

Microsoft Excel: The Complete Essentials - Teacher Notes

This guide book is dedicated to all my students who said,
"We hope to remember what you've taught us."
Your words inspired this guide.

Welcome!

This textbook is written for anyone who wants to learn and build practical skills in Microsoft Excel, whether it be for school, work, or personal projects.

Instructor information

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Excel Day 1

General information

Description

We will be creating and using Excel worksheets that can analyze important data for your success. We'll go over refreshers, recaps, shortcut keys, and helpful tips & tricks to help you work more easily, quickly, & efficiently.

Expectations and goals

In this course, you'll build a strong foundation in Excel by learning to:

- Understand and apply formal Excel terminology
- Master key essential tasks commonly performed by Excel users
- Modify and manage columns, rows, worksheets, and workbooks
- Format worksheets (for clarity and visual appeal!)
- Prepare and print Excel documents effectively

Course materials

Required materials

- A computer running the Windows operating system with Microsoft Office installed.

Prerequisites

To succeed in this course, students should be comfortable using a computer with a keyboard and mouse, working in Windows® environment, opening and closing programs, and managing files and folders. Although no prior Excel hands-on experience is required, students will get the most from the course if they already know how to use formulas as well as organize and analyze data.

Excel Day 2

General information

Description

We will be creating and using Excel worksheets that can analyze important data for your success. We'll go over refreshers, recaps, shortcut keys, and helpful tips & tricks to help you work more easily, quickly, & efficiently.

Expectations and goals

In this course, we will focus on how to turn raw data into clear insights and support data-driven decisions by:

- Sorting, filtering, grouping and subtotaling our data.
- Highlighting trends with conditional formatting
- Creating tables, and charts

Course materials

Required materials

- A computer running the Windows operating system with Microsoft Office installed.

Prerequisites

This guidebook is for anyone who already knows the basics of Excel and wants to learn more. It's great for analysts, admin staff, project leads, or anyone who uses Excel to work with data, create reports, or help make decisions.

Chapter 1 - Microsoft Excel Basics

Microsoft Excel is a software program that allows you to create spreadsheets containing data. Excel is the world's leading spreadsheet program, with a vast user community and ongoing support from Microsoft. Excel utilizes spreadsheets, which is a file that contains information, but Microsoft defines a spreadsheet as "a digital document used for storing, organizing, and manipulating data." ([Link](#))

A spreadsheet is a grid that organizes data into columns and rows:

- **Columns** are labeled with capital letters (A, B, C, etc.) and run vertically across the grid. In formulas, column letters always appear capitalized.
 - To select an entire **column**, press **Ctrl + Spacebar**.
- **Rows** are labeled with numbers (1, 2, 3, etc.) and run horizontally across the grid.
 - To select an entire **row**, press **Shift + Spacebar**

Generally, **columns** usually represent attributes, categories, or fields of data (*what kind of data*) while **rows** represent individual records or entries.

Example:

Name	Age
Alice	21
Bob	22
Carla	23

However, data is context-dependent since sometimes a row can represent a category instead of a record.

Example (Transposed Data):

Name	Alice	Bob	Carla
Age	21	22	23

Throughout this document, we will consider columns as fields or categories, and rows as records or entries.

A **data set** is a collection of related information in Excel.

To select an entire data set, simply place your cursor anywhere inside the set of data and press **Ctrl + A**.

- **Ctrl + A** is the shortcut that selects everything in the current data set.

Data sets usually are comprised of a header row and records.

- The **header row** is the row that contains the column names.
 - It **does not** have to be *Row 1* in Excel, but rather it can be any row with your column names.
- Records are entries that represent a single item (e.g. a person or a product) or row of data on a table.

Cells

A **cell** is the intersection of a row and a column.

- Cells are “boxes” that contain data. You can see its contents in the **formula bar**.
- Cells are the backbone and building blocks of every spreadsheet. Bad Joke: “Cells make up ExCELL”.
- The active or selected cell is the one clicked on and has an outline of a green border.
- Each cell has a **name**, determined by its column letter and row number.
 - Example: The cell in column E and row 2 is called **E2**.
 - Even empty cells have a name.
- The cell’s name also appears in the **Name Box** above the worksheet.

Ranges

- A combination or group of one or more cells. Ranges can be horizontal, vertical, or even empty.
- Naming Convention: A range is named using the **top-left cell** and the **bottom-right cell**, separated by a colon (:).
 - Example: The range from D1 ‘to’ F3 is written as **D1:F3**.
- Be careful: only a colon works - other symbols (like semicolon, dot, underscore, or space) will not.

Shortcuts

- **Shift + Arrow Keys** -> Resize a selected range.
 - Example: Start at A1, then hold **Shift** and press the arrow keys to expand the selection.
- **Ctrl + Shift + Arrow Keys** -> Select from the current cell to the end of the data set in that direction.
 - Example: If you’re in A1 and press **Ctrl + Shift + ↓**, Excel selects from A1 down to the last filled cell in that column.

Moving a Range

1. Select the range.
2. Place your **cursor on the border** until it changes to a **four-headed arrow**.
3. **Click and drag** the range to the new desired location.
(As you move it, Excel will even show the new range reference, which is helpful if you forget its original name.)

Copying a Range

1. Select the range.
2. Press ‘**Ctrl**’ + ‘C’ to copy the range.
3. You will see the “marching ants” across the border
4. Place your cursor on a new cell and either press “**Ctrl**” + “**V**” or simply press “**Enter**”.

Alternatively, to copy a range:

1. Select the range.

2. Place your cursor on the border.
3. Hold down Ctrl then Click and drag the range to move it to the new location.

As a result, the original range stays in place, and a duplicate is placed where you drag it.

Tips:

- Press **Ctrl + Z** to undo any mistakes.
- Using a **mouse** makes it easier to drag than using a trackpad.

Excel Interface Overview

The basic layout of Excel includes tools that help you navigate the program more efficiently:

- **Status Bar** (bottom)
- **Quick Access Toolbar** (top)
- **Ribbon** (commands and groups)
- **Backstage View** (File tab)

Let's break down each section:

1. Status Bar (Bottom of the Window)

- Found at the bottom of Excel (and most Microsoft apps).
- Displays the different various worksheets in a workbook (more to be discussed later).
- Displays the status of your document or selection.
 - Selecting a range of cells that contain names will show the count of the selected cells.
 - Provides **zoom controls** to zoom in/out.

2. Quick Access Toolbar (Top of the Window)

- A small toolbar at the very top of Excel.
- Provides **quick access to commonly used commands**.
 - By default, it usually contains **Save, Undo, and Redo**.
 - Commands can be used either by clicking them or by pressing **Alt** to activate *Key Tips*
- You can add commands by **right clicking a tool** (e.g., Fill Color) → *Add to Quick Access Toolbar*.
- While not heavily used in Excel, it can be handy for frequently used commands like **Clear Formats**.

