

# Step-by-Step: Formulas for success

This reading outlines the steps the instructor performs in the next video, [Formulas for success](#). In the video, the instructor explains the basics of using spreadsheet formulas for calculations.

Keep this step-by-step guide open as you watch the video. It can serve as a helpful reference if you need additional context or clarification while following the video steps. This is not a graded activity, but you can complete these steps to practice the skills demonstrated in the video.

## What you'll need

If you'd like to follow along with the first example in this video, choose a spreadsheet tool and open a blank sheet.

If you would like to access the other spreadsheet the instructor uses in this video, click the link to the dataset to create a copy. If you don't have a Google account, download the data directly from the attachments below.

Link to sales data: [Monthly sales](#)

OR

[Monthly Sales](#)

[XLSX File](#)

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## Example 1: Create a formula

Formulas form the groundwork for more complex spreadsheet tasks. Here's a simple exercise:

1. Open a new spreadsheet.
2. Select cell **A1**.
3. Enter `=2-2` and then press **Enter**. The cell displays the result of **0**.
4. Select cell **A2**.
5. Enter `=31982-17795` and press **Enter**. The cell displays the result 14187.

**Note:** The equal sign (=) signifies that you're beginning a formula.

## Example 2: Use cell references in a formula

Cell references make your spreadsheet flexible and responsive to data changes. To implement this:

1. Open the [Monthly sales](#) spreadsheet.
2. To find the total sales for April through July of 2017, select cell **F2**.
3. Enter the formula `=B2+C2+D2+E2` and then press **Enter**. You now have the total sales for this timeframe.
4. But what if the data in one of the cells was incorrect? Select cell **D2** and enter **47002** to correct the entry. Press **Enter**.
5. Notice that your spreadsheet automatically recalculates the sum in cell **F2**.

## Example 3: Copy a formula

Copying and pasting formulas saves time and helps ensure consistency across your calculations. To do this:

1. In the **Monthly sales** spreadsheet, select cell **F2**.

2. From the **Edit** menu, choose **Copy**. You can also use the Windows keyboard shortcut **Ctrl+C** or Mac keyboard shortcut **Command+C** to copy the formula.
3. Select cell **F3** and from the **Edit** menu, choose **Paste**. Alternatively, press **Ctrl+V** (Windows) or **Command+V** (Mac) to paste the formula into cell **F3**.

**Note:** After pasting into cell **F3**, the formula in that cell will be **=B3+C3+D3+E3**.

## Example 4: Calculate the average sales

Use formulas for different calculations, such as finding an average:

1. In the **Monthly sales** spreadsheet, select cell **G1**.
2. Enter **Average Sales** in cell **G1** and press **Enter**.
3. Select cell **G1** again. In the toolbar, select **Bold** to bold the text.

**Note:** Naming columns in spreadsheets enhances clarity by indicating the purpose of the numbers.

4. Select cell **G2**.

Enter **= (B2+C2+D2+E2) / 4** and press **Enter** to calculate the average sales over this timeframe.

5. **Note:** This formula calculates the average of sales for the month, including cases in which there are no sales (blank cells), which are treated as zeroes in the calculation. If the business had zero sales for a month, the blank cell is still included in the calculation to maintain accuracy.
6. Copy and paste the formula from cell **G2** into cells **G3** and **G4**.

## Example 5: Calculate the percent change in sales

Use a different formula to calculate percent change:

1. In the **Monthly sales** spreadsheet, select cell **H1**.
2. In cell **H1**, enter **June to July Change**. Bold this text.
3. In cell **H2**, enter **= (E2-D2) / D2** to calculate the percentage change in sales.
4. To format the value as a percentage, on the toolbar, select the **%** button. You now find that the percent change in sales between June and July is 247.5%.
5. Copy this formula to cell **H3**. Notice that the spreadsheet copies both the formula and the percentage formatting.

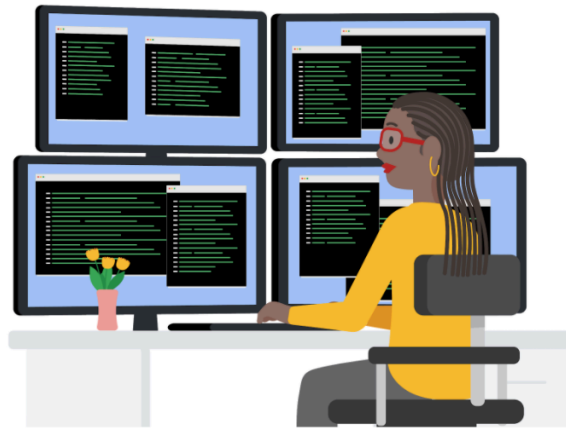
## Example 6: Correct a formula error

Correcting formula errors ensures your data analysis remains accurate and trustworthy. Here's how to troubleshoot one common mistake:

1. In the **Monthly sales** spreadsheet, copy the formula from cell **H2** to cell **H4** and press **Enter**.
2. Notice the error displayed in cell **H4**. This error occurs because the formula is trying to divide by a value of zero. The reason for this error is that cell **D4** is blank, and in this context, the spreadsheet interprets it as having a value of zero.
3. To resolve the error, type **75866** in cell **D4** and press **Enter**. Notice that the error disappears, and cell **H4** now displays **121.16%**.



