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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 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 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 2010. The latest version is Excel 2016. Even though we are using an older version, the user interface and feature set of Excel 2010 is very similar to that of Excel 2016, so the concepts taught in this class can still be applied to the latest version.

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 2010 Environment

Open Excel by using the Start menu or by double-clicking on the desktop icon for Microsoft Office Excel 2010.

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 screen tip.
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, and see the command get added to the Quick Access Toolbar.

4. The Quick Access Toolbar can also be moved to show below the Ribbon. Move the Quick Access Tool Bar back above the ribbon.

Ribbon

The Ribbon contains all of the tools that you use to interact with your Microsoft PowerPoint 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, and then return to Home tab.

Active Tab

By default, Excel will open with the Home tab of the Ribbon active. Note the subtle difference in appearance between an Active and an Inactive 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 given different colors. 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 screen tips. The screen tips display the name of the button, along with a short description of what the button does.

Two-Part Buttons

Some buttons in the groups have two parts, the button proper and the List arrow.

- A one-part button will light up completely in orange when you point to it.
- On a two-part button, only one section at a time will light up in orange when you point to it, so the orange color is key.

Dialogue Box Launcher

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

Click a launcher button, and then close the dialogue box.

Minimize Ribbon Button

The Minimize Ribbon button essentially takes the Ribbon out of view, with the exception of the names of the ribbon tabs.

1. Locate the Minimize the Ribbon button (underneath the window control buttons) and click it.

2. Clicking on tabs will make its tools available but the contents will not stay in view permanently unless you uncheck minimize the ribbon. Try clicking on a tab, then click into the document workspace. Note the tab goes out of view.
3. To keep the ribbon in view, click the minimize ribbon button again.

Note: It is also possible to minimize the ribbon by double-clicking on an active tab. If your ribbon suddenly disappears, then you may have done this by accident!

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 on the File tab.

2. Notice that the ribbon is no longer in view. Note the commands at the top of the menu 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. 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 Recent menu option. In the Recent pane, you can conveniently access Recent documents and Recent Places (folders and files recently accessed on your computer).

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

   d. Click the Options menu option. In this view you can change various application options. For example, you can adjust the spelling and grammar check settings, AutoRecover settings, and Language preferences.

4. To return to the document from the Backstage view, click any other tab.
Workspace

Open Excel and locate the parts of the Excel window.

- **Name Box**: Displays the currently selected cell.
- **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 workbook’s worksheets 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.

Current Information

The **left end** gives current information about the document. 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.

<table>
<thead>
<tr>
<th>View</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>This is the view we will be working in throughout this course. It simply displays the grid of cells that make up your spreadsheet.</td>
</tr>
<tr>
<td>Page Layout</td>
<td>Shows what your spreadsheet will look like when printed on paper.</td>
</tr>
<tr>
<td>Page Break Preview</td>
<td>Assists you in making your spreadsheet look good when printed.</td>
</tr>
</tbody>
</table>

Zoom Slider

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

Customization

The **Status Bar** can be customized.

1. **Right-click** on the Status Bar to bring up the customize menu. Options that are enabled have a checkmark next to them.
2. **Click** on **Num Lock** to enable this option, which will display an indicator about whether Num Lock is enabled or disabled.
3. **Notice** how the menu didn’t disappear. **Click** in a clear space to dismiss the menu.
4. **Notice** how the words “Caps Lock” appear in the Status Bar in the bottom left corner of the Excel window.
5. **Press** the **Num Lock** key on your keyboard to turn Num Lock off. **Notice** how the words “Num Lock” disappear from the Status Bar.
6. **Press** the **Num Lock** key on your keyboard to turn Num Lock back on.
### Excel Cursors

You will encounter many different cursor shapes while using Excel.

<table>
<thead>
<tr>
<th>Cursor Shape</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard</strong></td>
<td>Default cursor shape. Appears when you are pointing at buttons on the Ribbon.</td>
</tr>
<tr>
<td><strong>I-Beam</strong></td>
<td>Appears when you are pointing to editable text or to a textbox that you can type into.</td>
</tr>
<tr>
<td><strong>Move</strong></td>
<td>Clicking and dragging will move whatever object you are pointing to.</td>
</tr>
<tr>
<td><strong>Box Cross</strong></td>
<td>Appears when you point to a cell on your spreadsheet. Clicking and dragging will select cells.</td>
</tr>
<tr>
<td><strong>Fill Handle</strong></td>
<td>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).</td>
</tr>
<tr>
<td><strong>Select Column</strong></td>
<td>Appears when you point to a column header. Clicking will select an entire column.</td>
</tr>
<tr>
<td><strong>Select Row</strong></td>
<td>Appears when you point to a row header. Clicking will select an entire row.</td>
</tr>
<tr>
<td><strong>Resize Column</strong></td>
<td>Appears when you point to the divider line between two column headers. Allows you to resize columns.</td>
</tr>
<tr>
<td><strong>Resize Row</strong></td>
<td>Appears when you point to the divider line between two row headers. Allows you to resize rows.</td>
</tr>
</tbody>
</table>