3. Ribbon (Below the Quick Access Toolbar)

- The main command area in Excel, consists of **Tabs** (Home, Insert, Page Layout, etc.).
- Each tab contains **Groups**, which organize related commands (e.g., Font group, Alignment group).
- Within groups are **Commands** (buttons/actions). Hover over a command to see a **screen tip**.
- Some groups include a small **Dialog Launcher** button for advanced options.

- If the window is resized smaller, not all commands appear; you may only see group names. Click the group name to access hidden commands.

4. Backstage View (File Tab)

- Clicking **File** opens the **Backstage View** (**Think of this as the backstage pass to the files concert**).
- This view provides file-related actions such as **Info, Save, Open, and Print**.
- The **Info** section shows details about the file (name, location, size, last modified, etc.).
- Especially useful when working with shared drives or Teams files, to find out where a file is stored.
- To exit Backstage View, click the back arrow or press **Esc**.

Chapter 2 - Modifying worksheets

In this lesson we'll discuss:

- Adjusting, hiding, grouping, adding, and deleting columns and rows.

The general rule for this chapter is that whatever concept applies to columns (e.g. resizing) the same concept can be applied to rows and vice versa.

On the Home tab, in the Cells group, you'll find commands to insert, delete, and format cells, rows, and columns. Anything you need to add, remove, or format is available there. In this chapter however we will be discussing quicker, more efficient ways to perform these operations.

Adjusting rows and columns

To adjust a column's width, place the mouse pointer over the right edge of the column letter header until the double-headed arrow appears, then drag to the desired width. So, say I select column B - if I hover over its right edge border, I can simply drag to make the column wider or narrower.

One thing to note: If a column with numbers becomes too narrow, Excel may display scientific notation (like "1.23E+05") or just a row of pound signs #####. This doesn't mean the data is missing; it simply indicates that the column isn't wide enough. We can resize the column to fix it or use **AutoFit** to display it properly.

To autofit a column, move the mouse to the right edge of the column letter heading until the double-headed arrow appears, then double-click the border. So, in short instead of dragging, you can **double-click** to use *AutoFit*. That automatically adjusts the column width to fit the content.

If you select columns C through F and change the column width of one, all of them will resize to match.

If you want to adjust *all* columns at once, click the **Select All triangle** at the top-left corner of the worksheet, then apply AutoFit. That resizes every column and row automatically.

As another shortcut, pressing **Ctrl + A** once selects your current dataset, and pressing it again selects the entire sheet. From there, AutoFit works across everything.

Hiding rows and columns

Now let's cover hiding and unhiding rows and columns.

Many times, data sets have extra columns that aren't needed and just take up space. We hide or unhide columns to see or print only the data you need.

To hide a column, select the column letter, right-click, and choose **Hide**. For example, if you hide column C, it will disappear. To bring it back, select the entire columns on either side (in this case, B and D), right-click, and choose **Unhide**.

When you hide a column in Excel, it **won't appear when you print** the sheet (Ctrl + P). The hidden column is excluded from the printout, even though the data still exists in the spreadsheet. Even if a column is hidden, the data remains searchable using Ctrl + F.

This is true with multiple columns. For example, if I hide columns I through L, my sheet might only display Employee ID and Total. This is especially useful when preparing reports for management, since they usually want a *big picture* rather than every detail.

To unhide everything, you can again use the **Select All triangle**, right-click, and choose **Unhide**.

Unhiding multiple columns at once:

- Click the **Select All triangle** in the top-left corner.
- Right-click and select **Unhide**.
- If the sheet is protected, you'll need to **unprotect** it first.

A participant asked: “*If we send this spreadsheet to employees for entering time, how do we ensure they don't unhide and use other parts of the sheet?*”

Good question! Hiding columns is mainly a visual boundary, it doesn't prevent edits. To truly restrict changes, you can **protect the sheet** while allowing specific cells to remain editable. We'll discuss this in another chapter.

Here's an advanced trick that managers often use. Let's say I'm sending a timesheet or expense report to employees. We can hide any extra blank columns and rows to show only the form.

Here's how:

1. Select the first unused column (say, column P).
2. Press **Ctrl + Shift + Right Arrow** to select all columns to the end.
3. Right-click and select **Hide**.

Now everything beyond column O is hidden, making the sheet look clean and focused.

The same works for rows: select the first unused row, press **Ctrl + Shift + Down Arrow**, and hide them.

If you need everything back, just unhide as before.

And now, all those extra columns are hidden, leaving us with a neat and focused worksheet.

Grouping Columns

The issue with hiding columns is that it's very easy to overlook. Just like with filters, hidden columns are out of sight, and unless you're specifically checking for missing columns, you might not realize they're gone. For instance, when I'm reviewing data, checking if all the columns are still visible is usually one of the last things I personally think to do. That's why, rather than simply hiding columns, I prefer using grouping as a more effective option.

Grouping allows you to collapse and expand sections of your spreadsheet with a visible control button. This makes it clear that some columns are temporarily hidden which gives you better awareness and control.

The following steps illustrates how to group columns:

1. First select entire columns you'd like to group. For this example, I'll select columns C through E.
Note: Please do not select just a few cells.
2. Then go to the Data tab and on the Outline group, there will be a command named “Group”.
Note: Depending on the version of Excel, the options may appear as a single icon or as separate items.
The functionality remains the same.
3. Click Group.

Once grouped, you'll see a small minus icon (–) at the top. Clicking it collapses the columns. Clicking the plus icon (+) expands them again. Now you can easily hide or show the grouped columns using the toggle buttons.

Grouping is similar to hiding, but it adds a button to show or hide columns, making it easier to see something's hidden. Additionally, the Level 1 and Level 2 buttons allow you to expand or collapse all groups at once. This can be especially helpful if you've created multiple groups in your spreadsheet. Please note that if you create a new group next to an existing one, they'll merge together into a single group.

To ungroup, simply reselect the same columns (C through E), go back to the Outline section, and click Ungroup. This removes the grouping and restores the columns to normal.

Moving Columns

Next, let's talk about a useful trick: **moving columns**.

Suppose column L contains "Employee ID," but I want it closer to the beginning of my worksheet. Here's how to move it:

1. Select the entire column.
2. Place your cursor on the column border (not between two columns). The cursor changes to a four-arrow icon.
3. Hold down **Shift**, then click and drag the column to its new position.

For example, if I drag Employee ID to column B, it shifts over neatly without needing to cut and paste. Personally, this is one of my favorite Excel shortcuts—it's fast and clean.

