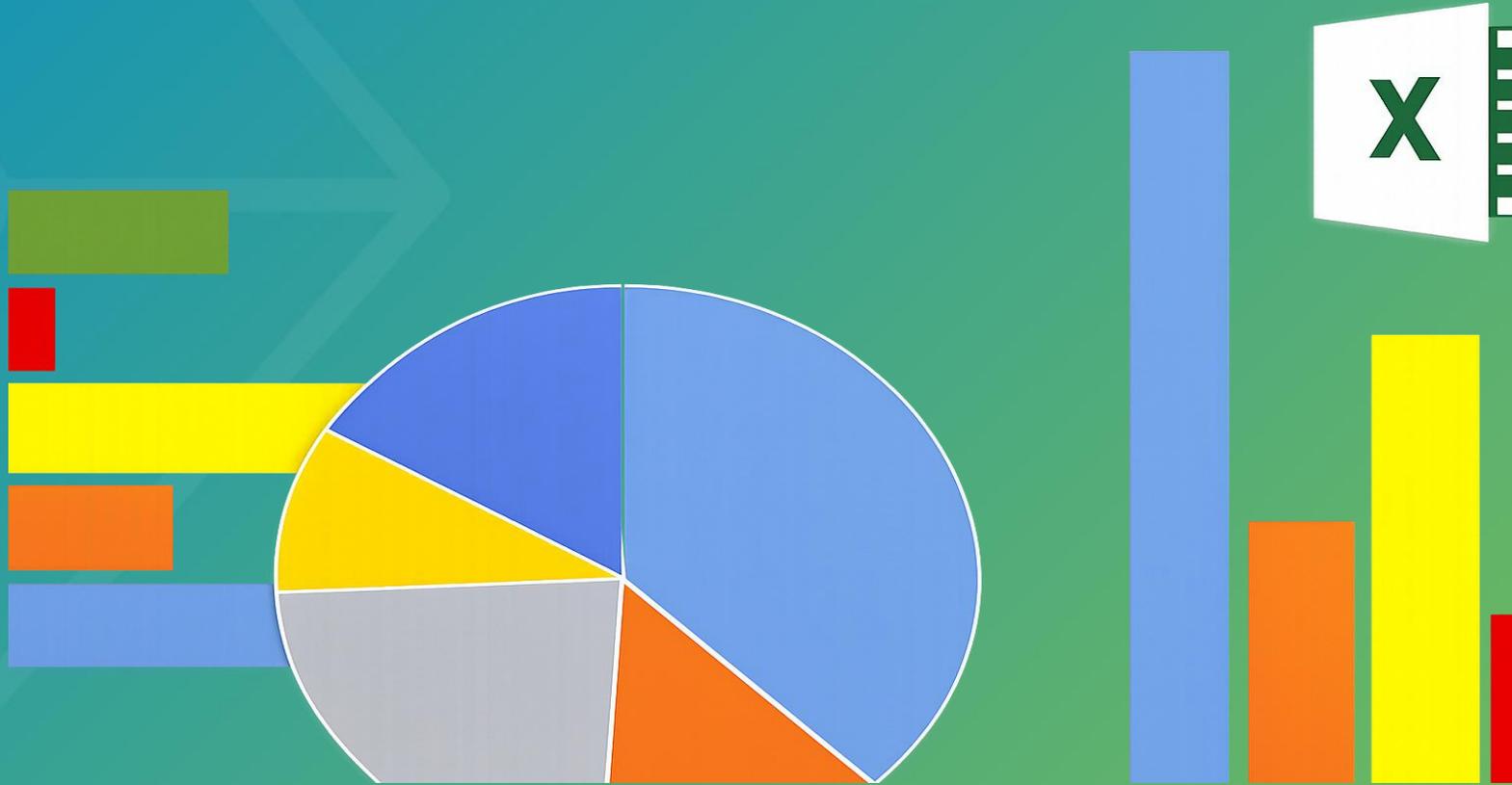


# Charts in Excel



Presented By:  
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One minute.  
Big **impact**.  
Complete the **session  
feedback** form.



