# Microsoft Excel 2016: Step-by-Step Guide

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Note to Home Students:

This lesson plan will frequently refer to flash drives that we have our students use during class. Instead of saving files to a flash drive, you may save them to your computer’s hard drive.

We preload these flash drives with an assortment of files that are used during class. These files can be downloaded from on our Class Resources page. Our class handouts and exercises can also be downloaded there. The website address is:

www.mc-npl.org/class-resources
Introduction

Notice the picture of a slide rule on the first slide. This is what people used before Excel!

Microsoft Excel is an electronic spreadsheet program that runs on a personal computer. As with a paper spreadsheet, you can use Excel to organize your data into rows and columns and to perform mathematical calculations.

**What is Microsoft Office?** The term “Microsoft Office” refers Microsoft’s entire suite of office productivity applications. Microsoft Excel is one of the many applications that are grouped under of the “Microsoft Office” umbrella.

**What is Office 365?** Office 365 is a service where you pay a monthly subscription fee (around $10 a month) to use Microsoft Office programs (as opposed to paying $100 or more up front, as was traditionally done). One benefit to using Office 365 is that software updates are free (for example, if a new version of Microsoft Excel comes out, you can upgrade to that new version for free).

In this class, we will be using Excel 2016.

An Excel **spreadsheet** contains one or more **worksheets**. Each worksheet contains a grid of **cells**. Related worksheets are held together in a **workbook**. When you save a spreadsheet made in Excel it saves a workbook regardless of how many worksheets it contains. An Excel workbook can hold a maximum of 1,048,576 rows and 16,384 columns. A row goes left-to-right, a column goes up-and-down (like the column of a building).
Exploring the Excel 2016 Environment

**Open** Excel by using the **Start** menu or by **double-clicking** the Desktop icon for Excel 2016.

**Title Bar**

1. **Note** the Title Bar section which has **window controls** at the right end, as in other Microsoft Office programs.
2. **Note** that a blank workbook opens with a default file name of **Book1**.

**Quick Access Toolbar**

The **Quick Access Toolbar** is located all the way to the left on the Title Bar. It contains frequently used commands and can be customized using the drop-down menu.

1. **Point** to each small icon to view its **ScreenTip**.
2. **Be aware** that the **Undo** and **Repeat** buttons commands are not located anywhere else in the application except for on the Quick Access Toolbar.
3. **Click** the **Customize Quick Access Toolbar** button, **check** New on the menu. **Notice** how a **new button** has appeared.

4. **Click** the **Customize Quick Access Toolbar** button again and **select** **Show Below the Ribbon**. This repositions the toolbar to be **below** the ribbon.

5. **Note** that when the toolbar is below the ribbon, its customize button is **very difficult to see**, due to its white color.

6. **Move** the Quick Access Toolbar back above the ribbon by **clicking** the **customize** button and **selecting** **Show Above the Ribbon**.
Ribbon

The ribbon contains all of the tools that you use to interact with your Microsoft Excel file. It is located at the top of the window. All of the programs in the Microsoft Office suite have one.

The ribbon has a number of tabs, each of which contains buttons, which are organized into groups. Try clicking on other tabs to view their buttons (do not click the File tab yet), and then return to Home tab.

Active Tab

By default, Excel will open with the Home tab active on the Ribbon. Note how the Active tab has a white background, and the Inactive tabs have the opposite.

Active Tab

Contextual Tabs

Contextual tabs are displayed when certain objects, such as an images and charts, are selected. They contain additional options for modifying the object. Contextual tabs stand out because they are darker in color and are located to the right of all the other tabs. As soon as we start being productive in the program, we will see contextual tabs appear.

Groups and Buttons

On each tab, the buttons (a.k.a. commands or tools) are organized into Groups. The groups have names, but the names are not clickable.

Hover over some active buttons on the Home tab to observe ScreenTips. The ScreenTips display the name of the button, along with a short description of what the button does.
Buttons with Arrows

**Note** that some buttons have images on them and some have images and an arrow. The arrow indicates that more information is needed to carry out the function of the button. Some arrowed buttons have two parts: the button proper and the list arrow.

- A **one-part arrowed button**, called a **menu button**, will darken completely when you point to it:
  1. In the **Styles group**, **point** to the **Conditional Formatting** button.
  2. **Note** there is no difference in shading between the left and right of the button when you point to each section.

- On a **two-part arrowed button**, called a **split button**, only one section at a time will darken when you point to it:
  1. In the **Font group**, **point** to the left part of the **Fill Color** button. This is the “**button proper**” section of the button. **Note** how it is darkened separately from the arrow portion of the button.
  2. **Point** to the right portion, the section with the arrow. This is the “**list arrow**” section of the button. **Note** how it is darkened separately from the left portion.
  3. The **button proper** is the section of a two-part button that will carry out the default option or the last used option.
  4. The **list arrow** section will open an options menu.

**Dialogue Box Launcher**

On some groups there is a **Launcher** button which will open a **dialogue box or side panel** with related but less common commands.

**Click** a launcher button, and then **close** the dialogue box.
**Ribbon Display Options button**

This button provides options that will hide the ribbon from view. The main benefit to this is that it allows your spreadsheet to take up more of the screen.

1. **Locate** the Ribbon Display Options button (to the left of the window control buttons).

   ![Ribbon Display Options button](image)

2. **Click** on it. Three options appear.

   ![Auto-hide Ribbon](image)

3. **Click** Auto-hide Ribbon. This option essentially makes Excel go into “full screen” mode. It hides not only the ribbon, but also the Quick Access Toolbar, title bar, and Window Controls.

4. To get the ribbon to **show** after Auto-hiding it:
   
   a. **Point** to the top-center of the screen and **click**. (Clicking the three dots does the same thing.) The full ribbon can be seen and used. However, as as soon as the body of the spreadsheet is clicked it will hide again.

   ![Point to top-center](image)

   b. **Click** in the middle of the document. **Notice** how the ribbon hides again.

5. To get a partial display of the ribbon to stay in view:
   
   a. **Click** the “mini” Ribbon Display Options button on the top right.

   ![Ribbon Display Options](image)

   b. **Click** Show Tabs. **Note** this option has brought back our Quick Access Toolbar, title bar, Window Controls, and part of the ribbon; only the Tabs are visible. The buttons are not.

   c. **Click** the Home tab. **Notice** how the buttons come into view.
d. **Click** in the middle of the spreadsheet. **Notice** how the buttons disappear again.

**Note:** A shortcut for changing to the “Show Tabs” view is to **double-click** the Active Tab. If the buttons in the ribbon suddenly disappear, then you may have done this by accident.

6. To get the entire ribbon to stay in view:
   a. **Click** Ribbon Display Options
   b. **Click** Show Tabs and Commands. This option keeps entire ribbon visible at all times. It is the default option. We will keep this option selected for the remainder of class.

**Dynamic Resizing**

If you use Excel on other computers, be aware that the button placement on the Ribbon might look slightly different. For instance, a button might be a different size or be positioned in a slightly different place. The reason for this is that the Ribbon auto-adjusts itself based on the size of the Excel window.

1. **Notice** what the buttons in the Styles group currently look like.

2. **Click** the Restore Down button.

3. **Notice** how the buttons look different now. Rest assured, they are still the same buttons.

4. **Click** the Maximize button to bring the window back to full screen.
File Tab

The File tab provides a Backstage view of your document. Backstage view gives you various options for saving, opening a file, printing, or sharing your document. Instead of just a menu, it is a full-page view which makes it easier to work with.

1. **Click** the File tab.

2. **Notice** that the Ribbon and the spreadsheet are no longer in view. **Note** the commands on the left side of the screen that you use to perform actions TO a document rather than IN a document.

3. Other things you can do in the Backstage view:
   
a. **Click** the Info menu option. The Info section of the File tab offers an easy to use interface for inspecting documents for hidden properties or personal information.

b. **Click** the New menu option. In this view you can create a new Blank document, or choose from a large selection of Templates.

c. **Click** the Open menu option. The Open pane is used to open existing files on your computer.
   
   i. It immediately presents you with a list of documents that you have recently opened, so you can quickly find and open them again. The computers in the Computer lab have this feature turned off for privacy reasons.

   ii. Clicking OneDrive allows you to open a file that is stored in OneDrive, which is Microsoft’s internet cloud service.

   iii. Clicking Browse opens a File Explorer dialog, which allows you to find the file on your computer. We will be using this option in class.

d. **Notice** the two “save” menu options: Save and Save As. There is a difference between these settings, which we will explain shortly.

4. To return to the spreadsheet from the Backstage view, **click** the large, left pointing arrow in the top-left corner of the screen.
Workspace

**Open** Excel and locate the parts of the Excel window.

- **Name Box**: Displays the currently selected sell.
- **Formula Bar**: Displays the number, text, or formula that is in the currently selected cell, and allows you to edit it. It behaves just like a text box.
- **Selected Cell**: The selected cell has a dark border around it.
- **Column**: Columns run vertically (top to bottom).
- **Column Label**: Identifies each column with a letter. Clicking on a column label selects the entire column.
- **Row**: Rows run horizontally (left to right).
- **Row Label**: Identifies each row with a number. Clicking on a row label selects the entire row.
- **Cell**: The intersection of a row and column.
- **Worksheets**: The worksheets contained in the workbook are displayed at the bottom-left of the screen. Click on a worksheet to view it.
- **Scroll Bars**: Used to view other parts of a worksheet when the entire worksheet cannot fit on the screen.
- **View Tools**: See Status Bar next
Status Bar

The status bar is located below the document window area.

| Ready | | | | | | 100% |

Current Information

The **left end** gives current information about the spreadsheet. Excel doesn't have much information here.

Views

At the **right end** are shortcuts to the different **views** that are available. Each view displays the spreadsheet in a different way, allowing you to carry out various tasks more efficiently.

- **Normal**
  - This is the view we will be working in throughout this course. It simply displays the grid of cells that make up your spreadsheet.

- **Page Layout**
  - Shows what your spreadsheet will look like when printed on paper.

- **Page Break Preview**
  - Allows you to add page breaks to your spreadsheet so you can better control what parts of the spreadsheet are printed on each page.

Zoom Slider

Also at the right end of the Status Bar is the **Zoom Slider**. This allows you to adjust how large the spreadsheet is displayed on the screen. It does not adjust the actual size of the text—just how big or small they are rendered on the screen (like moving a newspaper away from or closer to your eyes).

Customization

1. **Right-click** the **Status Bar** to display the **Customize Status Bar** menu.

   **Why does the Status Bar look empty when there are so many tools active? (most of the options have checkmarks next to them)**

   Many of these tools only appear under certain conditions. For example, the “Average” and “Count” tools only appear in the Status Bar when you select multiple cells that have numbers in them.
2. Notice how **Num Lock** does not have a check mark next to it. That means this piece of information is not currently being displayed on the status bar.

3. Click **Num Lock** to enable it.
   
   a. Notice how the **Customize Status Bar** menu remains on the screen.
   
   b. Notice how the status bar now contains the words **Num Lock**. This means that our keyboard’s Num Lock is currently turned on.

   ![Ready Num Lock]

   c. Look at the **top-right corner** of your **keyboard** and confirm that the Num Lock light is indeed on.

4. Click **Num Lock** a second time in the **Customize Status Bar** menu to turn it off.

5. Click in a **clear space** to dismiss the Customize Status Bar menu.

**Excel Cursors**

You will encounter many different cursor shapes while using Excel.

