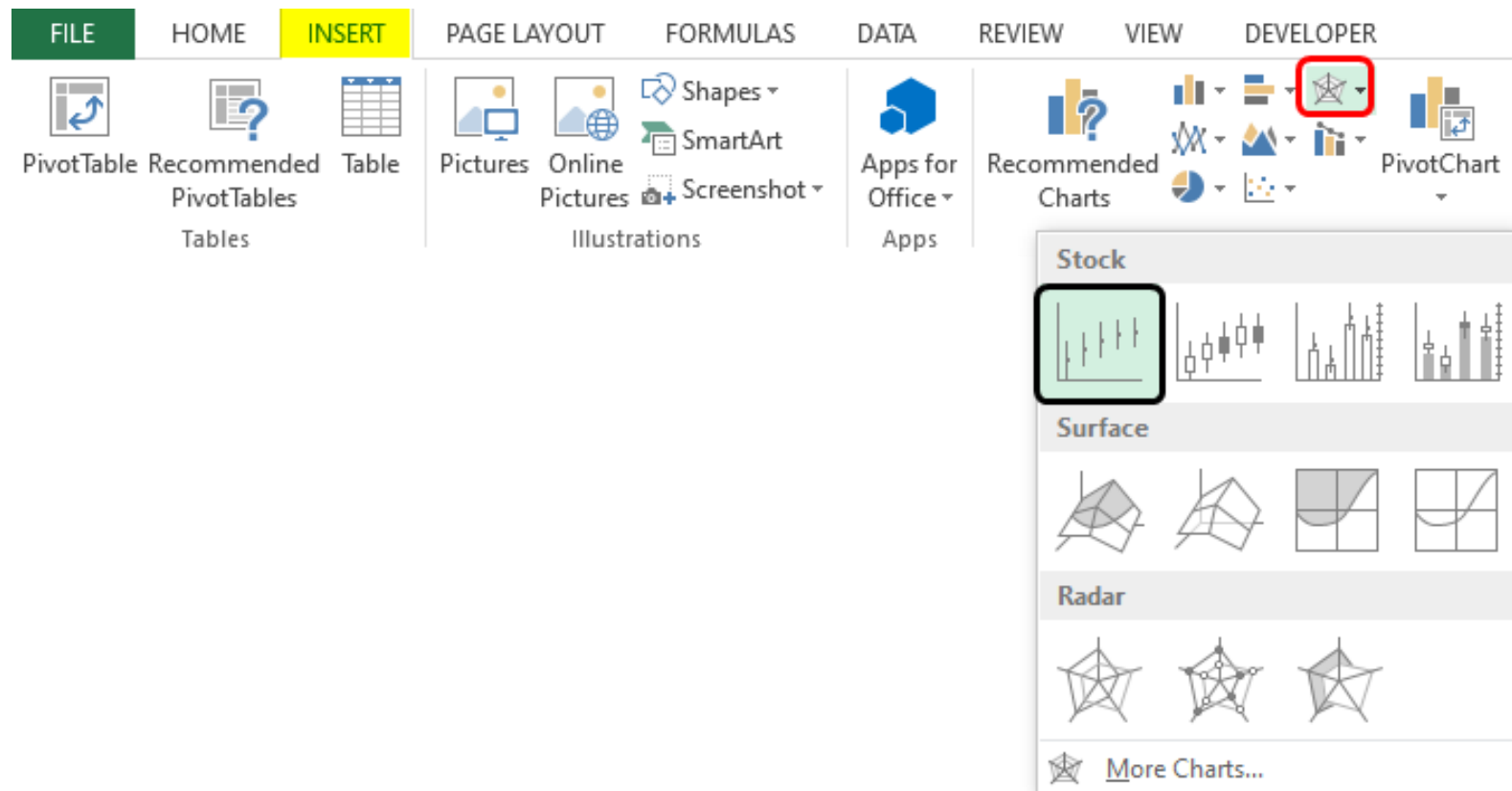


- Following the above procedure leads to the creation of a scatter plot. As we can see, the pattern formed by the scatter plot allows us to derive insights based on the context.

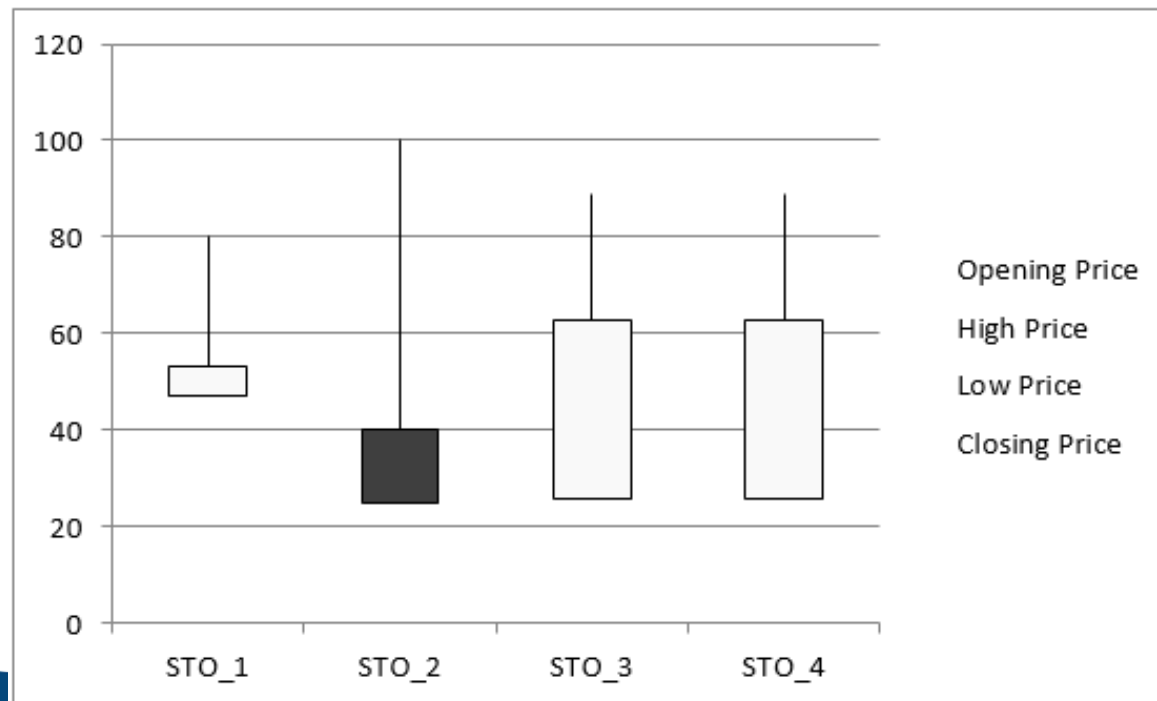


# 7. Stock Chart

- These are special types of charts that are used for stock price analysis. In order to build a stock chart, select the data and select the requisite stock chart option, as shown in the following screenshot.



