Google Sheets Course Notes

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Information

Course Notes for Google Sheets: The Comprehensive Masterclass

These course notes are accompanying documentation for my online course **Google Sheets: The Comprehensive Masterclass**. Please do not reproduce or transmit in any form without permission.

We have taken every effort to ensure the accuracy of this manual. In case you discover any discrepancies, please send us a quick email to: info@XelPlus.com.

How to Use the Notes

Use these course notes alongside the online course to review and revise each section of the course.

You can also print it out. Keep it handy and refer to it anytime the need comes.

About Leila Gharani

Leila Gharani is a Microsoft MVP & a bestselling online course instructor. She runs XelPlus.com an Office Productivity resource site to help people gain the knowledge they need so they can create useful tools, solve problems and get more done. She has a YouTube channel under her name with more than 500k subscribers.

Her background is: Masters in Economics, Economist, Consultant, Oracle HFM Accounting Systems Expert & Project Manager. Find out more here.

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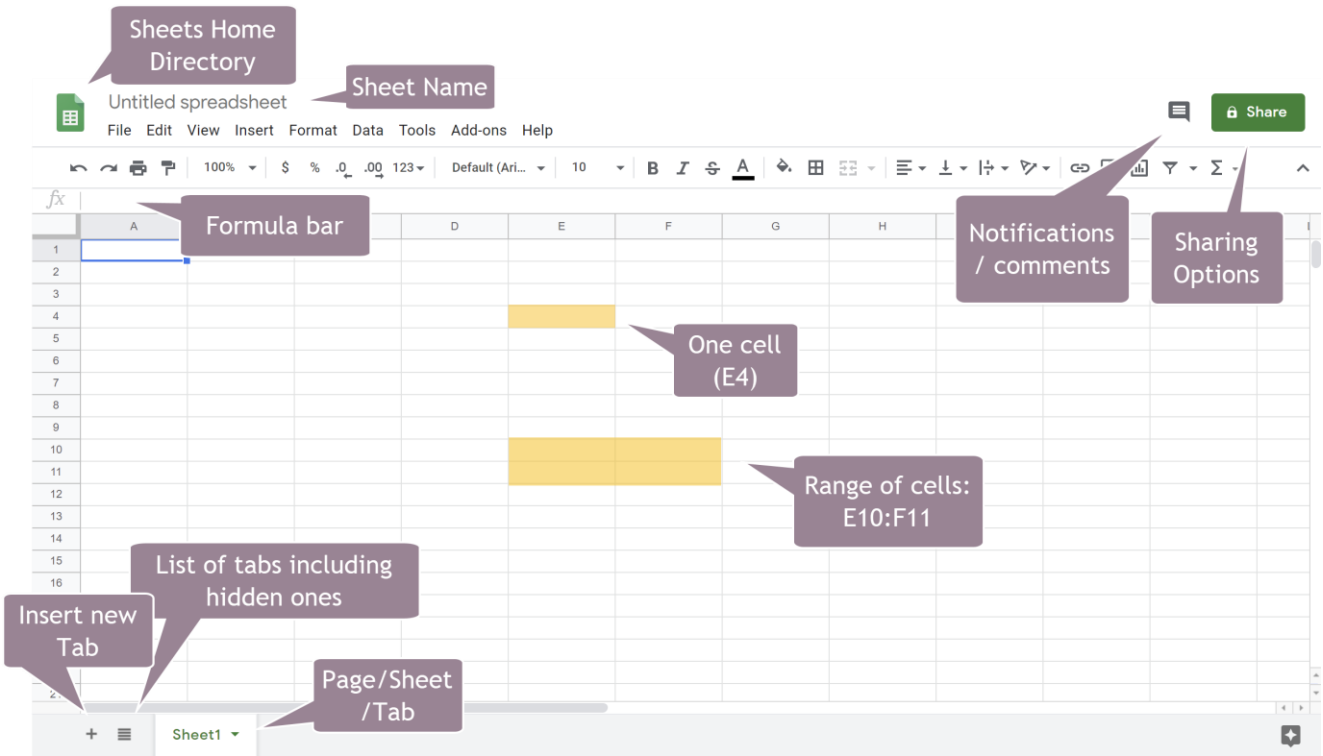
Quick Tour of Sheets



Most Common Features For Every Menu Option

File: Make a Copy, New, Email, Import, Download, Spreadsheet Settings

Edit: Copy, Paste Special, Find & Replace

View: Gridlines, Freeze Panes, Show Formulas, Zoom

Insert: Rows, Columns, Image, Checkbox, Link

Format: Theme, Underline, Conditional Formatting, Alternating Colors

Data: Sort Sheet, Slicer, Pivot Table, Data Validation, Protected Sheets

Tools: Create a Form, Macros, Protect Sheet, Spelling, Notification Rules

Add-ons: Get & Manage Add-ons

Help: Sheets Help, Keyboard Shortcuts

Sheets Vocabulary

Spreadsheet Terminology You'll Need:

Sheets / File / Spreadsheet: A file which includes one or more sheets (tabs)

Sheet / tab: A single page inside a spreadsheet which consists of cells

Cell: The intersection of a column & a row is a cell

Cell Address: Each cell has an address (e.g. C3, column= C, row=3)

Formula Bar: Shows the formula written in the selected cell or the cell value (if no formula is written)

Range: A group of cells

Range Address: Starts from the top left-hand corner to ":" bottom right-hand corner (e.g. C3:D6)

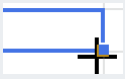
Mouse Icons

Selection Handle

Click to select one cell, drag selection to select a range

Move Handle

Click and drag to move a cell, range, row or column



Fill Handle

Drag to fill the cell value to the other cells

Data Entry & Basic Formulas

1 Absolute, Relative or Mixed Referencing

Use F4 to toggle the cell reference between the different types.