<table>
<thead>
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<th>Gray</th>
<th>Not unique to Excel</th>
<th>Green</th>
<th>Unique to Excel</th>
</tr>
</thead>
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| **Standard** | Default cursor shape. Appears when you are pointing at buttons on the Ribbon. |
| **I-Beam** | Appears when you are pointing to editable text or to a text box that you can type into. |
| **Move** | Clicking and dragging will move whatever object you are pointing to. |
| **Box Cross** | Appears when you point to a cell on your spreadsheet. Clicking and dragging will select cells. |
| **Fill Handle** | Appears when you point to the black square in the bottom-right corner of a selected cell. Clicking and dragging will auto-fill adjacent cells (we will talk more about auto-fill later). |
| **Select Column** | Appears when you point to a column header. Clicking will select an entire column. |
| **Select Row** | Appears when you point to a row header. Clicking will select an entire row. |
| **Resize Column** | Appears when you point to the divider line between two column headers. Allows you to resize columns. |
| **Resize Row** | Appears when you point to the divider line between two row headers. Allows you to resize rows. |
Creating an Excel Document and Saving It

Creating an Excel file

1. When Excel opens, it will display a blank worksheet ready for you to enter data. The data that you enter and the formatting that you use become your document.

2. In cell A1, type “My first spreadsheet.”

3. Each spreadsheet you create is temporary unless you save it as a file with a unique name and location.

Preparing a Save to Location – a USB Device

| Note: Home students can skip this section. |

When we save an Excel document, all the data in that document is collected and saved as a file. Normally, files are saved on a computer’s hard drive, but due to security restrictions on computer lab machines, files must be saved on removable storage devices.

For this class, we will be using a USB flash drive to save our work. This flash drive will remain in the lab between classes.

1. Orient the flash drive as pictured below

   ![USB flash drive orientation](image)

   Slide mechanism

   This end goes into the USB port on monitor

2. Notice that there is a slide mechanism on the side to retract the USB connector into the body of the drive. Slide this all the way to the right to expose the connector.

3. Locate the USB ports on the monitor. The connector will slide into the port only one way with your name label facing toward you and right-side up.

4. Fit the connector into the port and push it in gently.

5. At this point, you may get a notice that the computer is installing a device driver – wait until the message disappears.
6. A notification may appear in the bottom-right corner of the screen, asking what you want to do with the flash drive. **Close** it by pointing to it and clicking its **Close** button.

7. You are now ready to begin saving your file.

**Saving the File**

1. **Click** the **File** tab.

2. **Click** the **Save As** button. (We use **Save As** instead of **Save** the first time we save a file or whenever we want to save an existing file under a different name or change where we save the file.)

3. **Click** **Browse**.

4. **Notice** that a smaller window appears in front of our work. This small window is called a **dialog box**. Because the computer needs to know more than just “OK, save,” the dialog box is where we tell it **how** we want to save our work.

5. When it comes to saving, there are two important things to **identify** for the computer:

   1. The **location** where the file is going to be saved to.
2. What name you want to give the file.

6. The location where it will be saved is displayed for us in the Address field. In this case, note that the Documents directory is the default save location, but we want to save our file to the flash drive.

7. Notice other available folders and devices can be seen in the left pane, called the navigation pane. If we wanted to save to one of these alternate locations, we would have to click on it.

8. Find the location labeled Kingston (E:) and click on it. Kingston is the name of the company that created our flash drive.

   **Note:** If you are taking this class from home and do not have a flash drive, use "Documents" as the location to save your files.

9. Your address field should now read Computer > Kingston E:).

10. Now we need to name our file. Notice that the file name field is located towards the bottom of the dialogue box.

11. Click in the File Name box and the words will be highlighted. Then enter the word first to name your file ‘first’.
12. Once we have given the computer a file name and a save location, we are ready to save. At this point, your Save As dialog box should look like the image below. To save, you will click the Save button.

![Save As dialog box](image)

13. Your Excel window will still be open but notice the title bar will now show the file name `first.xlsx`.

![Excel window](image)

**Safe Removal of a USB Device**

Before we learn more about creating and saving files, we are going to learn how to safely remove our flash drive. You should never just pull it out because, if the computer is in the middle of writing information to the file, it could corrupt it and make it unreadable!

1. First, and MOST important, be sure to close any and all windows that you might have open. Check your taskbar for “lit up” buttons very carefully.

2. When you first insert an USB device, an icon resembling the one circled in the picture below appears in the notification area. This icon will aid in the safe removal of your flash drive from the computer.

3. Find the icon with the help of your ScreenTips. The ScreenTip will say “Safely Remove Hardware and Eject Media”.

![ScreenTip](image)
4. Once you **locate** the correct icon, **click** on it.

5. When you do, a menu will appear. **Click** on **Eject Cruzer Glide**. This is the brand name of our flash drives.

6. On most computers, you will then see a **confirmation message** that the drive is safe to physically remove from the computer. However, the computers in the lab do not display this message.

7. Occasionally you might **forget** to close your windows before clicking on the Safely Remove Hardware icon. In that case a dialog box will appear, saying that the drive cannot be safely ejected because it is in use. It prompts you to close all your windows and then try ejecting again.

8. **Be aware** that performing the safely remove step removes the USB device virtually from the computer. In order to use the drive again however, it must also be physically removed from the port and re-inserted. **Remove** your drive from the computer.
Creating a Simple Budget Spreadsheet

We are going to explore the functionality of Excel by creating a budget for household expenses.

1. **Open** Excel.

2. **Insert** your flash drive. We will save this file at the end of class.

**Merge and Center Cells**

We are going to put a title for our worksheet in row 1 and we want it to be centered over three columns.

1. **Click** cell A1 and **take note** of the appearance of the **buttons** on the **Formula Bar**. Two of them dimmed, indicating they are unavailable.

2. **Note** also the cell address in the **Name Box**.

3. **Note** the **dark green border** around cell A1. This means the cell is **selected** and ready to accept data.

4. **Type** Monthly Budget.

5. **Note** how all three buttons on the Formula Bar are now available.

   - **Cancel** Returns the cell content to its previous state.
   - **Enter** **Commits** the changes that were made to the cell. There are many ways to commit changes to a cell, but this button is **guaranteed** to work all the time, no matter what situation you are in.
   - **Insert Function** Inserts a function into the cell.

6. After typing, **commit** your content by **clicking** the check mark on the formula bar.

Teacher's note:
The file we create will be saved to the flash drive and named *My Budget*. It is always saved no matter when it gets closed.
7. **Select** cells A1 to C1 by **clicking** inside the first cell, **making sure** your mouse pointer is a **white box cross** (the selection tool) and **holding** the left mouse button down and **dragging** across to the last cell of the selection area.

8. On the **Home** tab, in the **Alignment** group, **click** the **Merge & Center** button. (See **Figure 1** on **Handout 3**)

9. **Click** in a clear cell to deselect the cells.

**Enter Data and Navigate Between Cells**

We will be typing content into cells and using two methods to move to adjacent cells.

1. **Click** in cell A2, **Type** **Item**, and **tap** the **Tab** key to move to cell B2.
2. In cell B2, **type** **Amount** and **tap** the **Tab** key to move to cell C2.
3. In cell C2, **type** **Comments**.
4. **Move** to a different cell to **commit** the content in C2 or, better yet, commit with the check mark.

**Format Cells**

Formatting can be applied to several cells at one time and can make the cells stand out from the rest of the cells in the worksheet.

1. **Select** the A2 through C2 **cell range** by **clicking** cell A2, **making sure** the cursor is the selection tool, and **dragging** across to cell C2. The selected cells should be highlighted - although the first cell will not be so. **Note** the dark black border around the selected cells.

2. On the **Home** tab in the **Font** group, **click** the **Bold** button.
3. **Change** the **font size** to 12.

4. **Find** the **Fill Color** button in the **Font** group and **click** the list arrow. **Select** a light color from the color choices.

5. **Click** in a clear cell to **view** the changes to this range of cells.

**Resize Column**

**Note** how the word **Comments** doesn’t seem to “fit” in the cell. To fix that, we need to widen the column.
Using the ribbon

1. Click on the C at the top of the column to select the column. This is called the column label.

2. On the Home tab in the Cells group, click the Format button. Under Cell Size, choose AutoFit Column Width.

   ![AutoFit Column Width](image)

   Note: If you add an even longer word to one of the cells in that column at a later point, the column must be resized again.

3. Click in a clear cell to deselect the column.

4. Notice the word Comments now “fits” in the C Column.

   ![Excel Table](image)

**Double-click Method**

Another way to resize a column is by double-clicking on the divider line on the column label.

1. Click the Undo button on the Quick Access Toolbar (see Handout 1, Fig 1) to undo our last operation. Notice how clicking the Undo button changes the column width back to the way it was before.

2. Point the cursor to the dividing line between the column C label and the column D label.

3. Notice how the pointer turns into an arrow pointing left and right.

   ![Arrow](image)

4. Keeping the cursor in that location, double-click to resize the column.
Enter More Data and Resize Columns

1. Using Figure 2 on Handout 3, type in the row headings, Rent, Utilities, etc. Use the Enter key to move to the cell below.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Item</td>
<td>Monthly Budget</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Rent</td>
<td>800 June 1st this goes to $825</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Utilities</td>
<td>40 Look into new windows</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Transportation</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Food</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Medical</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Clothing</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Leisure</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Miscellaneous</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>TOTAL</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>INCOME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>EXPENCES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>VACATION CLUB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>SAVINGS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Attempt to resize Column A using the point and double-click method. NOTE: This method will not work if you are still in edit mode in A16 cell.

3. Type the numbers into the cells in Column B using the Enter key to commit your changes and move to the next cell.

Teacher’s note:
Encourage students to use the number pad on their keyboard for number entry.

4. Click into C3 and type June 1st this goes to $825.

5. Click into C4 and type Look into new windows.

6. Resize column C using whichever method you prefer. Make sure you commit the content in C4 before you resize the column. You cannot resize a column while a cell is in edit mode.

7. We meant to type “May 1st” into cell C3. Let’s edit the text in that cell.
   a. Click on cell C3 to select it.
   b. Click in the formula bar. Note that the formula bar populates with the contents of the selected cell.
   c. Change “June” to “May”.
   d. Commit with the check mark.
Apply Currency Style Formatting

Since we are doing a budget, it would be nice to have the numbers in column B display in currency style rather than just plain numbers. To do this:

1. **Select** column B by **clicking** on the letter B at the top of the column.

2. On the **Home** tab in the **Number** group, **click** the **Accounting Number Format** button.

3. **Notice** how all of the numbers now have dollar signs and two decimal places.

4. **Click** into cell B3 and **observe** the formula bar. **Notice** how the formula bar still says “800” (it doesn’t have a dollar sign or decimal places). That’s because the formula bar shows what’s **actually** inside of a cell. In our case, this cell contains a plain old number. But we are telling Excel to **display** this number in our spreadsheet as currency.

   **Note:** When adding new numbers to a column formatted in this currency style, if the number includes dollars as well as cents, a decimal will have to be typed. For example, typing “200.5” yields “$200.50”.

Enter a Simple Formula

Next, we are going to examine several different ways to add the values in cells B3 through B10.

1. To let Excel know that you are going to enter a formula, always start your formula with an equal = sign. **Click** into B11 and **type** an = sign.

2. Now, **click** into cell B3. **Notice** how the cell name (B3) appears in B11 as if it was typed in and also a color border is now around cell B3.
3. Next, **type** a + (plus) sign and then **click** in cell **B4**. Continue to **type** the + signs and **click** into the cells, **which will add the value that is in that cell**, until you **click** into the last cell, **B10**. Do not type the + sign after clicking in **B10**.

![Excel formula example](image1.png)

4. **Check** your formula for accuracy using **Figure 4 on Handout 1**. The formula should be: 
   \[=B3+B4+B5+B6+B7+B8+B9+B10\]

5. **Click** the check mark on the formula bar to see the **result**, which should be $1340.00.

**Use a Function**

We are going to use a different method this time to add up the values in **B3** through **B10**. We are going to use a **function**, which in Excel is basically a pre-defined formula. The function name tells Excel what to execute. In this case, we’re going to use a function called **SUM**.

1. **Click** the **Undo button** on the **Quick Access Toolbar**. **Watch** what happens to cell **B11**. The formula has disappeared, so we can start again.

2. **Type** an = sign into cell **B11**. This lets Excel know that you are going to use a function, just as when you are typing a formula.

3. Next, **type** **SUM**. As you type, **note** that a **dropdown** list appears with suggestions for which function you might like to use.

