Data Analysis & Business Intelligence Made Easy with Excel Power Tools
Excel Data Analysis Basics = E-DAB
Notes for Video:
E-DAB-05- Visualizations: Table, Charts, Conditional Formatting & Dashboards

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1. Data Analysis Yields Numbers & Visualizations

- Convert Raw Data into Useful Information for Decision Makers
- Useful information can be:
    1. Numbers such as:
        i. Monthly Sales Total
        ii. % Change in Customer Complaints
        iii. Cross Tabulated Table to show calculations with two conditions
    2. Visualizations such as:
        i. Line Chart to show increase and decrease over time
        ii. Conditional Formatting to highlight to indicate Top or bottom three values
        iii. Maps to show relative number amounts
        iv. Word Clouds to show relative importance

2. Why Visualize Data?

- Quick visual impression
- Pictures tell a thousand words
- See patterns and trends
- Make relative comparisons quickly

3. What do Visualizations do?

- Visually portray quantitative data (number data).
- Give a **quick impression** of the number data.
- Create a picture that can communicate more quickly than just the numbers alone.
- Allow you to see **patterns, trends and gain insight** that you may not be able to see looking at just numbers.
- Allows you to make relative comparisons more quickly than if you are using a table

4. Research on Visualizations

- Research shows that humans can process visual images (like charts) faster than they can process rows of numbers.
- Research shows that column and bar charts can convey differences between categories more easily than pie charts.

5. Categories of Visualizations in Excel:

- Charts or Graphs
    1. They visually portray quantitative data (number data) to give a quick visual impression or reveal patterns and trends, rather than looking at detailed number information.
    2. In Excel, Charts are called Charts.
    3. In Power BI Desktop, Charts are called visualizations.
- Maps
    1. Visually portray quantitative data (number data) on a map.
- Conditional Formatting
    1. Use Logical Tests to apply formatting when the test evaluates to TRUE. For example: Format Top 5 Values.
    2. In Excel, we can add Conditional Formatting to the cells in a worksheet or in a PivotTable.
    3. In Power BI Desktop, we can add Conditional Formatting to Numbers in a visualization (like in a Matrix) or to elements in a visualization (like a Column in a Column Chart).
- Tables
    1. Tables such as Proper Data Sets or Cross Tabulated Table.
    2. Tables are used when you want to see the details and make precise comparisons of the numbers rather than a quick impression that is presented in a chart.

6. Specific Types and Uses of Visualizations in Excel & Power BI

- ***Tables***: Field Names in First Row and Records in Rows. Use when you want to see the individual numbers rather than a quick visual impression.
- ***Matrix***: Cross Tabulated Table with Row and Column Criteria and an intersecting calculation based on Row and Column Criteria.
- ***Column Chart***: Use to compare differences across categories. Height of column conveys number.
- ***Bar Chart***: Use to compare differences across categories. Length of bar conveys number.
- ***Stacked Column/Bar Chart***: Good for displaying crosstabulation, emphasis on horizontal axis categories.
- ***Clustered Column/Bar Chart***: Good for displaying crosstabulation, emphasis on legend categories.
- ***Histogram Chart***: Chart used for counting numbers between a lower and upper limit. No gap between column indicates that there are no numbers between the upper and lower limit.
- ***Line Chart***: Use to show trend for a number variable over a category such as time.
- ***Combination Chart***: Combine different chart types such as Column and Line.
- ***X-Y Scatter***: Used to show relationship between two number variables (x and y variables).
- ***Break Even Chart***: Specific type of X-Y Scatter Chart that shows the break-even cross over lines for Revenue and Costs.
- ***Bubble Chart***: Method of visualizing 3 variables in a 2-dimentional chart.
- ***Cards*** : Text box that can display summary numbers with labels.
- ***Maps***: Used for geographic data, like sales by zip code, sates, or country.

7. Effective Visualizations: No Chart Junk, No Extraneous Elements

- Edward R. Tufte is a world-renowned visualization expert who created the Golden Rule for Effective Visualizations:
    - No "Chart Junk".
      and
    - Data-Ink ratio should be high.
      both are summarized as follows:
    - Eliminate extraneous elements in your visualization that do not help to deliver the message.
- "No Chart Junk" rule means that in charts and visualizations:
    - Remove unnecessary repetition.
    - Remove any elements that does not contribute to the message.
    - Keep chart simple.
    - Change chart if it looks "busy", like:
        - Too many different colors
        - Patterns that are distracting.
    - .3-D effects that are not necessary and can be misleading
- The "Data-Ink Ratio should be high" rule means that in charts and visualizations and table reports:
    - All ink in the chart or table should help deliver the message or the meaning of the data
    - Ink that serves no useful purpose must be removed

8. Tables Design Principles

- Data-Ink ratio should be high
- Horizontal lines are generally necessary only for separating column titles from data values or when indicating that a calculation has taken place.
- In large tables, light shading can be used to differentiate columns
- Numbers should be right aligned (Right is the visual cue that it is a number)
- Text should be left aligned (Left is the visual cue that it is a text)
- All numbers should have same number of digits
- Units must be indicated either with Number Formatting or Labels
- Large numbers may be rounded to dollar or thousands or millions and so on

9. PivotTable Styles:

- To create your own PivotTable Style:
    1. PivotTable Tools Design Ribbon Tab, Styles, More button, New PivotTable Style, then use dialog box to create your own style.
    2. In the New PivotTable Style dialog box:
        i. Name new style.
        ii. From "Table Element" list, select element.
        iii. Click Format button and add desired formatting, then click OK.
        iv. Continue formatting Table Elements.
        v. When you are done formatting Table Elements, click OK on the New PivotTable Style dialog box.
    3. To apply the New PivotTable Style to a PivotTable:
        i. Click in one cell in a PivotTable.
        ii. Go to PivotTable Tools Design Ribbon Tab, Styles, More button, click New PivotTable Style.
    4. To modify New PivotTable Style:
        i. Go to PivotTable Tools Design Ribbon Tab, Styles, More button, right-click New PivotTable Style, then click on Modify.

10. Conditional Formatting in Excel PivotTable:

- Conditional Formatting is used to call attention to important data.
- Conditional Formatting is used to format cells where a certain condition is TRUE. For example: Format cells where number in cell in in Top 5 Values.
- Excel or Power BI Desktop:
    1. In Excel, we can add Conditional Formatting to the cells in a worksheet or in a PivotTable.
    2. In Power BI Desktop, we can add Conditional Formatting to Numbers in a visualization (like in a Matrix) or to elements in a visualization (like a Column in a Column Chart).
- To add Conditional Formatting to a PivotTable:
    1. Click in cell in PivotTable.
    2. Go to Home Ribbon Tab, Styles group, Conditional Formatting drop-down arrow.
    3. From the Conditional Formatting drop-down arrow, select the test you want and add the formatting you want.

