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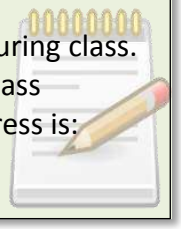
Note to Home Students:

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

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

www.mc-npl.org/class-resources



Introduction

Show Slides 1-5

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.

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.

Exploring the Excel 2010 Environment

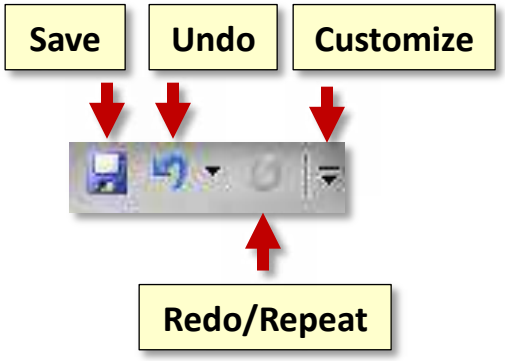
Open Excel by using the **Start** menu or by **double-clicking** on the desktop icon for Microsoft Office Excel 2010.

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**.

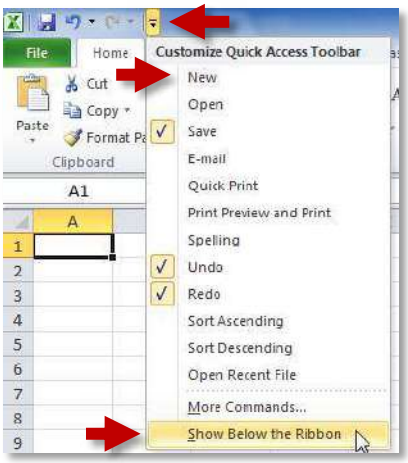
Quick Access Toolbar

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.



