

UP & RUNNING WITH

GOOGLE SHEETS

MASTER THE SKILLS YOU NEED TO WORK WITH DATA IN SPREADSHEETS,
CREATE PRACTICAL REPORTS & VISUALS, AND COLLABORATE WITH OTHERS



With Best-Selling Instructor **Enrique Ruiz**



COURSE STRUCTURE



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

Course resources include:

-  **Downloadable PDF eBook** (100+ 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	<h2>Introducing Google Sheets</h2>	<p><i>Create your first spreadsheets, navigate the Sheets interface, and draw comparisons with Microsoft Excel</i></p>
2	<h2>Spreadsheet Fundamentals</h2>	<p><i>Review key spreadsheet concepts like data types, tables, cell references, number formatting, and sorting & filtering</i></p>
3	<h2>Formulas & Functions</h2>	<p><i>Perform calculations and manipulate data using formulas, including function syntax, reference types, and common errors</i></p>
4	<h2>Pivot Tables</h2>	<p><i>Explore and analyze data using pivot tables, including data structure, calculation options, and sorting, filtering & grouping</i></p>
5	<h2>Charts & Graphs</h2>	<p><i>Visualize data using the right chart type and apply deliberate formatting to tell a clear and compelling story</i></p>
6	<h2>Sharing & Collaboration</h2>	<p><i>Share your work with others and collaborate in real time, including comments, chat, notifications, and edit history</i></p>

SETTING EXPECTATIONS



This course is designed to get you up and running with **Google Sheets**

- *Our goal is to provide a deep understanding of the essential aspects of working with data in spreadsheets*
- *We won't cover every single Google Sheets tool, function, or chart type*



Some of the key spreadsheet concepts you'll learn **also apply to Microsoft Excel**

- *Although we'll always be working in Google Sheets, most of the spreadsheet fundamentals, keyboard shortcuts, functions, pivot table features, and chart types are also available in Microsoft Excel*



This is a **hands-on** and **project-based** learning experience

- *You will get the most value out of this course if you follow along closely with the demos*
- *We'll be working through a different project as part of each section of the course*



What you see on your screen **may not always match mine**

- *Google Sheets is updated frequently, so features and functionality may change over time*

THE COURSE PROJECTS



Your goal is to use your **spreadsheet fundamentals** skills to organize ACME's employee database so it can be used and explored by your HR supervisor

You need to use **formulas & functions** to manipulate & analyze Northwind Traders' order data so your manager can present the insights to upper management

You'll use **pivot tables** to explore and analyze Maven Marketers' latest paid search campaign data to identify opportunities and improve future performance

Your goal is to visualize data using **charts & graphs** to find interesting trends & patterns in Kickstarter projects across the years and communicate them effectively

You need to **share & collaborate** on MCG's project management tracker with your coworkers in order to optimize your communication and finish your project on time

INTRODUCING GOOGLE SHEETS

INTRODUCING GOOGLE SHEETS



In this section we'll **introduce Google Sheets**, create & manage spreadsheets, explore its interface, review important settings, and draw comparisons with Microsoft Excel

TOPICS WE'LL COVER:

Meet Google Sheets

Sheets vs. Excel

Creating Spreadsheets

Menus & Settings

GOALS FOR THIS SECTION:

- Launch Google Sheets and create your first spreadsheet on Google Drive
- Identify the similarities and differences between Google Sheets and Microsoft Excel
- Navigate and explore the core components of the Google Sheets interface
- Align on important language settings

MEET GOOGLE SHEETS



Google Sheets

Meet Google Sheets

Sheets vs. Excel

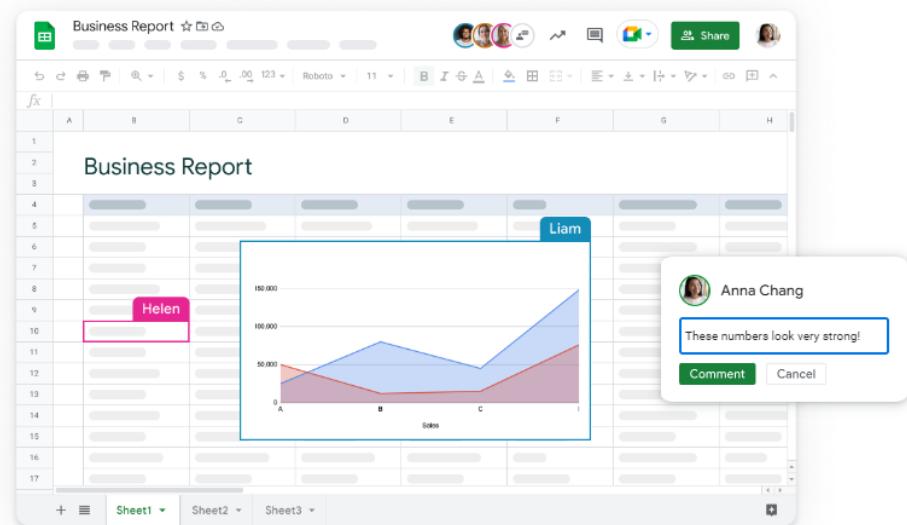
Creating Spreadsheets

Menus & Settings

Google Sheets is an online spreadsheet tool that lets you easily create & manage reports, analyze & visualize data, and collaborate in real-time with others

Common use cases include:

- Data analysis
- Business dashboards
- Financial modeling
- Project management
- Survey data collection
- and more!



GOOGLE ACCOUNT

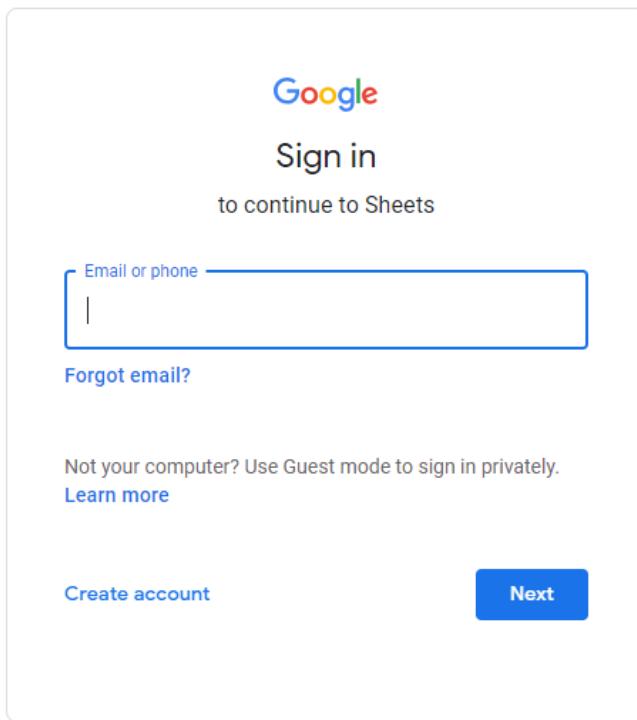
Meet Google Sheets

Sheets vs. Excel

Creating Spreadsheets

Menus & Settings

Google Sheets is completely free to use, but requires a **Google account**



- Head to **docs.google.com/spreadsheets** to get started with Google Sheets
- You can sign in to your existing account or create a new one



HEY THIS IS IMPORTANT!

All your spreadsheets will be saved to Google Drive on this account

GOOGLE SHEETS VS. MICROSOFT EXCEL

Meet Google Sheets

Sheets vs. Excel

Creating Spreadsheets

Menus & Settings

As the two most popular spreadsheet programs in the world, **Google Sheets** and **Microsoft Excel** are similar in many ways, but have a few key differences

Similarities

- Same spreadsheet structure & syntax
- They have almost identical function libraries (including dynamic arrays)
- Both have pivot tables for data analysis
- Both have data visualization capabilities (Excel has more customization options)
- Both have scripting languages for automation (Apps Script and VBA)

Differences

- Google Sheets is free & cloud-based, Excel is a paid desktop program
- Real-time collaboration is much more seamless in Google Sheets
- Excel has robust data prep and modeling features (Power Query & Power Pivot)
- Excel can handle much bigger datasets (Sheets is limited to 10 million cells)

CREATING SPREADSHEETS

There are several ways to **create a new spreadsheet**:

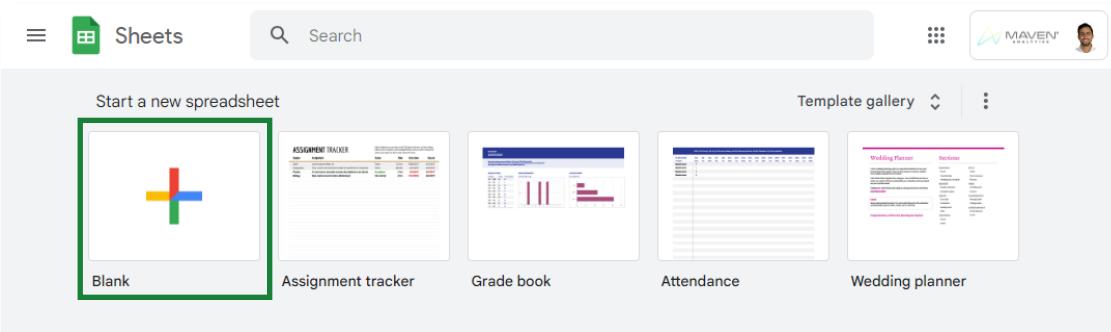
Meet Google Sheets

Sheets vs. Excel

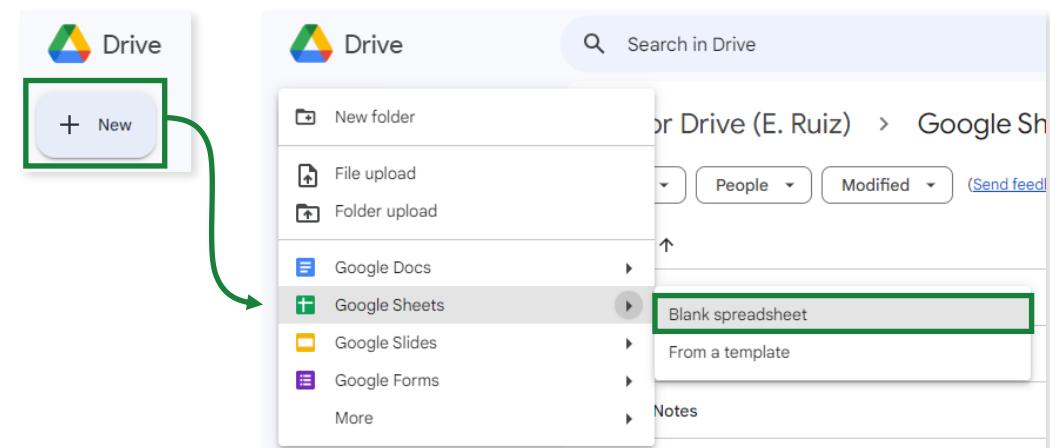
Creating Spreadsheets

Menus & Settings

- 1) Go to **docs.google.com/spreadsheets** and click on “Blank”



- 2) Go to **drive.google.com** and select New > Google Sheets > Blank spreadsheet



- 3) Go to **sheets.new**

CREATING SPREADSHEETS

Meet Google Sheets

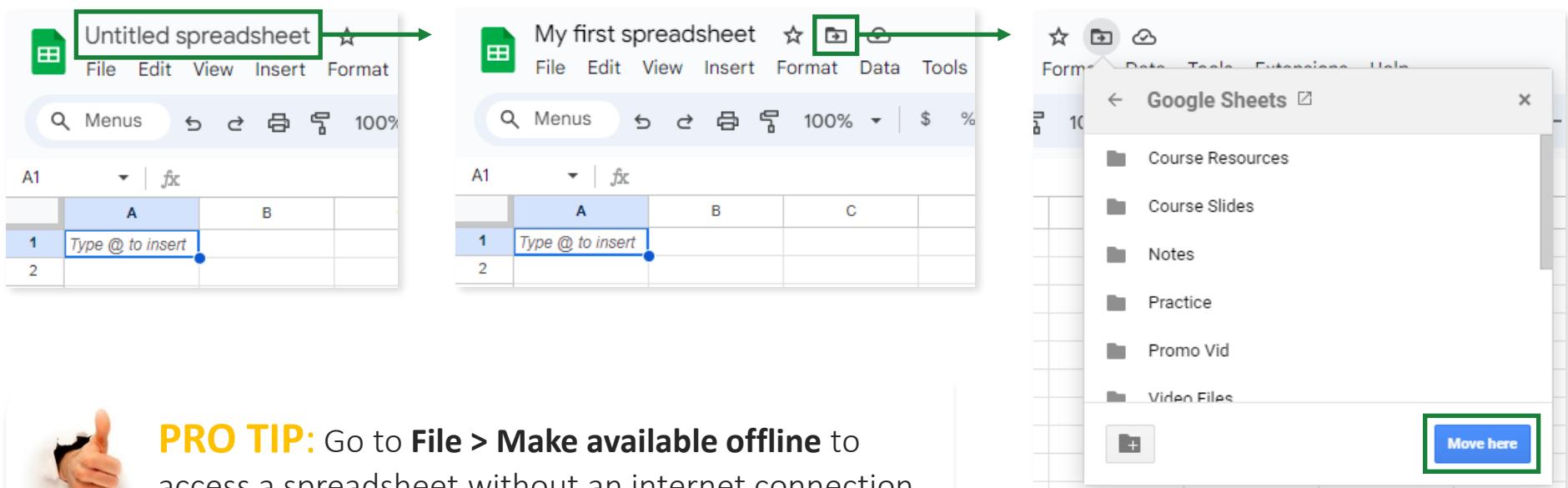
Sheets vs. Excel

Creating Spreadsheets

Menus & Settings

Once you're in a new spreadsheet, you can **name it** and **move it** to its desired location

- New spreadsheets are added to your main Google Drive folder by default



PRO TIP: Go to **File > Make available offline** to access a spreadsheet without an internet connection

OPENING & CONVERTING EXCEL FILES

Meet Google Sheets

Sheets vs. Excel

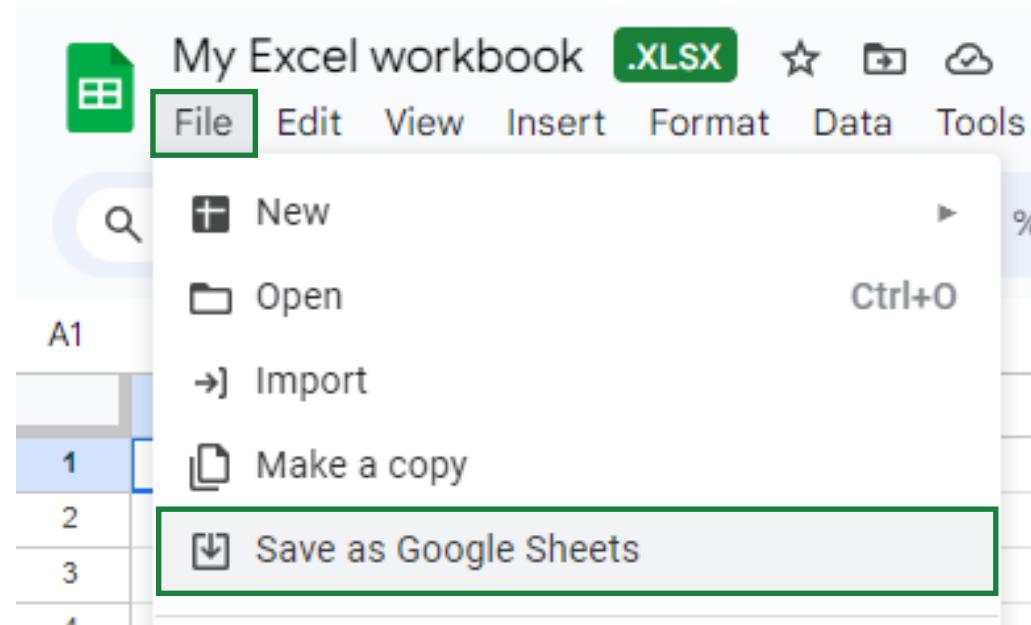
Creating Spreadsheets

Menus & Settings

You can **open Excel files** (.xlsx) in Sheets by saving them to Google Drive

- You can continue to use them normally or you can **convert** them to a Google Sheets document

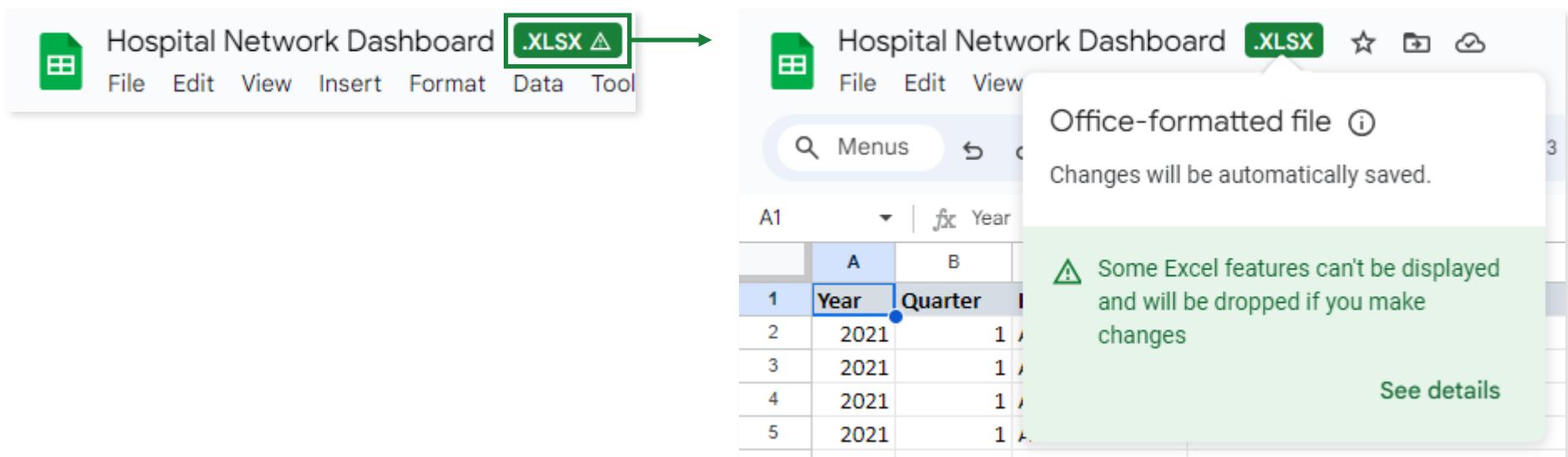
The .XLSX icon indicates this is an Excel file



COMPATIBILITY ISSUES

There are a few **compatibility issues** with Excel files in Google Sheets to be aware of:

- Excel functions not available in Sheets will return a #NAME? error
- Chart formatting may be lost or modified when opened in Sheets
- Some Excel pivot table features are unsupported in Sheets
- Excel form controls are unavailable in Sheets



