UP & RUNNING WITH

MICROSOFT EXCEL

MASTER FOUNDATIONAL SKILLS FOR MANAGING, ANALYZING, AND COMMUNICATING WITH DATA IN EXCEL

★★★★★ *With Best-Selling Instructor* ***Enrique Ruiz***

MAVEN ANALYTICS

COURSE STRUCTURE

This is a **project-based** course for students looking for a practical, hands-on, and highly engaging approach to learning Microsoft Excel

Course resources include:

- **Downloadable PDF eBook** *(90+ pages)* containing all course slides and reference materials
- **Quizzes** & **Exercises** to test and reinforce key concepts, with step-by-step solutions
- **Interactive demos** to help you apply your skills throughout the course and keep you engaged

COURSE OUTLINE

1	**Introducing Microsoft Excel**	*Create your first spreadsheet, navigate the Excel interface, and review the modern Excel landscape*
2	**Spreadsheet Fundamentals**	*Review key spreadsheet concepts like data types, tables, cell references, number formatting, and sorting & filtering*
3	**Formulas & Functions**	*Perform calculations and manipulate data using formulas, including function syntax, reference types, and common errors*
4	**Pivot Tables**	*Explore and analyze data using pivot tables, including data structure, calculation options, and sorting & filtering*
5	**Charts & Graphs**	*Visualize data using the right chart type and apply deliberate formatting to tell a clear and compelling story*

SETTING EXPECTATIONS

This course is designed to help you **make smart, data-driven decisions**

- *Our goal is to help you build a deep understanding of Excel's core features and functionality*
- *We'll focus on foundational data analytics skills, rather than specialized or advanced topics*

This course is **designed for everyone**, not just data professionals

- *Regardless of your role, data literacy can help you work smarter and make a bigger impact*
- *We'll help you build confidence managing, analyzing, and communicating with data in Excel*

We'll be using **Excel 365 for Windows/PC**

- *What you see on your screen may not always match mine, especially if you're using a different version of Excel*
- *Microsoft Excel is updated frequently, so features and functionality may change over time*

THE COURSE PROJECTS

Your goal is to leverage **spreadsheet fundamentals** to organize your food truck's check records so they can be easily registered and explored

You need to use **formulas & functions** to manipulate & analyze flight delay and cancellation data out of LAX so your manager can present the insights to the FAA

You'll use **pivot tables** to explore and analyze Maven Electronics' CRM data to identify opportunities in their sales pipeline and improve future performance

Your goal is to visualize data using **charts & graphs** to find interesting trends & patterns in historical health expenditure and life expectancy across the world

INTRODUCING MICROSOFT EXCEL

INTRODUCING MICROSOFT EXCEL

In this section we'll **introduce Microsoft Excel**, create and save our first workbook, navigate the Excel interface, and align on important language preferences for the course

TOPICS WE'LL COVER:

- **Meet Microsoft Excel**
- **Creating Workbooks**
- **Excel Interface**
- **Language Preferences**

GOALS FOR THIS SECTION:

- Review the current Excel landscape
- Launch Excel and create your first workbook
- Navigate and explore the core components of the Excel interface
- Set "English" as the display language

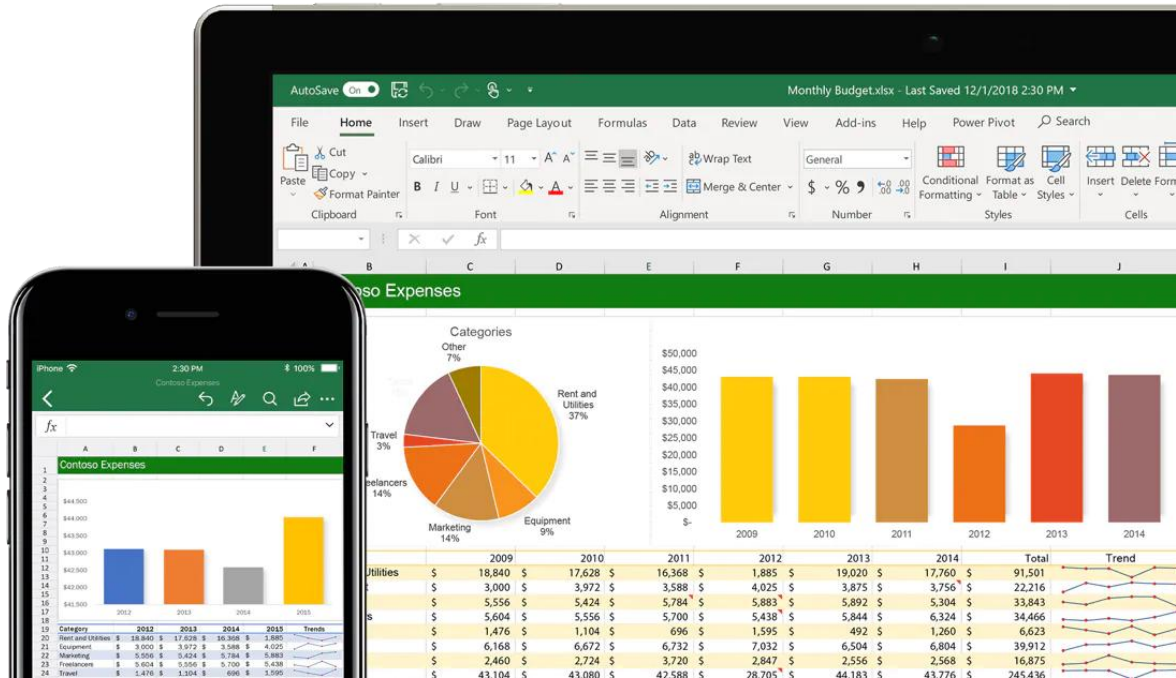
MEET MICROSOFT EXCEL

Excel

Microsoft Excel is a powerful spreadsheet tool which includes desktop, web-based, and mobile applications for managing, analyzing, and visualizing data

Common use cases include:

- Data analysis
- Business dashboards
- Financial modeling
- Project management
- Statistical inference
- and more!



EXCEL LANDSCAPE

The current **Excel landscape** consists of three main versions:

Excel Online

- Works on web
- Free
- Limited functionality

Excel 365

- Works on desktop
- Subscription payments
- Latest updates

Excel 2024

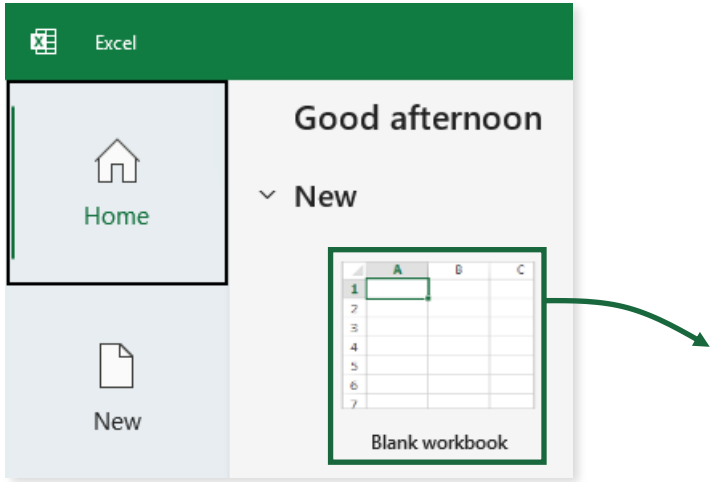
- Works on desktop
- One-time fee
- No updates

PRO TIP: Microsoft offers a 30-day free trial to a **Microsoft 365 Family** subscription that you can use to follow along with the course *(you can then cancel or switch to Personal)*

CREATING WORKBOOKS

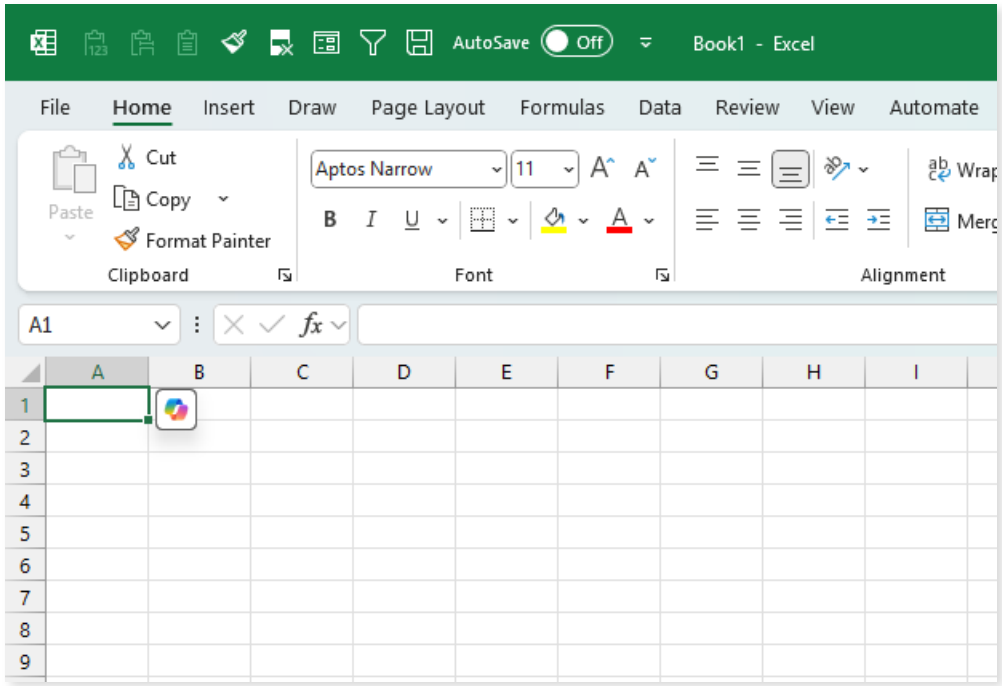
There are two main ways to **create a new Excel workbook**:

1) Open Excel and click **Blank workbook**



(You can also go to File > Blank workbook)

2) With a workbook open, click **CTRL + N** to open a new one



PRO TIP: SAVING WORKBOOKS

Meet Microsoft Excel

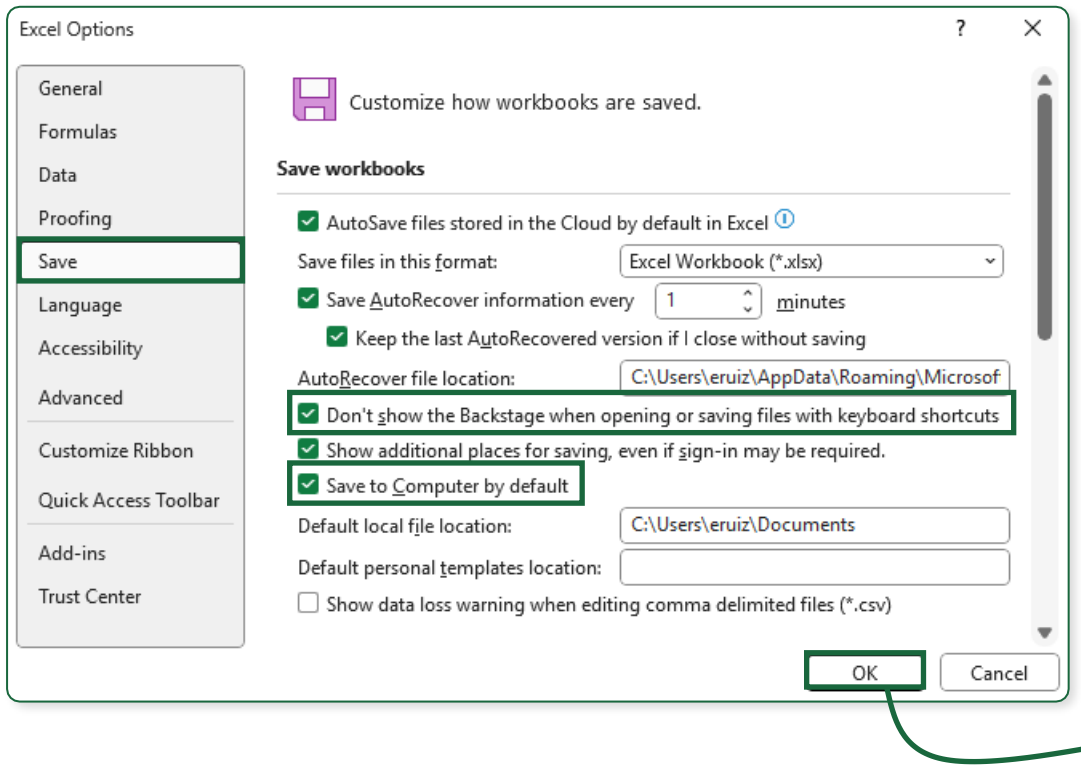
Creating Workbooks

Excel Interface

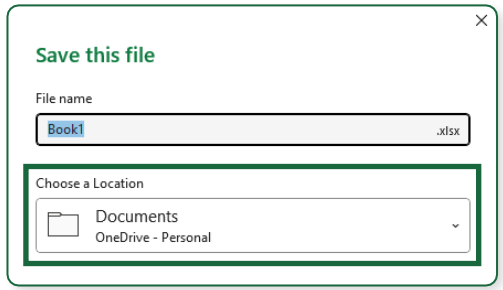
Language Preferences

Workbooks are **saved to OneDrive** by default, but you can modify this in the settings:

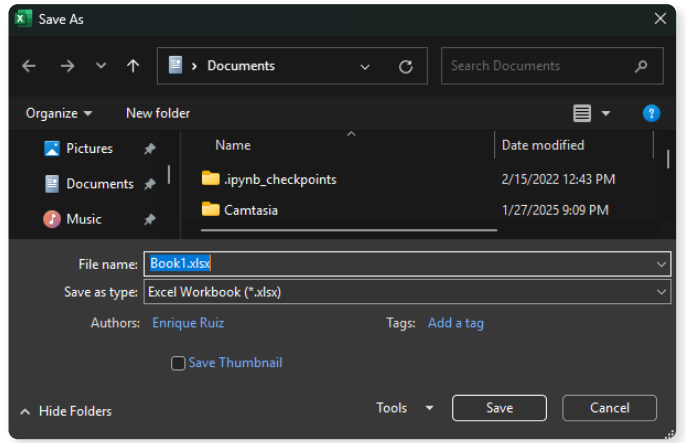
File > Options



BEFORE

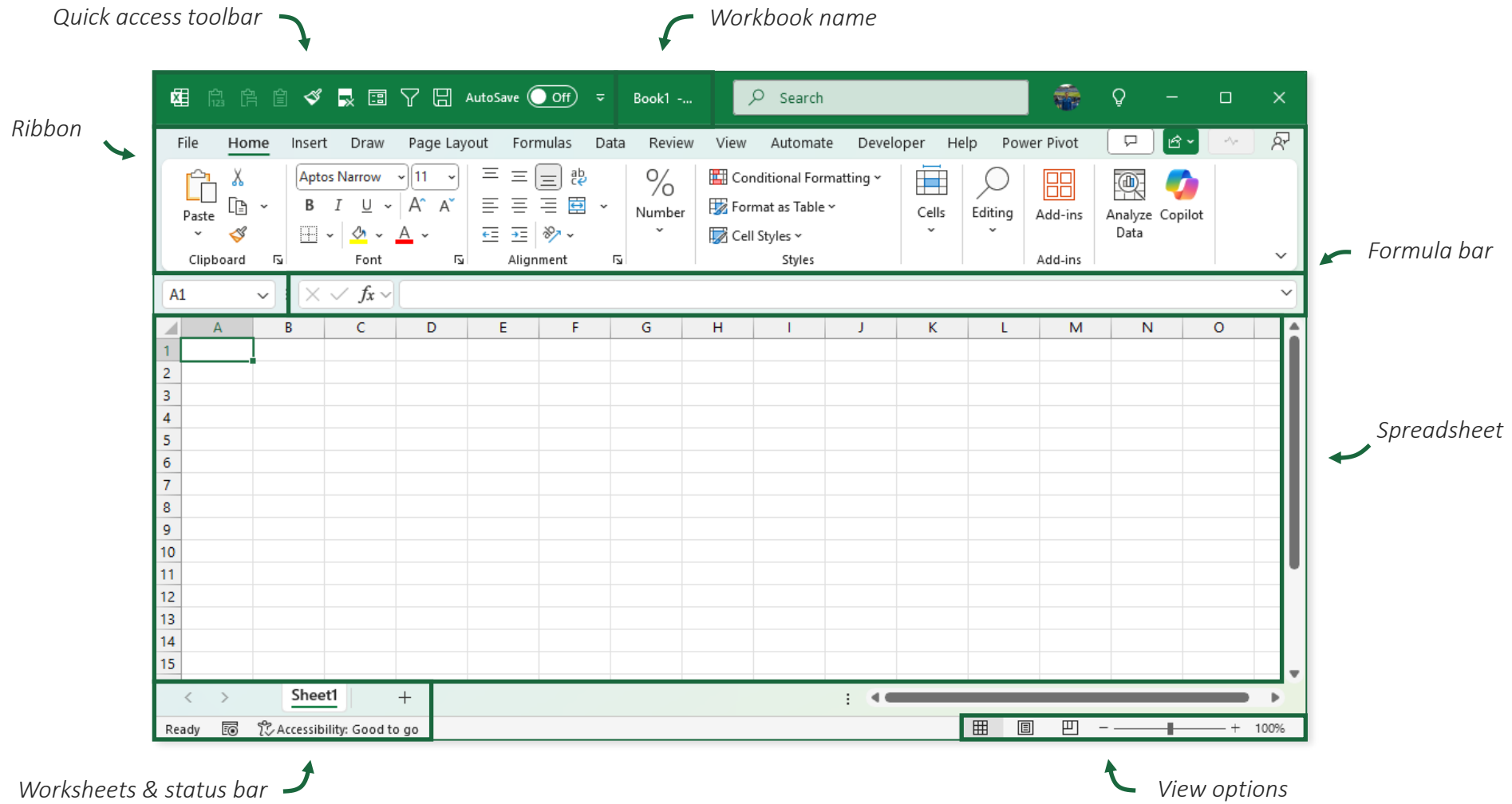


AFTER



THE EXCEL INTERFACE

- Meet Microsoft Excel
- Creating Workbooks
- **Excel Interface**
- Language Preferences

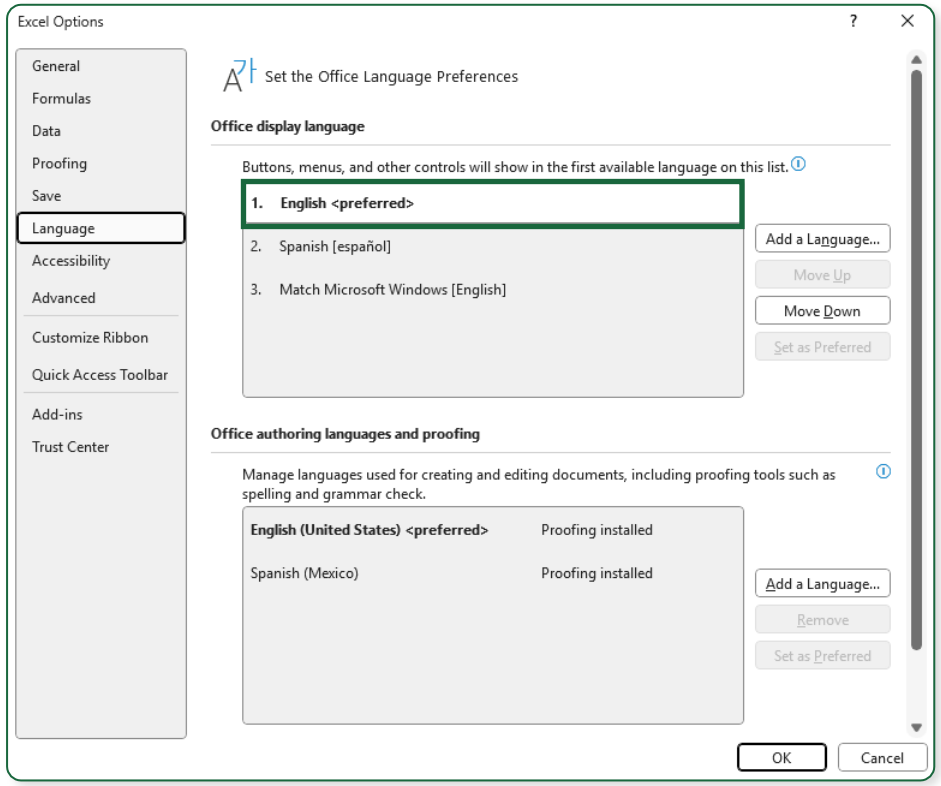


LANGUAGE PREFERENCES

The **Office display language** affects the buttons, menus, and functions

- Additional display languages can be installed through the “Add a Language” option

File > Options

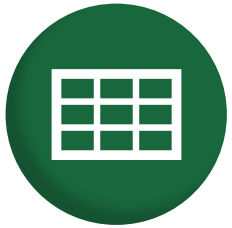


HEY THIS IS IMPORTANT!