= $A$1 → Reference to A1 will remain fixed.

= A$1 → Row 1 will remain fixed, but column will change.

= $A1 → Column A will remain fixed, but row will change.

= A1 → Both column and row will change.

2 Auto Fill For Index numbers, Weekdays, Months & more

If you'd like to get a list of numbers, months or days type in the first value and drag the selection down. If you'd like to apply a pattern, type the first 2 values and then drag down.

3 Easy Functions to Summarize

Below are a list of common spreadsheet functions:

Function	Description
COUNT COUNTA COUNTBLANK	Counts the number of cells that contain numbers Counts the number of cells that are not empty Counts the number of empty cells in a range of cells
COUNTUNIQUE	Counts the number of distinct values in a range
SUM AVERAGE	Sums individual values, cell references or ranges or a mix of all three. Returns the average (arithmetic mean) of the arguments.

Common Shortcuts

PC-Shortcuts	Mac Shortcuts	Action
Navigation		
[Ctrl] ▼	⌘ ▼	Move to the bottom of the data region Other arrow keys - move to the edge of the data region
[Ctrl] [Shift] ▼	[Shift] ⌘ ▼	Move to the bottom of the data region and highlight the range in between Other arrow key to move & highlight in different direction
[Ctrl] A	⌘ A	Select data in current region (or all if no data region)
[Home]	[Fn] ◄	Move to the first cell in the row
[Ctrl] [Home]	⌘ [Fn] ◄	Move to cell A1
[End]	[Fn] ►	Move the last cell in the row
[Ctrl] [End]	⌘ [Fn] ►	Move to the last cell in the sheet
[Ctrl] [Backspace]	⌘ [Backspace]	Show active cell
[Tab]		Move one cell to the right
[Shift] [Tab]		Move one cell to the left
[Enter]	[Enter]	Edit mode / move cell down
[F2]	[F2]	Edit cell content
[Ctrl] [Shift] [Page ▼]	[Option] ▼	Move to the next worksheet
[Ctrl] [Shift] [Page ▲]	[Option] ▲	Move to the previous worksheet
[Alt] [Shift] K	[Option] [Shift] K	Display a list of sheet (tab) names
[Ctrl] O	⌘ O	Open a file dialog box
[Ctrl] W	⌘ W	Close a file

PC-Shortcuts	Mac Shortcuts	Action
Working with Data, Formulas, Columns & Rows		
[F4]	[Fn] F4	Toggle cell referencing to absolute & relative during formula writing
[Ctrl] [Enter]	⌘ [Enter]	Fill the values / formulas in the range
[Ctrl] D	⌘ D	Fill value / formulas down
[Ctrl] R	⌘ R	Fill to the right
[Ctrl] [Shift] V	⌘ [Shift] V	Paste as values
[Shift] [Space]	[Shift] [Space]	Select the row
[Ctrl] [Space]	[Ctrl] [Space]	Select the column
[Ctrl] [Alt] [+]	⌘ [Option] = (with columns or rows selected)	Insert a new cell/row/column
[Ctrl] [Alt] [-]	⌘ [Option]	Delete a new cell/row/column
[Shift] [F11]	[Shift] [Fn] [F11]	Insert a new worksheet
[Ctrl] ;	⌘ ;	Insert current date
[Ctrl] [Shift] ;	⌘ [Shift] ;	Insert current time
[Ctrl] [Alt] [Shift] ;	⌘ [Option] [Shift] ;	Insert current date and time
[Ctrl] [Alt] 9	⌘ [Option] 9	Hide row
[Ctrl] [Shift] 9	⌘ [Shift] 9	Unhide row
[Ctrl] [Alt] 0	⌘ [Option] 0	Hide column
[Ctrl] [Shift] 0	⌘ [Shift] 0	Unhide column
[Alt] [Shift] ▶	[Option] [Shift] ▶	Group columns
[Alt] [Shift] ◀	[Option] [Shift] ◀	Ungroup columns
[Alt] [Shift] ▼	[Option] [Shift] ▼	Open grouped columns
[Alt] [Shift] ▲	[Option] [Shift] ▲	Collapse grouped columns
[F1]	[Fn] F1	When writing formula expand or collapse the formula help dialog box
[F9]	[Fn] F9	When writing a formula show and hide the result preview
[Ctrl] ▼ (or ▲)	Ctrl [Option] ▼ (or ▲)	Resize Formula Bar (when inside the bar)
[Ctrl] H	⌘ [Shift] H	Find and replace
[Ctrl] P	⌘ P	Print preview