Meet Google Sheets

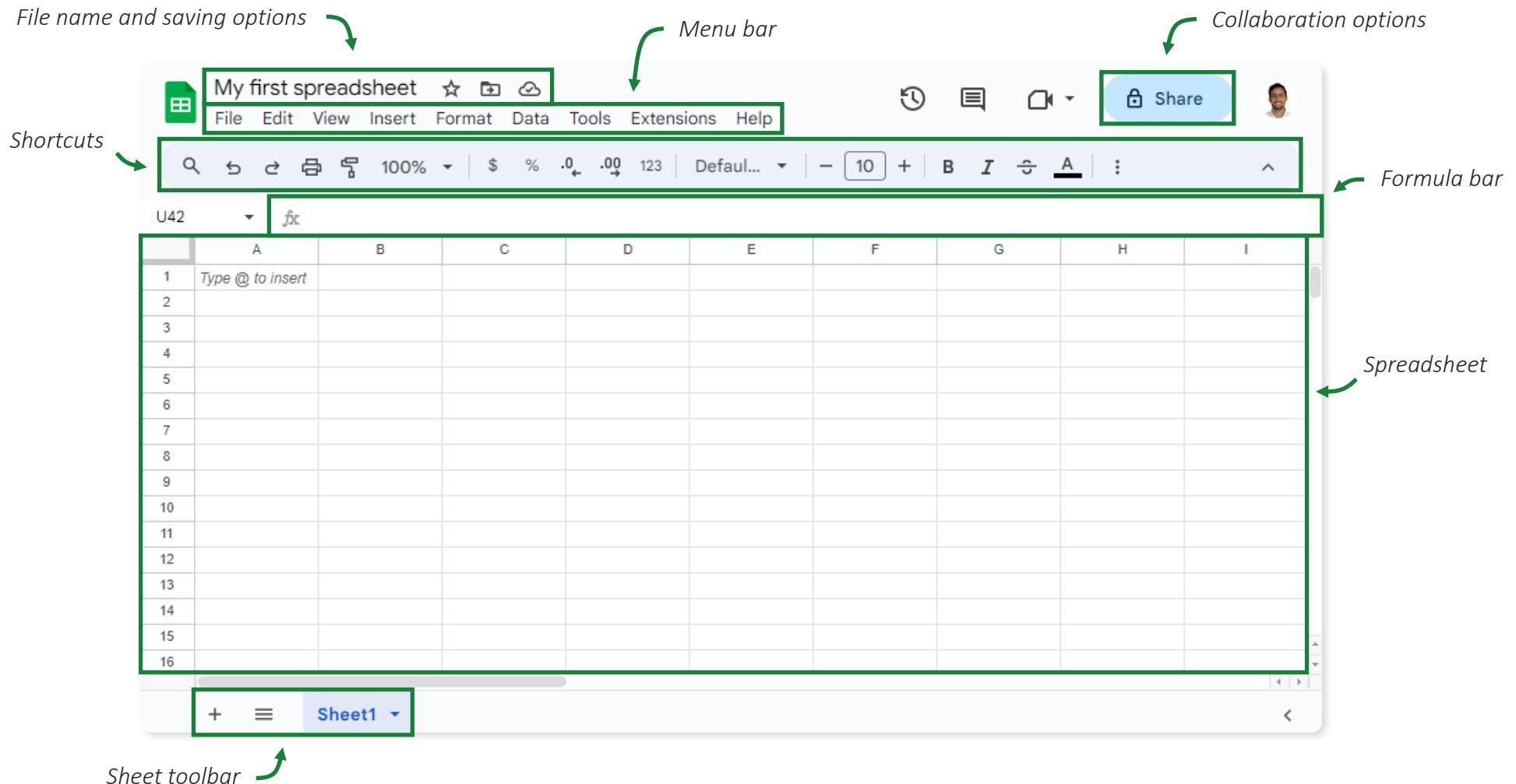
Sheets vs. Excel

Creating Spreadsheets

Menus & Settings

THE GOOGLE SHEETS INTERFACE

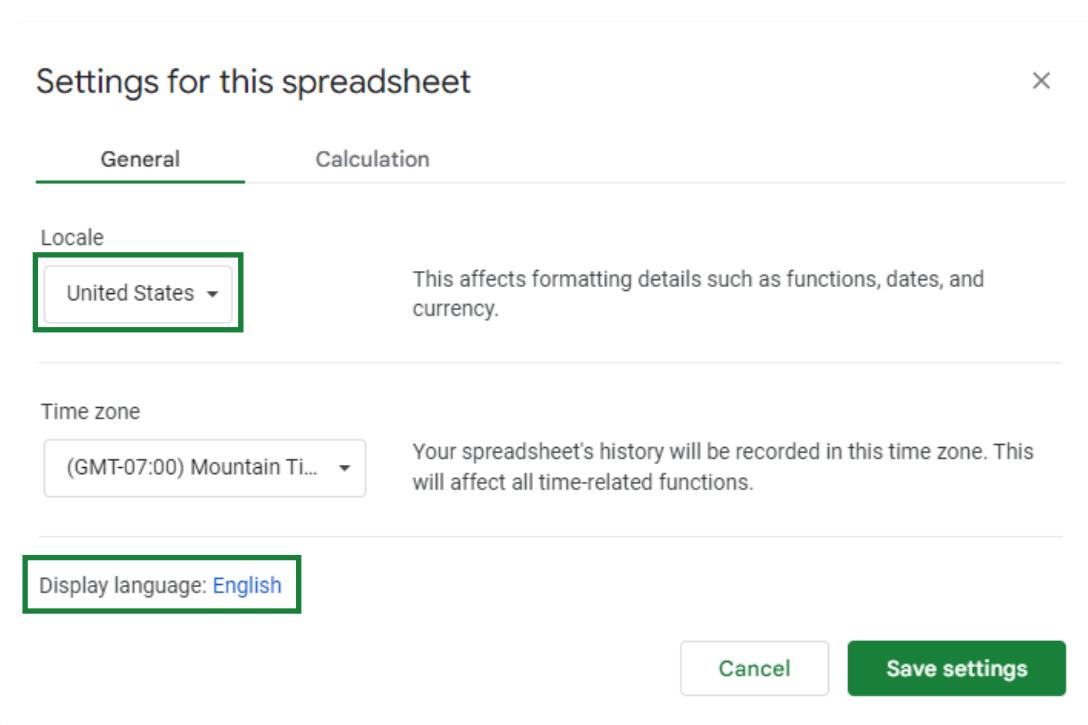
- Meet Google Sheets
- Sheets vs. Excel
- Creating Spreadsheets
- Menus & Settings



LOCALE & LANGUAGE SETTINGS

You can access the **locale & language settings** by going to File > Settings:

- The **locale** affects date, currency, and number formatting
- The **display language** affects the interface, menus, and functions



HEY THIS IS IMPORTANT!

Make sure you set your locale to “United States” and display language to “English” so you can follow along with the demos seamlessly

VERSION HISTORY & RECOVERY

Google Sheets lets you view a file's **version history** and **recover** earlier versions

- Simply go to File > Version history > See version history

The screenshot shows a Google Sheets interface with a sidebar for 'Version history'. The main area displays a spreadsheet titled 'Employees' with columns for Employee ID, Name, Email, Phone, Age, and Job title. The version history sidebar shows two versions: 'October 11, 10:56 AM' (the current version) and 'October 7, 9:58 AM'. A 'Show changes' checkbox is checked.

	A	B	C	D	E	F
1	Employee ID	Name	Email	Phone	Age	Job title
2	10194	Brown, Mia	mia_brown@acme.com	(555) 690-6884	28	Accountant I
3	10067	Ait Sidi, Karthikeyan	karthikeyana@acme.com	(555) 137-7418	40	Sr. DBA
4	10237	Akinkuolie, Sarah	sakinkuolie@acme.com	(555) 861-3082	27	Production Techni
5	10069	LaRotonda, William	wlarotonda@acme.com	(555) 472-7022	32	Accountant I
6	10126	Anderson, Carol	canderson@acme.com	(555) 375-6587	26	Production Techni
7	10002	Stearns, Tyrone	tyrone_stearns@acme.com	(555) 713-7228	29	Accountant I
8	10114	Singh, Nan	nans@acme.com	(555) 732-3344	27	Administrative As
9	10196	LeBlanc, Brandon R	brandon_leblanc@acme.com	(555) 885-5719	31	Shared Services I
10	10026	Boutwell, Bonalyn	bonalynb@acme.com	(555) 899-5042	29	Sr. Accountant
11	10084	Foster-Baker, Amy	afoster-baker@acme.com	(555) 825-2355	37	Sr. Accountant



PRO TIP: You can **name versions** for better control and easier access to previous states

KEY TAKEAWAYS: INTRODUCING GOOGLE SHEETS



Google Sheets is a free and fully capable spreadsheet application

- *It has a robust function library, pivot table tools, and data visualization options*



Google Sheets is **built for collaboration**

- *Files are automatically saved on Google Drive and let people multiple edit them seamlessly in real time*



Set your **locale & language settings** to “United States” and “English”

- *This will ensure that the menus, formatting, and formulas match mine as you follow along*

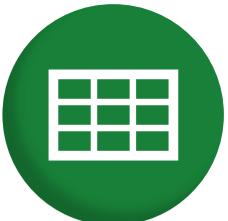


You can **name & recover** previous versions of your files

- *Go to File > Version history > See previous versions to view the changes made to the spreadsheet across time*

SPREADSHEET FUNDAMENTALS

SPREADSHEET FUNDAMENTALS



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

TOPICS WE'LL COVER:

Data Terminology

Data Types

Data Validation

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
- Apply conditional formatting rules
- Sort & filter data in a table

THE SECTION PROJECT

THE **SITUATION**

You work as an HR administrator at **ACME Corporation**, a fictitious manufacturing company that makes outlandish products for some of your favorite cartoons

THE **BRIEF**

You have access to the **employee database***, which includes information on job titles, departments, salaries, performance scores, and employee satisfaction surveys

Your goal is to **leverage your Google Sheets skills** to organize the data so that it can be used and explored properly by your HR supervisor

THE **OBJECTIVE**

Use Google Sheets to:

- Make the data easier to read by applying formatting
- Facilitate data entry by using data validation rules
- Help monitor employees by establishing filter views



CELLS, RANGES, ROWS & COLUMNS

Data Terminology

Data Types

Data Validation

Conditional
Formatting

Sorting & Filtering

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)

The diagram shows a 12x8 grid of cells. The columns are labeled A through H at the top, and the rows are numbered 1 through 11 on the left. A green arrow points to 'Row 3'. A green box highlights 'Cell B3'. A green bracket above the grid indicates 'Column B'. A green bracket below the grid indicates 'Range D6:G9'. The grid contains the following data:

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

COMMON DATA TERMINOLOGY

Data Terminology

Data Types

Data Validation

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
1	Employee ID	Name	Email	Phone	Age	Job title	Department
2	10026	Adinolfi, Wilson K	wadinolfi@acme.com	5551056321	32	Production Technician I	Production
3	10084	Ait Sidi, Karthikeyan	karthikkeyana@acme.com	5551377418	40	Sr. DBA	Information Technology
4	10196	Akinkuolie, Sarah	sakinkuolie@acme.com	5558613082	27	Production Technician II	Production
5	10088	Alagbe, Trina	talagbe@acme.com	5557088137	27	Production Technician I	Production
6	10069	Anderson, Carol	canderson@acme.com	5553756587	26	Production Technician I	Production
7	10002	Anderson, Linda	landerson@acme.com	5552149248	38	Production Technician I	Production
8	10194	Andreola, Colby	colbya@acme.com	5559602309	36	Software Engineer	Information Technology
9	10062	Athwal, Sam	sam_athwal@acme.com	5555898584	33	Production Technician I	Production
10	10114	Bachiochi, Linda	lindab@acme.com	5557247655	46	Production Technician I	Production
11	10250	Bacong, Alejandro	alejandro_bacong@acme.com	5555176120	28	IT Support	Information Technology
12	10252	Baczenski, Rachael	rbaczenski@acme.com	5558842895	42	Production Technician I	Production
13	10242	Barbara, Thomas	thomas_barbara@acme.com	5558267721	42	Production Technician I	Production
14	10012	Barbossa, Hector	hector_barbossa@acme.com	5552092359	27	Data Analyst	Business Intelligence
15	10265	Barone, Francesco A	francesco_barone@acme.com	5555873868	32	Production Technician I	Production
16	10066	Barton, Nader	nbarton@acme.com	5556417499	38	Production Technician I	Production
17	10061	Bates, Norman	nbates@acme.com	5557776825	34	Production Technician I	Production
18	10023	Beak, Kimberly	kimberlyb@acme.com	5553048274	50	Production Technician II	Production
19	10055	Beatrice, Courtney	courtneyb@acme.com	5551849305	45	Production Technician I	Production
20	10245	Becker, Renee	rbecker@acme.com	5557315477	30	Database Administrator	Information Technology

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

DATA TYPES

Data Terminology

Data Types

Data Validation

Conditional
Formatting

Sorting & Filtering

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.*)
- **Text**: any other combination of letters and characters

The diagram illustrates the alignment of data in a spreadsheet. It shows a table with columns for Name, Job title, Salary, Performance score, and Start date. A green arrow points from the text 'By default, text is left-aligned' to the 'Name' column, which contains names like 'Adinolfi, Wilson K'. Another green arrow points from the text 'Numbers & dates are right-aligned' to the 'Salary' column, which contains numerical values like '62506'. A third green arrow points from the text 'This is text, even if it has numbers' to the 'Performance score' column, which contains text entries like '4 - Exceeds'.

Name	Job title	Salary	Performance score	Start date
Adinolfi, Wilson K	Production Technician I	62506	4 - Exceeds	7/5/2016
Ait Sidi, Karthikeyan	Sr. DBA	104437	3 - Fully Meets	3/30/2020
Akinkuolie, Sarah	Production Technician II	64955	3 - Fully Meets	7/5/2016
Alagbe, Trina	Production Technician I	64991	3 - Fully Meets	1/7/2013
Anderson, Carol	Production Technician I	50825	3 - Fully Meets	7/11/2016
Anderson, Linda	Production Technician I	57568	4 - Exceeds	1/9/2017
Andreola, Colby	Software Engineer	95660	3 - Fully Meets	11/10/2019
Athwal, Sam	Production Technician I	59365	3 - Fully Meets	9/30/2018
Bachiochi, Linda	Production Technician I	47837	3 - Fully Meets	7/6/2014

This is **text**, even
if it has numbers

DATE VALUES

Data Terminology

Data Types

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Conditional
Formatting

Sorting & Filtering

Every date in Google Sheets has an associated numerical **date value**

- Sheets treats **December 30, 1899** as day 0, then counts each day that passes after that
- Times are captured as decimal values (*fractions of a 24-hour day*), starting at midnight

Date	Date
1899-12-30	0
1900-01-01	2
2021-05-29	44345
2023-10-06 12:00:00	45205.50
2023-10-06 18:00:00	45205.75

HEY THIS IS IMPORTANT!

Google Sheets, unlike Excel, will still recognize dates before December 30, 1899 using negative numbers for the date values, but it does not let you extract date components from them

NUMBER FORMATTING

Go to **Format > Number** to modify how numbers and dates are displayed:

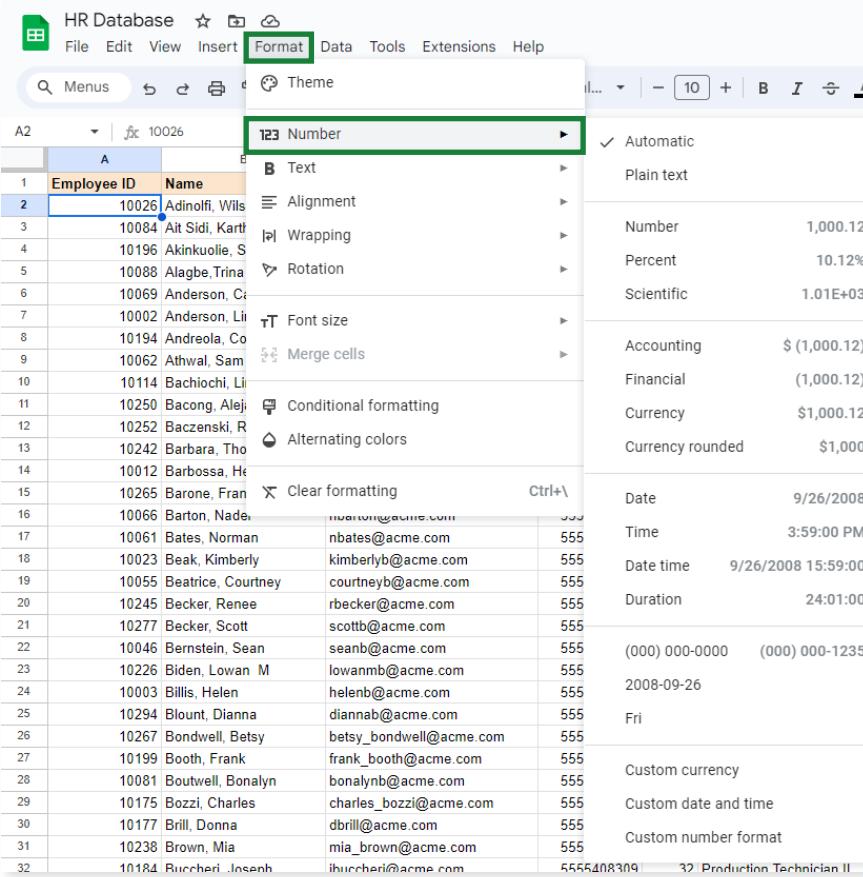
Data Terminology

Data Types

Data Validation

Conditional
Formatting

Sorting & Filtering



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

Conditional
Formatting

Sorting & Filtering

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

The screenshot shows a Google Sheets interface with the following details:

- Data Validation Rules Dialog:** A modal window titled "Data validation rules" is open. It specifies "Apply to range: Employees!E2:E1000". The "Criteria" dropdown is set to "Greater than or equal to" with the value "18".
 - Advanced Options:** A checkbox for "Show help text for a selected cell" is unchecked.
 - If the data is invalid:** A radio button for "Show a warning" is selected, while "Reject the input" is unselected.
- Data Menu:** The "Data" tab is highlighted in the top navigation bar. A dropdown menu is open under "Data", showing options like "Sort sheet", "Create a filter", and "Data validation". The "Data validation" option is highlighted with a green box and has a green curved arrow pointing from it to the corresponding setting in the dialog.
- Sheet Data:** The main sheet displays a table with columns "Employee ID" and "Name". Column E, labeled "Age", contains numerical values ranging from 27 to 45. The first few rows of data are:

Employee ID	Name	Age
10026	Adinolfi, Wilson K	32
10084	Ait Sidi, Karthikeyan	40
10196	Akinkuolie, Sarah	27
10088	Alagbe, Trina	27
10069	Anderson, Carol	26
10002	Anderson, Linda	38
10194	Andreola, Colby	36
10062	Athwal, Sam	33
10114	Bachiochi, Linda	46
10250	Bacong, Alejandro	28
10252	Baczenski, Rachael	42
10242	Barbara, Thomas	42
10012	Barbossa, Hector	27
10265	Barone, Francesco A	32
10066	Barton, Nader	38
10061	Bates, Norman	34
10023	Beak, Kimberly	50
10055	Beatrice, Courtney	45
10245	Becker, Renee	30
10277	Becker, Scott	37
10046	Bernstein, Sean	45

This only lets users enter "Age" values greater than or equal to 18 in column E

You can accept the values with a warning, or reject them altogether

PRO TIP: CHECKBOXES & DROPPDOWNNS

Data Terminology

Data Types

Data Validation

Conditional
Formatting

Sorting & Filtering

Data validation rules also let you add **checkboxes** and **dropdown lists** to a cell