Make sure you set the display language to “English” so you can follow along with the demos seamlessly

SPREADSHEET FUNDAMENTALS

SPREADSHEET FUNDAMENTALS



In this section we'll cover **spreadsheet fundamentals**, including data literacy concepts like tables, cell references, data types, duplicate values, sorting & filtering, and more

TOPICS WE'LL COVER:

- **Data Terminology**
- **Data Types**
- **Data Validation**
- **Removing Duplicates**
- **Conditional Formatting**
- **Sorting & Filtering**

GOALS FOR THIS SECTION:

- Learn to navigate across cells in a spreadsheet and move, create, and delete rows & columns
- Enter, edit, and format cell values with text, numbers, dates, dropdowns, and checkboxes
- Remove duplicate values in one or more columns
- Apply conditional formatting rules
- Sort & filter data in a table

THE SECTION PROJECT

THE SITUATION

You own and operate **Flamin' Maven**, a food truck in Phoenix that serves authentic Mexican food from Thursday to Sunday each week

THE BRIEF

You use Excel to keep a digital record of the **restaurant checks**, including the date, party size, bill amount, tip, payment type, and server for each order

Your goal is to **leverage your Excel skills** to organize and explore the data in order to facilitate data entry, find interesting patterns, and make informed decisions

THE OBJECTIVE

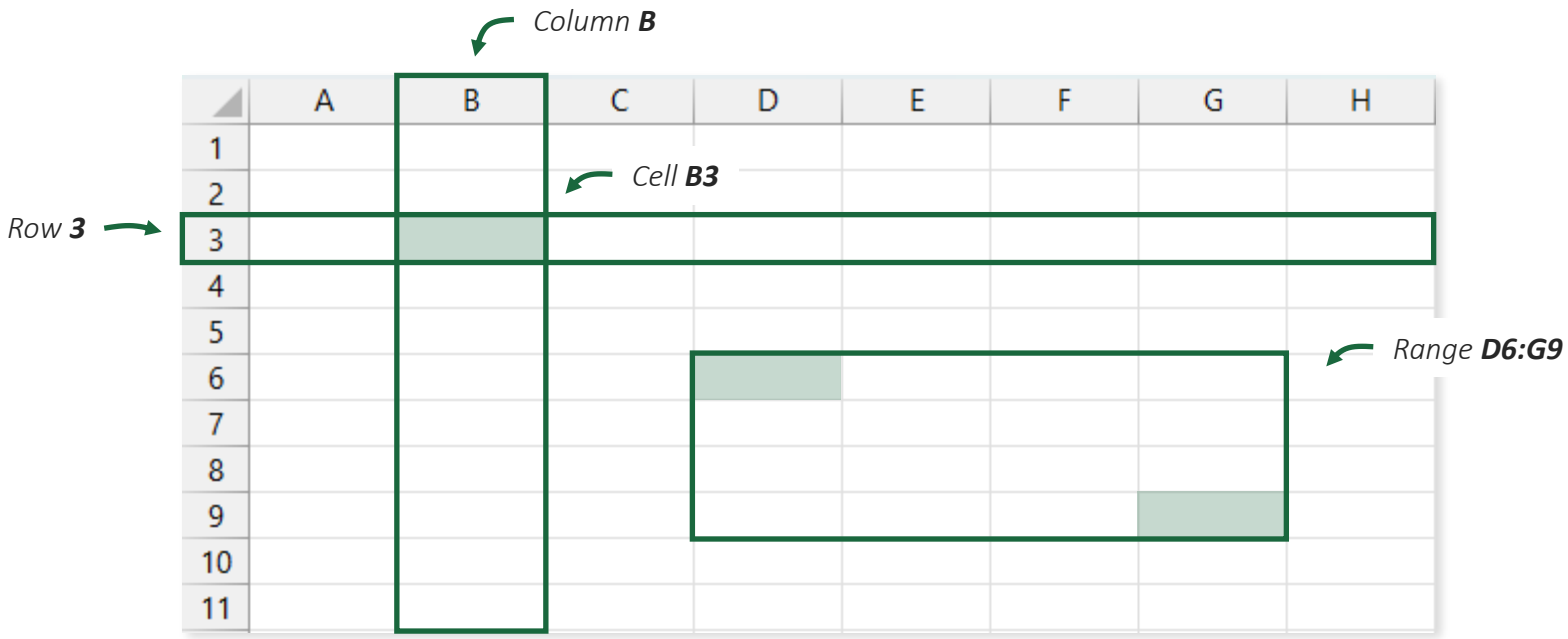
Use Excel to:

- Make the data easier to read by applying formatting
- Facilitate data entry by using data validation rules
- Verify service and earnings by applying custom filters

CELLS, RANGES, ROWS & COLUMNS

A spreadsheet is a grid of **cells** arranged into **rows** & **columns**

- **Rows** are represented by numbers *(1, 2, etc.)*, and **columns** are represented by letters *(A, B, etc.)*
- A **cell** is represented by the column letter and row number in which it lies *(A1, C4, etc.)*
- A **range** is a continuous group of cells represented by the top left and bottom right cells *(A1:C4)*



COMMON DATA TERMINOLOGY

- Data Terminology
- Data Types
- Data Validation
- Removing Duplicates
- Conditional Formatting
- Sorting & Filtering

When **data** is organized into the rows & columns of a spreadsheet, there are several terms used to describe its elements:

*A column that contains the same type of data is called a **field**, variable or feature*

*A row that contains the attributes for a single entity is called a **record** or observation*

	A	B	C	D	E	F	G	H	I
1	**Check #**	**Date**	**Day**	**Time**	**Party Size**	**Total Bill**	**Tip %**	**Cash**	**Server**
2	1	1/2/2025	Thu	Lunch	2	19.3	0.2	FALSE	Dennis
3	2	1/2/2025	Thu	Lunch	3	29.51	0.2	TRUE	Charlie
4	3	1/2/2025	Thu	Lunch	3	37.95	0.18	FALSE	Dennis
5	4	1/2/2025	Thu	Lunch	2	33.91	0.2	FALSE	Mac
6	5	1/2/2025	Thu	Lunch	4	69.37	0.2	FALSE	Dennis
7	6	1/2/2025	Thu	Lunch	4	52.8	0.15	TRUE	Charlie
8	7	1/2/2025	Thu	Lunch	2	26.56	0.2	TRUE	Charlie
9	8	1/2/2025	Thu	Lunch	4	28.17	0.18	FALSE	Dennis
10	9	1/2/2025	Thu	Lunch	2	27.36	0.18	FALSE	Dee
11	10	1/2/2025	Thu	Lunch	2	32.07	0.18	FALSE	Mac
12	11	1/2/2025	Thu	Lunch	2	27.14	0.2	TRUE	Dee

*A collection of related fields and records is a **table***

DATA TYPES

A cell can only store data of a single **data type**, which can be one of the following:

- **Numeric**: whole or decimal numbers that can be used in calculations *(adding, multiplying, etc.)*
- **Date**: calendar date & times that can be broken down into components *(year, month, hour, etc.)*
- **Binary**: TRUE or FALSE values *(can also be interpreted as 1 or 0)*
- **Text**: any other combination of letters and characters

*Numbers & dates are **right-aligned** by default*

*Text is **left-aligned***

*Binary values are **centered***

Check #	Date	Day	Time	Server	Party Size	Total Bill	Tip %	Cash
1	1/2/2025	Thu	Lunch	Dennis	2	19.3	0.2	FALSE
2	1/2/2025	Thu	Lunch	Charlie	3	29.51	0.2	TRUE
3	1/2/2025	Thu	Lunch	Dennis	3	37.95	0.18	FALSE
4	1/2/2025	Thu	Lunch	Mac	2	33.91	0.2	FALSE
5	1/2/2025	Thu	Lunch	Dennis	4	69.37	0.2	FALSE
6	1/2/2025	Thu	Lunch	Charlie	4	52.8	0.15	TRUE
7	1/2/2025	Thu	Lunch	Charlie	2	26.56	0.2	TRUE
8	1/2/2025	Thu	Lunch	Dennis	4	28.17	0.18	FALSE

DATE VALUES

Every date in Excel has an associated numerical **date value**

- Excel treats **January 1, 1900** as day 1, then counts each day that passes after that
- Times are captured as decimal values *(fractions of a 24-hour day)*, starting at midnight

This is what you see

Date
1900-01-01
1900-01-02
2021-05-29
2023-04-22 12:00:00
2023-04-22 18:00:00

This is what Excel sees

Date
1
2
44345
45038.50
45038.75

HEY THIS IS IMPORTANT!

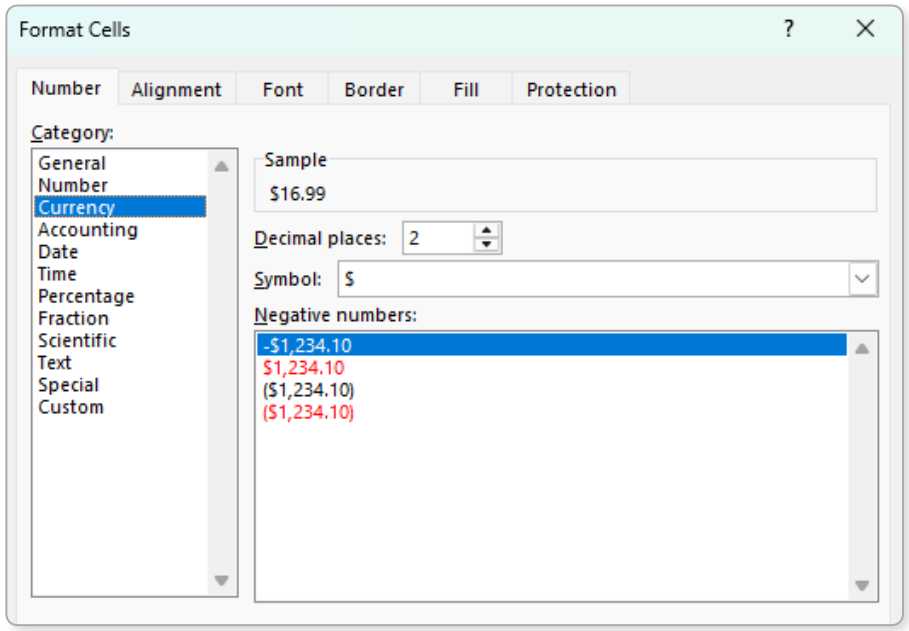
Excel does not recognize dates before 1900, and will treat them as text

NUMBER FORMATTING

- Data Terminology
- **Data Types**
- Data Validation
- Removing Duplicates
- Conditional Formatting
- Sorting & Filtering

Excel contains a variety of predefined **number formatting** options:

CTRL + 1



Number formatting *lets you:*

- *Add a thousands separator and currency symbols*
- *Round to whole numbers or specific decimal places*
- *Show numbers as percentages*
- *Display dates & times in different formats*

HEY THIS IS IMPORTANT!

The underlying value stays the same, you're only changing the way it's shown

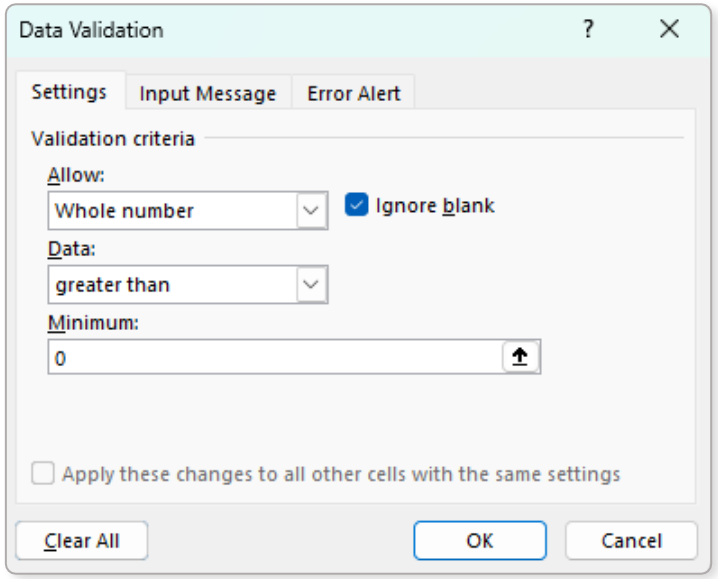
DATA VALIDATION

- Data Terminology
- Data Types
- **Data Validation**
- Removing Duplicates
- Conditional Formatting
- Sorting & Filtering

Data validation allows you to limit the values a particular cell will accept *(whole numbers, ranges, dates, text, etc.)*

	A	B	C	D	E	F
1	Check #	Date	Day	Time	Server	Party Size
2	1	2025-01-02	Thu	Lunch	Dennis	2
3	2	2025-01-02	Thu	Lunch	Charlie	3
4	3	2025-01-02	Thu	Lunch	Dennis	3
5	4	2025-01-02	Thu	Lunch	Mac	2
6	5	2025-01-02	Thu	Lunch	Dennis	4
7	6	2025-01-02	Thu	Lunch	Charlie	4
8	7	2025-01-02	Thu	Lunch	Charlie	2
9	8	2025-01-02	Thu	Lunch	Dennis	4
10	9	2025-01-02	Thu	Lunch	Charlie	2
11	10	2025-01-02	Thu	Lunch	Mac	2
12	11	2025-01-02	Thu	Lunch	Dee	2
13	12	2025-01-02	Thu	Lunch	Charlie	4
14	13	2025-01-02	Thu	Lunch	Mac	2
15	14	2025-01-02	Thu	Lunch	Dee	4
16	15	2025-01-02	Thu	Lunch	Mac	2
17	16	2025-01-02	Thu	Lunch	Dennis	2
18	17	2025-01-02	Thu	Lunch	Dennis	3

Data > Data Validation



This only lets users enter "Party Size" values greater than 0

PRO TIP: Add an **Input Message** or **Error Alert** to customize what users see when they select the cell or enter invalid values (only the **Stop** alert prevents users from entering data)

PRO TIP: CHECKBOXES & DROPDOWN LISTS

You can also add **checkboxes** and **dropdown lists** to a cell

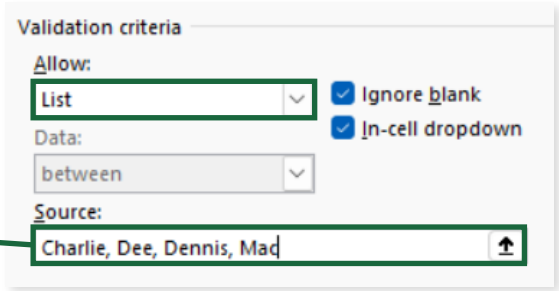
- **Checkboxes** let you toggle between TRUE and FALSE values
- **Dropdowns** let you select from a list of options

	A	B	C	D	E	F	G	H	I
1	**Check #**	**Date**	**Day**	**Time**	**Server**	**Party Size**	**Total Bill**	**Tip %**	**Cash**
2	1	2025-01-02	Thu	Lunch	Dennis	2	$19.30	20%	☐
3	2	2025-01-02	Thu	Lunch		3	$29.51	20%	☑
4	3	2025-01-02	Thu	Lunch		3	$37.95	18%	☐
5	4	2025-01-02	Thu	Lunch		2	$33.91	20%	☐
6	5	2025-01-02	Thu	Lunch		4	$69.37	20%	☐
7	6	2025-01-02	Thu	Lunch	Charlie	4	$52.80	15%	☑
8	7	2025-01-02	Thu	Lunch	Charlie	2	$26.56	20%	☑
9	8	2025-01-02	Thu	Lunch	Dennis	4	$28.17	18%	☐
10	9	2025-01-02	Thu	Lunch	Charlie	2	$25.75	18%	☐
11	10	2025-01-02	Thu	Lunch	Mac	2	$32.07	18%	☐
12	11	2025-01-02	Thu	Lunch	Dee	2	$27.14	20%	☑
13	12	2025-01-02	Thu	Lunch	Charlie	4	$49.93	18%	☐
14	13	2025-01-02	Thu	Lunch	Mac	2	$39.09	20%	☐
15	14	2025-01-02	Thu	Lunch	Dee	4	$53.50	18%	☑
16	15	2025-01-02	Thu	Lunch	Mac	2	$36.42	18%	☐
17	16	2025-01-02	Thu	Lunch	Dennis	2	$29.41	18%	☐
18	17	2025-01-02	Thu	Lunch	Dennis	3	$19.36	18%	☐
19	18	2025-01-02	Thu	Lunch	Dennis	3	$33.82	15%	☐
20	19	2025-01-02	Thu	Lunch	Charlie	3	$39.97	15%	☐

Charlie
Dee
Dennis
Mac

Insert tab

Data > Data Validation



Source items can be typed directly or referenced from a cell range

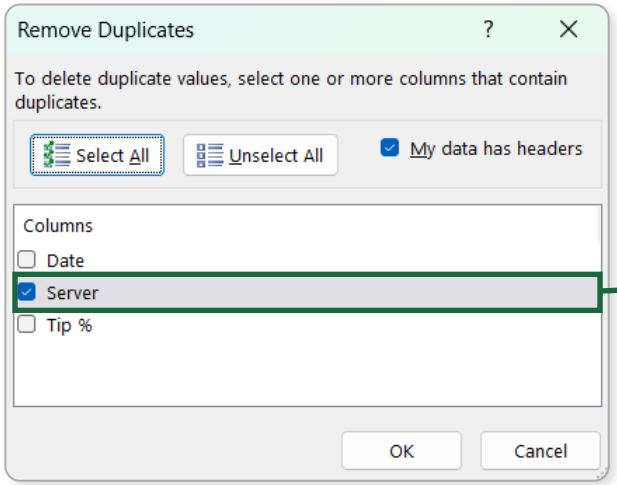
REMOVING DUPLICATES

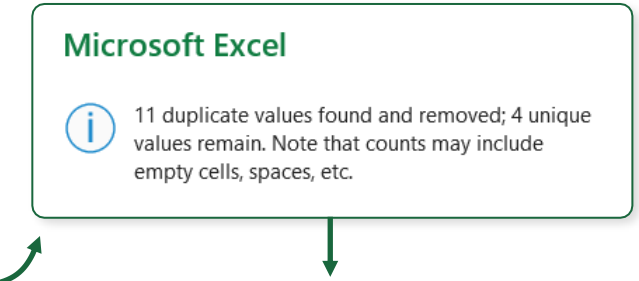
You can **remove duplicates** to only keep the unique records in a table

- You can choose to consider the values for *every* column, or only for *individual* columns

	A	B	C
1	**Date**	**Server**	**Tip %**
2	2025-01-02	Dennis	20%
3	2025-01-02	Charlie	20%
4	2025-01-02	Dennis	18%
5	2025-01-02	Mac	20%
6	2025-01-02	Dennis	20%
7	2025-01-02	Charlie	15%
8	2025-01-02	Charlie	20%
9	2025-01-02	Dennis	18%
10	2025-01-02	Charlie	18%
11	2025-01-02	Mac	18%
12	2025-01-02	Dee	20%
13	2025-01-02	Charlie	18%
14	2025-01-02	Mac	20%
15	2025-01-02	Dee	18%
16	2025-01-02	Mac	18%

Data > Remove Duplicates





	A	B	C
1	**Date**	**Server**	**Tip %**
2	2025-01-02	Dennis	20%
3	2025-01-02	Charlie	20%
4	2025-01-02	Mac	20%
5	2025-01-02	Dee	20%