# Quick Reference: Formulas in spreadsheets



You have been learning a lot about spreadsheets and all kinds of time-saving calculations and organizational features they offer. One of the most valuable spreadsheet features is a **formula**. As a quick reminder, a formula is a set of instructions that does a specific calculation using the data in a spreadsheet. Formulas make it easy for data analysts to do powerful calculations automatically, which helps them analyze data more effectively. Below is a quick-reference guide to help you get the most out of formulas.

## Formulas

### The basics

- When you enter a formula in math, it generally ends with an equal sign ( $2 + 3 = ?$ ). But with formulas, they always start with one instead (`=A2+A3`). The equal sign tells the spreadsheet that what follows is part of a formula, not just a word or number in a cell.
- After you enter the equal sign, most spreadsheet applications will display an autocomplete menu that lists valid formulas, names, and text strings. This is a great way to create and edit formulas while avoiding typing and syntax errors.
- A fun way to learn new formulas is just by typing an equal sign and a single letter of the alphabet. Choose one of the options that pops up and you will learn what that formula does.

### Mathematical operators

- The mathematical operators used in spreadsheet formulas include:
- Subtraction – minus sign ( `-` )
- Addition – plus sign ( `+` )
- Division – forward-slash ( `/` )
- Multiplication – asterisk ( `*` )

### Auto-filling

The lower-right corner of each cell has a fill handle. It is a small *green square* in Microsoft Excel and a small *blue circle* in Google Sheets.

- Click the fill handle square or circle for a cell and drag it down a column to auto-fill other cells in the column with the same value or formula in that cell.
- Click the fill handle square or circle for a cell and drag it across a row to auto-fill other cells in the row with the same value or formula in that cell.
- If you want to create a numbered sequence in a column or row, do the following: 1) Fill in the first two numbers of the sequence in two adjacent cells, 2) Select to highlight the cells, and 3) Drag the fill handle square or circle to the last cell to complete the sequence of numbers. For example, to insert 1 through 100 in each row of column A, enter **1** in cell A1 and **2** in cell A2. Then, select to highlight both cells, click the fill handle square or circle in cell A2, and drag it down to cell A100. This auto-fills the numbers sequentially so you don't have to enter them in each cell.

## Absolute referencing

- Absolute referencing is marked by a dollar sign (\$). For example, `=A$10` has absolute referencing for both the column and the row value
- Relative references (which is what you normally do, e.g. `=A10`) will change anytime the formula is copied and pasted. They are in relation to where the referenced cell is located. For example if you copied `=A10` to the cell to the right it would become `=B10`. With absolute referencing `=A$10` copied to the cell to the right would remain `=A$10`. But if you copied `A$10` to the cell below, it would change to `$A11` because the row value isn't an absolute reference.
- Absolute references will not change when you copy and paste the formula in a different cell. The cell being referenced is always the same.
- To easily switch between absolute and relative referencing in the formula bar, highlight the reference you want to change and press the **F4** key; for example, if you want to change the absolute reference, `A$10`, in your formula to a relative reference, `A10`, highlight `A$10` in the formula bar and then press the **F4** key to make the change.

## Data range

- When you click into your formula, the colored ranges let you see which cells are being used in your spreadsheet. There are different colors for each unique range in your formula.
- In a lot of spreadsheet applications, you can press the **F2** (or **Enter**) key to highlight the range of data in the spreadsheet that is referenced in a formula. Click the cell with the formula, and then press the **F2** (or **Enter**) key to highlight the data in your spreadsheet.

## Combining with functions

- **COUNTIF()** is a formula and a function. This means the function runs based on criteria set by the formula. In this case, **COUNT** is the formula; it will be executed IF the conditions you create are true. For example, you could use `=COUNTIF(A1:A16, "7")` to count only the cells that contained the number 7. Combining formulas and functions allows you to do more work with a single command.

# More about spreadsheet errors and fixes

The .pdf file in the attachment below includes topics and content from both the companion video and this reading. You can save this file for future reference:

[DAC2 Spreadsheet Errors and Fixes.pdf](#)

[PDF File](#)

When you are new to data analytics—and sometimes even when you aren't—spreadsheet struggles are real. It never feels good when you enter in what you are sure is a perfect formula or function, only to get an error message. Understanding errors and how to fix them is a big part of keeping your data clean, so it's important to know how to deal with issues as they come up, and more importantly, not to get discouraged.

Even the most advanced spreadsheet users come across problems from time to time.