   ![Function dropdown](image2.png)

   a. **Clicking once** will display a description of the function.

   b. **Double-clicking** will add the function to the formula in the cell.
4. **Double-click** the SUM entry.
   
a. **Note** how an open parenthesis is added to the formula, which marks the beginning of the function.

b. **Also note** the ScreenTip that shows the function’s **syntax**. This tells you what kind of values the function expects to receive.

5. We are going to pass a **range of cells** into the function.
   
a. **Click** into the first cell in the range, which is **B3**.

b. **Type** a colon.

c. **Click** into the last cell in the range, which is **B10**.

d. **Commit** the formula by **clicking** the check mark in the formula bar.

6. **Check** your formula for accuracy – it should be **=SUM(B3:B10)**.

---

**Use the Mouse to Express a Range of Cells**

1. **Clear** the formula by **clicking** the **Undo** button.

2. **Click** into cell **B11**.

3. **Type** in **=SUM**, and **double-click** on the SUM dropdown entry.

4. **Click and drag** from cell **B3** to **B10**.

5. **Check** your formula for accuracy – it should be **=SUM(B3:B10)**.

6. **Click** the check mark on the formula bar. This will insert the end parenthesis and commit the formula.

---

**AutoSum**

AutoSum is a two-part button in the Editing group on the Home tab. It looks like the Greek letter Sigma. It is a shortcut to the **SUM** function and does not require entering an **=** sign in the cell first.

The button has a list arrow with other functions and can be used to perform calculations quickly on a contiguous set of numbers. The AutoSum button will give you all the components of a sum formula except for the range of cells.

1. **Click** in **B11** and **tap** the **Delete** key. Pressing this key clears the contents of the selected cell.

2. On the **Home** tab in the **Editing** group, **click** the **AutoSum** button (not the list arrow).

3. **Note** the selection of cells denoted by the “marching ants” and the formula that has been entered into **B11**.

4. If the formula is correct, **click** the check mark on the formula bar.
Add Data to a Formatted Column

1. Now that we know our expenses add up to $1340.00, **type** the **numbers only** into cell B14. **Do not type the $ sign or the decimal places.**

2. **Click** the check mark on the formula bar to commit the content.

3. **Note** that the number we typed adopted the same currency formatting as the rest of the column.

Spell Check

The Spell Check function checks your worksheet for misspelled words and corrects them.

**Note** that, unlike Microsoft Word and PowerPoint, Excel does NOT underline misspelled words in red.

1. **Click** the Review tab. In the **Proofing** group, **click Spelling**.

2. A box will appear asking if you want to continue to check spelling from the beginning of the sheet (Excel starts the spell check from the selected cell). **Answer** yes.

3. **Respond** to any prompts you might get about misspelled words. You can either accept spelling suggestions or ignore them.

4. We typed some words in all capital letters. If any of those words were misspelled, spell check would not catch them as by default words in all caps will not be spell-checked.

5. **Note** that this technique **ONLY** spellchecks the **active** worksheet. To spellcheck all worksheets, right-click on a worksheet tab, select “Select All”, and then click the Spelling button in the ribbon.

**Tip:** You can tell Excel to spellcheck words that are in uppercase by going to the File tab and clicking Options. Then, navigate to the “Proofing” section and deselect the appropriate checkbox.
Enhancing the Budget Spreadsheet

Our budget spreadsheet is a little too basic at this point to be really useful so we will continue building it so that it works a little harder for us.

Insert your flash drive and open My Budget.xlsx.

Cell Referencing

A cell reference refers to the location or address of a cell. It tells Excel to make use of the value that is inside of the cell that’s being referenced. Cell references are used in formulas, functions, charts, and other Excel commands. When a cell reference is used in a formula or function, whenever that cell is updated, the result of the formula or function will update as well.

You can enter a cell reference into a formula by typing in the reference or preferably, by clicking into the cell you want to reference. This is preferable because the goal is to eliminate typing as much as possible since it is more prone to human error.

It is very important to use precision when cell referencing. If the “wrong” cell is referenced, as long as you have not yet typed an operator or committed the reference, you can fix it by clicking into the correct cell. Otherwise, corrections should be made by editing in the formula bar.

We are going to use cell referencing to correct a weakness in our spreadsheet.

1. Click into cell B14.

2. Look in the formula bar to see that the number displayed is simply hard coded data. We based that data entry on the sum of the Amount column that is displayed in B11. This was not a good strategy because consider what would happen if one of the amounts in column B changed. Let’s try it.

3. In cell B9, type 200 and click the check mark on the formula bar.

4. Notice what happened to the total in B11. It updated accordingly. But what about our expenses amount in B14?
5. Using a **cell reference** in cell B14 instead of typing in a value will force the value of this cell to be recalculated whenever any of the referenced cells are changed.
   a. **Click** in the cell B14 (no need to delete its contents)
   b. **Type** a “=”.
   c. **Click** on cell B11.
   d. **Click** the check mark on the formula bar.

### Adding Columns

As we think about our spreadsheet design, it is easy to see how we could make the spreadsheet work a little harder for us. In the first place, the Amount column could represent what we anticipate will be our expenses during any given month. Some expenses will not change but others such as utilities and food could vary from month to month. Second, if we add a column where we record our actual expenses as the bills come in during the month, we could see how those amounts compare to what we budgeted for them.

1. **Change** the label in cell B2 from “Amount” to “Budget”.

2. **Add** a column between **column B** (Budget) and **column C** (Comments):
   a. **Select** the column to the right of where you want the new column to insert by **pointing** to the column label (A, B, C, e.g.) and **clicking** on it. In this case, **click** on C.
   b. On the **Home** tab in the **Cells** group, **click** on the **Insert** button (not on the list arrow).

3. **Type** **Actual** into cell C2.

4. **Add** another column called **Difference** between column C (Actual) and column D (Comments).
   **Adjust** the column width so the word “Difference” fits inside of the column.

5. Using **Figure 3** on **Handout 3**, **type** in the **numbers** in cells C3 to C10 (do not enter the dollar signs).

### How did Excel know to format the numbers in the new column as currency?

When a new column is inserted, it applies the formatting style of the column to the left to the new column. In our case, it applied the formatting style of column B (currency) to the new column.

### Copy a Formula from One Cell to Another

We have a formula in cell B11 that adds the numbers in the cells directly above it. We can **copy** that formula to the C column (cell C11) rather than create the formula from scratch. This is accomplished using the **Fill Handle** tool.
This tool is not the same as “copy and paste”. It copies the formula, but adjusts the cell references inside of the formula so that they are relative to the original formula. For example, the formula \(=A1+B1\) would change to \(=B1+C1\) when filled to the right.

1. Click in cell B11. Take note that the formula bar reads \(=\text{SUM}(B3:B10)\).
2. Note the lower right corner of cell B11. There is a small black square. That is the fill handle.
3. Point your mouse at the fill handle until the cursor changes to a black cross.
4. To copy the formula in B11 to C11 maintain the black cross cursor shape as you left click the mouse and, keeping the mouse button held down, drag to C11. Then let go of the mouse.
5. Click into C11 and note that in the formula bar the cell range has been changed to \(C3:C10\).

What the ###??

Sometimes when working with numbers and formulas, the column might be too narrow to display the value of one or more cells. In these cases, you’ll see ###### in the cell instead of the expected value. Let’s recreate that scenario, and see how to quickly resolve the issue.

1. Point the cursor to the dividing line between the column C label and the column D label.
2. Keeping the cursor in that location, left-click and hold, then drag to the left to make column C about half as wide as it was. Release the mouse button to resize the column.
3. Notice that the cell values in column C have changed from numbers to hash marks.
4. Now click into one of the cells in column C that now display as ###. Look in the Formula Bar and notice that the value is still what you entered previously.
5. Resize column C again using any method, such as double-click, Autofit, or click-and-drag. Once the column is wide enough, you’ll see the values display properly again.

Enter a New Formula and Copy to Other Cells

Using cell referencing, we are going to enter a formula in D3 to show the difference between what was budgeted for Rent and what our actual expense was. Try to imagine what the formula should be. If you’re not sure, consult Figure 4 on Handout 1. After that, we will “fill” the formula down to Row 10.

1. In cell D3 enter \(-B3-C3\). Remember to use cell referencing (clicking into a cell) instead of typing the cell names. The minus (-) operator will need to be typed.
2. **Find** the Fill Handle (little black square) in D3, and using the Fill pointer (black cross) **fill** the formula from D3 down to D10.

3. **Using the same method, fill** the formula in C11 to D11.

**Teacher’s note:**
There is a reason we are filling horizontally from C11 instead of vertically from D10. It is for the Trace Error section. When populated in this way, D11 does not get a Trace Error like B11 and C11 do, at which point we tell students to always double check their formulas by hand.

### Formulas View

When designing a spreadsheet it is important to double-check yourself to make sure all your formulas make sense. In the view of the spreadsheet we have been using (normal view), it is impossible to tell which cells have formulas in them, unless each cell is clicked. The solution to that is the handy formulas view.

1. **To get** to the formulas view, **hold down** the Ctrl key, and **tap** the ~ (tilde) key. The tilde key is directly below the Esc key.

2. **Note** that cells containing formulas and cell references can be clearly seen. Like opening the hood of your car, it’s showing us what’s actually inside of each cell.
3. Everything seems to make sense except that our Expenses amount in B14 no longer represents what our items actually cost. The B14 cell references the amount we budgeted for our items. **Change** the cell reference in B14 so it will update when cell C11 updates.

4. To get back to the normal view, **repeat** the key combination.

**Adding Rows**

We are going to add a couple of more categories of expenses, so we need more rows. **To insert** a row, you must first **select** the row which is positioned **beneath** where you want the new row to go.

1. Let’s insert a row above **row 11** (TOTAL row).
   a. **Point** to the **row label** (the 11) and **click** on it. The entire row will be **selected**. **Notice** the dark black borders running all the way across the display.
   b. **Right click** on the row label (the 11).
   c. **Click** on **Insert** on the menu. **Notice** what happened. All the rows dropped down to insert another blank row. The TOTAL row is now row 12.
   d. Now, let’s populate the row with data.
      i. In cell A11, **type** Insurance.
      ii. **Tab** to B11 and **type** 50.
      iii. **Tab** to C11. **Notice** how the displayed amount in cell B12 changes because the formula in that cell updated to accommodate the addition of the new cell.
      iv. In C11 **type** 50 and **commit** the content with the check mark. **Notice** the additional updating that occurs in D11 and C12.

2. **Insert** another row above row 12.
   a. In A12, **type** Loans.
   b. **Tab** to B12 and **type** 75.
   c. **Tab** to C12 and **enter** 75.
   d. **Commit** the content with the check mark.

3. **Note** that the formulas in row 13 automatically updated the range to include the 2 extra rows that were inserted.

**Moving Rows and Columns**

Inserting the two new rows resulted in the Miscellaneous row ending up towards the middle of the list of expenses. Typically a miscellaneous category appears at the end of a list. We are going to move the Miscellaneous row so it is above the TOTAL row.
1. Click on row 10 to select it (remember to click on the row label).
2. Leaving your cursor positioned on the 10, right click and select “Cut” from the menu.
3. Select row 13 (TOTAL).
4. Right click and select “Insert Cut Cells”.

**Why not use the “Paste” option to insert the cut cells?**
Pasting our cut row would not insert a new row. It would replace the contents of the row we pasted into.

**Trace Errors**

We have encountered Trace Errors after moving our Miscellaneous row above the Total row. Trace errors are called out by green triangles in the cells containing errors. It is important to investigate any trace errors that appear.