REMOVING DUPLICATES

You can **remove duplicates** to only keep the unique records in a table

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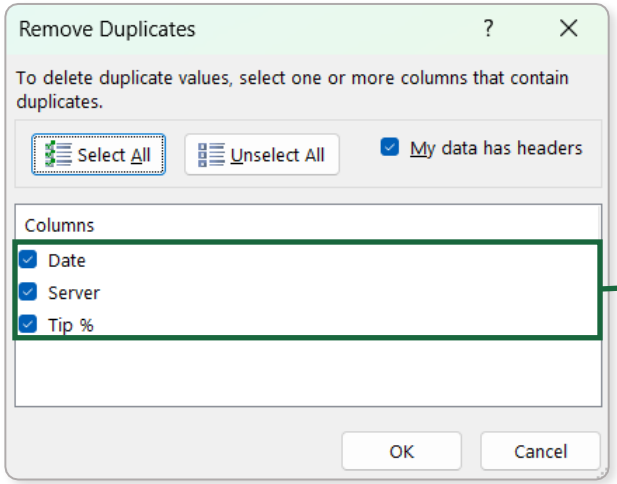
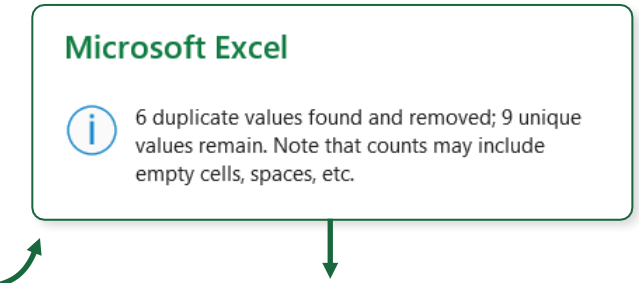
	A	B	C
1	**Date**	**Server**	**Tip %**
2	2025-01-02	Dennis	20%
3	2025-01-02	Charlie	20%
4	2025-01-02	Dennis	18%
5	2025-01-02	Mac	20%
6	2025-01-02	Dennis	20%
7	2025-01-02	Charlie	15%
8	2025-01-02	Charlie	20%
9	2025-01-02	Dennis	18%
10	2025-01-02	Charlie	18%
11	2025-01-02	Mac	18%
12	2025-01-02	Dee	20%
13	2025-01-02	Charlie	18%
14	2025-01-02	Mac	20%
15	2025-01-02	Dee	18%
16	2025-01-02	Mac	18%

Data > Remove Duplicates





	A	B	C
1	**Date**	**Server**	**Tip %**
2	2025-01-02	Dennis	20%
3	2025-01-02	Charlie	20%
4	2025-01-02	Dennis	18%
5	2025-01-02	Mac	20%
6	2025-01-02	Charlie	15%
7	2025-01-02	Charlie	18%
8	2025-01-02	Mac	18%
9	2025-01-02	Dee	20%
10	2025-01-02	Dee	18%

CONDITIONAL FORMATTING

- Data Terminology
- Data Types
- Data Validation
- **Conditional Formatting**
- Sorting & Filtering

Conditional formatting lets you apply special formatting to cells that meet a criteria

- This helps extract meaningful insights and identify patterns and trends at a glance

	Average High Temperature (F)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anchorage	23	27	34	44	56	63	65	64	55	40	28	25
Boston	36	39	45	56	66	76	81	80	72	61	51	41
New York	39	42	50	60	71	79	85	83	76	65	54	44
Dallas	57	61	69	77	84	91	95	96	89	80		
Phoenix	67	71	77	85	95	104	106	104	100	89		
Miami	76	78	80	83	87	89	91	91	89	86		
Cape Town	77	78	76	72	67	64	62	63	65	69		
Buenos Aires	84	81	78	71	65	59	58	61	64	70		
Sydney	75	73	72	66	61	55	49	57	61	64		
Auckland	74	70	68	63	57	49	44	49	55	59		

Home tab

	Average High Temperature (F)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anchorage	23	27	34	44	56	63	65	64	55	40	28	25
Boston	36	39	45	56	66	76	81	80	72	61	51	41
New York	39	42	50	60	71	79	85	83	76	65	54	44
Dallas	57	61	69	77	84	91	95	96	89	80	68	58
Phoenix	67	71	77	85	95	104	106	104	100	89	76	66
Miami	76	78	80	83	87	89	91	91	89	86	82	78
Cape Town	77	78	76	72	67	64	62	63	65	69	72	75
Buenos Aires	84	81	78	71	65	59	58	61	64	70	76	81
Sydney	75	73	72	66	61	55	49	57	61	64	70	74
Auckland	74	70	68	63	57	49	44	49	55	59	62	64

CONDITIONAL FORMATTING

- Data Terminology
- Data Types
- Data Validation
- **Conditional Formatting**
- Sorting & Filtering

Highlight Cells Rules

Format cells that match this criteria

- Greater Than...
- Less Than...
- Between...
- Equal To...
- Text that Contains...
- A Date Occurring...
- Duplicate Values...

Top/Bottom Rules

Format cells based on their value rank

- Top 10 Items...
- Top 10 %...
- Bottom 10 Items...
- Bottom 10 %...
- Above Average...
- Below Average...

Data Bars

Adds bars to each cell sized by relative value

Gradient Fill

Solid Fill

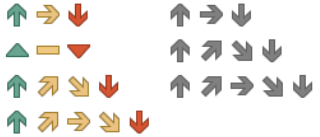
Color Scales

Uses color shades to compare values

Icon Sets

Ranks values by using intuitive symbols

Directional



Shapes

Indicators

Ratings

CONDITIONAL FORMATTING

- Data Terminology
- Data Types
- Data Validation
- **Conditional Formatting**
- Sorting & Filtering

Highlight Cells Rules

Greater than 40

	A	G
1	Check #	Total Bill
2	1	$19.30
3	2	$29.51
4	3	$37.95
5	4	$33.91
6	5	$69.37
7	6	$52.80
8	7	$26.56
9	8	$28.17
10	9	$25.75
11	10	$32.07
12	11	$27.14
13	12	$49.93
14	13	$39.09
15	14	$53.50
16	15	$36.42
17	16	$29.41
18	17	$19.36

Top/Bottom Rules

Bottom 25%

	A	G
1	Check #	Total Bill
2	1	$19.30
3	2	$29.51
4	3	$37.95
5	4	$33.91
6	5	$69.37
7	6	$52.80
8	7	$26.56
9	8	$28.17
10	9	$25.75
11	10	$32.07
12	11	$27.14
13	12	$49.93
14	13	$39.09
15	14	$53.50
16	15	$36.42
17	16	$29.41
18	17	$19.36

Data Bars

Blue Data Bar Only

	A	G
1	Check #	Total Bill
2	1	
3	2	
4	3	
5	4	
6	5	
7	6	
8	7	
9	8	
10	9	
11	10	
12	11	
13	12	
14	13	
15	14	
16	15	
17	16	
18	17	

Color Scales

Green – White – Red Scale

	A	G
1	Check #	Total Bill
2	1	$19.30
3	2	$29.51
4	3	$37.95
5	4	$33.91
6	5	$69.37
7	6	$52.80
8	7	$26.56
9	8	$28.17
10	9	$25.75
11	10	$32.07
12	11	$27.14
13	12	$49.93
14	13	$39.09
15	14	$53.50
16	15	$36.42
17	16	$29.41
18	17	$19.36

Icon Sets

3 Traffic Lights

	A	G
1	Check #	Total Bill
2	1	$19.30
3	2	$29.51
4	3	$37.95
5	4	$33.91
6	5	$69.37
7	6	$52.80
8	7	$26.56
9	8	$28.17
10	9	$25.75
11	10	$32.07
12	11	$27.14
13	12	$49.93
14	13	$39.09
15	14	$53.50
16	15	$36.42
17	16	$29.41
18	17	$19.36

FILTERING

Data Terminology

Data Types

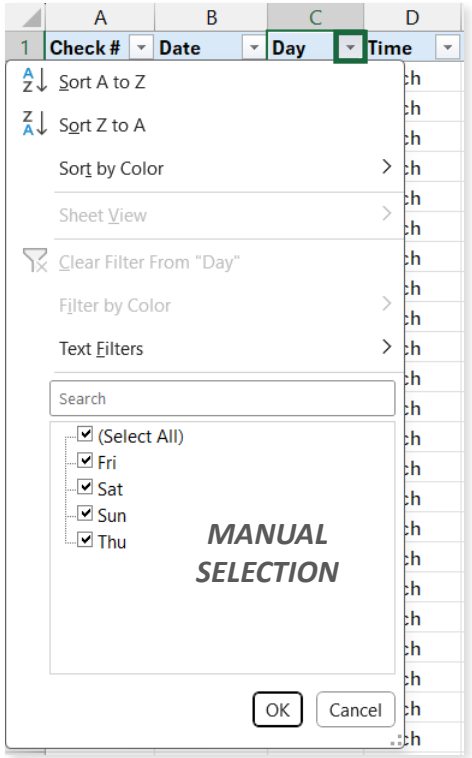
Data Validation

Conditional Formatting

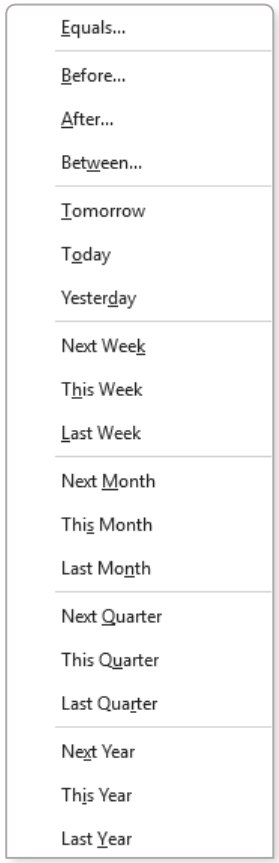
Sorting & Filtering

You can **filter** data in a table to only show the records that match a specific criteria

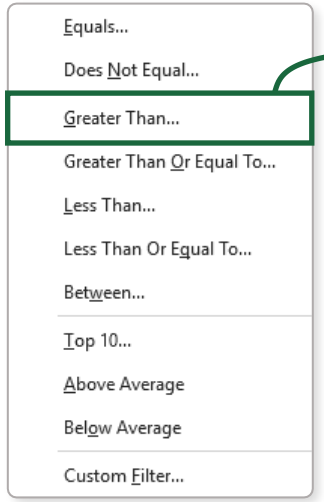
- To enable filters, you need to go to Home > Sort & Filter > Filter *(CTRL+SHIFT+L)*



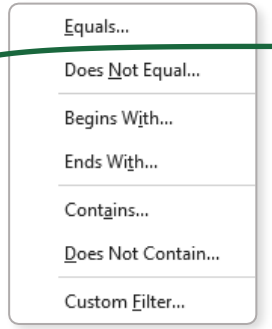
DATE FILTERS

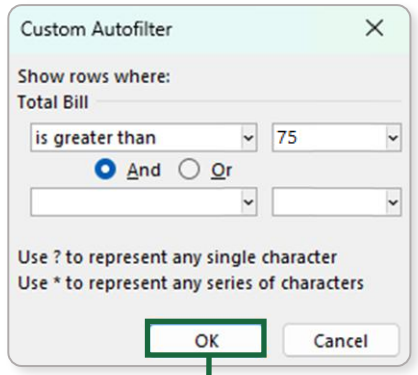


NUMBER FILTERS



TEXT FILTERS





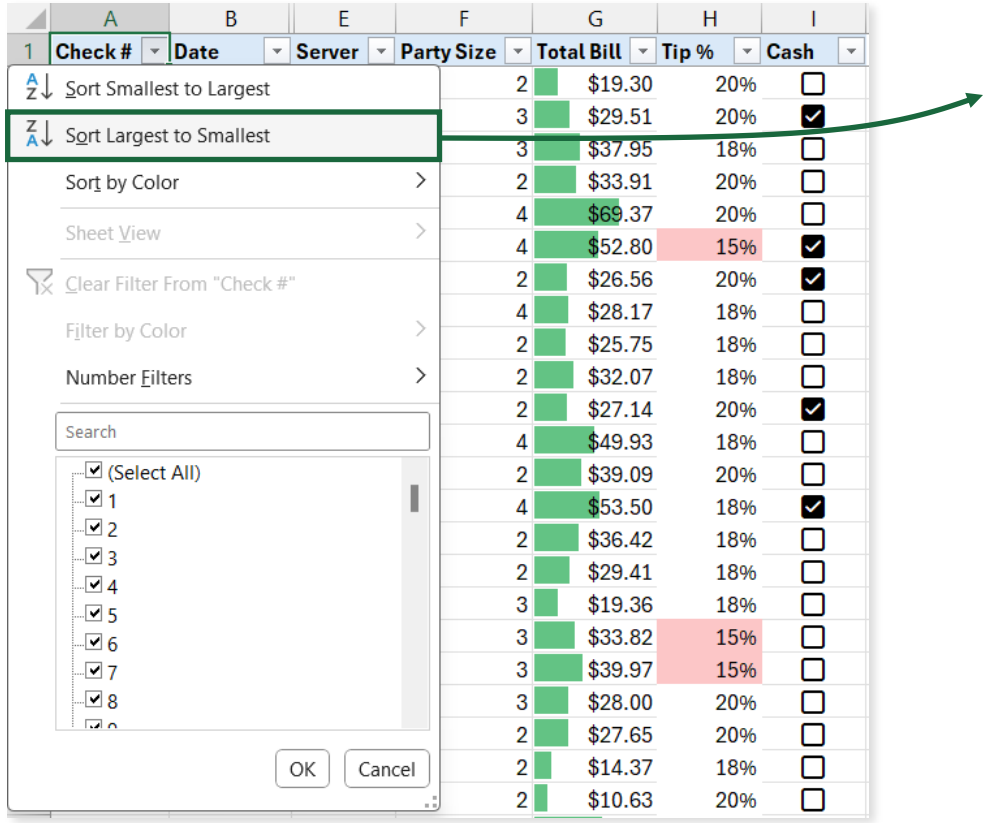
	Check #	Date	Day	Time	Server	Party Size	Total Bill	Tip %	Cash
58	57	2025-01-04	Sat	Dinner	Mac	4	$81.15	15%	☐
143	142	2025-01-11	Sat	Lunch	Dennis	6	$98.61	18%	☐
158	157	2025-01-11	Sat	Dinner	Mac	6	$77.31	20%	☑
187	186	2025-01-12	Sun	Dinner	Charlie	5	$86.69	15%	☑
206	205	2025-01-16	Thu	Lunch	Charlie	4	$76.37	18%	☑
218	217	2025-01-17	Fri	Lunch	Dee	5	$80.30	20%	☐
271									

SORTING

- Data Terminology
- Data Types
- Data Validation
- Conditional Formatting
- Sorting & Filtering

You can **sort** data in a column in ascending *(A to Z)* or descending *(Z to A)* order

- This works on numbers, dates, and text



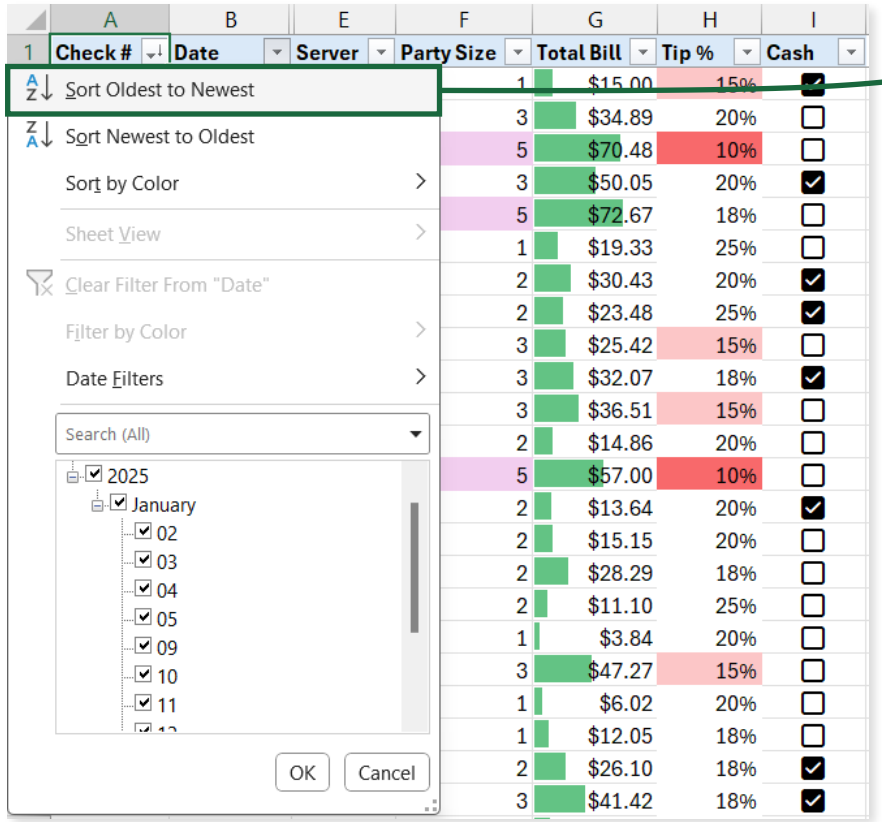
Check #	Date	Server	Party Size	Total Bill	Tip %	Cash
269	2025-01-19	Charlie	1	$15.00	15%	☑
268	2025-01-19	Mac	3	$34.89	20%	☐
267	2025-01-19	Dennis	5	$70.48	10%	☐
266	2025-01-19	Charlie	3	$50.05	20%	☑
265	2025-01-19	Dennis	5	$72.67	18%	☐
264	2025-01-19	Dee	1	$19.33	25%	☐
263	2025-01-19	Dee	2	$30.43	20%	☑
262	2025-01-19	Mac	2	$23.48	25%	☑
261	2025-01-19	Dee	3	$25.42	15%	☐
260	2025-01-19	Charlie	3	$32.07	18%	☑
259	2025-01-19	Dennis	3	$36.51	15%	☐
258	2025-01-19	Mac	2	$14.86	20%	☐
257	2025-01-19	Dee	5	$57.00	10%	☐
256	2025-01-19	Mac	2	$13.64	20%	☑
255	2025-01-19	Mac	2	$15.15	20%	☐
254	2025-01-19	Mac	2	$28.29	18%	☐
253	2025-01-19	Charlie	2	$11.10	25%	☐
252	2025-01-19	Mac	1	$3.84	20%	☐
251	2025-01-19	Dennis	3	$47.27	15%	☐
250	2025-01-19	Mac	1	$6.02	20%	☐
249	2025-01-19	Dennis	1	$12.05	18%	☐
248	2025-01-19	Mac	2	$26.10	18%	☑
247	2025-01-19	Mac	3	$41.42	18%	☑

SORTING

- Data Terminology
- Data Types
- Data Validation
- Conditional Formatting
- Sorting & Filtering

You can **sort** data in a column in ascending *(A to Z)* or descending *(Z to A)* order

- This works on numbers, dates, and text



Check #	Date	Server	Party Size	Total Bill	Tip %	Cash
19	2025-01-02	Charlie	3	$39.97	15%	☐
18	2025-01-02	Dennis	3	$33.82	15%	☐
17	2025-01-02	Dennis	3	$19.36	18%	☐
16	2025-01-02	Dennis	2	$29.41	18%	☐
15	2025-01-02	Mac	2	$36.42	18%	☐
14	2025-01-02	Dee	4	$53.50	18%	☑
13	2025-01-02	Mac	2	$39.09	20%	☐
12	2025-01-02	Charlie	4	$49.93	18%	☐
11	2025-01-02	Dee	2	$27.14	20%	☑
10	2025-01-02	Mac	2	$32.07	18%	☐
9	2025-01-02	Charlie	2	$25.75	18%	☐
8	2025-01-02	Dennis	4	$28.17	18%	☐
7	2025-01-02	Charlie	2	$26.56	20%	☑
6	2025-01-02	Charlie	4	$52.80	15%	☑
5	2025-01-02	Dennis	4	$69.37	20%	☐
4	2025-01-02	Mac	2	$33.91	20%	☐
3	2025-01-02	Dennis	3	$37.95	18%	☐
2	2025-01-02	Charlie	3	$29.51	20%	☑
1	2025-01-02	Dennis	2	$19.30	20%	☐

