

Chapter 8

Getting Started with Sheets

IN THIS CHAPTER

- » Getting to know Sheets
 - » Entering and editing sheet data
 - » Working with cell ranges
 - » Making cells fancy with fonts, alignment, and other formatting
 - » Messing around with rows and columns
-

If you've never used a spreadsheet, Sheets may seem intimidating, and getting it to do anything useful may seem like a daunting task. However, a spreadsheet is really just a fancy electronic version of a numeric scratch pad. With the latter, you write down a few numbers and then use elementary school techniques to calculate a result. At its most basic level, a Sheets spreadsheet is much the same: You type one or more values and then you create a formula that calculates a result.

The first part of this basic Sheets method is entering your sheet data, and that's what this chapter is all about. After some introductory stuff to get you acquainted with the Sheets interface and file basics, you learn the best ways to get your data into the sheet, some tips and tricks for easier data entry, and some techniques for formatting your data to make it easier to read and understand.

Opening Sheets

If you're ready to get started, use either of the following techniques to get Sheets out into the open:

- » Send your trusty web browser to <https://sheets.google.com>. (Note that you actually end up on <https://docs.google.com/spreadsheets>, but the other address is shorter to type.)
- » If you're in a G Suite app that has the Google Apps icon (such as Mail or Calendar; see [Figure 8-1](#)), go ahead and click the icon and then choose Sheets from the menu that appears.

Google apps

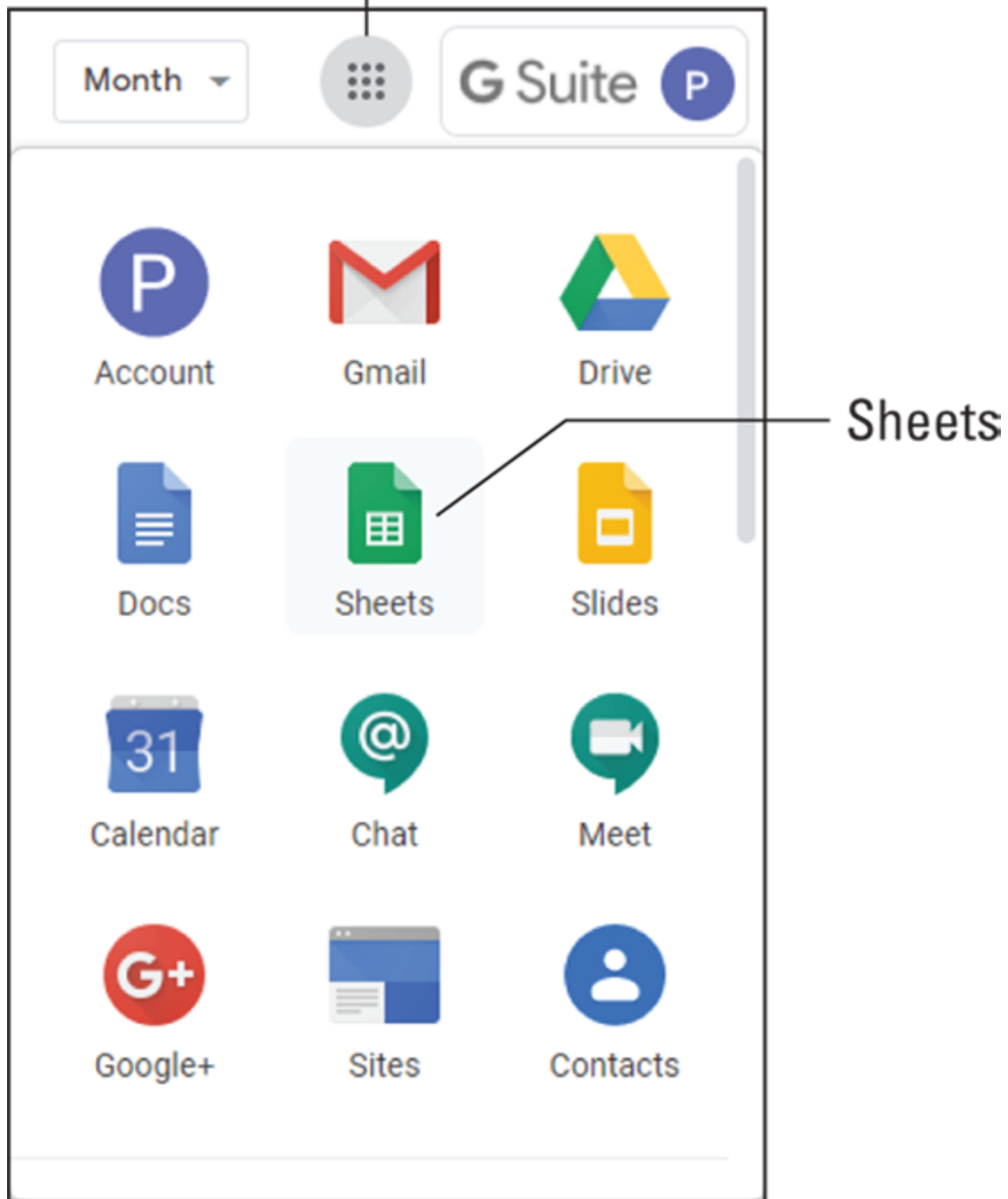
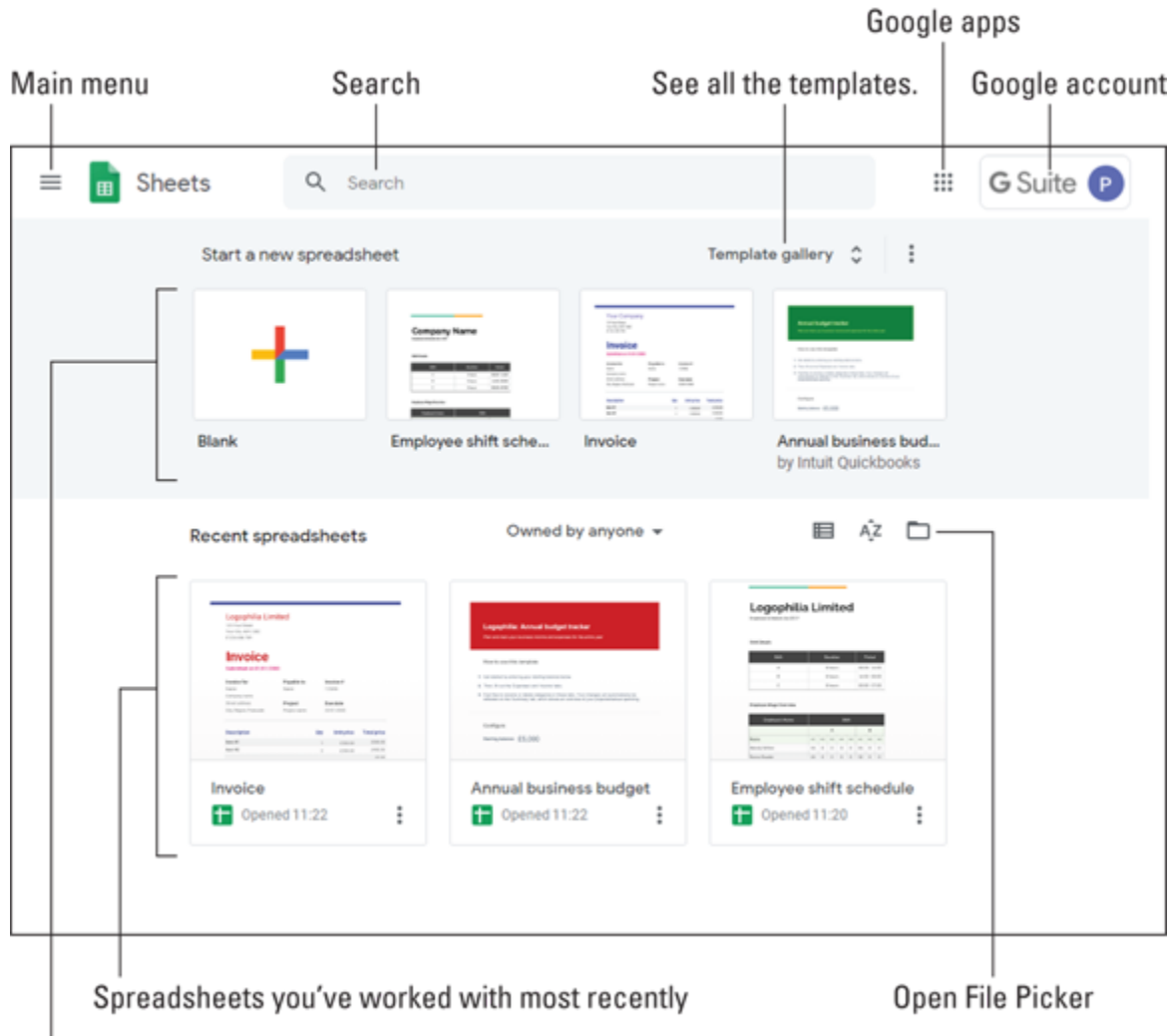


FIGURE 8-1: Choose Sheets on the Google Apps menu.

Touring the Google Sheets Home Page

When you first land on Sheets, you see the app's home page, which looks somewhat like the page shown in [Figure 8-2](#).



Some possible ways to launch a new spreadsheet

FIGURE 8-2: The home page is your Sheets launching point.

Here's a fast look at the main features of the screen (refer to [Figure 8-2](#), which points out the features in this list):

- » **Main menu:** An icon you click to open the main menu, which gives you access to other G Suite apps (such as Docs and Slides), Settings, and Drive. To close the menu, select any empty space outside the menu.
- » **Search:** Enables you to search Sheets for the spreadsheet you want.
- » **Google apps:** Displays icons for all Google apps.
- » **Google account:** Gives you access to your Google account.
- » **Start a new spreadsheet:** Displays a few templates you can use to start a new spreadsheet. (A *template* is a spreadsheet that comes with predefined text, formatting, and even a formula or two to get you off to a rousing start.)
- » **Template gallery:** A button you click to see the complete list of templates.
- » **Recent spreadsheets:** The three spreadsheets you've worked on most recently.
- » **Open File Picker:** An icon you click to open a spreadsheet file from Drive.

Creating a New Spreadsheet

From the Sheets home page, you can open a file you worked on previously (see the section “[Opening an existing spreadsheet](#),” later in this chapter), but you'll usually want to create a new spreadsheet. You have two ways to crank up a new spreadsheet:

- » *To open an empty spreadsheet* (that is, a spreadsheet with no predefined text or formatting), click Blank in the Start a New Spreadsheet section.
- » *To open a spreadsheet that has some ready-to-edit text, formatting, and formulas*, either select one of the template tiles shown in the Start a New Spreadsheet section or select Template Gallery and then choose a template from the long list of possibilities that Sheets displays.

Checking Out the Spreadsheet Screen

Whether you create a new spreadsheet or open an existing spreadsheet, you end up cheek-by-jowl with the spreadsheet screen. One of the confusing aspects I should tackle first is perhaps the most common Sheets-related question: What's the difference between a spreadsheet and a sheet? Here's the answer:

- » A *sheet* is a work area where you add data and formulas.
- » A *spreadsheet* is a file that contains one or more sheets.

By default, a new spreadsheet file contains a single sheet, but you're free to add as many sheets as you need.

[Figure 8-3](#) shows an example and points out the following features:

- » **Toolbar:** Offers one- or two-select access to the most popular Sheets features.
- » **Sheets home:** Takes you back to the Sheets home page.
- » **Spreadsheet name:** The name you've given your spreadsheet. When you start a new spreadsheet, the area says `Untitled spreadsheet`.
- » **Menu:** Gives you access to the full arsenal of Sheets commands, features, and tools.
- » **Save status:** Lets you know (among other info) when the spreadsheet was last edited.
- » **Hide menus:** Hides the Sheets Home icon, the menu, and the spreadsheet name to gain a bit more vertical headroom for your spreadsheet.
- » **Google account:** Gives you access to your Google account.
- » **Side panel:** The sidebar on the right, which consists of the following elements:

- *Calendar*: Opens a pane for quick access to Google Calendar.
 - *Keep*: Opens the Keep pane so you can create a note that gets stored in the Keep app.
 - *Tasks*: Opens the Tasks pane so you can add a task to the Tasks app.
- » **Hide side panel**: An arrow you click to collapse the side panel and gain a little extra horizontal legroom. Click the arrow again to return the side panel.
- » **Sheet area**: The area where you add, edit, and format your sheet data and formulas.
- » **Active cell**: Represents the cell that you want to edit or format.
- » **Formula bar**: Shows the formula (if any) entered into the active cell.
- » **Sheet tab**: Represents the current sheet. By default, a blank spreadsheet contains a single sheet named Sheet1, but you can add more, if needed (Sheet2, Sheet3, and so on), by clicking the Add Sheet icon. Each sheet gets its own tab, and you display a sheet by selecting its tab.

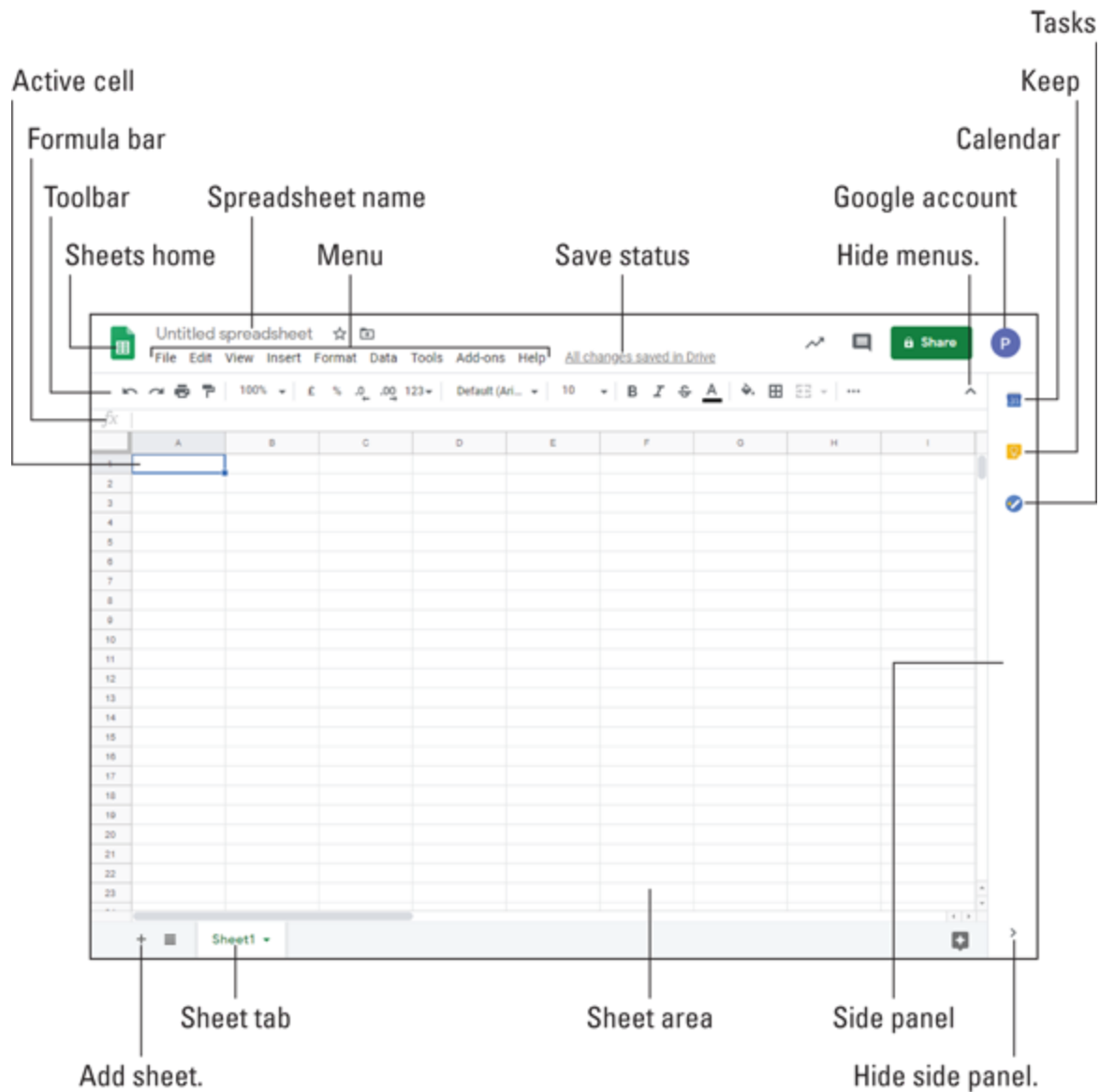


FIGURE 8-3: A blank spreadsheet and the Sheets features that surround it.