Show Slide 6

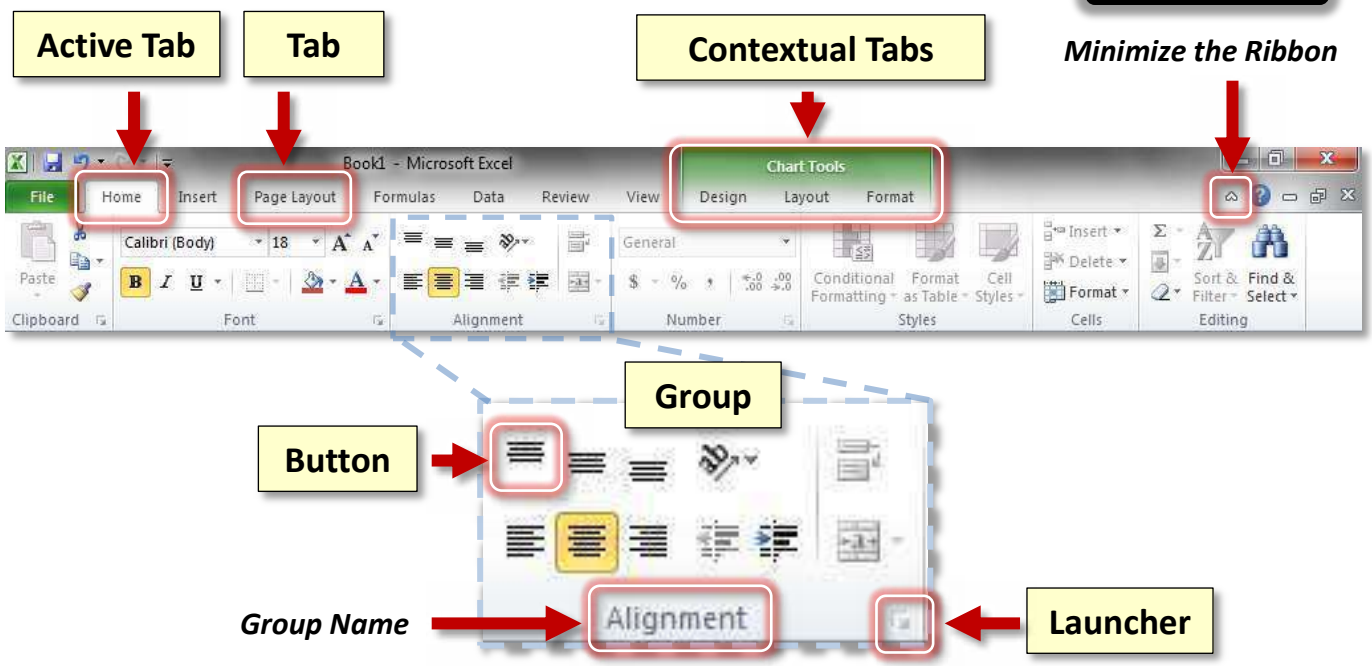
Ribbon

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**. Depending on the object you have selected in the document, several **contextual tabs** may appear, which provide additional formatting options for that object.

Try clicking on other **tabs** to **view** their buttons, and then **return** to Home tab.

See Handout



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.

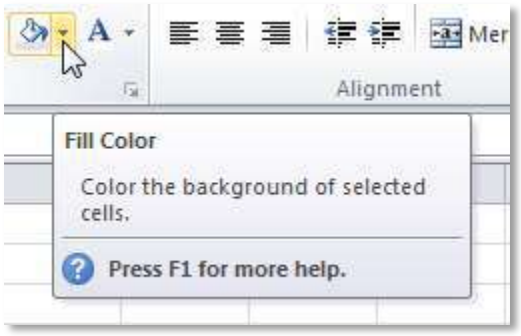
Contextual Tabs

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.

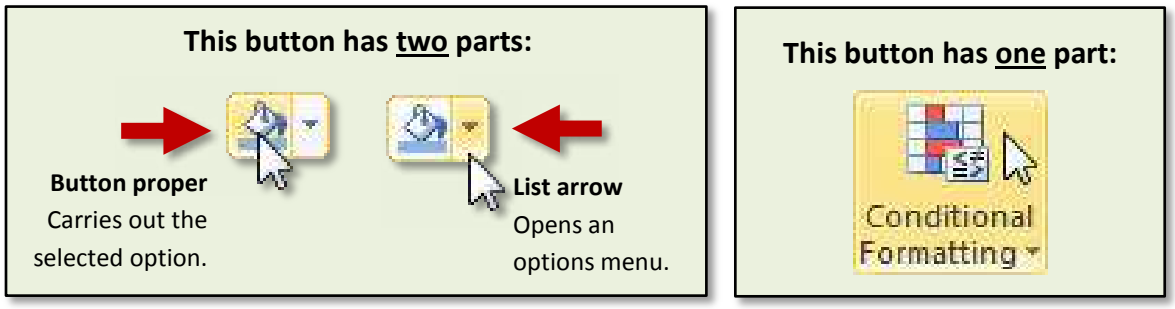
Hover over some active buttons on the Home tab to **observe screen tips**. The screen tips display the name of the button, along with a short description of what the button does.



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

Switch to Excel

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** and **notice** that the ribbon is no longer in view.
2. **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.

Status Bar

The status bar is located below the document window area.

Fig. 8

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.

Normal	This is the view we will be working in throughout this course. It simply displays the grid of cells that make up your spreadsheet.
Page Layout	Shows what your spreadsheet will look like when printed on paper.
Page Break Preview	Assists you in making your spreadsheet look good when printed.

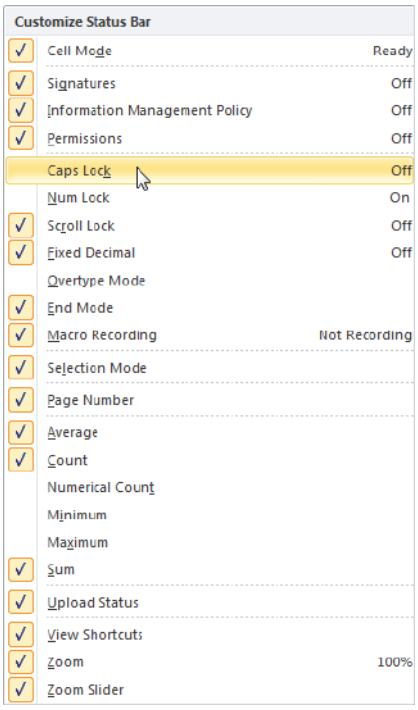
Zoom Slider

Also at the right end of the Status Bar (Fig. 8) 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 "Caps Lock" to enable this option.
3. **Notice** how the menu didn't disappear. **Click** in a clear space to dismiss the menu.
4. **Press** the Caps Lock key on the keyboard. **Notice** how the words "Caps Lock" appear in the Status Bar.
5. **Press** the Caps Lock key again to turn caps lock off.