1. Click in a clear cell.
2. Notice the green triangles in cells B13 and C13. These triangles alert us to an error in the formula.
3. Click in one of these cells. Notice how a Trace Error button appears.
4. Click in B13 and look in the formula bar. Note how the formula does not include all 12 rows it previously included. Apparently, Excel does not automatically assume we want the row we moved to be included in the formula any longer, so we have to tell Excel to do so.
5. To correct an error in a cell, click in the cell and, to get options, click the Trace Error button.
6. The options list is telling us the Formula Omits Adjacent Cells. To make the formula include the moved row, we have to select Update Formula to Include Cells.
8. Finally, note how cell D13 does not have a green triangle. Click in the cell and check if the formula is correct. It is not. Absent the Trace Error button, how would you update the formula to include the additional rows? Ans: Fill the formula again from C13 to D13.

**End of Session 1**
Sorting Data

We’d like to organize our spreadsheet so that our items appear in alphabetical order, with the exception of Miscellaneous, which should appear last. To do this we can employ the sort functionality.

1. Select cells A3 through A11.


3. A Sort Warning dialogue box appears.

   a. Microsoft Excel is smart enough to realize that data exists in adjacent cells and is asking if you want it included in your sort.

   b. In this instance, neither option in the sort warning box will give us the results we seek. Let’s try each of them.

4. Choose Continue with the current selection and click the Sort button. Note this results in only the item names being sorted leaving the rest of the data in place. The results show our clothing budget to be $800 and our rent only $200. This won’t do. Click Undo.

5. Click Sort & Filter again and select Sort A-Z. Choose Expand the selection. Note that Excel correctly identified that columns B (Budget) through E (Comments) should be included (the amounts are correctly aligned with the items). However, it also extended the sort vertically, including row 12 (Miscellaneous) and row 13 (Total) in the sort. This is not what we wanted either. Click Undo.

   Why did cells A3:E13 become selected when we clicked Undo?
   This is what Excel expanded our selection to when we selected “Expand the selection”.

6. The lesson learned from this is that when you perform a sort, it is best to select the specific cells you want included in the sort.

7. Select cells A3 through E11.

   Teacher’s note:
   Make sure students are selecting the CELLS. They should NOT be selecting ROWS 3-11 using the row labels. Selecting rows can cause problems under certain circumstances. Specifically: The Custom Sort dialog box will not detect the column headings when we have them sort by Actual.
8. **Click Sort and Filter** and then **Sort A to Z** (no dialog box appears because we are being more specific about what we want to sort).

![Excel spreadsheet](image)

**Custom Sort**

Although we like the result of our categories of expense organized into alphabetical order, we are going to perform another sort that will order our results by the actual money spent on each item, remembering that the Miscellaneous category should remain last.

1. **Reselect** cells **A3:E11** if they are no longer selected.

2. On the **Home** tab go to the **Editing** group and click **Sort & Filter**. **Choose Custom Sort**.

3. In the Sort dialogue box, in the **Column Sort by** field, use the list arrow to **select** our column labeled **Actual**. The **Sort On** field should be **Values** and the **Order** field should be **Smallest to Largest**. **Click OK**.

   ![Sort dialogue box](image)

**Teacher’s note:**
If the “Sort By” field is not listing the column headings, the student may have selected ROWS 3-11 instead of CELLS A3:E11.

4. **Note** that our items are no longer in alphabetical order and that our actual expenses column has figures from $25 through $800. We are able to note that we spent the same amount ($50) on three separate items.
Add a Sort Level

What if you are sorting a list that has two identical values? How do you determine their order? The answer is that you would sort those identical values by another field.

For example, say you are sorting a list of names. First, you would sort by last name. Then, if two people have the same last name, you would sort by first name.

We are going to do something similar to our list of expense items. We will add a second sort level for when the actual amounts are equal (for example, Clothing, Insurance, and Utilities are all $50). This second sort level will sort by the Budget column.

1. **Reselect** cells A3:E11 if they are no longer selected.
2. **Click** Sort & Filter again and **select** Custom Sort. Our recent sort is still listed.
3. **Click** Add Level and then **enter** the second sort criteria:
   a. **Column:** Budget
   b. **Sort On:** Values
   c. **Order:** Smallest to Largest.
   d. **Click** OK.

4. **Note** that the second sort did not order all the budgeted item amounts from lowest to highest but rather a subset of the budgeted item amounts, the ones that we spent $50 on.

5. Although informative, we’d like to see our report display a consistent order from month to month. Since the amount spent will vary from month to month, let’s undo the custom sorts. **Click** the list arrow next to the Undo button and **undo** the last two sorts.

   **Teacher’s note:**
   Make sure each student’s list is sorted alphabetically after clicking Undo twice!
Using a formula to calculate our Savings

1. We have a goal to save $1500 for our vacation. Our Vacation Club takes equal amounts for 10 months before returning it all with interest. Enter 150 into cell B17.

2. To find our Savings we need a formula that will total up the Vacation Club and the Expenses and then subtract that total from the Income. We’re not going to use a built-in formula to do this. Instead, we’re going to make our own.

3. In cell B18, using cell referencing, enter the formula =B15-B16-B17 which gives us the amount remaining for savings.

4. Click the check mark on the formula bar to see the result. ($895.00).

Precedence of Operations

It’s important to note that a formula in Excel is not always evaluated left to right, like you might think. Certain operators are evaluated before others, which changes the formula’s result.

For example, you might think the formula to the right equals 21. Reading left to right, 5 + 2 = 7, and 7 * 3 = 21. But that is incorrect because we have not applied the Precedence of Operations.

The Precedence of Operations would force the multiplication to be evaluated first and then the addition after that, 2 * 3 (6), and then add 5 to that (5 + 6 = 11) making the correct answer 11.

Evaluating certain operators before others in a mathematical expression is also called the Order of Operations. In the table below operators closer to the top are evaluated first.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>()</td>
<td>Parenthesis</td>
</tr>
<tr>
<td>^</td>
<td>Exponents</td>
</tr>
<tr>
<td>* /</td>
<td>Multiplication and Division</td>
</tr>
<tr>
<td>+ -</td>
<td>Addition and Subtraction</td>
</tr>
</tbody>
</table>

What is an exponent?

It’s when you multiply a number by itself multiple times. For example, 5^4 (“five to the fourth power”) means “multiply 5 by itself 4 times”.

\[ 5^4 = 5 \times 5 \times 5 \times 5 \]
Putting **parenthesis** around part of a formula forces Excel to evaluate that part first, no matter what operators it uses. In the example, we put the 5 + 2 in parentheses, forcing Excel to evaluate that part first.

\[
(5 + 2) \times 3 = 7 \times 3 = 21
\]

If two operators are on the same level in the Precedence of Operations table, then they are evaluated left to right.

\[
11 - 5 + 3 = 6 + 3 = 9
\]

You can use the phrase “**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally” to help you remember the order (Parenthesis, Exponents, Multiplication, Division, Addition, Subtraction).

**Other examples:**

\[
\begin{align*}
(5 + 2) \times 3 &= 7 \times 3 &= 21 \\
11 - 5 + 3 &= 6 + 3 &= 9 \\
11 - (5 + 3) &= 11 - 8 &= 3 \\
11 - 5 - 3 &= 6 - 3 &= 3 \\
3 + 15/3 &= 3 + 5 &= 8 \\
2 \times 15/3 &= 30/3 &= 10 \\
1 + 4^2 &= 1 + 4 \times 4 &= 1 + 16 &= 17
\end{align*}
\]
Conditional Formatting

Formatting can be applied to specific cells you would like to draw attention to. Through the use of **conditional formatting**, the formatting can be configured to **change** when the **values** in the cells change.

In our spreadsheet we’d like to draw attention, through the use of color formatting, to any item in the **Difference** column that represents overspending and also to items where we have underspent. We will use conditional formatting to highlight cells in **red** when our spending **exceeds** our budget and highlight cells in **green** when our spending is **less** than our budget. To do this we will be applying **two** conditional formatting rules to cell **D3**, which we will then be able to copy to the other cells.

1. The first rule will apply to the value in **D3** when it represents spending which is less than our budget.
   a. **Click** on cell **D3**.
   b. On the Home tab, in the **Styles** group, **click** Conditional Formatting. From the sub menus that appear, **point** to Highlight Cells Rules and then **click** Greater Than.
   c. In the **Greater Than** dialogue box, **enter** a **0** into the text box on the left.
   d. **Select** “Green Fill with Dark Green Text” in the dropdown list on the right.
   e. **Click** OK in the **Greater Than** dialogue box.
   f. **Note** that cell **D3** now has a **green fill color** because we spent less on **Clothing** than we budgeted for.
2. The second rule will apply to the value in D3 when it represents spending that exceeds our budget.
   a. Make sure cell D3 is still selected.
   b. On the Home tab, in the Styles group, click Conditional Formatting again. Then, click on Highlight Cell Rules and then Less Than.
   c. In the Less Than dialogue box enter a 0 in the text box on the left.
   d. Select “Light Red Fill with Dark Red Text” in the dropdown list on the right (it should already be selected).
   e. Click OK in the Less Than dialogue box.
3. To apply these two rules to the rest of the cells in the Difference column use the Fill Handle to copy this formula through cell D13.
4. Should you get unexpected results, you can view errors and manage the conditional formatting rules.
   a. Deselect the cells by clicking in an empty space.
   b. Click on Conditional Formatting button, the Manage Rules.
   c. Notice how the dialog is empty. Where are our rules? The dropdown list at the top of the dialog defaults to Current Selection, which means that only the rules defined in the selected cells are displayed.
   d. Select “This Worksheet” from the dropdown list to view all the rules defined in the worksheet.
   e. Click Close to close the dialog.
Comments

When we created this worksheet we added a column with reminder information about certain of our budgeted items. Excel offers a better way to comment on particular sections of a worksheet that will eliminate the need for our clunky Column E.

1. Comments get inserted into cells, so the first step is to decide which cell you want your comment to refer to. The “May 1st this goes to $825” comment refers to our budgeted amount for Rent, which will increase during the year. The comment should therefore be connected with cell B9.

2. Click in cell B9.

3. Click the Review tab and, in the Comments group, click on New Comment.

4. Notice how a small, yellow text box has appeared. This is where our comment will go.

5. Also notice how the text box is populated with the word “all” (home students will see something different).

6. Excel automatically populates all new comments with your Microsoft Office user name (defined in the settings). By default, this user name is set to the name of your Windows profile. So, we are seeing “all” because this is the name of the Windows profile here in the lab.

7. Use the Backspace key to remove the user name (optional).

Teacher’s note:
Their insertion point is already in the comment box. They DO NOT NEED TO CLICK. If they do, then the blank line underneath “all” may not be deleted, which will cause problems when they try to resize the comment box.
8. **Type** the “May 1st this goes to $825” comment into the comment box.

![Image of Excel worksheet with comment]

9. **Click** into a clear cell. **Note** the comment box is no longer visible.

10. **Note** the small red triangle in the upper-right corner of cell B9. This indicates that the cell contains a comment.

![Image of Excel worksheet with red triangle]

11. **Point** to the cell and the comment will appear.

12. **Point away** and it is no longer visible. This is because the comment’s visibility is set to “hidden”.

13. To “unhide” the comment:
   a. **Right-click** on the cell that contains the comment (B9). **You do not need to click the red triangle!**
   b. On the context menu, **click Show/Hide Comments**.

14. **Resize** the comment so it **hugs the text**.
   a. **Click** on the comment to select it.
   b. **Point** to one of the white squares so you get the **two-headed resize cursor**.

   ![Image of resized comment]
   c. **Click and drag** to resize the comment.
15. **Move** the comment so that it’s **not covering up any other data**.
   
a. **Point** to an **empty part of the border** so you get the **move cursor**. **Do not point to a white circle!**

   ![Comment moved to an empty part of the border](image)

   b. **Click and drag** to move the comment.

c. **Notice** the arrow that points to the cell that contains the comment. This is called the **leader line**.

16. **Follow** the instructions above to create and format a comment in B11 that says “**Look into new windows**”.

17. **Follow** the instructions above to create and format a comment in B17 that says “**This goes to 0 in November and December**”. This is to remind us that we will not be contributing any money to our Vacation Club during these months.

