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Spreadsheets

Introduction to Spreadsheets

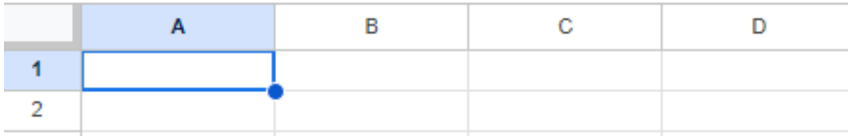
Spreadsheets are powerful tools used for organizing, analyzing, and storing data. They use a grid of cells arranged in numbered rows and lettered columns. Spreadsheets are especially useful for numerical data and can automatically perform complex calculations, but they can be used for all sorts of tasks.

Google Sheets is a free web-based spreadsheet program. It's part of Google Workspace, which includes other productivity tools like Google Docs and Google Slides. It provides functions, data visualization, and collaboration capabilities. It allows multiple users to work on the same spreadsheet simultaneously, making it ideal for collaboration.

Microsoft Excel is a powerful spreadsheet program and part of Microsoft 365 (formerly Microsoft Office). It provides a comprehensive set of tools for creating, editing, and analyzing data. It offers formulas and functions, data visualization through charts and graphs, pivot tables for data summarization and analysis, data filtering and sorting, conditional formatting, and advanced calculations.

Navigating Cells and Entering Data

A **cell** is the smallest unit of data entry in a spreadsheet, and it looks like a small box at the intersection of a column and a row. Each cell is identified by a unique address, such as A1, which represents the first cell at the intersection of column A and row 1. These cells can contain different types of data such as text, numbers, dates, or formulas, and can be formatted for readability or emphasis. Cells can contain anything from simple values or complex formulas.



You can navigate between cells using the mouse, as well as the arrow keys. You can also use the Tab key to move right, Enter to move down, Shift + Tab to move left, and Shift + Enter to move up. You can quickly move to the edge of the selected data region with Ctrl (or Command on a Mac) + an arrow key.

Entering data is straightforward; just click on a cell and start typing. Press Enter or click somewhere else to confirm your entry. To edit data, double-click the cell.

Moving, Copying, and Pasting Data

To **move** the data in cell A1 to B1, click on A1, drag the contents to B1, and release the mouse. To **copy and paste** the value from cell B2 to B3, click on B2, press Ctrl + C (Cmd + C on a Mac), click on B3, and press Ctrl + V (Cmd + V on a Mac). You can even copy and paste data between different spreadsheets.

Inserting Rows and Columns

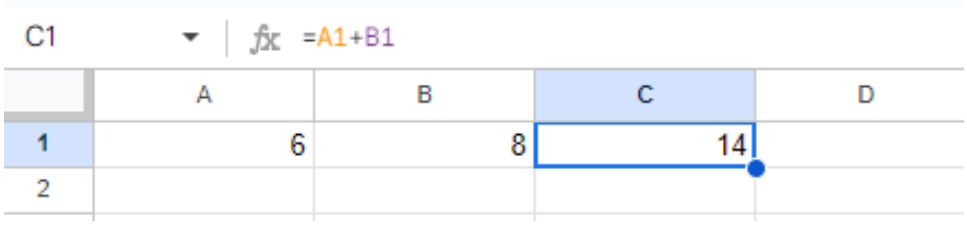
Inserting rows and columns into a spreadsheet lets you add new data or make space for additional information. If you had a table with data in rows 1 to 5 and you wanted to insert a new row between rows 2 and 3, you can right-click on row 3 and select "Insert Row." A new blank row will appear between the existing rows 2 and 3, and the data below will shift down.

If you need to temporarily **hide** a row or column, you can right-click it and choose “hide” to get it out of your way without deleting the data. You can unhide it by clicking on the two arrows where the hidden row or column used to be.

Calculations and Formulas

The ability to perform calculations within cells is one of the most powerful features of spreadsheets. Perform a calculation by typing an equal sign (=) followed by the math expression. For example, to add 5 and 7 together, you would type '=5+7' into a cell. After pressing Enter, the cell will display the result of the calculation (12).