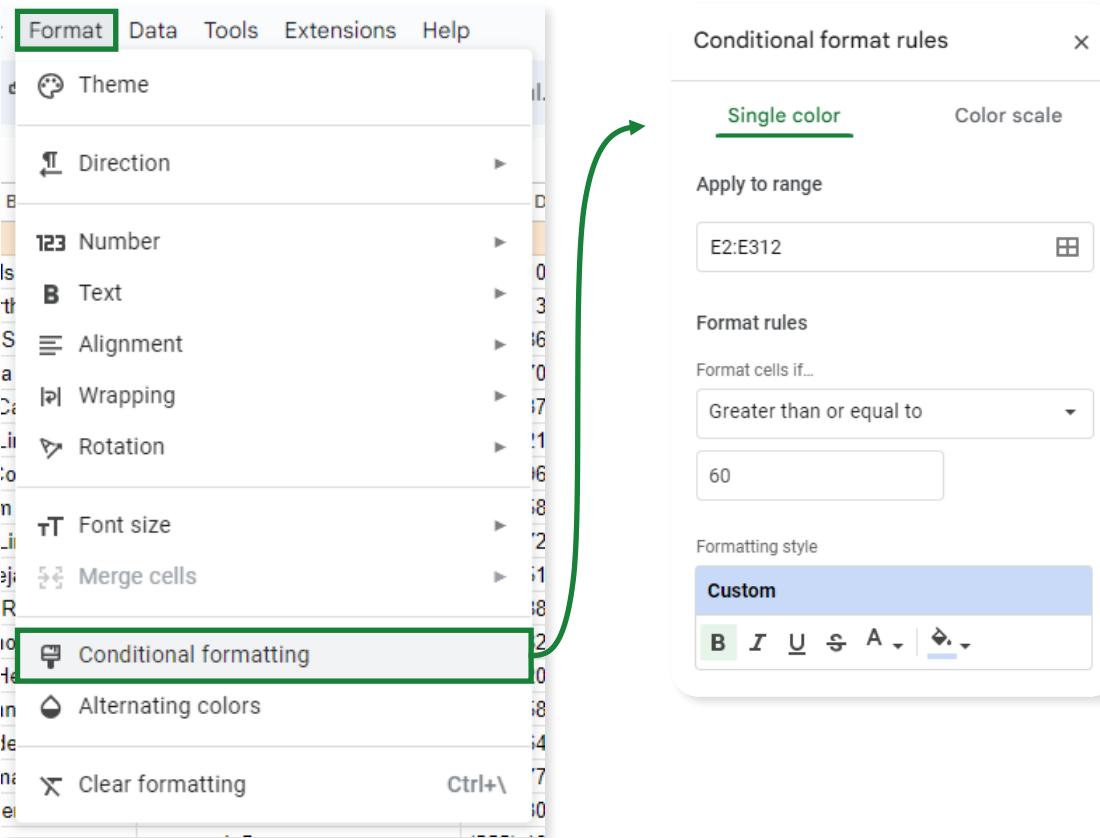
- **Checkboxes** let you toggle between two values (*TRUE/FALSE by default*)
- **Dropdowns** let you select from a list of options (*typed directly or selected from a range*)

Name	Performance score	Start date	Exit date	Active
Adinolfi, Wilson K	4 - Exceeds	2016-07-05		<input checked="" type="checkbox"/>
Ait Sidi, Karthikeyan	3 - Fully Meets	2020-03-30	2021-06-16	<input type="checkbox"/>
Akinkuolie, Sarah	3 - Fully Meets	2016-07-05	2017-09-24	<input type="checkbox"/>
Alagbe, Trina	3 - Fully Meets	2013-01-07		<input checked="" type="checkbox"/>
Anderson, Carol	3 - Fully Meets	2016-07-11	2021-09-06	<input type="checkbox"/>
Anderson, Linda	4 - Exceeds	2017-01-09		<input checked="" type="checkbox"/>
Andreola, Colby	3 - Fully Meets	2019-11-10		<input checked="" type="checkbox"/>
Athwal, Sam	3 - Fully Meets	2018-09-30		<input checked="" type="checkbox"/>
Bachiochi, Linda	3 - Fully Meets	2014-07-06		<input checked="" type="checkbox"/>
Bacong, Alejandro	1 - PIP	2020-01-05		<input checked="" type="checkbox"/>
Baczenski, Rachael	2 - Needs Improvement	2016-01-10	2022-01-12	<input type="checkbox"/>
Barbara, Thomas	3 - Fully Meets	2017-04-02	2021-09-19	<input type="checkbox"/>
Barbossa, Hector	4 - Exceeds	2019-11-10		<input checked="" type="checkbox"/>
Barone, Francesco A		2017-02-20		<input checked="" type="checkbox"/>
Barton, Nader		2017-09-24	2022-04-06	<input type="checkbox"/>
Bates, Norman		2016-02-21	2022-08-04	<input type="checkbox"/>
Beak, Kimberly		2021-07-21		<input checked="" type="checkbox"/>
Beatrice, Courtney	3 - Fully Meets	2016-04-04		<input checked="" type="checkbox"/>

CONDITIONAL FORMATTING

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

- There are two options: **single color & color scale**



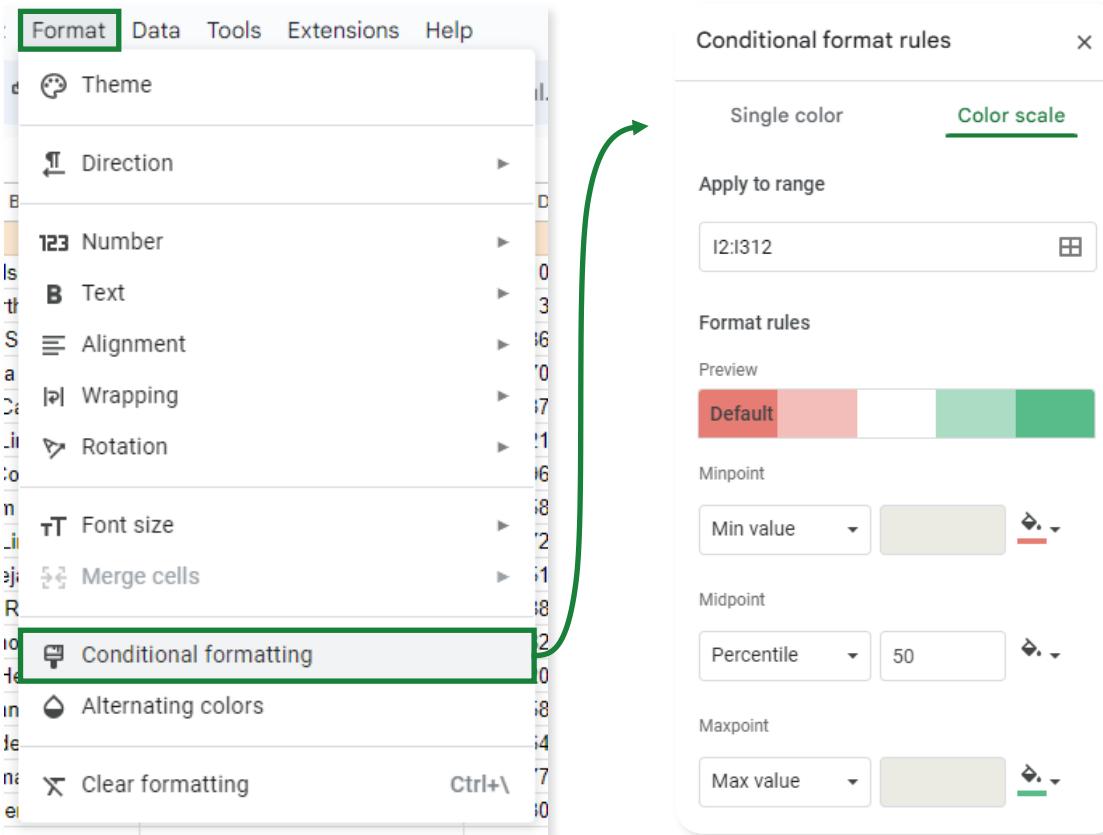
This formats cells in column E with "Age" values greater than or equal to 60 with bold text and a blue background

B	E
Name	Age
Adinolfi, Wilson K	32
Ait Sidi, Karthikeyan	40
Bunbury, Jessica	51
Burke, Joelle	36
Chace, Beatrice	65
Champaigne, Brian	44
Daneault, Lynn	26
Daniele, Ann	64
Darson, Jene'ya	37

CONDITIONAL FORMATTING

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

- There are two options: **single color & color scale**



This formats the “Salary” values in column I with a color scale that gives higher values a green color, and lower values a red color

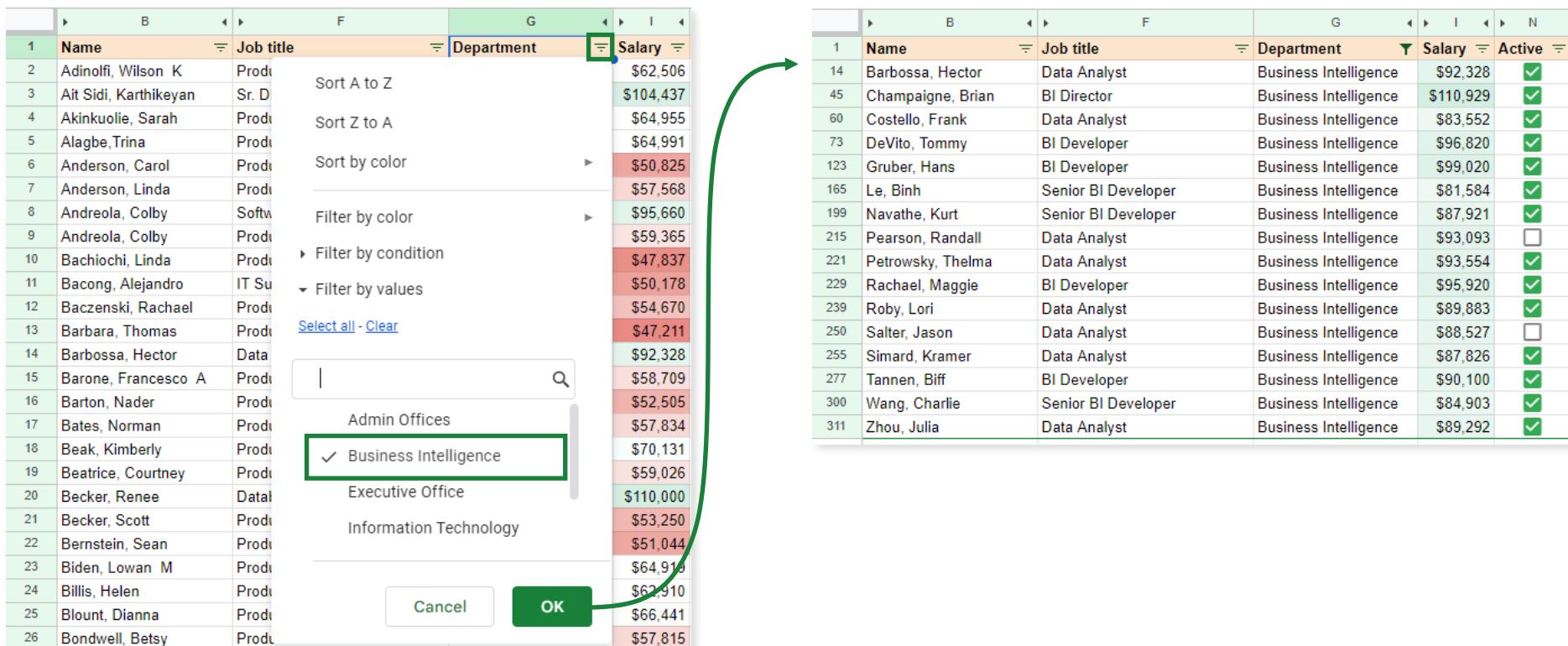
B	I
Name	Salary
Adinolfi, Wilson K	\$62,506
Ait Sidi, Karthikeyan	\$104,437
Bunbury, Jessica	\$74,326
Burke, Joelle	\$63,763
Chace, Beatrice	\$61,656
Champaigne, Brian	\$110,929
Daneault, Lynn	\$65,729
Daniele, Ann	\$85,028
Darson, Jene'ya	\$57,583

FILTERING

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

To enable filters, you need to select the  icon in the shortcuts bar (*ALT+D+F*)

- There are two main options: **by values & by condition**



	B	F	G	I
1	Name	Job title	Department	Salary
2	Adinolfi, Wilson K	Product Manager	Sort A to Z	\$62,506
3	Ait Sidi, Karthikeyan	Sr. Data Analyst	Sort Z to A	\$104,437
4	Akinkuolie, Sarah	Product Manager	Sort by color	\$64,955
5	Alagbe, Trina	Product Manager	Filter by color	\$64,991
6	Anderson, Carol	Product Manager	Filter by condition	\$50,825
7	Anderson, Linda	Product Manager	Filter by values	\$57,568
8	Andreola, Colby	Software Engineer	Select all - Clear	\$95,660
9	Andreola, Colby	Product Manager		\$59,365
10	Bachiochi, Linda	Product Manager		\$47,837
11	Bacong, Alejandro	IT Support		\$50,178
12	Baczenski, Rachael	Product Manager		\$54,670
13	Barbara, Thomas	Product Manager		\$47,211
14	Barbossa, Hector	Data Analyst		\$92,328
15	Barone, Francesco A	Product Manager		\$58,709
16	Barton, Nader	Product Manager		\$52,505
17	Bates, Norman	Product Manager		\$57,834
18	Beak, Kimberly	Product Manager		\$70,131
19	Beatrice, Courtney	Product Manager		\$59,026
20	Becker, Renee	Data Analyst		\$110,000
21	Becker, Scott	Product Manager		\$53,250
22	Bernstein, Sean	Product Manager		\$51,044
23	Biden, Lowan M	Product Manager		\$64,919
24	Billis, Helen	Product Manager		\$62,910
25	Blount, Dianna	Product Manager		\$66,441
26	Bondwell, Betsy	Product Manager		\$57,815

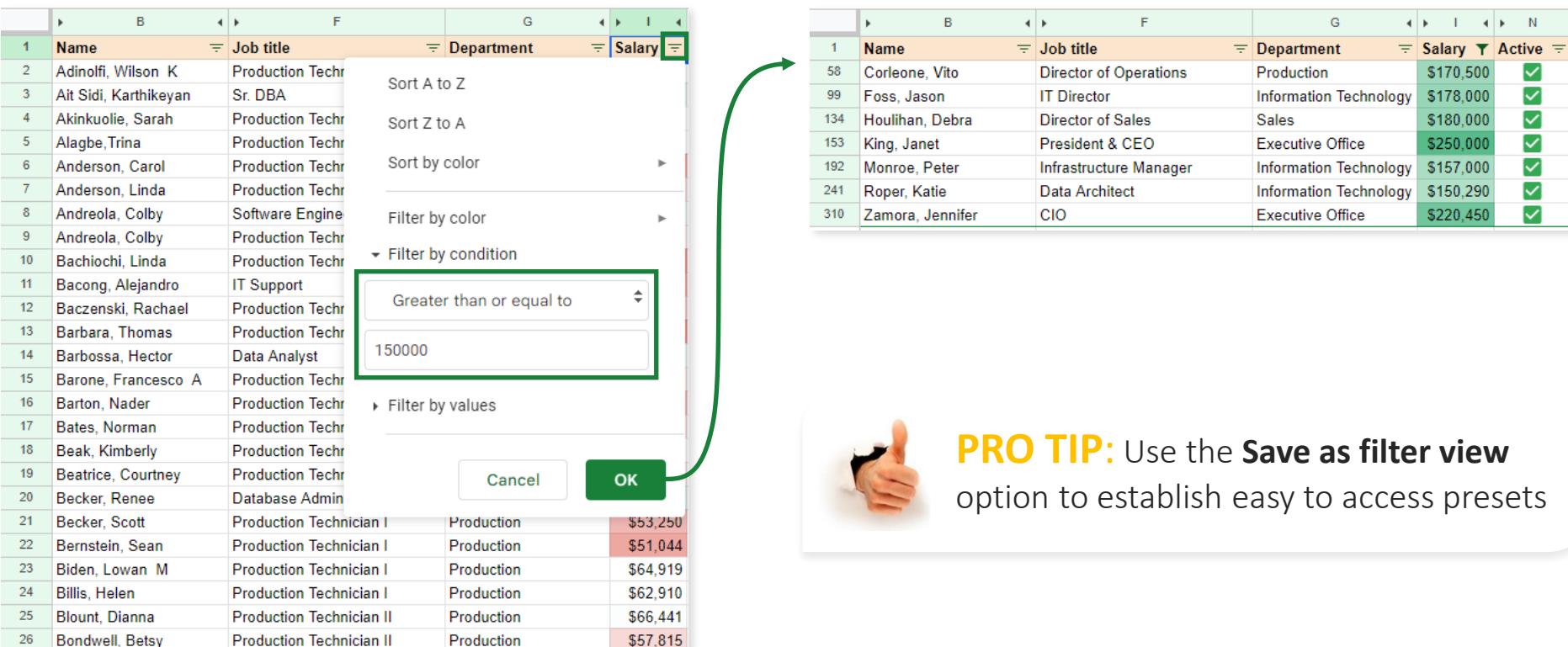
	B	F	G	I	N
1	Name	Job title	Department	Salary	Active
14	Barbossa, Hector	Data Analyst	Business Intelligence	\$92,328	✓
45	Champaigne, Brian	BI Director	Business Intelligence	\$110,929	✓
60	Costello, Frank	Data Analyst	Business Intelligence	\$83,552	✓
73	DeVito, Tommy	BI Developer	Business Intelligence	\$96,820	✓
123	Gruber, Hans	BI Developer	Business Intelligence	\$99,020	✓
165	Le, Binh	Senior BI Developer	Business Intelligence	\$81,584	✓
199	Navathe, Kurt	Senior BI Developer	Business Intelligence	\$87,921	✓
215	Pearson, Randall	Data Analyst	Business Intelligence	\$93,093	□
221	Petrosky, Thelma	Data Analyst	Business Intelligence	\$93,554	✓
229	Rachael, Maggie	BI Developer	Business Intelligence	\$95,920	✓
239	Roby, Lori	Data Analyst	Business Intelligence	\$89,883	✓
250	Salter, Jason	Data Analyst	Business Intelligence	\$88,527	□
255	Simard, Kramer	Data Analyst	Business Intelligence	\$87,826	✓
277	Tannen, Biff	BI Developer	Business Intelligence	\$90,100	✓
300	Wang, Charlie	Senior BI Developer	Business Intelligence	\$84,903	✓
311	Zhou, Julia	Data Analyst	Business Intelligence	\$89,292	✓

FILTERING

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

To enable filters, you need to select the  icon in the shortcuts bar (*ALT+D+F*)

- There are two main options: **by values & by condition**



	B	F	G	I
1	Name	Job title	Department	Salary
2	Adinolfi, Wilson K	Production Tech		
3	Ait Sidi, Karthikeyan	Sr. DBA		
4	Akinkuolie, Sarah	Production Tech		
5	Alagbe, Trina	Production Tech		
6	Anderson, Carol	Production Tech		
7	Anderson, Linda	Production Tech		
8	Andreola, Colby	Software Engine		
9	Andreola, Colby	Production Tech		
10	Bachiochi, Linda	Production Tech		
11	Bacong, Alejandro	IT Support		
12	Baczenski, Rachael	Production Tech		
13	Barbara, Thomas	Production Tech		
14	Barbossa, Hector	Data Analyst		
15	Barone, Francesco A	Production Tech		
16	Barton, Nader	Production Tech		
17	Bates, Norman	Production Tech		
18	Beak, Kimberly	Production Tech		
19	Beatrice, Courtney	Production Tech		
20	Becker, Renee	Database Admin		
21	Becker, Scott	Production Technician I	Production	\$53,250
22	Bernstein, Sean	Production Technician I	Production	\$51,044
23	Biden, Lowan M	Production Technician I	Production	\$64,919
24	Billis, Helen	Production Technician I	Production	\$62,910
25	Blount, Dianna	Production Technician II	Production	\$66,441
26	Bondwell, Betsy	Production Technician II	Production	\$57,815

	B	F	G	I	N
1	Name	Job title	Department	Salary	Active
58	Corleone, Vito	Director of Operations	Production	\$170,500	✓
99	Foss, Jason	IT Director	Information Technology	\$178,000	✓
134	Houlihan, Debra	Director of Sales	Sales	\$180,000	✓
153	King, Janet	President & CEO	Executive Office	\$250,000	✓
192	Monroe, Peter	Infrastructure Manager	Information Technology	\$157,000	✓
241	Roper, Katie	Data Architect	Information Technology	\$150,290	✓
310	Zamora, Jennifer	CIO	Executive Office	\$220,450	✓

PRO TIP: Use the **Save as filter view** option to establish easy to access presets

SORTING

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

- This works on text, numbers, and dates

The image shows two side-by-side screenshots of an Excel spreadsheet. On the left, a context menu is open over a column header labeled 'Name'. The menu includes options like 'Sort A to Z' (which is selected and highlighted in green), 'Sort Z to A', 'Sort by color', 'Filter by color', 'Filter by condition', and 'Filter by values'. At the bottom of the menu are 'Cancel' and 'OK' buttons. On the right, the resulting sorted data is shown. The 'Sort Z to A' option has been selected, resulting in the names being listed from Zima, Colleen at the top to Walker, Roger at the bottom. A green arrow points from the 'Sort Z to A' button in the menu to the sorted list on the right.