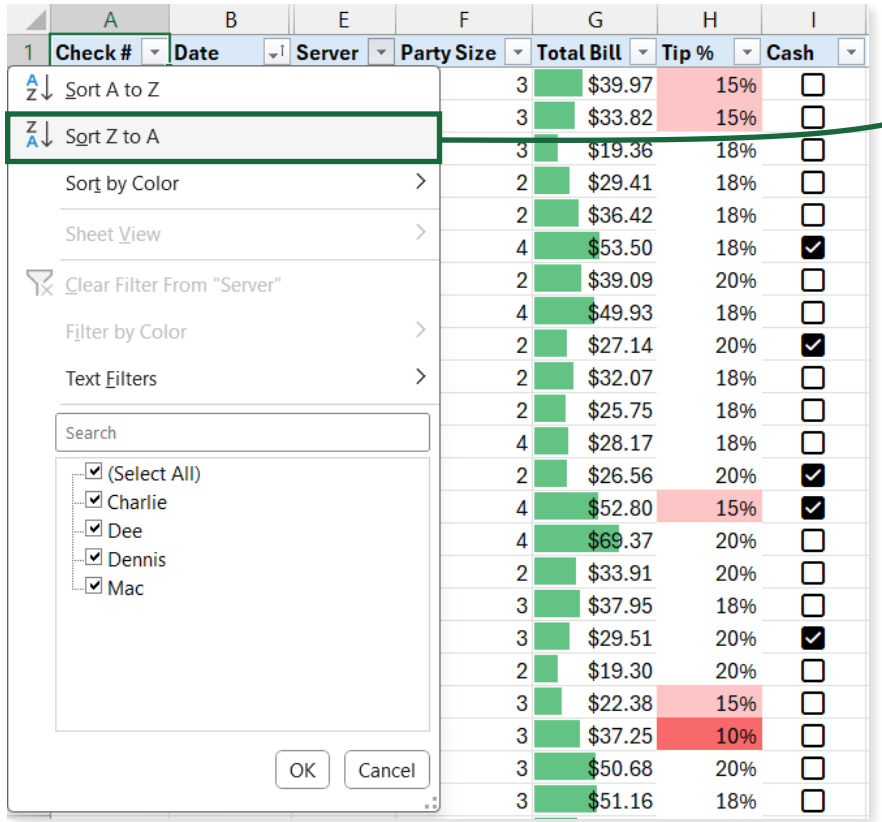
Note that the numbers are still sorted from largest to smallest

SORTING

- Data Terminology
- Data Types
- Data Validation
- Conditional Formatting
- Sorting & Filtering

You can **sort** data in a column in ascending *(A to Z)* or descending *(Z to A)* order

- This works on numbers, dates, and text



Check #	Date	Server	Party Size	Total Bill	Tip %	Cash
15	2025-01-02	Mac	2	$36.42	18%	☐
13	2025-01-02	Mac	2	$39.09	20%	☐
10	2025-01-02	Mac	2	$32.07	18%	☐
4	2025-01-02	Mac	2	$33.91	20%	☐
41	2025-01-03	Mac	3	$22.38	15%	☐
38	2025-01-03	Mac	3	$51.16	18%	☐
37	2025-01-03	Mac	3	$35.73	18%	☐
36	2025-01-03	Mac	3	$36.62	15%	☑
35	2025-01-03	Mac	2	$36.22	20%	☑
33	2025-01-03	Mac	2	$34.59	15%	☐
32	2025-01-03	Mac	4	$40.03	20%	☐
28	2025-01-03	Mac	2	$29.48	20%	☐
21	2025-01-03	Mac	2	$27.65	20%	☐
20	2025-01-03	Mac	3	$28.00	20%	☐
72	2025-01-04	Mac	3	$42.93	20%	☑
71	2025-01-04	Mac	2	$12.62	10%	☐
67	2025-01-04	Mac	2	$23.21	20%	☐
66	2025-01-04	Mac	3	$38.20	18%	☑
65	2025-01-04	Mac	3	$52.00	10%	☐
62	2025-01-04	Mac	2	$30.10	20%	☐
60	2025-01-04	Mac	4	$50.36	25%	☐
57	2025-01-04	Mac	4	$81.15	15%	☐
55	2025-01-04	Mac	4	$43.60	25%	☐

KEY TAKEAWAYS: SPEADSHEET FUNDAMENTALS

A spreadsheet is a **grid of cells** arranged into rows & columns

- *The cell address is made up of its corresponding column letter and row number*
- *Each cell can store data of a single data type (numbers, dates, text, or binary)*

Data validation lets you limit the values that a cell will accept

- *You can also add dropdown lists and checkboxes to cells to facilitate user input*

Conditional formatting lets you format cells that meet a criteria

- *You can also use color scales, data bars, or icon sets to format cells based on their relative values*

You can **sort** & **filter** data in a table

- *You can sort dates, text, and numbers in ascending or descending order*
- *You can filter data manually or by setting a specific condition based on its data type*

FORMULAS & FUNCTIONS

FORMULAS & FUNCTIONS

In this section we'll introduce essential **formulas & functions** you need to work with data in Excel, including math, logical, text, date, and lookup functions

TOPICS WE'LL COVER:

- **Function Syntax**
- **Reference Types**
- **Error Types**
- **Counting Functions**
- **Logical Functions**
- **Lookup Functions**
- **Date & Time Functions**
- **Text Functions**

GOALS FOR THIS SECTION:

- Write formulas & functions from scratch
- Understand the impact of reference types
- Learn to diagnose and fix common errors
- Apply different types of functions to solve real world business problems

THE SECTION PROJECT

THE SITUATION

You work as a data analyst at **Los Angeles International Airport (LAX)**, the largest and busiest airport on the West Coast of the United States and the eighth busiest in the world

THE BRIEF

You have access to the airport's **flight delay and cancellation data***, which includes information on each flight's airline, destination, and departure and arrival times

Your goal is to **leverage your Excel skills** to manipulate and analyze the data so your manager can share the airport's performance to the Federal Aviation Administration

THE OBJECTIVE

Use Excel to:

- Create calculated columns from existing data
- Join data from multiple related tables
- Summarize the data to gain meaningful insights

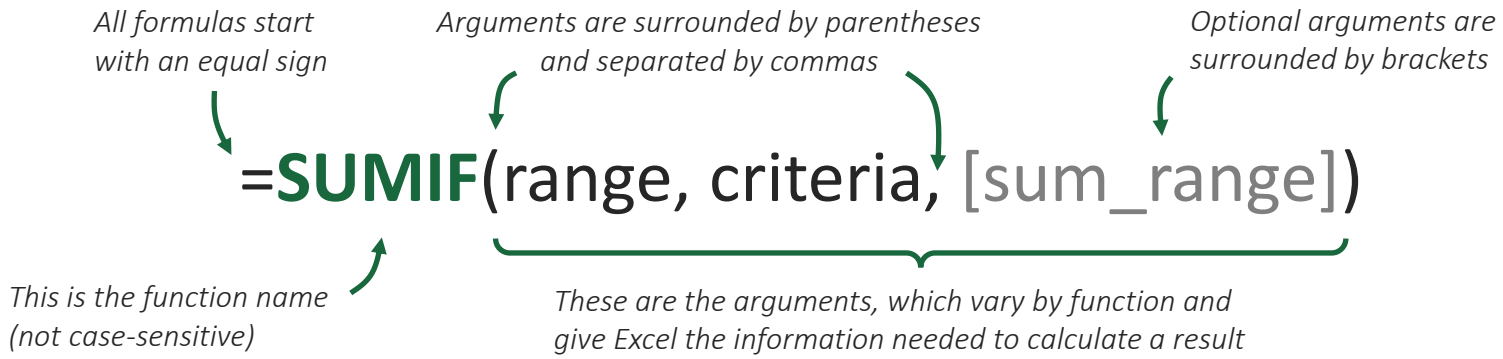
*This data is a sampled down version of the dataset published by the U.S. Department of Transportation's (DOT) Bureau of Transportation Statistics and is used for informational purposes only .
The data was adapted, and content was added, for the purpose of this course.

FORMULA & FUNCTION SYNTAX

Formulas are calculations performed in cells that start with an equal sign "="

Functions are preset calculations used in formulas that take arguments as inputs between parentheses and return a corresponding output

- **NOTE**: Formulas can have multiple functions, or none at all *(**= A1 + B1** is a valid formula)*

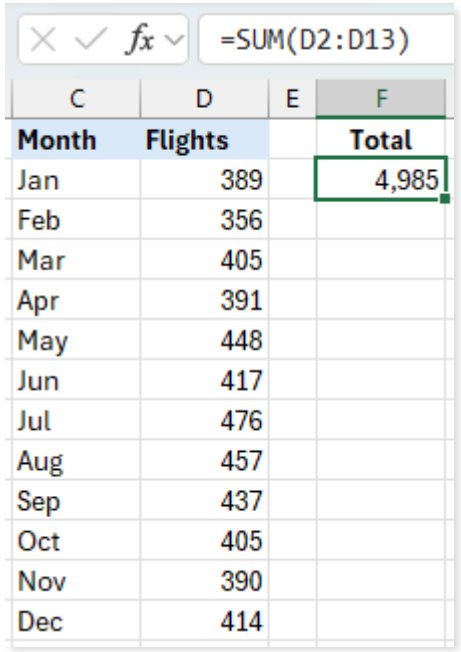


PRO TIP: As you begin writing a function, an "IntelliSense" window pops up with details on the function syntax and arguments

TYPES OF FUNCTIONS

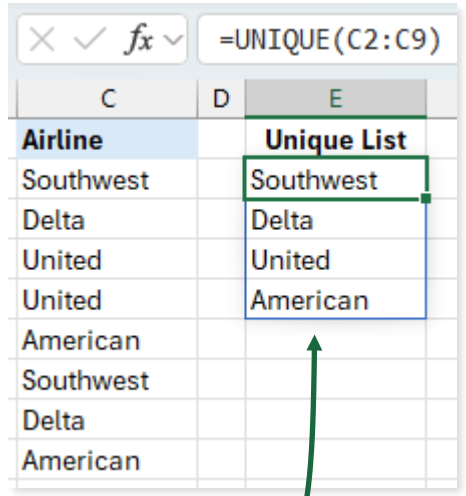
There are three **types of functions**:

1 Traditional functions that return **one value**



Month	Flights		Total
Jan	389		4,985
Feb	356		
Mar	405		
Apr	391		
May	448		
Jun	417		
Jul	476		
Aug	457		
Sep	437		
Oct	405		
Nov	390		
Dec	414		

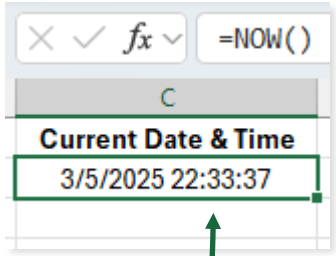
2 Array functions that return **multiple values**



Airline	Unique List
Southwest	Southwest
Delta	Delta
United	United
United	American
American	
Southwest	
Delta	
American	

The formula only lives in the first cell in the range

3 **Volatile** functions that recalculate automatically



Current Date & Time
3/5/2025 22:33:37

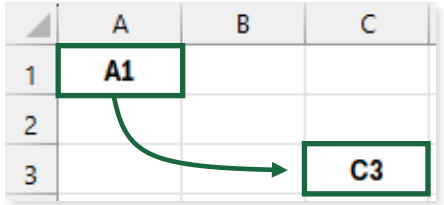
These can either return one value or multiple

FIXED VS. RELATIVE REFERENCES

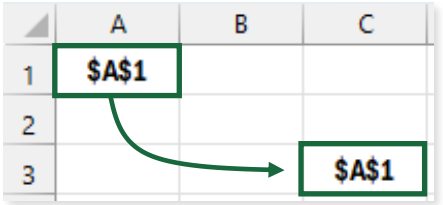
Fixed & relative references use a dollar sign ($) to determine how row and column references change when formulas are copied to new cells:

- **Relative** (A1): Both the column (A) and row (1) references can change
- **Fixed** ($A$1): Neither the column (A) nor the row (1) reference can change
- **Mixed** ($A1, A$1): Row *or* column references may change, depending which one is fixed

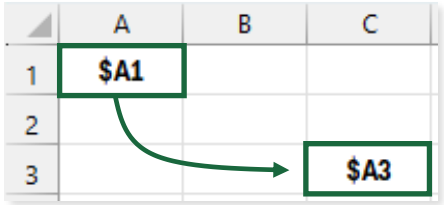
Relative Column, Relative Row



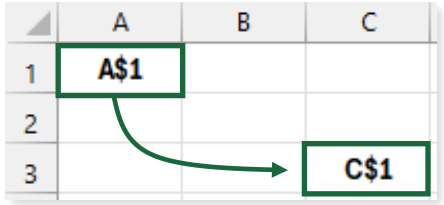
Fixed Column, Fixed Row



Fixed Column, Relative Row



Relative Column, Fixed Row



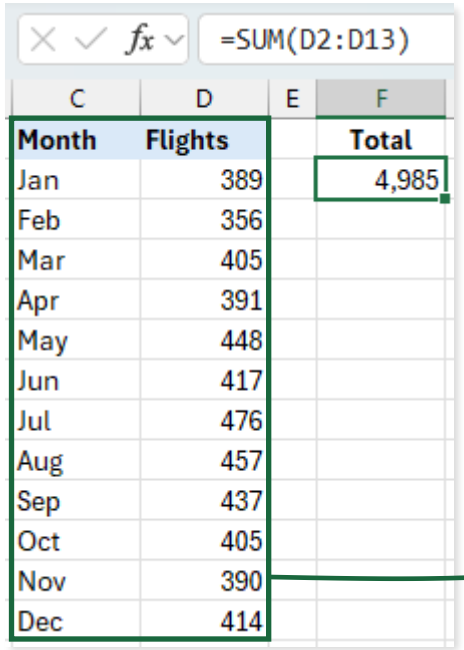
PRO TIP: Press **F4** to cycle between reference types

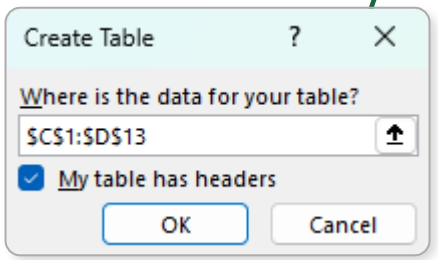
EXPLICIT VS. STRUCTURED REFERENCES

Explicit references are the traditional A1-style cell references Excel uses by default

Structured references are applied when you reference cells within Excel tables *(vs. ranges)*, and include entire table and column names rather than individual cells

EXPLICIT REFERENCE:





CTRL + T

STRUCTURED REFERENCE:

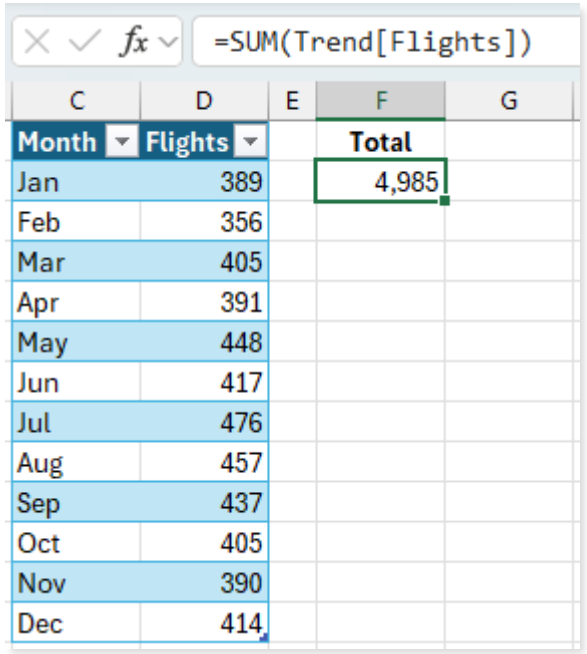


Table Name: ***Trend***

COMMON ERROR TYPES

Error type	What it means	How to fix it
#NAME?	*The function name isn't recognized*	*Make sure that function names are correct, references are valid, and quotation marks and colons are in place*
#VALUE!	*Function has the wrong type of argument*	*Check that you're not trying to perform an arithmetic operation on text strings or cells formatted as text*
#DIV/0!	*Formula is dividing by zero or an empty cell*	*Check the value of your divisor; if 0 is correct, use an IF statement to display an alternate value if you choose*
#REF!	*Formula refers to a cell that it not valid*	*Make sure that you didn't move, delete, or replace cells that are referenced in your formula*
#N/A!	*A lookup function didn't find a match*	*Check the lookup keys and ranges; if no match is correct, use an IF statement to display an alternate value*
#SPILL!	*Something prevents a range from spilling*	*Check if there is any text or merged cells obstructing the range from spilling (you also can't spill in an Excel table)*

COUNTING FUNCTIONS

Counting functions are used to count the cells in a range in different ways:

COUNT()	*Counts the **numeric** values in a range*	=**COUNT**(value1, [value2, …])
COUNTA()	*Counts the **non-empty** cells in a range*	=**COUNTA**(value1, [value2, …])
COUNTBLANK()	*Counts the **empty** cells in a range*	=**COUNTBLANK**(value1, [value2, …])

This accepts cell ranges

LOGICAL FUNCTIONS

Logical functions are Excel's *decision-making* tools

- **IF** a logical expression is true **THEN** do this, **OTHERWISE** do that
- A logical expression compares numbers, dates, text, cells or functions using **operators**

Operator	Name	Example	Result
=	Equal to	10 = 7	FALSE
>	Greater than	10 > 7	TRUE
<	Less Than	"e" < "r"	TRUE
>=	Greater than or equal to	"e" >= "r"	FALSE
<=	Less than or equal to	2012-05-19 <= 2008-05-21	FALSE
<>	Not equal to	2012-05-19 <> 2008-05-21	TRUE

HEY THIS IS IMPORTANT!