# Jeffrey A. Lee, CIAO / S



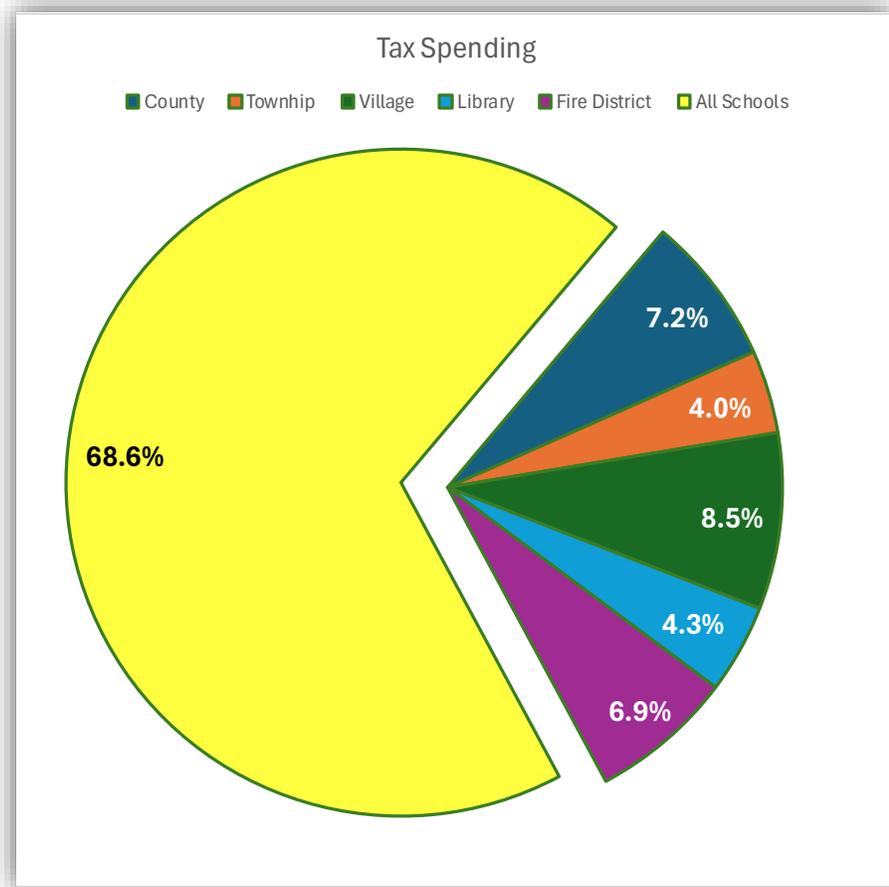
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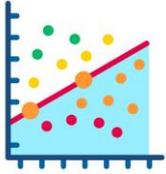
# Charts in Excel



## Why Use Charts

Using charts in Excel can turn raw numbers into something people can visually understand. There are numerous charts to assist in visualization, communication, data simplification, and decision making.

# Common Chart Types



## Scatter Plot

Displays the relationship between two variables



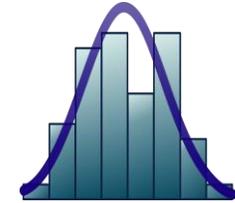
## Bar Chart

Useful for comparing categories and changes over time



## Pie Chart

Useful for showing proportions of whole



## Histogram

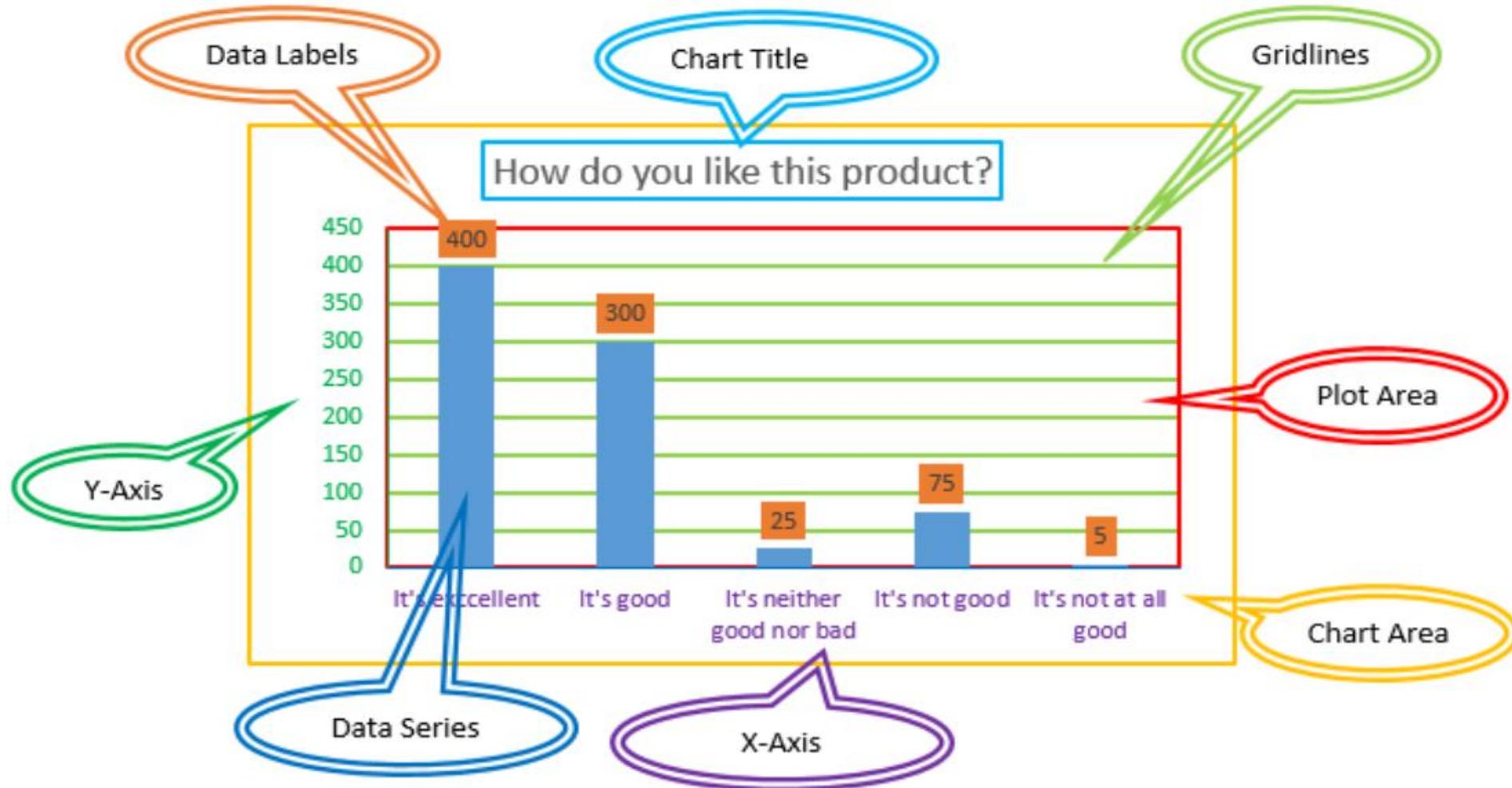
Displays the distribution or the spread of data