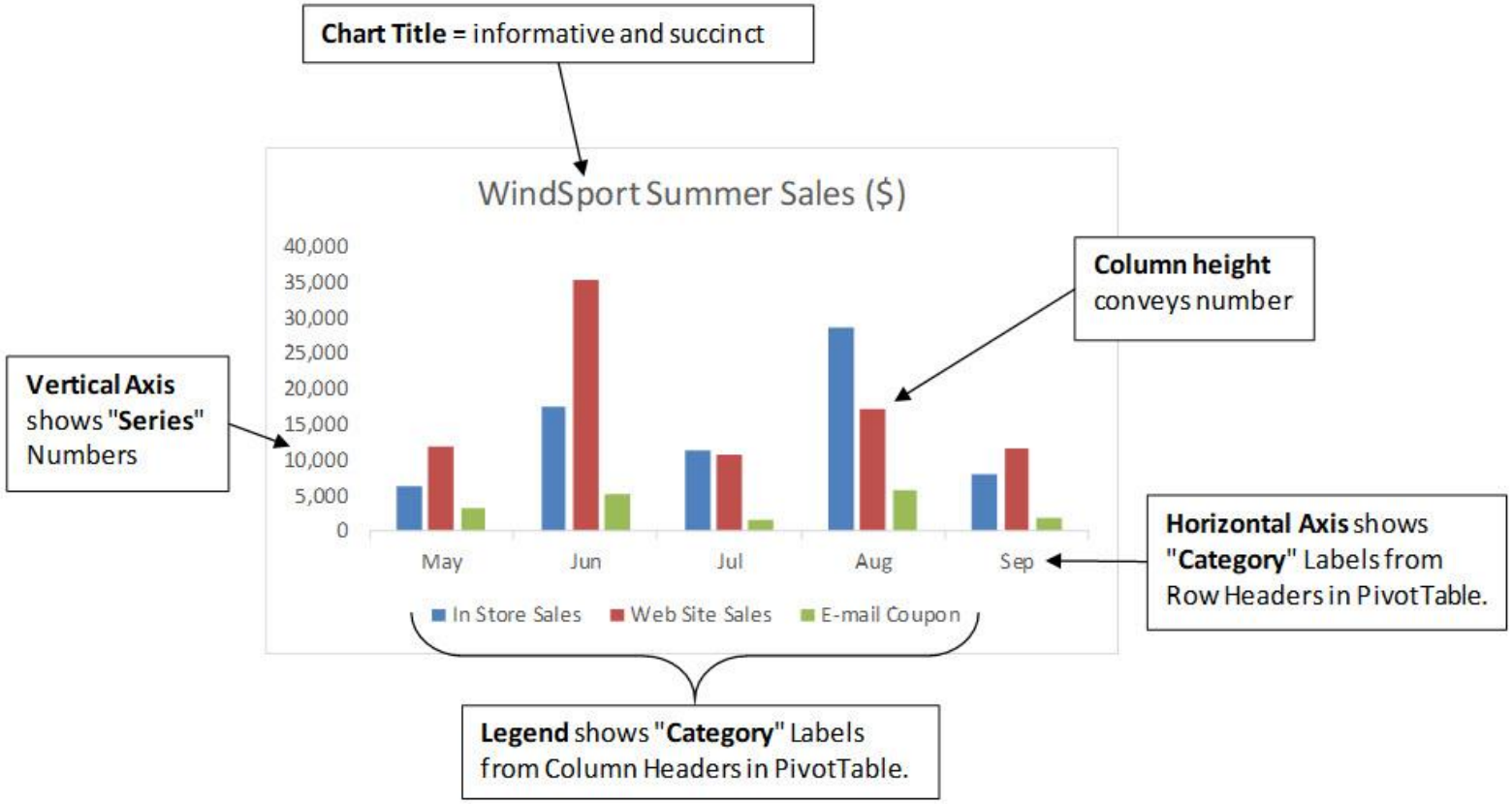
11. Dashboard

- A Dashboard is defined as one location where we can present the useful information in a neat an organized manner.
- Just like a dashboard in a car, a dashboard should present information that is required for making good decisions.
- Dashboards allow us to gather various tables, reports, charts, visualizations, and other useful information and pin them in one location that the decision maker can view and interact with the information to gage performance, see patterns and trends and gain insight.
- A dashboard should refresh if new data is available and it should be easily shared with other interested parties.
- Effective Dashboards:
    1. Presents timely summary data, metrics or key performance indicators (KPI).
    2. Metrics/KPIs should be useful for the user/decision maker.
    3. Dashboard should inform rather than overwhelm.
    4. Should call attention to unusual metrics/KPIs that require attention or are of interest.

12.Excel Chart Elements:

Excel Chart Elements in Column Chart:

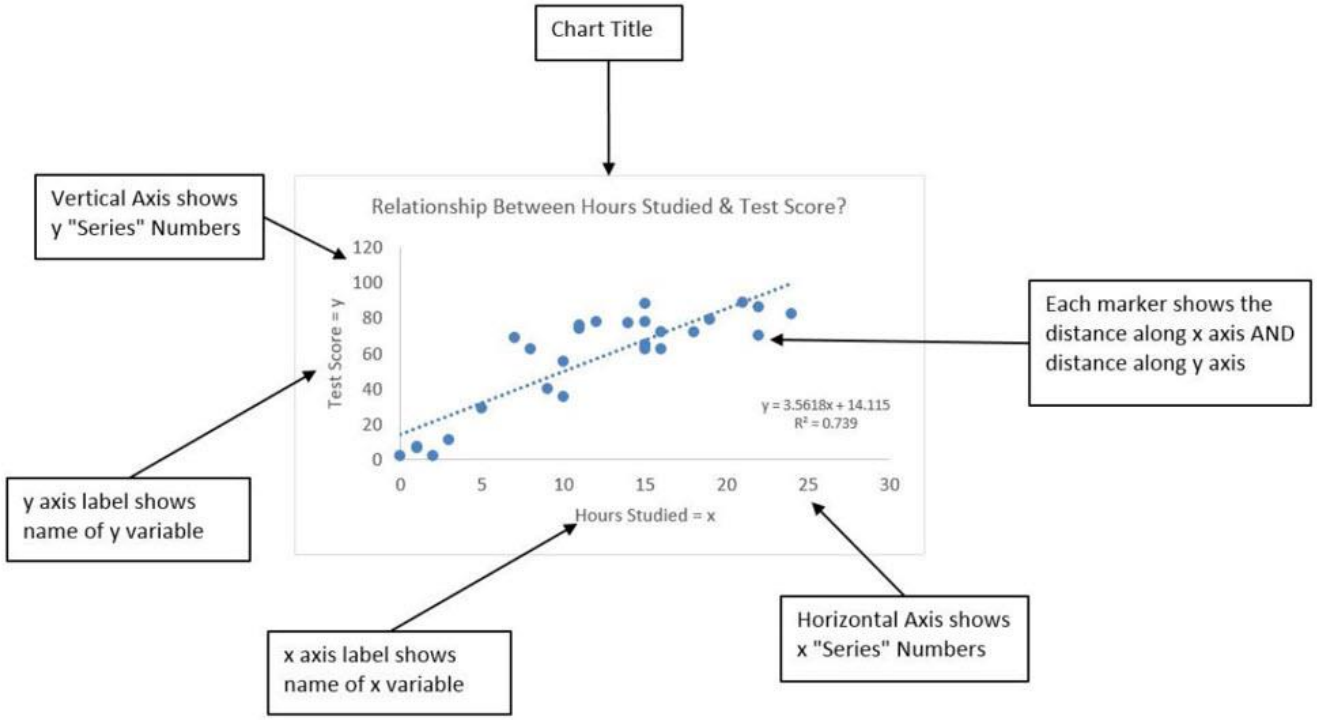
Sum of Sales ($)	SalesChannel			
Month	In Store Sales	Web Site Sales	E-mail Coupon	Grand Total
May	$6,206	$12,016	$3,275	$21,497
Jun	$17,351	$35,371	$5,328	$58,050
Jul	$11,360	$10,822	$1,555	$23,737
Aug	$28,722	$17,243	$5,913	$51,878
Sep	$7,995	$11,764	$1,913	$21,672
Grand Total	**$71,634**	**$87,216**	**$17,984**	**$176,834**



Source Data for X-Y Scatter Chart:

Hours Studied = x	Test Score = y
7	83
20	100
13	92
9	90
5	75
15	95
22	105
14	93
25	110
2	51
8	82
6	69
10	81
16	94
3	35
24	103
8	84
40	108
15	89
25	96

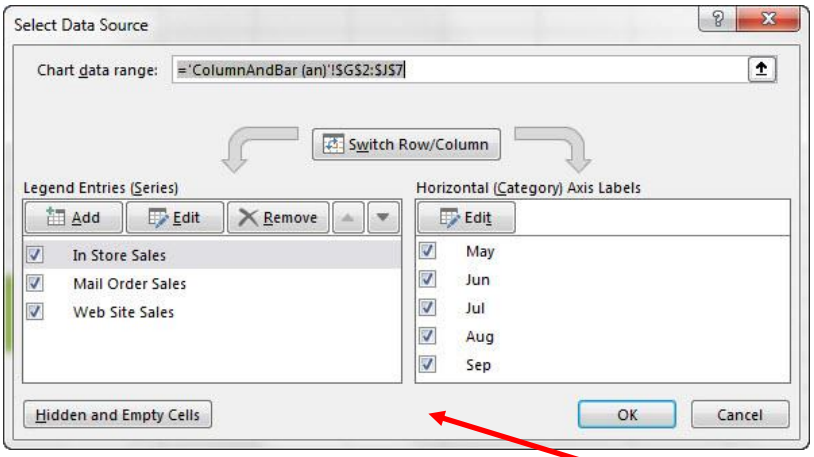
Excel Chart Elements in X-Y Scatter Chart:

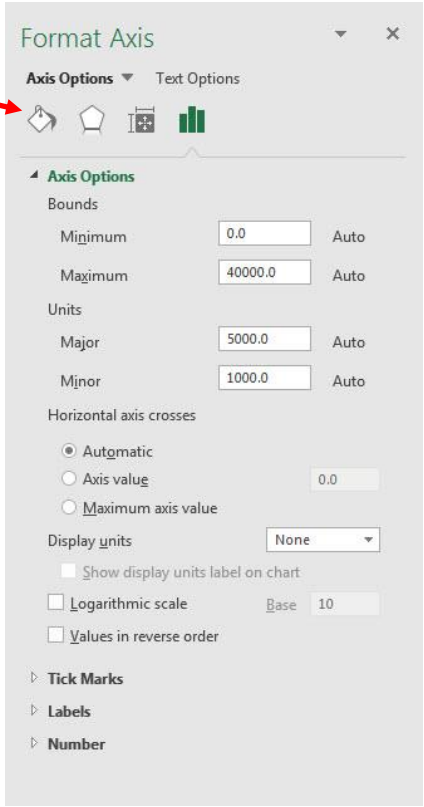


13. Format Chart Elements with

- Chart Elements Icon that shows up to the Right of the Chart.
- Chart Styles Icon that shows up to the Right of the Chart.
- Chart Filter Icon that shows up to the Right of the Chart (Be sure to click the Apply button).