---

### 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

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

   ![Slide mechanism](image)

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. An AutoPlay window may pop up. Close it by clicking the Close button. *(NOTE: If you have any other windows open, this may pop up behind them)*

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

**Saving the File**

1. **Click** on the File Tab.

2. **Click** on 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. **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.*
4. 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.

5. The location where it will be saved is displayed for us in the Address field.

6. 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.

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

8. Your address field should now read Computer > Kingston (I:).

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

10. Click into this box and the words will be highlighted. Then type the word first to name your file ‘first’.

11. 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 on the Save button.

12. Your Excel window will still be open but notice the title bar will now show the file name first.docx.
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 screen tips. The screen tip will say “Safely Remove Hardware and Eject Media”.

4. Once you locate the correct icon, click on it.

5. When you do, a menu will appear. Click on Eject Data Traveler 2.0. 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.

![Problem Ejecting USB Mass Storage Device](image)

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

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.

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 into cell A1 and take note of the appearance of the button on the Formula Bar.
2. Note also the cell address in the Name Box.
3. Note the dark border around cell A1. This means the cell is selected and ready to accept data.
4. Type Monthly Budget.
5. Note how three buttons have appeared on the Formula Bar.

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
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<tr>
<td>Cancel</td>
<td>Returns the cell content to its previous state.</td>
</tr>
<tr>
<td>Enter</td>
<td>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.</td>
</tr>
<tr>
<td>Insert Function</td>
<td>Inserts a function into the cell.</td>
</tr>
</tbody>
</table>

6. After typing, commit your content and get out of edit mode by clicking the check mark on the formula bar.
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.

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.
1. **Click** in cell **A2**, **Type Item**, and **press** the **Tab** key to move to cell **B2**.

2. In cell **B2**, **type Amount** and **press** 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** on 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.

   **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.
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.

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.

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 cell A16.

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

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.

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”.

**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 **Numbers** 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 “200” (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**

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.
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.

   ![Dropdown list with SUM function](image)

   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** on 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 screen tip 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** on the **checkmark** 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 **press** the Delete key. Pressing this key clears the contents of the selected cell.
2. On the Home tab in the Editing group, **click** on 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 checkmark 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 in 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.

**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, **enter** 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 =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**.

![Column Division](image)

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**.

---

**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 $14 no longer represents what our items actually cost. The $14 cell references the amount we budgeted for our items. Change the cell reference in $14 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 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 $12 changes because the formula in that cell updated to accommodate the addition of the new cell.
      iv. In C11 enter 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 enter 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 on 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.

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.

2. On the Home tab look in the Editing group and click on Sort & Filter. Choose the A to Z sort option.
3. A **sort warning box** appears. Microsoft Excel is smart enough to realize that data exists in adjacent cells and is asking if you want it included in your sort.

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

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

6. **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.**

7. **Click** on 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.**

8. 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.**


10. **Click** on **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).

**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** on **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)

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** on **Sort & Filter** again and **select** **Custom Sort**. Our recent sort is still listed.

   3. **Click** on **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** on 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.

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>
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.

$$\text{(5 + 2) * 3 = 7 * 3 = 21}$$

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

$$\text{11 - 5 + 3 = 6 + 3 = 9}$$

You can use the phrase “**Please Excuse My Dear Aunt Sally**” to help you remember the order (**Parenthesis, Exponents, Multiplication, Division, Addition, Subtraction**).

**Other examples:**

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result 1</th>
<th>Result 2</th>
<th>Result 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(5 + 2) * 3$</td>
<td>$7 * 3$</td>
<td>$21$</td>
<td></td>
</tr>
<tr>
<td>$11 - 5 + 3$</td>
<td>$6 + 3$</td>
<td>$9$</td>
<td></td>
</tr>
<tr>
<td>$11 - (5 + 3)$</td>
<td>$11 - 8$</td>
<td>$3$</td>
<td></td>
</tr>
<tr>
<td>$11 - 5 - 3$</td>
<td>$6 - 3$</td>
<td>$3$</td>
<td></td>
</tr>
<tr>
<td>$3 + 15/3$</td>
<td>$3 + 5$</td>
<td>$8$</td>
<td></td>
</tr>
<tr>
<td>$2 * 15/3$</td>
<td>$30/3$</td>
<td>$10$</td>
<td></td>
</tr>
<tr>
<td>$1 + 4^2$</td>
<td>$1 + 4 * 4$</td>
<td>$1 + 16$</td>
<td>$17$</td>
</tr>
</tbody>
</table>
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 on Conditional Formatting. From the sub menus that appear, click on Highlight Cell Rules and then Greater Than.
   c. In the Greater Than dialogue box, enter a 0 into the textbox 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 on 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 textbox 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.