Adding and deleting rows/columns:

Sometimes you need to adding or deleting columns, rows, or cells. To add a new record (e.g. a person, a transaction, etc.), I can insert a row, which moves all existing content down by one. We can insert by:

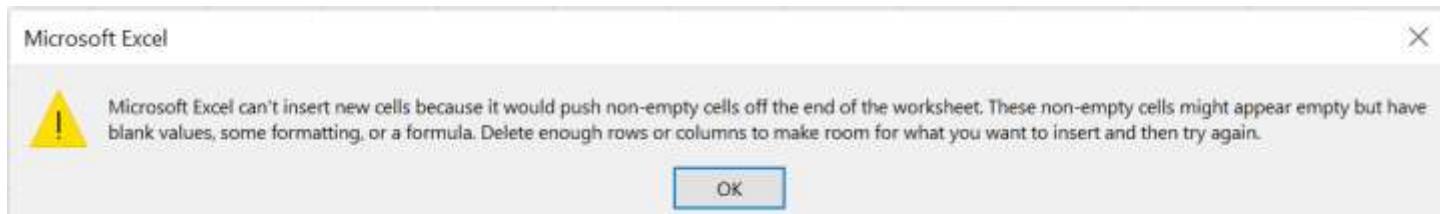
- Right-clicking a row (or column!) → **Insert** to add the row above/left.

To delete a row:

- Right-click on row → **Delete** to remove.

If you need to add several rows at once (for example, 4 rows for 4 people), select that many rows, right-click, and choose **Insert**. The new rows will appear, ready for your data. You can delete multiple rows the same way.

Please Note: In Microsoft Excel, row numbers are fixed, and sequential. They start at 1 and go up to the maximum row limit (for example, 1,048,576 in current versions). These row numbers are again *constant* and cannot be removed. Inserting or deleting Excel rows moves the content, but the row numbers stay the same. Adding a row at the bottom of the spreadsheet results in the error message:



Shortcuts:

- **Ctrl + Shift + Plus** → add a row/column
- **Ctrl + Minus** → delete a row/column
- **Shift + Spacebar** → select a row
- **Ctrl + Spacebar** → select a column

Navigation tips:

- **Ctrl + Down Arrow** → go to the last row
 - **Ctrl + Right Arrow** → go to the last column
 - **Ctrl + Home** → go to cell A1
-

Finding/Replacing Data:

To find data in Excel, you can use a command like Microsoft Word: **Ctrl + F** (or **Command + F** on a Mac). This opens the Find tool, allowing you to search for specific words or values in your worksheet. We can also access this via Home -> Editing -> Find & Select

For example, typing “Anderson” and pressing **Find All** will show every cell containing that name. You can also search the entire workbook if needed.

There are two helpful options in the Find tool:

- **Match Case** - Only finds cells that match the exact capitalization you type i.e. it makes the search **case-sensitive**.
 - Suppose your worksheet has these cells:
 - A1: Anderson
 - A2: Anderson
 - A3: ANDERSON
 - If you search for ‘Anderson’ **without Match Case**, Excel will find all three cells, ignoring capitalization.
 - If you search for ‘Anderson’ **with Match Case turned on**, Excel will only find A1.
 - Cells A2 and A3 won’t be found due to different capitalizations.
- **Match Entire Cell Contents** – Only finds cells where the content exactly matches your search term.
 - For example, searching for “West” will ignore “Southwest” if this option is selected.

To replace words, use **Ctrl + H** (or **Command + H** on Mac) to open the Replace tool. This lets you find one word and replace it with another.

It’s highly recommended to first find the data you want to update or replace, so I’ll click “Find All” to confirm the targets.

Task: Replace “Smith” with another name by clicking **Replace All**.

These tools work similarly to the Find and Replace features in Word or Adobe Acrobat, so they should feel familiar if you've used those programs. Just remember: Always **find first** to make sure you're targeting the correct cells before replacing.

Spell Check

To check spelling in Excel, go to the **Review tab** and select **Spelling**, or press **F7**. Excel will flag misspelled words, though uncommon names may still be marked as incorrect.

Chapter 3 – Managing Workbooks

Task: Open the file *Sales Tracker FY 2017*.

This workbook contains multiple worksheets—one for each quarter (Q1–Q4) and one for FY 2017 totals.

Working with Multiple Worksheets (Tabs)

Managing a few worksheets is simple, but handling many worksheets can be overwhelming. Microsoft Excel helps by letting you organize, reorder, and hide sheets to stay organized.

A workbook is the same as a file or document.

A workbook is made up of sheets (also called tabs or pages).

We can press **Ctrl + Page up** or **Ctrl + Page down** to cycle between sheets.

- To **add a sheet**, right click on a sheet -> click the “**Insert**” button.
 - We can also add a sheet by click on the “+” icon in the status bar.
- To **rename a sheet**, right click on a sheet -> click the “**Insert**” button.
 - We can also double-click the sheet tab and type a new name.
- To **delete a sheet**, right-click on the sheet tab and select **Delete**.
- To **move or copy a sheet**, right-click the tab -> **Move or Copy**.
 - You can duplicate it in the same workbook or move it to a new one.
 - Note: Of course, we can use to select our data to copy and paste somewhere (via **Ctrl + C** and **Ctrl + V**) but be careful – this will only copy some of the data on the worksheet. Some spreadsheets have multiple tables or ranges, so pressing **Ctrl + A** once will not select everything; you’ll need to press **Ctrl + A** **twice**.
 - **Task:** We can press **Ctrl + N** to open a new workbook. Try duplicating data into that new workbook.



Many of these commands are accessible from the Home tab on the Ribbon as well.

Organizing Sheets

- We can protect the sheet to “prevent unwanted changes from others by limiting their ability to edit”.

We can also protect a sheet while still letting certain cells be edited, which is useful for timesheets/forms:

1. Select the cells you want employees to edit (e.g., A1:O28).
2. Right-click and choose **Format Cells → Protection**, then **uncheck Locked**. Click **OK**.
3. Right-click the sheet tab and select **Protect Sheet**. Add a password if desired.
4. Now, employees can type in the unlocked cells but cannot edit or unhide the rest.

Tip: It’s often best to **hide unused columns first**, then protect the sheet. This keeps the sheet clean while still allowing input in the intended areas.

- You can **change tab color** to stay organized.
- You can **hide sheets** if you don’t want users to see them.
- To create a group of sheets, we can **select multiple sheets** by holding **Ctrl** and clicking each sheet. Changes (like formatting or tab color) apply to all selected sheets.

Freezing Panes

We can create a fixed/sticky header row so that part of a worksheet stays visible while scrolling.