Dealing with Spreadsheets

As you might expect from its name, Sheets is all about spreadsheets. So, before you learn how to add, edit, and format text, it pays to take a few minutes to learn some basic spreadsheet chores.

Sheets saves your work for you

As you work in Sheets, with each change you make, the spreadsheet's Save Status text (pointed out in [Figure 8-3](#)) changes to `Saving ...` When

the save is complete, you see the status `All changes saved in Drive`, as pointed out in [Figure 8-3](#).

That's right: With Sheets, you never have to worry about saving your work, because Sheets takes over the saving duties from here. Every time you make a change to the spreadsheet, you see the saving status change briefly to `Saving`, followed a second or two later by the anxiety-killing message `All changes saved in Drive`. Later, after you close and then reopen the spreadsheet, the status tells you how long ago you last edited the spreadsheet.

Naming a new spreadsheet

If you've just started a new spreadsheet, one of your earliest tasks should be to give the spreadsheet a descriptive name. Sheets launches new spreadsheets with the accurate-but-useless name `Untitled Spreadsheet`. Follow these steps to give your spreadsheet a proper name:

1. **Select the `Untitled Spreadsheet` text, which appears near the top left corner of the page.**

Alternatively, you can choose `File` ⇒ `Rename`.

Either way, Sheets opens the file name for editing.

2. **Delete the `Untitled Spreadsheet` text.**
3. **Enter the name you want to use for the new spreadsheet.**
4. **Press `Enter` or `Return`.**

Sheets saves the spreadsheet using the new name.

Opening an existing spreadsheet

To return to a spreadsheet you worked on previously, you need to open it by following these steps:

1. **Open the Sheets home page.**
2. **If you see the spreadsheet you want to open in the `Recent Spreadsheets` area, select it and then skip the rest of these steps.**

Otherwise, click the Open File Picker button (pointed out earlier in [Figure 8-2](#)).

Sheets displays the Open a File dialog box.

3. Select the spreadsheet you want to mess with.

4. Click Open.

Sheets opens the file.

Saving a copy of a spreadsheet

One of the secrets of Sheets productivity is to never reinvent the wheel. That is, if you have an existing spreadsheet and you need a second spreadsheet that's similar, don't go to the time and trouble to re-create the original spreadsheet from scratch. Instead, it's not hard to convince Sheets to make a copy of the original. With that copy in hand, all you need to do is make whatever changes are needed.

Here's how to make a copy of an existing spreadsheet:

1. Open the spreadsheet you want to copy.

2. Choose File ⇒ Make a Copy.

Sheets opens the Copy Spreadsheet dialog box. The Name text box shows `Copy of` followed by the name of the original spreadsheet.

3. Use the Name text box to give a descriptive name to the copy.

4. Click OK.

Sheets opens a new browser tab and displays the copy you just created.

Understanding Sheet Cells

A sheet is a rectangular arrangement of rows and columns. The rows are numbered, where the topmost row is 1, the row below it is 2, and so on. The columns are labeled with letters, where A is the leftmost column, the next column is B, and so on. After column Z come columns AA, AB, and so on, all the way up to ZZZ; that's 18,278 columns in all.



REMEMBER “What’s the maximum number of rows?” I hear you asking.

There isn’t one, but the maximum number of *cells* you can have in a spreadsheet is 5 million.

The intersection of each row and column is called a *cell*, and each cell has a unique address that combines its column letter (or letters) and row number. For example, the top left cell in a sheet is at the intersection of column A and row 1, so its address is A1. When you click a cell, it becomes the *active* cell — which Sheets designates by surrounding the cell with a heavy border and by displaying a small, blue square in the cell’s bottom right corner.

You use these sheet cells to enter data, which you learn more about in the next section. For now, you should know that sheet cells can hold these three kinds of data:

- » **Text:** These entries are usually labels such as *August Sales* or *Territory* that make a sheet easier to read, but they can also be text/number combinations for items such as phone numbers and account codes.
- » **Numbers:** These entries can be dollar values, weights, interest rates, or any other numerical quantity.
- » **Formulas:** These are calculations involving two or more values, such as $2*5$ or $A1+A2+A3$. I discuss formulas in more detail in [Chapter 9](#).

Entering Data

A spreadsheet is only as useful — and as accurate — as the data it contains. Even a small mistake can render the results meaningless. Rule Number One of good spreadsheet style is to enter your data carefully.

If you’re new to spreadsheet work, you’ll no doubt be pleased to hear that entering data in a sheet cell is straightforward: Select the cell you want

to use and then start typing. Your entry appears in both the cell and the formula bar — the horizontal strip above the column headings. (Refer to [Figure 8-3](#).) When you're done, press Enter. (If you prefer to cancel the edit without adding anything to the cell, press Esc instead.)



REMEMBER When entering numbers or text, you can also confirm your entry by pressing any of the arrow keys or clicking on another cell. The active cell moves either in the direction of the arrow or to the selected cell. This feature is handy if you have, say, a lengthy column of data to type.

Entering text

In Sheets, text entries can include any combination of letters, symbols, and numbers. Although text is sometimes used as data, you'll find that you use text mostly to describe the contents of your sheets. These descriptions are important because even a modest-size spreadsheet can become a confusing jumble of numbers without some kind of guideline to keep things straight. Text entries can be up to about 50,000 characters long but, in general, you shouldn't use anything too fancy or elaborate; a simple phrase such as Monthly Expenses or Payment Date usually suffices.



TECHNICAL STUFF Sheets uses the property of *data type coercion* to determine the data type of a cell entry. For example, Sheets automatically treats any cell that contains only numbers as a numeric type, but if the cell has at least one letter or symbol, Sheets treats it as text. You can use this property to force Sheets to interpret a number as a text entry by preceding the number with a single quote (').

However, not all symbols force Sheets to interpret an entry as text. The exceptions are the forward slash (/), used in dates; the colon (:), used in times; and the following symbols:

. , + - () \$ %

I expand on how these symbols affect numeric entries later in this chapter.

How can you tell whether a number in a cell is a text or numeric entry? One way is to look at how Sheets aligns the data in the cell. Text entries are automatically aligned on the left, whereas numeric entries are aligned on the right.

Entering numbers

Numbers are what sheets are all about. You add them, subtract them, take their average, or perform any number of mathematical operations on them.

According to the Sheets data type coercion, a cell entry that contains only numbers is considered a numeric data type. However, Sheets also recognizes that you're entering a number if you start the entry with a decimal point (.), a plus sign (+), a minus sign (-) or a dollar sign (\$). Here are some other rules for entering numbers:

- » You can enter percentages by following the number with a percent sign (%). Sheets stores the number as a decimal. For example, an entry such as 15% is stored as 0.15.
- » You can use scientific notation when entering numbers. For example, to enter the number 3,879,000,000, you can type 3.879E+09.
- » You can also use parentheses to indicate a negative number. If you make an entry such as (125), Sheets assumes you mean negative 125.
- » You can enter commas to separate thousands, but you have to make sure that each comma appears in the appropriate place. Sheets interprets an entry such as 12,34 as text.

You find out more information about number formatting later in this chapter, in the section “[Applying a numeric, date, or time format.](#)”



WARNING A common source of errors in Sheets is to mistakenly enter a lowercase *L* (*l*) instead of a one (1) or an uppercase *o* (*O*) instead of a zero (0). Watch for these errors when entering data.

Entering dates and times

Sheets uses serial numbers to represent specific dates and times. To get a date serial number, Sheets uses December 31, 1899, as an arbitrary starting point and then counts the number of days that have passed since then. For example, the date serial number for January 1, 1900, is 2; January 2, 1900, is 3; and so on. [Table 8-1](#) displays some sample date serial numbers.

TABLE 8-1 Examples of Date Serial Numbers

<i>Serial Number</i>	<i>Date</i>
366	December 31, 1900
16229	June 6, 1944
44066	August 23, 2020

To derive a time serial number, Sheets expresses time as a decimal fraction of the 24-hour day to return a number between 0 and 1. The starting point, midnight, is given the value 0, so 12 noon — halfway through the day — has a serial number of 0.5. [Table 8-2](#) displays some sample time serial numbers.

TABLE 8-2 Examples of Time Serial Numbers

<i>Serial Number</i>	<i>Time</i>
0.25	6:00:00 A.m.
0.375	9:00:00 A.m.
0.70833	5:00:00 P.m.
.99999	11:59:59 P.m.

You can combine the two types of serial numbers. For example, 44066.5 represents 12 noon on August 23, 2020.

The benefit of using serial numbers in this way is that it makes calculations involving dates and times easy. Because a date or time is really just a number, any mathematical operation you can perform on a number can also be performed on a date. This feature is invaluable for sheets that track delivery times, monitor accounts receivable or accounts payable, calculate invoice discount dates, and so on.

Although it's true that the serial numbers make manipulating dates and times easier for the computer, it's not the best format for humans to comprehend. For example, the number 25,404.95555 is meaningless, but the moment it represents (July 20, 1969, at 10:56 P.m. Eastern Time) is one of the great moments in history (the Apollo 11 moon landing). Fortunately, Sheets takes care of the conversion between these formats so that you never have to worry about it. To enter a date or time, use any of the formats outlined in [Table 8-3](#).

TABLE 8-3 Date and Time Formats in Sheets

<i>Format</i>	<i>Example</i>
m/d/yyyy	8/23/2020
d-mmm-yyyy	23-Aug-2020
d-mmm	23-Aug (Sheets assumes the current year)
mmm-yyyy	Aug-2020 (Sheets assumes the first day of the month)
h:mm:ss AM/PM	10:35:10 P.m.
h:mm AM/PM	10:35 P.m.
h:mm:ss	22:35:10
h:mm	22:35
m/d/yyyy h:mm	8/23/2020 22:35



TIP

Here are three shortcuts that let you enter dates and times quickly. To enter the current date in a cell, press Ctrl+; (semicolon); to enter the current time, press Ctrl+Shift+; (semicolon); to enter the current date and time in a cell, press Ctrl+Alt+Shift+; (semicolon).

[Table 8-3](#) represents Sheets' built-in formats, but these aren't set in stone. You're free to mix-and-match these formats, as long as you observe the following rules:

- » You can use either the forward slash (/) or the hyphen (–) as a date separator. Always use a colon (:) as a time separator.
- » You can combine any date-and-time format as long as you separate them with a space.
- » You can specify the month using the number (January is 1, February is 2, and so on), the first three letters of the month name, or the entire month name.
- » You can enter date and time values using either uppercase or lowercase letters. Sheets automatically adjusts the capitalization to its standard format.
- » To display times using the 12-hour clock, include either *am* (or just *a*) or *pm* (or just *p*). If you leave these off, Sheets uses the 24-hour clock.

You find out more information on formatting dates and times later in this chapter, in the section “[Applying a numeric, date, or time format.](#)”

Navigating a sheet

Data entry is much faster if you can navigate your sheets quickly. [Table 8-4](#) lists the most commonly used navigation keys.

TABLE 8-4 Sheets Navigation Keys

Press This	To Move Here
An arrow key	Left, right, up, or down one cell
Home	To the beginning of the row
End	To the end of the row
Page Down	Down one screen
Page Up	Up one screen
Ctrl+Home (Mac: ⌘+Home)	To the beginning of the sheet
Ctrl+End (Mac: ⌘+End)	To the bottom right corner of the sheet
Alt+down arrow (Mac: Option+down arrow)	To the next sheet
Alt+up arrow(Mac: Option+up arrow)	To the previous sheet
Ctrl+arrow key (Mac: ⌘+arrow key)	In the direction of the arrow to the next nonblank cell if the current cell is blank, or to the last nonblank cell if the current cell is nonblank



REMEMBER Some keyboards sneakily hide the Home, End, Page Up, and Page Down keys inside other keys (usually the arrow keys). To “press” these hidden keys, you need to hold down the Fn key. That is, to select Home, press Fn+Home, to select End, press Fn+End, to select Page Up, press Fn+Page Up, and to select Page Down, press Fn+Page Down.

Editing cell contents

If you make a mistake when entering data or you have to update the contents of a cell, you need to edit the cell to produce the correct value. One option you have is to select the cell and begin typing the new data. This method erases the previous contents with whatever you type. Often, however, you need to change only a single character or value, so retyping the entire cell is wasteful. Instead, Sheets lets you modify the

contents of a cell without erasing it. To edit a cell, first use any of the following techniques to produce an insertion point for editing:

- » Click the cell and then press F2. (Depending on your keyboard layout, you might have to press Fn+F2.)
- » Click the cell and then click inside the formula bar. (This technique is the best if you want to edit at a specific point in the cell, because you can click precisely at that position to place the insertion point there.)
- » Double-click the cell.

With the insertion point at your command, you can now make changes and press Enter when you're done to save your work. (Or, you can cancel the procedure without saving your changes, by pressing Esc.)

Working with Ranges

For small sheets, working with individual cells doesn't usually present a problem. However, as your sheets grow larger, you will find that performing operations cell-by-cell is both time-consuming and frustrating. To overcome this problem, Sheets enables you to work with multiple cells (that is, a *range* of cells) in a single operation. You can then move, copy, delete, or format the cells as a whole.

Understanding ranges

A *range* is defined as any group of related cells. A range can be as small as a single cell or as large as the entire sheet. Most ranges are rectangular groups of adjacent cells, but Sheets allows you to create ranges with noncontiguous cells. Rectangular ranges, like individual cells, have an address, and this address is given in terms of *range coordinates*. Range coordinates have the form UL:LR, where UL is the address of the cell in the top left corner of the range, and LR is the address of the cell in the bottom right corner of the range. For example, a range consisting of the intersection of the first four rows (1 to 4) and the first three columns (A

to C) would have the coordinates A1:C4. [Figure 8-4](#) shows this range selected.

Select All

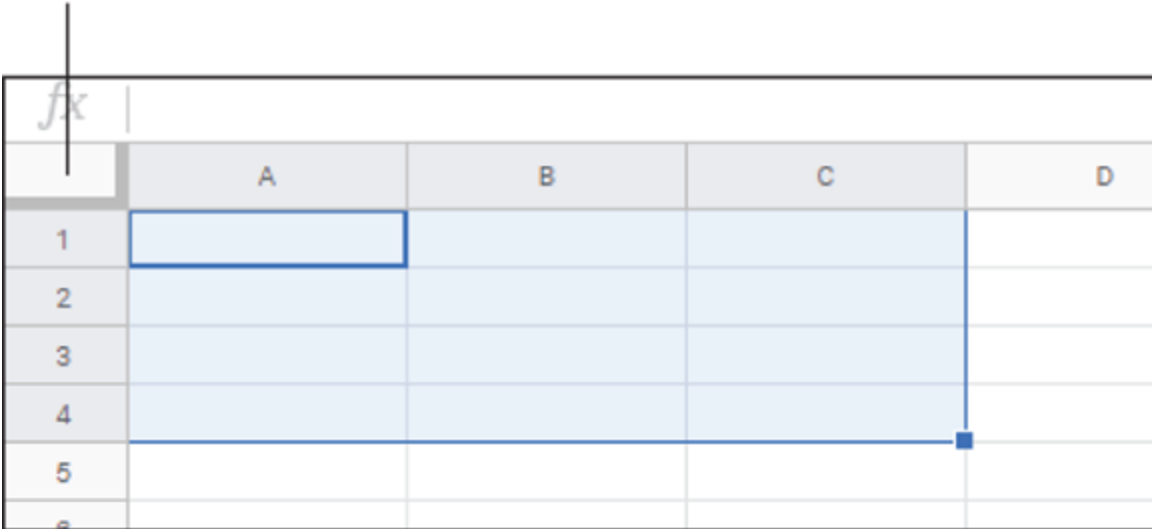


FIGURE 8-4: The range A1:C4.