	B	E	K	L	N
1	Name	Age	Start date	Exit date	Active
2	Adinolfi, Wilson K				
3	Ait Sidi, Karthikeyan				
4	Akinkuolie, Sarah				
5	Alagbe, Trina				
6	Anderson, Carol				
7	Anderson, Linda				
8	Andreola, Colby				
9	Andreola, Colby				
10	Bachiochi, Linda				
11	Bacong, Alejandro				
12	Baczenski, Rachael				
13	Barbara, Thomas				
14	Barbossa, Hector				
15	Barone, Francesco A				
16	Barton, Nader				
17	Bates, Norman	34	2016-02-21	2022-08-04	

	B	E	K	L	N
1	Name	Age	Start date	Exit date	Active
2	Zima, Colleen	37	2019-09-29		✓
3	Zhou, Julia	37	2020-03-30		✓
4	Zamora, Jennifer	36	2015-04-10		✓
5	Ybarra, Catherine	33	2013-09-02	2020-09-29	□
6	Woodson, Jason	30	2019-07-07		✓
7	Wolk, Hang T	31	2019-09-29		✓
8	Winthrop, Jordan	57	2018-01-07	2021-02-21	□
9	Williams, Jacquelyn	46	2017-01-09	2020-06-27	□
10	Wilkes, Annie	32	2016-01-10	2017-05-14	□
11	Wilber, Barry	50	2016-05-16	2020-09-07	□
12	Whittier, Scott	28	2016-01-10	2019-05-15	□
13	Warfield, Sarah	38	2020-03-30		✓
14	Wang, Charlie	34	2022-02-15		✓
15	Wallace, Theresa	35	2017-08-13	2020-09-01	□
16	Wallace, Courtney E	60	2016-09-26	2017-01-02	□
17	Walker, Roger	40	2019-08-18		✓

SORTING

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

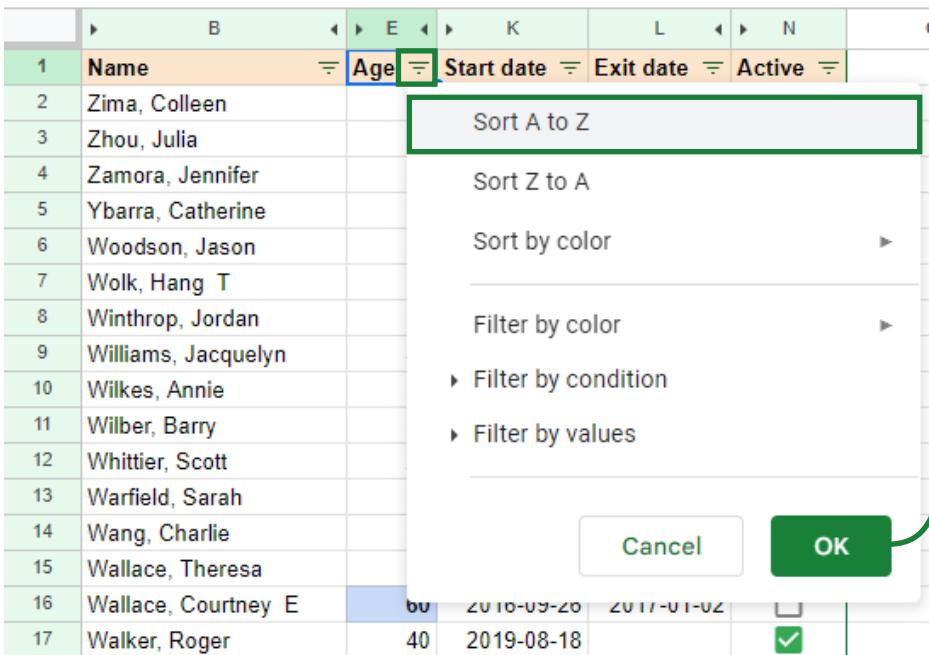
Data Terminology

Data Types

Data Validation

Conditional
Formatting

Sorting & Filtering



The screenshot shows a Microsoft Excel spreadsheet with a sorting dialog box open over it. The dialog box is centered on the 'Age' column header, which is highlighted with a green border. The dialog box contains the following options:

- Sort A to Z (highlighted with a green box)
- Sort Z to A
- Sort by color
- Filter by color
- Filter by condition
- Filter by values

At the bottom of the dialog box are two buttons: 'Cancel' and 'OK'. A green arrow points from the 'OK' button to the right-hand table, indicating the result of applying the sort.

Left Table (Original Data):

	B	E	K	L	N	O
1	Name	=Age	Start date	Exit date	Active	
2	Zima, Colleen					
3	Zhou, Julia					
4	Zamora, Jennifer					
5	Ybarra, Catherine					
6	Woodson, Jason					
7	Wolk, Hang T					
8	Winthrop, Jordan					
9	Williams, Jacquelyn					
10	Wilkes, Annie					
11	Wilber, Barry					
12	Whittier, Scott					
13	Warfield, Sarah					
14	Wang, Charlie					
15	Wallace, Theresa					
16	Wallace, Courtney E	60	2010-09-20	2017-01-02	☐	
17	Walker, Roger	40	2019-08-18		✓	

Right Table (Result of Sort):

	B	E	K	L	N	O
1	Name	=Age	Start date	Exit date	Active	
2	Monkfish, Erasmus	23	2016-11-07		✓	
3	Hutter, Rosalie	23	2020-06-05		✓	
4	Gold, Shenice	23	2018-11-11		✓	
5	Valentin, Jackie	24	2016-07-05		✓	
6	Eaton, Marianne	24	2016-04-04	2022-06-06	☐	
7	Onque, Jasmine	25	2018-09-30		✓	
8	Ivey, Rose	25	2018-08-19		✓	
9	Gentry, Mildred	25	2020-03-30		✓	
10	Brill, Donna	25	2017-04-02	2018-06-15	☐	
11	Blount, Dianna	25	2016-04-04		✓	
12	Villanueva, Noah	26	2017-03-05		✓	
13	Strong, Caitrin	26	2015-09-27		✓	
14	Pelletier, Ermine	26	2016-07-05	2020-09-15	☐	
15	Ndzi, Colombui	26	2016-09-26	2019-04-04	☐	
16	Kampew, Donysha	26	2016-11-07	2019-04-24	☐	
17	Gruber, Hans	26	2022-04-20		✓	

Note that the names are still sorted from *Z to A* for each age

SORTING

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

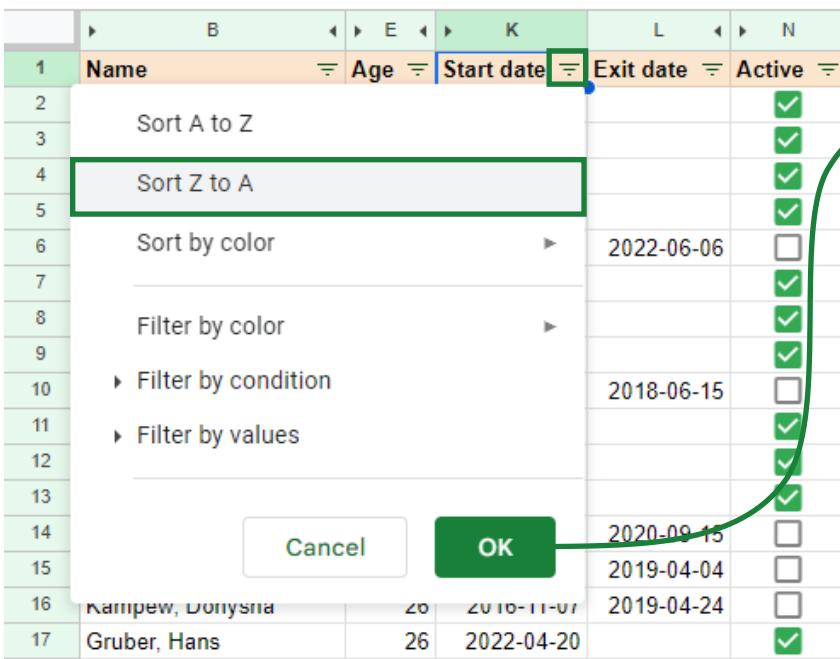
Data Terminology

Data Types

Data Validation

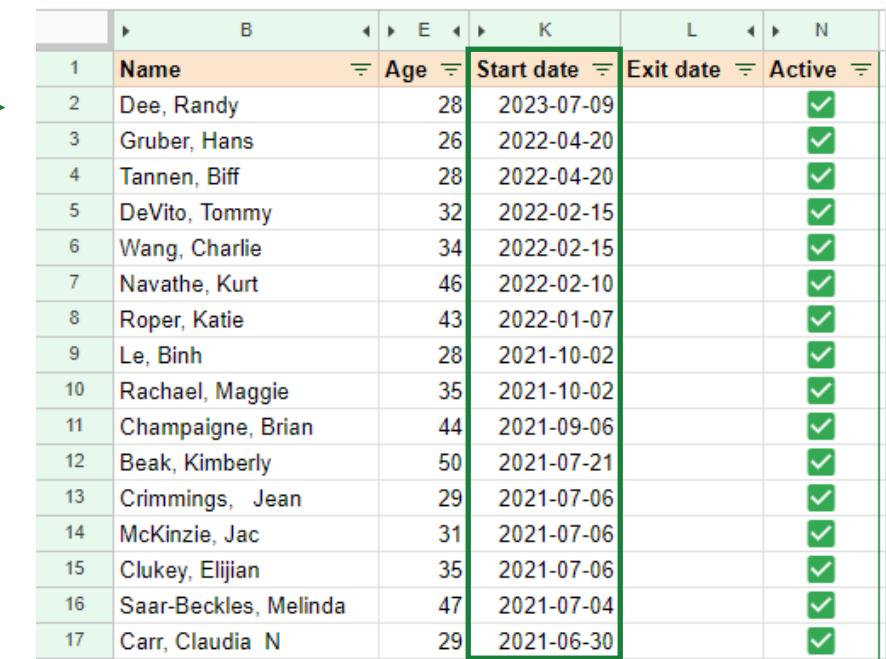
Conditional
Formatting

Sorting & Filtering



The screenshot shows the 'Sort' dialog box in Excel. The 'Start date' column is selected for sorting. The 'Sort Z to A' option is highlighted with a green box. The 'OK' button is at the bottom right of the dialog.

	B	E	K	L	N	
1	Name	=	Age	=	Start date	=
2					Exit date	=
3					Active	=
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16	Kampew, Donysma	20	2010-11-01	2020-09-15	2019-04-04	2019-04-24
17	Gruber, Hans	26	2022-04-20			✓



The screenshot shows the same table after sorting by 'Start date' in ascending order. The 'Start date' column is highlighted with a green box. The 'OK' button is at the bottom right of the dialog.

	B	E	K	L	N	
1	Name	=	Age	=	Start date	=
2	Dee, Randy		28	2023-07-09		✓
3	Gruber, Hans		26	2022-04-20		✓
4	Tannen, Biff		28	2022-04-20		✓
5	DeVito, Tommy		32	2022-02-15		✓
6	Wang, Charlie		34	2022-02-15		✓
7	Navathe, Kurt		46	2022-02-10		✓
8	Roper, Katie		43	2022-01-07		✓
9	Le, Binh		28	2021-10-02		✓
10	Rachael, Maggie		35	2021-10-02		✓
11	Champaigne, Brian		44	2021-09-06		✓
12	Beak, Kimberly		50	2021-07-21		✓
13	Crimmings, Jean		29	2021-07-06		✓
14	McKinzie, Jac		31	2021-07-06		✓
15	Clukey, Elijian		35	2021-07-06		✓
16	Saar-Beckles, Melinda		47	2021-07-04		✓
17	Carr, Claudia N		29	2021-06-30		✓

KEY TAKEAWAYS: SPREADSHEET 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, or text)*



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

- *It also lets you 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 a color scale to highlight cells in different shades depending on their value*



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*

FORMULAS & FUNCTIONS

FORMULAS & FUNCTIONS



In this section we'll introduce essential **formulas & functions** you need to work with data in Google Sheets, 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 by using the Google Sheets helper window
- 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 **Northwind Traders**, a global import and export company that supplies gourmet food products to restaurants, cafes, and specialty food retailers

THE **BRIEF**

You have access to their **orders database***, which includes information on orders, products, customers, and discounts, as well as their growth & forecasting reports

Your goal is to **leverage your Google Sheets skills** to manipulate and analyze the data so your manager can present the information and insights to upper management

THE **OBJECTIVE**

Use Google Sheets to:

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



NORTHWIND
TRADE**R**S

FORMULA & FUNCTION SYNTAX

Function Syntax

Reference Types

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Counting Functions

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Text Functions

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)

All formulas start with an equal sign

Function arguments are surrounded by parentheses and separated by commas

Optional arguments are surrounded by brackets

=VLOOKUP(search_key, range, index, [is_sorted])

This is the function name (not case-sensitive)

These are the arguments, which vary by function and give Sheets the information needed to calculate a result



PRO TIP: As you begin writing a function, a helper window pops up with details on the function syntax and arguments, and how to fill them in correctly

TYPES OF FUNCTIONS

Function Syntax

Reference Types

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Counting Functions

Logical Functions

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Text Functions

There are three **types of functions**:

1

Traditional functions
that return **one value**

A	B	C	D
Month	Orders		Total
Jan	33		408
Feb	29		
Mar	30		
Apr	31		
May	32		
Jun	30		
Jul	33		
Aug	33		
Sep	37		
Oct	38		
Nov	34		
Dec	48		

2

Array functions that
return **multiple values**

A	B	C
Categories	Unique List	
Beverages	Beverages	
Beverages	Condiments	
Condiments	Seafood	
Seafood	Produce	
Condiments		
Produce		
Produce		
Condiments		

The formula only lives in
the first cell in the range

3

Volatile functions that
recalculate automatically

A
Current Date & Time
10/20/2023 14:01:13

These can either return
one value or multiple

FIXED VS. RELATIVE REFERENCES

Function Syntax

Reference Types

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Text Functions

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

	A	B	C
1	A1		
2			
3		C3	

Fixed Column, Fixed Row

	A	B	C
1	\$A\$1		
2			
3		\$A\$1	

Fixed Column, Relative Row

	A	B	C
1	\$A1		
2			
3		\$A3	

Relative Column, Fixed Row

	A	B	C
1	A\$1		
2			
3		C\$1	



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

COMMON ERROR TYPES

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

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 is 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

COUNTING FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text 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, ...])

COUNTUNIQUE()

Counts the unique values in a range

=COUNTUNIQUE(value1, [value2, ...])

This accepts cell ranges



PRO TIP: REMOVE DUPLICATES WITH UNIQUE

Function Syntax

Reference Types

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Text Functions

UNIQUE()

Removes duplicates from a range of data and returns the unique records

=UNIQUE(range, [by_column], [exactly_once])

A range of cells that you want to remove duplicates from

TRUE = Remove duplicates in columns
FALSE = Remove duplicates in rows
(Default is FALSE)

TRUE = Extract values that **only appear once**
FALSE = Extract all unique values
(Default is FALSE)

	B	C	D	F	G
1	Product Name	Quantity per Unit	Product Category		Categories
2	Chai	10 boxes x 20 bags	Beverages		Beverages
3	Chang	24 - 12 oz bottles	Beverages		Condiments
4	Aniseed Syrup	12 - 550 ml bottles	Condiments		Produce
5	Chef Anton's Cajun Seasoning	48 - 6 oz jars	Condiments		Meat & Poultry
6	Chef Anton's Gumbo Mix	36 boxes	Condiments		
7	Grandma's Boysenberry Spread	12 - 8 oz jars	Condiments		
8	Uncle Bob's Organic Dried Pears	12 - 1 lb pkgs.	Produce		
9	Northwoods Cranberry Sauce	12 - 12 oz jars	Condiments		
▲ 10	Mishi Kobe Niku	18 - 500 g pkgs.	Meat & Poultry		

The function in this cell returns all the unique category values

PRO TIP: REMOVE DUPLICATES WITH UNIQUE

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

UNIQUE()

Removes duplicates from a range of data and returns the unique records

=UNIQUE(range, [by_column], [exactly_once])

A range of cells that you want to remove duplicates from

TRUE = Remove duplicates in columns
FALSE = Remove duplicates in rows
(Default is FALSE)

TRUE = Extract values that **only appear once**
FALSE = Extract all unique values
(Default is FALSE)

	B	C	D	F	G
1	Product Name	Quantity per Unit	Product Category		Categories
2	Chai	10 boxes x 20 bags	Beverages		Produce
3	Chang	24 - 12 oz bottles	Beverages		Meat & Poultry
4	Aniseed Syrup	12 - 550 ml bottles	Condiments		
5	Chef Anton's Cajun Seasoning	48 - 6 oz jars	Condiments		
6	Chef Anton's Gumbo Mix	36 boxes	Condiments		
7	Grandma's Boysenberry Spread	12 - 8 oz jars	Condiments		
8	Uncle Bob's Organic Dried Pears	12 - 1 lb pkgs.	Produce		
9	Northwoods Cranberry Sauce	12 - 12 oz jars	Condiments		
10	Mishi Kobe Niku	18 - 500 g pkgs.	Meat & Poultry		

This returns the categories that **only appear once**

LOGICAL FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

Logical functions are Google Sheet'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!

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

LOGICAL FUNCTIONS

Function Syntax

Reference Types

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Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text 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

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

IF()

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

=IF(logical_expression, 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

Examples:

- A1="Pizza"
- B2<100

	H	I	J	K
1	Product ID	Unit Price	Quantity	Discount
2	11	\$14.00	12	
3	42	\$9.80	10	
4	72	\$34.80	5	
5	14	\$18.60	9	
6	51	\$42.40	40	
7	41	\$7.70	10	
8	51	\$42.40	35	

fx =IF(J2>10,5%,0%)

	H	I	J	K
1	Product ID	Unit Price	Quantity	Discount
2	11	\$14.00	12	5%
3	42	\$9.80	10	0%
4	72	\$34.80	5	0%
5	14	\$18.60	9	0%
6	51	\$42.40	40	5%
7	41	\$7.70	10	0%
8	51	\$42.40	35	5%

NESTED IF FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

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

	H	I	J	K
1	Product ID	Unit Price	Quantity	Discount
2	11	\$14.00	12	
3	42	\$9.80	10	
4	72	\$34.80	5	
5	14	\$18.60	9	
6	51	\$42.40	40	
7	41	\$7.70	10	
8	51	\$42.40	35	

`=IF(J2>25,10%,IF(J2>10,5%,0%))`

	H	I	J	K
1	Product ID	Unit Price	Quantity	Discount
2	11	\$14.00	12	5%
3	42	\$9.80	10	0%
4	72	\$34.80	5	0%
5	14	\$18.60	9	0%
6	51	\$42.40	40	10%
7	41	\$7.70	10	0%
8	51	\$42.40	35	10%



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

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

AND()

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

=AND(logical_expression1, [logical_expression2, ...])