Excel interprets the logical value of **TRUE** as **1**, and the logical value of **FALSE** as **0**

LOGICAL FUNCTIONS

These are the most common **logical functions** used:

IF()	*Performs a logical test and returns a value if TRUE, or another if FALSE*	=**IF**(logical, [if_true], [if_false])
AND()	*Performs one or more logical tests and returns a value of TRUE if all arguments are true*	=**AND**(logical1, [logical2] , …)
OR()	*Performs one or more logical tests and returns a value of TRUE if any argument is true*	=**OR**(logical1, [logical2] , …)
IFERROR()	*Evaluates a formula and returns an alternative value if the formula returns an error*	=**IFERROR**(value, if_error)

THE IF FUNCTION

IF()

Checks whether a condition is met, and returns one value if TRUE, and another value if FALSE

=**IF**(logical_test, [value_if_true], [value_if_false])

*A logical test that can return **TRUE** or **FALSE***

*Value returned if logical test is **TRUE***

*Value returned if logical test is **FALSE***

G2 | =IF(F2<2,"No","Yes")

	A	B	C	D	E	F	G
1	**Date**	**Flight**	**Airline**	**Origin**	**Destination**	**Length (hr)**	**Meal**
2	2015-01-01	AA258	American Airlines	LAX	MIA	4.7	Yes
3	2015-01-01	WN2077	Southwest	LAX	ABQ	1.8	No
4	2015-01-01	US726	US Airways	LAX	PIT	4.7	Yes
5	2015-01-01	AA2419	American Airlines	LAX	DFW	3.2	Yes
6	2015-01-01	OO4535	Skywest	LAX	LAS	1.2	No
7	2015-01-01	VX412	Virgin America	LAX	JFK	5.0	Yes
8	2015-01-01	AA28	American Airlines	LAX	MIA	5.1	Yes
9	2015-01-01	OO6528	Skywest	LAX	PHX	1.3	No

If a flight's length is under 2 hours, no meal is served

NESTED IF FUNCTIONS

Nested IF functions allow you to include *multiple* logical tests within a single formula:

G2 : =IF(F2<2,"No",IF(F2<3.5,"Light","Full"))

	A	B	C	D	E	F	G
1	**Date**	**Flight**	**Airline**	**Origin**	**Destination**	**Length (hr)**	**Meal**
2	2015-01-01	AA258	American Airlines	LAX	MIA	4.7	Full
3	2015-01-01	WN2077	Southwest	LAX	ABQ	1.8	No
4	2015-01-01	US726	US Airways	LAX	PIT	4.7	Full
5	2015-01-01	AA2419	American Airlines	LAX	DFW	3.2	Light
6	2015-01-01	OO4535	Skywest	LAX	LAS	1.2	No
7	2015-01-01	VX412	Virgin America	LAX	JFK	5.0	Full
8	2015-01-01	AA28	American Airlines	LAX	MIA	5.1	Full
9	2015-01-01	OO6528	Skywest	LAX	PHX	1.3	No

If a flight's length is:

- *Less than 2 hours: No meal*
- *2 to 3.5 hours: Light meal*
- *3.5 hours or more: Full meal*

PRO TIP: When writing nested functions, **copy/paste repetitive pieces** and tweak individual elements to save time *(rather than starting from scratch)*

THE AND OPERATOR

AND()

*Performs one or more logical tests and returns a value of TRUE if **all** arguments are true*

=**AND**(logical1, [logical2], …)

*A logical test that can return **TRUE** or **FALSE***

Additional logical tests

H2 | =IF(AND(C2="US Airways",G2="Full"),"Yes","No")

	A	B	C	D	E	F	G	H
1	**Date**	**Flight**	**Airline**	**Origin**	**Destination**	**Length (hr)**	**Meal**	**Open Bar**
2	2015-01-01	AA258	American Airlines	LAX	MIA	4.7	Full	No
3	2015-01-01	WN2077	Southwest	LAX	ABQ	1.8	No	No
4	2015-01-01	US726	US Airways	LAX	PIT	4.7	Full	Yes
5	2015-01-01	AA2419	American Airlines	LAX	DFW	3.2	Light	No
6	2015-01-01	OO4535	Skywest	LAX	LAS	1.2	No	No
7	2015-01-01	VX412	Virgin America	LAX	JFK	5.0	Full	No
8	2015-01-01	AA28	American Airlines	LAX	MIA	5.1	Full	No
9	2015-01-01	OO6528	Skywest	LAX	PHX	1.3	No	No

US Airways flights with a full meal offer an open bar

THE OR OPERATOR

OR()

*Performs one or more logical tests and returns a value of TRUE if **any** argument is true*

=**OR**(logical1, [logical2], …)

*A logical test that can return **TRUE** or **FALSE***

Additional logical tests

H2 | =IF(OR(C2="US Airways",G2="Full"),"Yes","No")

	A	B	C	D	E	F	G	H
1	**Date**	**Flight**	**Airline**	**Origin**	**Destination**	**Length (hr)**	**Meal**	**Open Bar**
2	2015-01-01	AA258	American Airlines	LAX	MIA	4.7	Full	Yes
3	2015-01-01	WN2077	Southwest	LAX	ABQ	1.8	No	No
4	2015-01-01	US726	US Airways	LAX	PIT	4.7	Full	Yes
5	2015-01-01	AA2419	American Airlines	LAX	DFW	3.2	Light	No
6	2015-01-01	OO4535	Skywest	LAX	LAS	1.2	No	No
7	2015-01-01	VX412	Virgin America	LAX	JFK	5.0	Full	Yes
8	2015-01-01	AA28	American Airlines	LAX	MIA	5.1	Full	Yes
9	2015-01-01	OO6528	Skywest	LAX	PHX	1.3	No	No

Any flights with full meals or US Airways flights offer an open bar

THE IFERROR FUNCTION

IFERROR() — *Evaluates a formula and returns an alternative value if the formula returns an error*

=**IFERROR**(value, value_if_error)

Formula or value which may or may not result in an error

Value returned in case of an error

H2 | =G2/F2

	A	B	C	D	E	F	G	H
1	**Flight**	**Airline**	**Origin**	**Destination**	**Status**	**Length (hr)**	**Distance**	**Avg. Speed**
2	AA258	American Airlines	LAX	MIA	On time	4.7	2342	500
3	OO4678	Skywest	LAX	BOI	Cancelled	0.0	674	#DIV/0!
4	US726	US Airways	LAX	PIT	Delayed	4.7	2136	454
5	AA2419	American Airlines	LAX	DFW	Delayed	3.2	1235	382
6	OO4535	Skywest	LAX	LAS	On time	1.2	236	199
7	VX412	Virgin America	LAX	JFK	On time	5.0	2475	498
8	AA28	American Airlines	LAX	MIA	On time	5.1	2342	461
9	OO2600	Skywest	LAX	RDM	Cancelled	0.0	726	#DIV/0!

What do you do with cancelled flights?

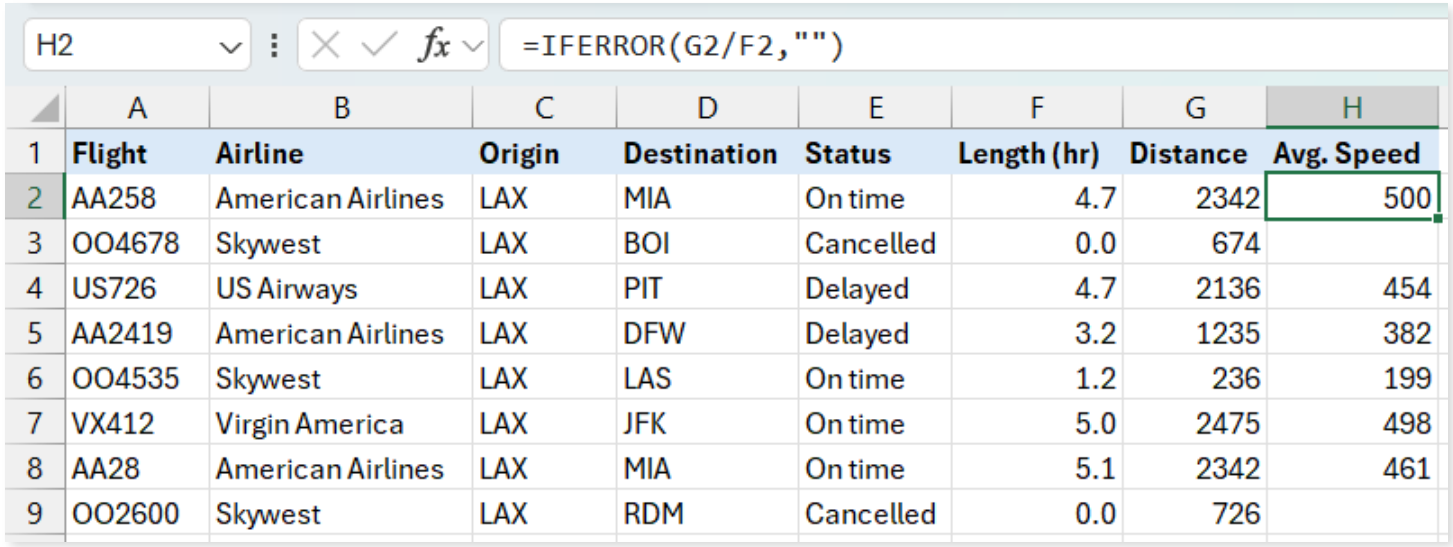
THE IFERROR FUNCTION

IFERROR() — *Evaluates a formula and returns an alternative value if the formula returns an error*

=**IFERROR**(value, value_if_error)

Formula or value which may or may not result in an error

Value returned in case of an error



	A	B	C	D	E	F	G	H
1	**Flight**	**Airline**	**Origin**	**Destination**	**Status**	**Length (hr)**	**Distance**	**Avg. Speed**
2	AA258	American Airlines	LAX	MIA	On time	4.7	2342	500
3	OO4678	Skywest	LAX	BOI	Cancelled	0.0	674	
4	US726	US Airways	LAX	PIT	Delayed	4.7	2136	454
5	AA2419	American Airlines	LAX	DFW	Delayed	3.2	1235	382
6	OO4535	Skywest	LAX	LAS	On time	1.2	236	199
7	VX412	Virgin America	LAX	JFK	On time	5.0	2475	498
8	AA28	American Airlines	LAX	MIA	On time	5.1	2342	461
9	OO2600	Skywest	LAX	RDM	Cancelled	0.0	726	

This replaces the errors with blanks

CONDITIONAL MATH FUNCTIONS

Conditional math functions let you perform basic math calculations on cells that meet a set of specified criteria:

COUNTIFS()	*Counts the number of rows in a range that meet a set of criteria*	=**COUNTIFS**(range1, criteria1, […])
SUMIFS()	*Adds the values in a range for the rows that meet a set of criteria*	=**SUMIFS**(sum_range, range1, criteria1, […])
AVERAGEIFS()	*Finds the average value in a range for the rows that meet a set of criteria*	=**AVERAGEIFS**(avg_range, range1, criteria1, […])
MIN / MAXIFS()	*Finds the max/min value in a range for the rows that meet a set of criteria*	=**MINIFS**(min_range, range1, criteria1, […])

CONDITIONAL MATH FUNCTIONS

Conditional math functions let you perform basic math calculations on cells that meet a set of specified criteria:

=**SUMIFS**(sum_range, criteria_range1, criteria1, [criteria_range2], [criteria2], …)

What values do you want the sum of?

What values need to meet a criteria?

What criteria do they need to meet?

Additional pairs of criteria ranges and criteria

	A	B	C	D	E
1	**Flight**	**Airline**	**Destination**	**Delay**	**Status**
2	AA258	American Airlines	MIA	-9	On time
3	OO4678	Skywest	BOI		Cancelled
4	US726	US Airways	PIT	24	Delayed
5	AA2419	American Airlines	DFW	38	Delayed
6	OO4535	Skywest	LAS	-6	On time
7	VX412	Virgin America	JFK	-27	On time
8	AA28	American Airlines	MIA	11	On time
9	OO2578	Skywest	SJC	31	Delayed

```
=SUMIFS(D2:D9,E2:E9,"Delayed")
```

= 93

CONDITIONAL MATH FUNCTIONS

Conditional math functions let you perform basic math calculations on cells that meet a set of specified criteria:

=**SUMIFS**(sum_range, criteria_range1, criteria1, [criteria_range2], [criteria2], …)

What values do you want the sum of?

What values need to meet a criteria?

What criteria do they need to meet?

Additional pairs of criteria ranges and criteria

	A	B	C	D	E
1	**Flight**	**Airline**	**Destination**	**Delay**	**Status**
2	AA258	American Airlines	MIA	-9	On time
3	OO4678	Skywest	BOI		Cancelled
4	US726	US Airways	PIT	24	Delayed
5	AA2419	American Airlines	DFW	38	Delayed
6	OO4535	Skywest	LAS	-6	On time
7	VX412	Virgin America	JFK	-27	On time
8	AA28	American Airlines	MIA	11	On time
9	OO2578	Skywest	SJC	31	Delayed

```
=SUMIFS(D2:D9,E2:E9,"Delayed",B2:B9,"Skywest")
```

= 31

LOOKUP FUNCTIONS

Lookup functions typically work by finding (or matching) a *lookup value* in a column and returning a related value in another column from the same row:

*This is known as a **fact** (or data) table*

Flight	Airline	Destination	Destination City
AA258	American Airlines	MIA	
US726	US Airways	PIT	
VX412	Virgin America	JFK	
AA28	American Airlines	MIA	
OO6528	Skywest	PHX	
AS461	Alaska Airlines	SEA	
AA219	American Airlines	SFO	
AA10	American Airlines	JFK	
VX406	Virgin America	JFK	
VX927	Virgin America	SFO	
AA1064	American Airlines	MIA	
US1927	US Airways	PHL	
AA118	American Airlines	JFK	
B6688	JetBlue	BOS	
B6288	JetBlue	BOS	

*This is a **foreign key***

lookup value

*This is known as a **dimension** (or lookup) table*

IATA Code	Airport Name	City
BOS	Logan International Airport	Boston
JFK	John F. Kennedy International Airport	New York
MIA	Miami International Airport	Miami
PHL	Philadelphia International Airport	Philadelphia
PHX	Phoenix Sky Harbor International Airport	Phoenix
PIT	Pittsburgh International Airport	Pittsburgh
SEA	Seattle-Tacoma International Airport	Seattle
SFO	San Francisco International Airport	San Francisco

*This is a **primary key***
(no duplicates)

LOOKUP FUNCTIONS

Lookup functions typically work by finding (or matching) a *lookup value* in a column and returning a related value in another column from the same row:

*This is known as a **fact** (or data) table*

Flight	Airline	Destination	Destination City
AA258	American Airlines	MIA	Miami
US726	US Airways	PIT	
VX412	Virgin America	JFK	
AA28	American Airlines	MIA	
OO6528	Skywest	PHX	
AS461	Alaska Airlines	SEA	
AA219	American Airlines	SFO	
AA10	American Airlines	JFK	
VX406	Virgin America	JFK	
VX927	Virgin America	SFO	
AA1064	American Airlines	MIA	
US1927	US Airways	PHL	
AA118	American Airlines	JFK	
B6688	JetBlue	BOS	
B6288	JetBlue	BOS	

*This is a **foreign key***

related value

*This is known as a **dimension** (or lookup) table*

IATA Code	Airport Name	City
BOS	Logan International Airport	Boston
JFK	John F. Kennedy International Airport	New York
MIA	Miami International Airport	Miami
PHL	Philadelphia International Airport	Philadelphia
PHX	Phoenix Sky Harbor International Airport	Phoenix
PIT	Pittsburgh International Airport	Pittsburgh
SEA	Seattle-Tacoma International Airport	Seattle
SFO	San Francisco International Airport	San Francisco

*This is a **primary key***
(no duplicates)

THE XLOOKUP FUNCTION

XLOOKUP()

Returns a value from a result range in the position where a match was found in a lookup range

=**XLOOKUP**(lookup_value, lookup_array, return_array, [if_not_found], [match_mode] , [search_mode])

- *Which value are you looking to match?*
- *Where are you trying to find the match for it?*
- *Where are the values you want to return?*
- *What if the lookup value isn't found?*
- *Do you want an exact or approximate match?*
- *Do you want to search top-down or bottom-up?*

D2 : =XLOOKUP(C2,$F$2:$F$9,$H$2:$H$9)

	A	B	C	D	E	F	G	H
1	**Flight**	**Airline**	**Destination**	**Destination City**		**IATA Code**	**Airport Name**	**City**
2	AA258	American Airlines	MIA	Miami		BOS	Logan International Airport	Boston
3	US726	US Airways	PIT	Pittsburgh		JFK	John F. Kennedy International Airport	New York
4	VX412	Virgin America	JFK	New York		MIA	Miami International Airport	Miami
5	AA28	American Airlines	MIA	Miami		PHL	Philadelphia International Airport	Philadelphia
6	OO6528	Skywest	PHX	Phoenix		PHX	Phoenix Sky Harbor International Airport	Phoenix
7	AS461	Alaska Airlines	SEA	Seattle		PIT	Pittsburgh International Airport	Pittsburgh
8	AA219	American Airlines	SFO	San Francisco		SEA	Seattle-Tacoma International Airport	Seattle
9	AA10	American Airlines	JFK	New York		SFO	San Francisco International Airport	San Francisco
10	VX406	Virgin America	JFK	New York				
11	VX927	Virgin America	SFO	San Francisco				
12	AA1064	American Airlines	MIA	Miami				

DATE & TIME FUNCTIONS

These are the most common **date & time functions** used:

TODAY / NOW()	***Volatile*** *function that returns the date (and time) value for the current moment*	=**TODAY**()
YEAR / MONTH / DAY()	*Extracts the year (1900+), month (1-12), or day (1-31) from a date*	=**YEAR**(date)
HOUR / MINUTE / SECOND()	*Extracts the hour (0-23), minute (0-59), or second (0-59) from a time*	=**HOUR**(time)
WEEKNUM / WEEKDAY()	*Returns the week of the year (1-53) or the day of the week (1-7) from a date*	=**WEEKNUM**(date, [type])

TEXT FUNCTIONS

These are the most common **text functions** used:

UPPER / LOWER / PROPER()	*Converts text to all caps / lowercase, or capitalizes the first letter in each word*	=**UPPER**(text)
TRIM()	*Removes leading, trailing, and repeated spaces in a text string*	=**TRIM**(text)
LEFT / RIGHT / MID()	*Returns a specified number of characters from a given point of a text string*	=**MID**(text, start, characters)
TEXTBEFORE / TEXTAFTER()	*Returns the text before or after a specified delimiter in a text string*	=**TEXTBEFORE**(text, delimiter, […])
TEXTSPLIT()	*Divides a text string at each occurrence of a delimiter across multiple cells*	=**TEXTSPLIT**(text, delimiter, […])
TEXTJOIN()	*Combines text strings from multiple cells into one, separating them by a delimiter*	=**TEXTJOIN**(delimiter, ignore_empty, text)

KEY TAKEAWAYS: FORMULAS & FUNCTIONS

Formulas are calculations performed in cells that start with "="

- *Functions are preset calculations used in formulas that take arguments as inputs and return a corresponding output*
- *Formulas can have one function, multiple functions, or none at all*

The "$" sign lets you establish **fixed & relative references**

- *You can fix an entire cell ($A$1), a cell's column ($A1), or a cell's row (A$1)*
- *Use the F4 key to cycle between reference types in a formula*

Use **IFERROR** to return an alternate value in case of an error

- *It's important to diagnose why you're receiving the error first, as a different fix might be necessary*

There are **hundreds of functions** to help work with & analyze data

- *You don't need to memorize their syntax; Excel is great at helping along the way!*
- *The key is to know what types of functions exist and the operations they can help you perform*

PIVOT TABLES

PIVOT TABLES

In this section we'll cover exploring & analyzing data with **pivot tables**, Excel's essential "drag & drop" tool that lets you perform calculations without formulas or functions

TOPICS WE'LL COVER:

- **Data Structure**
- **Creating Pivot Tables**
- **Calculation Options**
- **Sorting & Filtering**
- **Calculated Fields**

GOALS FOR THIS SECTION:

- Understand the source data requirements for analyzing data with pivot tables
- Quickly explore different pivot table views
- Summarize and show values in different ways
- Sort and filter pivot table results
- Create basic calculated fields

THE SECTION PROJECT

THE SITUATION

You work as a Sales Manager at **Maven Electronics**, an electronics retailer that sells computer components to businesses across the world

THE BRIEF

You have access to the company's **CRM data**, which has information on all the sales opportunities, including the sales agent, product, account, and deal stage

Your goal is to **leverage your Excel skills** to analyze trends and patterns in the sales pipeline and identify insights to improve your team's performance

THE OBJECTIVE

Use Excel to:

- Explore & analyze the data
- Create new calculated fields
- Find insights to improve your team

IMPORTANT: DATA STRUCTURE

- Data Structure
- Creating Pivot Tables
- Calculation Options
- Sorting & Filtering
- Calculated Fields

For pivot tables to work properly, your source data must have a **tabular structure**:

TABULAR

Opportunity	Sales Agent	Region	Product	Deal Stage	Deal Won	Close Date	Close Value
PE84CX4O	Zane Levy	West	GTX Basic	Closed	1	3/2/2017	517
9ME3374G	Vicki Laflamme	West	MG Special	Closed	1	3/2/2017	57
M6WEJXC0	Rosalina Dieter	West	MG Advanced	Closed	1	3/6/2017	3284
902REDPA	Cassey Cress	East	GTX Pro	Closed	0	3/9/2017	0
5J9CMGDV	Elease Gluck	West	MG Special	Prospecting			
JJXRR8R6	James Ascencio	West	GTX Plus Pro	Closed	0	3/17/2017	0
C5K2JP1H	Violet Mclelland	East	GTX Plus Basic	Closed	1	3/11/2017	1014
SBCR987L	Kami Bicknell	West	GTX Basic	Closed	1	3/23/2017	590
UP409DSB	Anna Snelling	West	MG Advanced	Engaging			
AO9Z2D17	Violet Mclelland	East	GTX Plus Pro	Closed	0	3/11/2017	0
5M58DTJK	Elease Gluck	West	MG Special	Closed	1	3/5/2017	58
KNY1OSAB	Anna Snelling	West	GTX Pro	Closed	1	3/14/2017	4899
EAZDUUM9	Moses Frase	East	MG Advanced	Closed	0	3/1/2017	0
JYKM0B00	James Ascencio	West	GTX Pro	Closed	1	3/6/2017	4338
KU28360J	Kary Hendrixson	West	GTX Basic	Closed	1	3/19/2017	578
N4SD17JR	Reed Clapper	East	GTX Basic	Closed	1	3/1/2017	556

- Single table *(fields as columns, records as rows)*
- Clear column headers
- Each column has a single data type
- No calculated fields or subtotals

FREE FORM

EAST

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Opportunities	226	181	172	206	207	134	212	190
Deals won	130	145	84	123	160	67	112	133
Win rate	58%	80%	49%	60%	77%	50%	53%	70%
Revenue	$353K	$447K	$208K	$302K	$409K	$192K	$269K	$364K

WEST

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Opportunities	263	212	202	254	201	181	270	224
Deals won	138	170	85	147	164	89	152	187
Win rate	52%	80%	42%	58%	82%	49%	56%	83%
Revenue	$337K	$482K	$195K	$375K	$440K	$245K	$374K	$370K

- Multiple tables *(months as columns, metrics as rows)*
- Multilayered column headers
- Each column contains different data types
- Calculated fields *(win rate)*

WHY PIVOT TABLES?