PC-Shortcuts	Mac Shortcuts	Action
Formatting		
[Ctrl] B	⌘ B	**Bold**
[Ctrl] I	⌘ I	*Italic*
[Ctrl] U	⌘ U	Underline
[Ctrl] [Enter]	⌘ [Enter]	Inside the formula bar to create a new paragraph
[F4]		Repeat last edit
[Ctrl] [Shift] L	⌘ [Shift] L	Left align
[Ctrl] [Shift] R	⌘ [Shift] R	Right align
[Ctrl] [Shift] E	⌘ [Shift] E	Centre align
[Ctrl] [Shift] 1	[Ctrl] [Shift] 1	Number format: Number with thousand separator & 2 decimal places
[Ctrl] [Shift] 2	[Ctrl] [Shift] 2	Number format: Time
[Ctrl] [Shift] 3	[Ctrl] [Shift] 3	Number format: Date
[Ctrl] [Shift] 4	[Ctrl] [Shift] 4	Number format: Currency
[Ctrl] [Shift] 5	[Ctrl] [Shift] 5	Number format: Percentage
[Alt] [Shift] 3	[Option] [Shift] 3	Apply bottom border
[Alt] [Shift] 6	[Option] [Shift] 6	Remove borders

Useful Features for Report Design

- [ ] **Insert Hyperlinks for easier navigation**

  Insert / Link or Ctrl + K to insert a hyperlink.

- [ ] **Freeze panes to keep an eye on what's important**

  Freeze the top rows or first columns (View / Freeze) so you can keep an eye on the table headers as you navigate your data.

- [ ] **Copy sheets to other spreadsheets**

  To properly bring over all formatting, click on the tab and select Copy to / New spreadsheet or Existing spreadsheet.

- [ ] **View formula cells**

  Keep an eye on cells that have formulas from View / Formula cells.

- [ ] **Hide rows or columns from view**

  Select columns or rows, right-mouse click and hide from view to keep a neat report layout.

- [ ] **Group rows and columns for better visibility**

  An alternative to hiding is to group rows and columns. Right-mouse click on the rows and columns you'd like to group and select "group.."

- [ ] **Use comments when collaborating**

  Add comments if you'd like to record responses.

- [ ] **Add notes for clarification**

  Add notes to clarify what's in a cell.

- [ ] **Apply alternating colors to large tables**

  This is useful especially if you remove gridlines. Add alternating color by going to background color from the tool bar / alternating colors or Format / alternating colors

- [ ] **Define your theme**

  Define your spreadsheet theme colors from Format / Theme.

Best Spreadsheet Design Practices

- [ ] **Rule of One Thing**

  Input one type of information in a cell.

- [ ] **Consistent look**

  Keep colors consistent throughout the report. If you have input fields that are a specific color in one tab, keep it the same across your Sheets.

- [ ] **Collect data in one table**

  Keep data in matrix format. Each column should have a header.

- [ ] **Keep raw data in rectangles without holes**

  Make sure you don't have empty rows or columns in the middle of the data tables.

- [ ] **Numbers right-aligned**

  Don't adjust the alignment of numbers. Keep these right-aligned so they can be easily compared to one another. You can also immediately notice numbers that were wrongly formatted as text.

- [ ] **Keep hardcoded values in cells not formulas**

  If the data might change, keep it in a cell instead of hard-coding it directly in the formula. Exceptions are number of days in a week, number of months and other metrics that are not subject to change.

- [ ] **Add contrast with formatting**

  Use formatting to bring attention to certain areas of your report.

- [ ] **Each sheet has a purpose**

  Each sheet should have a purpose. For example, the "report" tab is for final findings, the "calculation" tab organizes and prepares the data for the report tab.

- [ ] **Make it a pleasure to come back**

  Add Instructions & hyperlinks and organize these neatly.

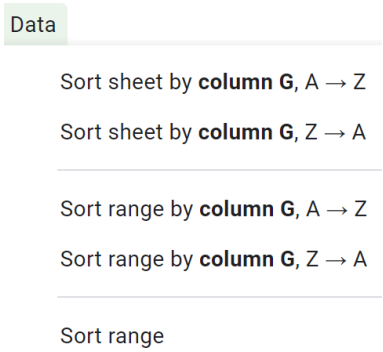
- [ ] **Consider the future**

  How should you reference your values? Entire column or a specific range? Will your data grow or stay the same size?

Data Cleaning & Management Tools

SORT DATA

Use the sort options: **Sort Sheet** or **Sort Range** to sort your data by one or more columns.



REMOVE DUPLICATES

Use **Remove Duplicates** from the **Data** tab to get a list of unique values. Performing this on more than one column ensures you get a unique list based on the combination of values from the different columns.

FIND & REPLACE

Ctrl+F brings up the Find dialog box.

Ctrl+H brings up the Replace dialog box.

You can use REGEX (regular expressions to find a specific pattern)

SPLIT TEXT TO COLUMNS

Use **Split to Columns** from the **Data** tab to split values in one cell to multiple cells based on the delimiter of your choice.

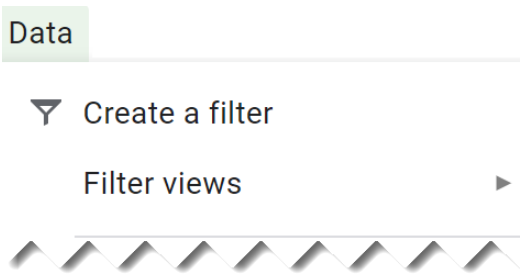
TRIM WHITESPACE

Use **Trim whitespace** from the **Data** tab to clean your data by removing extra whitespace before, between or after your values.