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

Additional logical tests

fx =IF(AND(E2=14 ,F2="ERNSH"), "High", "Low")

	A	B	E	F	G
1	Order ID	Order Date	Delivery Days	Customer ID	Priority
2	10249	2013-07-05	42	TOMSP	
3	10253	2013-07-10	14	HANAR	
4	10254	2013-07-11	28	CHOPS	
5	10430	2014-01-30	14	ERNSH	
6	10281	2013-08-14	14	ROMEY	
7	10258	2013-07-17	28	ERNSH	
8	10451	2014-02-19	14	QUICK	

	A	B	E	F	G
1	Order ID	Order Date	Delivery Days	Customer ID	Priority
2	10249	2013-07-05	42	TOMSP	Low
3	10253	2013-07-10	14	HANAR	Low
4	10254	2013-07-11	28	CHOPS	Low
5	10430	2014-01-30	14	ERNSH	High
6	10281	2013-08-14	14	ROMEY	Low
7	10258	2013-07-17	28	ERNSH	Low
8	10451	2014-02-19	14	QUICK	Low

THE OR OPERATOR

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

OR()

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

=OR(logical_expression1, [logical_expression2, ...])

A logical test that can return TRUE or FALSE

Additional logical tests

fx =IF(OR(E2=14,F2="ERNSH"),"High","Low")

	A	B	E	F	G
1	Order ID	Order Date	Delivery Days	Customer ID	Priority
2	10249	2013-07-05	42	TOMSP	
3	10253	2013-07-10	14	HANAR	
4	10254	2013-07-11	28	CHOPS	
5	10430	2014-01-30	14	ERNSH	
6	10281	2013-08-14	14	ROMEY	
7	10258	2013-07-17	28	ERNSH	
8	10451	2014-02-19	14	QUICK	

	A	B	E	F	G
1	Order ID	Order Date	Delivery Days	Customer ID	Priority
2	10249	2013-07-05	42	TOMSP	Low
3	10253	2013-07-10	14	HANAR	High
4	10254	2013-07-11	28	CHOPS	Low
5	10430	2014-01-30	14	ERNSH	High
6	10281	2013-08-14	14	ROMEY	High
7	10258	2013-07-17	28	ERNSH	High
8	10451	2014-02-19	14	QUICK	High

THE IFERROR FUNCTION

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

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

Month	2013 Orders	2014 Orders
January	0	33
February	0	29
March	0	30
April	0	31
May	0	32
June	0	30
July	22	33
August	25	33
September	23	37
October	26	38
November	25	34
December	31	48

YoY Growth
=D4/C4-1
#DIV/0!
#DIV/0!
#DIV/0!
#DIV/0!
50%
32%
61%
46%
36%
55%

fx =IFERROR(D4/C4-1, "-")

Month	2013 Orders	2014 Orders	YoY Growth
January	0	33	-
February	0	29	-
March	0	30	-
April	0	31	-
May	0	32	-
June	0	30	-
July	22	33	50%
August	25	33	32%

YoY Growth
-
-
-
-
-
-
50%
32%

CONDITIONAL MATH FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text 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, [...])

COUNTUNIQUEIFS()

Counts the number of unique values in a range that meet a set of criteria

=COUNTUNIQUEIFS(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

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

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

=SUMIFS(sum_range, criteria_range1, criterion1, [criteria_range2, ...], [criterion2, ...])

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	H	I	L
1	Order ID	Country	Product ID	Gross Revenue
2	10248	France	11	\$168
3	10248	France	42	\$98
4	10248	France	72	\$174
5	10249	Germany	14	\$167
6	10249	Germany	51	\$1,696
7	10250	Brazil	41	\$77
8	10250	Brazil	51	\$1,484

fx =SUMIFS(L2:L8,H2:H8,"France") = \$440

fx =SUMIFS(L2:L8,H2:H8,"France",I2:I8,42) = \$98

LOOKUP FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text 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

Order ID	Product ID	Product Name	Quantity
10262	3		12
10262	7		15
10264	2		35
10273	10		24
10276	10		15
10285	1		45
10289	3		30
10290	5		20
10294	1		18
10298	2		40
10309	4		20
10309	6		30
10317	1		20
10325	6		6
10326	4		24

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

Product ID	Product Name	Product Category
1	Chai	Beverages
2	Chang	Beverages
3	Aniseed Syrup	Condiments
4	Chef Anton's Cajun Seasoning	Condiments
5	Chef Anton's Gumbo Mix	Condiments
6	Grandma's Boysenberry Spread	Condiments
7	Uncle Bob's Organic Dried Pears	Produce
8	Northwoods Cranberry Sauce	Condiments
9	Mishi Kobe Niku	Meat & Poultry
10	Ikura	Seafood

lookup value

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

This is a **foreign key**

LOOKUP FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text 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

Order ID	Product ID	Product Name	Quantity
10262	3		12
10262	7		15
10264	2		35
10273	10		24
10276	10		15
10285	1		45
10289	3		30
10290	5		20
10294	1		18
10298	2		40
10309	4		20
10309	6		30
10317	1		20
10325	6		6
10326	4		24

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

Product ID	Product Name	Product Category
1	Chai	Beverages
2	Chang	Beverages
3	Aniseed Syrup	Condiments
4	Chef Anton's Cajun Seasoning	Condiments
5	Chef Anton's Gumbo Mix	Condiments
6	Grandma's Boysenberry Spread	Condiments
7	Uncle Bob's Organic Dried Pears	Produce
8	Northwoods Cranberry Sauce	Condiments
9	Mishi Kobe Niku	Meat & Poultry
10	Ikura	Seafood

This is a foreign key

*This is a primary key
(no duplicates)*

THE XLOOKUP FUNCTION

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

XLOOKUP()

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

=XLOOKUP(search_key, lookup_range, result_range, [missing_value], [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?

	A	I	J	L	S	T	U	V
1	Order ID	Product ID	Product Name	Quantity		Product ID	Product Name	Product Category
2	10262	3	Aniseed Syrup	12		1	Chai	Beverages
3	10262	7	Uncle Bob's Organic Dried Pears	15		2	Chang	Beverages
4	10264	2	Chang	35		3	Aniseed Syrup	Condiments
5	10273	10	Ikura	24		4	Chef Anton's Cajun Seasoning	Condiments
6	10276	10	Ikura	15		5	Chef Anton's Gumbo Mix	Condiments
7	10285	1	Chai	45		6	Grandma's Boysenberry Spread	Condiments
8	10289	3	Aniseed Syrup	30		7	Uncle Bob's Organic Dried Pears	Produce
9	10290	5	Chef Anton's Gumbo Mix	20		8	Northwoods Cranberry Sauce	Condiments
10	10294	1	Chai	18		9	Mishi Kobe Niku	Meat & Poultry
11	10298	2	Chang	40		10	Ikura	Seafood
12	10309	4	Chef Anton's Cajun Seasoning	20				

PRO TIP: APPROXIMATE MATCH LOOKUPS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text Functions

If an exact match is not found, an **approximate match** will return either:

- **1:** the next value that is *bigger* than the “search_key” or lookup value
- **-1:** the next value that is *lower* than the “search_key” or lookup value

For quantities under 11, it doesn't find a match or a lower value, so it returns 0

This looks for 12 in the “Min Quantity” column and doesn't find a match, so it finds the next lowest value (11) and returns its corresponding discount (5%)

	A	B	J	M	O	Q	R	S
1	Order ID	Order Date	Product ID	Quantity	Discount		Min Quantity	Discount
2	10248	2013-07-04		11		12	5%	
3	10248	2013-07-04		42		10	0%	
4	10248	2013-07-04		72		5	0%	
5	10249	2013-07-05		14		9	0%	
6	10249	2013-07-05		51		40	10%	
7	10250	2013-07-08		41		10	0%	
8	10250	2013-07-08		51		35	10%	
9	10250	2013-07-08		65		15	5%	
10	10251	2013-07-08		22		6	0%	

DATE & TIME FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

Text 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 (1899+), 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])

DATEDIF()

Calculates the number of days, months, or years between two dates

=DATEDIF(start, end, unit)

TEXT FUNCTIONS

Function Syntax

Reference Types

Error Types

Counting Functions

Logical Functions

Lookup Functions

Date & Time Functions

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()

Returns a specified number of characters from the beginning or end of a text string

=**LEFT**(text, characters)

MID()

Returns a specified number of characters from a starting position in a text string

=**MID**(text, start, characters)

SPLIT()

Divides a text string at each occurrence of a delimiter across multiple cells

=**SPLIT**(text, delimiter, [by_each])

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*

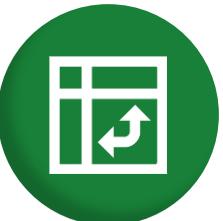


There are **hundreds of functions** to help work with & analyze data

- *You don’t need to memorize their syntax, Google Sheets 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**, Google Sheets' 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

Grouping

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, filter, and group pivot table results
- Create calculated fields

THE SECTION PROJECT

THE **SITUATION**

You work as a marketing analyst at **Maven Marketers**, an advertising agency that runs paid search campaigns for small and medium business across the United States

THE **BRIEF**

You've just completed a paid search campaign for a US shopping mall and have access to the **campaign metrics***, including impressions, clicks, conversions, and costs

Your goal is to **leverage your Google Sheets skills** to explore and analyze the data to gain insights, identify optimization opportunities, and improve future performance

THE **OBJECTIVE**

Use Google Sheets to:

- Explore & analyze the data
- Create new calculated fields
- Find insights for future campaigns



IMPORTANT: DATA STRUCTURE

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

Data Structure

Creating Pivot Tables

Calculation Options

Sorting & Filtering

Grouping

Calculated Fields



TABULAR

ID	Match Type	Platform	Keyword	Month	Impressions	Clicks	Conversions	Cost	Revenue
1	broad	desktop	coupon code	2022-07-01	16038	6504	1166	6669	6402
2	broad	desktop	discount code	2022-07-01	3635	1458	248	1606	1723
3	broad	desktop	promo code	2022-07-01	26185	10418	2294	13278	13042
4	broad	mobile	coupon code	2022-07-01	46507	21756	1665	13157	8550
5	broad	mobile	discount code	2022-07-01	9950	4283	347	2637	2038
6	broad	mobile	promo code	2022-07-01	57373	27121	2940	16946	14565
7	exact	desktop	competitor	2022-07-01	721	195	25	188	188
8	exact	desktop	coupon code	2022-07-01	8053	2678	392	2814	2475
9	exact	desktop	discount code	2022-07-01	2181	539	70	577	449
10	exact	desktop	free shipping	2022-07-01	656	168	29	65	84
11	exact	desktop	offer	2022-07-01	490	115	26	221	149
12	exact	desktop	promo code	2022-07-01	7366	2693	536	3469	3089
13	exact	desktop	sale	2022-07-01	6318	598	46	416	278
14	exact	mobile	competitor	2022-07-01	1771	594	34	272	177
15	exact	mobile	coupon code	2022-07-01	27672	9335	478	4105	2783

- 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

	DESKTOP				
	Jul	Aug	Sep	Oct	Nov
Impressions	134,316	103,347	88,992	92,228	339,010
Clicks	46,178	34,087	28,434	28,552	97,688
Click-through rate	34.4%	33.0%	32.0%	31.0%	28.8%
Conversions	8,127	5,906	4,246	5,270	18,641
Conversion rate	17.6%	17.3%	14.9%	18.5%	19.1%
MOBILE					
	Jul	Aug	Sep	Oct	Nov
Impressions	381,994	255,485	221,403	233,195	824,729
Clicks	145,373	84,947	87,853	88,159	283,232
Click-through rate	38.1%	33.2%	39.7%	37.8%	34.3%
Conversions	9,635	6,324	5,179	8,042	24,626
Conversion rate	6.6%	7.4%	5.9%	9.1%	8.7%

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

WHY PIVOT TABLES?

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

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

ID	Match Type	Platform	Keyword	Month	Impressions	Clicks	Conversions	Cost	Revenue
1	broad	desktop	coupon code	2022-07-01	16038	6504	1166	6669	6402
2	broad	desktop	discount code	2022-07-01	3635	1458	248	1606	1723
3	broad	desktop	promo code	2022-07-01	26185	10418	2294	13278	13042
4	broad	mobile	coupon code	2022-07-01	46507	21756	1665	13157	8550
5	broad	mobile	discount code	2022-07-01	9950	4283	347	2637	2038
6	broad	mobile	promo code	2022-07-01	57373	27121	2940	16946	14565
7	exact	desktop	competitor	2022-07-01	721	195	25	188	188
8	exact	desktop	coupon code	2022-07-01	8053	2678	392	2814	2475
9	exact	desktop	discount code	2022-07-01	2181	539	70	577	449
10	exact	desktop	free shipping	2022-07-01	656	168	29	65	84
11	exact	desktop	offer	2022-07-01	490	115	26	221	149
12	exact	desktop	promo code	2022-07-01	7366	2693	536	3469	3089
13	exact	desktop	sale	2022-07-01	6318	598	46	416	278
14	exact	mobile	competitor	2022-07-01	1771	594	34	272	177
15	exact	mobile	coupon code	2022-07-01	27672	9335	478	4105	2783

 Pivot table

 Platform
1 of 2 ▾

Values	Month - Month				
	Jul	Aug	Sep	Oct	Nov
Impressions	134,316	103,347	88,992	92,228	339,010
Clicks	46,178	34,087	28,434	28,552	97,688
Click-through rate	34.4%	33.0%	32.0%	31.0%	28.8%
Conversions	8,127	5,906	4,246	5,270	18,641
Conversion rate	17.6%	17.3%	14.9%	18.5%	19.1%



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

Data Structure

Creating
Pivot Tables

Calculation
Options

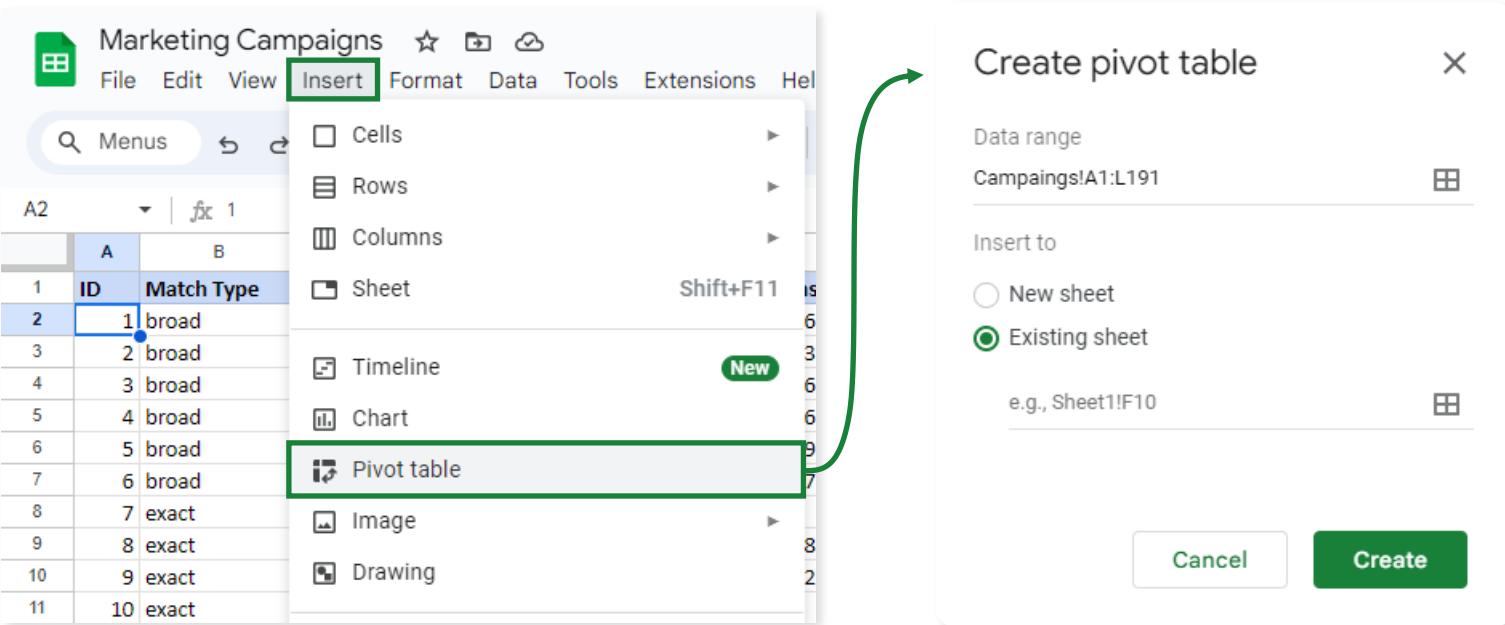
Sorting & Filtering

Grouping

Calculated Fields

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*



What data are you analyzing?

Where will it live?

THE PIVOT TABLE EDITOR

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

The **pivot table editor** lets you use fields from your source data as rows, columns, values, or filters in a pivot table:

The screenshot illustrates the Pivot Table Editor interface. On the left, a Microsoft Excel spreadsheet shows a pivot table structure with 'Rows' in the A1 cell and 'Values' in the B1 cell. A callout points to the 'Values' cell with the text: 'The unique values for a field added as **values** will be summarized here based on pivot table context (filters, rows & columns)'. Another callout points to the 'Rows' cell with the text: 'The unique values for a field added as **rows** will appear here'. On the right, the 'Pivot table editor' dialog box is open, showing the 'Field list' on the right side. The 'Field list' contains a list of fields: ID, Match Type, Platform, Keyword, Month, Impressions, Clicks, Conversions, Cost, and Revenue. Arrows point from the 'Rows' and 'Values' cells in the spreadsheet to their respective sections in the 'Field list'. A callout on the right side of the 'Field list' area says: 'You can drag or add fields here'.

THE PIVOT TABLE EDITOR

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

The **pivot table editor** lets you use fields from your source data as rows, columns, values, or filters in a pivot table:

A screenshot of the Microsoft Excel Pivot Table Editor. On the left, a pivot table is displayed with 'Keyword' in the rows and 'SUM of Impressions' in the values. The data includes various promotional terms like 'black friday', 'competitor', etc., with their respective impression counts. A callout bubble points to the 'SUM of Impressions' value, stating: "This sums the **Impressions** by **Keyword** in each row". On the right, the 'Pivot table editor' dialog shows the 'Rows' section with 'Keyword' selected and 'Show totals' checked. The 'Values' section shows 'Impressions' summarized by 'SUM'. The 'Suggested' section lists other available fields: ID, Match Type, Platform, Keyword, Month, Impressions, Clicks, Conversions, Cost, and Revenue.