- Format Chart Element with Task Pane (keyboard: Ctrl + 1).
  - * Task Pane changes depending on what element in chat you have selected
  - * Click the Icons at the top to see different options for chart element





14. Use "Select Data Source" dialog box to edit the ranges that the chart is pointing to

1) Open "Select Data Source "dialog box:
   - Right-click Chart and click on "Select Data"
   - Chart Tools Design Ribbon Tab, Data Group, Select Data button
2) Series = Number
3) Category = Labels.

15. Link Labels to Cells

1) Click on Chart Title
2) Type equal sign
3) Click on cell with label
4) Hit Enter

16. Chart Keyboards:

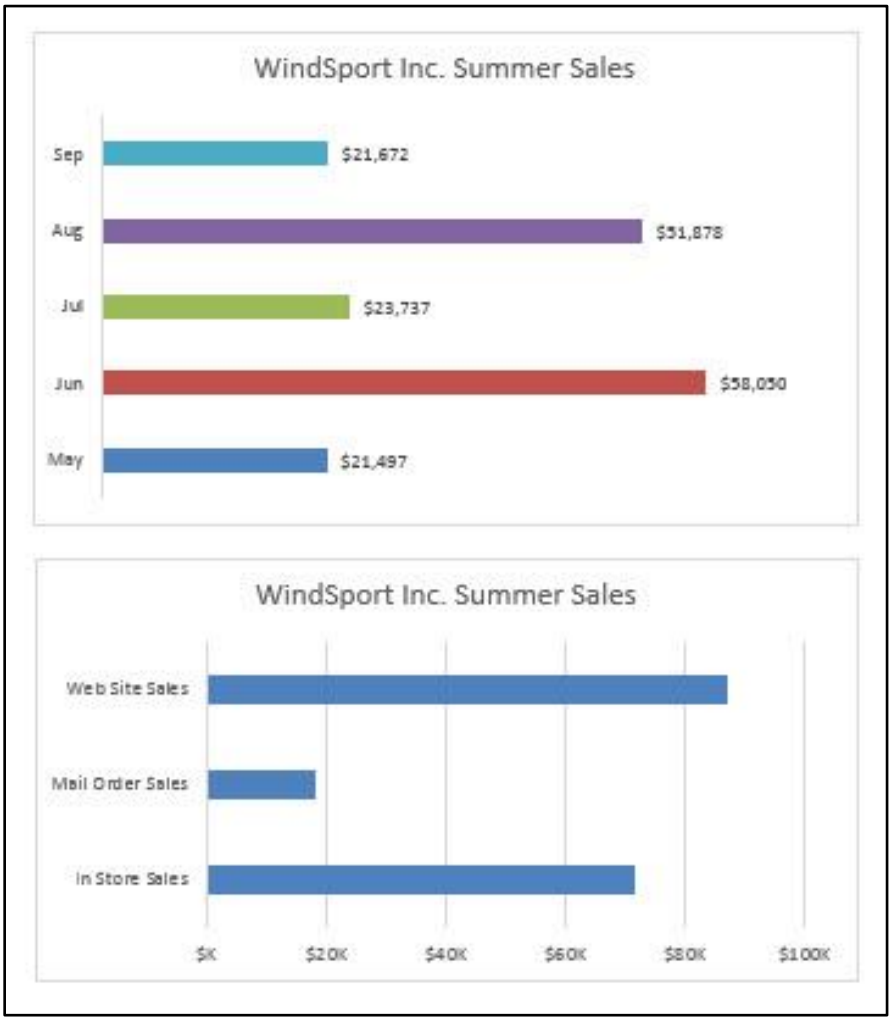
- F11 = Create Chart on a new sheet
- Alt + F11 = Create Chart on currently selected sheet.

17.Column Charts:

1) Use to compare differences across categories.
2) Column charts are more effective at conveying differences between categories than pie charts.
3) Height of column conveys number.
4) Categories are listed on Horizontal Axis or in Legend.
5) Gaps in columns:
    - Gaps between columns indicate that the data on the horizontal axis are:
        1. "Categorical" or "Qualitative" Variables (like words or names)
        2. Discrete Numbers (like counting 1, 2, 3 when there are gaps between numbers)
    - No gap between columns (columns touching) indicate that the data on the horizontal axis are:
        1. Continuous Quantitative data.
        2. There are no gaps between numbers, like with an upper and lower limit used in a Histogram Chart.
6) Column Chart Example:

18. Bar Charts

1) Same as column charts except:
    - Length of bar conveys number
    - If page is wider than tall, bars can emphasize differences more forcefully.
    - Long category labels are displayed on a single line (not wrapped).
2) Bar Chart Example:



19. Pie Charts:

1) Traditionally pie charts are used to compare differences across categories or to compare parts to the whole, usually expressed as percentages.
2) It is more effective to use Column or Bar Charts than Pie Charts:
    - Research shows that column/bar charts convey relative differences more effectively than pie charts.
    - People perceive differences across categories more precisely with column/bar charts than with pie charts.
    - In recent years data analysts and business intelligence experts prefer to use column or bar charts rather than pie charts.

20.Stacked Column Charts:

1) Good for displaying crosstabulation.
2) **Emphasis is on comparing the categories listed in the horizontal axis**
3) If the number of row headers are equal or greater than to the number of column headers, row headers show up on horizontal axis and column headers in legend. If not, they are reversed. (You can switch this with the Switch button in the Chart Tools Design Ribbon Tab)

21.Clustered Column Charts:

1) Good for displaying crosstabulation.
2) **Emphasis is on comparing the categories listed in the legend**
3) If the number of row headers are equal or greater than to the number of column headers, row headers show up on horizontal axis and column headers in legend. If not, they are reversed. (You can switch this with the Switch button in the Chart Tools Design Ribbon Tab)

Sum of Revenue	SalesChannel			
Month	In Store Sales	Mail Order Sales	Web Site Sales	Grand Total
May	$6,206	$3,275	$12,016	$21,497
Jun	$17,351	$5,328	$35,371	$58,050
Jul	$11,360	$1,555	$10,822	$23,737
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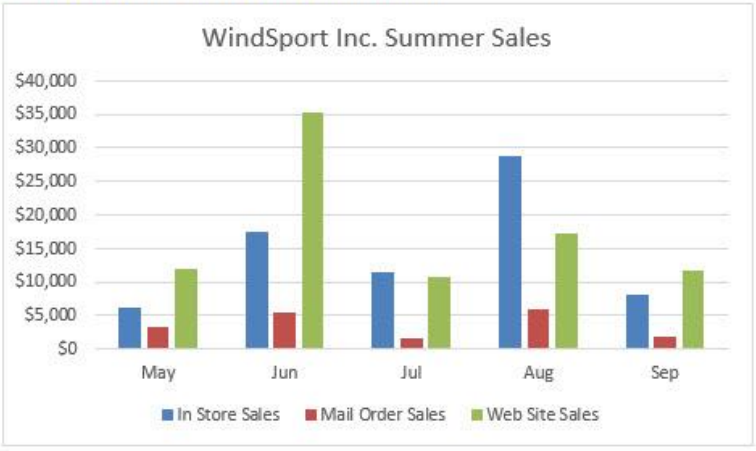
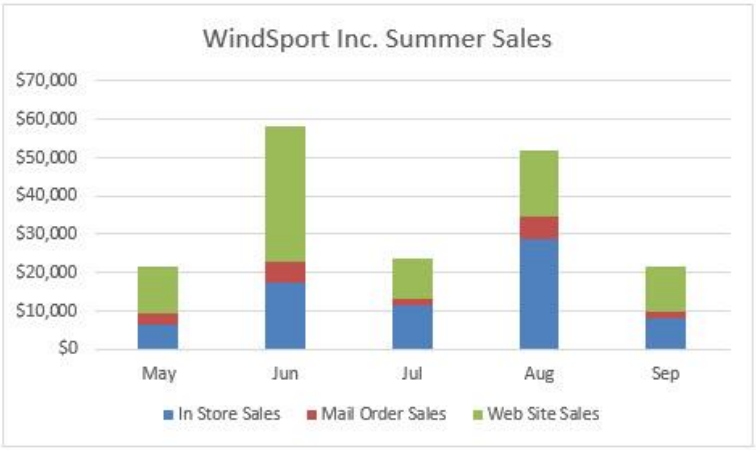
Sep	$7,995	$1,913	$11,764	$21,672
Grand Total	**$71,634**	**$17,984**	**$87,216**	**$176,834**