You can also refer to other cells in your calculations. For example, if cell A1 contains the number 6, and cell B1 contains the number 8, you could type '=A1+B1' into cell C1. After pressing Enter, cell C1 will display 14, the result of adding the values in cells A1 and B1. Try it for yourself and become familiar with this feature.



You can build more complex formulas by combining operations. For instance, the formula '=(A1+B1)*C1' first adds the values in cells A1 and B1, then multiplies the result by the value in cell C1. Remember to use parentheses to control the order of operations in your formulas.

Functions

Functions are ready-made formulas available in spreadsheets that simplify complex calculations. For example, if you want to calculate the average of numbers in cells A1 to A5, you can use the function =AVERAGE(A1:A5) instead of manually adding the numbers and dividing by 5. This function will automatically return the average value of the specified range. Most functions work the same in Google Sheets and MS Excel, but sometimes they have slight differences. Here are some of the most helpful and commonly used formulas:

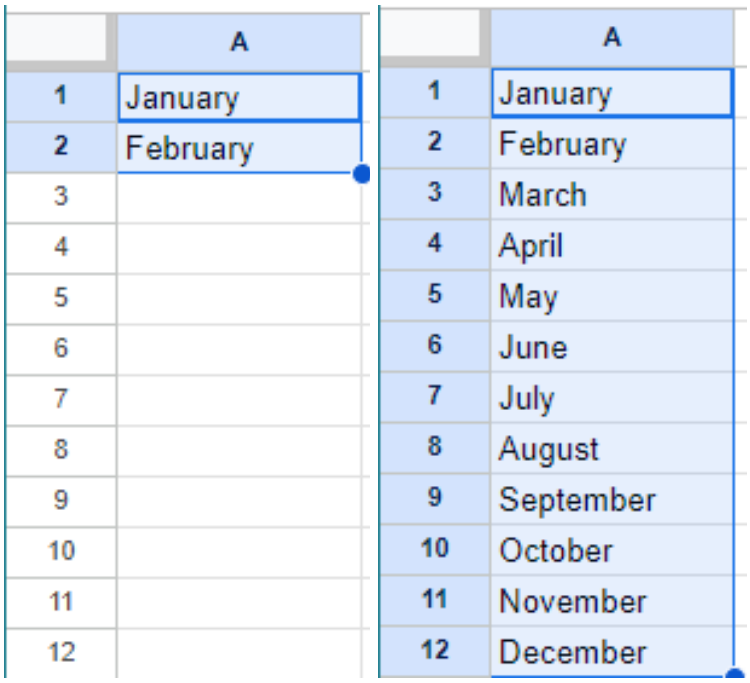
- **AVERAGE (Mean Value)**
    - **Example**: `=AVERAGE(A1:A5)`
    - Calculates the mean of the values in cells A1 through A5.
- **SUM (Addition)**
    - **Example**: `=SUM(B1:B3)`
    - Adds the numbers in cells B1 to B3.
- **MAX (Maximum Value) and MIN (Minimum Value)**
    - **Example**: `=MAX(C1:C5)`
    - Finds the largest number in the range C1 to C5.
- **IF (Conditional Function)**
    - **Example**: `=IF(F1>10, "Yes", "No")`
    - Checks if the value in cell F1 is greater than 10. If true, it returns "Yes"; if false, it returns "No."
- **XLOOKUP (Lookup Value)**
    - **Example**: `=XLOOKUP(H1, A1:A5, B1:B5)`
    - Searches for the value in cell H1 within the range A1 to A5. Once it finds a match, it returns the corresponding value from the same row in the range B1 to B5. You can also specify a value to be returned if the lookup value is not found.

Copying Formulas and Functions with AutoFill

AutoFill allows you to extend formulas in a patterned way. Let's say you have the numbers 1 and 2 in cells A1 and A2 and want to continue this sequence down to A10. You can type `=A1+1` in cell A2, and then use the AutoFill feature to copy this down to A10. The cells will automatically fill with the sequence 1, 2, 3, ..., 10.