18. Note that it’s possible to apply a limited amount of **formatting** to a comment.

   a. **Select** the text “May 1st" inside the first comment.

   b. In the **Home** tab, in the **Font** group, **click** the **Underline** button.

   c. **Click** in a clear cell to **deselect** and see the changes.

19. Finally, since we no longer need Column E, we can delete it.

   a. **Right click** Column E’s column label.

   b. **Select** **Delete** from the menu.
Managing Worksheets

Thus far we have been doing all of our work in one worksheet of the workbook, namely, Sheet 1. See the lower left portion of the Excel window; the “active” tab is Sheet 1.

At this point, our monthly budget spreadsheet is working very well for us; so well in fact that it can be used as a model for future months. Excel makes it easy to duplicate data, formulas and formatting through the manipulation of worksheets. We are going to set this workbook up so that we can keep track of our monthly budgets going forward.

First we’ll create a template worksheet which has all the data and formulas that our current worksheet does, except for data that will change from month to month, namely the Actual expenses data. The template worksheet will be copied several times and each worksheet will have the name of a different month of the year. As our bills come in, these amounts can be entered into the worksheet for each given month.

Copying a worksheet

Follow the steps to make a copy of Sheet 1.

1. In your My Budget.xlsx workbook, right click the Sheet 1 tab to bring up a menu.
2. Select “Move or Copy” from the menu.
3. Click in the checkbox next to “Create a Copy” and click OK.

4. Note there is now a new worksheet that is exactly the same as Sheet 1. The new worksheet’s name is Sheet 1 (2).

Renaming a worksheet

The new worksheet is going to become the template on which we base future month’s budget worksheets. We’re going to give it a name and edit the data. The template will not contain any data in the Actual column, but it will still retain formula(s) in that column. We will use copying and renaming to set up worksheets for future months.
1. Let’s rename “Sheet 1 (2)”:  
   a. **Right click** the Sheet 1 (2) tab and **click Rename** on the menu.  
   b. The sheet tab is now in **edit mode** and you can **type Template**.  
   c. When you are done typing, **tap** [Enter] or **click** in a clear cell to get out of edit mode.

2. **Switch** to the Formulas view of the Template worksheet (key combination: **Ctrl** + ``).

3. **Delete** the “Actual” data (not the formula, just the data). **Select** cells **C3:C12** and **tap** [Delete] on keyboard (do not use the Delete key on the Number Pad).

4. **Return** to the Normal view of the worksheet (key combination: **Ctrl** + ~).

5. **Rename** “Sheet 1” to “January”.

6. **Make 2 copies** of the Template sheet (refer back to the “Copying a worksheet” section for instructions on how to make a copy).

7. **Rename** “Template (2)” to “February”.

8. **Rename** “Template (3)” to “March”.

### Moving worksheets

The order of the worksheet tabs can be manipulated by dragging them into position. In our case we want to organize our worksheets from left to right starting with Template at the far left, then January, February, and March.

1. **Click** the Template worksheet tab and **hold** the mouse button down as you **move** your mouse slightly upwards. You will **notice** an image attaches itself to the cursor and a small black triangle appears. This triangle is the **drop point**.

2. As you move your mouse with the mouse button still held down (dragging), the **drop point** will move. When the drop point is where you want it to be, **let go** of the mouse and the tab will be in the new location.

3. **Click and drag** the sheet tabs to put them in order left to right, Template through March.
Tab Color

Excel allows you to assign colors to the worksheet tabs. Tab colors are useful when you have many worksheets and need certain ones to stand out. Let’s give our Template worksheet a color.

1. **Right click** the **Template** tab.
2. **Select** **Tab Color** from the context menu.
3. **Select** a color of your choice.
4. **Click** on a different tab to **deselect** the Template tab and **view** your color.

![Tab Colors](image)

To **remove** a tab’s color:

1. **Right click** the worksheet tab.
2. **Select** **Tab Color** from the context menu
3. **Select** **No Color**.

**Inserting worksheets**

In preparation for the next section, we will need a new worksheet.

1. **Look** for the **New Sheet** button to the right of all the worksheet tabs.
2. **Click** the button to add a new worksheet.

![New Sheet](image)

3. **Notice** how it inserts the new worksheet to the **right** of the worksheet you were previously viewing.
4. **Move** the new worksheet to the end of the list.

**Referencing Data on another worksheet**

It is possible to have formulas on a worksheet which reference data that was entered on a different worksheet. We are going to create a new worksheet for the purpose of analyzing data that is on several other worksheets in our budget spreadsheet. In **preparation**, **use Handout 5 to enter** the amounts for the **actual expenses** in the **February** and **March** worksheets. **Try using the number pad on the keyboard to enter the data.**

![End of Session 2](image)
Data Entry Tips

Auto fill and resize multiple columns to same width

This new worksheet will reference data on each monthly budget worksheet.

1. **Rename** the new sheet **Analysis**.

2. In the **Analysis** sheet, **enter** January in cell **B1**.

3. Using the fill handle, **drag across** to **M1**. **Note** the auto fill feature.

4. Some of the columns need to be resized. If we use the AutoFit feature on each column, the column for September will be much wider than the column for May. We’d like all of the columns to be the same width. To do this:
   a. **Select** columns **B:M** (place your cursor over the **B** until it turns into a downward pointing arrow, then **click and drag** to column **M** to select all columns).
   b. **Place** the cursor over the divider between columns **J** and **K**.
   c. **Click and drag** the divider so that column **J** is wide enough to hold the word September (approximately Width:10.00).
   d. **Notice** how all of the highlighted columns expand to this width when you release the mouse button (right click on column and select Column Width to view column width).

5. Now, let’s add some **formatting** to these column headers.
   a. **Select** row 1.
   b. On the **Home** tab, in the **Alignment** group, **click** the **Center** button
   c. In the **Font** group **click** the **Bold** button.

Copy and Paste between worksheets

1. In cell **A1**, **type** “Actual Expenses”. **Resize** column **A** so it fits.

2. **Click** the **tab** for the January worksheet. **Select** cells **A3:A12**. **Click** the **Copy** button, which is on the Home tab in the Clipboard group (or press **Ctrl + C** for Copy).

3. **Click** the **tab** for the **Analysis** worksheet. **Click** into cell **A2**. **Click** the **Paste** button itself (not the list arrow) which is on the Home tab in the Clipboard group (or press **Ctrl + V** for Paste).

Entering a worksheet reference

Cell references aren’t limited to referencing cells in the same worksheet. They can also reference cells from other worksheets. We are going to use cell referencing to reference the “actual” expenses from our January, February, and March worksheets.

1. **Click** in cell **B2** and **type** an =.

2. **Click** on the **tab** for the January worksheet. **Notice** how the value in the formula bar has changed. It has started building our cross-worksheet cell reference.
3. **Click** into cell **C3** (actual cost of Clothing). **Notice** how the cell reference updated in the formula bar.

4. **Click** the **check mark** on the formula bar.

5. **Note** the formula bar in the **Analysis** worksheet which displays characters indicating a referenced worksheet and cell. Its **syntax** consists of the name of the worksheet (“January”), followed by an exclamation point, followed by the cell location (“C3”).

![formula bar](image)

6. **Use** the **fill handle** to **copy** the reference from cell **B2** to cell **B11**.

7. Using the same method, **reference** the actual cost of Clothing for Feb and **fill** it down:
   a. **Click** in cell **C2**.
   b. **Type** an **=`**.
   c. **Click** on the tab for the February worksheet.
   d. **Click** into cell **C3**.
   e. **Click** on the check mark.
   f. **Use** the fill handle to **copy** the reference from cell **C2** to cell **C11**.

8. **Repeat** the steps to reference actual figures for March.

![Excel table](image)

**AutoSum and fill formula**

1. **Type** **Monthly Total** into cell **A13**.
2. **Use** the **AutoSum** button in the **Editing** group on the **Home tab** to total the expenses for January in cell **B13**.
3. **Use** the **fill handle** to total columns C through M. **Click** in a clear cell.
Line Break within a cell

1. **Type** the word *Monthly Average* into cell **N1** and **commit** the content with the check mark. **Do not adjust the size of the column!**

   ![Cell N1](image)

   2. Instead of making column N wider in order to fit the heading, we can make the word “Average” go on a separate line by inserting a **line break**.

   3. With cell **N1** selected **click** in the formula bar just after the letter *y*, so that the cursor is at the end of the word *Monthly*.

   4. **Press** **Alt + Enter** on the keyboard and **commit** with the check mark. **Notice** how “Average” is now on a second line.

   ![Cell N1](image)

Wrapping text

There is an even easier way to accomplish this.

1. **Click** the **Undo** button on the Quick Access Toolbar to remove the line break we just inserted.

2. With cell **N1** selected **click** **Wrap Text** in the **Alignment** group on the **Home** tab.

3. **Notice** how the text now fits inside the cell.

   ![Cell N1](image)

Entering a Function – Average

1. **Select** cell **N2**.

2. **Scroll** to the left until you can at least see the March column.

3. On the **Home** tab, in the **Editing** group, **click** on the **list arrow section** of the AutoSum button and **choose Average**. **Note** that, in order for Excel to auto-generate the formula, **at least one** of the columns that have values must be visible (January, February, or March columns).

4. **Check** that the cell range is correct (cells **B2:M2**) and **commit** the formula with the check mark.

5. **Use** the fill handle to find the average for rows 3 through 13.
6. **Notice** how cell N12 has a strange value in it. This is because it is trying to calculate the average of an empty row.

7. **Click** on cell N12 and **tap** Delete to clear it.

8. **Note** that Excel has determined the average for the values in the 3 months. Let’s enter a value for April. **Enter** 250 in cell E2 and **click** the check mark. **Notice** how the average is recalculated based on the addition of a fourth value.

### Freeze Panes

**Note** how, when we scroll horizontally to the right, we are no longer able to see our expense category names. There is a way to make the first column visible no matter how far to the right you scroll. It is called **freezing** a column.

1. **Scroll** all the way to the left so that the Column A is visible.

2. **Click** the View tab on the ribbon and in the Window group, **click** on Freeze Panes.

3. **Select** Freeze First Column.

4. **Note** the slightly-darker-than-normal line to the right of Column A.

5. **Scroll** horizontally to the right and **note** Column A remains **visible**.

### To unfreeze a column:

1. **Click** the View tab on the ribbon and in the Window group, **click** on Freeze Panes.

2. **Select** Unfreeze Panes.
You can also freeze **multiple** rows and/or columns. Let’s freeze the **top row**, as well as the **first column**.

1. First, we need to tell Excel what columns and rows we want to freeze. To do this, select the cell that is **one column to the right** of the column(s) you want to freeze, and **one row below** the row(s) you want to freeze.

2. Because we want to freeze the row and the first column, we will select B2.

3. Click the **View** tab on the ribbon and in the **Window** group, click on **Freeze Panes**.

4. **Select** Freeze Panes.

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### Saving a Workbook in Different Formats

#### Older Excel File Format (.xls)

**Story:** We want to send this workbook to our accountant for his review. Unfortunately he has an older version of Excel and may not be able to open this file which was created in Excel 2016 (he would need to have a compatibility pack installed). Excel 2016 provides an option to save the file in a format that can be opened by previous versions of Excel. However, this may result in some loss of formatting.

1. First we will put a little piece of functionality in place to demonstrate with:
   a. Click in an empty cell.
   b. On the **Insert** tab, in the **Sparklines** group, click the **Line** button. This is a feature that is unique to Excel 2010 and later versions.
   c. When prompted for the Data Range, select cells B2 to B11.
   d. Click **OK**.

2. **Save changes** to My Budget.xlsx.

3. To save the file in an older format, open the **File** tab, click **Save As**, then **click** **Browse**.

4. **Click** on the flash drive entry in the Navigation pane.

5. **Use** the list arrow in the **Save as type** field, **select** Excel 97-2003 Workbook (*.xls), and **click** Save.
6. A Microsoft Excel Compatibility Checker window pops up. This alerts us to the fact that some formatting may be lost when we save in an older file format. Click Continue. Note the change in file extension in the title bar.