Clustered Column: Emphasize items in Legend:

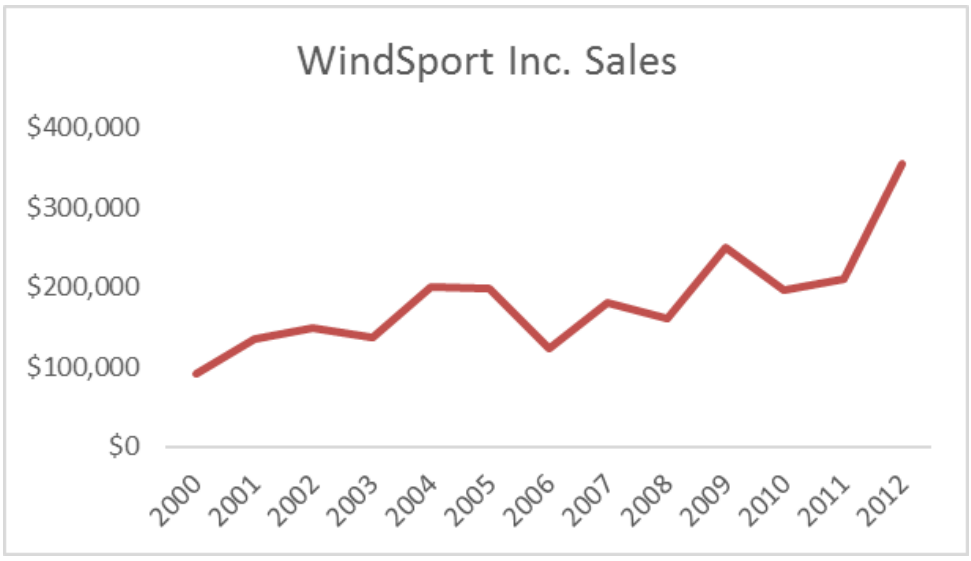


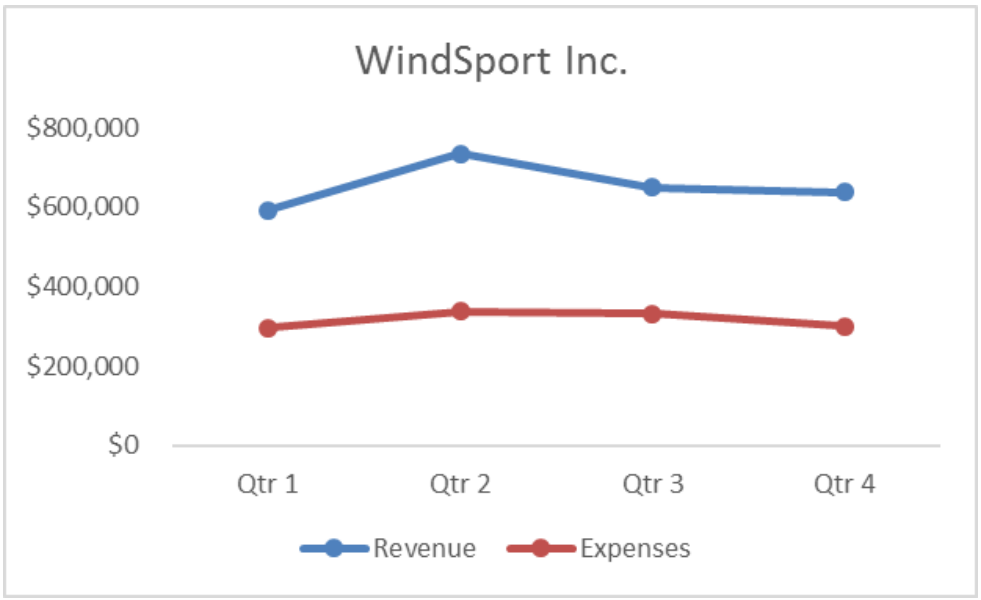
Stacked Column: Emphasize items in Horizontal Axis:



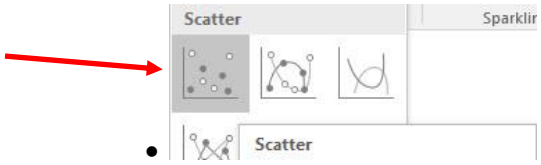
22.Line Charts

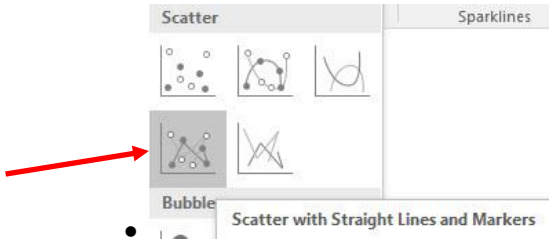
1) One number on vertical axis, category on horizontal axis.
2) Great for show trends over time.
    - Chart Time Series: Line Chart with time on horizontal axis and quantitative (number) variable on vertical axis.
3) Examples:



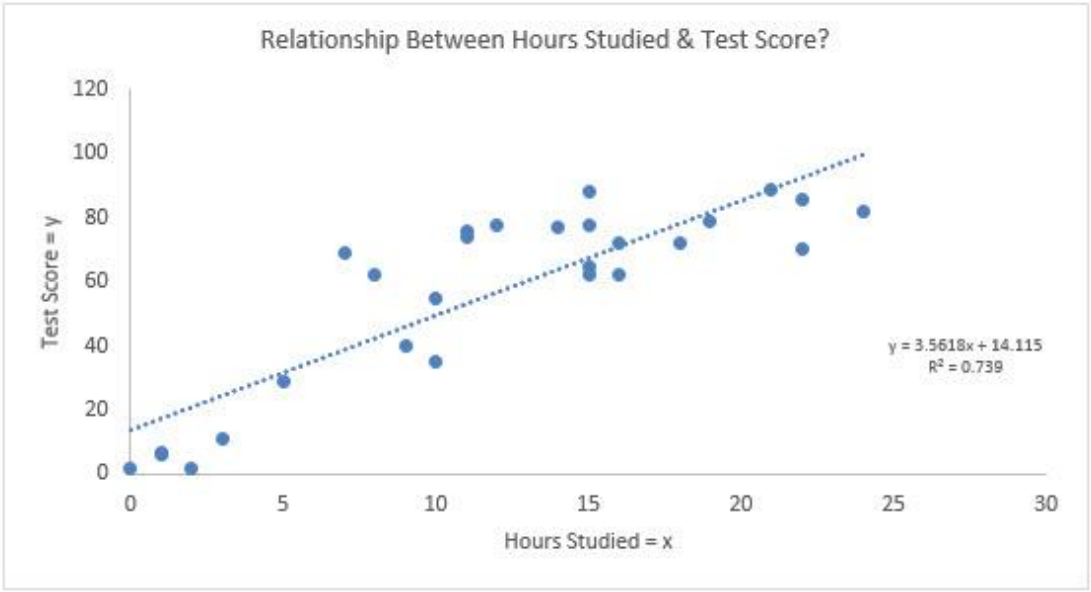


23.X-Y Scatter

1) Chart that shows the relationship between two quantitative (number) variables
    - Example: Is there a relationship between study time for a test and score on test?
2) One number on vertical axis, one number on horizontal axis:
    - Horizontal Axis = Independent Variable = x.
    - Vertical Axis = Dependent Variable = f(x) = y
3) Always put X values in Left Most Column in the Table of Data
    - This helps the chart understand which variable is x and therefore should be on horizontal axis.
4) Add Regression Line and Equation and R Square:
    - Right-click plotted scatter markers
    - Add Trendline
    - Select Linear
    - Check check box for Show Equation
    - Check check box for R Square
5) Overcome a common mistake by Excel users:
    - Use X-Y Scatter Plot Chart, not Line Chart when plotting X-Y Scatter Data
6) For sample data use the "Scatter" option:
    - 

7) For a model created with formulas, like for a Break-Even Analysis use the "Scatter with Straight Lines and Markers" option:
    - 

8) Example:



24. Video Examples Comparing Tables and Visualizations:

Information Presented in Table

Why Tables?