Ranges speed up your work by enabling you to perform operations or define functions on many cells at once instead of one at a time. Suppose that you want to copy a large section of a sheet to another file. If you work on individual cells, you might have to perform the copy procedure dozens of times. However, by creating a range that covers the entire section, you can do it with a single Copy command.

Similarly, suppose that you want to know the average of a column of numbers running from B1 to B50. You can enter all 50 numbers as arguments in the AVERAGE function, but typing AVERAGE(B1:B50) is decidedly quicker.

Selecting a range

When Sheets requires that you select a range, in some situations you can specify the range by typing the range coordinates. For example, a dialog box that requires a range input is common, and you can type the range coordinates in the text box provided. Similarly, you'll often come across a sheet function that requires a range value for an argument, and you can type the range coordinates while you're typing the rest of the formula.

However, using your mouse or keyboard to select the range you want to work with is much more common, so the next few sections take you through a few useful range selection techniques using both devices.

Mouse techniques for selecting a range

The mouse is the standard range-selection tool because it's both flexible and fast. Here are the main techniques:

- » **To select a contiguous range:** Click-and-drag the mouse pointer over the cells you want to select.
- » **To select a noncontiguous range:** Click the first cell, hold down Ctrl, and then either click the other cells or click-and-drag the other ranges you want to include in the selection.
- » **To select an entire column:** Click the column header. To select multiple adjacent columns, click-and-drag the mouse pointer over the column headings. To select nonadjacent columns, select the first column, hold down Ctrl, and then select the other columns.
- » **To select an entire row:** Click the row header. To select multiple adjacent rows, click-and-drag the mouse pointer over the row headings. To select nonadjacent rows, select the first row, hold down Ctrl, and then select the other rows.

Mouse tricks for selecting a range

You can save yourself lots of time if you become adept at some of the more esoteric tricks when selecting ranges with the mouse. Here's a list of my favorite mouse range-selection tricks:

- » **Using the Shift key:** To select a rectangular, contiguous range, click the top left cell (this is called the *anchor cell*), hold down Shift, and then click the bottom right cell. Note that this technique doesn't require that you always use the top left cell as the anchor. You can just as easily click any corner of the range, hold down Shift, and then click the opposite corner.
- » **Scrolling to the anchor cell:** After you select a large range, you often no longer see the anchor cell because you've scrolled it off the

screen. If you need to see the anchor cell before continuing, you can either use the scrollbars to bring it into view or press Ctrl+Backspace (⌘+Delete on a Mac).

- » **Selecting the entire sheet:** Click the Select All button near the top left corner of the sheet, as shown earlier, in [Figure 8-4](#).

Keyboard techniques for selecting a range

If you're inputting data, you can save time by leaving your hands on the keyboard to select a range. Here are the main techniques you can use to select a range via the keyboard:

- » **To select a contiguous range:** Use the arrow keys to select the top left cell of the range, press and hold down the Shift key, and then use the arrow keys (or Page Up and Page Down, if the range is a large one) to select the rest of the cells.
- » **To select an entire column:** Select a cell in the column and then press Ctrl+spacebar. To select multiple adjacent columns, select a cell in each column and then press Ctrl+spacebar.
- » **To select an entire row:** Select a cell in the row and then press Shift+spacebar. To select multiple adjacent rows, select a cell in each row and then press Shift+spacebar.

Keyboard tricks for selecting a range

If you prefer selecting ranges via the keyboard, here are a few tricks that can make selecting a range via the keyboard faster and more efficient:

- » **Selecting contiguous data:** If you want to select a contiguous range that contains data, begin by selecting the top left cell of the range. To select the contiguous cells below the top left cell, press Ctrl+Shift+down arrow; to select the contiguous cells to the right of the selected cells, press Ctrl+Shift+right arrow.
- » **Selecting the entire sheet:** Press Ctrl+A (⌘+A on a Mac) or Ctrl+Shift+spacebar (⌘+Shift+spacebar on a Mac).

» **Moving the active cell within a selection:** Use the techniques listed in [Table 8-5](#).

TABLE 8-5 Moving the Active Cell within a Selection

<i>Press This</i>	<i>To Move the Active Cell Here</i>
Enter	Down rows and from left to right across columns
Shift+Enter/Return	Up rows and from right to left across columns
Tab	From left to right across columns and down rows
Shift+Tab	From right to left across columns and up rows

Specifying a range input in a dialog box

I mentioned earlier that dialog boxes often have controls that require range coordinates as the input value. Again, you can type the range coordinates by hand, but you can also use any of the techniques you learned in the last few sections. Here's the general technique to follow:

1. **If a text box requires a range input, you see the Select Data Range button on the right side of the dialog box, as pointed out in [Figure 8-5](#). Click that button.**

Sheets temporarily hides the dialog box and opens the Select a Data Range dialog box.

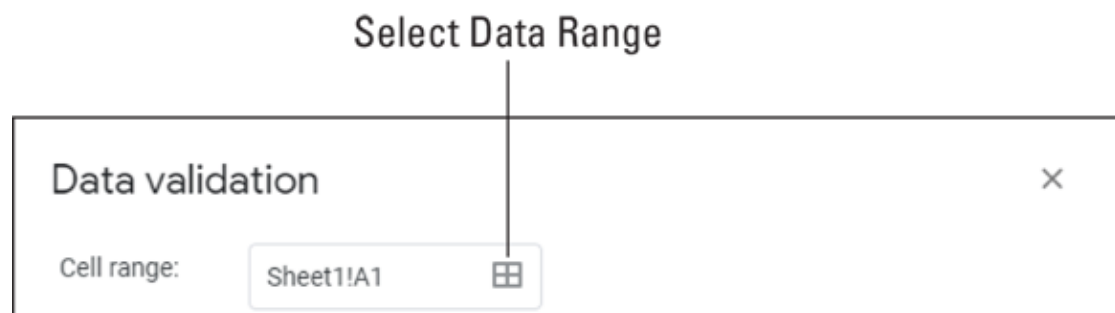


FIGURE 8-5: If a text box requires a range input, it also displays the Select Data Range button.

2. **In the sheet, use the mouse or keyboard to select the range.**

As you select the range, Sheet updates the range coordinates in the Select a Data Range dialog box, as shown in [Figure 8-6](#).

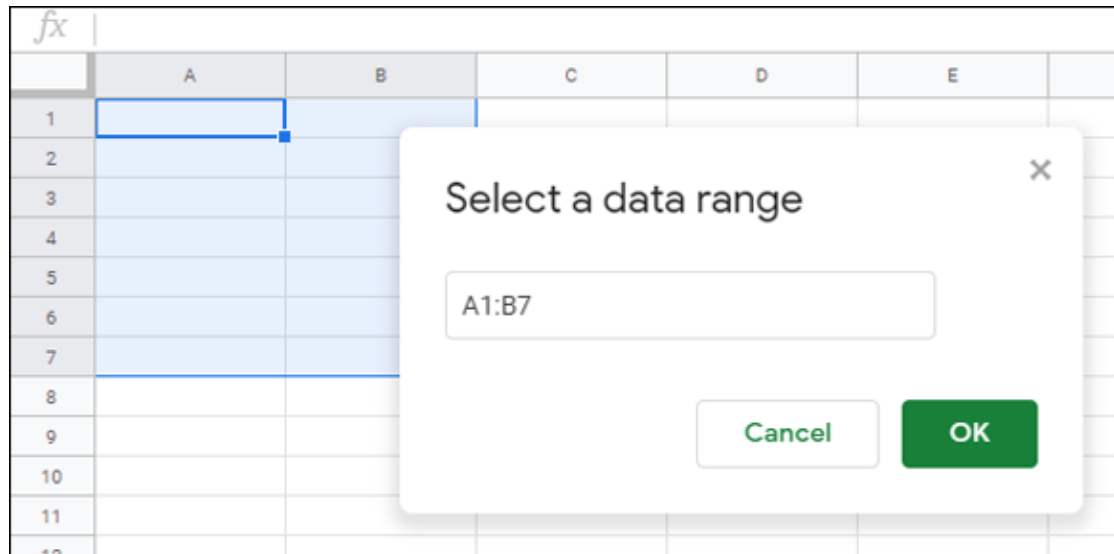


FIGURE 8-6: With the Select a Data Range dialog box onscreen, use the mouse or keyboard to select the range you want to use as input.

3. Click **OK**.

Sheets restores the dialog box, and the coordinates of the range you selected appear in the text box.

Working with named ranges

Working with multiple cells as a range is much easier than working with the cells individually, but range coordinates aren't very intuitive. For example, if you see a formula that uses the function `AVERAGE(A1:A25)`, knowing what the range `A1:A25` represents is impossible unless you look at the range itself.

You can make ranges more intuitive using *named ranges*, which are labels you assign to a single cell or to a range of cells. With a name defined, you can use it in place of the range coordinates. For example, assigning the name `ClassMarks` to a range such as `A1:A25` immediately clarifies the purpose of a function such as `AVERAGE(ClassMarks)`.

Sheets also makes named ranges easy to work with by automatically adjusting the coordinates associated with a named range if you move the

range or if you insert or delete rows or columns within the range.

Understanding named range restrictions

Named ranges are generally quite flexible, but you need to follow a few guidelines:

- » The named range can be no longer than 250 characters.
- » The named range must begin with either a letter or the underscore character (`_`). For the rest of the name, you can use any combination of characters, numbers, or underscore (no spaces, punctuation, or other symbols allowed).
- » For multiple-word names, separate the words by using the underscore character or by mixing case (for example, `August_Expenses` or `AugustExpenses`). Sheets doesn't distinguish between uppercase and lowercase letters in named ranges.
- » Don't use cell addresses (such as `Q1`).
- » Keep names as short as possible to reduce typing, but long enough that the name that retains some of its. `NetProfit20` is faster to type than `Net_Profit_For_Fiscal_Year_2020`, and it's certainly clearer than the more cryptic `NetPft20`.

Naming a range

Sheets gives you a hard way and two easy ways to name a range. Just so you appreciate the easy methods, let's take a quick run-through of the hard method:

1. **Select the range you want to name.**
2. **Choose Data ⇒ Named Ranges.**
Sheets opens the Named Ranges pane.
3. **Type the name in the text box.**



TIP

Always type at least the first letter of the name in uppercase because doing so can help you to troubleshoot formula problems. The idea is that you type the named range entirely in lowercase letters when you insert it into a formula. When you accept the formula, Sheets then converts the name to the case you used when you first defined it. If the name remains in lowercase letters, Sheets doesn't recognize the name, so it's likely that you misspelled the name when typing it.

4. If the range address displayed in the range box is incorrect, either type the correct range address or click the Select Data Range button and then use the mouse or keyboard to select a new range on the sheet.

5. Click Done.

Sheets names the range.

Using a named range

Using a named range in a formula or as a function argument is straightforward: Just replace a range's coordinates with the range's defined name. Suppose that a cell contains the following formula:

```
=B1
```

This formula sets the cell's value to the current value of cell B1. However, if cell B1 is named TotalProfit, then the following formula is equivalent:

```
=TotalProfit
```

Similarly, consider the following function:

```
AVERAGE (A1 : A25)
```

If the range A1:A25 is named ClassMarks, then the following is equivalent:

```
AVERAGE (ClassMarks)
```

Filling a range with data

If you have a range where you want to insert the same value into every cell, typing the value into each cell is time-consuming and boring. You can save a lot of time by telling Sheets to fill the entire range with the value in a single operation. Here are the steps to follow:

1. **Type the value or formula you want to appear in the first cell of the range.**
2. **Select the range you want to fill.**
3. **Press Ctrl+Enter (⌘+Return on a Mac). Sheets fills the entire range with the value or formula you typed.**

Alternatively, you can use these techniques if you want to fill only down or to the right:

- *Fill down only:* Press Ctrl+D (⌘+D on a Mac).
- *Fill right only:* Press Ctrl+R (⌘+R on a Mac).

Filling a range with a series of values

Rather than fill a range with the same value, you might need to fill it with a series of values. This might be a text series (such as Sunday, Monday, Tuesday; or January, February, March) or a numeric series (such as 2, 4, 6; or 2020, 2021, 2022). Again, such series can be time-consuming to insert by hand, particularly for longer series. Fortunately, Sheets has a feature called AutoFill that makes creating a series easy. Here's how it works:

1. **Enter at least the first two values in a series.**
AutoFill recognizes standard abbreviations, such as Jan (January) and Sun (Sunday).
2. **Select the cells you populated in Step 1.**
3. **Position the mouse pointer over the AutoFill handle — the blue square in the bottom right corner of the selection, in other words.**

The pointer changes to a plus sign (+).

4. Click-and-drag the mouse pointer until the dashed border encompasses the range you want to fill.

Clicking-and-dragging the handle down or to the right increments the values. Clicking-and-dragging up or to the left decrements the values.

5. Release the mouse button.

Sheets fills in the range with the series.

Copying a range

You often reuse data in sheets. For example, if you set up a range with a particular set of data, you might want to create a second range that uses different data so that you can compare the two. Although the numbers might be completely different in the second range, the labels and headings probably won't be. You can make this sort of sheet chore go much faster if you start off the second range by copying the unchanging data from the first.

Here's how to copy a range:

- 1. Select the original range.**
- 2. Choose Edit ⇒ Copy (or press Ctrl+C; ⌘+C on a Mac) to copy the range.**
- 3. Select the top left cell of the destination range.**



WARNING Check out the destination range before copying a range, to make sure you aren't overwriting any existing data. If you accidentally destroy some data during a copy, immediately choose Edit and then Undo (or press Ctrl+Z) to undo the damage.

- 4. Choose Edit ⇒ Paste (or press Ctrl+V; ⌘+V on a Mac).**

Sheets pastes a copy of the original range.



TIP In Step 4, rather than paste the copied range, you can insert the copy *within* an existing range. Right-click the destination cell, select Insert Cells, and then choose how you want the existing cells shifted to make room for the copied range: Shift Right or Shift Down.

Moving a range

If you want to move a range, Sheets gives you three methods:

- » **Drag-and-drop:** Select the range you want to move, and then hover the mouse pointer over any edge of the selection (except the AutoFill handle). Click-and-drag the mouse pointer to the destination range.
- » **Cut command:** Select the original range, choose Edit ⇒ Cut (or press Ctrl+X; ⌘+X on a Mac) to cut it, select the top left cell of the destination range, and then choose Edit ⇒ Paste (or press Ctrl+V; ⌘+V on a Mac).
- » **Insert within a range:** Select the original range, choose Edit ⇒ Cut (or press Ctrl+X; ⌘+X on a Mac) to cut it, right-click the destination cell, choose Insert Cells, and then choose how you want the existing cells shifted to make room for the moved range: Shift Right or Shift Down.

Formatting a Cell

Your sheets must produce the correct answers, of course, so most of your Sheets time should be spent on getting your data and formulas (see [Chapter 9](#)) entered accurately. However, you also need to spend some time formatting your work, particularly if other people will be viewing or working with the sheet. Labels, data, and formula results that have been augmented with fonts, borders, alignments, and other formatting are almost always easier to read and understand than unformatted sheets.

Formatting the cell font

Before moving on to some easier and faster methods for applying formatting, you should know the standard procedures. To begin, select the cell or range you want to format. You then choose your font formatting using any one of the following three methods:

- » On the menu bar, choose Format.
- » Press a keyboard shortcut.
- » Click a toolbar button.





[Table 8-6](#) shows the Format menu commands and their corresponding keyboard shortcuts (if any) that you can select.





[Table 8-7](#) shows the Sheets toolbar buttons for font-related chores.

TABLE 8-6 Font Formatting via Menu and Keyboard

<i>Text</i>	<i>Menu Command</i>	<i>Keyboard Shortcut</i>
Bold		Ctrl+B (⌘+B on a Mac)
Italic		Ctrl+I (⌘+I on a Mac)
Underline		Ctrl+U (⌘+U on a Mac)
Strikethrough		Alt+Shift+5 (⌘+Shift+X on a Mac)
Font Size		None

TABLE 8-7 Font Formatting from the Toolbar

<i>Toolbar Button</i>	<i>Button Name</i>	<i>What It Does</i>
	Font	Displays a list of typefaces
	Font Size	Displays a list of font sizes
	Bold	Applies bold to the text
	Italic	Applies italics to the text

Toolbar Button	Button Name	What It Does
	Strikethrough	Applies strikethrough to the text
	Text Color	Displays a color palette and then applies the color you select to the text
	Highlight Color	Displays a color palette and then applies the color you select to the background of the text
	Border	Applies a border style to one or more cell edges.