Using AutoFill to Complete a Series of Values

The Autofill feature works with all sorts of patterns. Try typing "January" into cell A1 and "February" into cell A2, then click and drag to highlight both cells. Hover over the bottom-right of your selection and the cursor should turn into a plus symbol. Click and drag down, and Sheets / Excel will recognize the pattern and automatically fill the cells with the corresponding months in order.



	A
1	January
2	February
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

	A
1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
10	October
11	November
12	December

Relative vs. Absolute Reference

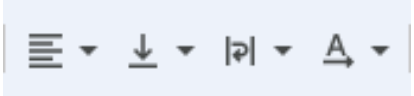
A **relative reference** in a formula means that the reference to the cell will change when the formula is copied to another cell, determined by the relative position of the formula. For example, you might have a formula in cell A3 that adds cells A1 and A2 together `=A1+A2`. If you copy this formula from cell A3 and paste it to B3, the references will change to `=B1+B2`. This is very useful when you want to apply the same formula to a series of cells.

An **absolute reference** is a reference that remains fixed even when the formula is copied to another location. Say you have a value in cell B1 that you want to multiply with values in A1 to A5. In cell C1, you can type `=A1*$B$1`. Notice the dollar signs before the column and row; they make the reference to B1 absolute. If you copy this formula down from C1 to C5, the reference to B1 stays constant, and the formula in C2 will be `=A2*$B$1`, C3 will be `=A3*$B$1`, and so on. Absolute references are useful when you have a constant value, like a tax rate, that you want to apply to a series of calculations.

You can also use a combination of relative and absolute references, called **mixed reference**. This can be either *row* absolute and *column* relative or *column* absolute and *row* relative. It looks like this:

- Column Absolute & Row Relative: `=$A1` - the column reference stays fixed, while the row can change.
- Row Absolute & Column Relative: `=A$1` - the row reference stays fixed, while the column can change.

Cell Formatting



Cell formatting allows you to change the organization and presentation of your data. You can find these options in the bar at the top of the screen.

Horizontal and Vertical Alignment: Text is aligned to the bottom-left by default. You can change this with the “Horizontal align” and “Vertical align” buttons.

Text Wrapping: Sometimes the text inside a cell is too long to be displayed normally. There are multiple ways to handle this. The default “Overflow” option just lets the text spill outside of the cell. “Wrap” expands the cell vertically so the text can fit onto a new line. “Clip” cuts off any text that doesn’t fit inside the cell. If neither of these options work for your situation, you can always just resize the cell.

Text Rotation: This lets you rotate the orientation of text within an individual cell.

WEEK 1					WEEK 2					WEEK 3				
Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday

Number Formatting

Spreadsheets let you automatically format numbers, which gives context for your data. **Currency formatting** is useful for financial data and automatically adds currency symbols to your numbers. Go to “Format Cells” > “Currency”, or simply highlight the cell (or row / column) and click the “Format as currency” button. If you have a cell A1 with the value “2500.5”, applying currency formatting will change it to “$2,500.50”.

Similarly, **percentage formatting** will convert decimal numbers to a percentage format. If you apply percentage formatting to the value “0.2”, it will change it to “20%”.

There are even more options in the “More formats” menu. These include **date**, where you can just enter “apr 1” and it will change to “04/01/2023” (or whatever the current year is, by default.) You can even adjust this in **custom date and time** so that it works the other way around, and entering “04 01 2023” will change to “April 1, 2023”. There is also **scientific formatting** which will change a number like “0.000894568” to “8.95E-04”. You can even create custom number formats. Explore the menu to see what options are available and consider how they might be useful to you.