FILTER DATA

Create a Filter to quickly analyze your data.

Use Filter views to save your filters. These are also great when collaborating with others so you can be in a filter view without changing the data view for others.



Important! Working with Functions

What is a Function?

A function is an in-built formula that runs specific calculations.

For the function to work, you need to provide it with values in the order it understands. This means following the right syntax.

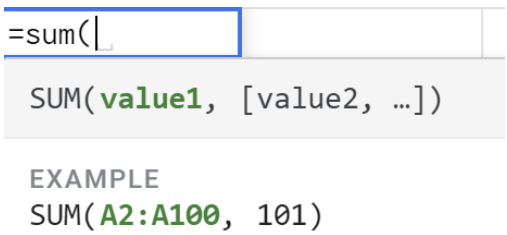
Sum Function Example

The SUM function is programmed to sum values from cells & ranges.

The suggestions you see inside the brackets when you type in a function is to help you understand what the function needs so it can process correctly.

These are called arguments and they are separated by either the **comma** (,) or the **semi-colon** (;).

Which one applies to you depends on your regional windows setting.



Three Types of Functions

1. Functions that return ONE value → SUM, COUNT
2. Functions that return MULTIPLE values → UNIQUE, SORT
3. VOLATILE Functions → TODAY, NOW, RAND, RANDBETWEEN

Working with Formulas

No Constants Inside Formulas

…Keep constants in separate cells with proper labeling so they can easily be adjusted if needed.

Exceptions are universal constants such as 24 hours in a day, 7 days a week, 12 months a year etc.

Formulas in a range should be consistent

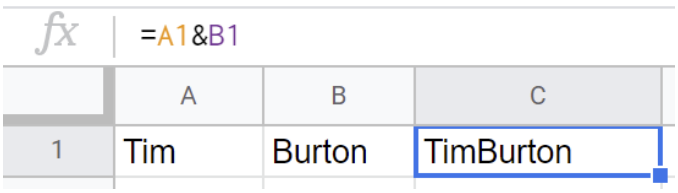
Don't adjust formulas in the middle of a range or remove them entirely if they result in an error.

Update the first formula in the range to handle different scenarios (Include IFERROR or IF Function).

Connect Cell References

Use **ampersand** to connect one cell reference with another.

For example: **=A1&B1**

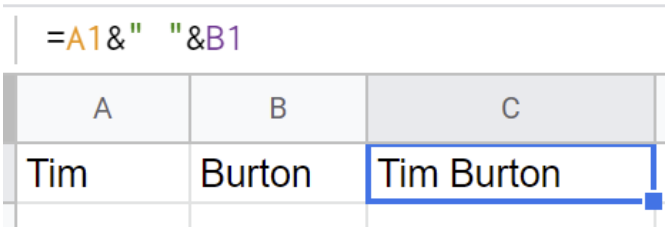


Properly Use Text In Formulas

Use quotation marks to insert text within formulas. E.g. **=“Hello ”&A1**

If you combine a cell reference with text you need to use ampersand.

For example: **=A1&" "&B1**



Essential Functions

Here is a list of some of the most common Functions in Sheets.

Function	Description
UNIQUE	Get a distinct list of values. You can reference one or more columns.
SORT	Sort text or numbers in ascending or descending order.
COUNTIFS	This function applies criteria to cells across multiple ranges and counts the number of times all criteria are met.
SUMIFS **AVERAGEIFS**	Adds all its arguments that meet multiple criteria. Returns the average (arithmetic mean) of all cells that meet multiple criteria.
MINIFS **MAXIFS**	Returns the minimum value among cells specified by a given set of conditions or criteria. Returns the maximum value among cells specified by a given set of conditions or criteria.
ROUND **ROUNDUP** **ROUNDDOWN**	Rounds a number to a specified number of digits. Rounds a number up, away from zero. Rounds a number down, toward zero.
IF & IFS	Allows you to make logical comparisons between a value and what you expect. To test for multiple conditions you can use nested IF functions or the IFS function.
VLOOKUP	Looks up a specified value in one column of data and returns the corresponding value from another column.
HLOOKUP	Looks up a specified value in one row of data and returns the corresponding value from another row.
FILTER	Return multiple match results for a lookup value or based on multiple conditions.
SORTN	Great for top n type of analysis. It sorts the data set and limits the results returned to the number specified.

Formula Errors

If your formula results in an error and you're not sure why, the list below might help.

Error	Example	Description
#DIV/0!	=100/0	This is probably the most common error and easiest to pinpoint. When you divide a number by zero you will get this error.
#VALUE!	=100*"one"	This error is returned when the wrong type of argument is used, or you try to multiply a number with text.
#REF!	=sort(A5:A15)	This error results when you move your formula, but haven't correctly specified which cell references should be fixed and which should move with your formula. You also get this if you delete some cells that were a part of your formula. AND if you use a formula that spills but there are cells with values that block the spillage.
#NAME?	=total(1,2)	The most common reason for this error is that the formula has been mistyped and Sheets doesn't recognize which function you are referring to.
#N/A	=vlookup("LG",A5:B15,2,false)	This is a frequent error if you are using Lookup formulas (especially in VLOOKUP) and the matching cannot be done.
#ERROR!	=sum(B5 B10)	Formula parse error. The common cause of this is when the arguments needed for the formula haven't been input correctly.