Aligning cell data




Sheets has default cell alignments depending on the data, such as left-aligned for text and right-aligned for numbers, dates, and times. However, you can apply your own alignments. Sheets offers three alignment methods:

- » Choose Format ⇒ Align from the menu bar.
- » Press a keyboard shortcut.
- » Click a toolbar button.

[Table 8-8](#) shows the Align menu commands, their corresponding keyboard shortcut, and the equivalent toolbar buttons for the Sheets alignment options.

TABLE 8-8 Aligning Cells in Sheets

Align Menu Command	Keyboard Shortcut	Toolbar Button	What It Does
Left	Ctrl+Shift+L (⌘+Shift+L on a Mac)		Aligns cell data on the left
Center	Ctrl+Shift+E (⌘+Shift+E on a Mac)		Centers cell data
Right	Ctrl+Shift+R (⌘+Shift+R on a Mac)		Aligns cell data on the right

<i>Align Menu Command</i>	<i>Keyboard Shortcut</i>	<i>Toolbar Button</i>	<i>What It Does</i>
Top			Aligns cell data vertically with the top of the cell
Middle			Aligns cell data vertically with the middle of the cell
Bottom			Aligns cell data vertically with the bottom of the cell

Applying a numeric, date, or time format

The numbers — both the raw data and the formula results — are the most important part of a sheet, so applying appropriate numeric formats to your numbers is always worth the time. For example, be sure to format dollar amounts with the appropriate currency symbol, and format large numbers to show commas as thousands separators. If your sheet includes dates or times, you should also format them to make them more readable and to avoid ambiguous dates such as 3/4/2020. (Is that March 4, 2020 or April 3, 2020? It depends on the country!)






You won't be the least bit surprised to learn that Sheets offers three methods for applying numeric, date, and time formats:

- » Choose Format ⇒ Number from the menu bar.
- » Press a keyboard shortcut.
- » Click a toolbar button.

[Table 8-9](#) shows the Number menu commands, their corresponding keyboard shortcuts, and the equivalent toolbar buttons for the Sheets numeric formatting options.

TABLE 8-9 Applying Numeric, Date, and Time Formats


<i>Number Menu Command</i>	<i>Keyboard Shortcut</i>	<i>Toolbar Button</i>	<i>Format Applied</i>
Number	Ctrl+Shift+!		Two decimal places; using thousands separator

Number Menu Command	Keyboard Shortcut	Toolbar Button	Format Applied
Percent	Ctrl+Shift+%		The number is displayed multiplied by 100 and with a percent sign (%) to the right of the number
Scientific	Ctrl+Shift+^		Two decimal places
Currency	Ctrl+Shift+\$		Two decimal places; using the dollar sign; negative numbers surrounded by parentheses
Date	Ctrl+Shift+#		d-mmm-yyyy
Time	Ctrl+Shift+@		h:mm AM/PM
Decrease Decimal			Decreases the number of decimal places
Increase Decimal			Increases the number of decimal places
More Formats	Ctrl+Shift+@		Displays all available formats

Using the Paint Format tool

Getting a cell formatted just right can take a fair amount of work. That's bad enough, but things get worse if you then have to repeat the entire procedure for another cell. The more times you have to repeat a format, the less likely you are to begin the whole process in the first place.

Fortunately, Sheets has a useful tool that can remove almost all the drudgery from applying the same formatting to multiple cells. It's called the Paint Format tool, and here are the steps to follow to use Paint Format to apply existing formatting to another cell:

- 1. Select the cell that has the formatting you want to copy.**
- 2.  Click the Paint Format button on the toolbar.**
The mouse pointer sprouts an icon that looks like a paint roller.
- 3. Select the cell that you want to receive the formatting.**
Sheets transfers the formatting from the selected cell to the new cell.

Working with Columns and Rows

One of the easiest ways to improve the appearance of your sheet is to manipulate its rows and columns. This section teaches you how to adjust column widths and row heights and how to hide and unhide entire rows and columns in addition to gridlines and headers.

Adjusting the column width

You can use column width adjustments to improve the appearance of your sheet in a number of different ways:

- » If you're faced with a truncated text entry or number, you can enlarge the column so that the entry can appear in full.
- » If your sheet contains many numbers, you can widen the columns to spread out the numbers and make the sheet appear less cluttered.
- » You can make your columns smaller to fit the entire sheet onto your screen or onto a single printed page.
- » You can adjust the column width for the entire sheet to create a custom grid for a specialized model (such as a timeline).

Sheets measures column width in pixels. When you create a new sheet, each column uses a standard width of 100 pixels. In the next three sections, I walk you through the Sheets methods for adjusting column widths.

Specifying a column width

Sheets allows column widths as small as 2 pixels and as large as 2,000. To specify a column width, follow these steps:

1. **If you want to resize multiple columns, select them.**
2. **Right-click the column header.**
Sheets displays a menu of commands for manipulating columns.
3. **Choose the menu's **Resize the Column** command.**

If you selected multiple columns, choose *Resize Columns X-Y*, where *X* is the first selected column and *Y* is the last selected column. The *Resize Column* dialog box appears.

4. **Click the *Enter New Column Width in Pixels* radio button.**
5. **In the text box, enter the width you want, in pixels.**
6. **Click *OK*.**

Sheets sets the column width and returns you to the sheet.

Using a mouse to set the column width

You can bypass the *Resize Column* dialog box entirely by using the mouse to drag a column to the width you want. To give this a whirl, move the mouse pointer to the column header area and position the pointer at the right edge of the column you want to adjust, and then drag the edge to the left (to make the column narrower) or to the right (to make the column wider).

Fitting the column width to the data

If you have a long column of entries of varying widths, getting the optimum column width may take you a few tries. To avoid guesswork, you can have Sheets set the width automatically using the *Fit to Data* feature. When you use this feature, Sheets examines the column's contents and sets the width slightly wider than the widest entry. Sheets gives you two methods to try:

- » Follow the steps outlined earlier, in the “[Specifying a column width](#)” section, but rather than specify a width, click the *Fit to Data* radio button.
- » Position the mouse pointer at the right edge of the column header and double-click.

Adjusting the row height

You can set the height of your sheet rows using techniques similar to those used for adjusting column widths. Sheets normally adjusts row heights automatically to accommodate the tallest font in a row. However,

you can make your own height adjustments to give your sheet more breathing room or to reduce the amount of space taken up by unused rows. Sheets measures row height in pixels and sets the default height to 21 pixels. The next three sections take you through the methods Sheets offers to adjust the row height.



WARNING When reducing a row height, always keep the height larger than the tallest font to avoid cutting off the tops of any characters.

Specifying a row height

Sheets allows row heights of between 2 and 2,000 pixels. To specify a row height, follow these steps:

1. If you want to resize multiple rows, select them.

2. Right-click the row header.

Sheets displays a menu of commands for working with rows.

3. Click Resize the Row.

If you selected multiple rows, choose Resize Rows $N-M$, where N is the first selected row and M is the last selected row.

The Resize Row dialog box appears.

4. Click the Specify Row Height radio button.

5. Use the text box to enter the height you want, in pixels.

6. Click OK.

Sheets sets the row height and returns you to the sheet.

Using the mouse to set the row height

You can bypass the Resize Row dialog box entirely by using your mouse to drag a row to the height you want. To try this, move the mouse pointer to the row header area, and position the pointer at the bottom edge of the row you want to adjust, and then drag the edge up (to make the row shorter) or down (to make the row taller).

Fitting the row height to the data

If you've made several font changes and height adjustments to a long row of entries, you may need several tries to set an optimum row height. To avoid guesswork, you can use the Fit to Data feature to set the height automatically to the best fit. Sheets gives you two techniques:

- » Follow the steps outlined earlier, in the “[Specifying a row height](#)” section, but rather than specify a height, click the Fit to Data radio button.
- » Position the mouse pointer at the bottom edge of the row header and double-click.

Hiding columns and rows

Your sheets may contain sensitive information (such as payroll figures) or unimportant information (such as the period numbers used when calculating interest payments). In either case, you can hide the appropriate columns or rows whenever you need to show your sheet to somebody else. The data remain intact but aren't displayed on the screen. Here are the techniques to use:

- » **Hide one or more columns:** Select the columns, right-click any column header, and then choose Hide Columns. Sheets hides the columns and displays left- and right-pointing arrows where the columns would normally appear, as shown in [Figure 8-7](#).
- » **Unhide columns:** In the column headers, click either the left- or right-pointing arrow to unhide the hidden columns.
- » **Hide one or more rows:** Select the rows, right-click any row header, and then choose Hide Rows. Sheets hides the rows and displays up- and down-pointing arrows where the rows would normally appear.
- » **Unhide rows:** In the row headers, click either the up- or down-pointing arrow to unhide the hidden rows.

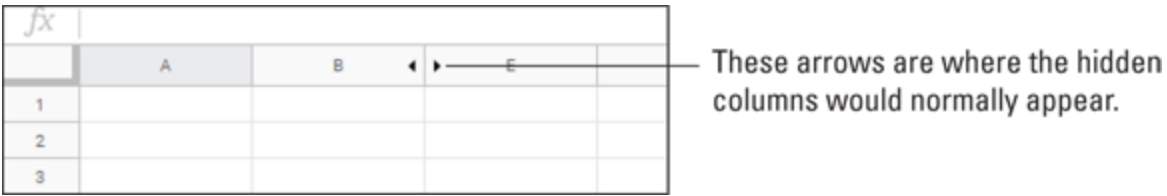


FIGURE 8-7: Sheets replaces hidden columns with arrows.

Inserting columns and rows

When you build a sheet model, you usually work down and to the right, adding new rows to the bottom of the model and new columns to the right. However, having to add new data within the existing model is common, and Sheets offers the following methods for inserting columns and rows within existing data:

- » **Inserting one or more columns:** Select the column before or after where you want to insert the new column. (If you want to insert multiple columns, select the same number of columns.) Right-click the column header and then choose either Insert *X* Left (to insert *X* columns to the left of the selected columns) or Insert *X* Right (to insert *X* columns to the right of the selected columns).
- » **Inserting one or more rows:** Select the row above or below where you want to insert the new row. (If you want to insert multiple rows, select the same number of rows.) Right-click the row header and then choose either Insert *X* Above (to insert *X* rows above the selected rows) or Insert *X* Below (to insert *X* rows below the selected rows).

Deleting columns and rows

No sheet is ever built perfectly from scratch, so you often end up with incorrect, old, or unnecessary data that you need to remove. Sheets offers these methods for deleting columns and rows:

- » **Deleting one or more columns:** Select the column or columns you want to delete, right-click the column header, and then choose either Delete Column (if you selected a single column) or Delete Columns

X – Y (where X and Y are the first and last letters of the range of columns you selected).

- » **Deleting one or more rows:** Select the row or rows you want to delete, right-click the row header, and then choose either Delete Row (if you selected a single row) or Delete Rows N – M (where N and M are the first and last numbers of the range of rows you selected).

Chapter 9

Crunching Numbers

IN THIS CHAPTER

- » Creating powerful formulas with your bare hands
 - » Beefing up your formulas with functions
 - » Sorting and filtering your sheet data
 - » Creating data eye candy with charts
 - » Creating a nice, neat summary of your data with a pivot table
-

Although you can use Sheets as a simple database for storing text and numbers, that's not what the program is designed to do. At its heart, Sheets is a powerful and sophisticated calculator that can take the raw data on a sheet and summarize it, analyze it, visualize it, and manipulate it in many different ways. In short, Sheets is all about crunching numbers, and that prowess is what this chapter is all about. In the pages that follow, I help you explore such number-crunching features as formulas, functions, sorting and filtering data, visualizing data with charts, analyzing data with pivot tables, and much more. There's a lot of ground to cover, so you had better get started... .

Building Formulas

The secret behind Sheets' calculation prowess is the *formula*, a collection of values and symbols that together produce some kind of result. Knowing how to build formulas, particularly if you enhance those formulas with functions, is the royal road to Sheets mastery and to learning everything you can about your data. This section tells you all you need to know to become a master formula builder. After first learning how to make simple calculations, you then learn about

operators and cell references and how to control your formulas to produce accurate results.

Creating a simple formula

This section begins with a simple example so that you get the feel of how to build a formula. This example calculates the mortgage principal by subtracting the down payment (in cell B2) from the house price (in cell B1):

1. **Select the cell in which you want the formula result to appear (such as B3).**

2. **Enter an equal sign (=).**

All Sheets formulas begin with an equal sign. Note that the equal sign appears both in the cell itself and in the formula bar. Everything you enter in the cell is mirrored in the formula bar. In fact, you can turn things around and enter stuff in the formula bar and Sheets will automatically mirror that text in the cell.

3. **Select B1.**

What you're doing here is asking Sheets to include whatever value is in cell B1 to your formula. Sheets does that by adding "B1" to the formula, both in the cell and in the formula bar.

4. **Enter a minus sign (-).**

Sheets adds the minus sign in the cell and in the formula bar.

5. **Select B2.**

Again, you're asking Sheets to include whatever value is in cell B2 to your formula, which Sheets does by adding "B2" to the formula, both in the cell and in the formula bar.

The formula now reads =B1-B2, which asks Sheets to take whatever value is in cell B1 and subtract whatever value is in cell B2.

6. **Press Enter.**

Sheets calculates the formula result.

[Figure 9-1](#) shows this example in action. As you can see, the formula result appears in cell B3, whereas the formula itself appears on the formula bar when you select cell B3.

All Sheets formulas have this basic structure: an equal sign (=) followed by one or more *operands* — which can be a cell reference, a value, a range, a range name, or a function name — separated by one or more *operators* — the symbols that combine the operands in some way, such as the minus sign (–).

The formula appears in the formula bar.

	A	B	C
1	House Price	\$400,000	
2	Down Payment	\$80,000	
3	Principal	\$320,000	
4			

The formula result appears in the cell.

FIGURE 9-1: A simple formula that calculates the difference between two values.

Here are a few notes to keep in mind when entering your formulas:

- » *When you need to include a cell reference in a formula, just typing the cell address is often tempting. However, to ensure accuracy, always select the cell itself instead of typing its address.*
- » *When you add a cell address to a formula, Sheets colors the address in the formula and surrounds the cell with a dashed border of the same color. For example, the address might appear as blue, and the*

cell might be surrounded by a dashed, blue border. These colors are unique (the next cell reference might use green; the next, magenta; and so on), so you can use them to make sure that you've chosen the correct cell.

» *If you need to make changes to the formula before finalizing it by pressing Enter, you cannot use the arrow keys to move the insertion point because Sheets interprets these keystrokes as attempts to select a cell address for inclusion in the formula. To enable the arrow keys for editing rather than for cell selection, press F2 (on some Macs you might have to press Fn+F2) to put the cell into Edit mode.*

Understanding formula operators

Almost all Sheets formulas fall into one of two categories: arithmetic and comparison. Each category has its own set of operators, and you use each type in different ways, as shown in the rest of this section.

Most of your formulas will be *arithmetic* formulas — that is, they'll combine numbers, cell addresses, and function results with mathematical operators to perform numeric calculations. [Table 9-1](#) lists the operators used in arithmetic formulas.

TABLE 9-1 Sheets Arithmetic Operators

<i>Operator</i>	<i>Example</i>	<i>Result</i>
+ (addition)	=3+2	5
– (subtraction)	=3–2	1
– (negation)	=–3	–3
* (multiplication)	=3*2	6
/ (division)	=3/2	1.5
% (percentage)	=3%	0.03
^ (exponentiation)	=3^2	9

You use a *comparison* formula to compare two or more numbers, text strings, cell contents, or function results. If the statement is true, the

result of the formula is given the logical value `TRUE` (which is equivalent to any nonzero value). If the statement is false, the formula returns the logical value `FALSE` (which is equivalent to 0). [Table 9-2](#) lists the operators you can use in comparison formulas.