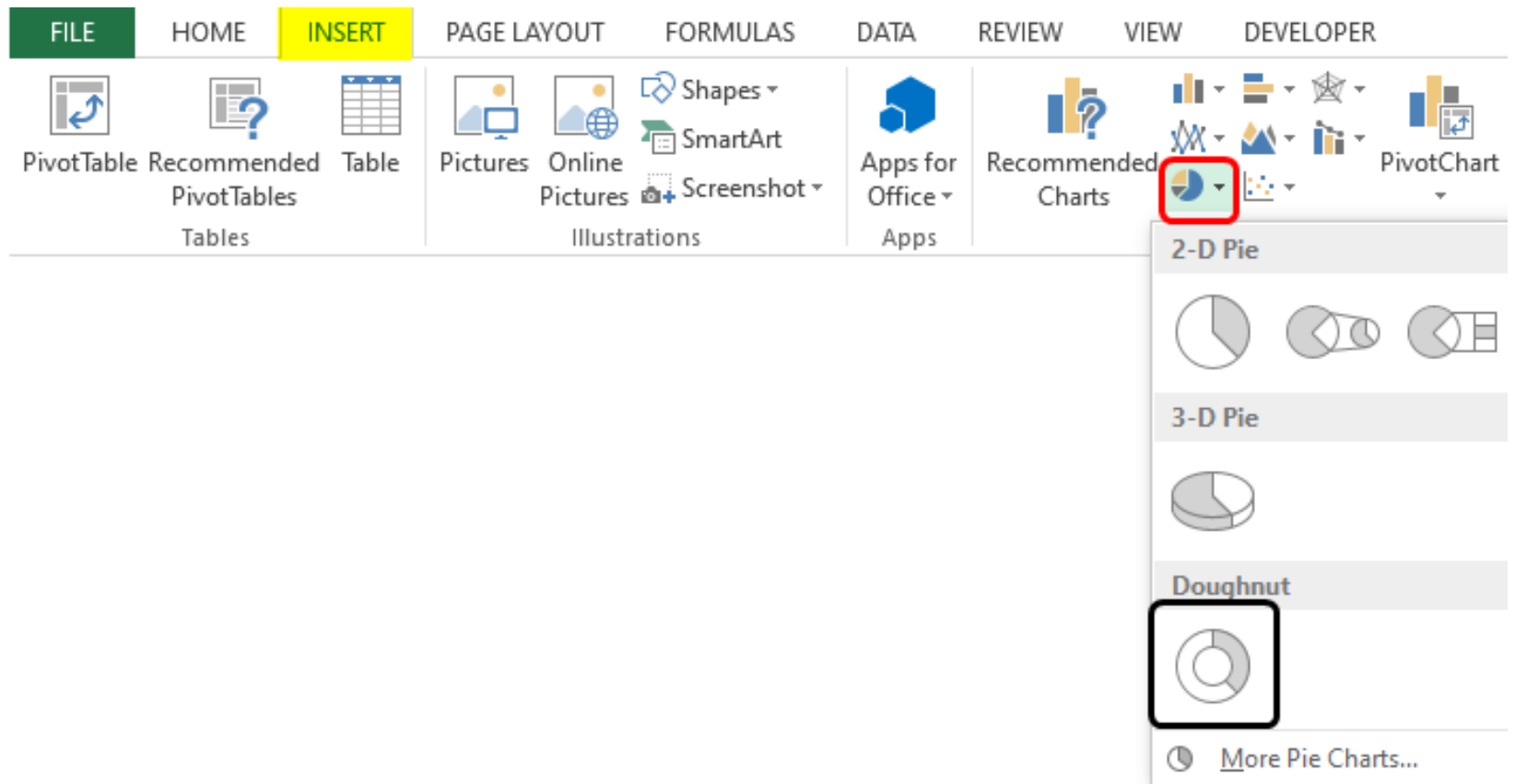
- As can be seen in the above screenshot, Open-High-Low-Close stock chart. This chart requires that the Opening Price, High Price, Low Price, and Closing Price of stocks must be defined in the order. Each of the chart options in the Stock chart requires a different set of inputs. When the chart is built, it looks like as shown below.