7. Note the change in file extension in the title bar. The extension is “.xls” (before, it was “.xlsx”)

8. Next, in order to observe the loss in functionality, we need to close the file and re-open it.

9. Note that our Sparkline is missing.

10. Click the Insert tab and note that the buttons in the Sparklines group are greyed out.


PDF

Another saving option is to save an Excel spreadsheet as a PDF (Portable Document Format). One benefit to using this format is that it is widely supported across all computer and mobile devices. Nearly all computers come pre-installed with software that can open PDF files. If your computer does not have this software, you can download software called “Adobe Acrobat Reader DC” for free. This makes PDF an ideal choice for sharing files with people who do not have Microsoft Excel.

Another benefit to using PDFs is that they retain ALL of the formatting in your document. PDFs are designed to represent printed pieces of paper, so they act like an electronic “print-out”.

But the main downside is that PDF files cannot be edited unless you purchase special software called Adobe Acrobat. If you want to make a change to a PDF, you must open the original Excel spreadsheet, make the change there, then re-save it as a PDF.

1. Open My Budget.xlsx.

2. Use the Save As function again but choose PDF as the file format.

3. Notice the checkbox that says Open file after publishing. If checked, then the PDF file will be opened in Adobe Reader as soon as the Save operation is complete. This gives you the chance to inspect the PDF file to make sure it looks OK. Leave it checked.
4. Click Save.

5. Notice how Adobe Reader opens after a few moments.

6. Notice that only the Analysis worksheet is included in the PDF file. We are missing the other worksheets. Saving to PDF will default to saving only the active worksheet unless you tell it otherwise. Close Adobe Reader.

7. Use the Save As function again, but this time, after you have selected the PDF file format, click the Options button.

8. In the Options dialogue, select Entire Workbook and click OK.

9. Click the Save button and click Yes to overwrite the PDF file we created previously.

10. After Adobe reader opens, notice that the PDF now shows all the worksheets.

11. Be aware that, the PDF file you’ve created does NOT automatically update whenever your Excel document updates! This means that, if you change your Excel document, you will need to re-save it as a PDF.

12. Close the PDF window.

What is that dotted line that now appears on the January worksheet?

The dotted line marks the end of page. It appeared because we saved our spreadsheet as a PDF. We’ll be looking into this feature soon when we discuss printing spreadsheets.
Creating a Chart

Often a visual element can display data in a more meaningful and understandable way. We are going to insert a chart to illustrate the Expenses and Savings section of our January worksheet. We will be selecting data for the chart and formatting sections of the chart to make it more understandable.

Insert a chart

1. Click on the tab for the January worksheet.
2. Click in an empty cell in column G. works well.
3. On the Insert tab, in the Charts group, click the Insert Pie or Doughnut Chart button.
4. Click the 3-D Pie style.
5. Notice the Chart Tools ribbon that opens up. It contains two contextual tabs: Design and Format.
6. Click in a clear cell and note the Chart Tools contextual ribbon disappears.
7. Click the chart to select it and the Chart Tools contextual ribbon comes back.

Select data for chart

1. Our chart looks blank because the data it refers to is in cell , and that cell had no data.
   On the Design tab on the Chart Tools ribbon, locate the Data group, and click Select Data.
2. When the Select Data Source dialogue box prompts for a data range, on the worksheet, select cells (unlike most dialogue boxes, this dialogue box lets us interact with our spreadsheet while the dialogue box is open). Click OK.

Teacher’s note: If their chart doesn’t look right, try clicking the “Switch Row/Column” button.
Format the chart

1. On the Chart Tools Design tab, in the Chart Layouts group, **click** the Quick Layout button. **Find Layout 2** and **click** on it.

2. **Replace** the text in the chart title text box.
   a. **Click** where it says “Chart Title”.
   b. **Type** “Expenses vs Savings”. As you type, the letters will appear in the formula bar.
   c. **Click** the check mark to commit your changes.

3. On the Chart Tools Design tab, in the Chart Layouts group, **click** the Add Chart Element button. **Point to Data Labels** from the list, and then **select** More Data Label Options.
4. A **Format Data Labels** pane opens on the right. This allows us to customize the labels that appear on our chart. **Note** that the chart will immediately update as we make our customizations.
   
a. **Check Value.** This causes the actual dollar amount to be displayed on the label

b. For **Separator**, select **(New Line)**. This puts the percentage underneath the dollar value.

c. **Check Outside End.** This moves the labels so they are not covering up the chart.

d. **Close** the Format Data Labels pane by **clicking** the small X in the upper-right corner.

5. **Move** and **resize** the chart to straddle columns **H** through **M**. (Note: move tool engages when you click inside the chart, then drag to move.)

6. **Click** in a clear area to **deselect** your chart.
Printing a worksheet

We are now ready to print our January budget. Printing an Excel worksheet can have its challenges, a few of which will be noted and addressed below.

Viewing the Preview

1. **Make sure** the January worksheet is the active sheet.
2. **Click** the File tab. **Click on Print and look** at the Preview on the right.

   **Teacher’s note:**
   If all they see is the chart, then they forgot to deselect their chart before doing a File > Print.

   **Teacher’s note:**
   Ask the students: What is missing from the print preview?
   - Chart
   - Name of worksheet
   - Comments
   - The other worksheets

3. **Note** how the chart is not entirely displayed on page 1.
   a. **Click** the navigation arrow at the bottom to view page 2.
      The rest of the chart is on page 2.
   b. **Click** back to page 1.

4. **Note** that it doesn’t show the name of the worksheet anywhere (“January”).

5. **Note** that the comments are missing.

6. **Also note** that it’s just printing our January worksheet. By default, Excel only prints the active worksheet. This can be changed by clicking the top button in the Settings area on the left side of the screen where it says “Print Active Sheets”.

   ![Chart preview](chart_preview.png)
Scaling a printout

We can use a method called scaling to make our data and our chart fit all on one page. Scaling refers to shrinking a printout so that it will print on only one page.

1. To the left of the preview is the Print Settings section. At the bottom of the section is a setting that says No Scaling. This means the worksheet is set to print at 100% of its actual size. Click the list arrow and select Fit Sheet on One Page.

2. Note the data and chart sections of the worksheet are all on one page. However, the print is smaller.

Changing Orientation of a printout

If it isn’t mandatory that the printout be oriented in Portrait Orientation, another way to get the data and the chart all on one page is to change the printout orientation to Landscape. However, in our case, this method will require some additional adjustment on our worksheet.

1. Change the Scaling back to No Scaling.

2. Note the setting that says Portrait Orientation. Click the list arrow for that section and select Landscape Orientation.
3. **Note** that a small part of the chart is still on page 2.

4. **Click** the Back button to return to the spreadsheet.

5. **Note** the dotted line on the worksheet between columns L and M, which indicates where the first page of printing will break.

6. **Move** the chart to the left so that it fits inside the print area.

7. **Click** File → Print again. What do you see in the preview? Ans: The chart, because it is still selected.

8. **Click** the Back button to return to the spreadsheet and **deselect** the chart.

9. **Go** back to File → Print and **note** that everything fits on one printed page now, without any scaling.
Creating a Header and Footer for a printout

To address the situation of our title “Monthly Budget” not being centered across our data and our chart, we will be deleting that entire row in the spreadsheet and inserting a title in the Header section of the Printout instead. We will also insert a Footer.

1. Click the Page Setup link at the bottom of the Print Settings section.
2. Click the Header/Footer tab.
3. Click the Custom Header button. This will open the Header dialogue box.
   a. Click in the Center section and type January 2020 Budget.
   b. Highlight the Header text and click the Format Text button.
   c. In the Font dialogue box, choose Font style Bold and Size 14.
   d. Click OK.
   e. Click OK in the Header dialogue box.

4. Click the Custom Footer button.
   a. In the Footer dialogue box, click in the Left section and type your name.
   b. Click in the Center section. Find the Insert Date button and click it. This inserts special code that tells Excel to always display the current date.
   c. Click in the Right section and find the Insert Page Number button and click it. This inserts special code that tells Excel to display the current page number.
   d. Click OK in the Footer dialogue box.
5. **Click** OK in the Page Setup dialogue box.

6. **Click** the Back button to return to your spreadsheet and **delete** Row 1.

7. **Go back** to File → Print to view the results.

---

8. **To center** the content on the page:
   
   a. **Click** Page Setup, then on the Margins tab.
   
   b. In the Center on page section, **click** in the Vertically checkbox.
   
   c. **Click** OK.

---

**Printing Comments**

By default, comments will not print. We will configure the Page Setup to print the comments as they are displayed on the worksheet.

1. **Click** the Page Setup link at the bottom of the Print Settings section.

2. **Click** the Sheet tab.

3. **Find** the section for Comments, **noting** the drop-down box where (None) is visible.

4. **Use** the list arrow to see the two other choices and **click** As Displayed on Sheet.

5. **Click** the OK button.

6. **Note** the comments are now visible in the print preview.

7. **Close** and save My Budget.xlsx.

---

**Note:** If it is hard to read, click the “Zoom to page” button located in the bottom-right corner of the screen. Click the button again to zoom out.
Linking Workbooks

Excel spreadsheets can contain links to data or formulas in other workbooks. The links between workbooks are maintained as long as the file name for each workbook does not change, as well as the location where the workbook files are stored.

A workbook has been created, for the purpose of this class, which contains data regarding income. We will be referencing this workbook in our My Budget workbook. If you recall, in My Budget.xlsx, on the January worksheet, we hard-coded an income figure of $2500.00. In this lesson, we will be exchanging that raw data for a workbook reference.

Referencing Data from an External Workbook

1. Open the Monthly Income.xlsx workbook that’s on your flash drive.
2. Note that the Monthly Income workbook has a January worksheet that keeps track of various sources of income per month.
3. Note the total income for the month, which is $2750.
4. Open the My Budget.xlsx workbook.
5. Note that each open workbook is represented by a button on the task bar. The buttons will “stack”, but when you point to them you can see a preview window of each workbook.
6. In the My Budget workbook, on the January worksheet click in cell B14, and type an equal sign.
7. Reference the Monthly Income workbook by clicking on its preview window.
9. Click the check mark on the formula bar. As soon as the check mark is clicked you will be back in the My Budget workbook.
10. Notice the formula bar. Its syntax consists of:

\[=\text{[Monthly Income.xlsx]}\text{January!$D$9}\]


b. January – The name of the worksheet inside of the reference spreadsheet.

c. $D$9 – The cell that’s being referenced. The dollar signs in the cell reference means it is anchored. An anchored cell reference will not change when an auto-fill is performed.
Managing Linked Workbooks

In order to maintain links between workbooks, the file names must not change and the storage locations must remain the same. When workbooks are first linked, upon reopening the file containing the workbook reference, a security warning will appear prompting you to enable the linked content if you trust the external source. Also, each time you open a file that contains a workbook reference, you will be prompted to update the data from the other (external) workbook.

1. **Save** and **close** **My Budget.xlsx**.
2. In the **Monthly Income.xlsx** workbook, **change** the Secretary salary (Amount Paid) to $700. **Note** the change in cell D9 to $2950.00.
3. **Save** and **close** **Monthly Income.xlsx**.
4. **Open** **My Budget.xlsx**. **Notice** the income amount in B14. Did it update to $2950.00? (Ans: No)
5. **Note** the Security Warning above the formula bar. **Click Enable content**.

![Security Warning]

6. **Notice** that the amount in B14 changed to $2950.00.
7. **Save** and **close** **My Budget.xlsx** and **reopen** **Monthly Income.xlsx**.
8. **Change** the Secretary salary to **$750**, then **save** and **close** the workbook.
9. **Open** **My Budget.xlsx**. A warning dialogue box asks you if you wish to update your workbook with the data from the external source. **Choose Update**. This message will appear each time you open this workbook.

![Security Warning]

10. **Save** and **close** **My Budget.xlsx**.
Number Formats (supplemental)

Excel can format the data you enter into a worksheet in many ways. We have already demonstrated one of the ways Excel can do this by formatting our monthly budget amounts as currency values. In this section, we will demonstrate some of the others ways data can be formatted.