TABLE 9-2 Sheets Comparison Operators

<i>Operator</i>	<i>Example</i>	<i>Result</i>
= (equal to)	=3=2	FALSE
> (greater than)	=3>2	TRUE
< (less than)	=3<2	FALSE
>= (greater than or equal to)	=“a”>=“b”	FALSE
<= (less than or equal to)	=“a”<=“b”	TRUE
<> (not equal to)	=“a”<>“b”	TRUE

Avoiding problems with cell references

Cell references in a formula appear to be straightforward. After all, if you reference cell B1, surely that's the end of the story. Unfortunately, the way Sheets interprets cell references in a formula is a bit counterintuitive and can cause problems if you don't understand how it works.

Let's begin with a real-world example. Imagine a conference center with 26 halls, named Room A, Room B, and so on. Imagine further that each hall has three doors — front, middle, and back — and that for security reasons the middle and back doors are always locked. Now imagine, if you will, *The Tale of Two Signs*:

- » All the hall doors look the same, so you want to put a sign on the (locked) back door that directs people to the front door. For Room A, one possibility is a sign that says “Enter using front door of Room A.” That would work, but you have 25 other halls, so you need a different sign for each back door. A better solution is a nonspecific

sign such as “Hall entrance two doors up.” This way, you need to construct just one sign and make copies for the other doors.

- » In the conference center foyer, you want to place a sign for a meeting that's taking place in Room C. One possibility is a sign by the main hallways that says “Penske meeting: seven doors down.” That works (although it's a bit odd), but what if you want to place a second sign just after Room A? Then you'd need a different sign that says “Penske meeting: four doors down.” A better solution is a specific sign such as “Penske meeting: Room C.” This way, you just need to construct one sign and make copies for the other locations.

A nonspecific description such as “two doors up” is equivalent to what is called a *relative cell reference* in Sheets. For example, if you're entering a formula in cell B3 and you reference cell B1, Sheets doesn't interpret this directly as “cell B1.” Instead, it interprets the reference as “the cell that's two cells above the current cell.”

This feature sounds strange, but it can actually be quite useful. Suppose that you create a second set of House Price and Down Payment data for comparison purposes and you again want to calculate the principal, as in [Figure 9-2](#). You can reconstruct the formula from scratch, but copying the original formula and then pasting it where you want the new formula to appear is much easier. [Figure 9-2](#) shows the result when the original formula is copied and then pasted into cell B7.

Sheets adjusts the cell references.

	A	B	C
1	House Price	\$400,000	
2	Down Payment	\$80,000	
3	Principal	\$320,000	
4			
5	House Price	\$600,000	
6	Down Payment	\$110,000	
7	Principal	\$490,000	
8			
9			

FIGURE 9-2: With relative referencing, Sheets adjusts cell references automatically when you copy a cell containing a formula.

As you can see on the formula bar, Sheets has changed the cell references to B5 and B6. That's because the original contained relative cell references, so when the reference “the cell that is two cells above the current cell” is placed in B7, it now refers to cell B5. Thanks to relative referencing, everything comes out perfectly. You’ll find that this way of handling copy operations saves you incredible amounts of time when you’re building your sheet models.



REMEMBER Just to keep you on your toes, Sheets adjusts relative cell references when you copy a formula, but it doesn't adjust relative cell references when you move a cell.

However, you need to be a bit careful when copying or moving formulas. To see why, let's look at a different example. [Figure 9-3](#) shows a sheet that has a fixed house price and two different down payments. The idea here is to see the different Principal value that results if you use a different down payment. For Down Payment 1, the sheet uses the formula =A2-B5, as shown on the formula bar, in [Figure 9-3](#).

	A	B	C
1	House Price		
2	\$400,000		
3			
4		Down Payment #1	Down Payment #2
5		\$80,000	\$110,000
6	Principal	\$320,000	
7			

FIGURE 9-3: This sheet calculates the Principal amount for two different down payments.

Suppose that now you copy the formula from B6 to C6. The result, as you can see in [Figure 9-4](#), is incorrect. What happened? The problem is the revised formula in cell C6, which (as you can see on the formula bar in [Figure 9-4](#)) is =B2-C5. Cell B2 is blank, and Sheets interprets this as 0, so the result is incorrect. The problem is the relative cell references. When you copy the formula and paste it one cell to the right, Sheets adjusts the cell reference by one cell to the right. Unfortunately, this means that the original reference to cell A2 changes to B2, thus resulting in the error.

The solution in such cases is to tell Sheets when you want a particular cell reference to remain constant when you copy the formula. Returning

to the real-world example from earlier in this section, this is the equivalent of the description “Penske meeting: Room C.” In Sheets, this type of explicit direction is called an *absolute cell reference*, and it means that Sheets uses the actual address of the cell.

	A	B	C	D
1	House Price			
2	\$400,000			
3				
4		Down Payment #1	Down Payment #2	
5		\$80,000	\$110,000	
6	Principal	\$320,000	-\$110,000	
7				

FIGURE 9-4: Copying the formula in cell B6 causes the revised formula in cell C6 to be incorrect.

You tell Sheets to use an absolute reference by placing a dollar sign (\$) before both the row number and column letter of the cell address. For example, Sheets interprets the reference $\$A\2 as “the cell A2.” No matter where you copy a formula containing such an address, the cell reference doesn’t change. The cell address is said to be *anchored*.

To fix the down payment sheet, you need to anchor the House Price value in cell A2. You do that by opening cell A6 for editing to see the formula, then changing the original formula in B6 to $=\$A\$2-B5$. As you can see in [Figure 9-5](#), copying this revised formula produces the correct result in cell C6.

fx =\$A\$2-C5				
	A	B	C	D
1	House Price			
2	\$400,000			
3				
4		Down Payment #1	Down Payment #2	
5		\$80,000	\$110,000	
6	Principal	\$320,000	\$290,000	
7				

FIGURE 9-5: When you anchor the House Price value using an absolute cell reference, copying the formula to cell C6 now produces the correct result.

It's also worth noting that Sheets also supports *mixed cell references*, where only the row or only the column is anchored:

- » *Anchor just the cell's row* by placing the dollar sign in front of the row number only — for example, A\$2.
- » *Anchor just the cell's column* by placing the dollar sign in front of the column letter only — for example, \$A2.



TIP To quickly change cell reference formats, place the cursor inside the cell address and keep pressing F4. Sheets cycles through the various formats.

Using Functions for More Powerful Formulas

Suppose, just for fun, that you want to deposit a certain amount in an investment that earns a particular rate of interest over a particular number of years. Assuming that you start at 0, how much will the investment be worth at the end of the term? Given a present value (represented by p_v), a regular payment (p_{mt}), an annual interest rate

(*rate*), and some number of years (*nper*), here's the general calculation that determines the future value of the investment:

```
pv(1 + rate) ^ nper + pmt * (((1 + rate) ^ nper) - 1) / rate
```

Yikes! This formula is scarily complex, particularly given all those parentheses. That complexity wouldn't be a big deal if this formula were obscure or rarely used. However, calculating the future value of an investment is one of the most common Sheets chores. (It is, for example, the central calculation in most retirement planning models.) Having to enter such a formula once is bad enough, but it's one you might need dozens of times. Clearly, entering such a formula by hand multiple times is both extremely time-consuming and prone to errors.

Fortunately, Sheets offers a solution: a function called `FV`, which reduces the earlier formula to the following:

```
fv(rate, number_of_periods, payment_amount, present_value)
```

This formula is much simpler to use and faster to type, *and* you don't have to memorize anything other than the function name, because, as you'll soon see, Sheets shows you the full function syntax as you type it.

In general, a *function* is a predefined formula that calculates a result based on one or more *arguments*, which are the function's input values (such as `rate` and `number_of_periods` in the `FV` example). Note that most functions have at least one argument, and that for functions with two or more arguments, in most cases some of those arguments are required (that is, Sheets returns an error if the arguments aren't present), and some are optional.



REMEMBER Functions not only simplify complex mathematical formulas, but they also enable you to perform powerful calculations such as statistical correlation, the number of work days between two dates, and square roots.

Entering functions directly

The quickest way to include a function in a formula is to type the function and its arguments directly into the cell. Here are the steps:

1. **Get your formula off to a flying start by typing an equal sign (=), then continue entering your formula up to the point where you want to add the function.**
2. **Start entering the function name.**



REMEMBER Although function names are uppercase, it doesn't matter if you use lowercase or uppercase letters when entering the name. If you use lowercase letters, Sheets helpfully converts the name to uppercase automatically when you complete your formula.

As you type, Sheets displays a list of function names that begin with the characters you've entered so far. Type `f`, for example, you see a list of functions that begin with `F`.

3. **Use the up- and down-arrow keys to select a function name and see a description of the function.**
4. **To add the selected function name to the formula, press Tab.**

Sheets adds the function name and a left parenthesis: `(`. If you're typing the function name by hand, be sure to add the left parenthesis after the name.

Sheets now displays an alarmingly large banner with the function syntax, an example, and explanations for each argument, as shown in [Figure 9-6](#). Here are two things to note about the syntax:

- The current argument — that is, the one you're about to enter or are in the middle of entering, is highlighted. For example, when you type `fv(` into the cell, you see the `rate` argument highlighted. When you enter the current argument and then a comma `,`, the next argument in the list appears highlighted.
- The optional arguments are surrounded by square brackets: `[` and `]`.

5. Enter the required arguments, separated by commas.
6. Enter the optional arguments you want to use, if any, separated by commas.
7. Enter the right parenthesis:).
8. Complete the rest of your formula, if needed.
9. Press Enter.

Sheets enters the formula and calculates the result. [Figure 9-7](#) shows the result for the FV function.

	A	B	C	D
1	Annual Interest Rate	5%		
2	Term (Years)	10		
3	Annual Deposit	-\$1,000		
4	Initial Deposit	-\$10,000		
5	Future Value	=fv(

FV(rate, number_of_periods, payment_amount, present_value, [end_or_beginning])

Example
FV(2%, 12, 100, 400, 0)

Summary
Calculates the future value of an annuity investment based on constant-amount periodic payments and a constant interest rate.

rate
The interest rate.

number_of_periods
The number of payments to be made.

payment_amount
The amount per period to be paid.

present_value
The current value of the annuity.

end_or_beginning - [optional]
Whether payments are due at the end ('0') or beginning ('1') of each period.

[Learn more about FV](#)

FIGURE 9-6: After you type the left parenthesis, Sheets displays a banner with the function syntax and more.



REMEMBER Notice in [Figure 9-7](#) that I used negative numbers for the Annual Deposit and Initial Deposit values. What's up with that? In Sheets, any money that you pay out — such as funds paid into an investment or funds used to make a loan payment — is entered as a negative value, while money you receive — such as interest or dividends from an investment — is entered as a positive value.

fx		=fv(B1,B2,B3,B4)	
	A	B	
1	Annual Interest Rate	5%	
2	Term (Years)	10	
3	Annual Deposit	-\$1,000	
4	Initial Deposit	-\$10,000	
5	Future Value	\$28,866.84	
6			

FIGURE 9-7: The result of the FV function.

Entering functions via the Function menu

The pop-up function list and syntax banner that I talk about in the earlier section “[Entering functions directly](#)” are so useful that typing functions by hand is almost always the fastest way to incorporate functions into your formulas. However, if you're not sure which function you need, the Function menu might help because it organizes the functions into categories such as Financial, Logical, Math, and Statistical.

Here are the steps to follow to include a function in a formula by using the Function menu:

1. **Enter your formula up to the point where you want to add the function.**
2. **∑ Choose Insert ⇒ Function from the menu bar or click the toolbar's Function button.**

The Function menu shows a few common functions — SUM, AVERAGE, COUNT, MAX, and MIN — at the top, followed by the function categories.

- 3. Choose a function category.**
- 4. Select the function you want to insert.**

Sheets adds the function name and a left parenthesis — (— and displays a banner like the one shown earlier, in [Figure 9-6](#).
- 5. Enter the required arguments, separated by commas.**
- 6. Enter the optional arguments you want to use, if any, separated by commas.**
- 7. Complete the rest of your formula, if needed.**
- 8. Press Enter.**

Sheets enters the formula and calculates the result.

Using a Range as a Database

Sheets can operate as a simple database, with each column representing a field and each row representing a record. When you use a range to store data in this way, you can also perform several database-like operations on the data, including sorting the range and filtering the range. The next two sections show you how to perform these operations on your data.

Sorting a range

One benefit of using Sheets as a database is that you can rearrange the records so that they're sorted alphabetically or numerically. This feature enables you to view the data in order by customer name, account number, part number, or any other field. You even can sort on multiple fields, which would enable you, for example, to sort a client list by country and then by city within each state.

If you want to sort the range on the data in a single column, select any cell within that column and then use one of the following techniques:

- » **To sort in ascending order:** Choose Data ⇒ Sort Sheet by Column X , A to Z (where X is the letter of the column).
- » **To sort in descending order:** Choose Data ⇒ Sort Sheet by Column X , Z to A (where X is the letter of the column).

If you prefer to sort on the data in two or more columns, follow these steps instead:

1. **Select the range you want to sort.**
If you want to sort on multiple columns, select those columns.
2. **Choose Data ⇒ Sort the Range.**
Sheets displays the Sort Range dialog box.
3. **If the selected range has a header row that you don't want Sheets to include in the sort, select the Data Has Header Row check box.**
4. **Use the Sort By list to select the column you want to use for the sort.**
5. **Choose the sort order for the column: A to Z (ascending) or Z to A (descending).**
6. **Select Add Another Sort Column, and then repeat Steps 4 and 5 to set the sort options for the new column.**
7. **Repeat Step 6 to sort on other fields.**

[Figure 9-8](#) shows the Sort Range dialog box, set up to sort first on the Country field, then on the Region field, and then on the PostalCode field.

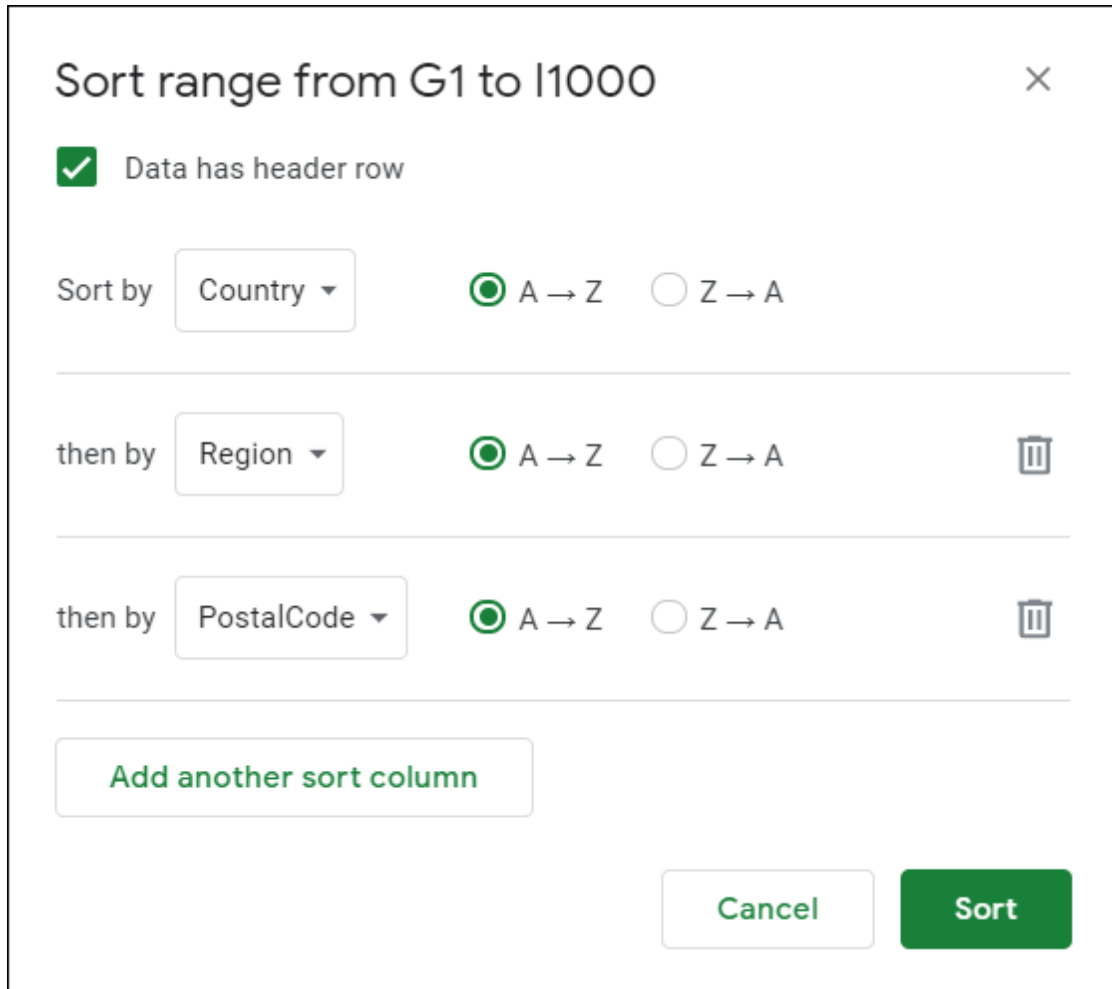


FIGURE 9-8: You can sort a range using multiple columns.