Essential TEXT & DATE Functions

Here is a list of some of the most common Text and Date Functions.

Function	Description
LEFT **RIGHT** **MID**	Get the left, right or the mid part of the cell value depending on the number of characters specified.
UPPER **LOWER** **PROPER**	Adjust the letter case to the specified case.
LEN	Returns the number of characters.
TRIM	Removes empty spaces before or after a value (it also removes extra spaces between words).
SUBSTITUTE	Replaces parts of a text with another value. This function IS case sensitive.
SEARCH **FIND**	Searches for text inside another text and returns the position. If text is not found, it returns an error. SEARCH is NOT case sensitive. FIND IS case sensitive.
SPLIT	Splits a value to multiple columns based on a delimiter.
CONCATENATE	Like the ampersand inside formulas, this function combines values together.
JOIN	Concatenates multiple values and separates these based on a specified delimiter.
DATE	Creates a date from multiple cells by specifying the year, month and day.
YEAR **MONTH** **DAY**	Each returns either the respective year, month or day from a date.
TODAY()	Returns today's date.
NOW()	Returns today's date & current time.
EOMONTH()	Returns the date of the last day of the month (either current month or offset by a certain number of months)

Working with Dates

Inputting Dates Correctly

Dates are stored as a serial number:

Dec-31-1899 = 1

Jan-01-1900 = 2

Aug-24-2020= 44067

How dates are input depend on your **locale / regional settings**.

In US, dates are input as MM/DD/YYYY

In Europe, they are generally input as DD/MM/YYYY

You can input dates as 24-Aug-2020 regardless of your locale.

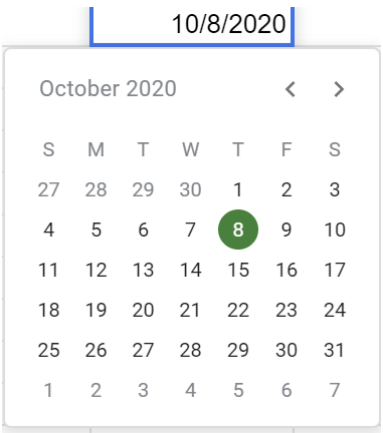
To ensure the date is input correctly double click on the cell to see the calendar.

The fact that dates are stored as numbers helps us make calculations on dates.

For example:

10/8/2020 + 10 = 10/18/2020

10/8/2020 - 10 = 9/28/2020



Working with Time

Inputting Time Correctly

Time is input as hour : minute : second followed by space then AM or PM.

You can also input time as a 24-hour clock -> 7:00 PM or 19:00

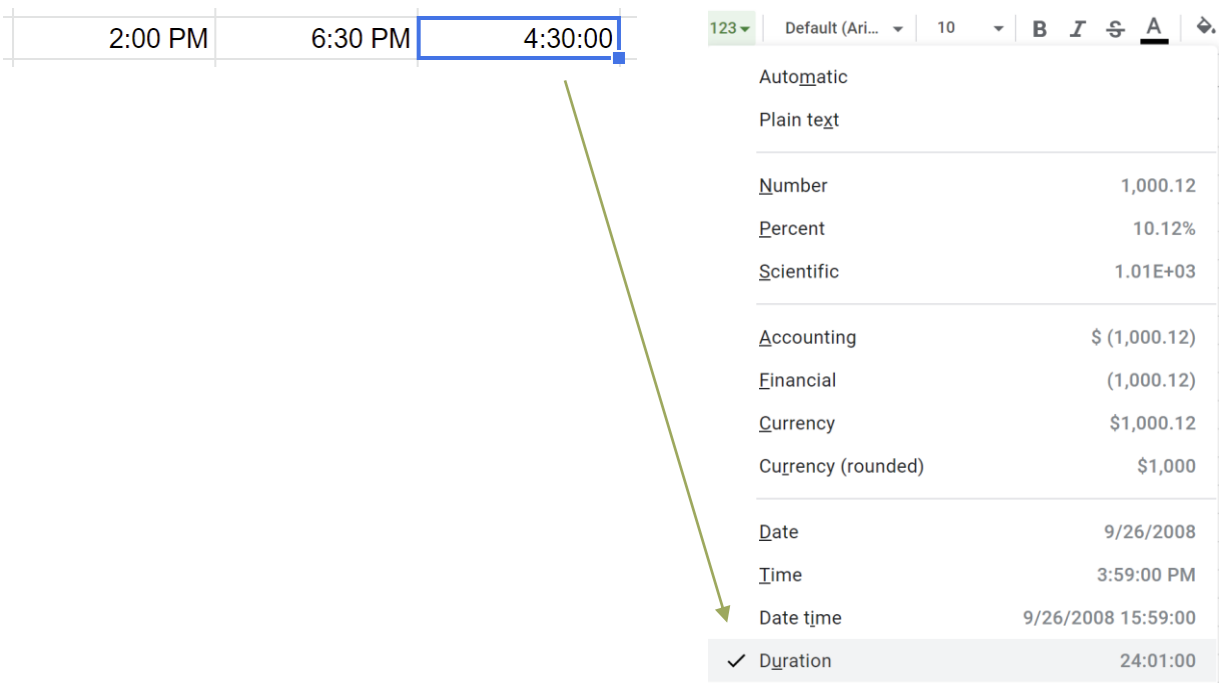
Time is stored as a number which represents the proportion of 24 hours.