Formatting as Text

1. **Open** a new Excel workbook.

2. In the Home tab, inside the Number group, **notice** the Number Format dropdown list. This allows you to choose how to format the currently selected cell.

3. **Notice** how it says General. That means Excel will make a **guess** as to how you want to format the data.

4. **Type** “0123” into cell **A1** and **commit** with the check mark.

5. **Notice** how the zero disappears and how the number is right-aligned. This is because Excel assumes you are typing a number, and numbers don’t start with zeroes. But what if you wanted it to start with a zero? (for example, a barcode number)

6. To force Excel to display the starting zero, we have to **change** its Number Format.
   a. **Select** cell **A1** if it’s not already selected.
   b. **Select** “Text” from the Number Format dropdown list (note: you may need to scroll down to the bottom of the list).
   c. **Notice** how the cell alignment changed from right to left. That’s because Excel right-aligns numbers and left-aligns text (by default).

7. **Type** “0123” into cell **A1** again and **commit** with the check mark.

8. **Notice** how the zero stayed this time.

9. **Also notice** how the cell now contains a Trace Error. Excel noticed that what you typed looks a lot like a number, and is suggesting that you might want to format the value as a number instead.
10. We will ignore this suggestion because formatting it as a number will remove the zero, which is not what we want to do. Click on the Trace Error and select Ignore Error.

**Formatting as Percentage**
1. Click into an empty cell and enter a number, following it with the % symbol (no space).
2. Commit with the check mark. Look at the Number Format dropdown and notice how it was automatically assigned the Percentage number format.

**Formatting Dates**
Excel allows you to customize the way dates are formatted.
2. In the Home tab, under the Editing group, click the Clear button and select Clear All.
   This not only clears the cell value, but its formatting as well.
3. Notice how the Number Format dropdown list now says “General” instead of “Text”. This is because of the “Clear All” we did in the previous step.
4. Type today’s date with a two-digit year (for example, “11/23/15”) and commit with the check mark.
5. Notice how the Number Format dropdown changed to “Date”. Because what we typed looks like a date, Excel is assuming that we want to treat our cell value as a date.
6. Notice how Excel changed the year to four digits. This is because the default date format uses a four digit year.
7. Select “Long Date” from the Number Format dropdown.
8. Notice how the cell now displays “Monday, November 23, 2015”, but the formula bar still displays “11/23/2015”. This is because we’ve told Excel to format the date a certain way. The actual cell value stays the same.
9. With cell A1 still selected, select “More Number Formats” at the bottom of the Number Format dropdown.

10. A dialog box appears.

   a. Notice how “Date” is selected in the “Category” list box on the left side of the dialog. That’s because our cell value is currently being treated as a date.

   b. Notice how an assortment of date formats is displayed on the right.

   c. Let’s say we really want our date to be displayed with a two digit year. Choose “3/14/12” from the list.

   d. Click OK.

11. Notice how the cell now displays “11/23/15”, and the formula bar still displays “11/23/2015” (it still has a four-digit year). The value of the cell hasn’t changed, just the way Excel displays the value.

Tip: A French person who can speak English might think in French, but speak in English. The same is true for Excel—Excel “thinks” in a specific date format (what you see in the formula bar), but “speaks” in a format of your choosing (the Number Format dropdown).
Filtering (supplemental content)

Introduction

Excel doesn’t have to be used for financial data. It can also be used to store tables of data.

Filters can be used to narrow down the data in your worksheet and hide parts of it from view. While it may sound a little like grouping, filtering is different in the way that it allows you to qualify and display only the data that interests you. For example, you could filter a list of survey participants to view only those who are between the ages of 25-34. You could also filter an inventory of paint colors to view anything that contains the word "blue," such as "bluebell" or "robin's egg blue."

In this lesson, you will learn how to filter the data in your worksheet to display only the information you need.

Filtering Data

Filters can be applied in many different ways to improve the performance of your worksheet. You can filter text, dates, and numbers. You can even use more than one filter to further narrow down your results.

To Filter Data

In this example, we will filter the contents of an equipment log at a technology company. We will display only the laptops and projectors that are available for check-out.

1. **Open “Equipment Log.xlsx”**.

2. **Notice** how our worksheet has a **header row** (row 2) listing ID#, Type, Equipment Detail, etc.

3. **Select** any cell that’s within the table.

4. **Select** the **Data tab**, and **locate** the **Sort & Filter group**. **Click** the **Filter** button.
5. **Notice** how drop-down arrows appear in the header of each column.

6. **Click** the drop-down arrow for the column you would like to filter. In this example, we will filter the Type column to view only certain types of equipment. The Filter menu appears.

7. **Notice** the list of checkboxes. This lists all the unique values in this column, and lets us choose which ones we want to display.

8. **Uncheck** the boxes next to the data values you don't want to view. In this example, we only want to view “Laptop” and “Projector”, so uncheck everything else.

9. **Click OK**. All other data will be filtered, or temporarily hidden. Only laptops and projectors will be visible.

**Notice** the following things about the table:

- The row numbers are blue. This indicates that the table is being filtered.

- Some row numbers are missing. These are the rows that are being filtered out.

- The “Type” column’s list arrow looks different. It has a “filter” icon inside of it.
To Add Another Filter

Filters are additive, meaning you can use as many as you need to narrow down your results. In this example, we will continue to work with our spreadsheet that has been filtered to display only laptops and projectors. Now we will display only laptops and projectors that were checked out during the month of August.

1. **Click** the drop-down arrow where you would like to add a filter. In this example, we will add a filter to the Checked Out column to view information by date.

2. **Uncheck** the boxes next to the data you don’t want to view. In this example, we want to only show the rows whose Checked Out column is within the month of August, so uncheck everything except for “August”.

3. **Click OK**. In addition to the original filter, the new filter will be applied. The worksheet will be narrowed down even further.

To Clear a Filter

1. **Click** the drop-down arrow in the column from which you want to clear the filter. In this case, we want to clear the filter in the Checked Out column.

2. **Choose Clear Filter From “Checked Out”**. The filter will be cleared from the column. The data that was previously hidden will be on display once again.

3. **Click** the Filter button on the Data tab. This will instantly clear all filters from your worksheet.
Advanced Filtering

Excel gives you very fine-grained control over how you can filter your data. You’re not limited to clicking checkboxes like we’ve been doing so far.

Filtering Using Search

Searching for data is a convenient alternative to checking or unchecking data from the list. You can search for data that contains an exact phrase, number, or date, or a simple fragment. For example, searching for the exact phrase "Saris X-10 Laptop" will display only Saris X-10 Laptops. Searching for the word "Saris," however, will display Saris X-10 Laptops, and any other Saris equipment, including projectors, digital cameras, and more.

1. **Click** in a cell inside the table.

2. From the **Data** tab, **click** the **Filter** button.

3. **Click** the drop-down arrow in the column you would like to filter. In this example, we will filter the **Equipment Detail** column to view only a specific brand.

4. **Notice** the list of checkboxes that appear. This is a listing of every **unique data value** in that column.

5. **Enter** the data you would like to view in the **Search** box. We will enter the word "Saris" to find all Saris brand equipment.

6. **Notice** how the list of unique data values **changes** as you type.

7. **Click** **OK**. The worksheet will be filtered according to your search term.

---

**Teacher’s note:**
Click into cell **C9** to demonstrate the dark line that appears when a selected cell gets filtered out.

**Note**
When you filter a table, you may see a dark green, horizontal line in your table (see screenshot). This means that the currently selected cell has been **filtered out** and is not visible.
Advanced Text Filters

**Advanced text filters** can be used to display more specific information, such as cells that contain a certain number of characters, or data that does not contain a word you specify. In this example, we will use advanced text filters to hide any equipment that is related to cameras, including digital cameras, camcorders, and more.

1. From the **Data** tab, **click** the **Filter** command to remove all filters.

2. **Click** the **Filter** command again to enable filtering.

3. **Click** the drop-down arrow in the column of **text** that you would like to filter. In this example, we will filter the **Equipment Detail** column to view only certain kinds of equipment.

4. **Choose Text Filters** to open the advanced filtering menu. **Select Does Not Contain** to view data that does not contain the text we specify.

5. The **Custom AutoFilter** dialog box appears. **Enter** your **text** to the right of your filter. In this example, we will enter "cam" to view data that does not contain those letters. That will exclude any equipment related to cameras, such as digital cameras, camcorders, camera bags, and the digicam printer.

6. **Click** **OK**. The data will be filtered according to the filter you chose and the text you specified.
Advanced Date Filters

Advanced date filters can be used to view information from a certain time period, such as last year, next quarter, between two dates, and more. Excel automatically knows your current date and time, making this tool very easy to use. In this example, we will use advanced date filters to view only the equipment that has been checked out this week.

1. From the Data tab, **click** the Filter command to remove all filters.

2. **Click** the Filter command again to enable filtering.

3. **Click** the drop-down arrow in the Checked Out column.

4. **Choose** Date Filters to open the advanced filtering menu, and select “After...” to filter for equipment that has been checked out after a certain date.

5. **Enter** 9/20/14 in the first text box and **click** OK (you can **use** the “Date Picker” button on the right or just **type** the date into the text box).

To Use Advanced Number Filters:

Advanced number filters allow you to manipulate numbered data in many different ways. For example, in a worksheet of exam grades, you could display the top and bottom numbers to view the highest and lowest scores. In this example, we will display only certain kinds of equipment based on the range of ID #s that have been assigned to them.

1. From the Data tab, **click** the Filter command to remove all filters.

2. **Click** the Filter command again to enable filtering.

3. **Click** the drop-down arrow in the “ID #” column.
4. **Choose Number Filters** to open the advanced filtering menu. Then **choose Between**. This will allow us to view only the rows whose IDs are between a range we specify.

![Image of Number Filters menu]

5. **Enter** a number to the right of each filter. In this example, we will view ID #s greater than or equal to 3000, but less than or equal to 4000. That will display ID #s in the 3000-4000 range.

![Image of Custom AutoFilter dialog box]

6. **Click OK**. The data will be filtered according to the filter you chose and the numbers you specified.
Text to Columns (supplemental content)

The “text to columns” feature allows you to break up the contents of a single cell into multiple cells.

1. **Open Conference Registrants.xlsx**.

2. **Notice** how the **Name** column contains the first and last name of each registrant. We’re going to use **Text to Columns** to automatically separate the first and last names out into two separate columns.

3. The first thing we need to do is **make room** for our new columns. Since we are just splitting these cells into two columns, we only need to insert one new one. **Insert** a column after **column A**.

4. **Type** **Last Name** into cell **A2**.
5. **Type** **First Name** into cell **B2**.
6. **Select** cells **A3** through **A7**.
7. In the **Data** tab on the ribbon, in the **Data Tools** group, **click** the **Text to Columns** button.
8. A wizard dialog appears which allows us to customize the operation. The **first screen** of the wizard asks us how our data is formatted.
   a. **Delimited**: Each field within the cell value is separate with one or more special characters, like spaces or commas.
   b. **Fixed width**: Will split the cell value based on character count (for example, at the 10th character).
   c. Our data generally takes the form of “last name”, “comma”, “first name”, so **delimited** is what we want. **Select Delimited** (it should already be selected).
   d. **Click** **Next**.
9. The **next screen** allows us to choose what our **delimiters** are.
   
a. **Click** the **Comma** check mark. **Note** how the **Data preview** updates.
   
b. It looks like most of our data was successfully split. But not all of it.
   
i. **Note** how there is an **extra space** before some of the first names. This is because these cells had a space after the comma.
   
ii. **Note** how “Williams Stephanie” **was not split**. This is because a comma wasn’t added in between the last and first names.
   
iii. To correct these errors, let’s count the **space character** as a delimiter as well. **Click** the **Space** check mark.
   
c. **Click** **Next**.