There are many types of charts within Excel with many ways to edit and format the charts to achieve and display the desired results

# Common Usage of Charts for Assessment Purposes

- Level of Assessment (LOA) – Compare LOA between areas, neighborhoods, models, construction styles or living square footage.
- Sale Price changes over time.
- Sale Price per square foot illustrating economies of scale.
- Sale Price compared to Assessed Value.
- Show trends and forecast future.
- Assist in creating models for valuation both land and improvement values.
- Outliers Outliers Outliers find those observations that need further review.

# Chart Parts / Elements



## Prepare Your Data

- Know your data. Whether it is queried from a database or if it is created in-house, make sure you capture the data accurately. GARBAGE IN GARBAGE OUT!!!
- When creating a chart, Excel can automatically select the entire range of your data and headers or the data range can be specified by the user.
- Do not have empty columns or rows. Keep data in a continuous block. This ensures Excel will capture all data.
- Use descriptive and unique column headings or row labels in the top columns or first row of data.

## Chart Basics – Inserting a Chart

- Select data to be graphed.
- Click “Insert” to add a chart.
- Select the desired Chart or use “Recommended Charts”.
- After selecting a Chart, new ribbon tabs are available; “Chart Design” and “Format”.
- “Add Chart Element” allows for adding desired elements such as titles, trendlines, data labels, and formatting options for each element.
- The “Quick Layout” option provides different styles that can be easily and quickly applied.
- The “Format” tab allows for many customizations.

# Inserting a Chart – Excel screen shot

The screenshot shows the Microsoft Excel interface. The 'Insert' tab is active, and the 'Recommended Charts' button is highlighted with a red box. Below the ribbon, a data table is visible:

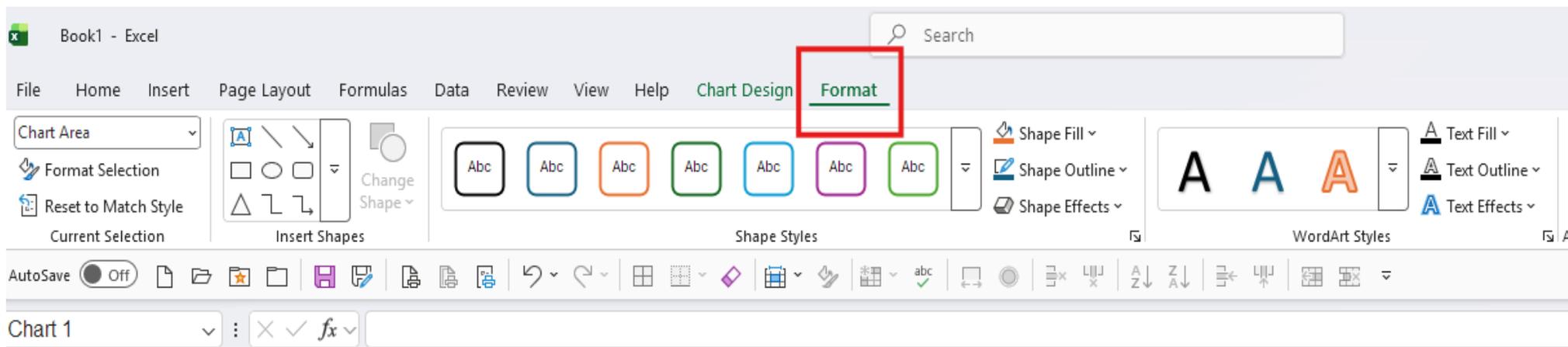
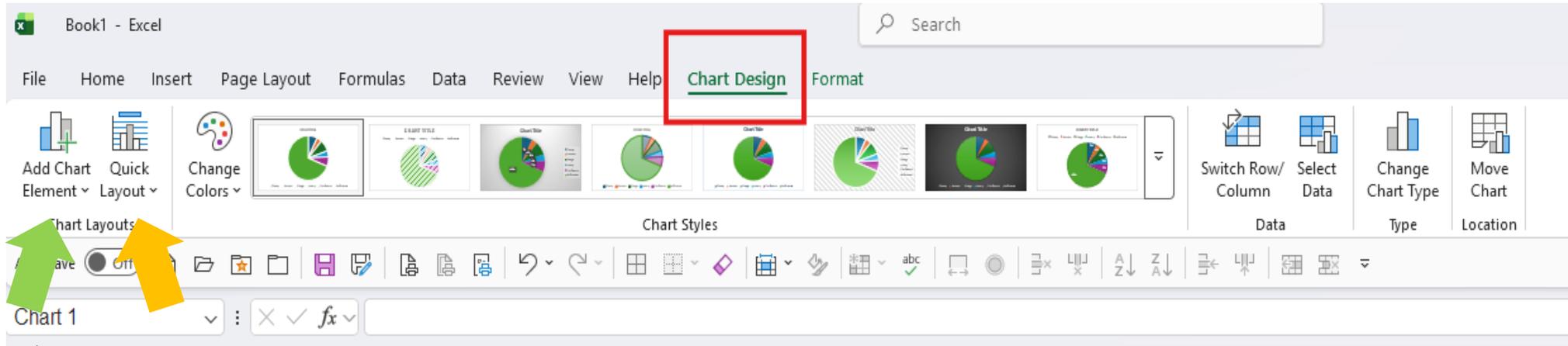
Jurisdiction	Percent
County	7.2%
Township	4.0%
Village	8.5%
Library	4.3%
Fire District	6.9%
All Schools	68.6%

A pie chart titled 'Tax Spending' is displayed, showing the distribution of tax spending across these jurisdictions. The largest slice is 'All Schools' at 68.6%.

The 'Change Chart Type' dialog box is open, showing various chart options. The 'Pie' chart type is selected, and a red box highlights the 'Pie' chart icon in the 'Recommended Charts' section. A text box explains: 'A pie chart is used to show proportions of a whole to show numbers that relate to a larger sum and equal 100%. Do not use this chart if it contains multiple slices as angles are hard to estimate.'

# Chart Design and Format

## Menu Choices – Excel screen shot



# Chart Basics – Inserting Trendline and Formula

- A trendline in Excel charts is a visual tool that helps you see the overall direction or pattern in your data. It's essentially a statistical trend drawn on top of your chart to make patterns easier to see. It is also a representation of the line of best fit.
- Excel lets you add trendlines to charts such as scatter plots, line charts, and column charts.
- Trendlines are useful to:
  - Identify whether values are increasing, decreasing, or staying steady.
  - Understand relationships between variables.
  - Make predictions or forecasts, (modeling).
  - Highlight patterns that aren't obvious from raw data.

# Chart Basics – Inserting Trendline and Formula

- A trendline formula can be added to the chart. It is the mathematical equation Excel calculates to describe the trendline.
- A trendline formula can be utilized in developing valuation models. The formula can be used within a CAMA system and/or an Excel spreadsheet.
- A linear trendline is the most commonly used type. It represents the straight line that best approximates the best fit of data points in a scatter plot. The resulting linear formula creates a simple mathematical formula.
- Other trendlines interpret curved data patterns – non linear, not a straight line. Those trendline formulas can also be utilized but they are a little more difficult.

# Inserting a Trendline and Formula – Excel screen shot

Excel Charts live examples 2-23-26

File Home Insert Page Layout Formulas Data Review View Help **Chart Design** Format

Add Chart Element Quick Layout Change Colors Chart Styles

Switch Row/Column Select Data Change Chart Type Move Chart

Chart Elements

- Axes
- Axis Titles
- Chart Title
- Data Labels
- Data Table
- Error Bars
- Gridlines
- Legend
- Lines
- Trendline**
  - None
  - Linear
  - Exponential
  - Linear Forecast
  - Moving Average
  - More Trendline Options...
- Up/Down Bars

Market Factor

Sale Ratio using Line

Market Factor Constant

Market Factor Constant	
Count	95
Median	1.4975
Mean	1.5466
Min	1.0257
max	2.3682
Range	1.3425
Abs Avg Dev	0.2571
Std Dev	0.1726