- Data Structure
- **Creating Pivot Tables**
- Calculation Options
- Sorting & Filtering
- Calculated Fields

Pivot tables are one of the most powerful tools for data analysis, as they allow you to easily filter, summarize, and analyze information without modifying the raw data

Opportunity	Sales Agent	Region	Product	Deal Stage	Deal Won	Close Date	Close Value
PE84CX4O	Zane Levy	West	GTX Basic	Closed	1	3/2/2017	517
9ME3374G	Vicki Laflamme	West	MG Special	Closed	1	3/2/2017	57
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902REDPA	Cassey Cress	East	GTX Pro	Closed	0	3/9/2017	0
5J9CMGDV	Elease Gluck	West	MG Special	Prospecting			
JJXRR8R6	James Ascencio	West	GTX Plus Pro	Closed	0	3/17/2017	0
C5K2JP1H	Violet Mclelland	East	GTX Plus Basic	Closed	1	3/11/2017	1014
SBCR987L	Kami Bicknell	West	GTX Basic	Closed	1	3/23/2017	590
UP409DSB	Anna Snelling	West	MG Advanced	Engaging			
AO9Z2D17	Violet Mclelland	East	GTX Plus Pro	Closed	0	3/11/2017	0
5M58DTJK	Elease Gluck	West	MG Special	Closed	1	3/5/2017	58
KNY1OSAB	Anna Snelling	West	GTX Pro	Closed	1	3/14/2017	4899
EAZDUUM9	Moses Frase	East	MG Advanced	Closed	0	3/1/2017	0
JYKM0B00	James Ascencio	West	GTX Pro	Closed	1	3/6/2017	4338
KU28360J	Kary Hendrixson	West	GTX Basic	Closed	1	3/19/2017	578
N4SD17JR	Reed Clapper	East	GTX Basic	Closed	1	3/1/2017	556

Region	East

	Month							
Values	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Opportunities	226	181	172	206	207	134	212	190
Deals won	130	145	84	123	160	67	112	133
Win rate	58%	80%	49%	60%	77%	50%	53%	70%
Revenue	$353K	$447K	$208K	$302K	$409K	$192K	$269K	$364K

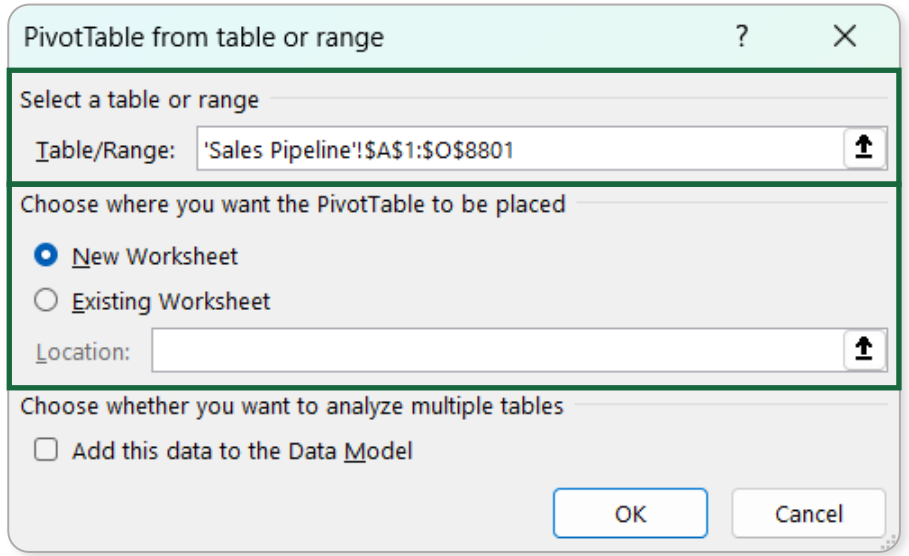
PRO TIP: When entering data manually into a spreadsheet, try to stick to a tabular format – you can later tweak how you display the results in a pivot table!

CREATING A PIVOT TABLE

Pivot Tables are created from a *single* data range with clear column headers that include both dimensions & measures:

- **Dimensions** are categorical fields typically used to *group* or *filter* data
- **Measures** are numerical fields typically used for *aggregation* or *value calculations*

Insert > PivotTable



What data are you analyzing?

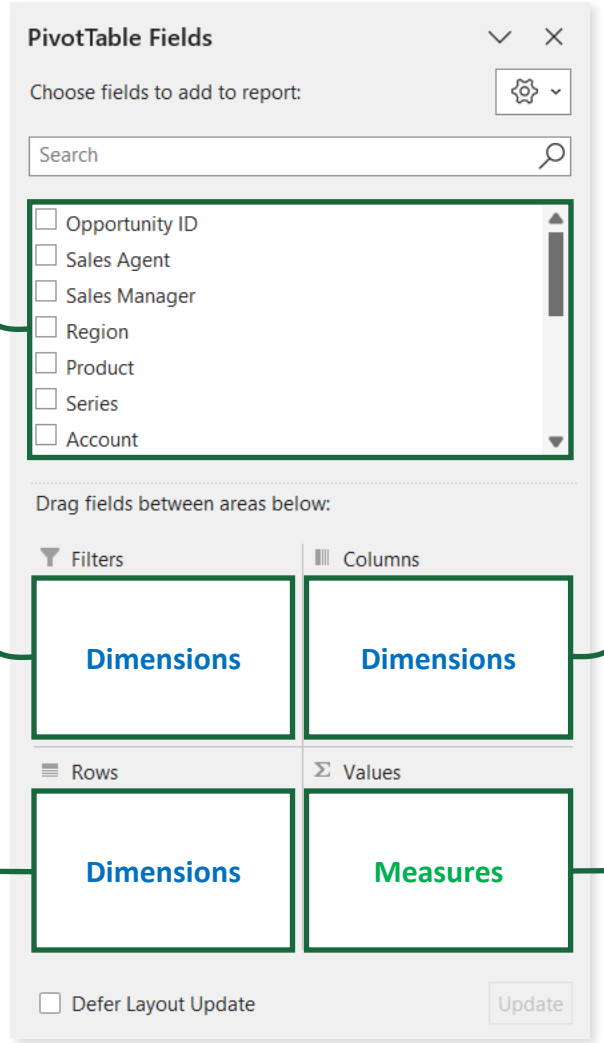
Where will the PivotTable live?

HEY THIS IS IMPORTANT!

Checking **"Add this data to the Data Model"** will load the data into Excel's data model, and require the use of advanced tools like Power Pivot and DAX *(covered in a separate course)*

THE FIELD LIST

The **Field List** shows all the columns in your data



Filters appear as drop-down lists, and can be used to filter the entire pivot table view

Fields included as **Columns** will appear as individual column items in the pivot table

Fields included as **Rows** will appear as individual row items in the pivot table

Fields included as **Values** will be summarized based on Pivot Table context *(filters, rows & columns)*

PIVOTING DATA

Data Structure

Creating Pivot Tables

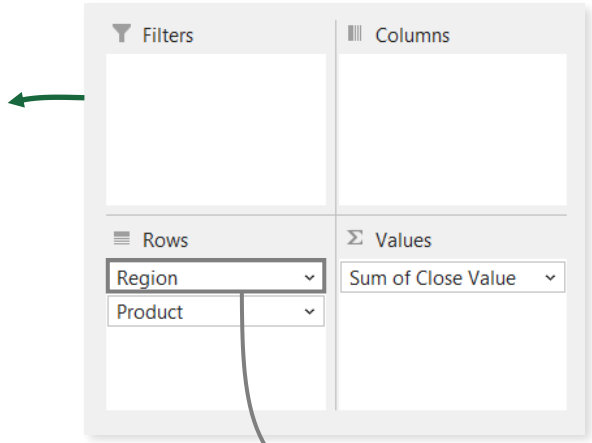
Calculation Options

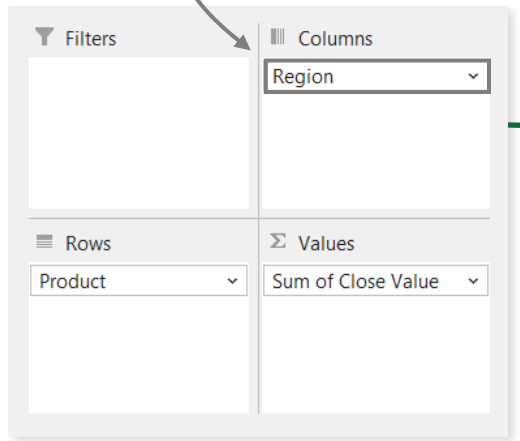
Sorting & Filtering

Calculated Fields

Moving fields from rows to columns, or **pivoting**, changes the way data is displayed:

Region	Product	Sum of Close Value
Central		**$3,346,293**
	GTK 500	$0
	GTX Basic	$182,839
	GTX Plus Basic	$276,512
	GTX Plus Pro	$931,904
	GTX Pro	$1,104,109
	MG Advanced	$828,947
	MG Special	$21,982
East		**$3,090,594**
	GTK 500	$0
	GTX Basic	$117,331
	GTX Plus Basic	$200,679
	GTX Plus Pro	$822,168
	GTX Pro	$1,285,647
	MG Advanced	$655,914
	MG Special	$8,855
West		**$3,568,647**
	GTK 500	$400,612
	GTX Basic	$199,093
	GTX Plus Basic	$228,084
	GTX Plus Pro	$875,579
	GTX Pro	$1,120,822
	MG Advanced	$731,526
	MG Special	$12,931

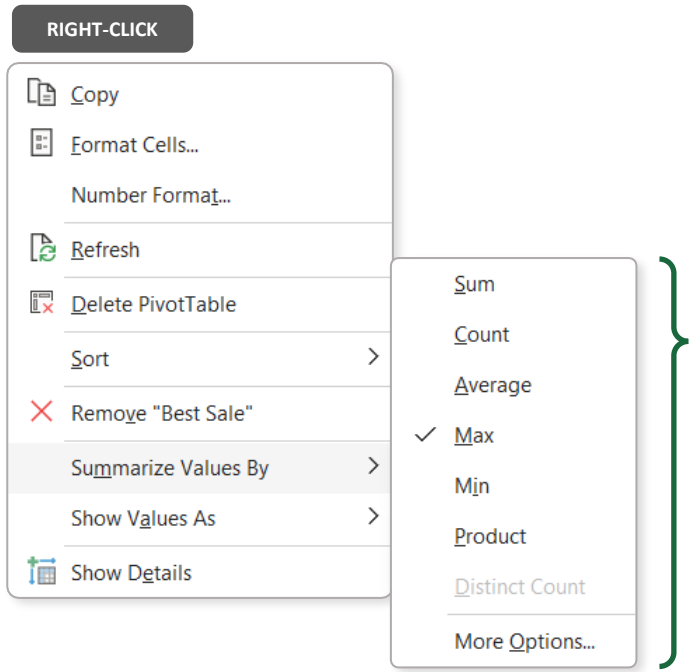




Sum of Close Value	Region		
Product	Central	East	West
GTK 500	$0	$0	$400,612
GTX Basic	$182,839	$117,331	$199,093
GTX Plus Basic	$276,512	$200,679	$228,084
GTX Plus Pro	$931,904	$822,168	$875,579
GTX Pro	$1,104,109	$1,285,647	$1,120,822
MG Advanced	$828,947	$655,914	$731,526
MG Special	$21,982	$8,855	$12,931

SUMMARIZE VALUES BY

The **summarize values by** option determines how your data will be aggregated when rolled up or summarized at different levels *(sum, count, average, max, etc.)*



	Total Sales	*Deals Won*	*Avg Deal Size*	*Best Sale*
Month	**Sum of Close Value**	**Count of Close Value**	**Average of Close Value**	**Max of Close Value**
Mar	$1,134,672	531	$2,137	$25,897
Apr	$721,932	285	$2,533	$25,288
May	$1,025,713	438	$2,342	$6,310
Jun	$1,338,466	531	$2,521	$30,288
Jul	$696,932	308	$2,263	$6,100
Aug	$1,050,059	446	$2,354	$25,791
Sep	$1,235,264	503	$2,456	$29,166
Oct	$731,980	279	$2,624	$27,971
Nov	$938,943	406	$2,313	$26,186
Dec	$1,131,573	511	$2,214	$29,220
Grand Total	**$10,005,534**	**4,238**	**$2,361**	**$30,288**

SHOW VALUES AS

Data Structure

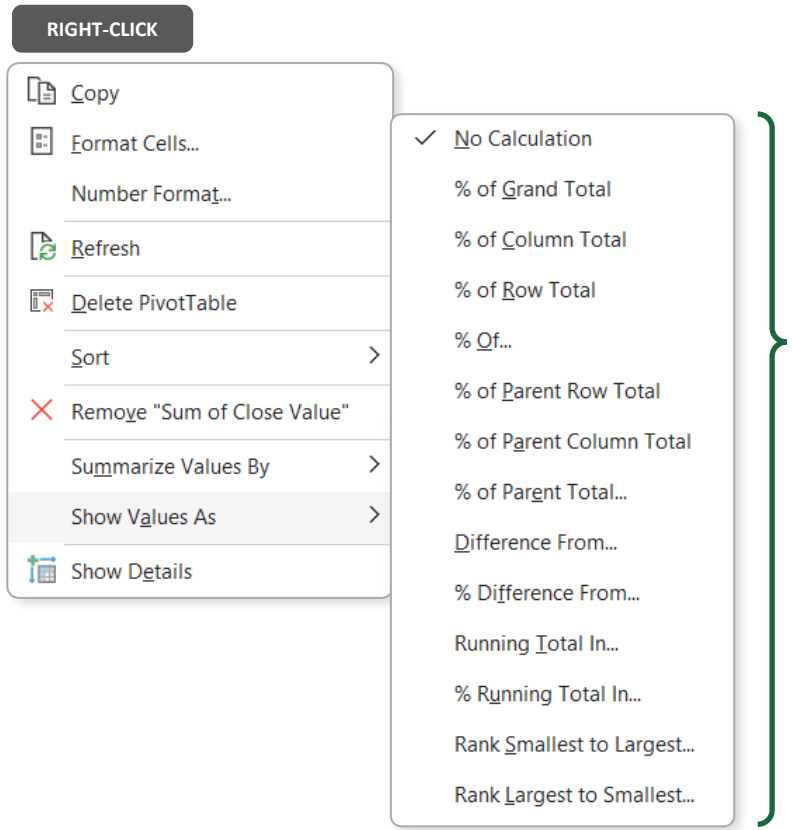
Creating Pivot Tables

Calculation Options

Sorting & Filtering

Calculated Fields

Show values as options allow you to apply calculations which change the way values are represented in the pivot table *(percent of column, row, total, etc.)*

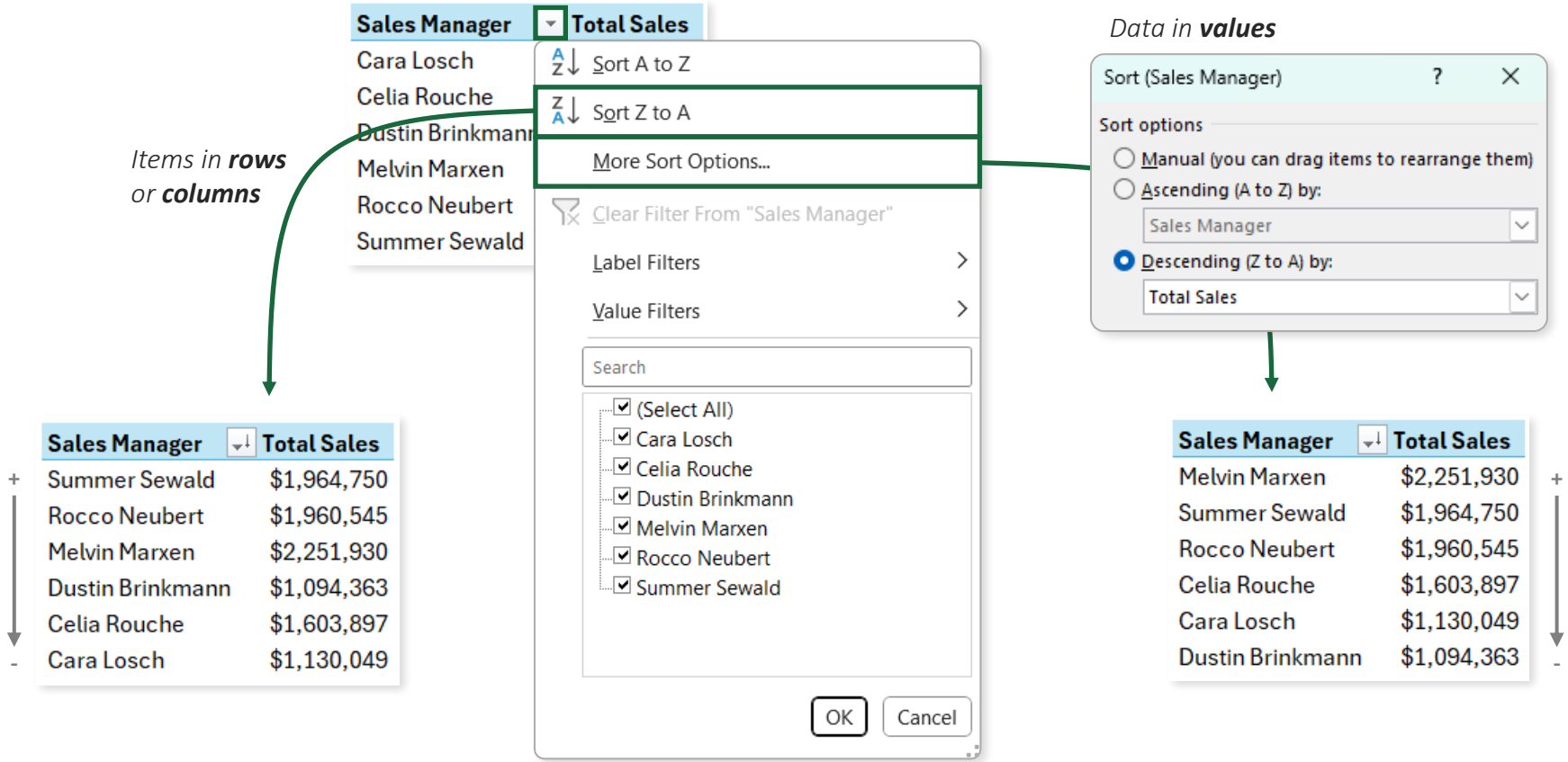


	No Calculation	*% of Column Total*	*Diff. from prev. Month*	*Running Total*
Month	**Sum of Deal Won**	**Sum of Deal Won2**	**Sum of Deal Won3**	**Sum of Deal Won4**
Mar	531	12.53%		531
Apr	285	6.72%	-246	816
May	438	10.34%	153	1,254
Jun	531	12.53%	93	1,785
Jul	308	7.27%	-223	2,093
Aug	446	10.52%	138	2,539
Sep	503	11.87%	57	3,042
Oct	279	6.58%	-224	3,321
Nov	406	9.58%	127	3,727
Dec	511	12.06%	105	4,238
Grand Total	**4238**	**100.00%**		

SORTING

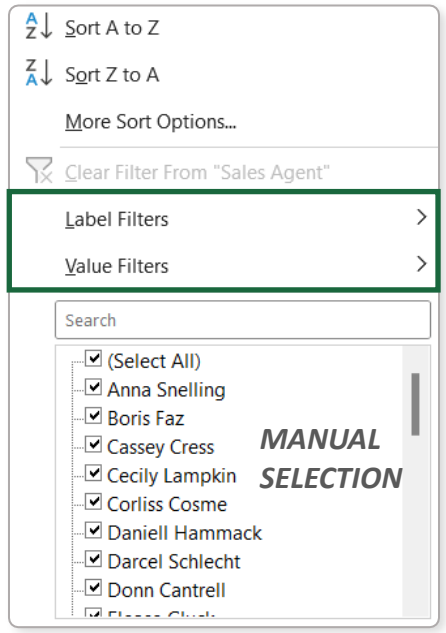
- Data Structure
- Creating Pivot Tables
- Calculation Options
- **Sorting & Filtering**
- Calculated Fields