For example:

6:00 PM = 18:00 = 18/24 = 0.75

Calculating Duration

To correctly calculate duration, adjust the number formatting from Time to Duration.



Google-Specific Functions

The below Google specific spreadsheet functions make it easy to translate and import data from web pages.

Function	Description
GOOGLETRANSLATE	Translates text from one language into another.
IMAGE	Inserts an image from a URL into a cell. You can use this to create QR codes by using this root URL: https://chart.googleapis.com/chart? – define cht=qr, chs=widthxheight and finally chl=url
IMPORTHTML	Import data from a table or list from any webpage. This works if the data has been officially formatted as a table and list. Otherwise you can use IMPORTXML.
IMPORTXML	Imports online data. By using xml path nodes, you can import any part of a webpage.
GOOGLEFINANCE	Get stock, mutual fund & currency data (both current and historical data).

Helpful Resources

To get the language codes for GOOGLETRANSLATE function check out:
https://developers.google.com/admin-sdk/directory/v1/languages

More information about QR code:
https://developers.google.com/chart/infographics/docs/qr_codes

IMPORTXML function and XPATH:
https://www.w3schools.com/xml/xpath_intro.asp

More info about GOOGLEFINANCE:
https://support.google.com/docs/answer/3093281?hl=en

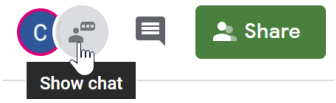
Collaborate, Protect & Collect Data

Great Tools for Collaboration

Comments – Use comments if you need to track responses. You can also @ mention someone.

Notifications – Update your notification settings from **Tools / Notification Rules**.

Chat – You can chat directly with people you're collaborating with inside a spreadsheet.

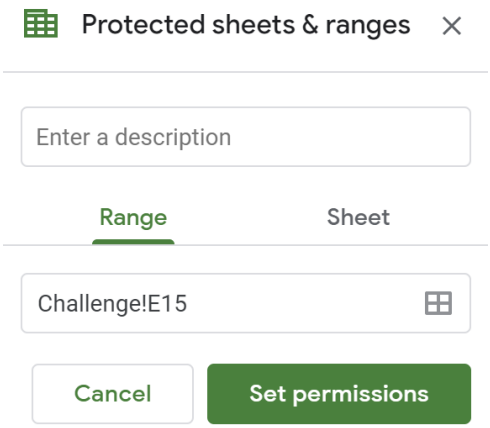


Protect Sheet / Range

To view protected Sheets and Ranges, go to **Data / Protected sheets & ranges**.

You can protect specific ranges or entire sheets and set the permission level of those you're collaborating with.

As the owner, you will always have edit rights to all ranges and sheets.

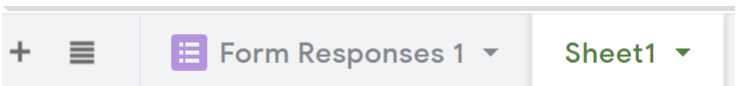


Data Collection

Consider using Google Forms to collect data.

If you'd like to connect an existing Google Sheet to a form's results, go to **Tools / Create a form** or **Insert / Form**.

When a Sheet is connected to a form, you get a new tab that collects the form's responses.



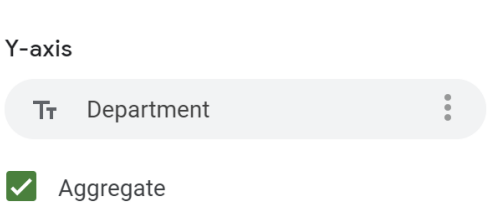
You can also create a separate form that's connected to its own Google Sheet by going to **File / New / Form**.

Chart Tips

Automatic Aggregation of Data

If you'd like to aggregate the data automatically in the chart, place a checkmark for Aggregate.

This saves you from creating a separate data preparation table.



Consider Future Data

Update the chart range to include additional cells for future data.

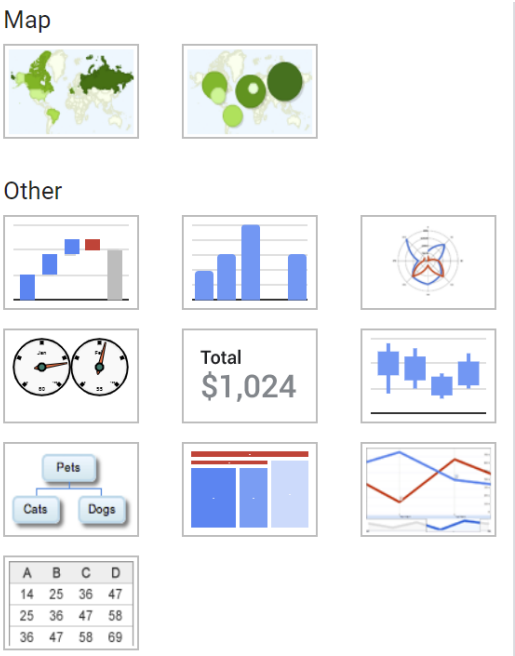
You can either add some extra rows or remove the row reference at the end of your range. This will automatically add the last visible row number.