SR Trend

SR Trend	
Count	
Median	
Mean	
Min	
max	
Range	
Abs Avg Dev	
Std Dev	

Format Trendline

Trendline Options

- Exponential
- Linear**
- Logarithmic
- Polynomial
- Power
- Moving Average

Trendline Name

- Automatic
- Custom

Forecast

- Forward
- Backward

Set Intercept

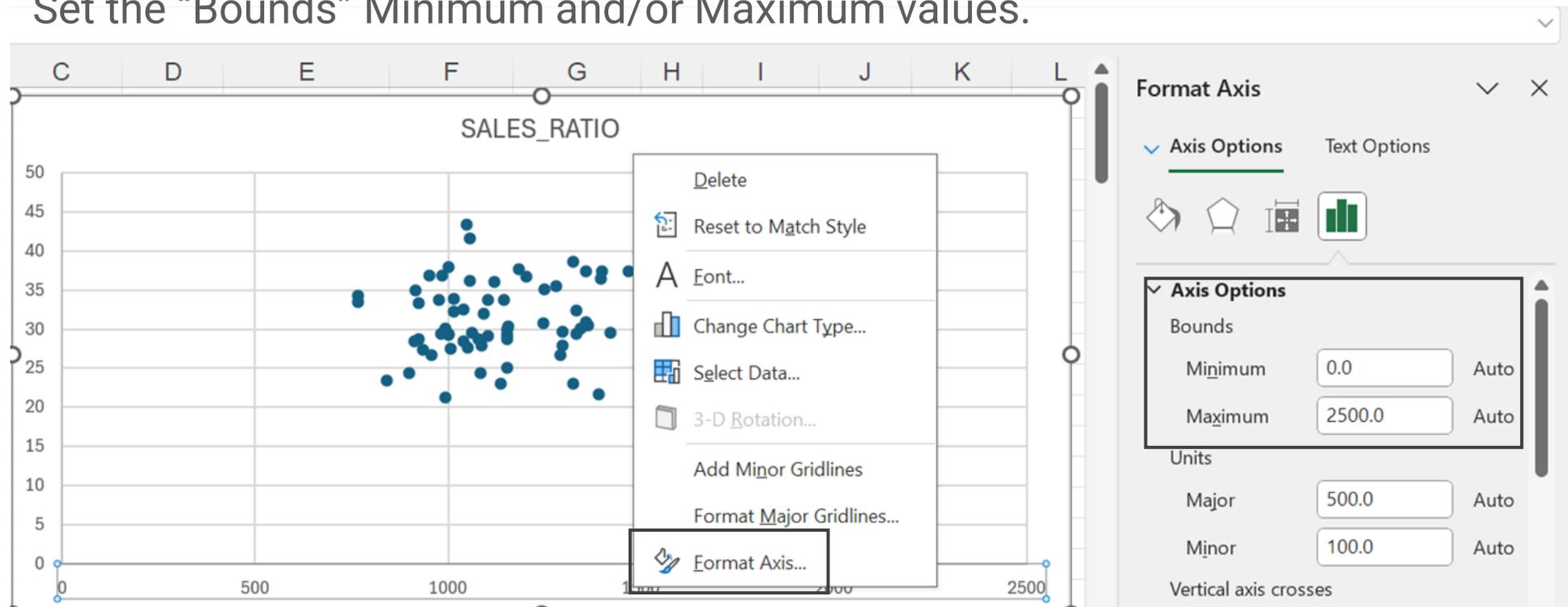
Display Equation on chart

Display B-squared value on chart

# Edit a Chart – Change the Bounds

Excel Charts begins a chart at 0 on the Vertical and or Horizontal axis (X and Y axis). This can be changed to improve data visualization in a more concise, focused way.

- Select the Vertical and/or Horizontal axis.
- Choose “Format Axis” the “Axis Options”.
- Set the “Bounds” Minimum and/or Maximum values.



## Setting the X and Y axis

- X-axis aka Independent Variable is normally displayed on the Horizontal Axis.
  - It displays the variable that controls or is used as a basis for comparison.
  - Common examples for assessment purposes would be time or square footage.
- Y-axis aka Dependent Variable is normally displayed on the Vertical Axis.
  - It is the variable that changes because of changes to the independent variable.
  - Common examples for assessment purposes would be percent change, level of assessment, market value or price per square foot.
- Excel will set the X and Y axis automatically based on the data selected. Excel can incorrectly assign the X-axis and Y-axis. It can be adjusted by using “Chart Design”, “Select Data”, “Edit”, then edit cell ranges.

# Database Functionality – Format As Table

- Converting the data into an Excel Table enhances functionality.
- Tables help visualize and summarize data.
- Multiple table styles and customization options are available.
- From the Home tab, select "Format as Table," check the data range, and indicate if there is a header row. A new "Table Design" tab appears on the ribbon.
- A table creates named ranges based on column headers.
- When rows/columns are added, each is auto-formatted to match the existing table.
- Formulas auto-populate across cells.
- Filter icons enable sorting and filtering.
- To remove Table Formatting select "Convert to Range".

# Filtering and the Changes to Charts

Filtering in Excel is a powerful way to control what data appears in your chart without deleting or rearranging the database or chart. When you filter a dataset, Excel automatically updates any connected chart with the data that meets the criteria – filter selection. Also, the database only displays the applicable rows meeting the criteria – filter selection. It does not delete data from the dataset. Filters can be cleared to reset the database.