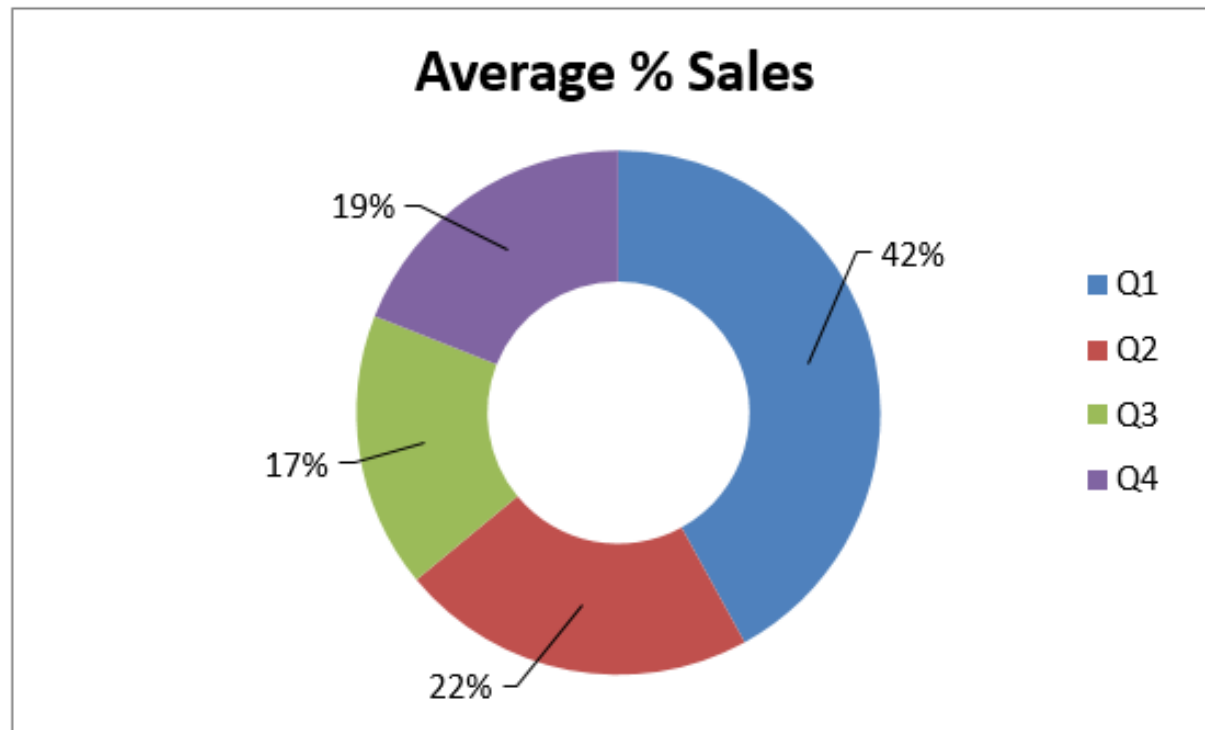


# 8. Doughnut Chart

- This chart is a type of pie chart, only that it is represented in the shape of a doughnut. Building this chart is quite simple. Select the data over which the chart needs to be built, and then from the other chart option, select the required option from the two doughnut options. This is as shown in the below screenshot.

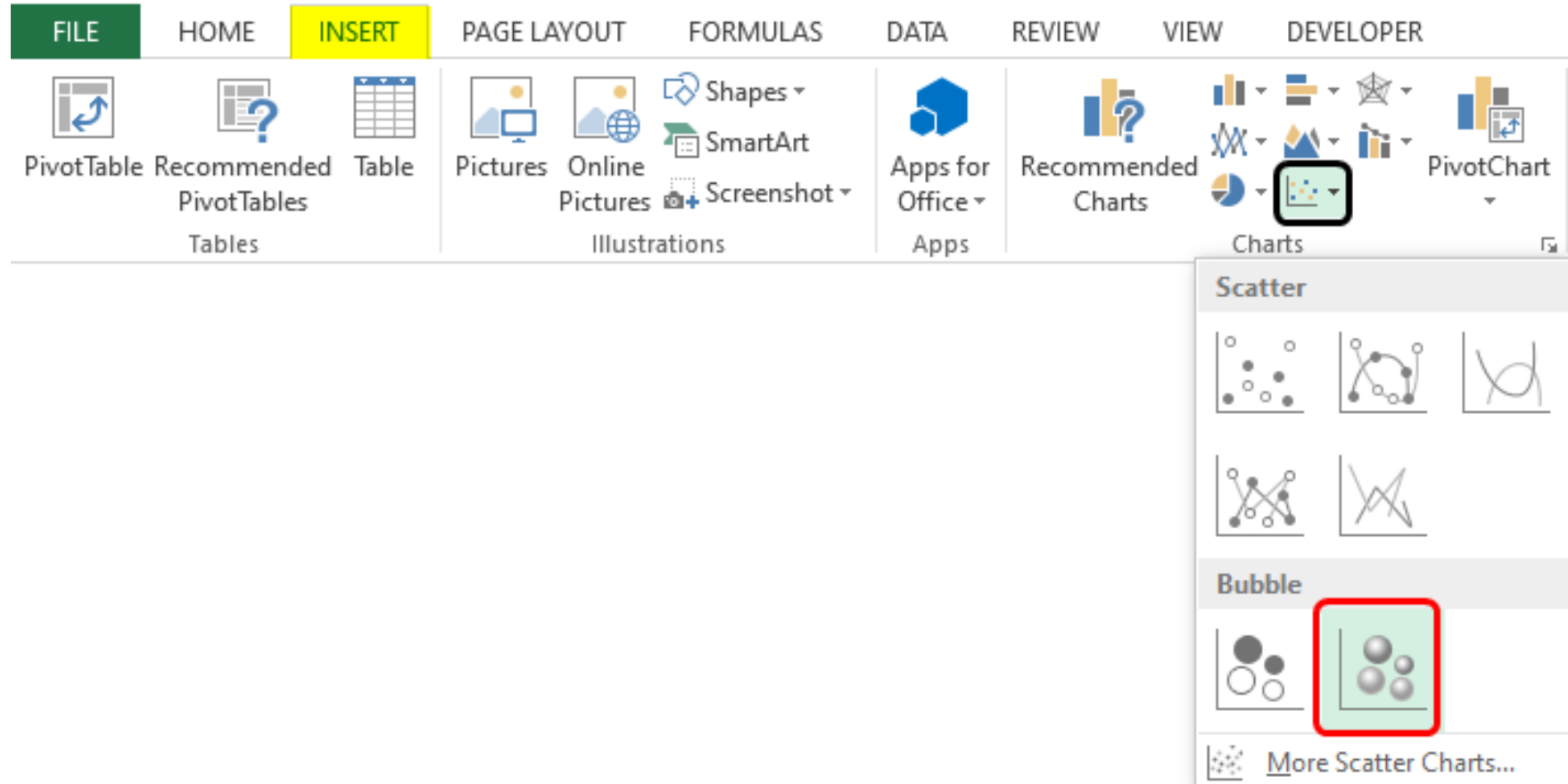


- The above procedure leads to the creation of the doughnut chart, which is as shown below. The doughnut chart gives us an idea of the average % contribution in total sales. The middle space in the doughnut chart can be used to write a meaningful text that conveys some insight.