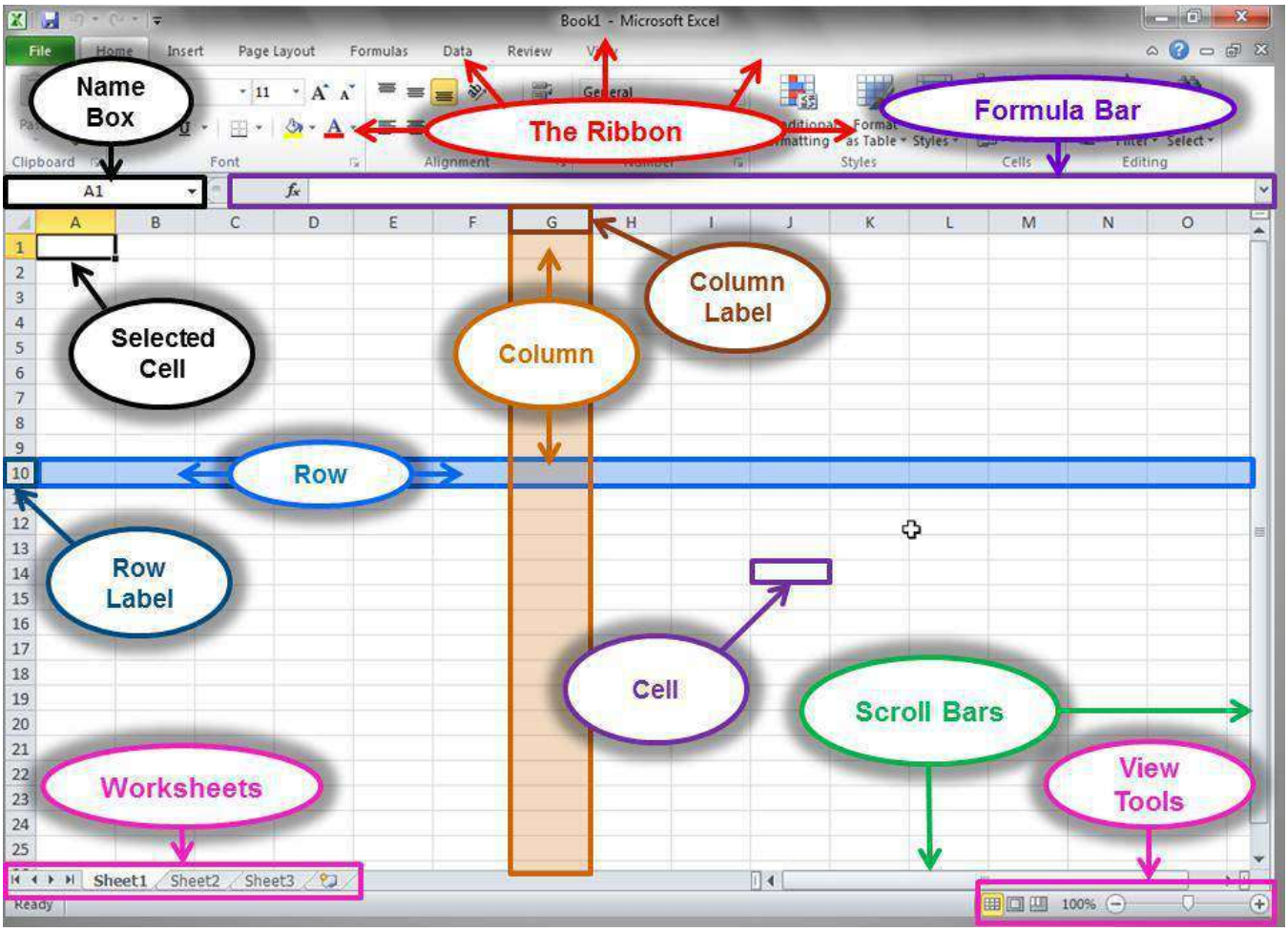


Workspace

Show Slide 7

Open Excel and, using Fig. 1, locate the parts of the Excel window.