![Conditional Formatting Rules Manager](image)

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

![New Comment](image)

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).

8. **Type** the “May 1st this goes to $825” comment into the comment box.

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.

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 on the red triangle!**
   b. On the context menu, **click** on **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 circles** so you get the **two-headed resize cursor**.
   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!*
   
   ![Move comment](image)

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

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

17. 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.
   
   ![Select text](image)

   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.

   ![Underline](image)

18. **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.

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 on 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 on the Sheet 1 (2) tab and click on Rename on the menu.
   b. The sheet tab is now in edit mode and you can type Template.
   c. When you are done typing, press 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 press Delete on keyboard.
4. Return to the Normal view of the worksheet (key combination: Ctrl + ~).
5. Rename “Sheet 1” to “January”.

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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** on 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**.

![Drop Point](image1)

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.

![Drop Point](image2)

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** on 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.
To remove a tab’s color:

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

Deleting worksheets

Work done with worksheet tabs (such as deleting or renaming worksheets) is NOT something that can be reversed by using the Undo button. Therefore, care must be taken especially when deleting a worksheet.

Let’s delete Sheet 2 and Sheet 3, since we are not using these worksheets.

1. Right click on the Sheet 2 tab.
2. On the menu, select Delete.
3. Repeat the steps above for Sheet 3.

Inserting worksheets

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

1. Look for the Insert Worksheet button to the right of all the worksheet tabs.
2. Click the button to add a new worksheet.

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.

End of Session 2
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** on the **Center text** button.
   c. In the **Font** group **click** on the **Bold** button.

Copy and Paste between worksheets

1. In cell **A1**, **type** “Actual Expenses”. **Resize** column A.
2. **Click** on 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** on 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 example](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.

**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 checkmark. Do not adjust the size of the column!

![cell with line break](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 (aka carriage return).

3. With cell **N1** selected click inside 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 checkmark. **Notice** how “Average” is now on a second line.

![Image](image_url)

**Wrapping text**

1. There is an even easier way to accomplish this. **Click** the **Undo button** on the Quick Access Toolbar to remove the line break we just inserted.

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

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

![Image](image_url)

**Entering a Function – Average**

1. **Select** cell N2.

2. 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).

3. **Check** that the cell range is correct (cells B2:M2) and **commit** the formula with the checkmark.

4. **Use** the fill handle to find the average for rows 3 through 11.

5. **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 on the View tab on the ribbon and in the Window group, click on Freeze Panes.
3. Select Freeze First Column.
4. Note dark 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 on 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 on the View tab on the ribbon and in the Window group, click on Freeze Panes.
4. Select Freeze Panes.
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 2010 (he would need to have a compatibility pack installed). Excel 2010 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 and **click** on the **Save As** button.

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

8. **Note** that our Sparkline is missing. **Click** on the **Insert** tab and **note** that the **Sparklines** group is greyed out.

9. **Close** My Budget.xls.
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 Reader” 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 Word document, make the change there, then re-save it as a PDF.

1. Open My Budget.xlsx and make sure the January worksheet is the active worksheet.
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 we only have one page. 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 on the Options button below it.
8. In the **Options** dialogue, **select Entire Workbook** and **click OK**.

![Options dialog]

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 has **multiple pages** and 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. G4 works well.
3. On the Insert tab, in the Charts group, **click** on the Pie button.
4. **Mouse over** the pie chart styles until you find the Exploded pie in 3D and **click** on it.
5. **Notice** the Chart Tools ribbon that opens up and the three associated tabs.
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 G4, 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 A15:B18 (unlike most dialogue boxes, this dialogue box lets us interact with our spreadsheet while the dialogue box is open). **Click** OK.

Format the chart

1. On the Chart Tools Design tab, in the Chart Layouts group, **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** on the **checkmark** to commit your changes.