Keyword	SUM of Impressions
black friday	3,919
competitor	12,524
coupon code	1,469,514
discount code	163,620
free shipping	11,319
offer	71,840
promo code	765,481
sale	176,482
Grand Total	2,674,699

This sums the **Impressions** by **Keyword** in each row

Pivot table editor

Campaigns!A1:J19

Suggested

Rows

Keyword

Order Ascend... Sort by Keyword

Show totals

Columns

Values

Impressions

Summarize by SUM Show as Default

ID

Match Type

Platform

Keyword

Month

Impressions

Clicks

Conversions

Cost

Revenue

PIVOTING DATA

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

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

Platform	Keyword	Impressions
desktop	black friday	257
	competitor	4,078
	coupon code	342,155
	discount code	43,789
	free shipping	4,437
	offer	21,919
mobile	promo code	260,495
	sale	80,763
	black friday	3,662
	competitor	8,446
	coupon code	1,127,359
	discount code	119,831
Grand Total		2,674,699

Rows

Platform

Order Ascendi... Sort by Platform

Show totals

Repeat row labels

Add

Rows

Keyword

Order Ascendi... Sort by Keyword

Show totals

Columns

Platform

Order Ascendi... Sort by Platform

Show totals

Add

Impressions	Platform	desktop	mobile
Keyword	black friday	257	3,662
black friday	competitor	4,078	8,446
competitor	coupon code	342,155	1,127,359
coupon code	discount code	43,789	119,831
discount code	free shipping	4,437	6,882
free shipping	offer	21,919	49,921
offer	promo code	260,495	504,986
promo code	sale	80,763	95,719
Grand Total		757,893	1,916,806

SUMMARIZE BY

Data Structure

Creating
Pivot Tables

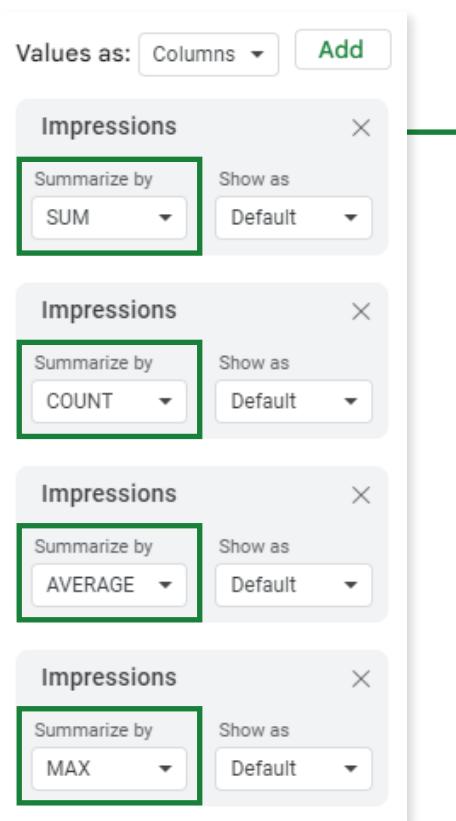
Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

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



	A	B	C	D	E
1		Total impressions	Ad campaigns	Impressions per campaign	Best campaign
2	Keyword	SUM of Impressions	COUNT of Impressions	AVERAGE of Impressions	MAX of Impressions
3	black friday	3,919	2	1,960	3,662
4	competitor	12,524	18	696	3,155
5	coupon code	1,469,514	40	36,738	276,568
6	discount code	163,620	30	5,454	24,726
7	free shipping	11,319	20	566	3,279
8	offer	71,840	20	3,592	31,793
9	promo code	765,481	40	19,137	138,811
10	sale	176,482	20	8,824	19,335
11	Grand Total	2,674,699	190	14,077	276,568

HEY THIS IS IMPORTANT!

Text columns can only be summarized by COUNTA or COUNTUNIQUE

*Copyright Maven Analytics, LLC

SHOW AS

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

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

Values	Add	Values	Add	Values	Add	Values	Add																																																																																																																																																																																
<p>Conversions (Conversions) X</p> <p>Summarize by SUM</p> <p>Show as Default</p>	Add	<p>Conversions (Conversions) X</p> <p>Summarize by SUM</p> <p>Show as % of row</p>	Add	<p>Conversions (Conversions) X</p> <p>Summarize by SUM</p> <p>Show as % of column</p>	Add	<p>Conversions (Conversions) X</p> <p>Summarize by SUM</p> <p>Show as % of grand total</p>	Add																																																																																																																																																																																
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How many conversions did we have by keyword and platform?

Of the conversions for each keyword, what percentage came from each platform?

Of the conversions for each platform, what percentage came from each keyword?

Of the total conversions, what percentage came from each keyword-platform combination?

SORTING

You can **sort** your pivot table data in ascending or descending order based on:

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

1

Items in Rows or Columns

Rows Add

Keyword X

Order Descending Sort by Keyword

Show totals

Keyword	AVERAGE of Revenue
+ sale	\$213
promo code	\$6,086
offer	\$447
free shipping	\$28
discount code	\$1,017
coupon code	\$6,811
competitor	\$91
- black friday	\$103
Grand Total	\$2,958

2

Data in Values

Rows Add

Keyword X

Order Ascending Sort by AVERAGE of Revenue

Show totals

Keyword	AVERAGE of Revenue
free shipping	\$28
competitor	\$91
black friday	\$103
sale	\$213
offer	\$447
discount code	\$1,017
promo code	\$6,086
coupon code	\$6,811
Grand Total	\$2,958

FILTERING

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

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

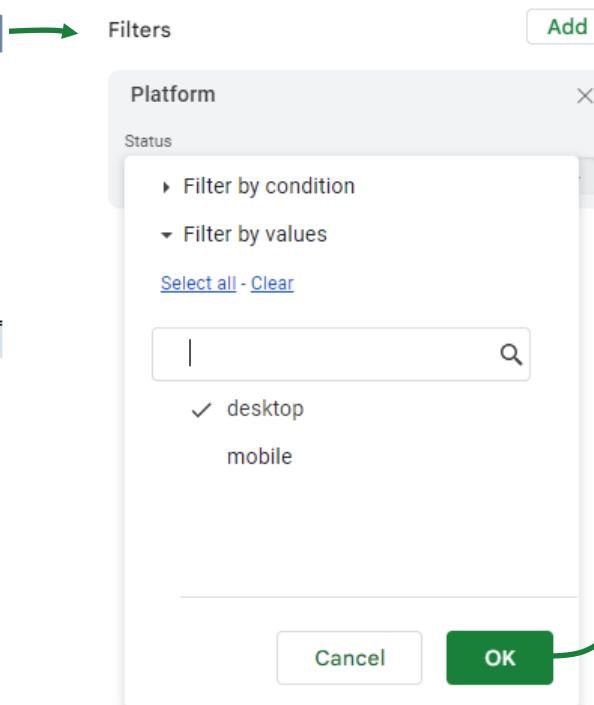
Calculated Fields

Keyword	Campaigns	Clicks	Cost
promo code	40	285,078	\$261,083
coupon code	40	551,648	\$313,148
discount code	30	48,862	\$35,467
sale	20	17,313	\$10,645
offer	20	15,236	\$12,126
free shipping	20	2,597	\$742
competitor	18	3,479	\$2,114
black friday	2	290	\$47
Grand Total	190	924,503	\$635,372

Full data

Filter by values

Desktop campaigns only



Keyword	Campaigns	Clicks	Cost
promo code	20	87,901	\$127,423
coupon code	20	122,381	\$135,096
discount code	15	11,896	\$13,793
sale	10	7,203	\$4,698
offer	10	3,681	\$4,510
free shipping	10	938	\$379
competitor	8	915	\$939
black friday	1	24	\$3
Grand Total	94	234,939	\$286,841

FILTERING

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

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

Keyword	Campaigns	Clicks	Cost
promo code	40	285,078	\$261,083
coupon code	40	551,648	\$313,148
discount code	30	48,862	\$35,467
sale	20	17,313	\$10,645
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free shipping	20	2,597	\$742
competitor	18	3,479	\$2,114
black friday	2	290	\$47
Grand Total	190	924,503	\$635,372

Full data

Filters

Add

Month

Status

Filter by condition

Date is after

exact date

10/31/2022

Filter by values

Cancel OK

Campaigns after October 2022

Keyword	Campaigns	Clicks	Cost
promo code	8	128,789	\$123,118
coupon code	8	209,917	\$127,160
discount code	6	23,816	\$17,059
sale	4	5,361	\$4,477
offer	4	10,491	\$7,869
free shipping	4	1,012	\$261
competitor	3	1,244	\$762
black friday	2	290	\$47
Grand Total	39	380,920	\$280,753



PRO TIP: Go to **Data > Add a slicer** to add a physical “filter dropdown” to the spreadsheet for any specified fields in your pivot table

GROUPING TEXT FIELDS

You can **group text-based fields** in a pivot table to create higher-level categories

- Grouping creates a new field which **can be used independently**

Data Structure

Creating Pivot Tables

Calculation Options

Sorting & Filtering

Grouping

Calculated Fields

Select the rows for the first group

Keyword	Campaigns	Clicks	Cost
promo code	40	285,078	\$261,083
coupon code	40	551,648	\$313,148
discount code	30	48,862	\$35,467

sale offer free comp black Grand

Cut Ctrl+X
Copy Ctrl+C
Paste Ctrl+V
Paste special ►

+ Insert 1 column left

>Create a filter

+ Create pivot group

Get link to this range
Comment Ctrl+Alt+M
Insert note

Create the rest of the groups and rename

Keyword Type	Keyword	Campaigns	Clicks	Cost
- Codes	promo code	40	285,078	\$261,083
- Codes	coupon code	40	551,648	\$313,148
- Codes	discount code	30	48,862	\$35,467

Codes Total 110 885,588 \$609,698

Type	Keyword	Campaigns	Clicks	Cost
- Sales	sale	20	17,313	\$10,645
- Sales	offer	20	15,236	\$12,126
- Sales	black friday	2	290	\$47

Sales Total 42 32,839 \$22,818

Type	Keyword	Campaigns	Clicks	Cost
- Others	free shipping	20	2,597	\$742
- Others	competitor	18	3,479	\$2,114

Others Total 38 6,076 \$2,856

	Campaigns	Clicks	Cost
Grand Total	190	924,503	\$635,372

Remove original field and keep groups

Keyword Type	Campaigns	Clicks	Cost
Codes	110	885,588	\$609,698
Sales	42	32,839	\$22,818
Others	38	6,076	\$2,856

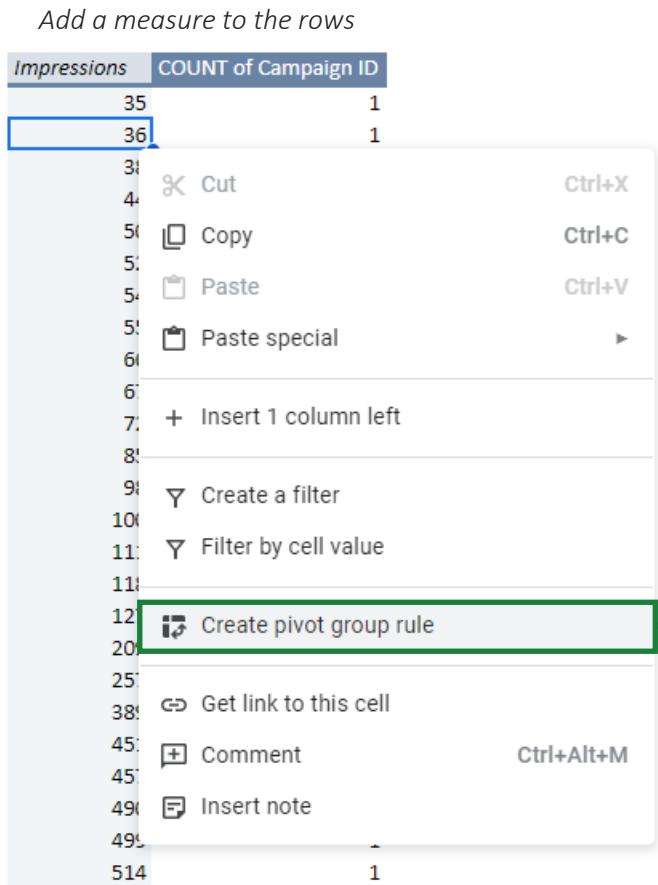
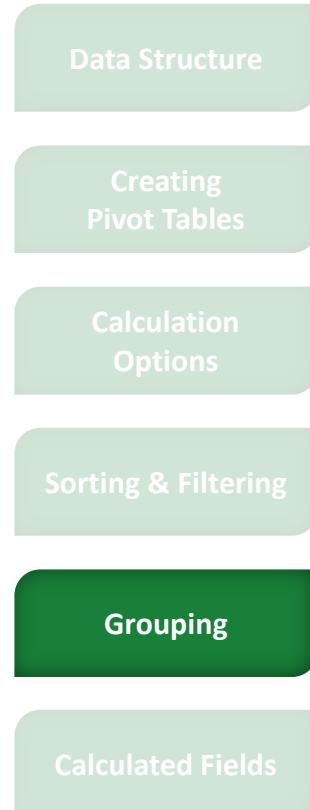
Grand Total 190 924,503 \$635,372

 **PRO TIP:** You can also create these groups as a new column in the source data

GROUPING NUMERICAL FIELDS

You can **group numerical fields** in a pivot table to create custom buckets of values

- This is a great way to analyze which numbers are the most frequent



Select the min/max values and interval size

Grouping rule

Minimum value	1
Maximum value	10,000
Interval size	1,000

Cancel

OK

Grouped Impressions	COUNT of Campaign ID
1 - 1,000	46
1,001 - 2,000	22
2,001 - 3,000	10
3,001 - 4,000	12
4,001 - 5,000	5
5,001 - 6,000	8
6,001 - 7,000	13
7,001 - 8,000	8
8,001 - 9,000	5
9,001 - 10,000	7
> 10,000	54
Grand Total	190

GROUPING DATE FIELDS

You can **group date fields** to roll dates into their date components (*months, years, etc.*)

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

Date Start Campaigns Clicks Cost

Date Start	Campaigns	Clicks	Cost
2022-07-01	34	117,019	\$86,548
2022-07-16	4	74,532	\$33,993

2022-07-16

- Cut
- Copy
- Paste
- Paste special
- + Insert 1 column left
- Create a filter
- Filter by cell value
- + Create pivot date group
- Get link to this cell
- Comment
- Insert note

Hour-Minute (24 hour)
Hour-Minute (12 hour)
Day of the week
Day of the year
Day of the month
Day-Month
Month
Quarter
Year
Year-Month
Year-Quarter
Year-Month-Day

Date Start - Month	Campaigns	Clicks	Cost
Jul	38	191,551	\$120,541
Aug	38	119,034	\$84,225
Sep	38	116,287	\$71,597
Oct	37	116,711	\$78,256
Nov	39	380,920	\$280,753
Grand Total	190	924,503	\$635,372



PRO TIP: A more flexible approach can be to **create new fields in your source data** using date functions

CALCULATED FIELDS

Calculated fields allow you to create measures based on existing fields

Data Structure

Creating
Pivot Tables

Calculation
Options

Sorting & Filtering

Grouping

Calculated Fields

The screenshot shows a data analysis interface with a sidebar on the left containing navigation links. The main area displays several data series: 'Campaign ID (Campaigns)', 'Clicks (Clicks)', 'Cost (Cost)', and 'Filters'. A modal window titled 'Revenue' is open, showing an 'Add' button and a search bar. Below the search bar, a list includes 'Calculated Field' (which is highlighted with a red box and has a green arrow pointing to it), 'Campaign ID', 'Match Type', 'Platform', 'Keyword', 'Date Start', 'Impressions', 'Clicks', 'Conversions', 'Cost', and 'Revenue'. The 'Calculated Field' option is selected.

A separate dialog box titled 'Calculated Field 1' is shown. It contains a 'Formula' field with the value '=Cost/Clicks', a 'Summarize by' dropdown set to 'SUM', and a 'Show as' dropdown set to 'Default'. A green arrow points from the 'Calculated Field' entry in the previous modal to this dialog.

Date Start - Month	Campaigns	Clicks	Cost	Cost per click
Jul	38	191,551	\$120,541	\$0.63
Aug	38	119,034	\$84,225	\$0.71
Sep	38	116,287	\$71,597	\$0.62
Oct	37	116,711	\$78,256	\$0.67
Nov	39	380,920	\$280,753	\$0.74
Grand Total	190	924,503	\$635,372	\$0.69

KEY TAKEAWAYS: PIVOT TABLES



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

- *It's important to have clear column 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**, **filter**, and **group** pivot table results

- *You can sort by dimensions or values, and filter by values or criteria*
- *You can group text, numbers, and dates*

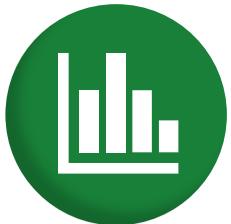


Create **calculated fields** to perform dynamic calculations

- *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 Google Sheets, including line, bar, pie charts, and more!

THE SECTION PROJECT

THE **SITUATION**

You work as a data visualization specialist at **Kickstarter**, a global crowdfunding platform focused on bringing creative projects to life

THE **BRIEF**

You've been given access to a sample of around 5,000 **Kickstarter projects*** from 2009 to 2017, including the project name, category, launch date, goal, and amount pledged

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

THE **OBJECTIVE**

Use Google Sheets 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 Viz 101

Creating Charts

Essential Visuals

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



10

WHY VISUALIZE DATA?

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



CREATING CHARTS

You can visualize data in Sheets by **creating a chart** and selecting a chart type

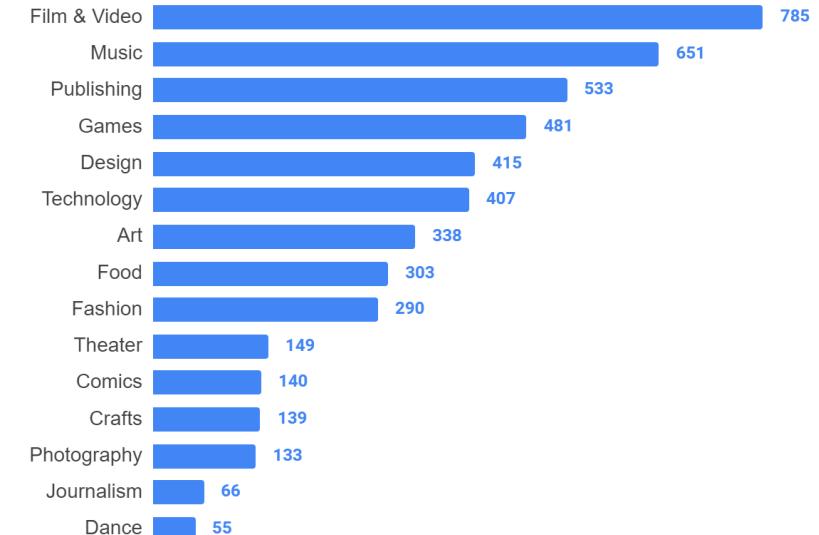
Data Viz 101

Creating Charts

Essential Visuals

The screenshot shows a Google Sheets interface. On the left, there's a table titled 'Category' and 'Projects' with various categories like Film & Video, Music, Publishing, etc., and their respective project counts. The 'Insert' menu is open, showing options like Cells, Rows, Columns, Sheet, Timeline, Chart (which is highlighted with a green box), Pivot table, Image, Drawing, and Chart editor. The 'Chart editor' sidebar is also visible, with tabs for Setup (which is active) and Customize, and a dropdown for 'Chart type' set to 'Bar chart'.