Want details of the numbers

Tables of Numbers help make precise comparisons

Information Presented Visually

Why Visualize?

Quick Visual Impression

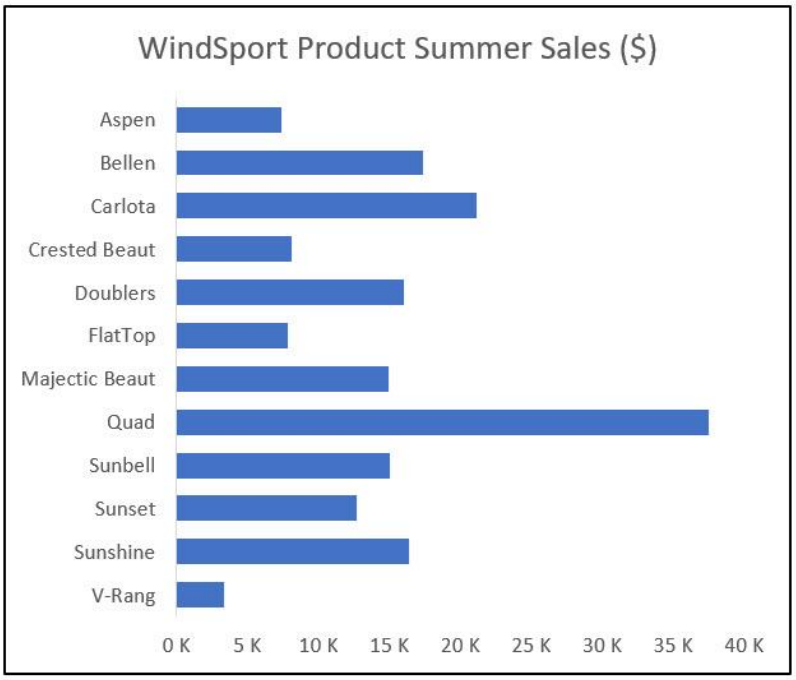
Pictures tell a Thousand Words

See Patterns and Trends

Make Relative Comparisons Quickly

WindSport Product Summer Sales ($)

Product	Sum of Revenue ($)
Aspen	7,377
Bellen	17,410
Carlota	21,195
Crested Beaut	8,107
Doublers	16,006
FlatTop	7,818
Majectic Beaut	14,919
Quad	37,491
Sunbell	15,077
Sunset	12,731
Sunshine	16,350
V-Rang	3,358
Grand Total	**177,839**



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Why Visualize?

Quick Visual Impression

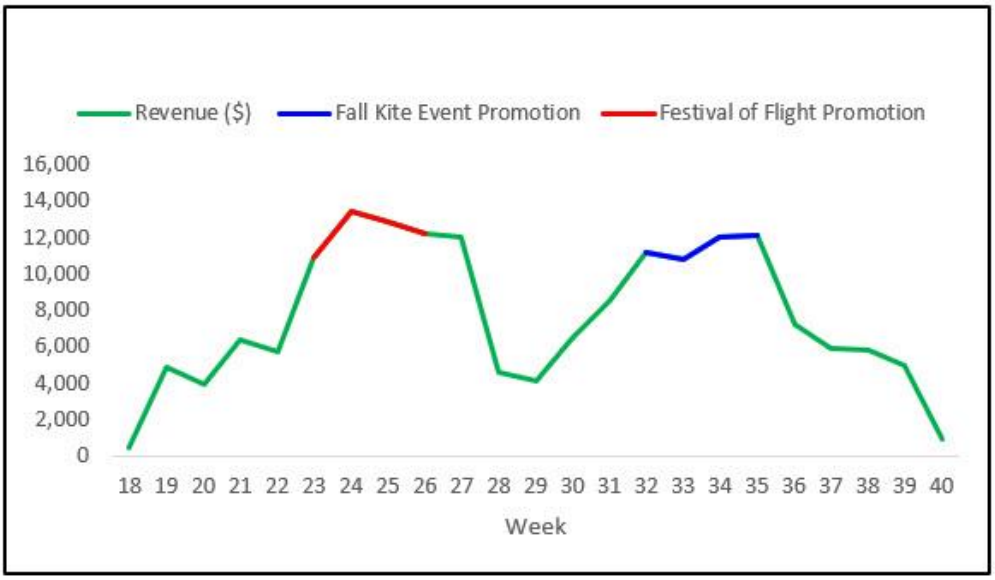
Pictures tell a Thousand Words

See Patterns and Trends

Make Relative Comparisons Quickly

WindSport Product Summer Sales ($)

Week	Revenue ($)
18	431
19	4,899
20	3,964
21	6,403
22	5,785
23	10,912
24	13,437
25	12,876
26	12,208
27	12,014
28	4,623
29	4,147
30	6,479
31	8,529
32	11,211
33	10,778
34	12,066
35	12,137
36	7,278
37	5,903
38	5,822
39	4,950
40	988
Grand Total	**177,839**



Information Presented in Table

Why Tables?

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Information Presented Visually

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Quick Visual Impression

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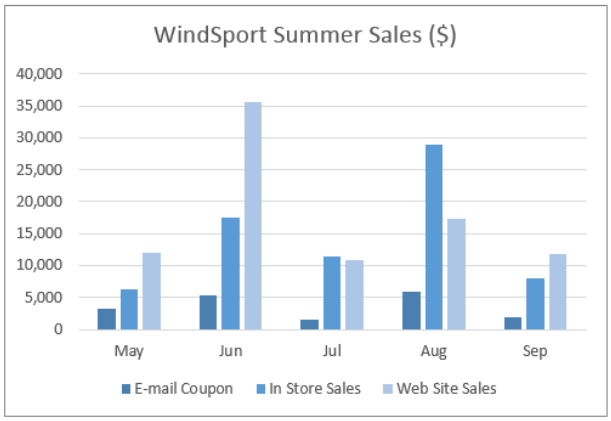
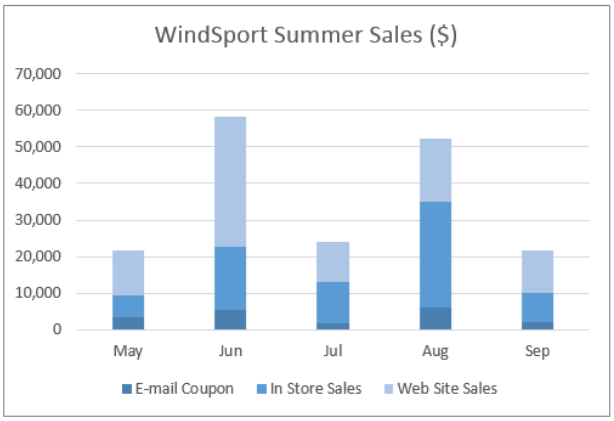
See Patterns and Trends

Make Relative Comparisons Quickly

WindSport Product Summer Sales ($)

Sum of Revenue ($)	SalesChannel			
Month	E-mail Coupon	In Store Sales	Web Site Sales	Grand Total
May	3,291	6,251	12,079	21,621
Jun	5,360	17,459	35,564	58,383
Jul	1,566	11,409	10,893	23,869
Aug	5,948	28,897	17,331	52,176
Sep	1,927	8,036	11,827	21,790
Grand Total	**18,093**	**72,052**	**87,694**	**177,839**





Information Presented in Table **Information Presented Visually**

Sometimes We Mix Tables, Numbers and Visualizations

WindSport Product Summer Sales ($)

Top 3

Product	Sum of Revenue ($)
Aspen	7,377
Bellen	17,410
Carlota	21,195
Crested Beaut	8,107
Doublers	16,006
FlatTop	7,818
Majectic Beaut	14,919
Quad	37,491
Sunbell	15,077
Sunset	12,731
Sunshine	16,350
V-Rang	3,358
Grand Total	**177,839**

Rule for effective Visualizations:

Eliminate extraneous elements in your visualization that do not help to deliver the message.