Useful Visualizations

Some helpful "charts" can be found at the bottom of the chart type selection.

For example:

- Map chart
- Waterfall chart
- Gauge chart
- Scorecard
- Scrolling tables
- Organization chart



Sparkline

Sparklines are created with the SPARKLINE function.

Check out this link for more information:
https://support.google.com/docs/answer/3093289?hl=en

Sparkline Function Syntax

"charttype"	"line" for a line graph (the default)
	"bar" for a stacked bar chart
	"column" for a column chart
	"winloss" for a special type of column chart that plots 2 possible outcomes: positive and negative.
For line graphs:	"xmin" sets the minimum value along the horizontal axis.
	"xmax" sets the maximum value along the horizontal axis.
	"ymin" sets the minimum value along the vertical axis.
	"ymax" sets the maximum value along the vertical axis.
	"color" sets the color of the line.
	"empty" sets how to treat empty cells. Possible corresponding values include: "zero" or "ignore".
	"nan" sets how to treat cells with non-numeric data. Options are: "convert" and "ignore".
	"rtl" determines whether the chart is rendered right to left. Options are true or false.
	"linewidth" determines how thick the line will be in the chart. A higher number means a thicker line.
For column and winloss:	"color" sets the color of chart columns.
	"lowcolor" sets the color for the lowest value in the chart
	"highcolor" sets the color for the higest value in the chart
	"firstcolor" sets the color of the first column
	"lastcolor" sets the color of the last column
	"negcolor" sets the color of all negative columns
	"empty" sets how to treat empty cells. Possible corresponding values include: "zero" or "ignore".
	"nan" sets how to treat cells with non-numeric data. Options are: "convert" and "ignore".
	"axis" decides if an axis needs to be drawn (true/false)
	"axiscolor" sets the color of the axis (if applicable)
	"ymin" sets the custom minimum data value that should be used for scaling the height of columns (not for win/loss)
	"ymax" sets the custom maximum data value that should be used for scaling the height of columns (not for win/loss)
	"rtl" determines whether the chart is rendered right to left. Options are true or false.
For bar charts:	"max" sets the maximum value along the horizontal axis.
	"color1" sets the first color used for bars in the chart.
	"color2" sets the second color used for bars in the chart.
	"empty" sets how to treat empty cells. Possible corresponding values include: "zero" or "ignore".
	"nan" sets how to treat cells with non-numeric data. Options are: "convert" and "ignore".
	"rtl" determines whether the chart is rendered right to left. Options are true or false.

Working with Pivot Tables

Get Quick Insights from Data

Pivot Tables enable you to analyze your data (such as sum, filter, sort, group, drill-down) without writing complex calculations.

Company	Region	Document No	Document Date	Customer Code	Customer Name	Product Code	Product Description	Quantity	Sales USD
Meta Creations	America	28112	5/27/2020	8020	Erma	108	Laptop bag black	10	280
Lucas Basics	Europe	45444	5/28/2020	8060	Liebher	108	Laptop bag black	60	1970
Urban Right	America	66017	5/29/2020	8010	Dellicia	103	Women type T simple white	140	1680
Lucas Basics	Europe	45444	5/29/2020	8060	Liebher	110	Smartphone case diamond	60	4230
Lucas Basics	Europe	48112	5/30/2020	8060	Liebher	109	Laptop bag red	60	1970
Urban Right	America	66031	5/31/2020	8020	Erma	103	Women type T simple white	140	1680
Urban Right	America	66016	5/31/2020	8020	Erma	103	Women type T simple white	120	1440
Lucas Basics	Europe	44031	6/1/2020	8050	Aida GmbH	110	Smartphone case diamond	60	4230
Lucas Basics	Europe	48112	6/2/2020	8060	Liebher	110	Smartphone case diamond	50	3520
Urban Right	America	68116	6/4/2020	8020	Erma	105	Women crop top black	190	1900
Urban Rig									
Urban Rig									
Urban Rig									
Meta Crea									
Urban Rig									
Lucas Bas									
Urban Rig									
Lucas Bas									
Urban Rig									

- **Which product is in demand?**
- **Which product generates the most sales?**
- **Which customer accounts for the highest % of total sales?**

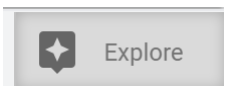
Checklist Before Creating a Pivot Table

✓ Make sure your data is in a Data List format

- Each column has a header
- No empty columns in your data table
- No summations embedded in your data table

Use Explore to get Quick Insights

✓ Quickly create a Pivot Table or a chart by using the Explore feature.



Tips for Pivot Tables

Rename Pivot Headers

SUM of Sales

Instead of **Sum of Sales** in the Pivot field header, change this to your preferred text.

Double-click on Values to Get the Full List

To get a list of each line of data making up the value shown in the Pivot Table, you can double-click the cell value. This creates a new sheet with all the rows of data that make up the aggregated value.

No Refresh Needed

Pivot tables automatically refresh once the source data change.

Account for Future Data

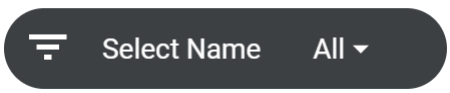
To ensure future data is automatically included expand the source range.

For example if the data is from A4:D150, you could expand to A4:D200 or A4:D to include all rows.