- To begin filtering, select “Data” then “Filter”.
- A drop-down triangle appears on the column headers.
- When a column is filtered the icon looks like martini glass.
- There are numerous way to filter; by color, greater than or less than, select individual observations such as neighborhood. All which can produce different results.

# Data Filter– Excel screen shot

The screenshot shows the Microsoft Excel interface with a data table. The 'Data' tab is active, and the 'Filter' button in the 'Sort & Filter' group is highlighted with a red box. A context menu is open over the 'TOTAL\_MV\_PSF' column header, also highlighted with a red box. The menu includes options for sorting (Smallest to Largest, Largest to Smallest), filtering by color, and number filters. The number filter sub-menu is open, showing a list of values with checkboxes. The table data is as follows:

PIN	Sale Date	Sale Price	Year Built	AGLA	SALES_PRICE_PER_SF	SALES_RATIO_BOR	BLDG_AV	PER_SF	TOTAL_MV_PSF
0227203011	8/6/2023	565000	2004	2766	204.27	36.99			
0605301025	8/16/2024	429500	2007	2468	174.03	36.12			
0605301048	6/1/2023	454000	2006	2400	189.17	32.87			
0227401003	3/31/2025	464900	2002	2471	188.14	30.68			
0227401003	7/10/2024	305000	2002	2471	123.43	46.76			
0227403002	7/24/2024	490000	2001	2354	208.16	29.55			
0236207001	1/3/2024	347000	1999	2355	147.35	38.66			
0227403010	4/25/2025	575000	2004	2926	196.51	29.47			
0227403010	6/12/2024	430324	2004	2926	147.07	39.37			
0605306034	1/30/2024	423000	2011	2760	153.26	39.13			
0227203021	3/18/2024	585000	2005	2994	195.39	32.68			
0236210004	6/11/2024	615000	2004	2986	205.96	30.59			
0236202037	12/23/2024	641000	2006	3265	196.32	30.45			
0236210008	5/9/2024	627000	2006	3293	190.4	30.39			
0236403023	8/19/2025	665000	2012	3186	208.73	27.21			
0234205027	6/9/2025	650000	2006	3684	176.44	33.07			
0228404062	7/1/2024	534900	2000	2808	190.49	30.54			

# Pivot Tables and Pivot Charts

- Pivot Tables are a powerful, interactive tool that lets you summarize, group, filter, and analyze large datasets quickly.
- Data can be summarized and grouped into ranges or categories that can calculate totals, averages, counts, or percentages. Note, it can not calculate medians.
- Summary data can be modified and altered by dragging and dropping various fields.
- Creating and changing a Pivot Table does not change the database. The Pivot Table must be refreshed if changes are made to the database.
- Like tables, Pivot Tables offer various styles and customization options.
- Pivot table data can be filtered and sorted.

# Pivot Tables and Pivot Charts

- A Pivot Chart is the visual representation of a PivotTable. They make large datasets easier to understand visually.
- Pivot Charts can be created from PivotTable data.
- A Pivot Chart updates automatically whenever you change the Pivot Table. Pivot Tables and charts can change by grouping, filtering, slicers or timelines.
- Creation of a Pivot Chart functions much like normal charts within Excel.
- Also, like normal charts within Excel, Pivot Charts offer various styles and customization options.

# Pivot Table – Excel screen shot

The screenshot shows the Microsoft Excel interface with the **Insert** tab selected. The **PivotTable** icon in the **Tables** group is highlighted with a red box. A dialog box titled "PivotTable from table or range" is open, showing the following options:

- Table/Range: Table3
- Choose where you want the PivotTable to be placed:
  - New Worksheet
  - Existing Worksheet
- Location: (empty text box)
- Choose whether you want to analyze multiple tables:
  - Add this data to the Data Model

The background spreadsheet contains the following data:

	A	B	C	D	E	F	G
		PIN	Neighborhood Number	Neighborhood Name	Sale Date	Year	Sale Price
1							
2	49	0604411010	9502063	CEDAR CROSSING / SMALLER <2400	4/25/2023	2023	413,500
3	50	0604411010		R <2400	6/8/2023	2023	395,000
4	48	0604411010		R <2400	6/15/2023	2023	360,000
5	39	0603300000		R <2400	5/17/2023	2023	390,000
6	47	0604400000		R <2400	8/7/2023	2023	350,000
7	29	0603100000		R <2400	3/14/2023	2023	340,000
8	42	0603300000		R <2400	8/25/2022	2022	323,000
9	51	0604411010		R <2400	10/26/2023	2023	310,000
10	36	0603300000		R <2400	3/18/2022	2022	345,000
11	38	0603300000		R <2400	2/8/2023	2023	330,000
12	40	0603300000		R <2400	4/11/2022	2022	321,000
13	32	0603100000		R <2400	1/25/2023	2023	315,900
14	33	0603100000		R <2400	2/28/2023	2023	319,000
15	31	0603101006	9502063	CEDAR CROSSING / SMALLER <2400	3/5/2022	2022	300,000