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1) Data-Ink ratio should be high

Product	Sum of Revenue ($)
Aspen	7,377
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Sunset	12,731
Sunshine	16,350
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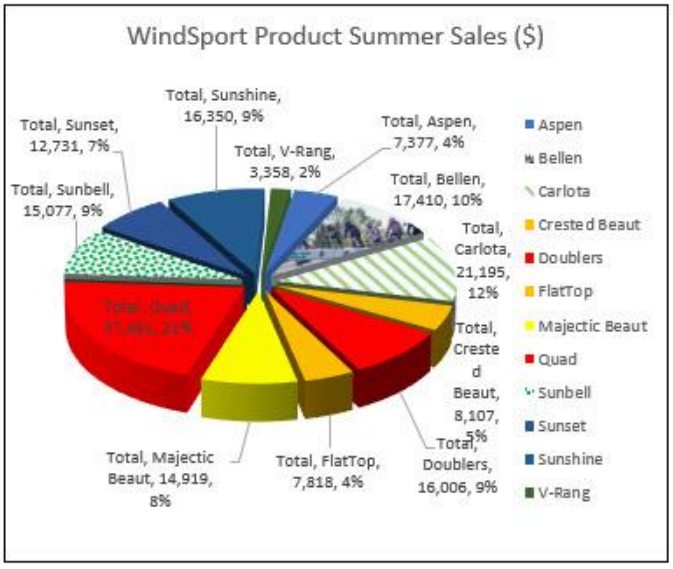
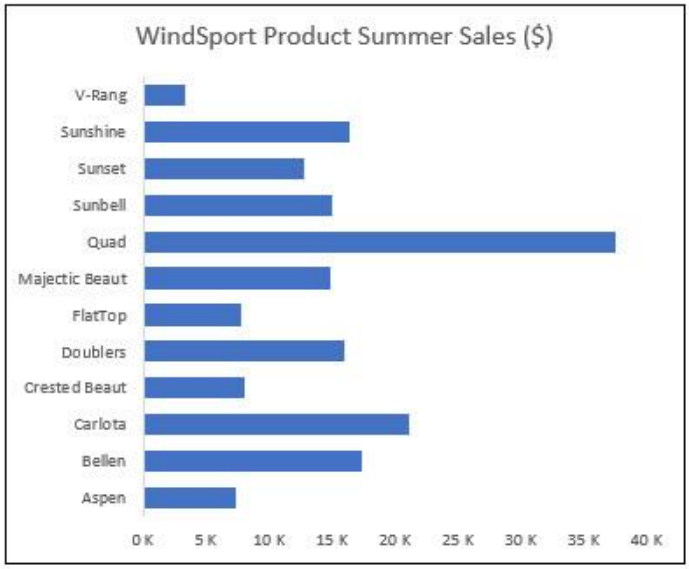
Grand Total	**177,839**

Product	Sum of Revenue ($)
Aspen	$7,377.44
Bellen	$17,410.4800
Carlota	$21,195.40
Crested Beaut	$8,107.09
Doublers	$16,006
FlatTop	$7,817.8900
Majectic Beaut	$14,919.1200
Quad	$37,490.8
Sunbell	$15,077
Sunset	$12,730.8400
Sunshine	$ 16,350
V-Rang	$3,357.9
Grand Total	$177,839.1500

2) No "Chart Junk"





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- Tables Design Principles
  1. Data-Ink Ratio should be high
  2. Horizontal lines are generally necessary only for separating column titles from data values or when indicating that a calculation has taken place.
  3. In large tables, light shading can be used to differentiate columns
  4. Numbers should be right aligned (Right is the visual cue that it is a number)
  5. Text should be left aligned (Left is the visual cue that it is a text)
  6. All numbers should have same number of digits
  7. Units must be indicated either with Number Formatting or Labels
  8. Large numbers may be rounded to dollar or thousands or millions and so on

SalesRep	2015 Total Sales ($)	2016 Total Sales ($)	% Change	Customer Accounts	Years with Company
Maricela Merritt	30346.7	32291.9235	0.0641	8	1
Dick Fish	340821.2	317577.1942	-0.0682	88	11
Carl Levin	53363.33	42338.4660	-0.2066	18	2
Wilford Snell	366373.12	348750.5729	-0.0481	74	10
Mabelle Longo	264435.35	220539.0819	-0.1660	89	11
Tyrone Pham	483572.75	494527.0949	0.0226	113	15
Chin Smithe	56195.37	43135.5660	-0.2324	33	6
Terica Mcswain	247830.8	227136.9282	-0.0835	45	10
Gigi Wilke	296267	289749.1260	-0.0220	96	13
Brook Unger	228739.45	221991.6362	-0.0295	63	9

SalesRep	2015 Total Sales ($)	2016 Total Sales ($)	% Change	Customer Accounts	Years with Company
Maricela Merritt	30,347	32,292	6.41	8	1
Dick Fish	340,821	317,577	-6.82	88	11
Carl Levin	53,363	42,338	-20.66	18	2
Wilford Snell	366,373	348,751	-4.81	74	10
Mabelle Longo	264,435	220,539	-16.60	89	11
Tyrone Pham	483,573	494,527	2.26	113	15
Chin Smithe	56,195	43,136	-23.24	33	6
Terica Mcswain	247,831	227,137	-8.35	45	10
Gigi Wilke	296,267	289,749	-2.20	96	13
Brook Unger	228,739	221,992	-2.95	63	9

Steps to Format Table

1) Remove All Formatting (Home Ribbon Tab, Editing group, Clear dropdown, Clear Formats (Alt, E, A, F) (Alt, H, E, F)
2) Light Fill Color
3) Number Formatting
4) Paste Special, Operation, Multiply by 100
5) Bottom Border
6) Column Widths
7) Copy Paste Special Picture
8) Page Setup

26. Video Example for Conditional Formatting:

Top Five in Green

Sum of Revenue ($)	SalesChannel			
Month	E-mail Coupon	In Store Sales	Web Site Sales	Grand Total
May	3,291	6,251	12,079	21,621
Jun	5,360	17,459	35,564	58,383
Jul	1,566	11,409	10,893	23,869
Aug	5,948	28,897	17,331	52,176
Sep	1,927	8,036	11,827	21,790
Grand Total	**18,093**	**72,052**	**87,694**	**177,839**

Heat Map: Blue = Bid | White = Mid | Red = Small

Sum of Revenue ($)	SalesChannel			
Month	E-mail Coupon	In Store Sales	Web Site Sales	Grand Total
May	3,291	6,251	12,079	21,621
Jun	5,360	17,459	35,564	58,383
Jul	1,566	11,409	10,893	23,869
Aug	5,948	28,897	17,331	52,176
Sep	1,927	8,036	11,827	21,790
Grand Total	**18,093**	**72,052**	**87,694**	**177,839**

27.Video Example for Column, Bar and Pie Charts:

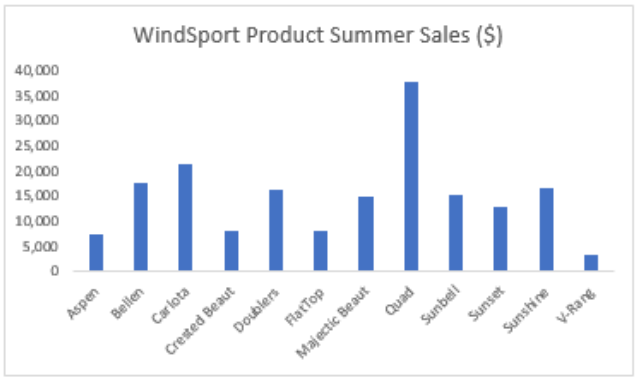
Product	Sum of Revenue ($)
Aspen	7,377
Bellen	17,410
Carlota	21,195
Crested Beaut	8,107
Doublers	16,006
FlatTop	7,818
Majectic Beaut	14,919
Quad	37,491
Sunbell	15,077
Sunset	12,731
Sunshine	16,350
V-Rang	3,358
Grand Total	**177,839**

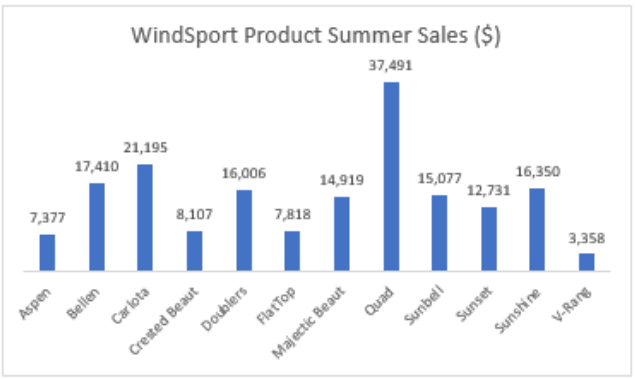
Column, Bar, Pie

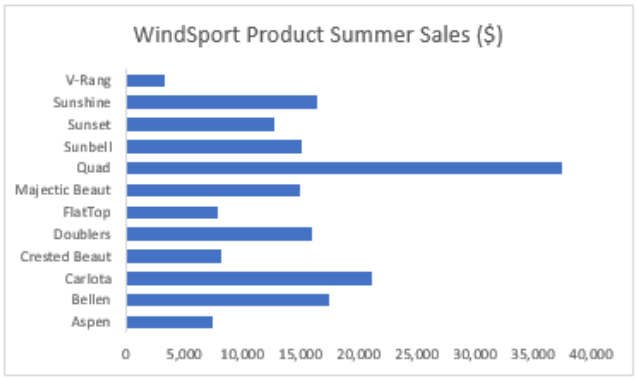
Use to compare differences across categories.