To freeze multiple rows, we must:

- Start by selecting the row or cell immediately below the rows you want to freeze.
 - e.g. if we want to freeze the first three rows, we can select row 4 or simply cell A4
- Go to the View tab and use Freeze Panes to lock rows or columns
- As a result, the frozen rows as marked by a gray line will stay at the top while you scroll down.
 - This is helpful so your header rows (like “Quarter” or “Product”) always stay visible when scrolling.
 - To undo, choose **Unfreeze Panes**.

Additional things to keep in mind:

- **Freeze Top Row** keeps row 1 visible while you scroll.
- You can also freeze columns –
 - For example, if we select column B & then click freeze panes, Column A remains visible as we scroll right.

Alternatives:

- When we create a table, as long as the table has headers and we select a cell that is within the table, the header row automatically stays frozen and replaces the column letters (A, B, C) as you scroll down.
- We can also use the “Split” command to create separate scrollable sections.

Arranging Excel Workbooks:

- **Ctrl + N:** Open a new workbook.
- **Ctrl + W:** Close the current workbook window.
- Use **Windows Key + Arrow keys** to snap windows to the side, top, or bottom of your screen.
- On the **View** tab, we can use **Arrange All** to arrange multiple Excel windows (side-by-side or stacked).
- **New Window** (on the View tab) opens another view of the same workbook. You can then use **Arrange All** to compare two sheets in the same file side-by-side (e.g., Q1 vs FY 2017 Totals).
 - Result: We can now view the same document in two windows, allowing us to see the Q1 and Q2 worksheets simultaneously *at the same time*.

Chapter 4 – Formulas & Functions

Open Chapter 2: Performing Calculations => open the **Sales Contests** file.

We're looking at a Sales Ledger similar to the workbook we used earlier.

Columns A through E represent the **salesperson** and their **quarterly earnings**.

We'll work on filling out columns F through J shortly, but first, let's review some **basic formulas**.

Formulas

Excel formulas are expressions that perform arithmetic operations and calculations within a cell. We use formulas in Excel to do mathematical calculations.

Excel uses the following arithmetic operators for basic math:

- + Addition
- - Subtraction
- * Multiplication (use the asterisk symbol)
- / Division (the forward slash symbol)

We enter expressions or what are called **formulas** into cells and return calculated **results** within those cells.

Every Excel formula **must** start with an equals sign (=) e.g. to add 3 and 3 in cell A1, enter the following:

=3+3

Once you press 'Enter', the result 6 appears in the cell.

Note: The **formula bar** still shows =3+3, which is the actual input.

The output is what's in the **cell** (the result).

The input is what is in the **formula bar** (the formula).

Let's try a few examples:

- = 7 - 1 => Result: 6
- = 7 * 2 => Result: 14
- =100/4=> Result: 25

To **edit a formula**, you can either:

- Double-click the cell
- Use the formula bar
- Or press **F2** to enter **edit mode** (you'll see the ribbon grayed out while editing)

Press '**Enter**' to save changes or '**Escape**' to cancel.

Formula Formatting Tips

1. Start every formula with =
 - o No spaces are allowed before the equal sign. Even a single space will cause the formula to fail.
 2. You can use spaces between numbers and operators for clarity.
 - o For example:
 $=3 + 3$ is the same as $=3+3$
 3. Use parentheses to control order of operations & change the outcome. For example:
 - o $=4 * (3 + 2)$ → Result: 20
 - o $=4 * 3 + 2$ → Result: 14
-

The Show Formulas command

There's a command in Excel that lets you **view all formulas** in the sheet instead of the results. To access it:

- Go to the **Formulas** tab and under **Formula Auditing** (group), click **Show Formulas**

Alternatively, use the shortcut: **Ctrl + ` (tilde key)**

Remember to treat it like a light switch – you turn it **on** to see the formulas, and **off** to go back to the results.

Using Cell References

Although you can make basic formulas using constants (e.g. $=3+3$), we can reference other cells in formulas instead of typing in the numbers directly. A cell reference is another name for cell name or cell address. Cell references help keep formulas correct because they update automatically when the cell value changes.

Example:

B3 contains 500 and

B4 contains 700,

On B7 we can add them together with: $=B3 + B4$. This returns 1200.

Note: If you update B3 or B4, the total will automatically update too.

Precedents and Dependents

- A **dependent** is the cell that contains the formula (e.g., B7).
- **Precedents** are the cells that the formula depends on (e.g., B3 and B4).

Note: If you move the dependent cell (B7), the formula and result stay the same. But if you move the precedent cells, the formula will update, and the result will still be the same. You can visualize this using:

- **Trace Precedents** in the Formulas tab
 - **Trace Dependents** to see where a cell is being used
 - Use **Remove Arrows** to clear those traces
-

Formulas with Dates and Text

On any cell, we can press 'Ctrl' + ';' to get today's **static date**.

To add a single day, we can enter: = E1 + 1

To combine (concatenate) text, we can type:

G1: "North"

G2: "east"

To now combine two cells: =G1 & G2

The & symbol is the concatenate operator that joins the contents of the two cells (e.g., "North" & "east" → "Northeast").

Practice Example: Grocery Cart

Let's switch to **Sheet 3** and do a fun example.

Imagine we're buying grocery! Here are some sample items that we can add to our cart, each with its price.

- Bananas – \$1.50
- Avocados – \$2.00
- Milk – \$0.99
- Eggs – \$10.00 (yes, that's the real price in California!)

Let's first apply formatting:

- Apply a **currency format** by selecting cells B2 to B5, and clicking the \$ icon on **Home** tab -> **Number** group.
- Use **Increase/Decrease Decimal** command to control decimal places
 - Note: Formatting (like rounding) doesn't change the actual input

With our items written, let's calculate the total cost using cell references:

In cell B8 we can write: $=B2 + B3 + B4 + B5$

As a result, this gives us the total: **\$16.00**

To verify, select B2 to B5 and check the Status Bar at the bottom of the Excel window to show the sum.

(We could've also used the SUM function, but that will be discussed later.)

Now, let's assume that there is a tax of **10%**.

In B9, we write the tax: $= 0.1$

In B10, we write the Taxed Amount: $= B8 * B9$

To get the grand total (a.k.a. the damage to your wallet), type:

In B11 (Grand Total): $=B8 + B10$

If you decide to add another item (like peanut butter for \$3.00), just update your formula in cell B8:

$=B2 + B3 + B4 + B5 + B6$

Thanks to our formulas, Excel will automatically recalculate the total, tax, and grand total.

Functions

We've only used basic formulas so far i.e. no functions yet. This is useful to know since sometimes all you need is a quick way to add or multiply values. We can explore functions which make your work even more efficient by seeing the web pages on functions.

Chapter 5 - Formatting

In this section we'll cover **formatting**. Big worksheets can be hard to read, especially with different types of data. Microsoft Excel has formatting tools that help organize information and make important details stand out, so your worksheets are clear and easy to use.