Fig. 1



- **Name Box**: Displays the currently selected sell.
- **Formula Bar**: Displays the number, text, or formula that is in the currently selected cell.
- **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**: Changes the way the worksheet looks on the computer screen (for example, by zooming in). Adjusting the view settings does not affect the contents of the worksheet, just the way it **looks** on the screen (like bringing a book closer to your face so you can see the words).

Excel Cursors

Using Fig. 2, **note** the different cursor shapes you will encounter while using Excel.

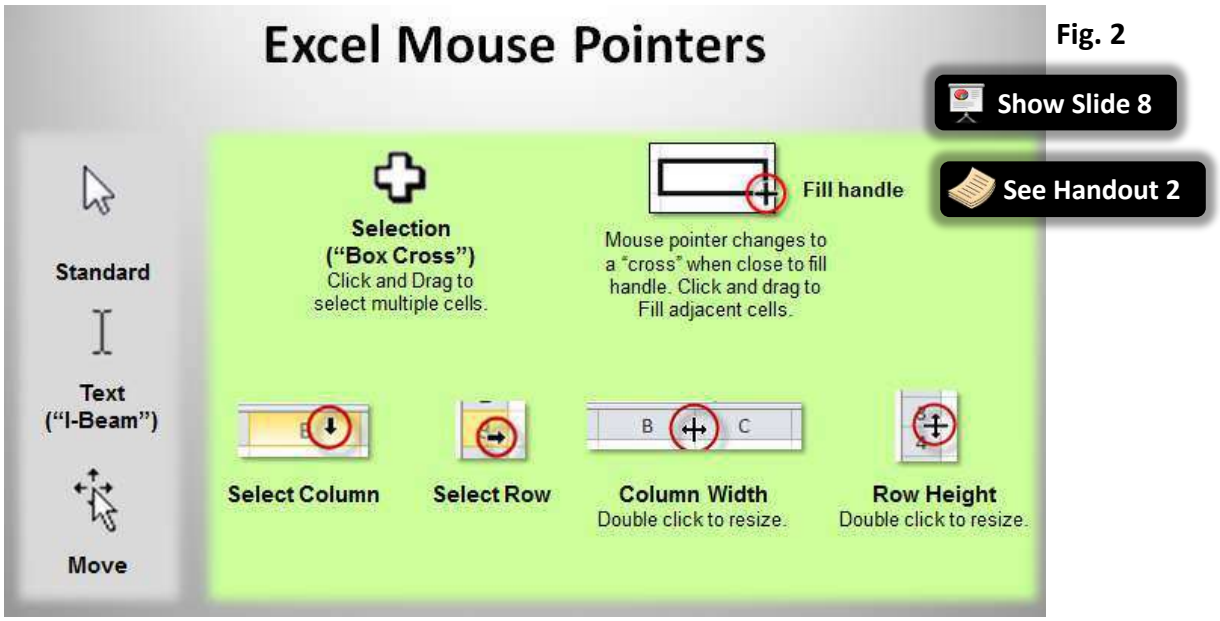


Fig. 2

Creating an Excel Document and Saving It

Creating an Excel file

Switch to Excel

1. When Excel opens, it will display a blank worksheet ready for you to enter data. The data that you enter and the formatting that you use become your document.
2. In cell A1, **type** "My first spreadsheet."
3. Each spreadsheet you create is temporary unless you save it as a **file** with a unique name and location.

Preparing a Save to Location – a USB Device

Note: Home students can skip this section.

Show Slide 10

When we save a 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.

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.