Alternating Colored Rows

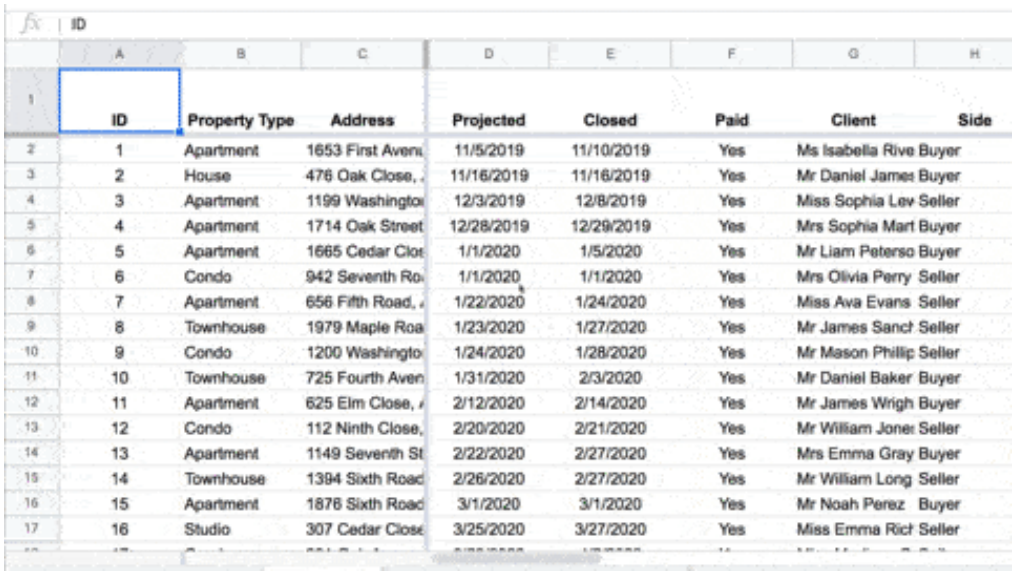
Alternating row colors, also called "zebra striping," can make large datasets much easier to read. It helps make each row distinct, which reduces eye strain and lowers the chance of misreading data.

	A	B	C	D
1	**Artist**	**Album**	**Released**	**Sales**
2	Michael Jackson	Thriller	1982	70 million
3	AC/DC	Back in Black	1980	50 million
4	Whitney Houston	The Bodyguard	1992	45 million
5	Pink Floyd	The Dark Side of the Moon	1973	45 million
6	Eagles	Greatest Hits	1976	44 million
7	Meat Loaf	Bat Out of Hell	1977	43 million
8	Eagles	Hotel California	1976	42 million
9	Shania Twain	Come On Over	1997	40 million
10	Fleetwood Mac	Rumours	1977	40 million
11	Bee Gees	Saturday Night Fever	1977	40 million
12				

Select the rows where you want to apply alternating colors. Go to “Format” > “Alternating colors” and choose your color scheme. You can specify whether or not there is a header and/or a footer row, which will be a darker color.

Freezing Panes

The “Freeze panes” tool allows you to keep certain rows or columns visible no matter how far you scroll through your data. If you have headers in the first row and you want them to remain visible, go to "View" > "Freeze Panes" > "Freeze Top Row."



ID	Property Type	Address	Projected	Closed	Paid	Client	Side
1	Apartment	1653 First Aven	11/5/2019	11/10/2019	Yes	Ms Isabella Rive	Buyer
2	House	476 Oak Close,	11/16/2019	11/16/2019	Yes	Mr Daniel Jame	Buyer
3	Apartment	1199 Washingto	12/3/2019	12/8/2019	Yes	Miss Sophia Lev	Seller
4	Apartment	1714 Oak Street	12/28/2019	12/29/2019	Yes	Mrs Sophia Mart	Buyer
5	Apartment	1665 Cedar Clo	1/1/2020	1/5/2020	Yes	Mr Liam Peterso	Buyer
6	Condo	942 Seventh Ro	1/1/2020	1/1/2020	Yes	Mrs Olivia Perry	Seller
7	Apartment	656 Fifth Road,	1/22/2020	1/24/2020	Yes	Miss Ava Evans	Seller
8	Townhouse	1979 Maple Roa	1/23/2020	1/27/2020	Yes	Mr James Sanct	Seller
9	Condo	1200 Washingto	1/24/2020	1/28/2020	Yes	Mr Mason Phillip	Seller
10	Townhouse	725 Fourth Aven	1/31/2020	2/3/2020	Yes	Mr Daniel Baker	Buyer
11	Apartment	625 Elm Close,	2/12/2020	2/14/2020	Yes	Mr James Wrigh	Buyer
12	Condo	112 Ninth Close,	2/20/2020	2/21/2020	Yes	Mr William Jone	Seller
13	Apartment	1149 Seventh St	2/22/2020	2/27/2020	Yes	Mrs Emma Gray	Buyer
14	Townhouse	1394 Sixth Road	2/26/2020	2/27/2020	Yes	Mr William Long	Seller
15	Apartment	1876 Sixth Road	3/1/2020	3/1/2020	Yes	Mr Noah Perez	Buyer
16	Studio	307 Cedar Close	3/25/2020	3/27/2020	Yes	Miss Emma Rich	Seller