To remove null values from the Pivot table result add a filter condition to only show values where a field in not empty.

Add a Slicer

Slicers add an additional level of interactivity to Pivot tables by adding an adjustable filter directly to the sheet.



Advanced Functions

With these advanced functions you can tackle more complex data analysis.

Function	Description
INDEX **MATCH**	The INDEX function returns text or numbers based on a given row and column reference. The MATCH function finds the position of a value in a range. These two functions are commonly used together for more complex lookups that can't easily be done with VLOOKUP. Tip: The INDEX range should be your "answer" area. You don't need to include your lookup range.
ARRAYFORMULA	Turns non-array functions into arrays. This helps you avoid intermediate calculations steps.
INDIRECT	Converts text into a range reference.
RAND **RANDBETWEEN** **RANDARRAY**	These functions return random numbers. RANDARRAY results can spill.
SEQUENCE	Returns a grid of sequential numbers.

Working with Arrays

What is an Array?

An array is a table of values

Some functions are programmed to return many values (e.g. FILTER).

Most functions though are programmed to return a **SINGLE** value.

However, they can be used as arrays by wrapping the formula inside ARRAYFORMULA or use Ctrl+Shift+Enter instead of just Enter after finalizing the formula.

Creating your Own Arrays

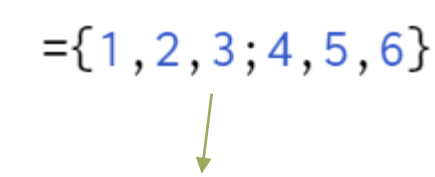
You can create your own arrays by using the curly brackets { }.

Commas inside the brackets, separate values to columns.

Semicolons inside the brackets, separate values to rows.

*Note: Countries where comma is a decimal, need to use *

EXAMPLE



1	2	3
4	5	6

QUERY Rules

1 Column Referencing

Columns are referenced with identifiers.
In Sheets, the identifiers are column Letters.
Query function sees the table headers as “labels” and not identifiers.

Exception: When Array syntax is used OR the IMPORTRANGE Function, then the column identifiers are no longer the column letters, but instead the column number in the range.

Example: Col1 instead of A

2 What can be retrieved

You can retrieve Boolean, numeric and string values (No images).

Each column needs one single data type – if it’s a mix, majority will decide.

3 The Select Statement

The Select statement needs to be in quotation marks.
The order of clauses is important. They must be according to the Clause table.

You can combine cell referencing inside the Select statement. For example:

```
=QUERY($A$2:$E$100,"select B where A='" &B4  & "' ")
```

QUERY Function Syntax

1. Each clause has a keyword.
2. Each clause is optional.
3. The order of keywords is as below.

Clause	Description
select	Selects which columns to return, and in what order. If omitted, all the table's columns are returned, in their default order (In Sheets the identifier of a column is the column Letter. If multiple headers, separate these with a comma).
where	Returns only rows that match a condition. If omitted, all rows are returned.
group by	Aggregates values across rows.
pivot	Transforms distinct values in columns into new columns.
order by	Sorts rows by values in columns.
limit	Limits the number of returned rows.
offset	Skips a given number of first rows.
label	Sets column labels.
format	Formats the values in certain columns using given formatting patterns.
options	Sets additional options.

Source: https://developers.google.com/chart/interactive/docs/querylanguage

Advanced Features

Number Formatting Options

Take advantage of custom number formatting to create your own customized number formatting logic.

EXAMPLE

6,500 Win
-567 Loss

Custom formatting applied:

#,##0 "Win";-#,##0 "Loss";

	Actual	Budget	
Laptop	$4,220	$5,200	■
Phone Case	$4,230	$3,500	■
Women	$4,800	$5,100	■
Men	$6,900	$9,800	■
Unisex	$610	$400	■

Custom formatting applied:

[color43]■;[color53]■;

Get the complete list of color codes (Sheets & Excel codes are identical) :

https://docs.microsoft.com/en-us/previous-versions/office/developer/office-2007/cc296089(v=office.12)

Conditional Formatting

Create conditional formatting rules to format your data based on a condition. Take advantage of available built-in logic or create your own custom formulas.

TIP

When using custom formulas, it helps to write out the formula on the grid to check for TRUE and FALSE values before copying the formula into the custom formula dialogue box.

Google Apps Script

What you can achieve with macros

You can record a set of actions that you routinely apply to your sheet. Once recorded, these actions can be automatically applied to a similar data set with a click of a button.

Difference between Absolute and Relative Recording

When you select absolute referencing during your macro recording, the address of the cells are fixed to the ones you select.

With Relative recording, the address is based on the active cell.

To select a range of data that has different lengths, you can use shortcut keys like Ctrl+Shift+Down while recording in Relative mode.

Macros & Apps Script

Macros are recorded in Apps Script which is a programming language based on JavaScript.

To be able to write macros with branching rules, you'll need to write the code directly in Apps Script. These cannot be recorded.

More About Apps Script

Check out these resources for more information about Apps Scripts:

- Apps Script Overview
  https://developers.google.com/apps-script/overview

- Apps Script Introduction
  https://codelabs.developers.google.com/codelabs/apps-script-fundamentals-1/#0

- Apps Script Reference for Sheets
  https://developers.google.com/apps-script/reference/spreadsheet

THANK YOU!

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Visually Effective Excel Dashboards

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