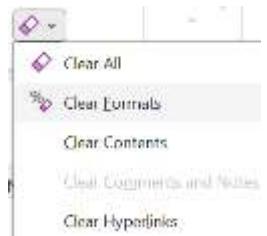
Most of the tools we'll use in this chapter are found on the **Home tab**. We won't go through every single icon since you may already be familiar with them (e.g. the **Font group** is very similar to Microsoft Word). Instead, I'll highlight the most useful ones. For example, we often do need to change the font and fill color of our cells, and this can be done as shown below:



Clearing Formats

Cells have one style with multiple formats such as purple text, bold, underlined, or a larger font size.

A useful command is **Clear Formatting**, which removes all formatting from the selected text and leaves only plain, uniform text.



- Step 1: Select a cell that has formatting
- Step 2: Go to Home (Tab) -> Editing (Group) -> Clear Formats

Format Painter

The first tool I want to demonstrate is **Format Painter**. If there is a cell with specific formatting, we can double-click the Format Painter button to have the cursor change into a paintbrush icon. From there, simply select the cells you want to format, and the formatting is then applied and copied over to other cells. Once we're done, press '**Esc**' to turn Format Painter off.

Font Group & Alignment

Let's look at alignment and text overflow. Suppose in cell A1 I type *Sales Ledger Reported on*. Press the command '**Ctrl + ;**' to get current date. If the text is too long, it might overflow into the next cell. To fix that, there are three main ways:

1. **AutoFit the column** by double-clicking the right edge of the column header.
2. Use **Wrap Text** (under the Alignment group). This makes the text stay inside the cell and wrap to the next line automatically.
3. **Merge and Center** cells. Select a large group of cells and then on the Home tab, under Alignment (group), click *Merge & Center*. This combines cells and centers the text.
 - Merged Cells usually have the text centered vertically & horizontally.

To have the text display on two separate lines within the same cell, place the cursor where we want the line break and press **Alt + Enter**. This inserts a line break inside the cell.

For formatting, I can also change alignment settings—such as centering vertically or rotating text slightly for visual effect.

Number Formats

Next is the **Number group**. Formats can also be copied with Format Painter, but the dialog box gives more options. For example, you can change a number to different currencies (dollars, yen, pesos, etc.), or you can format cells as dates and times.

Task: Cover the difference between accounting & currency formats.

Task: Press **Ctrl + ;** enters today's date.

- Dates and times can then be displayed in different styles (e.g., 24-hour or AM/PM). Note that even though the display changes, the underlying value remains the same.

Styles

Moving on, let's talk about **Cell Styles**. Styles are prebuilt combinations of formats - useful for labeling, calculations, or highlighting important cells. We can create and save our custom styles instead of formatting cells manually.

There's also **Format as Table**, which we'll cover more in part two.

Conditional Formatting - Part 1

Finally, let's cover **Conditional Formatting**.

This feature automatically applies formatting when certain conditions are met.

For example:

- To highlight the bottom 5% of sales totals, I select the range, go to
 - *Home (Tab) → Conditional Formatting → Top/Bottom Rules → Bottom 10%*, then change it to 5%. Those values are now flagged.
- If I change a number so it no longer qualifies, the formatting updates instantly.

Other common rules include:

- Highlighting cells greater than a certain value (e.g., sales over \$700,000 turn green).
- Equal to (e.g., highlighting all cells where the region is "Southwest").
- Duplicate values (great for finding duplicate emails or names).
- Dates greater than or less than a certain date.

You can also use **Color Scales, Data Bars, and Icon Sets** to visualize trends. And if needed, you can clear all rules or manage them individually under *Manage Rules*.

Chapter 6 – Printing

You're almost at the finish line—just a little more, and we'll be done with this final chapter.

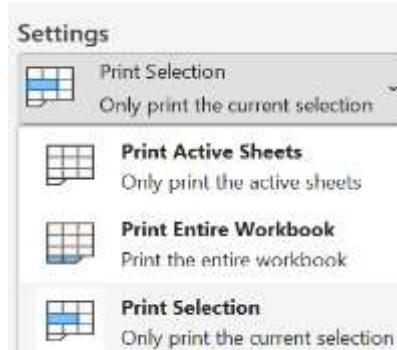
Although most information today is digital, there are still times when you may need a printed copy of a document. Before printing a workbook, we should always check and preview the print settings to make sure everything looks right.

Task: Open Printing Example.xlsx

In this example, the workbook looks great with different styles and formatting, but when we press **Ctrl + P** to print, the spreadsheet is spread across five pages. Pages 1–2 show the data from first set of columns, pages 3–4 show the next set, and page 5 shows commission rates and other metrics.

To make the document more printer-friendly, we can prevent extra columns (e.g. anything past like past column M) from printing. There are multiple ways of doing this:

- One way is to simply hide excess columns past Column M, which reduces the page count from five to four.
- A second way is to only print out selected cells.
 - o First select the data via **Ctrl + A** & then press **Ctrl + P** to go to print settings.
 - o Under settings we can then select “Print Selection”



- The third and final way is to set up a **print area**, so only the selected range prints.
 - o First select the data set via **Ctrl + A** then go to the tab **Page Layout** → **Print Area** → **Set Print Area**.

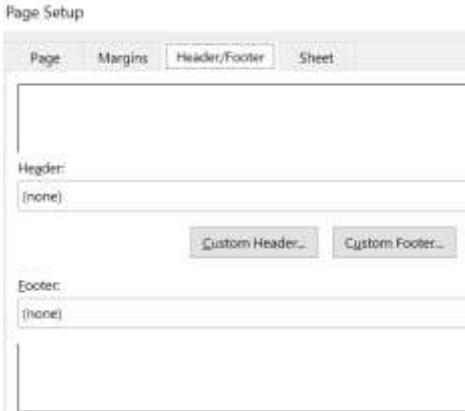


Once the print area is set, we can confirm what the print area is in **Page Layout** → **Print Titles**.

Showing the print preview (via “**Ctrl + P**”) shows that the page count has dropped. We can improve it further by:

- Changing the orientation from ‘Portrait’ to ‘**Landscape**’,
- Adjusting page margins (Normal → Narrow),
- and finally using **Scaling** option to select “Fit All Columns on One Page”.
 - o This reduces the document to just two pages, which is the desired result.
 - o Be careful, though — using the option “Fit Sheet on One Page” works but makes the text hard to read.
 - Therefore, “Fit All Columns on One Page” is often the best option.

Additionally, we can add **headers and footers**. Under Page Layout (Tab) -> Print Titles, if we select the header/footer tab, we can choose a header (like “Created by [Name]”) and a footer (like “Page 1 of ?”) to appear in Print Preview.