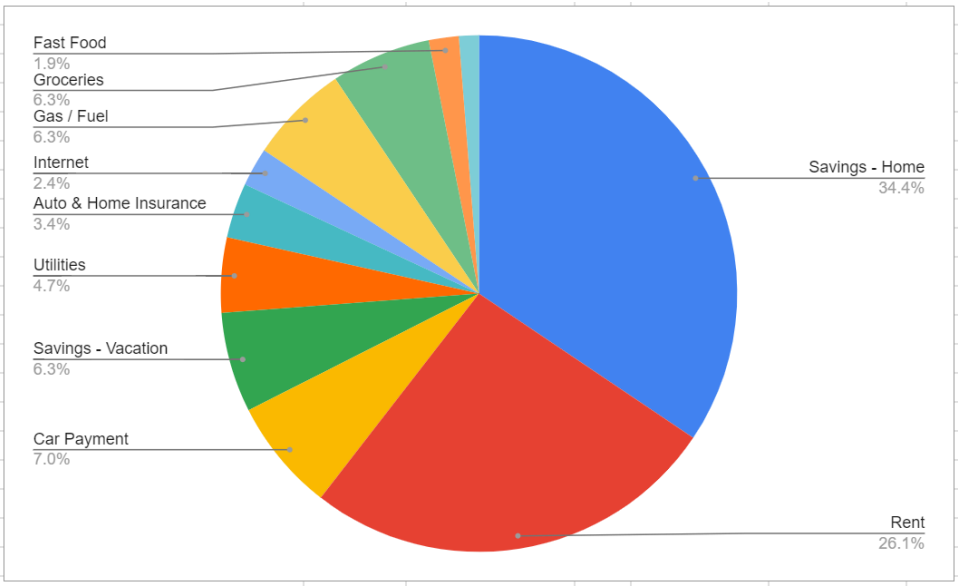
Single and Multi-Level Sorting

Single-level sorting involves sorting by just one column. Click a cell in Column A, then in Google Sheets navigate to “Data” > “Sort sheet A to Z”, or in Excel go to “Sort & Filter” > “Sort A to Z”. For instance, sorting a column by “name” arranges them in ascending order for easier identification.

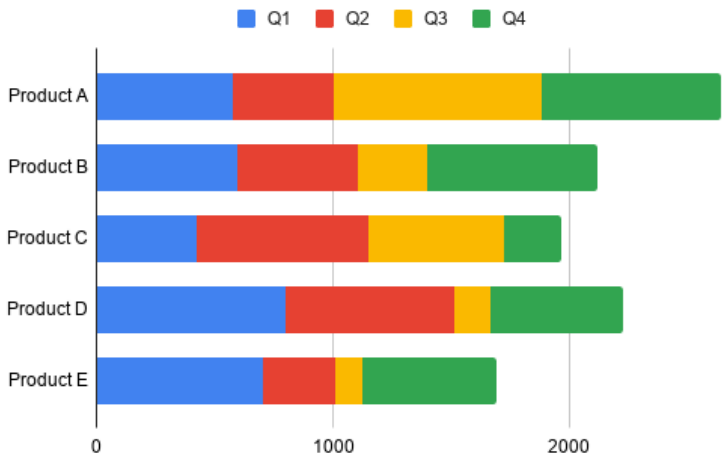
Multi-level sorting allows you to sort based on multiple columns. Select the data range, then go to “Data” > “Sort Range” in Google Sheets or “Sort & Filter” > “Custom Sort” in Excel. Add your criteria and sort. For example, sorting by “age” and *then* by “name”. This gives you more control over how your data is organized.