3. On the **Chart Tools Layout** tab, in the **Labels** group, **click** the **Data Labels** button and **select More Data Label Options**.
4. **Move** the dialogue box so it is not covering up the chart.
   
   a. Under **Label Options**, check **Value** and **Percentage** and **uncheck** **Show Leader Lines**.
   
   b. Under **Label Position**, check **Outside End**.
   
   c. Under **Separator**, select **(New Line)**.
   
   d. **Click** Close.

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** on the File tab. **Click** on Print and look at the Preview on the right.
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”.

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.

![Image of worksheet with chart and data]

**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.

![Image of worksheet showing change in orientation]

4. **Click** on the **Home** tab, and **note** the **dotted line** on the worksheet which indicates where the first page of printing will break.

![Image of worksheet showing dotted line]

**Teacher’s note:** Sometimes, the line won’t be there for some reason. If the line is not there, go to File > Print again, and then click on the Home tab again.

5. **Move** the chart to the **left** so that it fits inside the **print area**.
6. **Click** on File → Print again. What do you see in the preview? Ans: The chart, because it is still selected.

![Chart](chart.png)

7. **Go back** to the Home tab and **deselect** the chart.

8. **Go back** to File → Print and **note** that everything fits on one printed page now, without any scaling.

![Spreadsheet](spreadsheet.png)

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

2. **Click** on the Header/Footer tab.
3. **Click** on the Custom Header button. This will open the Header dialogue box.
   a. **Click** in the Center section and **type** January 2017 Budget.
   b. **Highlight** the Header text and **click** on the Format Text button. **Note** that, due to an Excel bug, the buttons’ screen tips do not always display in this dialog.
   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** on 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 Home tab and **delete** Row 1.
7. Go back to File ➔ Print to view the results.

![Image of Excel sheet]

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.

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

![Image of Excel sheet]

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 on 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 on “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.

![Image of Excel sheet]
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 entered an arbitrary income figure of $2500.00. In this lesson we will be exchanging that raw data for a workbook reference.

The new workbook, Monthly Income.xlsx, must be downloaded from the library website, and saved to your student flash drive.

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.
8. In the Monthly Income workbook, **click** in cell D9.
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:

    ![Formula Image]

    a. **Monthly Income.xlsx** – The filename of the referenced spreadsheet.
    b. **January** – The name of the worksheet **inside** of the reference spreadsheet.
    c. **D9** – The cell that’s being referenced. Putting dollar signs in a cell reference is a more precise way of defining a cell reference (rather than just doing “D9”).
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. As soon as content is enabled you will see the amount in B14 change.

6. **Save** and **close** My Budget.xlsx and **reopen** Monthly Income.xlsx.

7. **Change** the Secretary salary to **$750**, then **save** and **close** the workbook.

8. **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.

9. **Notice** how the **chart hasn’t updated**. In order to get the chart to update, you must **hover** the mouse cursor over the chart.

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 other 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 checkmark.

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 checkmark.

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

9. **Click** on the **Trace Error** that appeared. 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. **Select “Ignore Error”**. We will ignore this suggestion because formatting it as a number will remove the zero, which is not what we want to do.

![Image of Ignore Error option]

**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. **Notice** how it is assigned the **Percentage** number format, allowing for easy formula building for finding percentages of values.

**Formatting Dates**

Excel allows you to customize the way dates are formatted.

1. **Select** cell A1.

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**”. 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 checkmark.

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** “3/14/01” 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.
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.

![Image of Excel table with drop-down arrows]

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.

![Image of filtered Excel table]
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** on 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, 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 textbox and click OK (you can use the “Date Picker” button on the right or just type the date into the textbox).
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.

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.
6. **Click OK**. The data will be filtered according to the filter you chose and the numbers you specified.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td><strong>B</strong></td>
<td><strong>C</strong></td>
<td><strong>D</strong></td>
</tr>
<tr>
<td>1</td>
<td><strong>ID #</strong></td>
<td><strong>Type</strong></td>
<td><strong>Equipment Detail</strong></td>
</tr>
<tr>
<td>2</td>
<td>Equipment Log — Ragnar Technologies Inc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3000</td>
<td>Other</td>
<td>Saris Lumina Digital Camera</td>
</tr>
<tr>
<td>4</td>
<td>3900</td>
<td>Other</td>
<td>U-Go Saris Label Maker</td>
</tr>
<tr>
<td>6</td>
<td>3005</td>
<td>Other</td>
<td>Saris Zoom Z-60 Digital Camera</td>
</tr>
<tr>
<td>8</td>
<td>3800</td>
<td>Other</td>
<td>U-Go Saris DigiCam Printer II</td>
</tr>
<tr>
<td>31</td>
<td>3070</td>
<td>Other</td>
<td>Omega PixL Digital Camcorder</td>
</tr>
</tbody>
</table>
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** on the **Comma** checkmark. **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** on the **Space** checkmark.