Finally, we make the header rows repeat on every page, set **Rows to Repeat at Top** under Print Titles (e.g., rows 1–4). This ensures the headers are visible on all pages.

Page Setup



And with that, we've successfully reduced the workbook from five pages to two, added headers and footers, and repeated header rows for clarity.

Optional Task: Insert a page break so that each page prints only 25 rows.

Congratulations—you've completed this exercise!

Chapter 7 - Sorting, Filtering, Grouping & Subtotaling Data

In this lesson, we will use Microsoft Excel to sort, filter, and subtotal data. These tools will help you organize and understand your data better. A lot of this material will carry over to our future chapter on Pivot Tables. When we sort and filter regular data, we can do the same with a pivot table. The commands might look a little different, but the spirit is the same which is to organize your data.

Sorting

Let's open up Employees.xlsx.

In this spreadsheet, we have employees working in different departments and offices, with various hire dates and extensions. Notice that there is no organization; the list isn't in any alphabetical order by first or last. That's where sorting helps.

Sorting rearranges your data to make it organized. For instance, you can sort a column:

- alphabetically (A to Z),
- reverse alphabetically (Z to A),
- by date (oldest to newest or newest to oldest),
- or by number size (smallest to largest or largest to smallest).

Task: Let's suppose we want to sort by first name. The easiest way to sort is by:

- Clicking on any single cell in the column you want to sort (You don't need to select the whole range.)
- Right click on that cell and on the context menu, hover over "Sort"
- Pick your sorting option. In this case, we'll select 'Sort A-Z' from the context menu

Keep in mind: Since Excel treats the first row as a header, it will be excluded from sorting.

Task: Sort the data by last name.

When we sort by one column, all of the other columns stay matched to their rows, so the data stays consistent. This means that if you sort by a different column afterward, it overrides the previous sort. This way, we can only sort one column at a time.

Excel also recognizes data types. If we were to sort a column that contains date values, it will offer sorting options like "oldest to newest" or "newest to oldest" instead of alphabetical sorts.

Task: Sort by hire date.

Whenever we sort data, please watch out for empty rows since they can disrupt sorting. If there's a blank row within a data set, Excel will stop sorting at that row because it thinks the data ends there. This leads to a partially sorted dataset, which causes confusion because although the data appears sorted at first, scrolling down reveals that some rows further down still reflect the earlier sort. This usually occurs with large data sets when other users clear the contents of a row but don't delete the row itself.

Note: If a column has a blank cell and we sort that column, the blank cell will end up at either at the top or bottom depending on the sort order.

Multilevel Sort

In Excel, we can't sort two columns independently at the same time. For example, we can't sort by **First Name A–Z** and **Last Name Z–A** simultaneously. However, we can perform a multi-level sort where Excel sorts by one column first, and then within each resulting group, sorts by the second column. That way, rather than sorting both columns separately, you're sorting them in a hierarchical order.

Task: Let's go to the 'Data' tab and click 'Sort,' the Sort dialog box will open where you can add multiple levels of sorting. This is useful for large data sets where you want to sort by several columns e.g. sort by department first, then by first name within each department. This lets you organize data more precisely, like grouping employees by department and then sorting their names alphabetically.

Sorting can be automated, but it usually requires a macro. Excel doesn't automatically sort data as you type, so to make that happen, you'd need to add a bit of code.

Sorting and filtering usually go hand in hand together, so it's only natural to next discuss about filtering.

Filtering

Filtering helps you narrow down data to just the information you want to see. Think of it as casting a net; you're targeting only specific departments, locations, or criteria within your dataset. By focusing only on specific categories or values, filtering helps reduce the amount of data you're looking at.

Sorting and filtering are essential tools when working with datasets. You've probably encountered filters on websites like YouTube, Amazon or eBay where you narrow down results by price, rating, or brand. Excel's filters work in a similar fashion.

Now please keep in mind that having a header row in your dataset is important when applying filters, as it allows Excel to organize the data properly and improves clarity. So for instance if your data looks like the following:

John Smith

Jane Doe

Ali Mirza

If the top row is "Jon Smith," Excel will treat "Jon" and "Smith" as column headers when you apply a filter. This means:

- We can't filter or sort the "Jon Smith" row because Excel thinks it's the header.
- Filter dropdowns will show up in the first row, and only the rows below it will be filtered.

To fix this, we can add a header row like so:

First Name Last Name

John Smith

Jane Doe

Ali Mirza

To enable a filter:

1. Make sure you're clicked somewhere inside your data set.
2. Go to the Data tab.
3. Click on Filter.

⚠ Important: If you're clicked on a random cell outside of the data set, the filter won't apply properly.

Once filtering is enabled, you'll see drop-down arrows appear in the column headers. But remember: this doesn't mean the data is already filtered since all rows are still visible at this point.

Applying Filters

Let's say you want to filter by department. Click the drop-down in the Department column and uncheck everything except "HR," "IT," and "Engineering." Now your table only shows people from those departments.

You can also apply additional filters on other columns to narrow the data down further (e.g., only show people in office "CC1").

When you're done, click Clear to remove all applied filters and return to the full dataset.

To filter out blank cells in Excel:

- Ensure a filter is applied by checking if the filter arrows are visible on the header row.
- Click the filter arrow on the desired column.
- Uncheck (Blanks) in the dropdown.
- Click OK.

We can also find and remove blank rows using Excel's "Go To Special" feature. Here's how:

- Select your entire dataset. Be sure to include any blank rows!
- Go to the Home tab, find the Editing group, click Find & Select, and then choose "Go to Special".
- In the pop-up box, select "Blanks" and click OK.
- Excel will highlight all blank cells. To delete the blank rows, right-click one of the selected row numbers and choose Delete.

Custom Auto Filters

Custom AutoFilters in Excel let you filter datasets according to specific criteria. The custom filter options you see depend on the data type in the column. Click the filter arrow in the header row and choose **Text Filters**, **Number Filters**, or **Date Filters** to see more options. This will open another menu with different filter choices.

Below are the most common custom AutoFilter options in Excel:

Text Filter

Text Filters help find data based on specific words or phrases (**Note:** This option works only with text columns).

Let's suppose we want to find people whose names start with "R". To do that:

- Click the drop-down on the First Name column.
 - Go to Text Filters > Begins With.
 - Type "R".
- ✓ As a result, this will show only names that start with R.

We can also use the filter search bar and type "R," to show names that contain "R" anywhere, not just at the beginning. To show word that begin with the letter "R", type in "R*" in the filter search box. The asterisk (*) is a wildcard that matches any characters after "R," similar to how wildcards work in SQL.