10. The **third screen** allows you to choose what **data type** to assign to each column and **where in the worksheet** to position each column.
   
a. **Leave General** selected. Our data is just text, so we don’t have to worry about this screen.
   
b. **Click** **Finish**.
Data Validation (supplemental content)

The Data Validation tool allows you to assign rules to a collection of cells. If the user tries to enter a value into a cell that doesn’t fit the rules, the value will be rejected.

1. **Open Questionnaire Statistics.xlsx**. This spreadsheet is used to keep track of the answers that people give to our new student questionnaire.

2. **Notice** how the **Home Computer?** column consists of mostly **yes/no values**. We will add data validation to this column to enforce this.

3. First, we need to **specify the list of valid values**.
   a. **Create** a new worksheet and **name** it **Validation Data**.
   b. **Type** Home Computer? in cell A1.
   c. **Type** yes in cell A2.
   d. **Type** no in cell A3. Commit the content.

   **Note**: You can put this values list anywhere as long as you can create a cell reference to it! We are choosing to store it in a separate worksheet to keep it apart from our statistics data.

4. **Switch back** to the **Statistics** worksheet.

5. **Select** Column C.

6. In the **Data** tab on the ribbon, in the **Data Tools group**, **click** the **Data Validation** button proper.

   a. **Select** List from the **Allow** dropdown menu. We’re going to specify a list of valid values to validate against.
   b. Next, we need to specify where our data values are.
      i. **Click** inside of the **Source** text box.
      ii. **Click** the **Validation Data** worksheet tab.
      iii. **Select** cells A2 through A3.
   c. **Click** OK.

Takes: 10min
7. **Deselect** the selected cells by clicking in a clear cell.

8. Now, let’s **validate** our worksheet using the rule we just entered. **Click** the Data Validation button’s list arrow and **click Circle Invalid Data**.

![](image1.png)

9. The cells in that column that don’t have a yes or no value will be circled in red.

10. Let’s **correct** the circled values.

   a. We don’t the header row to be validated, so let’s remove the data validation from that cell.

      i. **Select** cell C2.

      ii. **Click** the Data Validation button proper.

      iii. **Select** Any value from the Allow dropdown list.

      iv. **Click** OK.

   b. Let’s correct cell C9.

      i. **Select** cell C9.

      ii. **Notice** how a list arrow appears to the right of the cell. **Click** on it.

      iii. A list of acceptable values appears. **Click no** (we don’t consider tablets to be computers, since they are very different from the desktop computers we use in the lab).
c. **Enter no** into cell C12.

d. **Enter yes** into cell C15.

11. **Click** the Data Validation button’s list arrow and **click Circle Invalid Data** to re-validate the worksheet. All the red circles should **disappear**.

**Exercise:** Apply Data Validation to column B. This column should be validated for the following list of values: under 40, 40-50, 51-60, 61-70, over 70.
IF Function (supplemental content)

In this lesson, we will be using several different formulas to perform a tax calculation. The form we will use is very loosely based on the Federal tax form 1040EZ and is only an example for class.

1. Open the Finance.xlsx file that is on your flash drive.
2. Note that the workbook has two worksheets, Tax Form and IF Statement.
3. Switch to the Tax Form worksheet. This worksheet is meant to resemble a Federal 1040EZ tax form.
4. Note the Tax Form has three sections:
   a. The first section, Tax Rate, shows the tax rate in this imaginary land – everyone is supposed to pay 15% of their income.
   b. The second section, W2s, has the income for our married couple and some empty cells where we will calculate the tax withheld.
   c. The third section is the Tax Calculation.
5. Let’s start by calculating what the Tax withheld amount is going to be for Joe and Sally.
   a. Click cell C7 and note the number format is Percentage. This means it can be used in a formula to find the percentage of a value in a cell.
   b. Click cell D10 and use cell referencing to create a formula that will find 15% of Joe’s income.
   c. Do the same for Sally’s tax withheld.
   
   English: Joe’s income times 15%
   Formula: \[ C10 \times C7 \]

6. Now, let’s start the Tax Calculation section at Line 1. In cell C14 use cell referencing to create a formula that will add up Joe’s and Sally’s wages.

   English: Joe’s and Sally’s taxable income combined.
   Formula: \[ C10 + C11 \]

7. For Line 4, let’s use the Insert Function button on the formula bar to insert the Sum function to add the amounts on lines 1, 2 and 3.
   a. Click cell C17 and click the Insert Function button on the formula bar.
   b. Note that it automatically enters the equal sign.
   c. Click SUM from the list of functions and click OK.
   d. Note the suggested range in the function arguments dialogue is the range we want \[ C14:C16 \]. Click OK.

   English: Add lines 1, 2, and 3.
   Formula: \[ \text{SUM}(C14, C15, C16) \text{ or SUM(C14:C16)} \]

Takes: 30min
8. For Line 5, type the amount for Married Filing Jointly.

   **English:** Enter $16,400.
   **Formula:** Trick question! There is no formula. This is raw data!

9. For Line 6, we’re going to use a very powerful formula called an IF statement. Before we do that we are going to a separate worksheet named IF Statement, to practice with IF formulas.

**IF Statement Worksheet**

The IF statement makes a comparison. If the comparison is true, it will display one thing. If it is false, it will display something else. The pieces of the formula (called parameters) are separated with commas. In Excel-speak this comparison is called **logical test**.

The best way to build IF formulas is to understand them in English first. You’re going to do four IF formulas on this sheet, working with the First and Second numbers that are in cells **B3** and **B4**.

1. **Switch** to the “IF Statement” worksheet.

2. **Note** that there are two cells at the top with numbers in them, cells **B3** and **B4**. We’re going to compare these two numbers and display different things based on the comparison. So, right now, First Number equals 10 and Second Number equals 5.

3. Let’s build Formula #1 as we read the English. We will also need to type an open parenthesis after the formula name.

   **Formula:** =IF(B3=10,10,0)

   a. **Click** cell **C10**.
   b. **Type** =IF(.
   c. **Click** on **B3** representing the first number.
   d. **Type** 10
   e. **Type** a comma.
   f. **Type** 10
   g. **Type** a comma.
   h. **Type** 0
   i. **Commit** the formula with the check mark.
   j. Let’s test out the formula further.

      i. **Type** a 9 into cell **B3** and **commit** with the check mark.
      ii. **Note** the formula displayed a 0 since the amount in cell B3 does not equal 10.
      iii. **Change** cell **B3** back to **10**.
4. With Formula #2, we’re going to display text instead of a number. When displaying text, always enclose the text in double quotes.

   **Formula:** `=IF(B3>5, "greater", "less")`

   a. Click in cell **C14**.
   b. Type `=IF(`
   c. Click on **B3** representing the first number.
   d. Type a `>` sign
   e. Type `5`
   f. Type a comma.
   g. Type `"greater"` (including the quotation marks)
   h. Type a comma.
   i. Type `"less"` (including the quotation marks)
   j. **Commit** formula with check mark
   k. Let’s test out the formula further
      i. **Change** the number in **B3** to a 3
      ii. **Note** the word less is displayed rather than the word greater
      iii. **Change** cell **B3** back to 10

5. With formula #3, we are going to put a calculation inside the IF statement’s condition. Also, instead of typing in the formula ourselves, we’re going to use the “Insert Function” button.

   **Formula:** `=IF(B3-B4>5,"greater","less")`

   a. Click in cell **C18**.
   b. Click on the **Insert Function** button.
   c. Select **IF** from the function list and click **OK**.
   d. A **Function Arguments** dialogue will open.
      i. Click in the **Logical_test** text box.
         1. Click on cell **B3**.
         2. Type a minus sign.
         3. Click on cell **B4**.
         4. Type a greater than sign, then a `5`.
      ii. In the **Value_if_true** text box, type `"greater"` (including the quotation marks).
         Note that Excel will automatically enclose the text in double quotes when you click out of the text box.
iii. In the Value_if_false type "less" (including the quotation marks).

iv. Click OK.

![Function Arguments dialog]

- e. Because the difference is not greater than 5, the word less is displayed rather than the word greater.

- f. Let’s test out the formula further
  
  i. Change the number in cell B3 to 11.
  
  ii. Because the difference is greater than 5, the word greater displays this time.
  
  iii. Change cell B3 back to 10.

6. With formula #4, we are going to closely approximate the formula for the Taxable Income line (line 6) of the Tax Form.

**Formula:** 

\[ =IF(B4>B3, 0, B3 - B4) \]

- a. Click cell C22.

- b. Click the Insert Function button in the formula bar.

- c. Select IF from the function list and click OK.

- d. A Function Arguments dialogue will open.
  
  i. Click in the Logical_test text box.
     
     1. Click on cell B4.
     
     2. Type a greater than sign.
     
     3. Click on cell B3.
  
  ii. In the Value_if_true text box, type 0.
  
  iii. In the Value_if_false, type B3-B4.
  
  iv. Click OK.
e. Because the second number is not greater than the first number, the middle parameter was not used. Instead the third parameter was used

f. Let’s test out the formula further

i. **Change** the number in cell B4 to 20

ii. Because the second number is greater than the first number, the second parameter was used and a 0 displayed

iii. **Change** cell B4 back to 5

**Tax Form Worksheet**

1. **Go back** to Tax Form worksheet.

2. Let’s focus on Line 6 of the Tax form. Line 6 is where we calculate our taxable income. Taxable income is your income minus an allowance for the standard deduction. But the calculation has to take into account that the Adjusted Gross Income might be either greater or less than the standard deduction.

   **English:** If the Standard Deduction > Adjusted Gross Income, display 0, otherwise display Adjusted Gross Income - Standard Deduction.

   **Formula:** =IF(C18>C17,0,C17-C18)

3. For Line 7, create a formula to add the Tax Withheld for Joe and Sally.

   **English:** Joe’s withheld taxes plus Sally’s withheld taxes.

   **Formula:** =D10+D11

4. For Line 8, we will leave the value at 0.

5. For Line 9, create the formula according to the directions in cell B22.

   **English:** Add lines 7 and 8.

   **Formula:** =C20+C21

6. For Line 10, we need to calculate the tax. It is asking us to find 15% of our Taxable incomes.

   **English:** Multiply our taxable income (Line 6) by this year’s tax rate.

   **Formula:** =C19*C7

7. Line 11 will require another IF statement. Let’s see if you can figure out how to enter it.

   **English:** If (Line 9 > Line 10, then display Line 9 – Line 10, otherwise display 0).

   **Formula:** =IF(C22>C23,C22-C23,0)

8. Line 12 also requires an IF statement.

   **English:** If (Line 10 > Line 9, then display Line 10 – Line 9, otherwise display 0)

   **Formula:** =IF(C23>C22,C23-C22,0)
9. Great! Joe and Sally don’t owe any more tax and are getting a nice refund!

![Using Formulas in Tax Calculations](image)

**Conditional Formatting**

On the **Tax Form** worksheet, let’s make the refund amount stand out. Let’s say that if we get a refund, we want to make it display in bold and green. This is called Conditional Formatting. Let’s change the **Refund** formatting now.

1. **Click on** C24.
2. On the **Home** ribbon, find the **Styles** group and **click on** Conditional Formatting. Then, under **Highlight Cell Rules**, **select Greater Than**.
3. **Type 0** into the text box and **select Green Fill with Dark Green Text** from the dropdown list.

Let’s do something similar for Line 12 (the amount you owe). Let’s make the text red if anything is owed.

1. **Click on** C25.
2. On the **Home** ribbon, find the **Styles** group and **click Conditional Formatting**. Then, under **Highlight Cell Rules**, **click Greater Than**.
3. **Type 0** into the text box and **select Light Red Fill with Dark Red Text** from the dropdown list.
Manipulate the Tax file

What happens if the tax rate goes up to 25%? Do Joe and Sally get a refund?

What if Sally really made $15,000? What happens to what they pay?

This is really the power of Excel—to be able to enter formulas and then change values and watch the spreadsheet change. And you can see that most of the formulas we used were adding, subtracting, and summing. That is mostly what you do in Excel.