   ![Image of Convert Text to Columns Wizard](image)

   **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** textbox.
      ii. **Click** on the Validation Data tab.
      iii. **Select** cells A2 through A3.
   c. **Click** OK.

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 select Circle Invalid Data. The cells in that column that don’t have a yes or no value will be circled in red.

<table>
<thead>
<tr>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Computer?</td>
<td>Reason for taking class</td>
</tr>
<tr>
<td>014 under 40</td>
<td>yes</td>
<td>1,3</td>
</tr>
<tr>
<td>014 over 70</td>
<td>no</td>
<td>1,3</td>
</tr>
<tr>
<td>014 over 70</td>
<td>yes</td>
<td>I don’t know anything</td>
</tr>
<tr>
<td>014 40-50</td>
<td>yes</td>
<td>1</td>
</tr>
<tr>
<td>014 over 70</td>
<td>tablet</td>
<td>sell online</td>
</tr>
<tr>
<td>014 over 70</td>
<td>yes</td>
<td>need for volunteer</td>
</tr>
<tr>
<td>014 under 40</td>
<td>yes</td>
<td>3</td>
</tr>
</tbody>
</table>

9. 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 on 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. Select 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.

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

Optional: Now, try to do the same for 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. **Select** the Tax Form worksheet. This worksheet is meant to resemble a Federal 1040EZ tax form.
4. **Note** the Tax Form has three sections:
   - The first section, **Tax Rate**, shows the tax rate in this imaginary land – everyone is supposed to pay 15% of their income.
   - The second section, **W2s**, has the income and tax withheld for our married couple.
   - 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.
   - **Click** into 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.
   - **Click** into D10 and **use** cell referencing to **create** a formula that will find 15% of Joe’s income.
   - **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.
   - **Click** into C17 and **click** the Insert Function button on the formula bar.
   - **Note** that it automatically enters the equal sign.
   - **Select** “SUM” from the list of functions and **click** OK.
   - **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**: \( \text{SUM}(C14, C15, C16) \) or \( \text{SUM}(C14:C16) \)

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8. For **Line 5**, enter 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** into cell C10.
   b. **Enter** =IF(
   c. **Click** on B3 representing the first number.
   d. **Enter** =10
   e. **Type** in a comma.
   f. **Enter** 10 and a comma.
   g. **Enter** 0
   h. **Commit** the formula with the checkmark.

   i. Let’s test out the formula further.

   i. **Type** a 9 into cell B3 and commit with the checkmark.
   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:** \( \text{IF}(B3>5, \text{"greater"}, \text{"less"}) \)

   a. **Click** in cell **C14**.
   b. **Enter** `=IF(`
   c. **Click** on **B3** representing the first number.
   d. **Type** a `>` sign
   e. **Type** a 5
   f. **Type** in a comma
   g. **Type** “greater”
   h. **Type** in a comma
   i. **Type** “less”
   j. **Commit** formula with checkmark
   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:** \( \text{IF}(B3-B4>5, \text{"greater"}, \text{"less"}) \)

   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” dialog will open.
   
i. **Click** in the “Logical_test” textbox.
   
   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” textbox, **type** “greater” (including the quotation marks).

   Note that Excel will automatically enclose the text in double quotes when you click out of the textbox.

   iii. In the “Value_if_false” **type**, enter “less” (including the quotation marks).

   iv. **Click OK**.

![Function Arguments dialog](image)

   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:**  
   \[ \text{IF}(B4>B3,0,B3-B4) \]
   
   a. **Click** in cell C22.  
   b. **Click** on the “Insert Function” button.  
   c. **Select** “IF” from the function list and click **OK**.  
   d. A “Function Arguments” dialog will open.  
      i. **Click** in the “Logical_test” textbox.  
         1. **Click** on cell B4.  
         2. **Type** a greater than sign.  
         3. **Click** on cell B3.  
      ii. In the “Value_if_true” textbox, **enter** “0”  
      iii. In the “Value_if_false”, **enter** “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:**  
   \[ \text{IF}(C18>C17,0,C17-C18) \]

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 9**, create the formula according to the directions in cell _B22_.

   **English**: Add lines 7 and 8.
   **Formula**: =C20+C21

5. 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

6. **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)

7. **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)

8. Great! Joe and Sally don’t owe any more tax and are getting a nice refund!
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. **Enter** 0 into the textbox 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** on Conditional Formatting. Then, under Highlight Cell Rules, **select** Greater Than.

3. **Enter** 0 into the textbox 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.