Kickstarter Projects by Category



CHOOSING THE RIGHT CHART TYPE

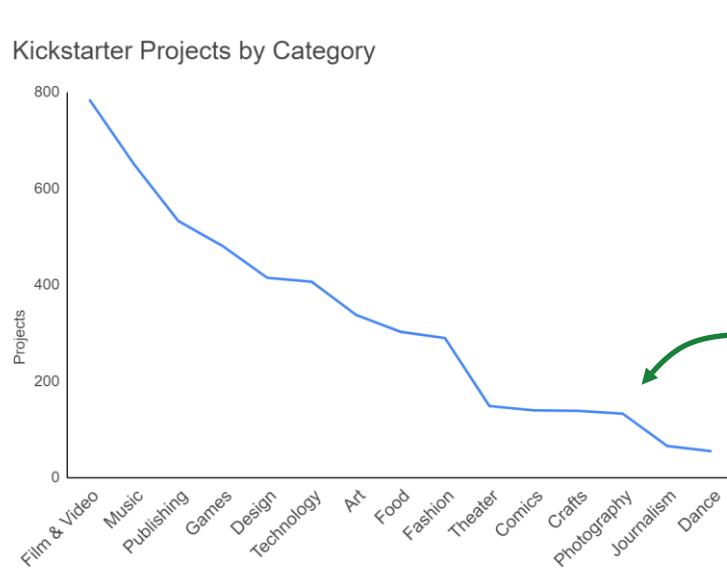
Data Viz 101

Creating Charts

Essential Visuals

Category	Projects
Film & Video	785
Music	651
Publishing	533
Games	481
Design	415
Technology	407
Art	338
Food	303
Fashion	290
Theater	149
Comics	140
Crafts	139
Photography	133
Journalism	66
Dance	55

← We have project **categories** that we want to **compare** by the number of projects for each



Showing categorical data in a line chart gives the false sense of a trend occurring

CHOOSING THE RIGHT CHART TYPE

Data Viz 101

Creating Charts

Essential Visuals

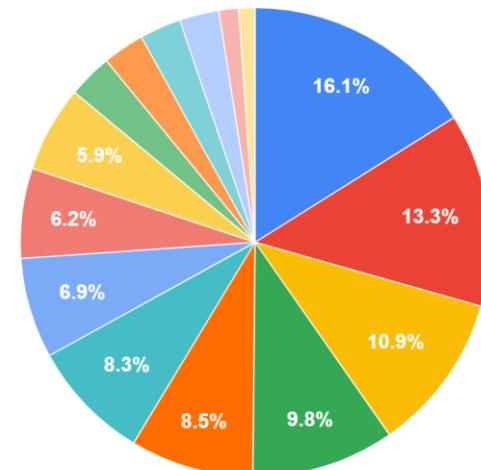
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← We have project **categories** that we want to **compare** by the number of projects for each



Kickstarter Projects by Category

- Film & Video
- Music
- Publishing
- Games
- Design
- Technology
- Art
- Food
- Fashion
- Theater
- Comics
- Crafts
- Photography
- Journalism
- Dance



← 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

Data Viz 101

Creating Charts

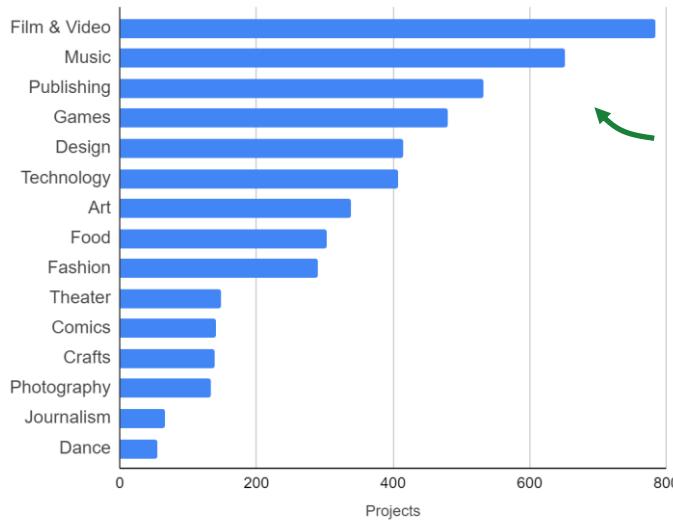
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← We have project **categories** that we want to **compare** by the number of projects for each



Kickstarter Projects by Category



Bar charts are perfect for comparing categorical data!

LINE CHARTS

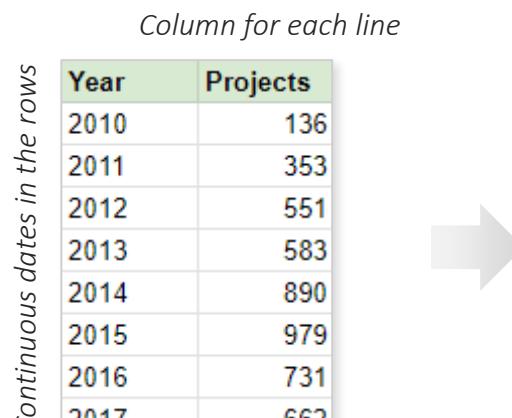
Data Viz 101

Creating Charts

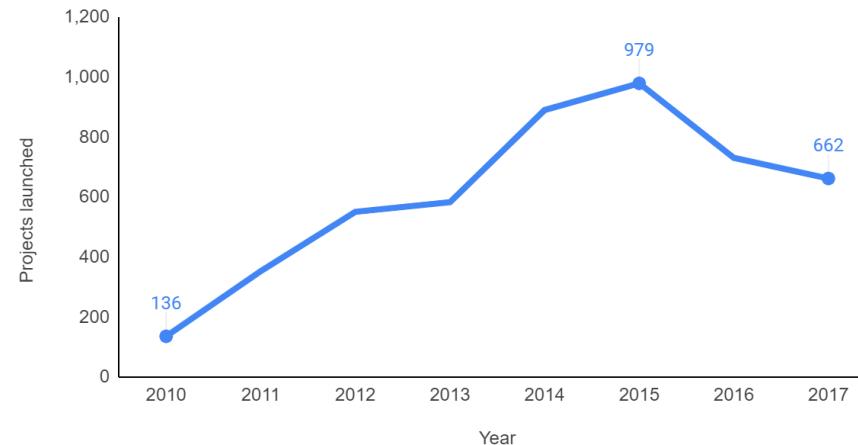
Essential Visuals

Line charts are commonly used for visualizing trends over time

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



Kickstarter project launches peaked in 2015



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**

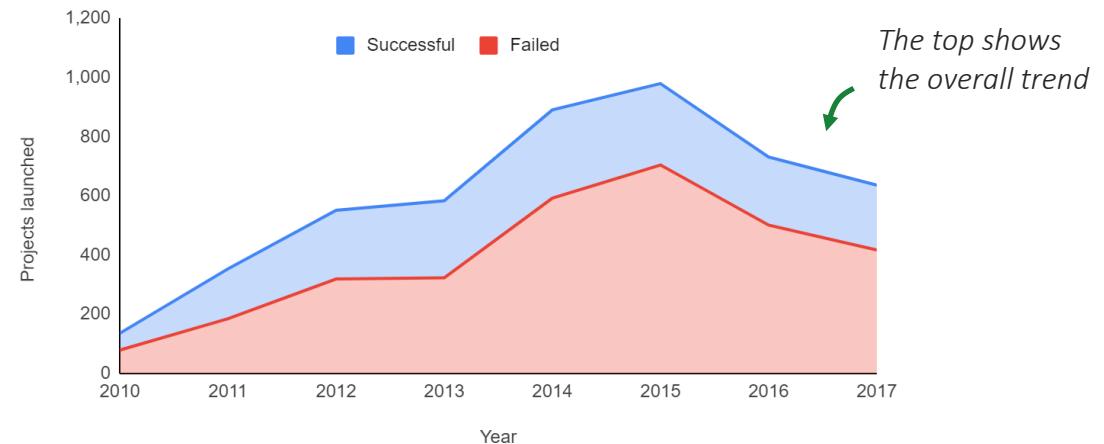
Continuous dates in the rows

Column for each area

Year	Failed	Successful
2010	79	57
2011	185	168
2012	319	232
2013	323	260
2014	592	298
2015	704	275
2016	501	230
2017	417	219



Most projects have been unsuccessful across the years



STACKED AREA CHARTS

Data Viz 101

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Essential Visuals

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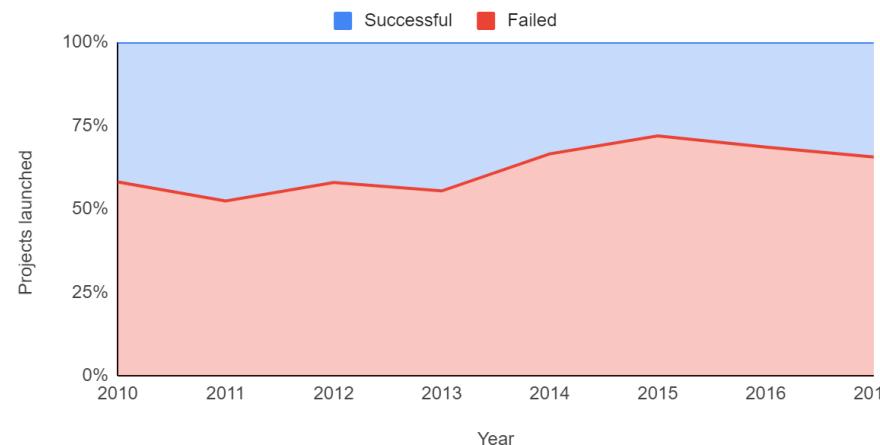
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Most projects have been unsuccessful across the years



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**

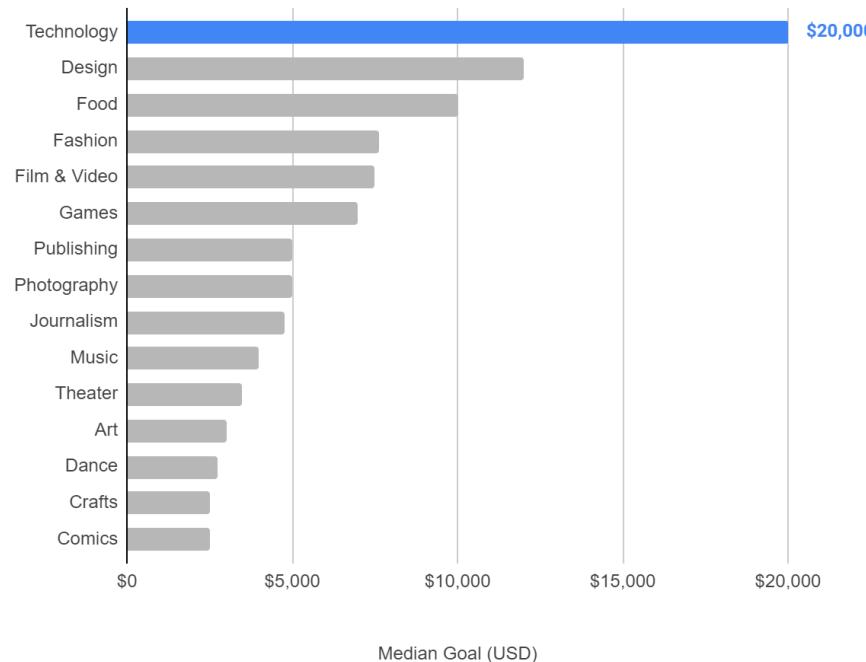
Categories as the rows

Values in a single column

Category	Median Goal
Technology	\$20,000
Design	\$12,000
Food	\$10,000
Fashion	\$7,613
Film & Video	\$7,500
Games	\$7,000
Publishing	\$5,000
Photography	\$5,000
Journalism	\$4,750
Music	\$4,000
Theater	\$3,454
Art	\$3,000
Dance	\$2,727
Crafts	\$2,500
Comics	\$2,500



Technology projects typically require more funding



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**

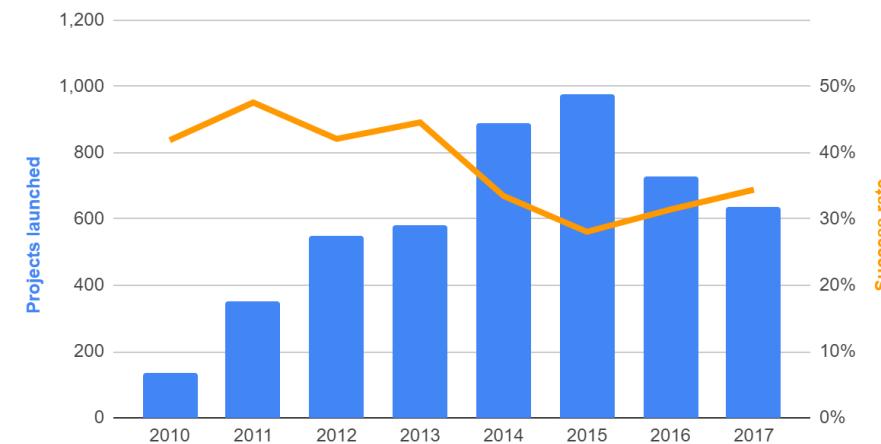
Y-axis values in each column

X-axis values as the rows

Year	Projects	Success Rate
2010	136	41.9%
2011	353	47.6%
2012	551	42.1%
2013	583	44.6%
2014	890	33.5%
2015	979	28.1%
2016	731	31.5%
2017	636	34.4%



Project launches grew in 2014-2015, but success rates dipped



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

PIE & DONUT CHARTS

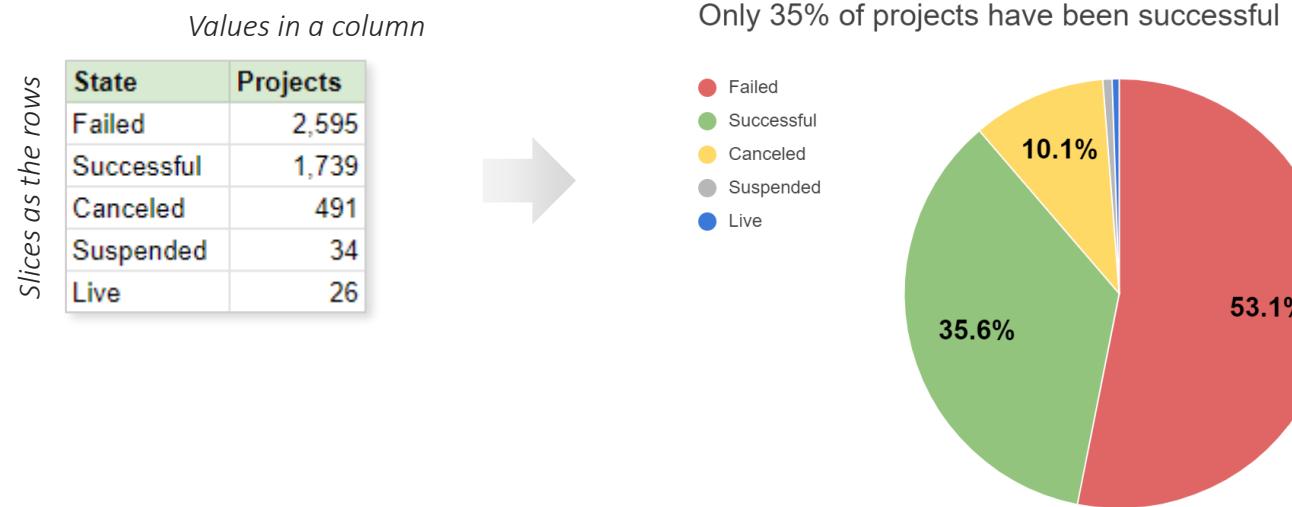
Data Viz 101

Creating Charts

Essential Visuals

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

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



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

SCATTERPLOTS

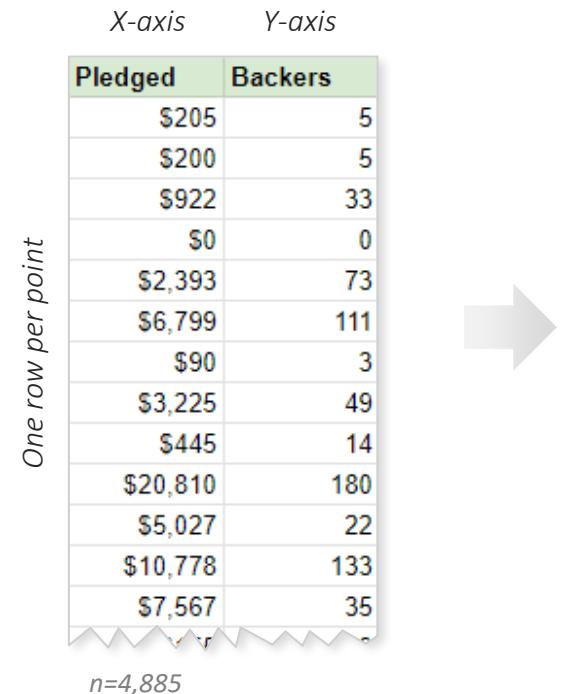
Data Viz 101

Creating Charts

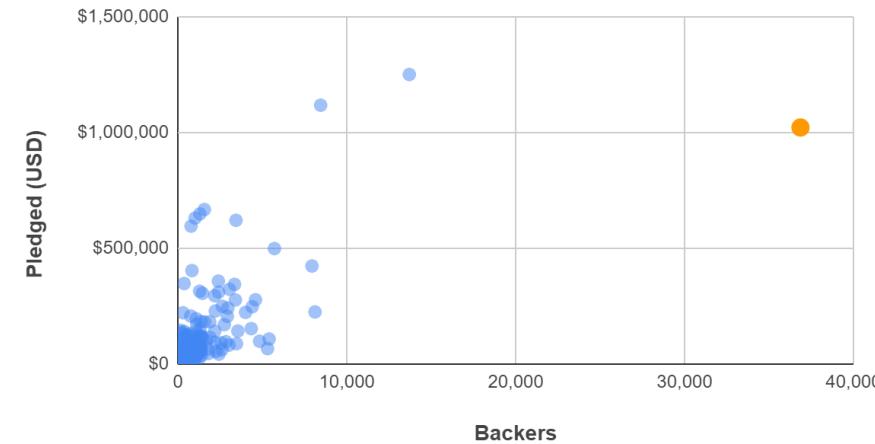
Essential Visuals

Scatterplots are used for visualizing the relationship between numerical variables

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



The "Polygons Measuring Spoon" project had 36,863 backers!



MAPS

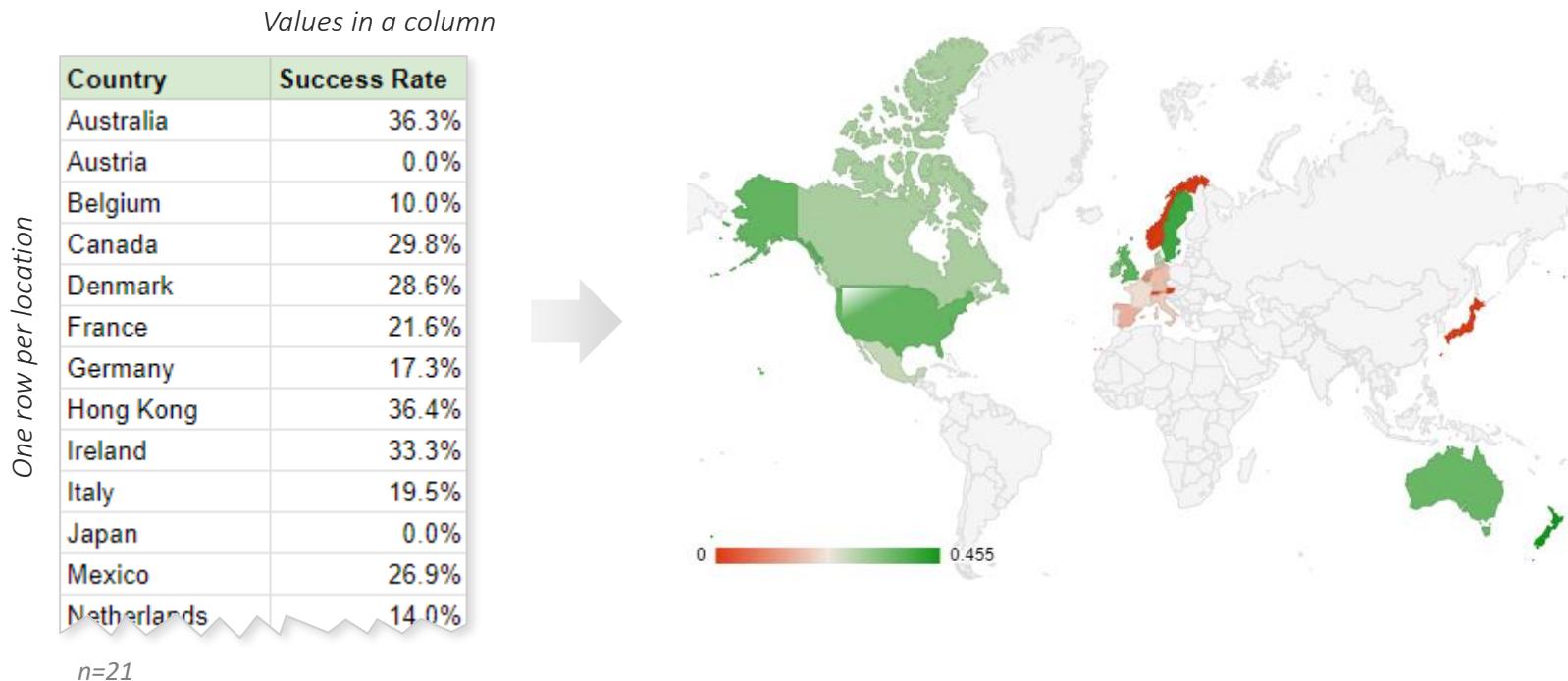
Data Viz 101

Creating Charts

Essential Visuals

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

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



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*

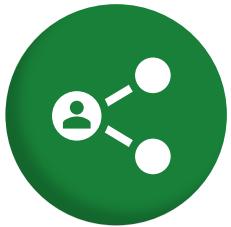


Chart formatting can help turn an OK visual into an excellent one

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

SHARING & COLLABORATION

SHARING & COLLABORATION



In this section we'll cover Google Sheets' **sharing & collaboration** options, including sharing spreadsheets with others, collaborating in real time, setting notifications, and more