WARNING Be careful when you sort list records that contain formulas. If the formulas use relative addresses that refer to cells outside their own record, the new sort order might change the references and produce erroneous results. If your list formulas must refer to cells outside the list, be sure to use absolute addresses.

8. Click Sort.

Sheets sorts the range.

Filtering a range

If your range has a large amount of data, finding what you want can be difficult. Sorting can help, or you can use the Edit menu's Find and Replace command to locate data. However, in some cases, what you really need to do is work with just a subset of the data. You can do so by *filtering* the data so that you see only those records that meet your criteria. The next few sections show you how to filter data in Sheets.

Activating the filter

The Sheets Filter feature makes filtering out subsets of your data as easy as choosing an option from a drop-down list. In fact, that's literally what happens, as you'll soon see. First, turn on Filter by choosing Data ⇒ Create a Filter from the menu bar. Sheets adds Filter icons in the cells containing the data's column labels. Clicking one of these icons displays a list of filtering options for that column. For example, [Figure 9-9](#) shows the filter list for the Country field in a database of customers.

Filtering by the values in a column

The bottom part of a column's filter list includes check boxes for the unique items in the column. Use the following techniques to filter the range using these check boxes:

- » *To hide every row that contains a particular column value, deselect that value's check box.*
- » *To filter the range to show only those records that match just a few column values, choose the Clear link to deactivate every check box in the list, and then select the check boxes for the values you want to see.*

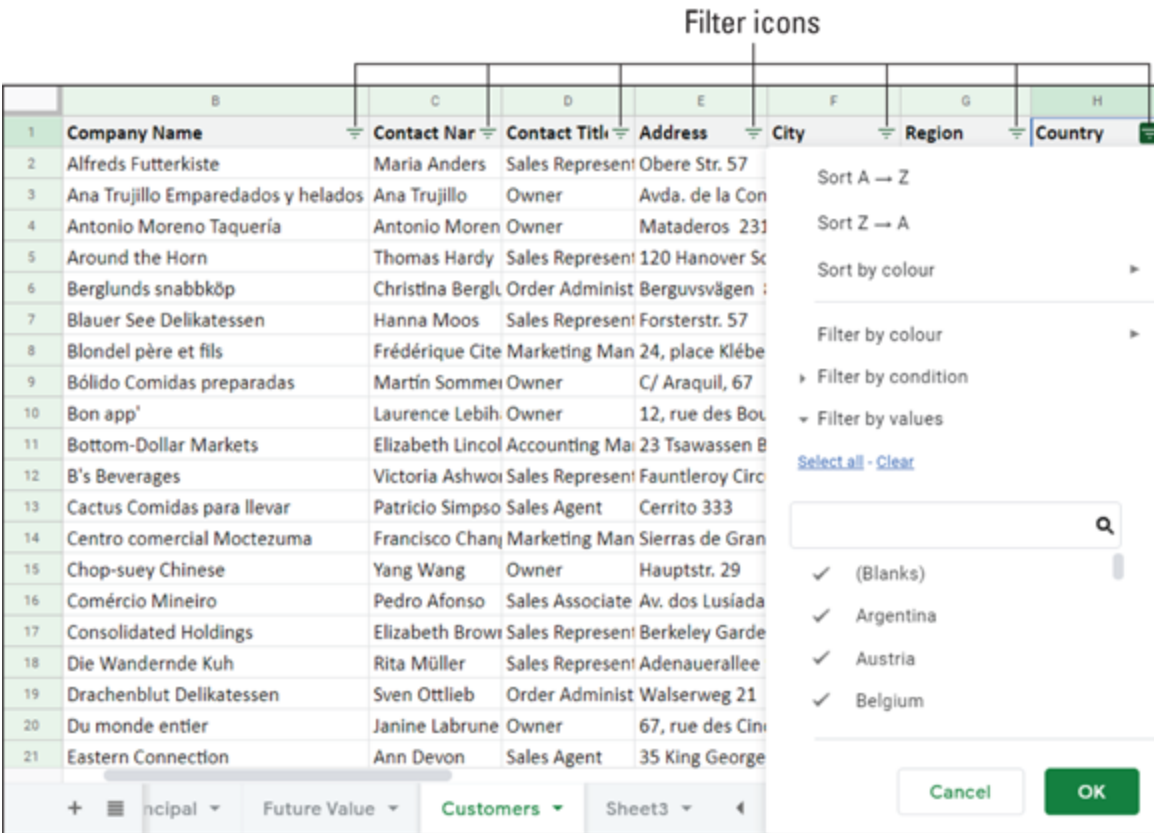


FIGURE 9-9: For each column, Filter adds an icon that opens the list of that column's filtering options.

To continue filtering the data, you can select an item from one of the other lists. For example, after filtering by country, you can then choose a state from the Region field to see only the customers from that state. When you're done, click OK to apply the filter.



REMEMBER To remove a filter, display the filter list and then choose the Select All link.

Filtering by condition

The Filter lists enable you to filter the range based on the exact values in a column. However, you can also filter the range based on less-stringent criteria. For example, you can filter based on column text values that begin or end with a particular string or on column numeric values that fall within a particular range.

Pull down the column's filter list and then select Filter By Condition to open the menu of conditions. You see three type of conditions:

- » **Text:** These filters are related to text values and include conditions such as Text Contains, Text Starts With, and Text Is Exactly. Each condition displays a text box so that you can enter the specific criteria.
- » **Numeric:** These filters are related to numeric values and include conditions such as Is Equal To, Greater Than, and Is Between. Each condition displays one or two text boxes so that you can enter the specific criteria.
- » **Date:** These filters are related to date values and consist of the conditions Date Is, Date Is Before, and Date Is After. Each condition displays a list so that you can enter the specific criteria.

When you're ready, click OK to apply the filter.

Visualizing Data with Charts

One of the best ways to analyze your sheet data — or get your point across to other people — is to display your data visually in a chart. Sheets gives you tremendous flexibility when creating charts; it enables you to place charts in separate documents or directly on the sheet itself. Not only that, but you also have dozens of different chart formats to choose from, and if none of Sheets' built-in formats is just right, you can further customize these charts to suit your needs.

Getting to know the chart elements

Before getting down to the nitty-gritty of creating and working with charts, take a look at some chart terminology that you need to become familiar with. [Figure 9-10](#) points out the various parts of a typical chart. I explain each part in [Table 9-3](#).

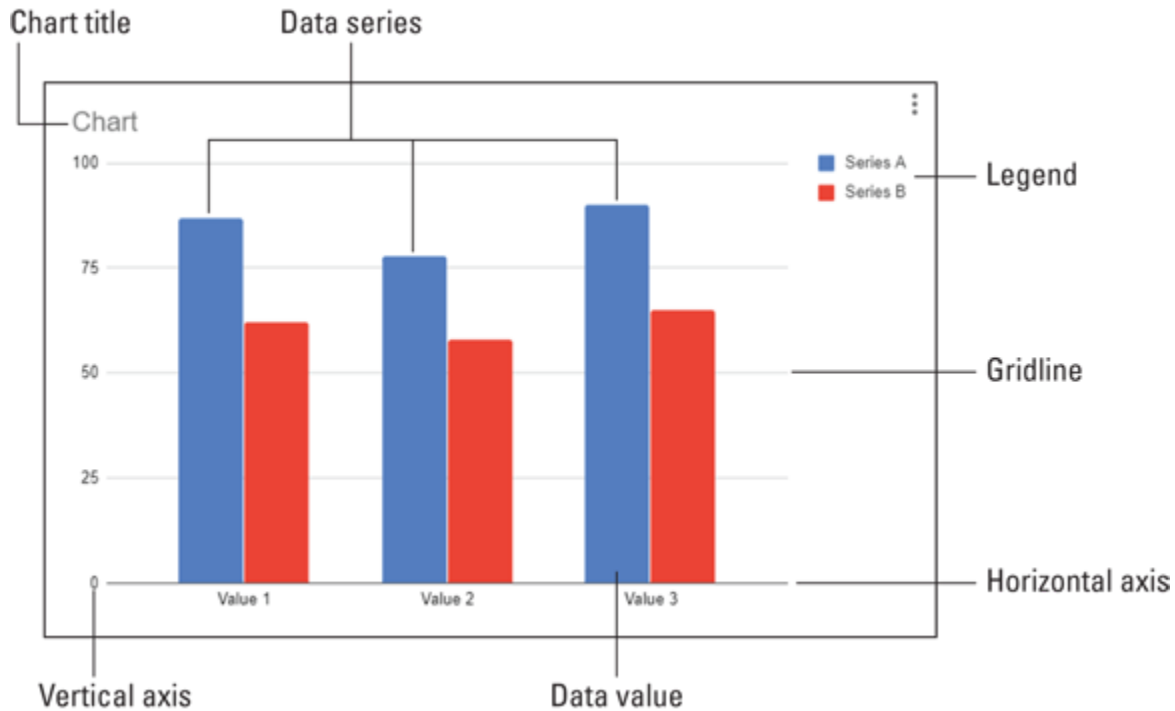


FIGURE 9-10: The elements of a Sheets chart.

TABLE 9-3 The Elements of a Sheets Chart

<i>Element</i>	<i>Description</i>
Category	A grouping of data values on the horizontal axis. Figure 9-10 shows three categories: Value 1, Value 2, and Value 3.
Horizontal axis	The X axis, which contains the category groupings.
Chart title	The title of the chart.
Data marker	A symbol that represents a specific data value. The symbol that's used depends on the chart type. In a column chart such as the one shown in Figure 9-10 , each column is a marker.
Data series	A collection of related data values. Normally, the marker for each value in a series has the same pattern. Figure 9-10 has two series: Series A and Series B. These are identified in the legend.
Data value	A single piece of data. Also called a <i>data point</i> .
Gridlines	Optional horizontal and vertical extensions of the axis tick marks. These make data values easier to read.

Element	Description
Legend	A guide that shows the colors, patterns, and symbols used by the markers for each data series.
Vertical axis	The Y axis, which contains the data values.

How Sheets converts sheet data into a chart

Creating a Sheets chart usually is straightforward, and often you can create one in only a few mouse clicks. However, a bit of background on how Sheets converts sheet data into a chart can help you avoid some charting pitfalls.

When Sheets creates a chart, it examines both the shape and the contents of the range you've selected. From this data, Sheets makes various assumptions to determine what should be on the horizontal axis, what should be on the vertical axis, how to label the categories, and which labels should show within the legend.

The first assumption Sheets makes is that there are more categories than data series. This assumption makes sense because most graphs plot a small number of series over many different intervals. For example, a chart showing monthly sales and profit over a year has two data series (the sales and profit numbers) but 12 categories (the monthly intervals). Consequently, Sheets assumes that the horizontal axis of the chart runs along the longest side of the selected sheet range.

The chart shown in [Figure 9-11](#) is a plot of the range A1:D3. Because, in this case, the range has more columns than rows, Sheets uses each column as a category. Conversely, [Figure 9-12](#) shows the plot of the range A1:C4, which has more rows than columns. In this case, Sheets uses each row as a category.

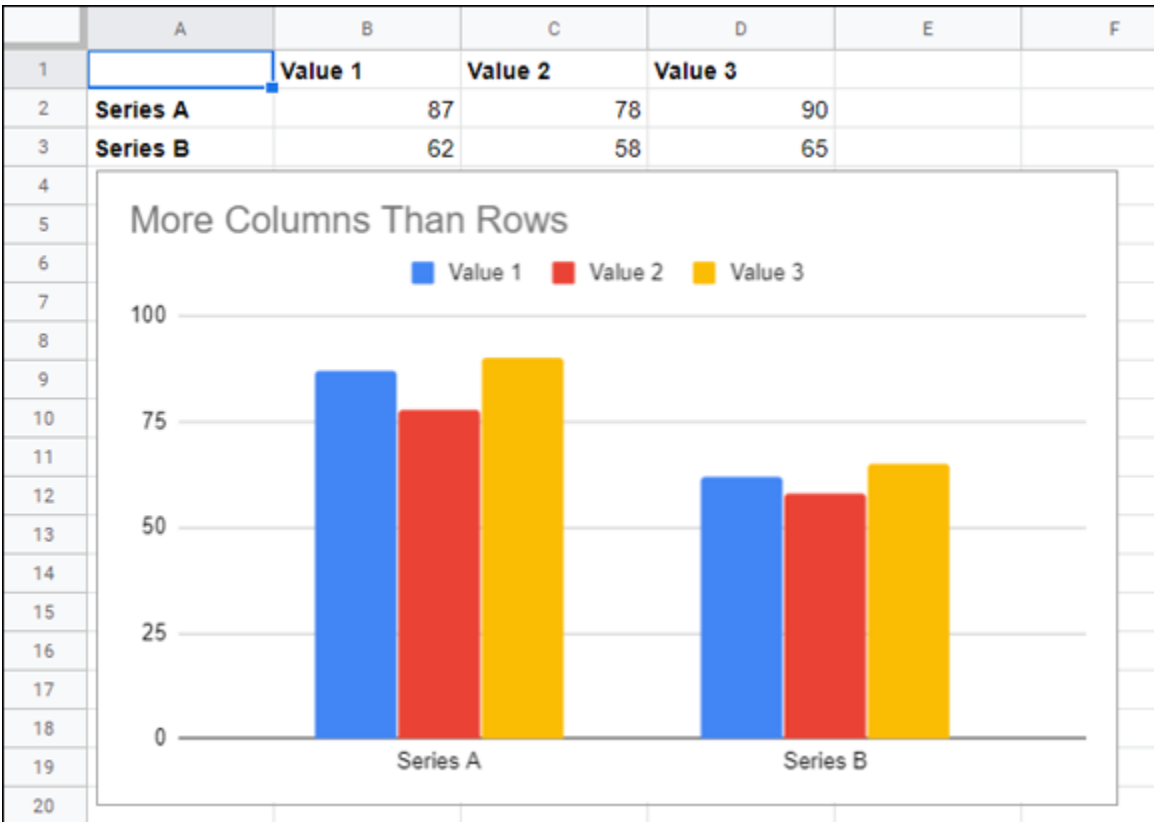


FIGURE 9-11: A chart created from a range with more columns than rows.