Inserting Data Charts

Charts can help you quickly understand your data at a glance. Select the data range you’d like to create a chart for. For example, you could select cells A1:B10 if the first row contains column headers such as "Month" and "Sales." Go to the menu and click on "Insert" > "Chart" to generate your new chart.



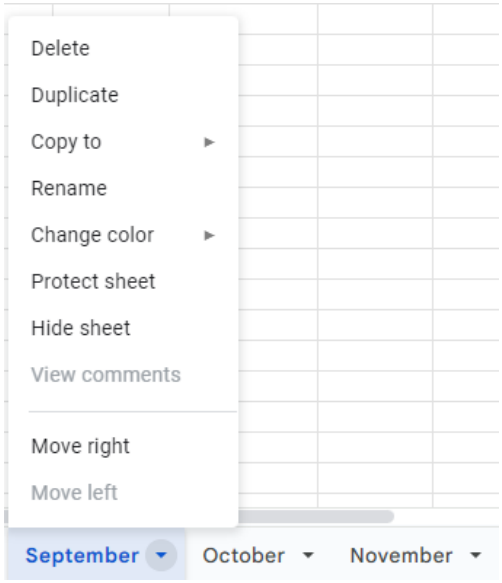
After your chart appears, a panel will pop up on the right-hand side of the screen. This panel is loaded with customization options. You can opt for various chart types, such as line, bar, or pie charts. You can define what data goes on the X and Y axes for a more accurate representation. You can add legends to your chart to make it more understandable. You can also set specific colors for different data points to represent categories or trends more clearly. Use these features to represent your data in a manner that highlights what's most important.



As your dataset changes, your charts will automatically adjust. If you need to make changes to the data range represented by the char, click on the chart to activate the right-hand panel. From here, you can change the data range or add a new series to the chart. If you want to remove a data series, select it from the chart and then click the "Delete" button in the right panel.

Inserting, Deleting, Renaming, Moving, and Copying Worksheets

A single spreadsheet file can have multiple worksheet tabs. You can insert a new one by clicking the “+” button in the bottom left corner of the screen. Right-clicking a worksheet tab lets you delete and duplicate tabs, copy them to a different spreadsheet file, rename them, and more.



Importing Web Data

You can pull data directly from lists and tables that you find on the web. This can be a big time saver, and the data you import will even update in real time. You can do this with the =`IMPORTHTML` formula. Here’s an example:

```
=IMPORTHTML("https://en.wikipedia.org/wiki/List_of_countries_and_dependencies_by_population", "table", 1)
```

This tells Google Sheets to go to that URL, look for tables, and import the first one it finds. Typing “2” after “table” will find the second table on the web page, etc. The imported table will update dynamically. If you don’t want the data to update, you’ll have to copy the data in the sheet and paste it elsewhere.

A1 =IMPORTHTML("https://en.wikipedia.org/wiki/List_of_countries_and_dependencies_by_population", "table", 1)

	A	B	C	D	E	F	G	H	I
1		Country / Depen	Population	% of world	Date	Source (official or from the United Nations)			
2	–	*World*	*8,060,008,000*	*100%*	*15 Sep 2023*	*UN projection*[3]			
3	1	China	1,411,750,000	17.50%	31 Dec 2022	Official estimate[[b]			
4	2	India	1,392,329,000	17.30%	1 Mar 2023	Official projectior [c]			
5	3	United States	335,426,000	4.20%	15 Sep 2023	National populat [d]			
6	4	Indonesia	277,749,853	3.40%	31 Dec 2022	Official estimate[8]			
7	5	Pakistan	241,499,431	3.00%	1 Mar 2023	2023 census res [e]			
8	6	Nigeria	216,783,400	2.70%	21 Mar 2022	Official projection[10]			
9	7	Brazil	203,062,512	2.50%	1 Aug 2022	2022 census result[11]			
10	8	Bangladesh	169,828,911	2.10%	14 Jun 2022	2022 census result[12]			
11	9	Russia	146,424,729	1.80%	1 Jan 2023	Official estimate[[f]			
12	10	Mexico	129,202,482	1.60%	30 Jun 2023	National quarterly estimate[14]			