As a follow-up to what you learned in the previous video, here are a few best practices and helpful tips. These strategies will help you avoid spreadsheet errors to begin with, making your life in analytics a whole lot less stressful:

1. Filter data to make your spreadsheet less complex and busy.
2. Use and freeze headers so you know what is in each column, even when scrolling.
3. When multiplying numbers, use an asterisk (\*) not an x.
4. Start every formula and function with an equal sign (=).
5. Whenever you use an open parenthesis, make sure there is a closed parenthesis on the other end to match.
6. Change the font to something easy to read.
7. Set the border colors to white so that you are working in a blank sheet.
8. Create a tab with just the raw data, and a separate tab with just the data you need.

Now that you have learned some basic ways to avoid errors, you can focus on what to do when that dreaded pop-up does appear. The following table is a reference you can use to look up common spreadsheet errors and examples of each. Knowing what the errors mean takes some of the fear out of getting them.

Error	Description	Example
#DIV/0!	A formula is trying to divide a value in a cell by 0 (or an empty cell with no value)	=B2/B3, when the cell B3 contains the value 0

<b>#ERROR!</b>	(Google Sheets only) Something can't be interpreted as it has been input. This is also known as a parsing error.	<code>=COUNT(B1:D1 C1:C10)</code> is invalid because the cell ranges aren't separated by a comma
<b>#N/A</b>	A formula can't find the data	The cell being referenced can't be found
<b>#NAME?</b>	The name of a formula or function used isn't recognized	The name of a function is misspelled
<b>#NUM!</b>	The spreadsheet can't perform a formula calculation because a cell has an invalid numeric value	<code>=DATEDIF(A4, B4, "M")</code> is unable to calculate the number of months between two dates because the date in cell A4 falls after the date in cell B4
<b>#REF!</b>	A formula is referencing a cell that isn't valid	A cell used in a formula was in a column that was deleted
<b>#VALUE!</b>	A general error indicating a problem with a formula or with referenced cells	There could be problems with spaces or text, or with referenced cells in a formula; you may have additional work to find the source of the problem.

If you are working with Microsoft Excel, an interactive page, [How to correct a #VALUE! error](#), can help you narrow down the cause of this error. You can select a specific function from a drop-down list to display a link to tips to fix the error when using that function.

## Pro tip: Spotting errors in spreadsheets with conditional formatting

Conditional formatting can be used to highlight cells a different color based on their contents. This feature can be extremely helpful when you want to locate all errors in a large spreadsheet. For example, using conditional formatting, you can highlight in yellow all cells that contain an error, and then work to fix them.

### Conditional formatting in Microsoft Excel

To set up conditional formatting in Microsoft Excel to highlight all cells in a spreadsheet that contain errors, do the following:

1. Click the gray triangle above row number 1 and to the left of Column A to select all cells in the spreadsheet.
2. From the main menu, click **Home**, and then click **Conditional Formatting** to select **Highlight Cell Rules > More Rules**.
3. For **Select a Rule Type**, choose **Use a formula to determine which cells to format**.
4. For Format values where this formula is true, enter `=ISERROR(A1)`.
5. Click the **Format** button, select the **Fill** tab, select yellow (or any other color), and then click **OK**.
6. Click **OK** to close the format rule window.

To remove conditional formatting, click **Home** and select **Conditional Formatting**, and then click **Manage Rules**. Locate the format rule in the list, click **Delete Rule**, and then click **OK**.

## Conditional formatting in Google Sheets

To set up conditional formatting in Google Sheets to highlight all cells in a spreadsheet that contain errors, do the following:

1. Click the empty rectangle above row number 1 and to the left of Column A to select all cells in the spreadsheet. In the [Step-by-step in spreadsheets](#) video, this was called the **Select All** button.
2. From the main menu, click **Format** and select **Conditional Formatting** to open the Conditional format rules pane on the right.
3. While in the **Single Color** tab, under Format rules, use the drop-down to select **Custom formula is**, enter **=ISERROR (A1)** , select yellow (or any other color) for the formatting style, and then click **Done**.

To remove conditional formatting, click **Format** and select **Conditional Formatting**, and then click the **Trash** icon for the format rule.

## Spreadsheet error resources

To learn more and read about additional examples of errors and solutions, explore these resources:

- [Microsoft Formulas and Functions](#): This resource describes how to avoid broken formulas and how to correct errors in Microsoft Excel. This is a useful reference to have saved in case you run into a specific error and need to find solutions quickly while working in Excel.
- [When Your Formula Doesn't Work: Formula Parse Errors in Google Sheets](#): This resource is a guide to finding and fixing some common errors in Google Sheets. If you are working with Google Sheets, you can use this as a quick reference for solving problems you might encounter working on your own.

With some practice and investigative determination, you will become much more comfortable handling errors in spreadsheets. Each error you catch and fix will make your data clearer, cleaner, and more useful.