Filtering by Date

We can apply Date Filters for columns with date values to focus on specific time periods. After selecting Date Filters, we can see a wide range of time-based filters such as:

- Before, After, or Between – to show dates in a specific range.
For example, let's suppose we filter a date range to show only hires after January 1, 2000:
 - Click the drop-down on the Hire Date column.
 - Choose Date Filters > After.
 - Enter the date.
- All Dates in the Period – lets you group dates by year, quarter, or month.
For instance, if you want to see employees hired in specific years like 2011, 2013, or 2015—you can select those from the drop-down. Or if Want to see everyone hired in August? Use the filter to select only that month.

These filters are helpful when managing timelines, tracking dates, checking overdue tasks or reviewing trends over time. For example, you can use a filter to view only sales made in the last quarter.

Filtering by Numbers

Use Number Filters to find data based on specific numbers or number ranges for columns with number values.

Suppose we want to filter people whose extension numbers fall between 4200 and 4500:

- Go to the Extension column.
- Choose Number Filters > Between.
- Enter the range.
- As a result, we're only viewing those records that fall within that range.

Remember: When we sort data, we typically also apply filters to narrow it down.

A few important points to remember and watch out for:

One common issue is when a filter is active without you knowing. For example, if someone filters the data without telling you, your search results might appear incomplete. Similar to how printing with a filter only includes visible rows, searching for a term that's been filtered out won't return any results. For example, if you filter the data to show only the "HR" department and then use **Ctrl + F** to search for "IT," Excel will say no results found. That's because the "IT" rows are hidden by the filter even though they still exist in the sheet! So this leads to the question:

How Can We Tell a Filter Is Applied?

Lucky for us, there are a few ways to check:

- ▾ Funnel icon: The drop-down arrows in the headers turn into a funnel symbol on columns that are filtered.
- Clear option available: If the Clear button is active, it means a filter is in place.
- Missing row numbers: You'll notice some row numbers are skipped on the left.
- Status bar: At the very bottom of the Excel window, the status bar will say something like "11 of 30 records found". This one is easy to miss but very useful.

Copying Filtered Data

If you try copying and pasting filtered data, it might paste all of the data. If this does occur, after you've selected the data, make sure you use "Select Visible Cells Only" under the "Go To Special" menu. Otherwise, you might copy hidden rows along with the visible ones. Using an Excel Table format can also help with this.

Grouping (again)

As you might recall from Part One, we can group columns to collapse or expand sections for easier viewing:

1. Select the columns to group (e.g., I:L).
2. Go to **Data → Outline → Group**.
3. A small **plus/minus icon** appears to expand or collapse the group.

You can do the same for rows. This is especially helpful for spreadsheets with many columns, allowing users to focus only on the data they need.

Ungrouping:

- Select grouped columns or rows and click **Ungroup** to return them to normal.

Subtotals

Subtotals in Excel are used to quickly group and summarize data. Instead of summarizing columns, subtotals calculate conditional sums, averages, counts, etc. for each group within a single sorted column. Subtotals operate *vertically*, creating summaries from groups within a single column.

Subtotals are useful when you want to:

- Calculate totals by group (i.e. conditional sums), like sales per product or quarter, without using PivotTables.
- Collapse or expand groups for cleaner, more organized analysis

Final Note: To use Subtotals correctly, ensure your data is sorted by the column you want to group by. If it's not sorted, Excel will produce inaccurate or meaningless results so in short always sort your data first - this is key.

Situation:

Please open the file and go to the 2018 Sales worksheet. You should all still have it open.

In this worksheet, we're looking at quarterly sales data for different products, quantities, prices, and total sales (which are listed in column F). Column A is already sorted by quarter, so as you scroll down column A, you'll notice that each record's values are limited to one of four values: Q1, Q2, Q3, or Q4, which essentially represent categories.

Task:

Let's suppose we want to answer the question

"What are the total sales for each quarter?"

We could find the answer by using a PivotTable (which we'll cover later), or by using Subtotals.

Action:

1. On the 2018 Sales Worksheet, ensure **column A (Quarter)** is sorted.
2. Click on any cell in your dataset (for example, A1).
3. Go to the Data tab and in the Outline group, click Subtotal.
 - a. If you don't see "Outline," check your screen size because some icons may be grouped together.

The result of this step is that the Subtotal dialog box will appear.

This box lets you specify how Excel should group and summarize your data.

4. In the Subtotal dialog box, Select the following:
 - a. At each change in: Quarter
 - b. Use function: Sum
 - c. Add subtotal to: Total Sales (usually Column F)

In plain terms, it is saying: "At each change in [column], use [function] on [column]."

So for our example, it is saying "At each change in Quarter, Use the SUM function On Total Sales"

Note: This is similar to using a GROUP BY clause in SQL.

5. Press OK to finish the subtotal.

Result:

After clicking OK, Excel automatically inserts subtotal rows. As you scroll down, you'll see rows added showing us the totals for Q1, Q2, Q3, and Q4.

Additionally, small numbered buttons (1, 2, 3) on the worksheet's left side represent outline levels, showing grouped views that you can expand or collapse.

Level 3: Shows all details.

Level 2: Shows subtotals only.

Level 1: Displays the grand total.

This feature lets you quickly expand or collapse grouped data using the numbered buttons on the worksheet's left side to change views.

Copying Subtotaled Data

If you want to copy only the visible subtotaled results (and not hidden rows):

1. Select your data.
2. On the Home tab, Go to Find & Select -> Go To Special.
3. Choose Visible cells only, then click OK.
4. Result: Now you can copy and paste just the visible subtotal rows.

To remove all subtotals:

1. Go back to Subtotal Alert via Data -> Subtotal.
2. Click Remove All.
3. Result: This clears the subtotal groupings.

Practice Exercise #1:

Using Subtotals, determine which product generated the most sales and which product generated the least sales?

(Tip: This should be done regardless of region — we're looking at total product performance overall.)

Solution:

0. Before running the subtotal, make sure to sort your data by Product Name (A → Z). This step is crucial since if you skip sorting, your results will be inaccurate.
 1. Sort by Product Name.
 2. Go to Data → Subtotal.
 3. In "At each change in," choose Product (not Quarter).
 4. Use the SUM function for Total Sales.
 5. Click OK.
- Switch to Level 2 view to see each product's subtotal. After doing this, you should find:
- Printers had the lowest sales.
 - Laptops had the highest sales.

Practice Exercise #2:

Using Subtotals, determine which region generated the most sales.

Common Mistakes

- When removing a subtotal, do not click Ungroup since that doesn't properly work. Instead, always use Data -> Subtotal -> Remove All.
- Always sort the column you're grouping by first. If you don't, the results will be misleading.

Summary

Subtotals are a quick and simple alternative to PivotTables for summarizing data.