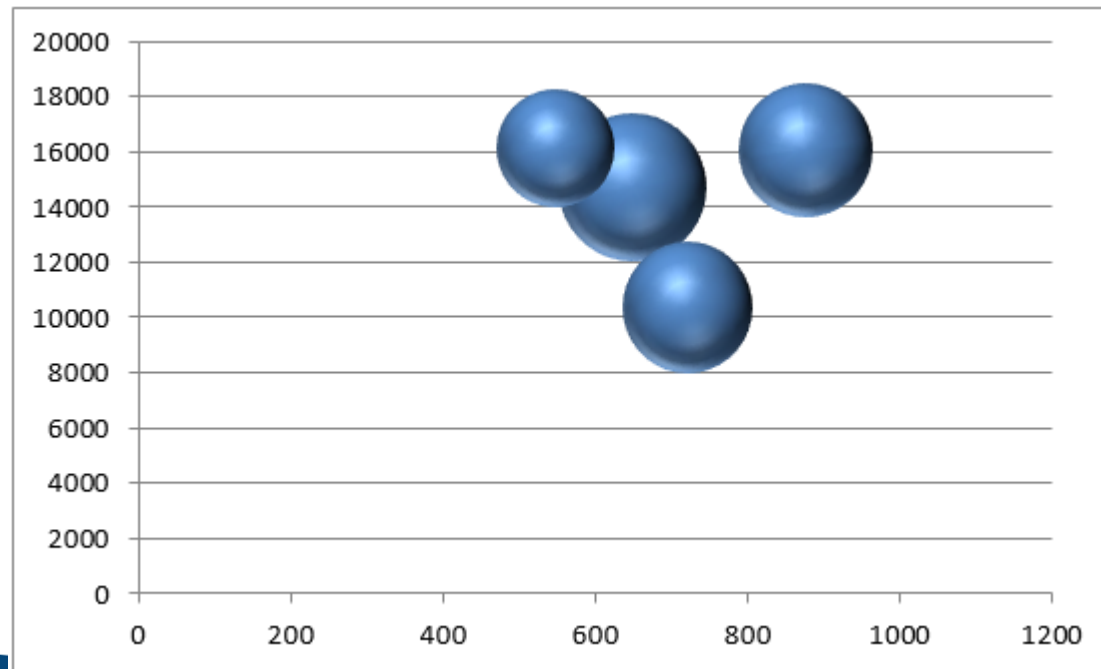


# 9. Bubble Chart

- Bubble charts, though complex, can be beautifully used to derive insights from data. This chart takes into consideration three values.
- Two of the three dimensions are used for representing X-axis and Y-axis, respectively, and the third value determines the size of the bubble. We shall build a bubble chart using the method as illustrated below.



- As can be seen in the above screenshot, we selected a bubble chart with a 3-D effect. Note that we selected numeric data only from the table for building the bubble chart, which can be seen in the screenshot. When we follow the above method, we get a bubble chart, as shown below.



# Organize data interactively with Tables

- Data Tables: The most common way of looking at data is through a table, where the raw data is displayed in familiar rows of observations and columns of variables. It is essential for reviewing the raw data

Names	Cylinders	Displacement	Horsepower	Weight	Acceleration	Model Year	Origin	MPG
Chevrolet Chevelle Malibu	8	307	130	3504	12	1970	1	18
Buick Skylark 320	8	350	165	3693	11.5	1970	1	15
Plymouth Satellite	8	318	150	3436	11	1970	1	18
Amc Rebel SST	8	304	150	3433	12	1970	1	16
Ford Torino	8	302	140	3449	10.5	1970	1	17
Ford Galaxie 500	8	429	198	4341	10	1970	1	15
Chevrolet Impala	8	454	220	4354	9	1970	1	14
Plymouth Fury III	8	440	215	4312	8.5	1970	1	14
Pontiac Catalina	8	455	225	4425	10	1970	1	14
Amc Ambassador Dpl	8	390	190	3850	8.5	1970	1	15

# Organize data interactively with Tables

- Contingency Tables : Also referred to as two-way cross-classification tables provide insight into the relationship between two variables. The variables must be categorical or transformed to a categorical variable.

Group * Adverse Event Cross-Tabulation				
Count				
		Adverse Event		Total
		AE = Yes	AE = No	
Group	Treatment	167	490	657
	Control	150	193	343
Total		317	683	1,000



# Organize data interactively with Tables

- Summary Table: A summary table (or aggregate table) is a common way of understanding data. Summary tables will often show a count of the number of observations (or percentage) that have that particular value (or range).
- Any number of other variables can be shown alongside. Since each row now refers to a set of observations, any other columns of variables must now contain summary information. Descriptive statistics that summarize a set of observations can be used.

Cylinders	Count	Mean (MPG)
3.0	4	20.55
4.0	199	29.28
5.0	3	27.37
6.0	83	19.97
8.0	103	14.96

# Organize data interactively with Tables

- An **ordered array** is a sequence of data, in rank order, from the smallest value to the largest value

Age of Surveyed College Students	Day Students					
	16	17	17	18	18	18
	19	19	20	20	21	22
	22	25	27	32	38	42
	Night Students					
	18	18	19	19	20	21
	23	28	32	33	41	45

# Organize data interactively with Tables

- The **frequency distribution** is a summary table in which the data are arranged into numerically ordered class groupings.
- You must give attention to selecting the appropriate *number* of **class groupings** for the table, determining a suitable *width* of a class grouping, and establishing the *boundaries* of each class grouping to avoid overlapping.
- To determine the **width of a class interval**, you divide the **range** (Highest value–Lowest value) of the data by the number of class groupings desired.

# Organize data interactively with Tables

Example: A manufacturer of insulation randomly selects 20 winter days and records the daily high temperature

**24, 35, 17, 21, 24, 37, 26, 46, 58, 30, 32, 13, 12, 38, 41, 43, 44,  
27, 53, 27**

- Sort raw data in ascending order:  
12, 13, 17, 21, 24, 24, 26, 27, 27, 30, 32, 35, 37, 38, 41, 43, 44, 46, 53, 58
- Find range:  $58 - 12 = 46$
- Select number of classes: 5 (usually between 5 and 15)
- Compute class interval (width): 10 ( $46/5$  then round up)  
**Usual widths multiples of 5**
- Determine class boundaries (limits): 10, 20, 30, 40, 50, 60
- Compute class midpoints: 15, 25, 35, 45, 55
- Count observations & assign to classes

Class	Frequency	Relative Frequency	Percentage
10 but less than 20	3	.15	15
20 but less than 30	6	.30	30
30 but less than 40	5	.25	25
40 but less than 50	4	.20	20
50 but less than 60	2	.10	10
<b>Total</b>	<b>20</b>	<b>1.00</b>	<b>100</b>