# Pivot Table Analyze– Excel screen shot

The screenshot displays the Microsoft Excel interface with the 'PivotTable Analyze' ribbon selected. The ribbon includes various tools such as 'Active Field', 'Group Selection', 'Insert Slicer', 'Refresh', 'Change Data', 'Actions', 'Fields, Items, & Sets', 'PivotChart', 'Recommended PivotTables', 'Field List', '+/- Buttons', and 'Field Headers'. Below the ribbon, a PivotTable is visible with the following data:

Row Labels	Sum of AGLA
9500180:CEDAR RIDGE -2 STY SMALLER	38,466
9500181:CEDAR RIDGE-2 STY LARGER>3600	61,631
9502063:CEDAR CROSSING / SMALLER <2400	47,239
9502064:CEDAR CROSSING LARGER >2400	73,435
9503035:WINDDANCE 2 STY	90,617
9503085:ISHNALA/DEEP LK SHORES 2 STY	20,023
9530115:WALDENSTROM SUB 2 STY	8,090
9530300:PRAIRIE TRAIL	89,739
9530345:PINEVIEW 2 STY	22,574
<b>Grand Total</b>	<b>451,814</b>

The 'PivotTable Fields' task pane is open on the right side of the screen. It shows a list of fields to add to the report, with 'Neighborhood Number' and 'AGLA' selected. The 'Filters' section is empty, and the 'Columns' section is also empty. The 'Rows' section shows 'Neighborhood Number' selected, and the 'Values' section shows 'Sum of AGLA' selected.

- A new menu tab, “PivotTable Analyze” lists many pivot table functions
- PivotTable Fields box opens to enter the data to summarize