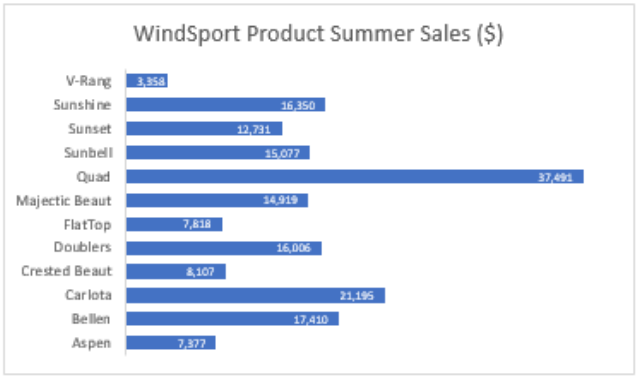
Research shows that Column and Bar convey differences across categories more effectively than Pie.

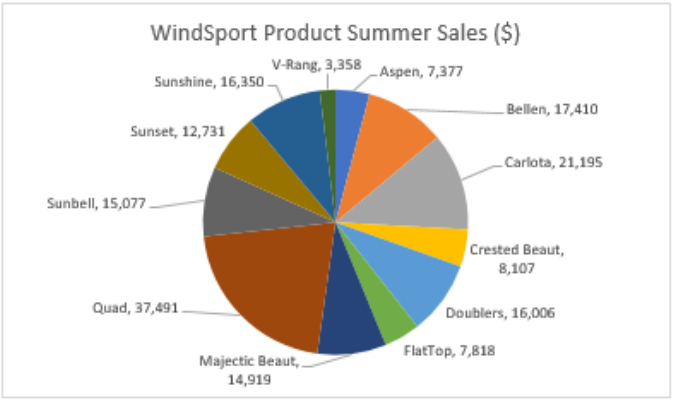
Bar accommodates longer labels, and emphasizes differences more forcefully that Columns.









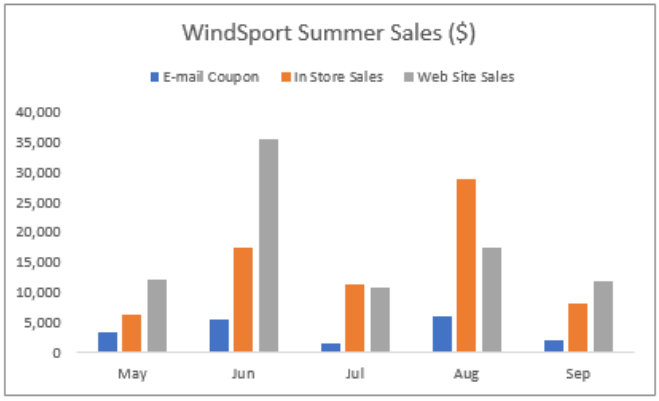


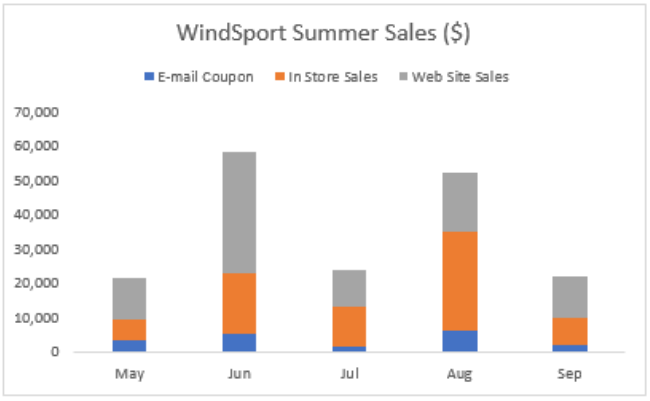
28.Video Example for Cross Tab Charts:

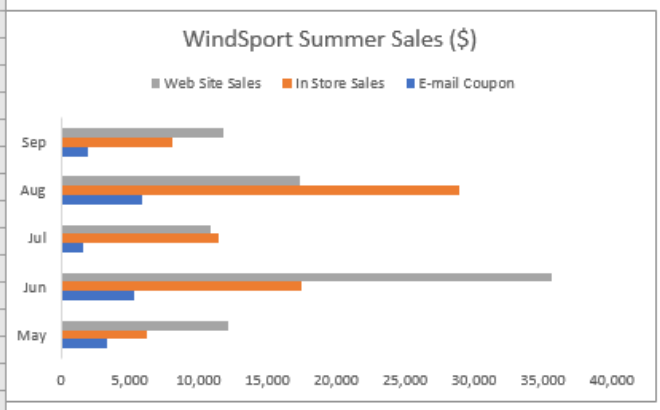
- ***Stacked Column/Bar Chart***: Good for displaying crosstabulation, emphasis on horizontal axis categories.
- ***Clustered Column/Bar Chart***: Good for displaying crosstabulation, emphasis on legend categories.

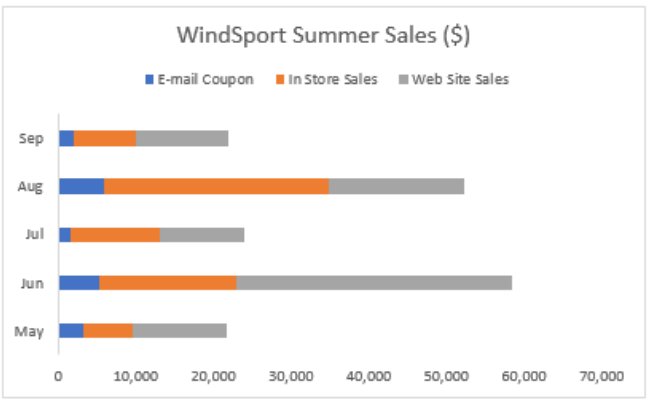
WindSport Summer Sales ($)

Sum of Revenue ($)	SalesChannel			
Month	E-mail Coupon	In Store Sales	Web Site Sales	Grand Total
May	3,291	6,251	12,079	21,621
Jun	5,360	17,459	35,564	58,383
Jul	1,566	11,409	10,893	23,869
Aug	5,948	28,897	17,331	52,176
Sep	1,927	8,036	11,827	21,790
Grand Total	**18,093**	**72,052**	**87,694**	**177,839**



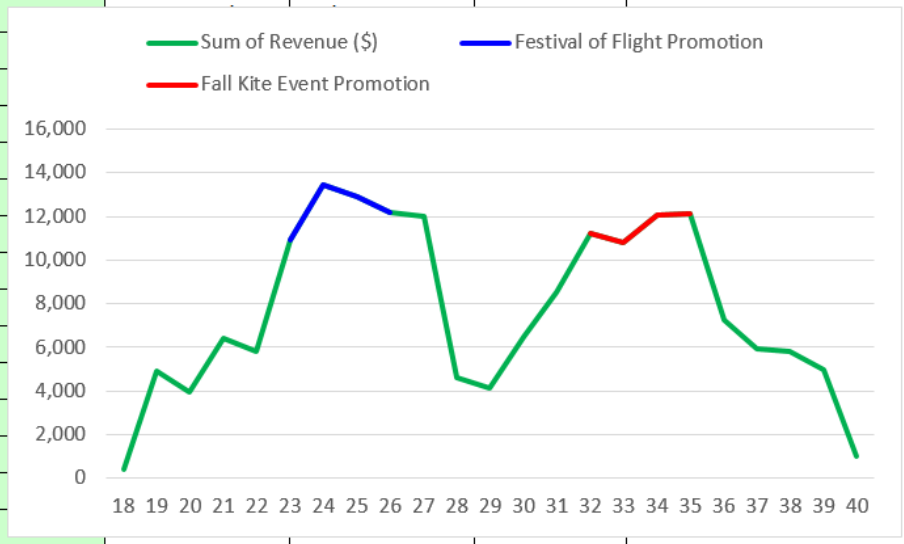






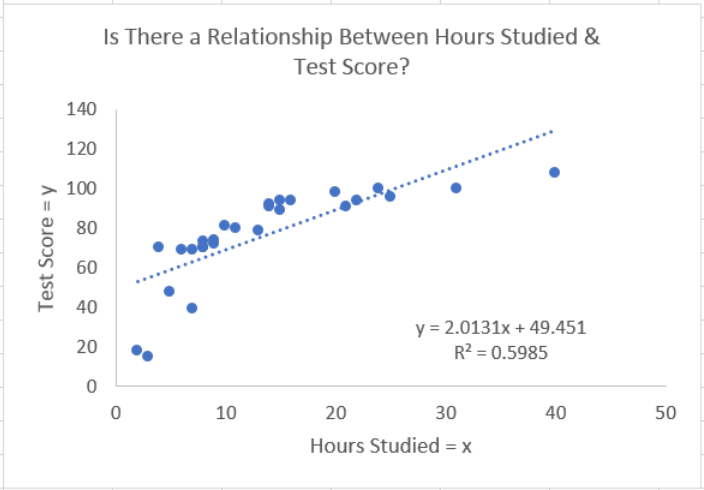
29.Video Example of Line Chart:

	D	E	F	G	H	I	J	K	L
1		**Promotions:**							
2		Fall Kite Event							
3		Festival of Flight							
4									
5	**Promotion?**	**Festival of Flight Promotion**	**Fall Kite Event Promotion**	**SalesChannel**	**Product**	**Revenue ($)**		**Week**	**Sum of Revenue ($)**
6	None	#N/A	#N/A	In Store Sales	Doublers	160.04		18	431
7	None	#N/A	#N/A	In Store Sales	Sunshine	40.76		19	4,899
8	Festival of Flight	75.62	#N/A	E-mail Coupon	Crested Beaut	75.62		20	3,964
9	None	#N/A	#N/A	Web Site Sales	Quad	99.29		21	6,403
10	None	#N/A	#N/A						5,785
11	Festival of Flight	28.28	#N/A						10,912
12	None	#N/A	#N/A						13,437
13	None	#N/A	#N/A						12,876
14	None	#N/A	#N/A						12,208
15	None	#N/A	#N/A						12,014
16	Festival of Flight	66.85	#N/A						4,623
17	None	#N/A	#N/A						4,147
18	None	#N/A	#N/A						6,479
19	None	#N/A	#N/A						8,529
20	None	#N/A	#N/A						11,211
21	None	#N/A	#N/A						10,778
22	None	#N/A	#N/A						12,066
23	None	#N/A	#N/A						12,137
24	None	#N/A	#N/A						7,278
25	None	#N/A	#N/A	Web Site Sales	Carlota	69.85		37	5,903
26	None	#N/A	#N/A	In Store Sales	Quad	99		38	5,822
27	Festival of Flight	68.39	#N/A	In Store Sales	Quad	68.39		39	4,950
28	None	#N/A	#N/A	Web Site Sales	FlatTop	28.92		40	988
29	None	#N/A	#N/A	In Store Sales	Carlota	46.85		**Grand Total**	**177,839**



30.Video Example of X-Y Scatter:

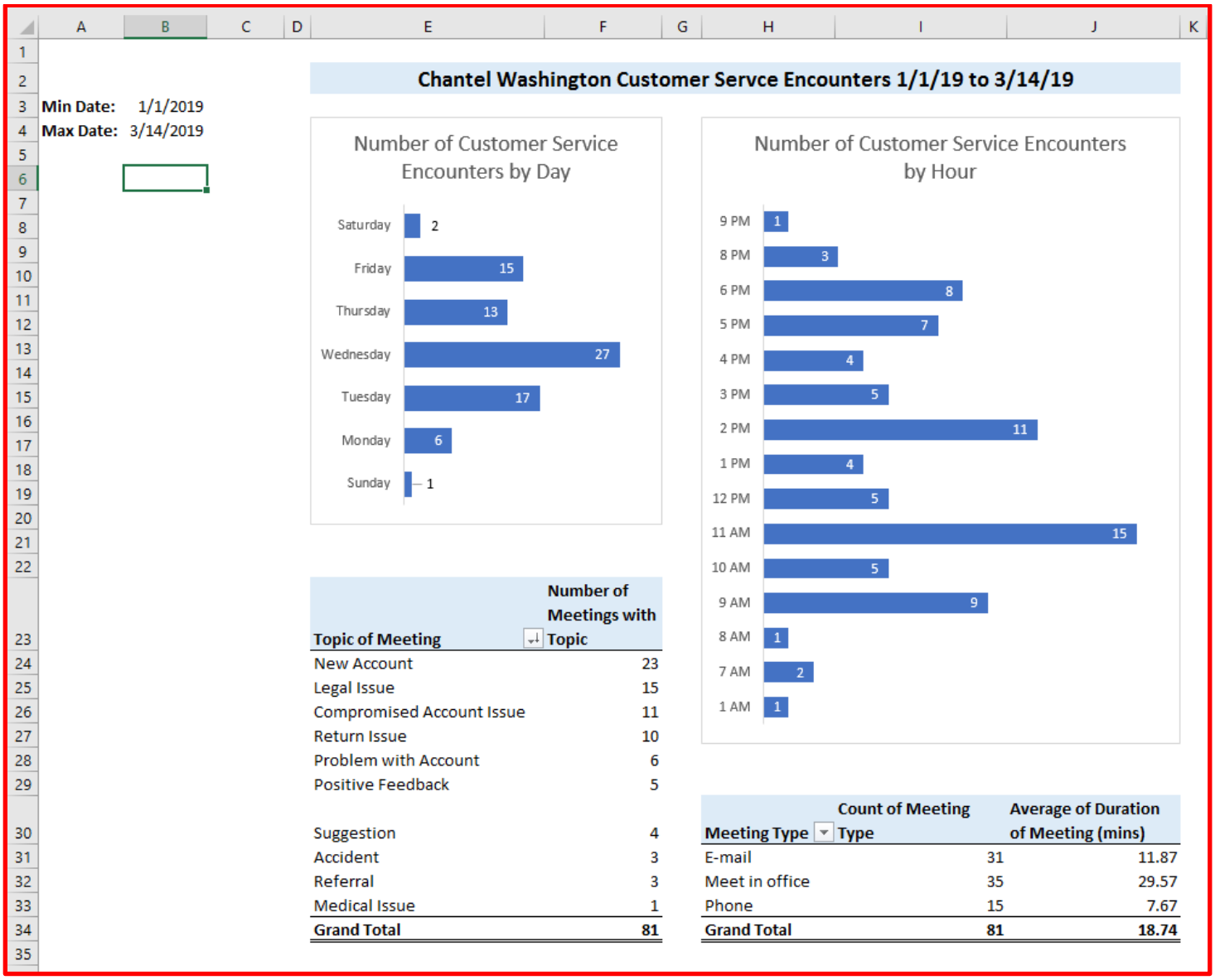
	A	B	C	D	E	F	G	H	I	J	K
1	Hours Studied = x	Test Score = y			Title:	Is There a Relationship Between Hours Studied & Test Score?					
2	7	69									
3	20	98									
4	13	79									
5	9	72									
6	5	48									
7	15	94									
8	22	94									
9	14	92									
10	31	100									
11	2	18									
12	8	70									
13	6	69									
14	10	81									
15	16	94									
16	3	15									
17	24	100									
18	8	73									
19	40	108									
20	15	89									
21	25	96									
22	21	91									
23	7	39									
24	9	74									
25	11	80									
26	14	91									
27	4	70									
28	8	70									



31. Video Example of Dashboard:

Goals of Dashboard:

- Chantel Washington is a manager who works at large hardware and lumber store with many customer accounts.
- Customer service is not part her main duty
- The manager wants to document the excessive customer service duties she is performing
- The manager wants to build a dashboard with a number of tables and charts
- The manager needs a quick visual impression of frequency of customer contact by hour and a second visual of frequency of customer contact by day
- The manager wants to see specific counts for topics of meeting, counts of meeting type (as a %) and the average meeting duration
- The manager wants to have the dashboard update easily when she adds new records
- Needs to print out the dashboard about once a week



Topic of Meeting	Number of Meetings with Topic
New Account	23
Legal Issue	15
Compromised Account Issue	11
Return Issue	10
Problem with Account	6
Positive Feedback	5
Suggestion	4
Accident	3
Referral	3
Medical Issue	1
Grand Total	**81**

Meeting Type	Count of Meeting Type	Average of Duration of Meeting (mins)
E-mail	31	11.87
Meet in office	35	29.57
Phone	15	7.67
Grand Total	**81**	**18.74**