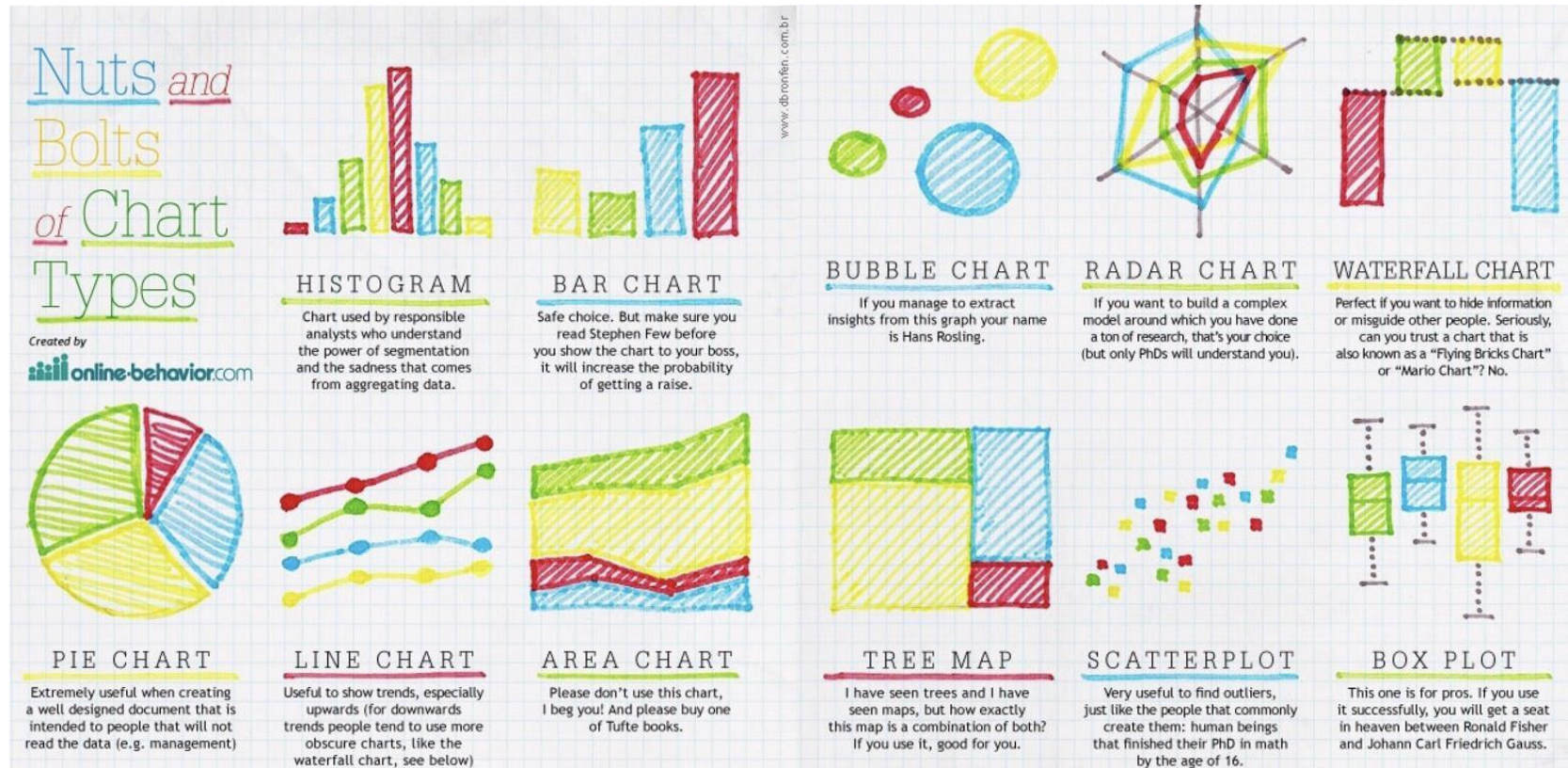
# Organize data interactively with Tables

- Cumulative frequency tabulation is performed from a frequency table by adding each frequency to the total of frequencies of all data values before it in the data set.

Class	%	Cumulative %
0 < 10	0	0
10 < 20	15	15
20 < 30	30	45
30 < 40	25	70
40 < 50	20	90
50 < 60	10	100



# Visualizing Data with Charts





# Visualization: Principles of Excellent Graphs

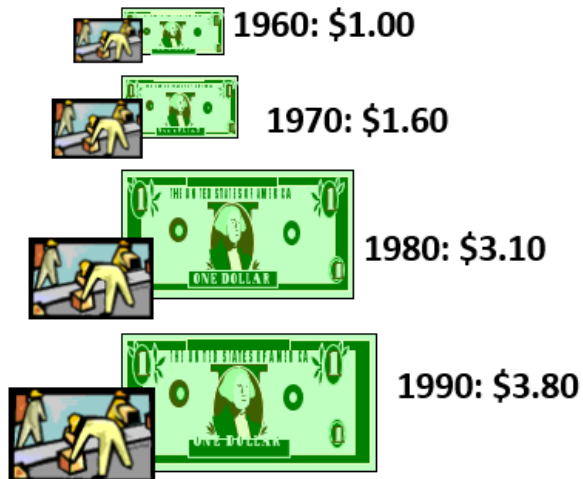
- The graph should not distort the data.
- The graph should not contain unnecessary adornments (sometimes referred to as chart junk).
- The scale on the vertical axis should begin at zero.
- All axes should be properly labeled.
- The graph should contain a title.
- The simplest possible graph should be used for a given set of data.