There are two ways to **sort** your pivot table data in ascending or descending order:

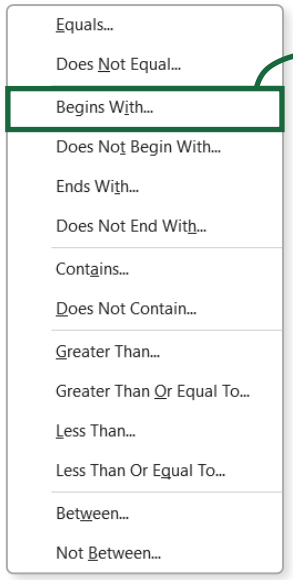


FILTERING

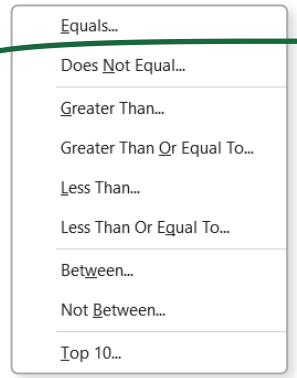
Like normal tables, you can **filter** pivot table data by values *(manual)* or by condition:

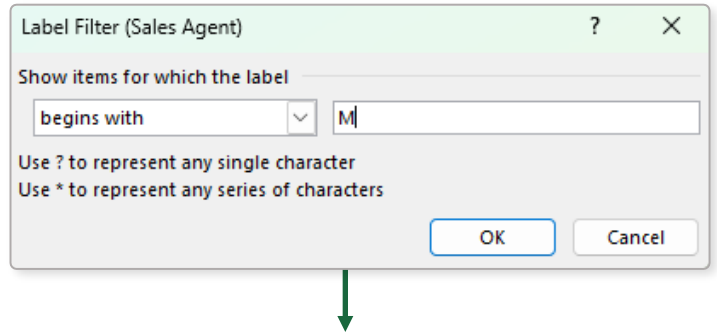


LABEL FILTERS:



VALUE FILTERS:



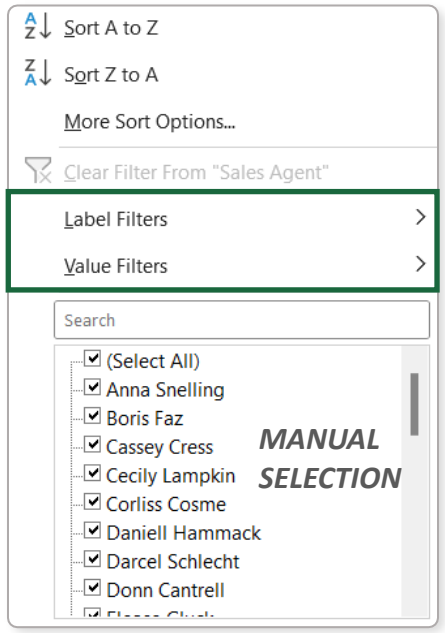


Sales Agent	Total Sales
Markita Hansen	$328,792
Marty Freudenburg	$291,195
Maureen Marcano	$350,395
Moses Frase	$207,182

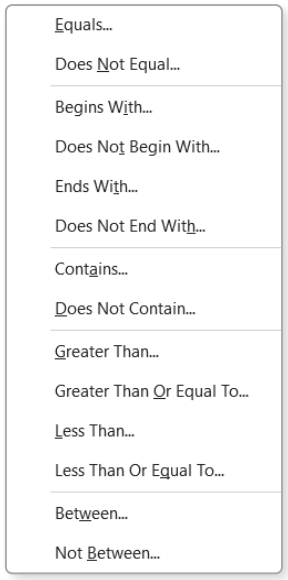
PRO TIP: By default, you can only apply *one* filter at a time. To enable multiple filters, go to *PivotTable Analyze > Options > Totals & Filters and* select **"Allow multiple filters per field"**

FILTERING

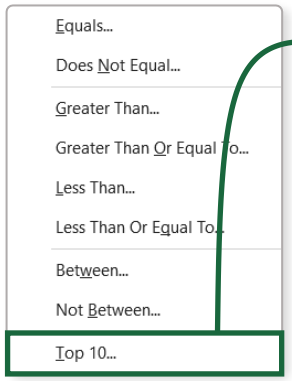
Like normal tables, you can **filter** pivot table data by values *(manual)* or by condition:

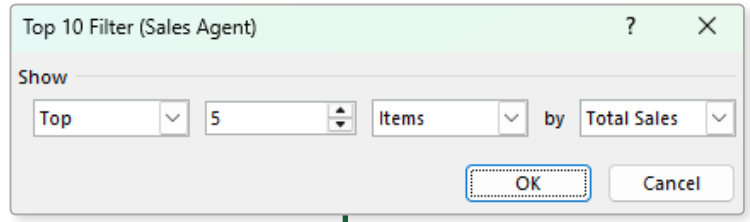


LABEL FILTERS:



VALUE FILTERS:





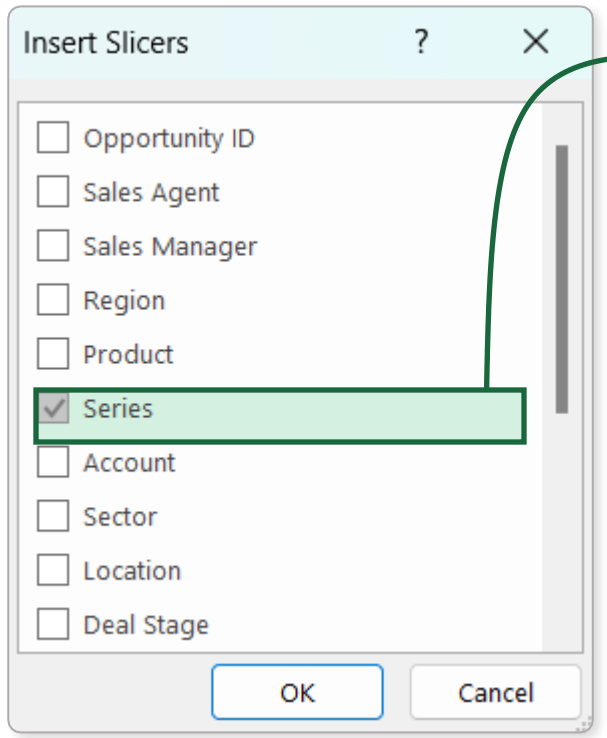
Sales Agent	Total Sales
Cassey Cress	$450,489
Darcel Schlecht	$1,153,214
Donn Cantrell	$445,860
Kary Hendrixson	$454,298
Vicki Laflamme	$478,396

PRO TIP: By default, you can only apply *one* filter at a time. To enable multiple filters, go to *PivotTable Analyze > Options > Totals & Filters and* select **"Allow multiple filters per field"**

PRO TIP: SLICERS & TIMELINES

Slicers are user-friendly, interactive versions of Pivot Table filters, and **Timelines** are slicers specifically designed to work with date fields

PivotTable Analyze > Insert Slicer



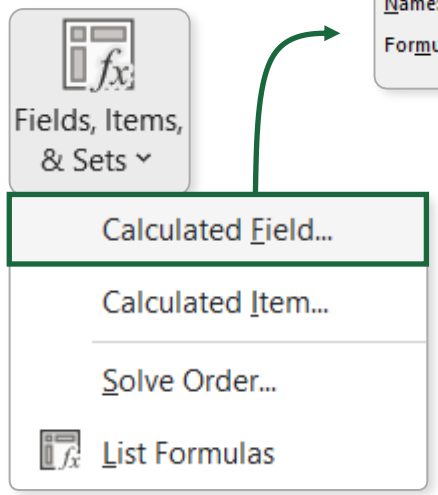
Product	Total Sales
GTX Basic	$499,263
GTX Plus Basic	$705,275
GTX Plus Pro	$2,629,651
GTX Pro	$3,510,578
Grand Total	**$7,344,767**

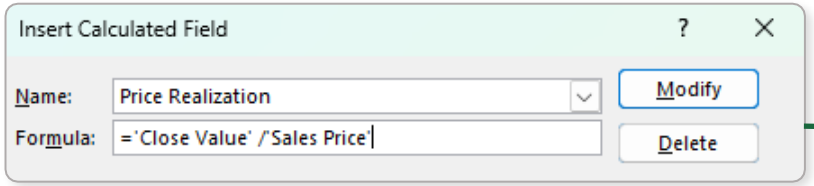
PRO TIP: Use the "Report Connections" option in the Slicer tab to link slicers to ***multiple*** **Pivot Tables** that share the same source data

CALCULATED FIELDS

Calculated fields allow you to create measures based on existing fields

PivotTable Analyze





Deal Won 1

Sales Manager	Sum of Sales Price	Sum of Close Value	Price Realization
Cara Losch	$1,130,734	$1,130,049	99.94%
Celia Rouche	$1,607,106	$1,603,897	99.80%
Dustin Brinkmann	$1,103,493	$1,094,363	99.17%
Melvin Marxen	$2,248,701	$2,251,930	100.14%
Rocco Neubert	$1,956,632	$1,960,545	100.20%
Summer Sewald	$1,976,816	$1,964,750	99.39%
Grand Total	**$10,023,482**	**$10,005,534**	**99.82%**

HEY THIS IS IMPORTANT!

Calculated fields are always based on the SUM of the fields they contain

KEY TAKEAWAYS: PIVOT TABLES

The source data for a pivot table must be **tabular**

- *It's important to have clear columns headers and include both dimensions and measures*

Pivot tables let you easily **explore data** by slicing & dicing it

- *Move dimensions into rows & columns and measures into values to analyze & summarize data in multiple ways*
- *Use "summarize by" options and "show as" calculations to modify how you aggregate and display measures*

You can **sort** and **filter** pivot table results

- *You can sort by dimensions or values, and filter by values or criteria*

Create **calculated fields** to perform dynamic calculations

- *These are ideal for calculating rates that adapt to the data as you modify the pivot table views*

CHARTS & GRAPHS

CHARTS & GRAPHS

In this section we'll cover visualizing data with **charts & graphs**, including how to identify the right chart type, how to format it properly, and how to use it to tell a story

TOPICS WE'LL COVER:

- **Data Viz 101**
- **Creating Charts**
- **Essential Visuals**

GOALS FOR THIS SECTION:

- Understand the importance of visualizing data to communicate numbers effectively
- Learn to choose the right chart type
- Create and customize basic charts in Excel, including line, bar, pie charts, and more!

THE SECTION PROJECT

THE SITUATION

You work as a data visualization specialist at the **World Health Organization (WHO)**, a specialized agency of the United Nations responsible for global public health

THE BRIEF

You've been given access to a subset of data on **World Development Indicators** that contains life expectancy and health expenditure figures from 2000 to 2021

Your goal is to **leverage your Excel skills** to find interesting trends & patterns in the data and visualize them to communicate your insights effectively

THE OBJECTIVE

Use Excel to:

- Prepare the data for visualization
- Create the right chart for each scenario
- Customize each chart to tell a clear story

WHY VISUALIZE DATA?

Data visualization allows you to bring your data to life

- The human brain is built to interpret raw data as meaningless numbers and noise
- We need **clear patterns** and **visual cues** to help us quickly make sense of complex information

*In **10 seconds**, what can you learn from the data below?*

Product Sales by Month (in millions)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Product A	4.8	5.78	6.24	6.34	6.95	3.02	8.45	8.79	10.3	9.93	11.4	11.56
Product B	0.67	1.05	1.62	2.67	3.91	5.49	8.36	10.99	13.58	14.81	15.13	15.26
Product C	4.53	4.61	4.74	5.1	5.32	5.7	5.77	6.32	6.56	6.64	18.5	19.8
Product D	8.35	7.72	12.05	7.7	7.05	11.05	6.95	6.39	9.5	4.83	4.03	8.03

WHY VISUALIZE DATA?

Data visualization allows you to bring your data to life

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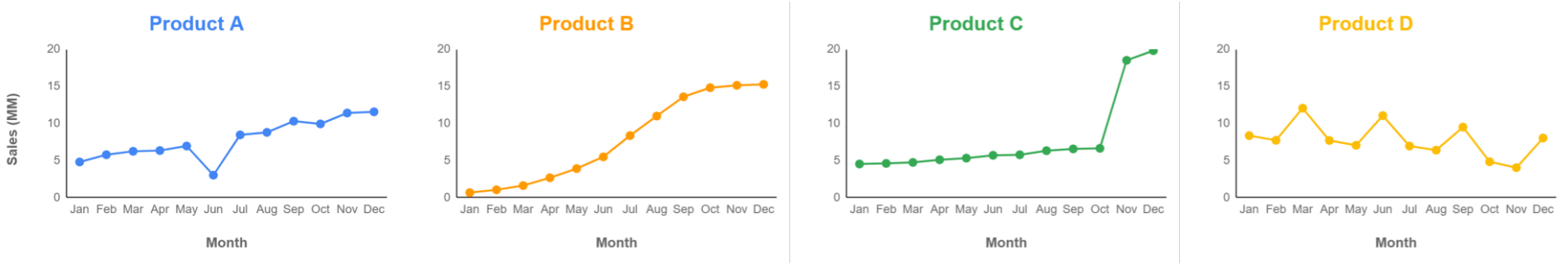
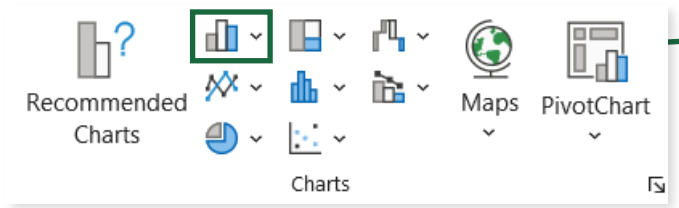
*What if you **visualize** it?*

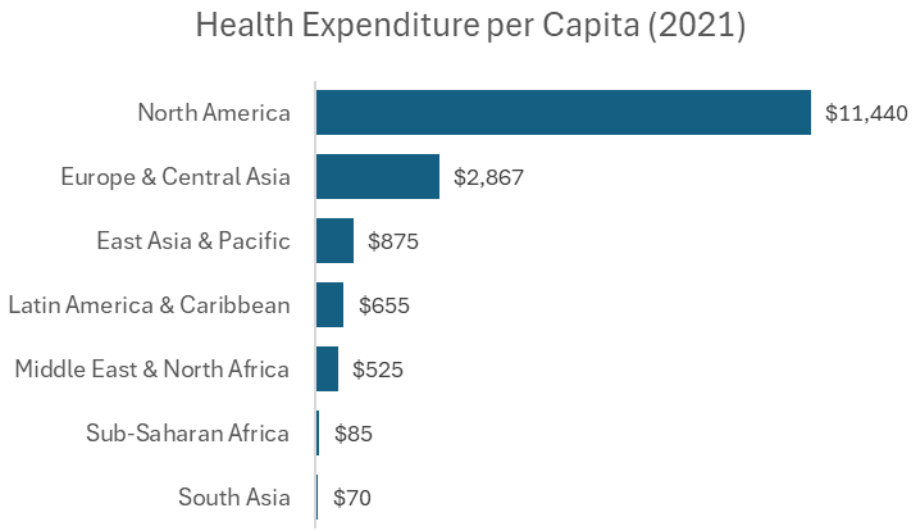


CREATING CHARTS

You can **create a chart** in Excel by a selecting a chart type from the Insert tab:

Region	Health Expenditure per Capita
North America	$11,440
Europe & Central Asia	$2,867
East Asia & Pacific	$875
Latin America & Caribbean	$655
Middle East & North Africa	$525
Sub-Saharan Africa	$85
South Asia	$70





CHOOSING THE RIGHT CHART TYPE

When **choosing the right chart type**, there are two main things to focus on:

- The **type of data** you're working with *(categorical, time series, or numerical)*
- What you want to **communicate** *(comparison, composition, relationship, or distribution)*

Region	Health Expenditure per Capita
North America	$11,440
Europe & Central Asia	$2,867
East Asia & Pacific	$875
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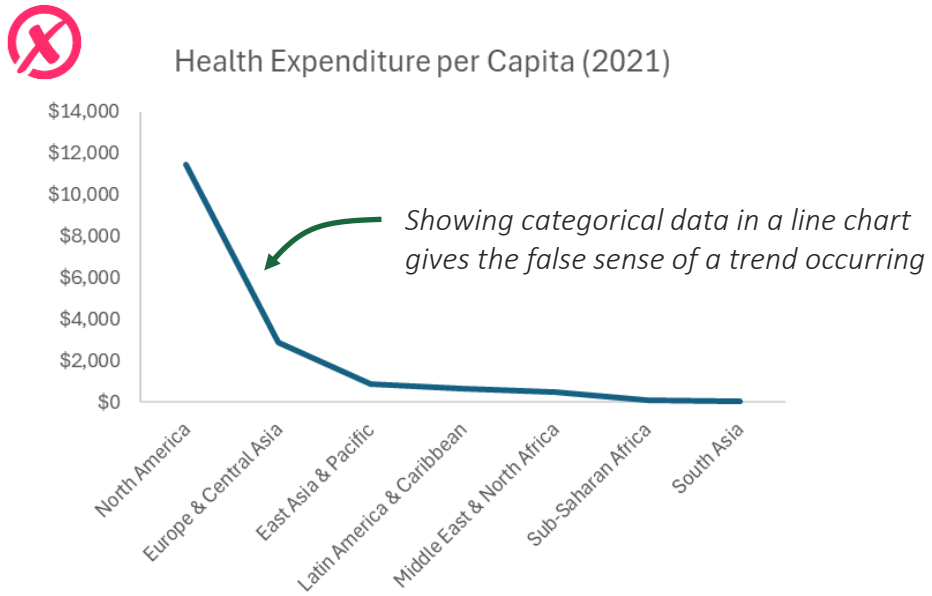
Sub-Saharan Africa	$85
South Asia	$70

*We want to **compare** health expenditure across these regions, or **categories***



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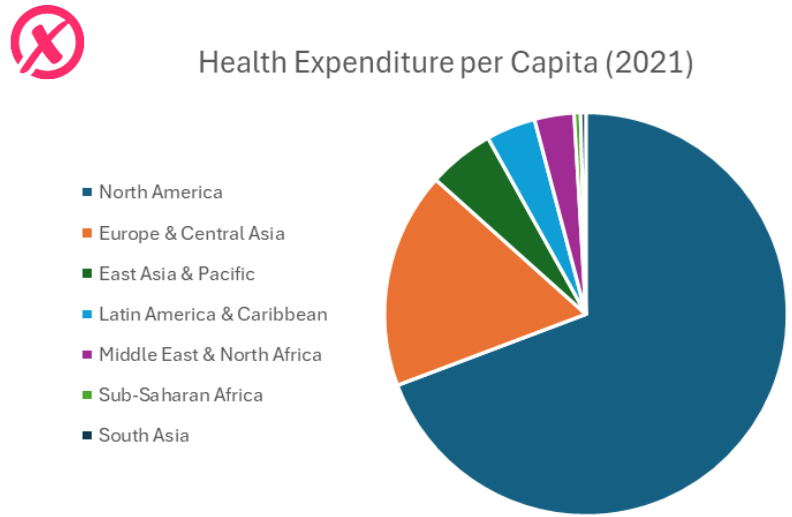

Pie charts help show the composition of parts in a whole, but don't let you compare the parts very well