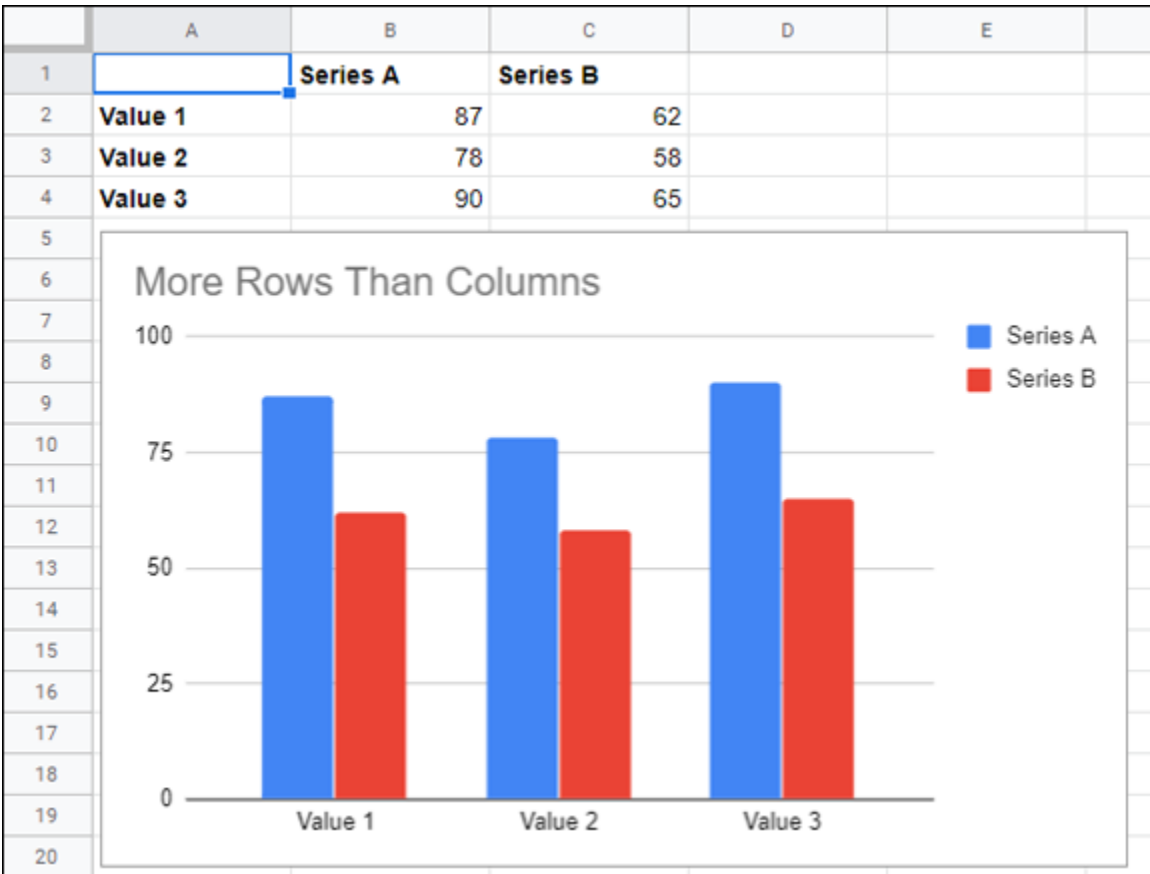


FIGURE 9-12: A chart created from a range with more rows than columns.

The second assumption Sheets makes involves the location of labels for categories and data series:

- » For a range with more columns than rows (such as in [Figure 9-11](#)), Sheets uses the contents of the top row (row 1 in [Figure 9-11](#)) as the category labels, and the far-left column (column A in [Figure 9-11](#)) as the data series labels.
- » For a range with more rows than columns (such as in [Figure 9-12](#)), Sheets uses the contents of the far-left column (column A in [Figure 9-12](#)) as the category labels, and the top row (row 1 in [Figure 9-12](#)) as the data series labels.



REMEMBER If a range has the same number of rows and columns, Sheets uses the columns as categories. Also, Sheets uses the top row for the category labels and the far left column for the data series labels.

Creating a chart

When plotting your sheet data, the resulting chart sits on top of your sheet and can be moved, sized, and formatted. The chart is linked with the sheet data, so any changes you make to the data are automatically updated in the chart. Nice!

The basic steps for creating a chart require just a few mouse movements, as the following steps show:

1. Select the range you want to plot.

Be sure to include the row and column labels, if there are any. Also, make sure that no blank rows are between the column labels and the data.

2. Choose Insert ⇒ Chart from the menu bar.

Sheets opens the Chart Editor pane, shown in [Figure 9-13](#).

3. Use the Chart Type list to choose the kind of chart you want to use.

4. If you want to mess around with fonts, colors, and other chart formatting fun, select the Customize tab and then choose the chart element you want to tweak: Chart Style, Chart & Axis Titles, or Series, for example.

5. When you're done with the Chart Editor, click Close (X).

6. Position the chart on the sheet using the following techniques:

- *To move the chart*, click-and-drag any empty section of the chart.
- *To size the chart*, click-and-drag a chart corner or the middle of any side of the chart border.

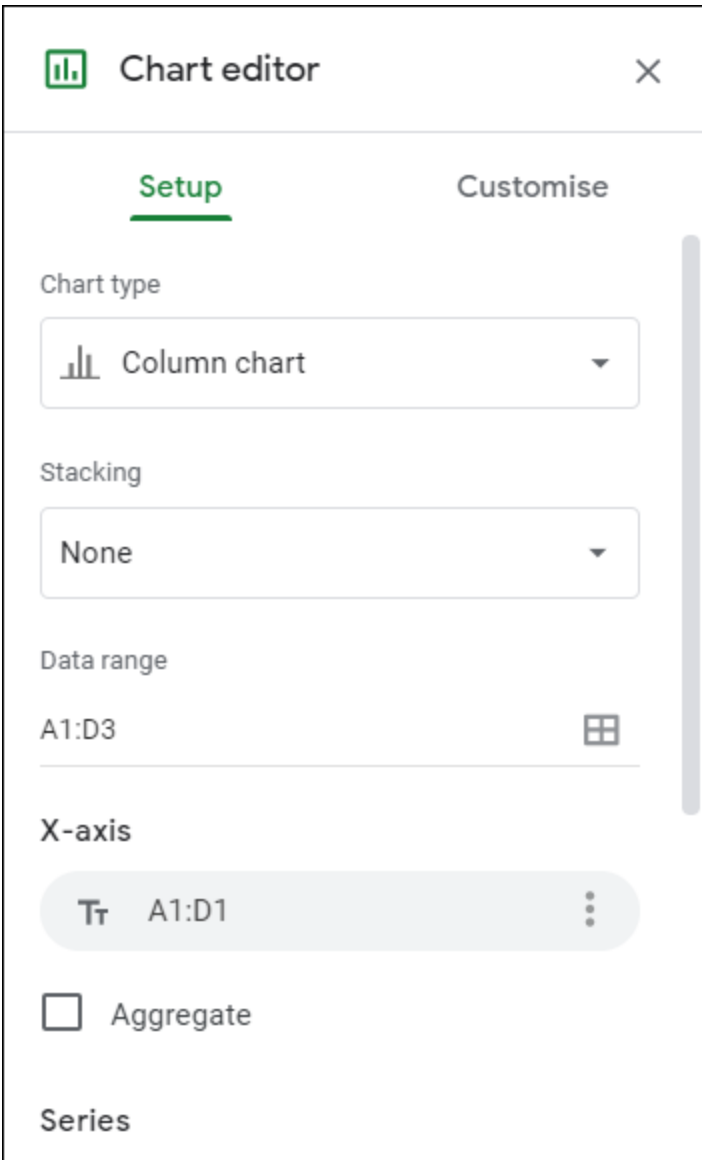


FIGURE 9-13: Use the Chart Editor to set up your new chart.

Moving a chart to its own sheet

After you create a chart, you might decide later that you want to move the chart to its own sheet. Easier done than said:

1. **Select the chart you want to move.**
2. **Click the More Options button. (Refer to the three vertical dots in [Figure 9-14](#).)**
3. **Select the Move to Own Sheet option.**

Sheets moves the chart to a separate sheet.

Editing the chart

After you've created a chart, you may decide that the existing chart type doesn't display your data the way you want. Or, you may want to experiment with different chart types to find the one that best suits your data. Fortunately, the chart type isn't set in stone — you can change it at any time. You can also change the formatting and perform any other tasks in the Chart Editor. Here's how:

1. **Select the chart you want to edit.**
2. **Click the More Options button. (Refer to the three vertical dots in [Figure 9-14](#).)**

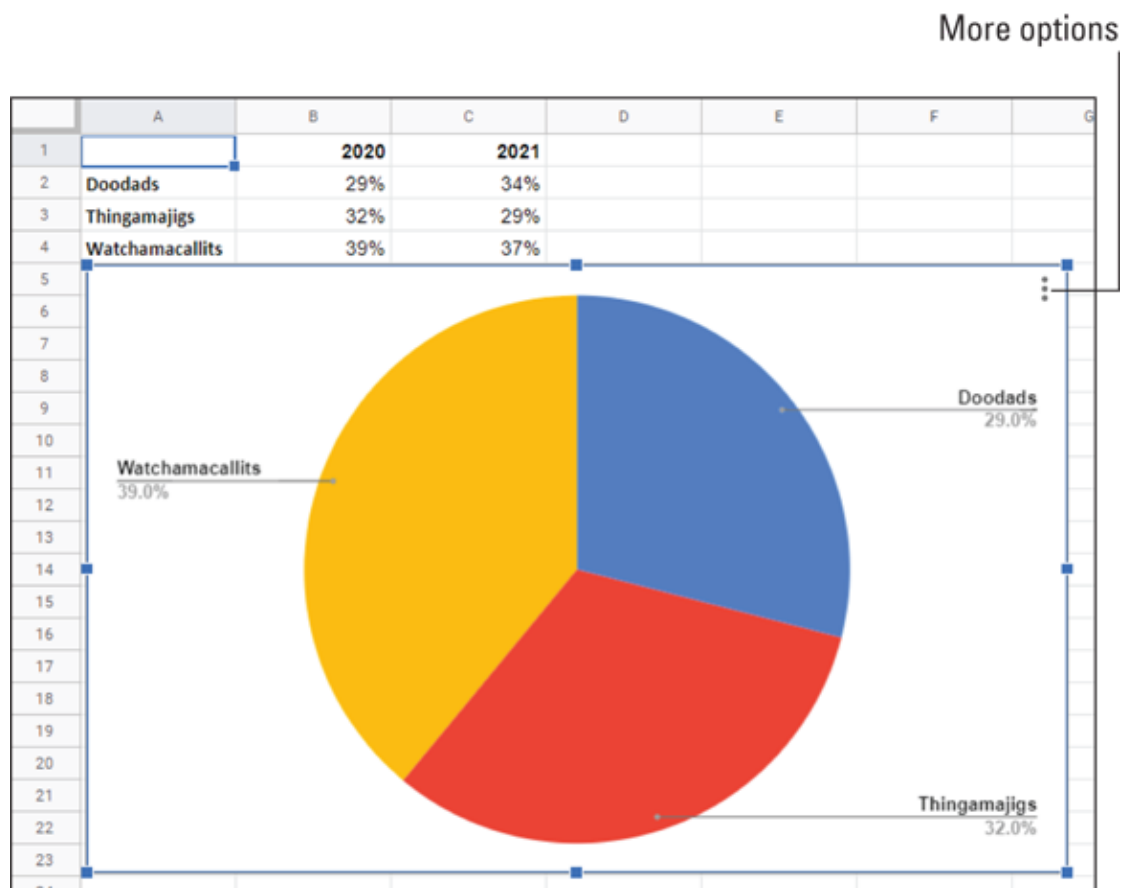


FIGURE 9-14: Click the More Options button to make changes to the chart.

3. **Choose the Edit the Chart option.**

Sheets opens the Chart Editor.

4. **Make your changes to the chart type, chart settings, chart formatting, and so on.**

5. **Click Close (X).**

Sheets updates your chart.

Building Pivot Tables

It's not that unusual for a sheet to contain thousands of rows. Let's face it: Figuring out how to glean useful insights from that much data will either keep you awake at night or cause nightmares if you do sleep. Want to get some quality shut-eye? No need for sleeping pills when Sheets offers a powerful and versatile data analysis tool called a *pivot table*, which enables you to take those thousands of rows and summarize them in a concise tabular format. You can then manipulate the layout of — or *pivot* — the pivot table to see different views of your data.

This section shows you everything you need to know to get started with what is arguably the most useful data-analysis tool in Sheets. You learn how to create pivot tables, refresh them, pivot them, group them, filter them, and more.

Understanding pivot tables

In a general sense, pivot tables take a large amount of information and condense that data into a report that tells you something useful or interesting. For example, take a look at the table shown in [Figure 9-15](#). This table contains well over 100 records, each of which is an order from a sales promotion. That's not a ton of data in the larger scheme of things, but trying to make sense of even this relatively small dataset just by eyeballing the table's contents is futile. For example, how many earbuds were sold via the social media advertising? Who knows? Ah, but now look at [Figure 9-16](#), which shows a pivot table built from the order data. This report tabulates the number of units sold for each product based on each promotion. From here, you can quickly see that 322 earbuds were sold via social media advertising. *That* is what pivot tables do.

	A	B	C	D	E	F
1	SUMMER SALES PROMOTION - ORDERS					
2	Date	Product	Quantity	Net \$	Promotion	Advertisement
3	June 1, 2020	Smartphone case	11	\$119.70	1 Free with 10	Social media
4	June 1, 2020	HDMI cable	6	\$77.82	Extra Discount	Blog network
5	June 1, 2020	USB car charger	15	\$100.95	Extra Discount	Search
6	June 1, 2020	HDMI cable	11	\$149.71	1 Free with 10	Blog network
7	June 2, 2020	USB car charger	22	\$155.40	1 Free with 10	Blog network
8	June 2, 2020	USB car charger	3	\$20.19	Extra Discount	Search
9	June 2, 2020	Earbuds	5	\$33.65	Extra Discount	Social media
10	June 2, 2020	Smartphone case	22	\$239.36	1 Free with 10	Search
11	June 2, 2020	HDMI cable	10	\$129.70	Extra Discount	Blog network
12	June 5, 2020	USB car charger	22	\$155.40	1 Free with 10	Blog network
13	June 5, 2020	Smartphone case	8	\$82.96	Extra Discount	Social media
14	June 5, 2020	Smartphone case	22	\$239.40	1 Free with 10	Social media
15	June 5, 2020	Earbuds	55	\$388.50	1 Free with 10	Blog network
16	June 5, 2020	USB car charger	25	\$168.25	Extra Discount	Search
17	June 5, 2020	HDMI cable	22	\$299.42	1 Free with 10	Blog network
18	June 6, 2020	USB car charger	33	\$256.41	1 Free with 10	Blog network

FIGURE 9-15: Some great data, but how do you make sense of it?

	A	B	C	D	E
1	<i>SUM of Quantity</i>	<i>Advertisement</i>			
2	<i>Product</i>	Blog network	Search	Social media	Grand Total
3	Earbuds	555	562	322	1,439
4	HDMI cable	719	587	402	1,708
5	Smartphone case	546	460	338	1,344
6	USB car charger	1,596	1,012	752	3,360
7	Grand Total	3,416	2,621	1,814	7,851

FIGURE 9-16: The pivot table creates order out of data chaos.

Pivot tables help you analyze large amounts of data by performing three operations: grouping the data into categories, summarizing the data using calculations, and filtering the data to show just the records you want to work with:

- » **Grouping:** A pivot table is a powerful data-analysis tool in part because it automatically groups large amounts of data into smaller,

more manageable chunks. Suppose that you have a data source with a Region field in which each item contains one of four values: East, West, North, and South. The original data may contain thousands of records, but if you build your pivot table using the Region field, the resulting table has just four rows — one each for the four unique Region values in your data.

You can also create your own grouping after you build your pivot table. For example, if your data has a Country field, you can build the pivot table to group all the records that have the same Country value. When you have done that, you can further group the unique Country values into continents: North America, South America, Europe, and so on.

- » **Summarizing:** In conjunction with grouping data according to the unique values in one or more fields, Sheets also displays summary calculations for each group. The default calculation is Sum, which means that for each group, Sheets totals all the values in some specified field. For example, if your data has a Region field and a Sales field, a pivot table can group the unique Region values and display the total of the Sales values for each one. Sheets has other summary calculations, including Count, Average, Maximum, Minimum, and Standard Deviation.

Even more powerful, a pivot table can display summaries for one grouping broken down by another. Suppose that your sales data also has a Product field. You can set up a pivot table to show the total sales for each product, broken down by region.

- » **Filtering:** A pivot table also enables you to view just a subset of the data. For example, by default, the pivot table's groupings show all the unique values in the field. However, you can manipulate each grouping to hide those that you don't want to view. Each pivot table also comes with a feature that enables you to apply a filter to the entire pivot table. For example, your sales data may also include a Customer field. By placing this field in the pivot table's filter, you can filter the pivot table report to show just the results for a single customer.