Still on Slide 10

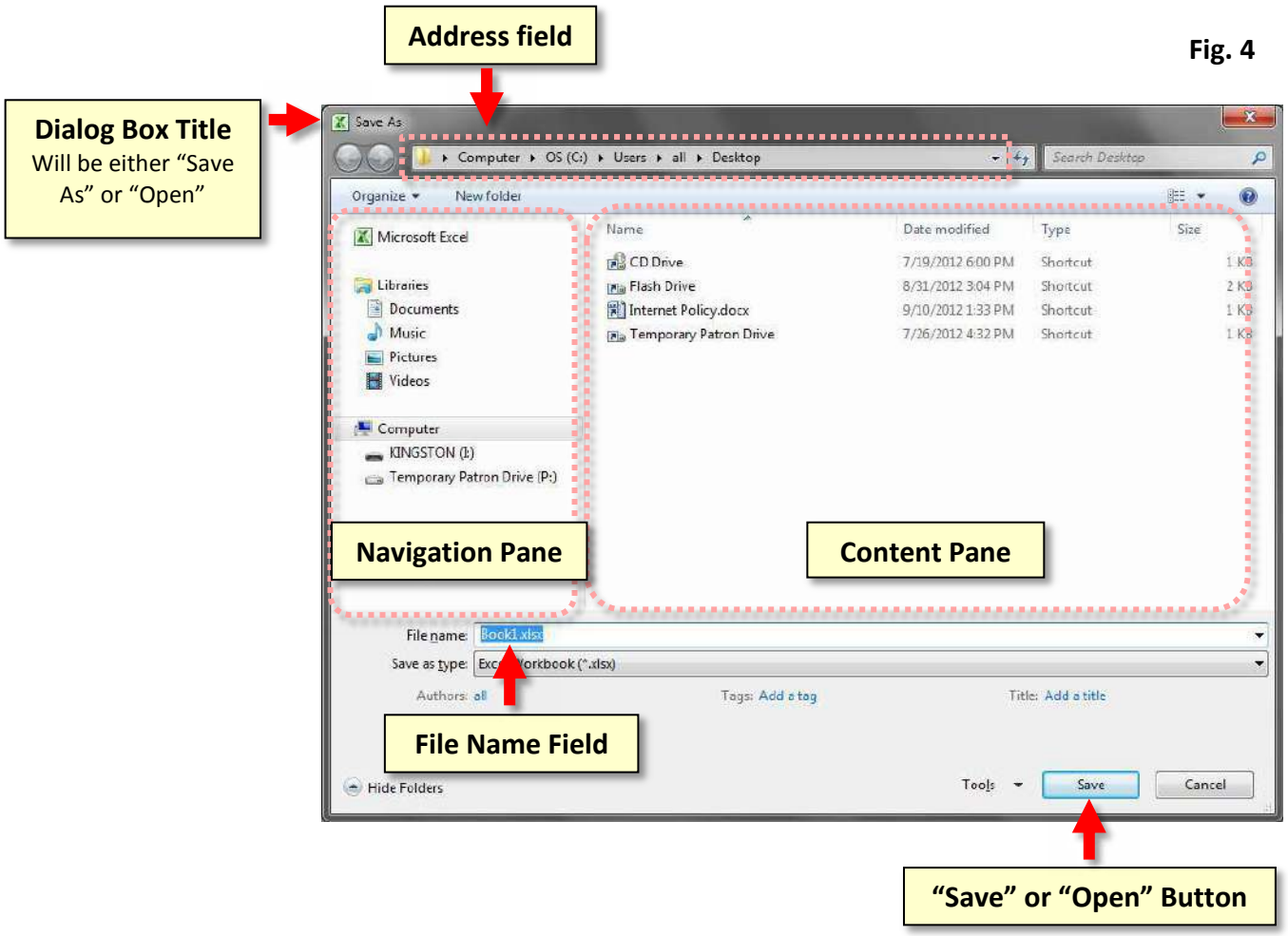
4. **Fit** the connector into the port and **push** it in gently.
5. At this point, you may get a notice that the computer is installing a device driver – **wait** until the message disappears.
6. An **AutoPlay** window *may* pop up. Close it by clicking the Close button. *(NOTE: If you have any other windows open, this may pop up behind them)*
7. You are now ready to begin saving your file.

Saving the File

Switch to Excel

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 (*see* Fig. 4) 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.

Fig. 4



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, and (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** (*see* Fig. 4).
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 brand name of 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 (*see* Fig. 4).