They can organize and summarize data by calculating totals, averages, or counts for each category.

Chapter 8 - Creating Tables

In Microsoft Excel, a table is essentially a structured container for a dataset. It organizes the data neatly and provides structure, which helps with:

- Improving robustness
- Using formulas like XLOOKUP
- Exporting data to other programs.

There are two ways to create a table:

Shortcut Method:

Select a cell in your data range and press Ctrl + T (easy way to remember: "Ctrl + T(able)"). A popup will appear asking you to confirm your table range and whether your data has headers.

Menu Method:

Select a cell in your data range. Go to the Insert tab and click on Table. The same popup that the shortcut method uses will appear, asking you to confirm your table range and whether your data has headers.

As a result, your data is now in a table, making it more robust.

Table Design Tab

When we select one or more cells in a table, the Table Design tab occurs on the ribbon in the top-right hand corner. This tab is a contextual tab; it only appears when the table is selected. If you click outside the table, the tab disappears. Click back inside the table, and the tab returns.

In short, the presence of the Table Design tab confirms that your data is a table. This means that you can only design a table when the table is selected.

From the Table Design tab, you can:

Rename your table (e.g., change it from "Table1" to "Sales")

Change the table's color/style

Quick Tip: If you remove the style/colors from a table, it's still a table. As long as the Table Design tab shows up when selected, it's active.

Apply banded rows or banded columns (alternating shading for better readability)

Highlight the first and last columns

Benefits of using tables:

Table Expansion

One big benefit of using tables is that they automatically expand when you add data. When you insert new rows or columns, Excel includes them in the table by default. This is particularly useful when working with functions such as the VLOOKUP function, as there's no need to manually update functions when the data range changes.

Headers Replace the Column Letters

If the active cell is in a table and the user scrolls down, Excel shows table headers instead of column letters to keep the header row visible, so there's no need to freeze the top row manually.

Warning: Click inside the table to keep headers visible; click outside to show column letters.

A	B	
1	fname	Iname
2	John	Smith
3	Jane	Doe
4	Aqsa	Hussain
5	Salman	Naqvi
6	Alizeh	Hussain

A	B	
1	fname	Iname
4	Aqsa	Hussain
5	Salman	Naqvi
6	Alizeh	Hussain

Total Row

The Total Row feature adds a row at the bottom to calculate totals, averages, maximums, minimums, and more for a column. We can enable it from the Table Design Tab. Use the dropdown in each column to change the summary type.

This feature works well with filters. If we filter a table by a product (e.g., “Laptops”), the total row will show the total for the filtered results. This works like a SUMIF function but saves you time by eliminating the need to write a function!

If the Total Row is not showing or if the command is greyed out, try either:

Saving, closing, and reopening your spreadsheet.

Checking that your table contains valid numeric data.

As a last resort, convert the table back to a normal range, then recreate it.

Summary

That wraps up our section on tables. They're structured, dynamic, and easy to style. Tables work seamlessly with formulas and filters, automatically expand with your data, and offer a Total Row which is a powerful alternative to some common functions. When we move on to pivot tables, you'll see that Excel will ask for a data source to which tables work great for this. For example, we can make a PivotTable from “Table4” or whatever your table is named.

Tables aren't too bad once you get the hang of them especially since there's a good chance you've used them before!

Chapter 9 - Creating Charts

We will end this guide with style by talking about charts! This chapter is straightforward since charts are visuals that help tell a story. Upper management LOVES chart, especially when effort and style are put into the presentation.

The theme for this chapter:

“It’s an art, not a science.”

You can’t go “wrong” with charts unless you overcomplicate them or make it hard to read

To create a chart:

1. Select your data. We’ll choose cells A1 to E5 but we do not include row 6 since that is not a part of the chart.
2. Insert a Chart by going to the Insert tab -> Recommended Charts
The result of this step is showing an alert pop up viewing a variety of charts.
If Insert doesn’t work (as seen in some cases), use the Quick Analysis Tool (Ctrl + Q)
3. On the alert pop up, click “All Charts” to view all available types.
Note: If you’ve used other Microsoft products like PowerPoint or Power BI, you’ll recognize many of them!
4. Feel free to browse through the selection. We will select the “Clustered column chart”.
Pro Tip: Choose a chart type that best communicates your message.

Once your chart is created, we can move and resize it. In some Excel versions, right-clicking allows you to save as a picture. If not, use Windows + Shift + S to take a screenshot.

Please keep in mind that charts are dynamic; charts update as the data changes. For instance, accidentally adding an extra zero to a number can significantly exaggerate the results. Because of that, it’s always important to double-check for typos since your chart is only as accurate as your data.

Chart Tools Overview

1. Filter (funnel icon)

Filter data (e.g., only Q3 & Q4, or only laptops products) to show only what's necessary for your audience.

2. Chart Styles (paintbrush icon)

Change layout and color. Try to avoid monochromatic color schemes since they can be hard to distinguish when projected. Try to choose colors that differ from each other.

3. Chart Elements (+ icon)

Add elements like data labels, titles, legends. For small charts, use vertical styles for better readability.

Rule: The chart should match the purpose and message.

Chart Design Tab

Many of the options you see under the Chart Design tab are also the icons we've seen in the last Chart Tools section. This tab allows you to:

- Add or modify chart layouts
- Change colors
- Use Switch Row/Column to flip your axis/legend focus
(e.g., switch from showing devices per quarter to quarters per device)

Chart Formatting

Unlike text boxes (which are single objects), charts have multiple elements. Understanding text boxes can help us understand charts a little better, so let's focus on that.

To add Text Boxes:

Insert -> Text -> Text Box

You can format it with borders, fills, shadows, etc. Acts like a shape, and can be customized freely.

Use the Format tab to select and style different parts (title, axis, legend, etc.) Double-clicking opens formatting options for the selected element. So if we double click on a chart, the charts pane shows up. Options vary depending on the selected element (chart area vs. plot area, etc.). Always check which element you're formatting to avoid mistakes. Properties like fill, outline, shadow, and glow can be toggled as needed.

Overall, many of these tools apply to pivot charts as well, which will be covered later. Everything you're learning now will carry over when the discussion of PivotTables arises.

❖ Best Practices for Chart Design

Less is more

Avoid overcrowding with too many elements.

Use color effectively to avoid poor color choices.

You can create multiple charts if needed. Try different types like pie charts to compare how data is represented.

Choose contrasting colors

Avoid shades that are too similar

Make text readable

Don't use font sizes that are hard to see.

Use data labels when needed. This is especially important in pie charts where similar-looking slices can be misleading.

Your audience shouldn't have to guess. Tell the story clearly.

Be mindful of visual clarity, accuracy, and audience needs.

Chapter 10 - The End