TOPICS WE'LL COVER:

Sharing Options

Collaboration Tips

Protecting & Publishing

GOALS FOR THIS SECTION:

- Share files with others and set the desired user roles for viewing, commenting, or editing
- Collaborate in real time with comments & chat
- Set edit notifications to track a file's edit history
- Protect sheets & ranges to prevent users from making undesired changes or edits

THE SECTION PROJECT

THE **SITUATION**

You work as a Project Manager at **Maven Consulting Group**, a multinational firm that specializes in integrating machine learning frameworks for manufacturing companies

THE **BRIEF**

For every project, you're in charge of creating and maintaining a file to track progress, including the project tasks, due dates, owners, status, and hours worked

Your goal is to **leverage your Google Sheets skills** to share this file with your coworkers in order to collaborate in real time, allowing you to optimize your communication

THE **OBJECTIVE**

Use Google Sheets to:

- Share the file & edit user permissions
- Collaborate using notes & chat
- Prevent users from modifying certain cells



SHARING OPTIONS

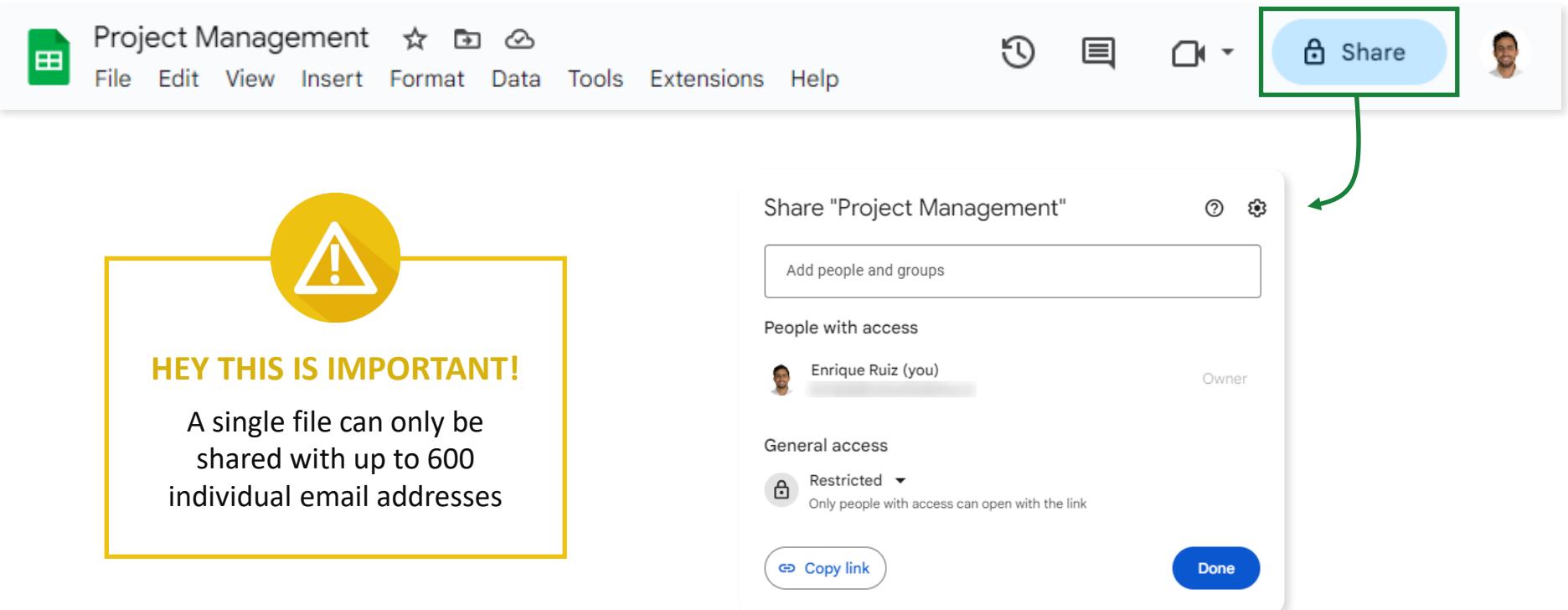
Sharing Options

Collaboration Tips

Protecting & Publishing

Google Sheets has two main **sharing options**:

- **Restricted:** only people with access can open the link by signing in to their Google account
- **Anyone with the link:** anyone who has the link can access, even without signing in



The screenshot shows the Google Sheets interface with a 'Project Management' spreadsheet open. The top navigation bar includes 'File', 'Edit', 'View', 'Insert', 'Format', 'Data', 'Tools', 'Extensions', and 'Help'. On the far right of the toolbar is a 'Share' button, which is highlighted with a green box and a green arrow pointing to it from the 'Sharing Options' sidebar. A large yellow warning box in the bottom-left corner contains a yellow exclamation mark icon and the text 'HEY THIS IS IMPORTANT! A single file can only be shared with up to 600 individual email addresses'. To the right of the warning box is a 'Share "Project Management"' dialog box. This dialog shows 'People with access' (Enrique Ruiz, Owner) and 'General access' set to 'Restricted' (Only people with access can open with the link). Buttons at the bottom include 'Copy link' and 'Done'.

ROLES

When you share a file with someone, you can choose their **role**, or access level:

- **Viewer:** Can access the file but can't change it or share it with others
- **Commenter:** Can make comments but can't change or share the file with others
- **Editor:** Can make changes and share the file with others

Share "Project Management"

Add people and groups

People with access

User	Role
Enrique Ruiz (you)	Owner
Alice Zhao	Editor ▾
Chris Dutton	Commenter ▾
Christopher Bruehl	Editor ▾

Settings for "Project Management"

Editors can change permissions and share

Viewers and commenters can see the option to download, print, and copy

COMMENTS & CHAT

Users can add **comments** to provide feedback in specific cells or **chat** with anyone that's currently working on the spreadsheet

Sharing Options

Collaboration Tips

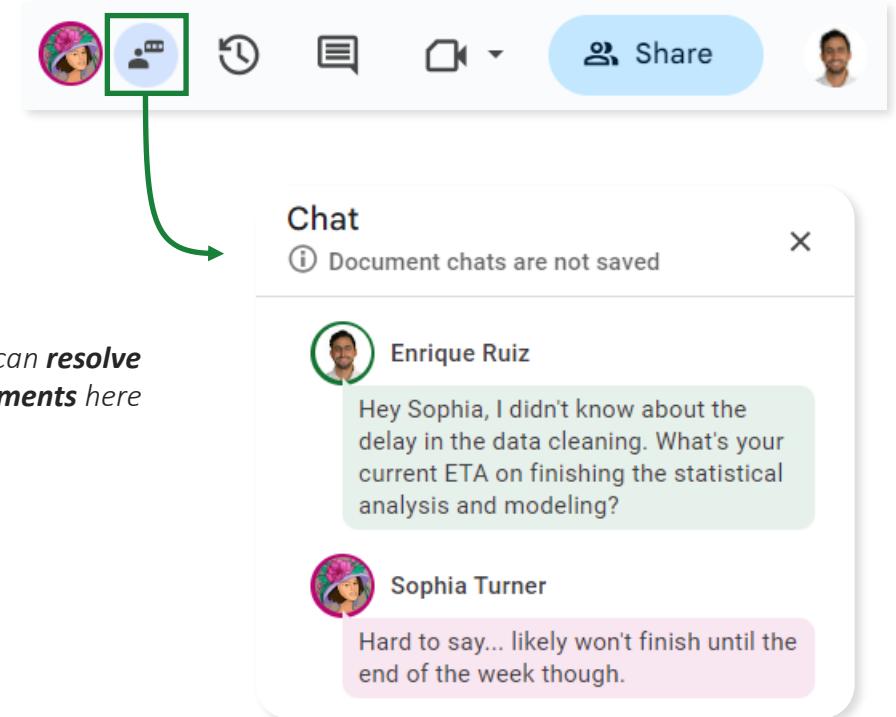
Protecting & Publishing

Right click > Comment

Actual Hours	Notes
20	We'll need access to their MySQL database
75	
40	
8	Remember to export to png
5	
1	

Enrique Ruiz 9:26 PM Today
Only 5 hours so far? I need this done ASAP.

Sophia Turner 9:27 PM Today
The data cleaning took longer than expected, so I didn't get a chance to work on it earlier.



EDIT HISTORY & NOTIFICATIONS

Sharing Options

Collaboration Tips

Protecting &
Publishing

You can right-click on a cell to view its **edit history** or set **edit notifications** to receive emails whenever changes are made on a spreadsheet

Right click > Show edit history

Due Date	Owner	Status	Estimate
2023-10-02	John	Complete	
2023-10-09	Emily	Complete	
2023-10-18	Emily	Complete	
2023-10-20	Sarah	In Progress	
2023-10-25	Sophia	In Progress	
2023-11-02			
2023-11-01			
2023-11-03			
2023-11-08			
2023-11-09			
2023-11-10		Replaced: "2023-10-31" with "2023-11-02"	
2023-11-22			
2023-11-30	JOHN	NOT Started	

Use the arrows to
view previous edits

Tools > Notification settings > Edit notifications

Set notification rules

Help X

Notify me at when...

- Any changes are made
- A user submits a form

Notify me with...

- Email - daily digest
- Email - right away

Cancel

Save

PROTECTING SHEETS & RANGES

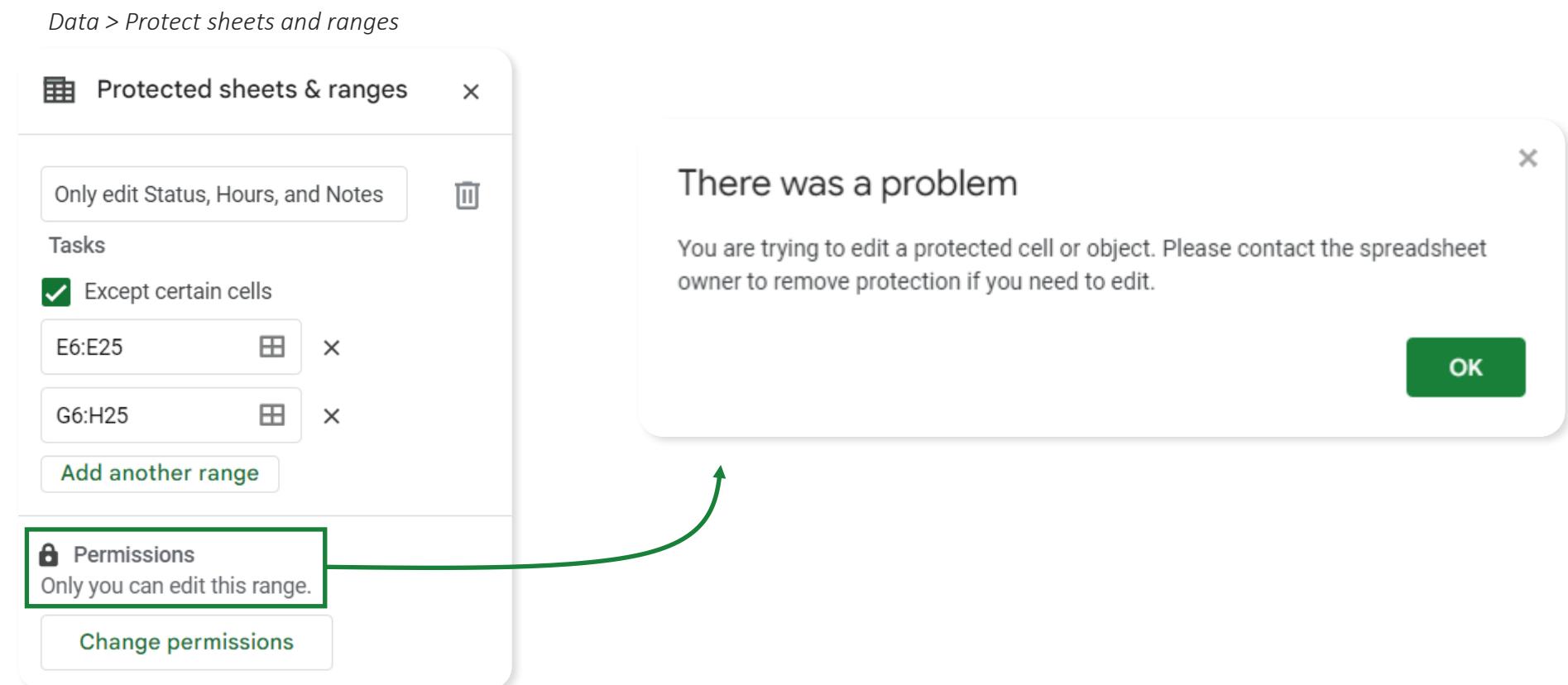
You can **protect sheets or ranges** to prevent users from editing them

- You can also allow them to make edits, but display a warning first

Sharing Options

Collaboration Tips

Protecting &
Publishing



PROTECTING SHEETS & RANGES

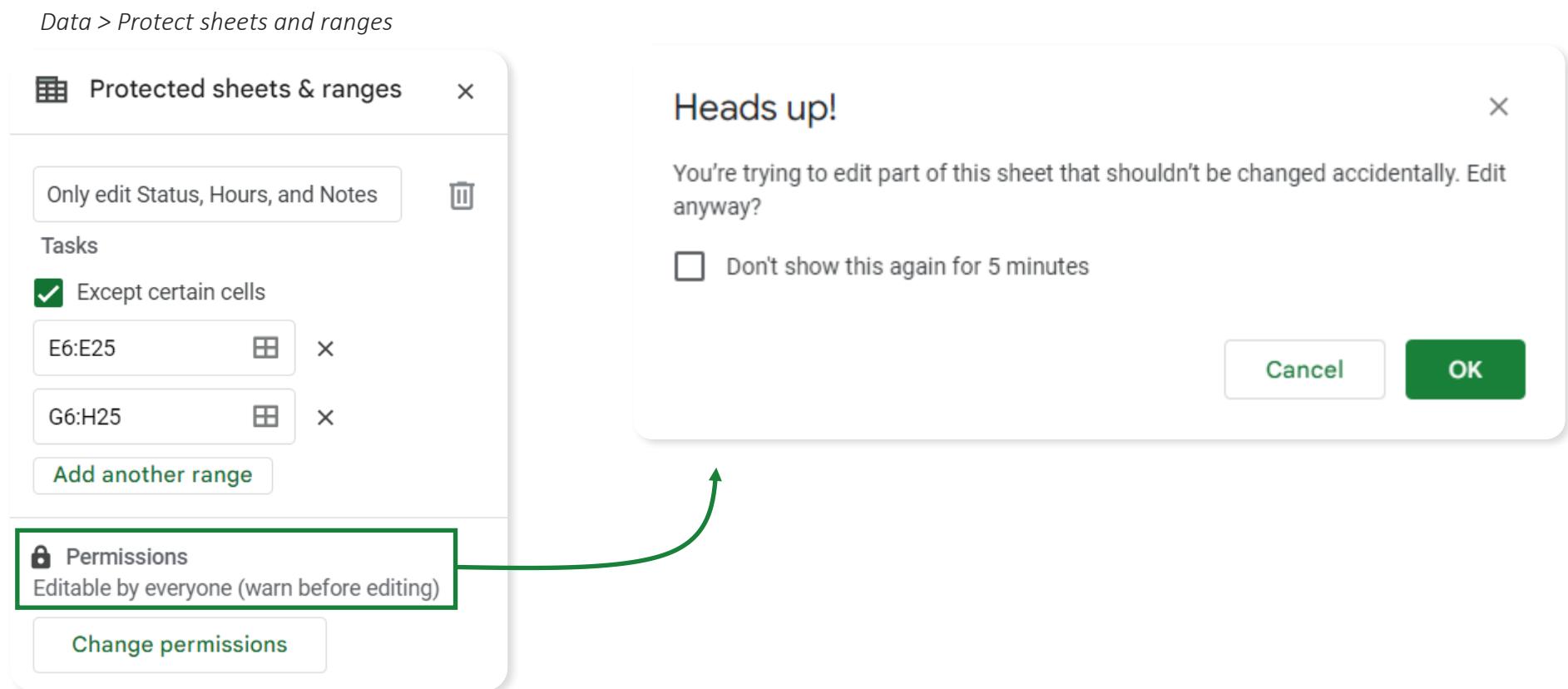
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- You can also allow them to make edits, but display a warning first

Sharing Options

Collaboration Tips

Protecting & Publishing



PUBLISHING TO THE WEB

You can **publish to the web** to display your Google Sheets documents online

- You can publish the entire document or a single tab

Sharing Options

Collaboration Tips

Protecting & Publishing

File > Share > Publish to web

Publish to the web

This document is not published to the web.

Make your content visible to anyone by publishing it to the web. You can link to or embed your document. [Learn more](#)

Link

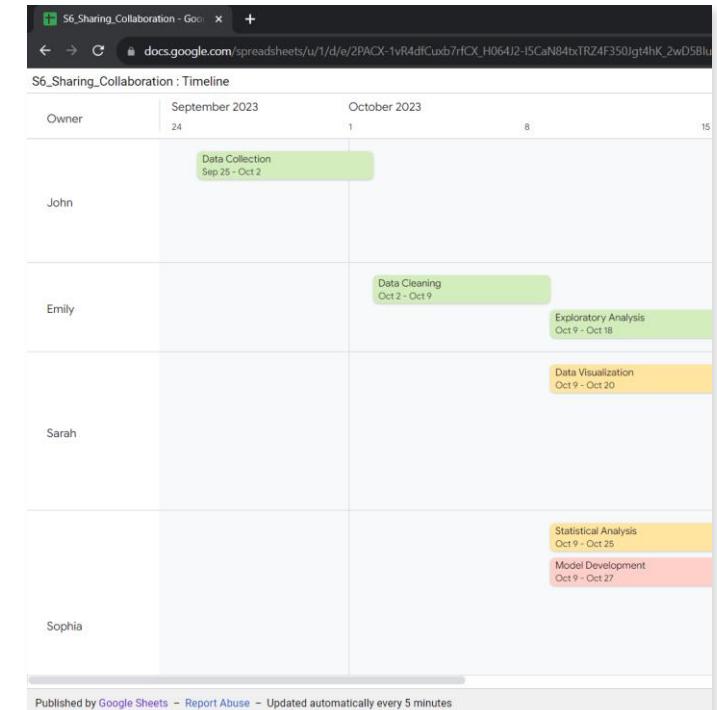
Embed

Timeline ▾

Web page ▾

Publish

▶ Published content & settings



KEY TAKEAWAYS: SHARING & COLLABORATION



Google Sheets allows for **seamless real-time collaboration**

- *You can share files with others in your organization via email or by sharing a public link*
- *Everyone can edit at the same time and changes are saved immediately*



You can **add & resolve comments** directly in cells

- *Modify the “edit notification” preferences to avoid receiving an email every time someone comments on your file*



Enable **edit notifications** to keep track of changes to spreadsheets

- *You can also view a cell’s edit history directly in the spreadsheet*



Protect sheets & ranges to prevent users from editing them

- *You can choose to prevent editing altogether or show a warning whenever a user tries to edit*