Exploring pivot table features

You can get up to speed with pivot tables very quickly after you learn a few key concepts. You need to understand the features that make up a typical pivot table, particularly the four areas — row, column, data, and filter — to which you add fields from your data. [Figure 9-17](#) points out the following pivot table features:

- » **Row area:** Displays vertically the unique values from a field in your data.
- » **Column area:** Displays horizontally the unique values from a field in your data.
- » **Value area:** Displays the results of the calculation that Sheets applied to a numeric field in your data.
- » **Row Field header:** Identifies the field contained in the Row area. You also use the Row Field header to filter the field values that appear in the Row area.
- » **Column Field header:** Identifies the field contained in the Column area. You also use the Column Field header to filter the field values that appear in the Column area.
- » **Value Field header:** Specifies both the calculation (such as Sum) and the field (such as Quantity) used in the Value area.

The diagram shows a pivot table with the following structure:

- Row field header:** Row 1, labeled 'SUM of Quantity'.
- Column field header:** Row 2, labeled 'Advertisement'.
- Value field header:** Column A, labeled 'Product'.
- Column area:** Columns B, C, D, and E, labeled 'Blog network', 'Search', 'Social media', and 'Grand Total'.
- Row area:** Rows 3 through 7, labeled with product names: 'Earbuds', 'HDMI cable', 'Smartphone case', 'USB car charger', and 'Grand Total'.
- Value area:** The numerical data cells within the table.

	A	B	C	D	E
1	SUM of Quantity	Advertisement			
2	Product	Blog network	Search	Social media	Grand Total
3	Earbuds	555	562	322	1,439
4	HDMI cable	719	587	402	1,708
5	Smartphone case	546	460	338	1,344
6	USB car charger	1,596	1,012	752	3,360
7	Grand Total	3,416	2,621	1,814	7,851
8					

FIGURE 9-17: The features of a typical pivot table.

Building a pivot table

If the data you want to analyze exists as a Sheets table, you can use the Summarize with Pivot Table command to quickly build a pivot table report based on your data. You need to specify only the location of your source data and then choose the location of the resulting pivot table.

Here are the steps to follow:

- 1. Select a cell within the data you want to use as the basis for your pivot table.**
- 2. Choose Data ⇒ Pivot Table from the menu bar.**

The Create Pivot Table dialog box shows up. The Data Range box shows the range address of your data. Double-check the address to make sure it's correct, and adjust the address as needed before moving on.

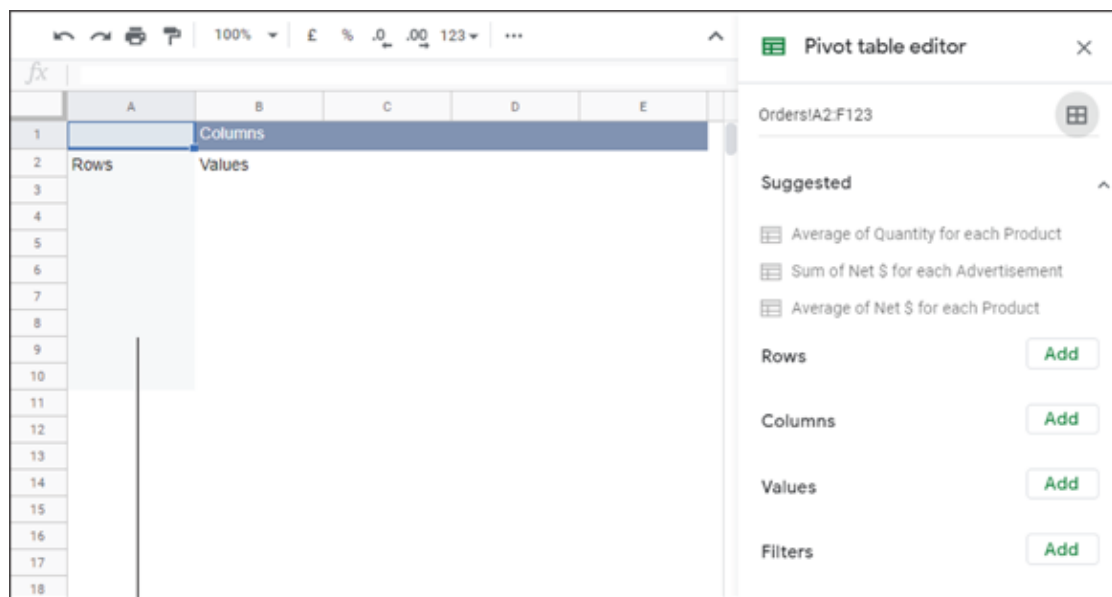
- 3. Click the New Sheet radio button.**

Alternatively, if you want to add the pivot table to an existing location, click the Existing Sheet radio button and then use the range box to select the sheet and cell where you want the pivot table to appear.

4. Click the Create button.

Sheets creates a blank pivot table and displays the Pivot Table Editor pane, as shown in [Figure 9-18](#). This pane contains two main areas:

- A Suggested list that offers a few ready-made pivot table layouts.
- Four boxes representing the four areas of the pivot table: Row, Column, Value, and Filter. To complete the pivot table, your job is to add one or more fields to some (or even all) of these areas.



Blank pivot table

FIGURE 9-18: You start with a blank pivot table and the Pivot Table Editor pane.

5. In the Pivot Table Editor on the right side of the screen, click the Add button beside Rows and then select a field from your data.

For example, using the fields shown in [Figure 9-15](#), you can add the Product field to the Rows area.

Sheets adds the field's unique values to the pivot table's Row area.

Sheets also displays three controls associated with the field:

- *Sort by:* The field on which to sort the Row area

- *Order*: How the items are sorted. Choose either Ascending or Descending
- *Show Totals*: A check box you select in order to have Sheets add a Grand Total row to the bottom of the pivot table

6. In the Pivot Table Editor, click the Add button beside Values and then select a numeric field from your data.

For example, using the fields shown in [Figure 9-15](#), you can select the Quantity field.

Sheets sums the numeric values based on the row values.

Sheets also displays two controls associated with the field:

- *Summarize By*: The operation Sheets uses to calculate the pivot table's values.
- *Show As*: Specifies whether you want the values to appear as raw numbers or as percentages (of the row, column, or grand total).

7. If desired, click the Add button beside Columns and then select a field from your data.

For example, using the fields shown in [Figure 9-15](#), you can add the Advertisement field to the Column area.

Each time you add a field in an area, Sheets updates the pivot table to include the new data.

[Figure 9-19](#) shows a completed pivot table, with fields in the Row, Column, and Value areas.



REMEMBER To remove a field from a pivot table, click the X that appears in the top right corner of the field in the Pivot Table Editor.

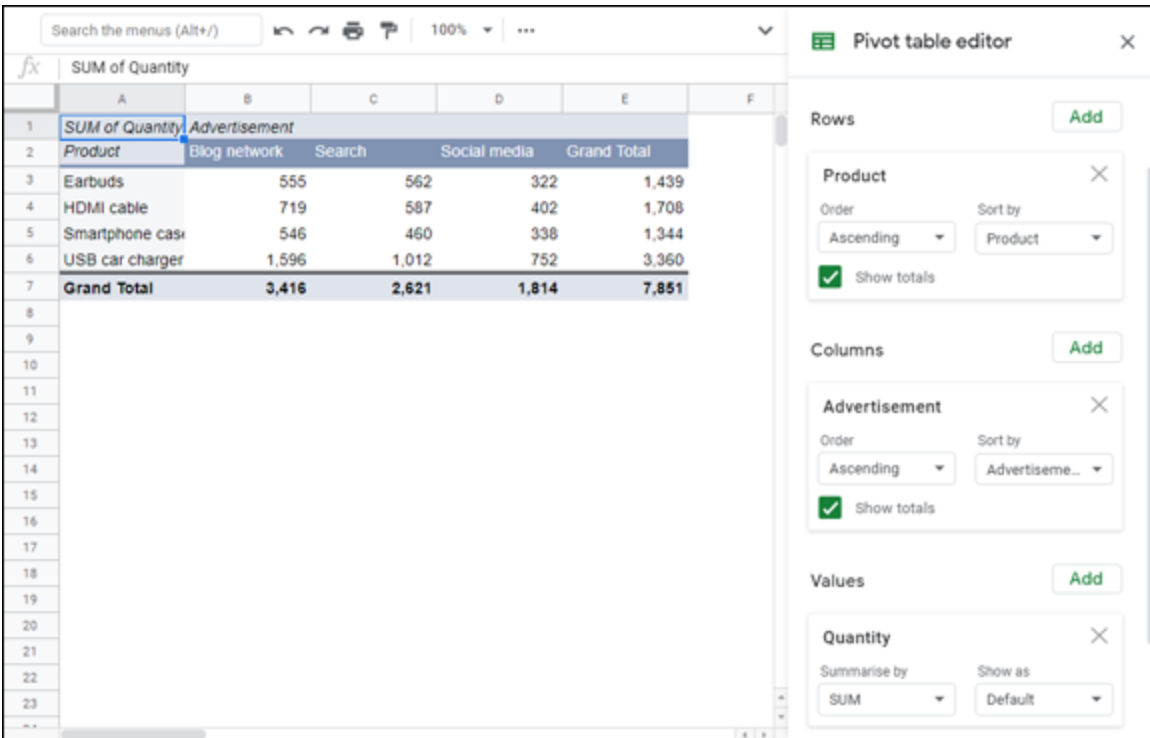


FIGURE 9-19: A pivot table built from the data in [Figure 9-15](#).

Adding multiple fields to a pivot table area

You can add two or more fields to any of the pivot table areas. Having multiple fields is a powerful feature that enables you to perform further analysis of your data by viewing the data differently. Suppose that you're analyzing the results of a sales campaign that ran different promotions in several types of advertisements. A basic pivot table might show you the sales for each product (the Row field) according to the advertisement used (the Column field). You might also be interested in seeing, for each product, the breakdown in sales for each promotion. You can do that by adding the Promotion field to the Row area.



REMEMBER Sheets doesn't restrict you to just two fields in any area. Depending on your data analysis requirements, you're free to add three, four, or more fields to any pivot table area.

Follow these steps to add another field to a pivot table area:

1. **Select a cell within the pivot table to display the Pivot Table Editor.**
2. **Click the Add button for the field you want to work with.**
3. **Select a field from your data.**
4. **Configure the new field as needed.**

Sheets updates the pivot table to include the new data.



TIP After you add a second field to the row or column area, you can change the field positions to change the pivot table view. In the Pivot Table Editor, drag the name of the field you want to move and then drop the field above or below an existing field button.

When you add a second field to the Value area, Sheets moves the labels, such as Sum of Quantity and Sum of Net \$, into the Column area for easier reference. This is also reflected in the addition of a Values As button in the Columns box section of the pivot table Fields pane. This enables you to pivot the values within the report, as I describe in the next section.

Pivoting a field to a different area

A pivot table is a powerful data analysis tool because it can take hundreds or even thousands of records and summarize them into a compact, comprehensible report. However, a pivot table isn't a static collection of sheet cells. Instead, you can move a pivot table's fields from one area of the pivot table to another. Moving fields to various areas enables you to view your data from different perspectives, which can greatly enhance the analysis of the data. Moving a field within a pivot table is called *pivoting* the data.

The most common way to pivot the data is to move fields between the Row and Column areas. However, you can also pivot data by moving a Row or Column field to the Filter area. Either way, you perform the

pivot by dragging the field from its current box in the pivot table Fields pane and then dropping it inside the area where you want it moved.

You can move any Row, Column, or Filter field to the pivot table's Value area. Moving a field to this location may seem strange because Row, Column, and Page fields are almost always text values, and the default value area calculation is Sum. How can you sum text values? You can't, of course. Instead, the default Sheets pivot table summary calculation for text values is CountA (which counts text values). For example, if you drag the Promotion field and drop it inside the Value area, Sheets creates a second value field named CountA of Promotion.

Grouping pivot table values

To make a pivot table with a large number of row or column items easier to work with, you can group the items. For example, you can group months into quarters, thus reducing the number of items from 12 to 4. Similarly, if you use a numeric field in the row or column area, you may have hundreds of items, one for each numeric value. You can improve the report by creating just a few numeric ranges.

Grouping numeric values

Grouping numeric values is useful when you use a numeric field in a row or column field. Sheets enables you to specify numeric ranges into which the field items are grouped. For example, you might have a pivot table of invoice data that shows the extended price (the Row field) and the salesperson (the Column field). It would be useful to group the extended prices into ranges and then count the number of invoices each salesperson processed in each range.

Follow these steps to group numeric values in a pivot table field:

- 1. Right-click any item in the numeric field you want to group.**
- 2. Choose the Create a Pivot Group Rule option from the menu that appears.**

The Grouping Rule dialog box appears.

3. Use the **Minimum Value** text box to enter the starting numeric value.

The value you enter will be the starting value for the lowest range.

4. Use the **Maximum Value** text box to enter the ending numeric value.

The value you enter will be the ending value for the highest range.

5. In the **Interval Size** text box, enter the size you want to use for each grouping.

[Figure 9-20](#) shows the Grouping Rule dialog box set up to create ten intervals: 1 to 100, 101 to 201, up to 901 to 1000.

6. Click **OK**.

Sheets groups the numeric values.

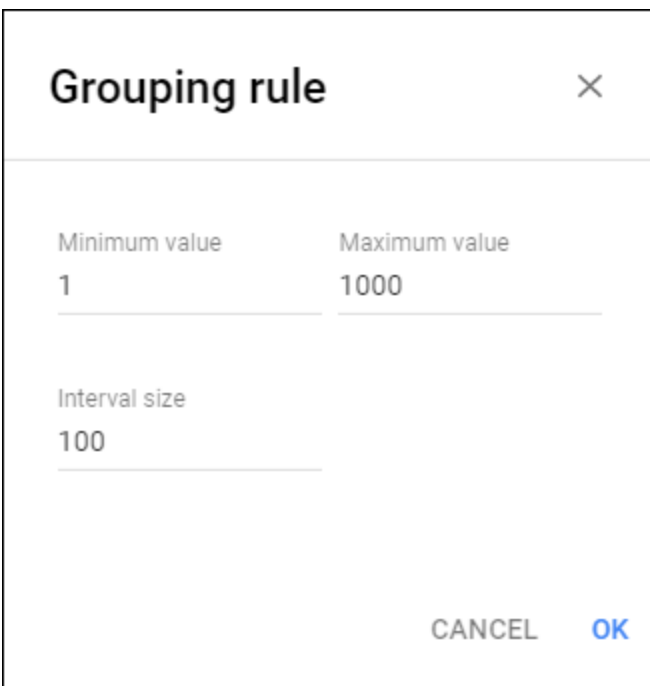


FIGURE 9-20: Use the Grouping Rule dialog box to specify the numeric ranges you want to use to group your data.

Grouping date and time values

If your pivot table includes a field with date or time data, you can use the grouping feature to consolidate that data into more manageable or useful groups. Follow these steps:

1. **Right-click any item in the date or time field you want to group.**
2. **Choose the Create a Pivot Group Rule option from the menu that appears.**

Sheets displays a menu of the date-and-time grouping options.

3. **Select the grouping option you want to apply to your data.**

Sheets groups the date or time values.

Filtering pivot table values

By default, each pivot table report displays a summary for all the records in your source data. This is usually what you want to see. However, you may have situations in which you need to focus more closely on some aspect of the data. You can focus on a specific item from one of the source data fields by taking advantage of the pivot table's Filter field.

Suppose that you're dealing with a pivot table that summarizes data from thousands of customer invoices over a certain period. A basic pivot table might tell you the total amount sold for each product you carry. That's interesting, but what if you want to see the total amount sold for each product in a specific country? If the Product field is in the pivot table's Row area, you can add the Country field to the Column area. However, you may have dozens of countries, so adding the field to the Column area isn't an efficient solution. Instead, you can add the Country field to the filter and tell Sheets to display the total sold for each product for the specific country you're interested in.

Follow these steps to apply a pivot table filter:

1. **Select a cell within the pivot table to display the Pivot Table Editor.**
2. **Click the Add button for the Filters field.**
3. **Select a field from your data.**
4. **Select the Status drop-down list.**
Sheets displays the filter options for the field.
5. **Choose your filter options.**