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 Fig. 5. To save, you will **click** on the Save button.

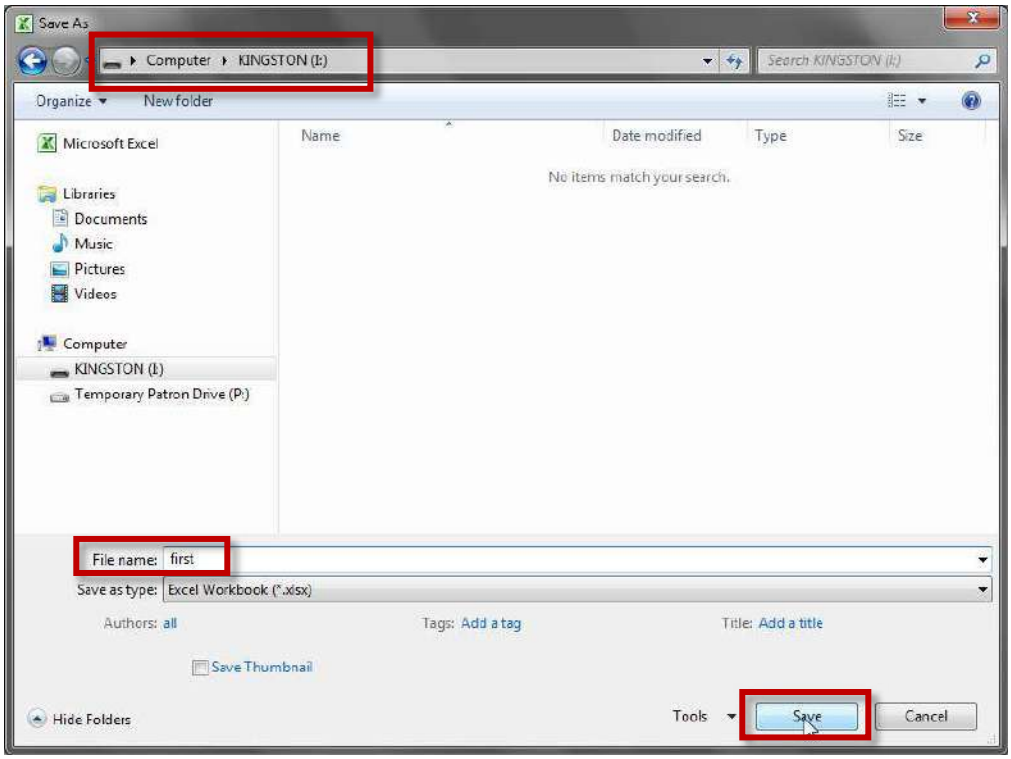
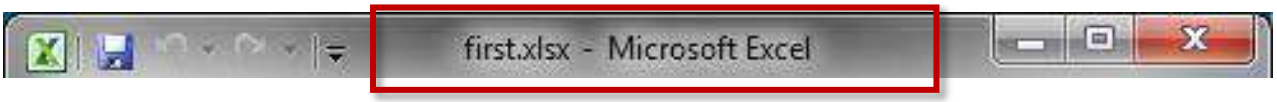


Fig. 5

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

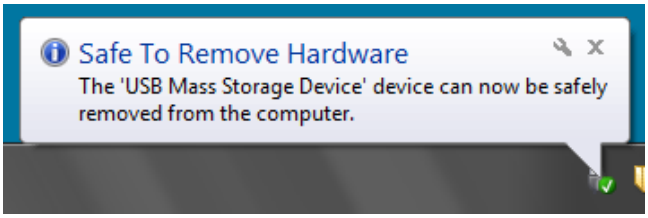
Show Slides 11, 12

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, this menu will appear. **Click** on **Eject Data Traveler 2.0**.

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



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

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

Creating a Simple Budget Spreadsheet

Switch to Excel

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

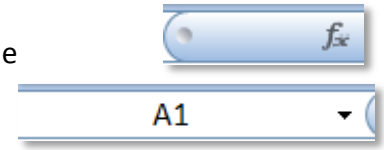
1. **Open** Excel.
2. **Insert** your flash drive. We will save this file at the end of class.