# Graphical Errors: Chart Junk

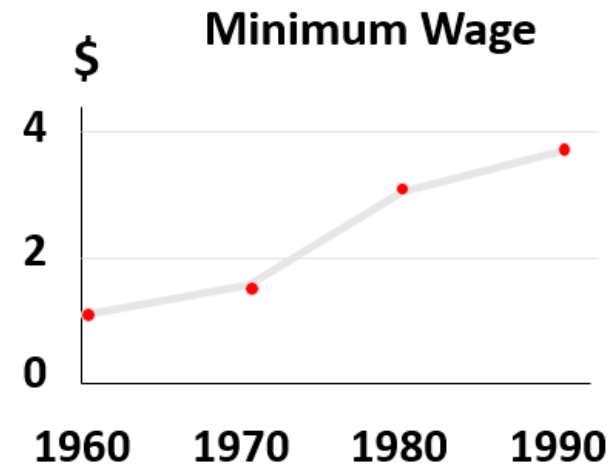


**Bad Presentation**

## Minimum Wage



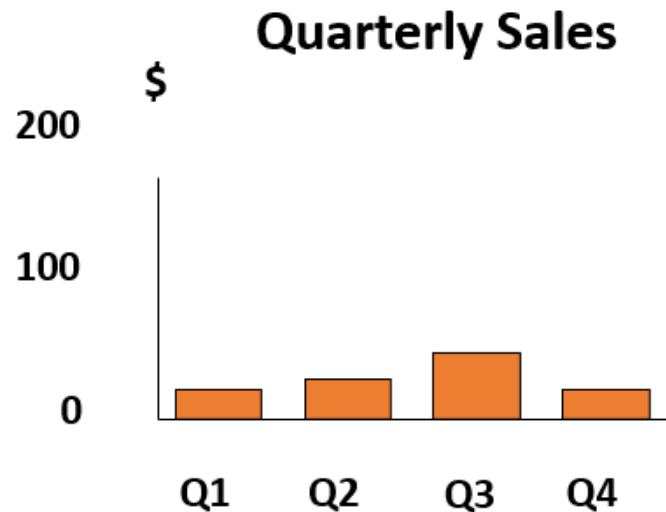
**Good Presentation**



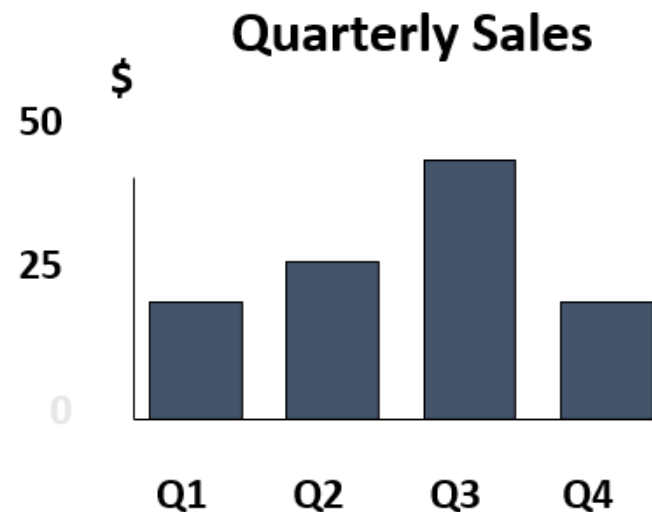
# Graphical Errors: Compressing the Vertical Axis



## Bad Presentation



## Good Presentation



# Analyzing Data With Pivot Tables

If you want to see at a glance the trends, patterns, and meaning behind your data, then PivotTable reports are for you.

Imagine an Excel worksheet of company sales figures with thousands of rows of data. Everyone has questions about what the data means. How do you get answers quickly and easily?

PivotTable reports summarize and organize data into different views that present comparisons, reveal patterns and relationships, and analyze trends. Let's find out how PivotTable reports make it so easy.



# Analyzing Data With Pivot Tables

- With a PivotTable report, you decide what data you want to be analyzed, and how to organize it.
- Instead of a single arbitrary form that doesn't really suit your needs, each PivotTable report gives you a different view of your data that is customized to your purposes and answers your questions on the spot.



# Analyzing Data With Pivot Tables

- Creating a PivotTable report is about moving pieces of information around to see how they fit together.
- Not satisfied with the first report? It just takes a couple of seconds to pivot rows and columns into a different arrangement, a bit like turning a kaleidoscope to see different patterns.

# Pivot Table: Example

	A	B	C	D	E	F
1	Sl.No	Type	Block Name	Area	Maintenance Deposit	Final Product Value
2	1	B4	Mickey	2,589.62	258,962	24,545,068
3	2	B2a	Rainbow	2,531.09	253,109	25,572,452
4	3	A2a	Rainbow	3,341.12	334,112	33,559,029
5	4	A2a	Cheeku	3,341.12	334,112	31,447,779
6	5	C2	Mickey	2,501.98	250,198	23,941,476
7	6	B2a	Cheeku	2,531.09	253,109	23,378,552
8	7	B2a	Strawberry	2,531.09	253,109	23,876,492
9	8	A2a	Strawberry	3,341.12	334,112	36,421,719
10	9	A1	Cheeku	3,365.21	336,521	30,785,575
11	10	A1	Rainbow	3,365.21	336,521	30,142,645
12	11	A1	Strawberry	3,365.21	336,521	30,142,645
13	12	A1	Donald	3,365.21	336,521	30,142,645
14	13	B1	Cheeku	2,546.79	254,679	22,922,834
15	14	B1	Rainbow	2,546.79	254,679	22,922,834
16	15	B1	Strawberry	2,546.79	254,679	22,922,834
17	16	B1	Mickey	2,546.79	254,679	23,843,144
18	17	C1b	Cheeku	2,330.07	233,007	22,307,235
19	18	C1a	Strawberry	2,341.96	234,196	21,562,732
20	19	C1a	Donald	2,341.96	234,196	21,562,732
21	20	C1a	Rainbow	2,341.96	234,196	21,562,732
22	21	C1a	Strawberry	2,341.96	234,196	21,562,732

# Pivot Table: Example

**PivotTable Fields** [X]

Choose fields to add to report: [Settings] [Dropdown]

- ☐ SI.No
- ☐ Type
- ☒ Block Name
- ☐ Area
- ☐ Maintenance Deposit
- ☒ Final Product Value

MORE TABLES...

---

Drag fields between areas below:

FILTERS	COLUMNS
ROWS	VALUES
Block Name [Dropdown]	Sum of Final ... [Dropdown]

	A	B
3	Row Labels [Dropdown]	Sum of Final Product Value
4	Cheeku	293696554.2
5	Donald	212986681.1
6	Mickey	324692355.3
7	Rainbow	466978229.7
8	Strawberry	355723914
9	Grand Total	1654077734
10		



# Pivot Table: Example

	A	B	F
3	Row Labels	Sum of Final Product Value	
4	Cheeku	293696554.2	
5	Donald	212986681.1	
6	Mickey	324692355.3	
7	Rainbow	466978229.7	
8	Strawberry	355723914	
9	Grand Total	1654077734	
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

PivotTable Fields

Choose fields to add to report:

- ☐ SI.No
- ☐ Type
- ☒ Block Name
- ☐ Area
- ☐ Maintenance Depo
- ☒ Final Product Value

MORE TABLES...

Drag fields between areas:

FILTERS

ROWS

Block Name

Defer Layout Update

UPDATE

Move Up

Move Down

Move to Beginning

Move to End

Move to Report Filter

Move to Row Labels

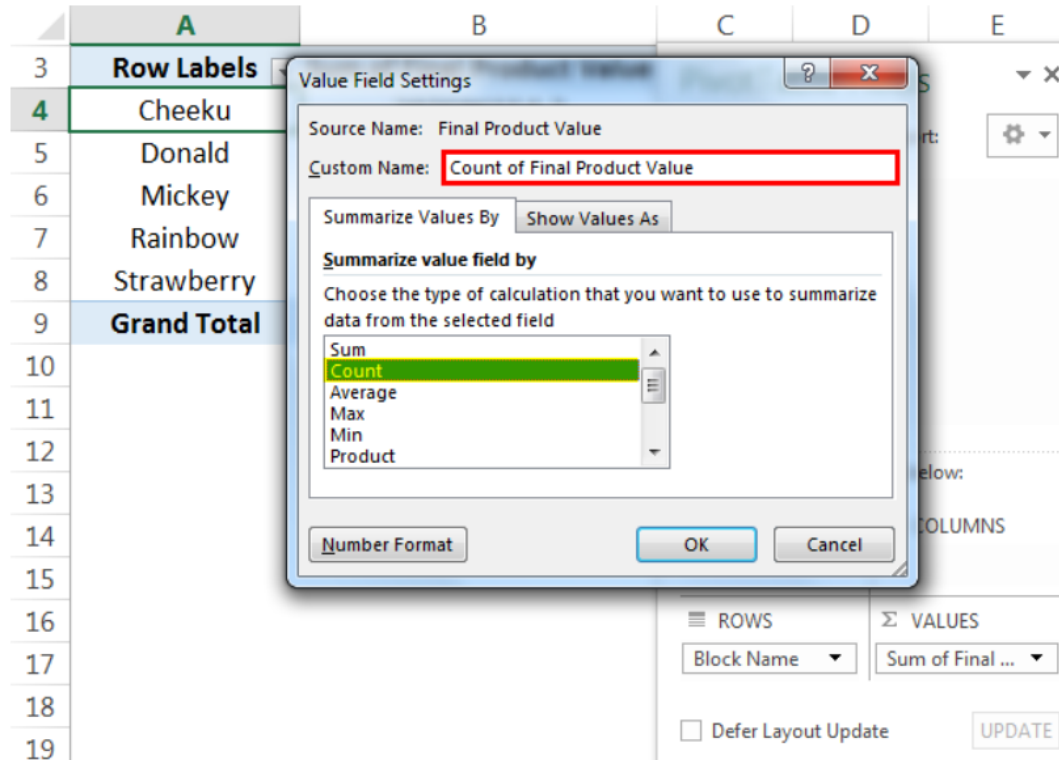
Click on Value Field settings

Remove Field

Value Field Settings...

Sum of Final ...


# Pivot Table: Example



The screenshot shows an Excel spreadsheet with a Pivot Table. The Pivot Table is located in columns B through E, with rows 3 through 19. The Pivot Table has 'Row Labels' in column A, with values 'Cheeku', 'Donald', 'Mickey', 'Rainbow', 'Strawberry', and 'Grand Total'. The Pivot Table is set to 'Sum of Final Product Value'. A 'Value Field Settings' dialog box is open, showing 'Source Name: Final Product Value' and 'Custom Name: Count of Final Product Value'. The 'Summarize value field by' section is set to 'Count'.

Row Labels	Sum of Final Product Value
Cheeku	
Donald	
Mickey	
Rainbow	
Strawberry	
Grand Total	

# Pivot Table: Example

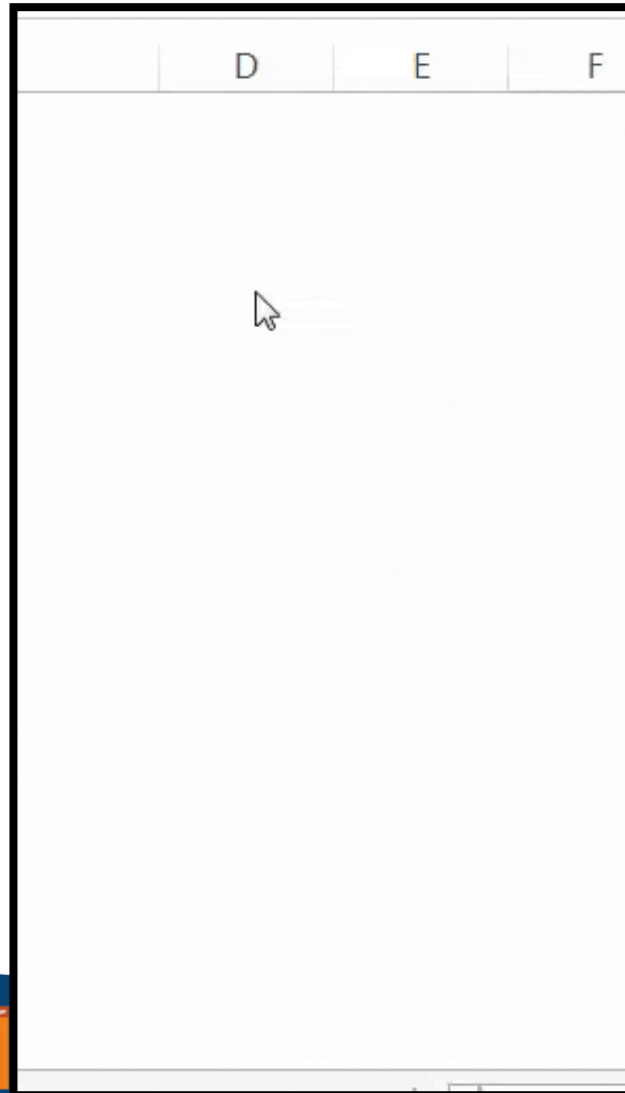
	A	B	C	D	E
3	Row Labels	Count of Final Product Value	PivotTable Fields		
4	Cheeku	15			
5	Donald	9	Choose fields to add to report: 		
6	Mickey	15			
7	Rainbow	20	<input type="checkbox"/> SI.No <input type="checkbox"/> Type <input checked="" type="checkbox"/> Block Name <input type="checkbox"/> Area <input type="checkbox"/> Maintenance Deposit <input checked="" type="checkbox"/> Final Product Value		
8	Strawberry	20			
9	Grand Total	79	MORE TABLES...		
10			Drag fields between areas below:		
11					
12					
13					
14					
15					
16					
17					
18					
19					

.....