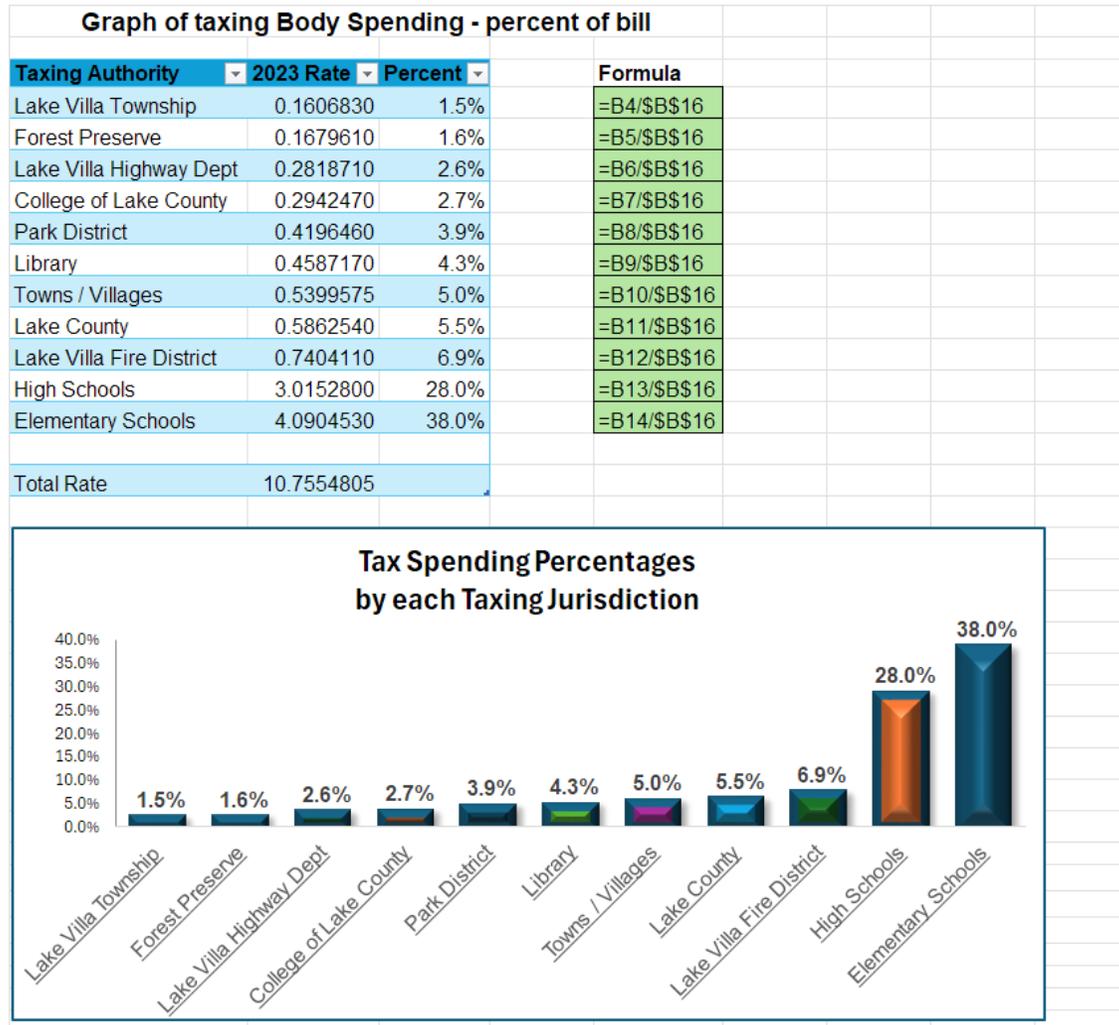
# Pivot Chart – Excel screen shot

The screenshot displays the Microsoft Excel interface. The PivotTable Analyze ribbon is active, with the PivotTable Name set to 'PivotTable37' and the Active Field set to 'Average of Sale Price'. The PivotTable data is as follows:

Row Labels	2021	2022	2023	Grand Total
CEDAR CROSSING / SMALLER <2400	290,375	322,250	345,764	322,409
CEDAR CROSSING LARGER >2400	338,385	413,563	391,899	371,808
CEDAR RIDGE -2 STY SMALLER	384,596	423,583	440,000	408,707
CEDAR RIDGE -2 STY LARGER>3600	410,000	483,667	502,500	454,786
PINEVIEW 2 STY	328,967	346,500	366,633	347,475
PRAIRIE TRAIL	399,447	457,643	481,633	425,604
WINDDANCE 2 STY	304,077	337,192	348,556	322,206
<b>Grand Total</b>	<b>343,525</b>	<b>399,640</b>	<b>379,109</b>	<b>368,098</b>

The 'Insert Chart' dialog box is open, showing the 'All Charts' task pane with 'Column' selected. The 'Clustered Column' chart type is highlighted, and a preview of the chart is shown. The chart preview displays a grouped bar chart with three series representing the years 2021, 2022, and 2023 for each row label. The 'OK' and 'Cancel' buttons are visible at the bottom of the dialog box.

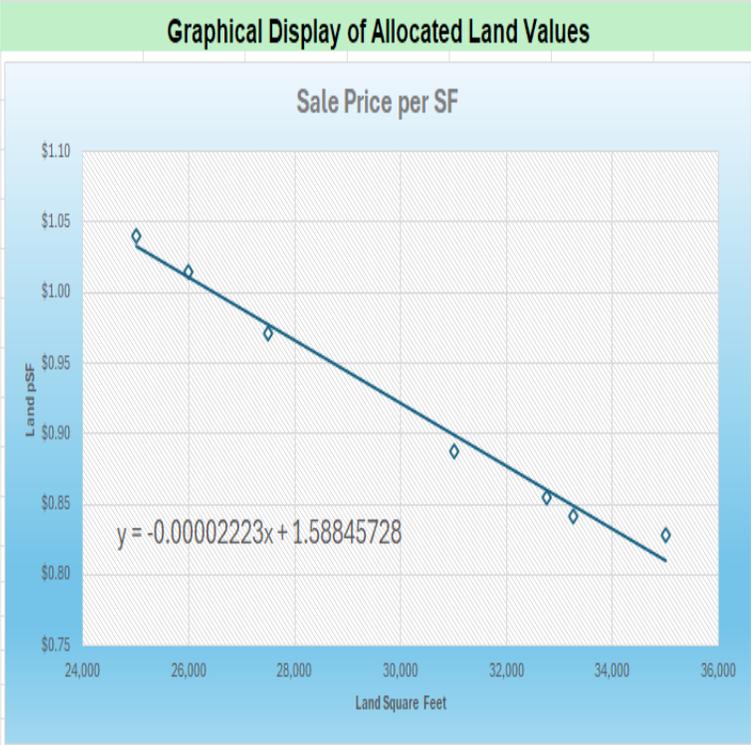
# Tax Spending Bar Chart – Excel screen shot



# Trendline and Formula Modeling Example

## – Excel screen shot

Cedar Subdivision Recent Sales			
Sale #	Land SF	Sale Price	Sale Price per SF
1	25,000	\$26,000	\$1.04
2	26,000	\$26,400	\$1.02
3	27,500	\$26,700	\$0.97
4	31,000	\$27,500	\$0.89
5	32,750	\$28,000	\$0.85
6	33,250	\$28,000	\$0.84
7	35,000	\$29,000	\$0.83



Trend Line Formula Breakdown	
Solving for Price per Square Foot	

Y = Land Value per Square Foot	
X = Land Square Feet	
Slope = -0.00002223	"-" = decreasing adjustment
Constant = 1.58846	
Slope Adjustment Factor = Slope X Land SF	

Example					
Land SF	Slope	Slope Adj Factor	Constant	Land Value pSF	Land Value
27,500	-0.00002223	-0.611325	1.58846	0.977	26,868

# Pivot Table and Chart – Excel screen shot



**Live examples**

One minute.  
Big **impact**.  
Complete the **session  
feedback** form.