CHOOSING THE RIGHT CHART TYPE

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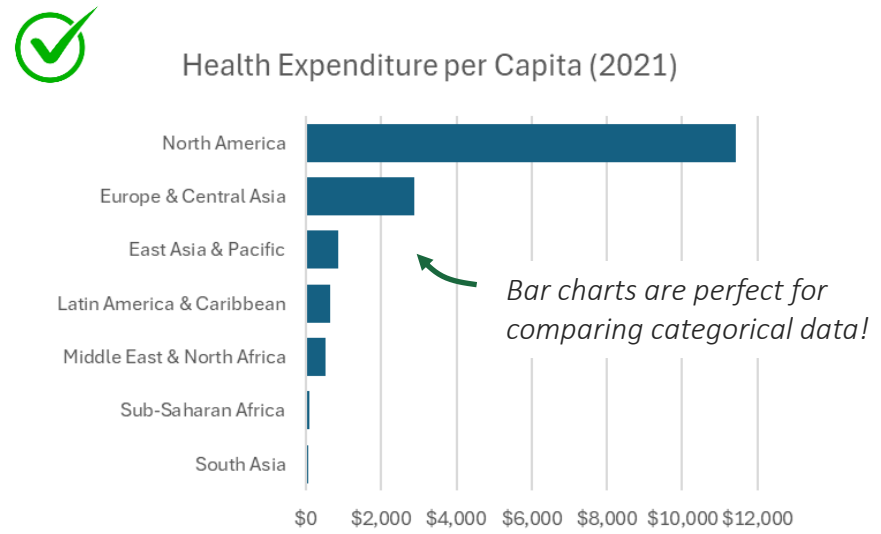


LINE CHARTS

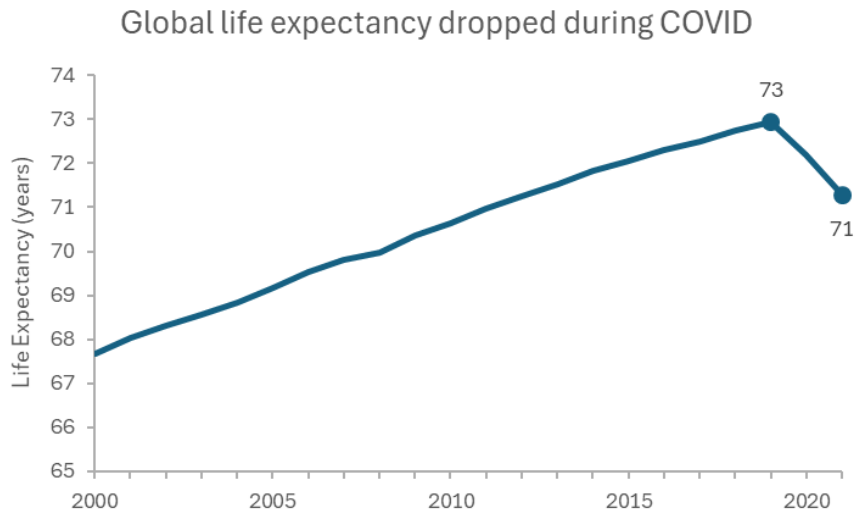
Line charts are commonly used for visualizing trends over time

- They use **time series** data and communicate **comparison**

Column for each line

Continuous dates in the rows

Year	Life Expectancy
2000	68
2001	68
2002	68
2003	69
2004	69
2005	69
2006	70
2007	70
2008	70
2009	70



PRO TIP: If you have multiple series, try to highlight one or two lines using color and thickness and mute out the rest to focus on a clear story

STACKED AREA CHARTS

Data Viz 101

Creating Charts

Essential Visuals

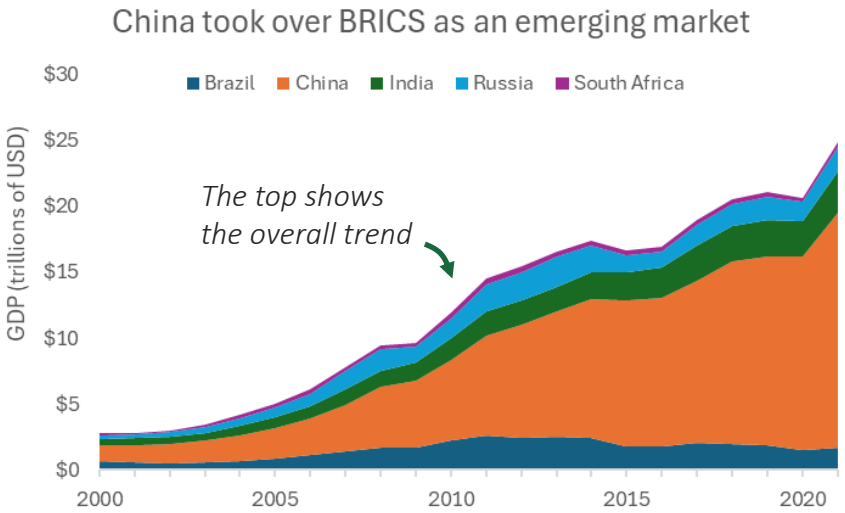
Stacked area charts are used for visualizing changes in composition over time

- They use **time series** data and communicate both **comparison** and **composition**

Column for area

Continuous dates in the rows

Year	Brazil	China	India	Russia	South Africa
2000	$0.7	$1.2	$0.5	$0.3	$0.2
2001	$0.6	$1.3	$0.5	$0.3	$0.1
2002	$0.5	$1.5	$0.5	$0.3	$0.1
2003	$0.6	$1.7	$0.6	$0.4	$0.2
2004	$0.7	$2.0	$0.7	$0.6	$0.3
2005	$0.9	$2.3	$0.8	$0.8	$0.3
2006	$1.1	$2.8	$0.9	$1.0	$0.3
2007	$1.4	$3.6	$1.2	$1.3	$0.3
2008	$1.7	$4.6	$1.2	$1.7	$0.3
2009	$1.7	$5.1	$1.3	$1.2	$0.3



PRO TIP: Use a **100% stacked area chart** to focus on the changes in composition (by losing the comparison)

STACKED AREA CHARTS

Data Viz 101

Creating Charts

Essential Visuals

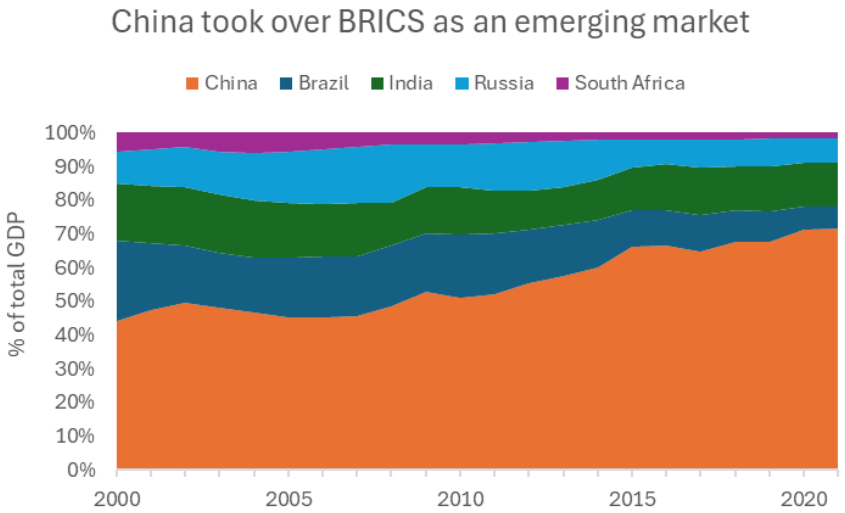
Stacked area charts are used for visualizing changes in composition over time

- They use **time series** data and communicate both **comparison** and **composition**

Column for each area

Continuous dates in the rows

Year	Brazil	China	India	Russia	South Africa
2000	$0.7	$1.2	$0.5	$0.3	$0.2
2001	$0.6	$1.3	$0.5	$0.3	$0.1
2002	$0.5	$1.5	$0.5	$0.3	$0.1
2003	$0.6	$1.7	$0.6	$0.4	$0.2
2004	$0.7	$2.0	$0.7	$0.6	$0.3
2005	$0.9	$2.3	$0.8	$0.8	$0.3
2006	$1.1	$2.8	$0.9	$1.0	$0.3
2007	$1.4	$3.6	$1.2	$1.3	$0.3
2008	$1.7	$4.6	$1.2	$1.7	$0.3
2009	$1.7	$5.1	$1.3	$1.2	$0.3



PRO TIP: Use a **100% stacked area chart** to focus on the changes in composition (by losing the comparison)

BAR CHARTS

Data Viz 101

Creating Charts

Essential Visuals

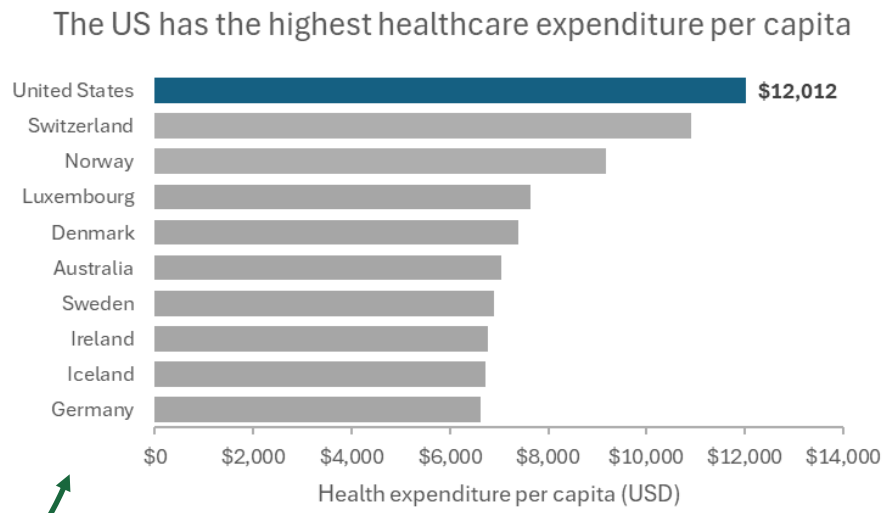
Bar charts are used for comparing values across different categories

- They use **categorical** data and communicate **comparison**

Values in a single column

Categories as the rows

Country	Health Expenditure per Capita
Germany	$6,626
Iceland	$6,716
Ireland	$6,764
Sweden	$6,901
Australia	$7,055
Denmark	$7,382
Luxembourg	$7,636
Norway	$9,163
Switzerland	$10,897
United States	$12,012



The bars are sorted in opposite order as their source data!

COMBO CHARTS

Data Viz 101

Creating Charts

Essential Visuals

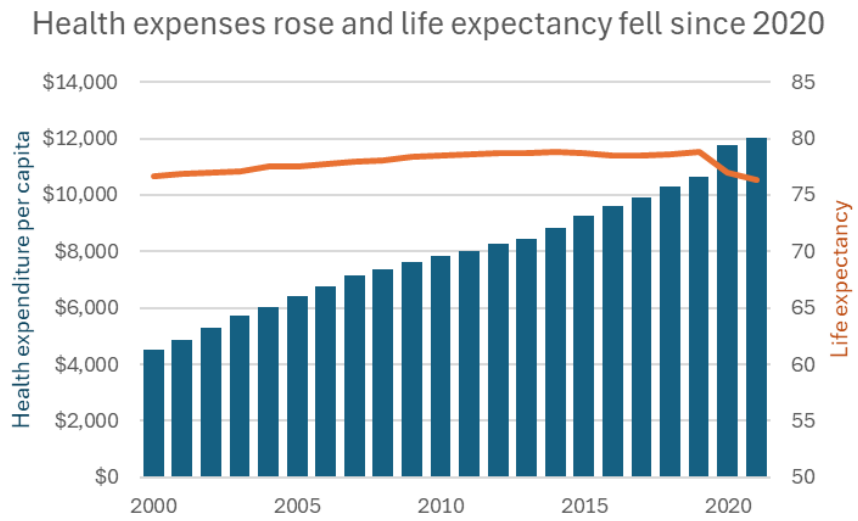
Combo charts are used for visualizing two or more series of data using multiple chart types within a single visual

- They typically use a combination of a line and column chart
- They work best with **time series** data to communicate **comparison** and **relationships**

Y-axis values in each column

X-axis values as the rows

Year	Health Expenditure per Capita	Life Expectancy
2000	$4,534	77
2001	$4,881	77
2002	$5,305	77
2003	$5,709	77
2004	$6,048	77
2005	$6,404	77
2006	$6,779	78
2007	$7,132	78
2008	$7,347	78
2009	$7,603	78
2010	$7,833	79
2011	$8,022	79
2012	$8,274	79



*Use a **secondary y-axis** when the series are on different scales*

PIE & DONUT CHARTS

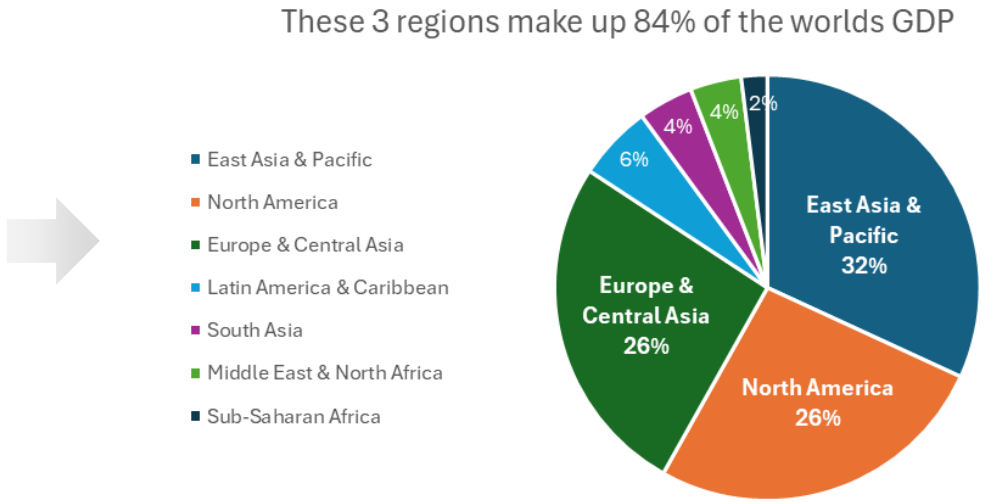
Pie & donut charts are used for visualizing part-to-whole relationships

- They use **categorical** data to communicate **composition**

Values in a column

Slices as the rows

Region	GDP (trillions)
East Asia & Pacific	$31
North America	$26
Europe & Central Asia	$26
Latin America & Caribbean	$6
South Asia	$4
Middle East & North Africa	$4
Sub-Saharan Africa	$2



PRO TIP: Keep the number of slices low (<6) to maximize readability; you can group "others" into a single slice

HISTOGRAMS

Data Viz 101

Creating Charts

Essential Visuals

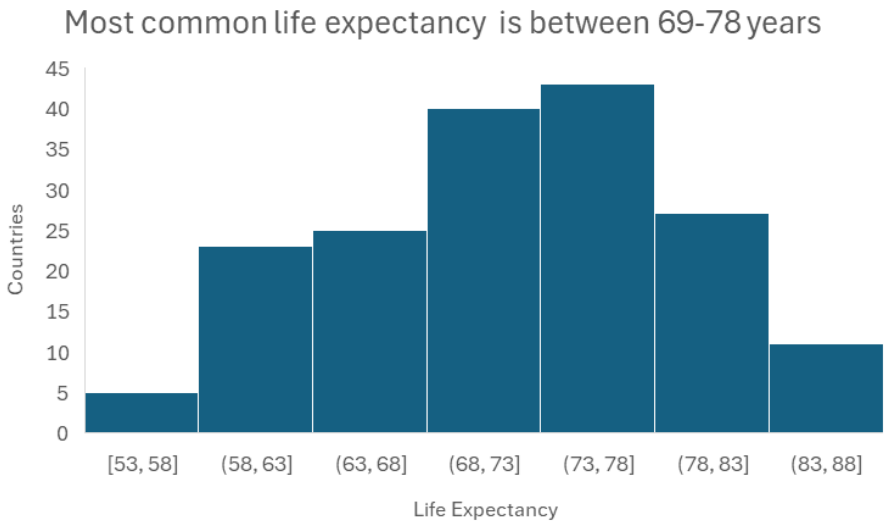
Histograms are used for visualizing the distribution of a numerical variable

- They use **numerical** data to communicate **distribution**

Values in a column

Life Expectancy
76
76
62
78
75
72
83
81
69
72
79
72
78

n=174



SCATTERPLOTS

Scatterplots are used for visualizing the relationship between numerical variables

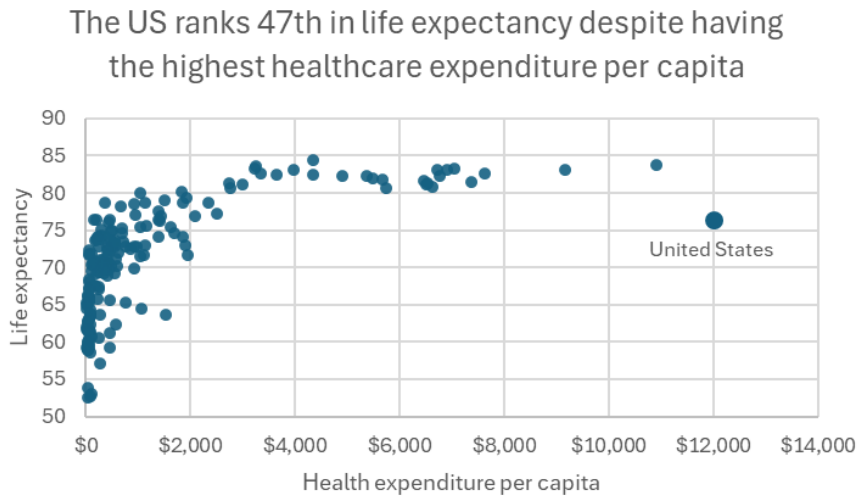
- They use **numerical** data to communicate **relationships**

X-axis *Y-axis*

Health Expenditure per Capita	Life Expectancy
$465	76
$205	76
$64	62
$923	78
$1,045	75
$613	72
$7,055	83
$6,505	81
$249	69
$1,962	72
$1,146	79
$58	72
$1,400	78

One row per point

n=174



MAPS

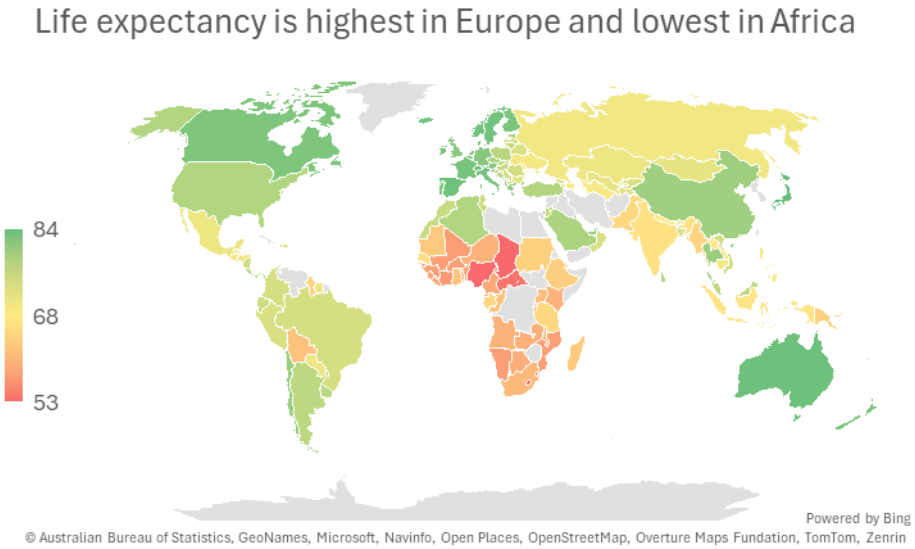
Maps are used to visualize data for geographic locations *(countries, cities, states, etc.)*

- They use **geographical** data to communicate **comparisons**

Values in a column

One row per location

Country	Life Expectancy
Albania	76
Algeria	76
Angola	62
Antigua and Barbuda	78
Argentina	75
Armenia	72
Australia	83
Austria	81
Azerbaijan	69
Bahamas, The	72
Bahrain	79
Bangladesh	72
Barbados	78
Belarus	72
[illegible]	82



KEY TAKEAWAYS: CHARTS & GRAPHS

Data visualization allows you to **bring your data to life**

- *Humans aren't wired to understand raw data and numbers, but charts are intuitive and easy to understand*

It's critical to **choose the right chart type** for each situation

- *This will depend on the type of data you have and the message you're trying to communicate*

Chart formatting can help turn an OK visual into an excellent one

- *Focus on eliminating noise and distractions, using color with purpose, and telling a story*