▼ FILTERS	COLUMNS
≡ ROWS	Σ VALUES
Block Name ▼	Count of Final... ▼

☐ Defer Layout Update UPDATE

# Pivot Table: Example(Animated)



	D	E	F
--	---	---	---

# Pivot Table: Example

	A	B	C
3	Row Labels	Sum of Maintenance Deposit	Average of Final Product Value
4	Cheeku	3228028	19579770.28
5	Donald	2311882	23665186.78
6	Mickey		21646157.02
7	Rainbow		23348911.49
8	Strawberry	3931756	17786195.7
9	Grand Total	8	20937692.84
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			

# Pivot Table: Example

	A	B	C
3	Row Labels ▼	Sum of Maintenance Deposit	Average of Final Product Value
4	Group1		
5	Cheeku	3228028	19579770.28
6	Strawberry	3931756	17786195.7
7	Group2		
8	Donald	2311882	23665186.78
9	Mickey	3500541	21646157.02
10	Rainbow	5055341	23348911.49
11	Grand Total	18027548	20937692.84
12			

# Build presentation ready dashboards

1. Organize data - The most important part is to have all the information you plan on graphing in one area. It can be very hard to link the graphs if data is spread out throughout the spreadsheet
2. Set up page - The orientation can be landscape or portrait, and the size will depend on the output you're trying to create. The most common is to make it an 8.5" by 11" page so that it can easily print to paper or PDF in a standard size



# Build presentation ready dashboards

3. Brainstorm – Experiment and tinker to finally come up with a great design. This step usually takes several iterations, and may even continually change and get updated based on the feedback received over time

4. Select visuals – Choose the right type of charts



# Build presentation ready dashboards

5.Focus attention – Create comments, arrows, use appropriate colors to draw attention to information

6.Tell a story - make sure it tells a compelling story. Is it painting the picture you want it to? This is when you step back and take a bird's-eye view of your data, the key messages, and compare that to the original purpose of the dashboard.

# Example: Corporate Dashboard



# Turn real world data into business insights



# Making Forecasts

Many types of models differ in complexity & amount of data & way they generate forecasts:

1. Forecasts are rarely perfect
2. Forecasts are more accurate for grouped data than for individual items
3. Forecast are more accurate for shorter than longer time periods



# Making Forecasts

- Decide what needs to be forecast
  - Level of detail, units of analysis & time horizon required
- Evaluate and analyze appropriate data
  - Identify needed data & whether it's available
- Select and test the forecasting model
  - Cost, ease of use & accuracy
- Generate the forecast
- Monitor forecast accuracy over time

# Interpretation and Report Writing

## Most Important Things to Remember About Data Analysis

- Develop a plan before you analyse data.
- Develop some dummy tables or lists to hold your analysed data – share those with others.
- Identify the most important findings from your data, summarize them and then use the specific results (e.g., a table or list of data) to clarify your findings.
- Present your analysis in an orderly, meaningful, simple way.



# Interpretation and Report Writing

## Things to Avoid When Analysing Data

1. Including response rates and problems with your methodology as part of your findings.
2. Reporting both numbers and percentage unless one is needed to make the other clear.
3. Listing in a sentence or a table, all of the response choices for every question on a survey in the order they appear on the survey. [Don't do this with interview data either]
4. Report your results with excessive precision – most of the time you can just round to the nearest whole number when reporting percentages.



# Interpretation and Report Writing

5. Feel compelled to keep your results in the same order as they appeared on the survey or the interview protocol. It is the job of the analyst to order things in the best way to clarify the findings – you are NOT REQUIRED to present things in the order you asked them.
6. Do not include any action steps or conclusions that are not clearly developed from your findings.





# Interpretation and Report Writing: Rules for a Good Report

1. Follow the report writing outline in your manual. Feel free to be somewhat flexible with the order, but don't leave out whole sections.
2. Make your own internal outline including who is responsible for which sections. Be sure that you leave time for stakeholders to help you with editing/making revisions.
3. Be economical in your decisions about what to include in your report. Shorter is better.
4. Avoid excessive use of jargon.
5. Read your work – if you can't understand it, chances are others won't be able to either. Think, in simple terms, about what you are trying to say, and then write that.
6. Use complete sentences and standard English grammar conventions. You can rely some on bullets and be limited in your transitions, but be sure your reader can follow your logic.

# Interpretation and Report Writing: Rules for a Good Report

7. Use headers and sections to help your reader know what is happening in your report. Be consistent about where and how they appear (centered, bold, underlined, side headings etc.). **NUMBER THE PAGES.**
8. Use tables and Graphs to help illustrate findings. **ALL TABLES AND GRAPHS MUST HAVE TITLES, LABELS AND LEGENDS OR FOOTNOTES SO THAT THEY STAND ALONE.**
9. Use quotes and vignettes or snippets from field notes to illustrate your findings. Remember quotes should have quote marks around them and be attributed to the speaker or writer.
10. Be consistent in your use of language, capitalization, punctuation etc. For the most part, evaluation reports should be written in the past tense – only report what you actually did and what you found.
11. Do not introduce totally new topics into your report in the final sections.



# Sample Data Analysis Report Outline

## Data Analysis Report

Prepared by

John Lync

john@fdmhotelandcondominiums.com

December 4, 2030

### Overview

This data analysis report is to provide the findings of the survey that the company conducted about the current target market's condo living preferences.

### Scope

The company built a 15,000 sq ft condominium building last 2029 and has an occupancy rate of 80% as of December 1, 2030. The company surveyed 500 residents within a 3-mile radius from the location of the condominium, wherein a survey response rate of 90% was acquired.

### Methodology

The company conducted a survey prior to designing the condominium building and units to gather data about the preferences of the target market. Upon the completion of the survey, the company began designing and constructing the condominium building.

### Market Analysis

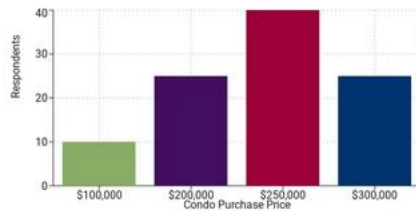
The target demographic of the company are employed individuals aged 25 years and above who are looking for a small affordable space to live.

# Sample Data Analysis Report Outline

## Findings

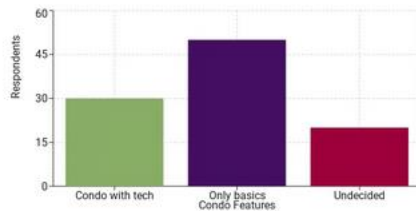
### Finding 1

According to the survey, 75% of the respondents were most likely to move into a condominium unit if the price range is within \$250,000.00 and below.



### Finding 2

The survey showed that only 30% of the respondents chose to have technologically advanced condominium units.



## Conclusion

To conclude, the company created and designed the condominium units with the basics or the necessary features and furnishings that residents will need for their daily living, therefore saving an estimated \$2,000,000.00.

## Recommendations

1. The company will focus on looking for space-saving furniture pieces that are affordable to improve the living spaces of the residents.
2. Additional research and survey will have to be conducted to determine whether or not the company will build another condominium building within the area.

Ref:

<https://www.template.net/pro/10766/data-analysis-report>

Thank  
you!



**PRESIDENCY  
UNIVERSITY**

Private University Estd. in Karnataka State by Act No. 41 of 2013