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.

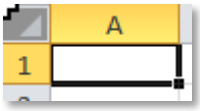
Merge and Center Cells

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.

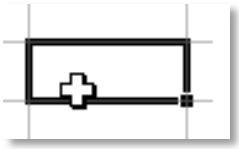


4. **Type** **Monthly Budget**.
5. **Note** how three **buttons** have appeared on the Formula Bar.

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

6. After typing, **commit** your content 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 1**)
9. **Click** in a clear cell to deselect the cells.

Enter Data and Navigate Between Cells

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

1. **Click** in cell **A2**. **Type Item**, and **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

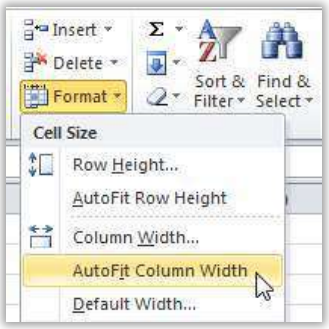
Formatting can be applied to several cells at one time and can make the cells stand out from the rest of the cells in the worksheet.

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.**

3. **Click** in a **clear cell** to deselect the column.
4. **Notice** the word **Comments** now "fits" in the C Column.

> **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**.

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

See Handout 1, Fig 2

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

> **Teacher's note:**
> For the spellcheck section:
> 1. Spell at least one of the row headers wrong.
> 2. Spell at least one of the all-caps headers wrong.

2. **Attempt** to resize Column A using the point and double-click method. **NOTE**: This method will not work if you are still in edit mode in **A16** cell.
3. **Type** the numbers into the cells in Column B using the Enter **key** to commit your changes and move to the next cell.
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:

See Handout 1, Fig 1

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.

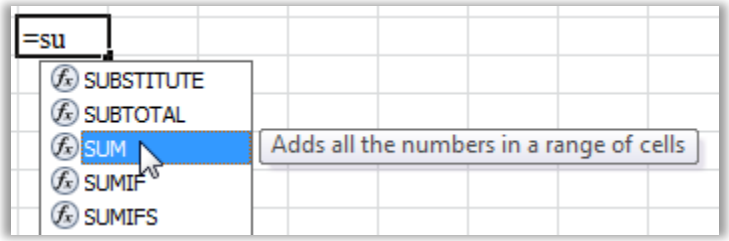
Use a Function

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**.

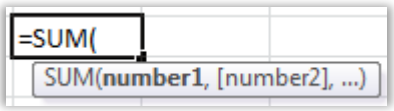
See Handout 1, Fig 1

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.
   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.



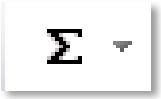
5. We are going to pass a **range of cells** into the function.
   a. **Click** into the first cell in the range, which is **B3**.
   b. **Type** a colon.
   c. **Click** into the last cell in the range, which is **B10**.
   d. **Commit** the formula by **clicking** on the **checkmark** in the formula 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 an 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** into cell **B14**. **Do not type the $ sign or the decimal places.**
2. **Click** the check mark on the formula bar to commit the content.
3. **Note** that the number we typed adopted the same currency formatting as the rest of the column.

Spell Check

The Spell Check function checks your worksheet for misspelled words and corrects them. Note that, unlike Microsoft Word and PowerPoint, Excel does NOT underline misspelled words in red.

1. **Click** the **Review** tab. In the **Proofing** group, **click** **Spelling**.
2. A box will appear asking if you want to continue to check spelling from the beginning of the sheet (Excel starts the spell check from the selected cell). **Answer** yes.
3. **Respond** to any prompts you might get about misspelled words. You can either accept spelling suggestions or ignore them.
4. We typed some words in all capital letters. If any of those words were misspelled, spell check would not catch them as by default words in all caps will not be spell-checked. You can change this in the program configuration options.

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 1**, **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**.

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 **B14** no longer represents what our items *actually* cost. The **B14** cell references the amount we *budgeted* for our items. **Change** the cell reference in **B14** so it will update when cell **C11** updates.
4. To get back to the normal view, **repeat** the key combination.

Adding Rows

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

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

iv. In **C11** **enter** **50** and **commit** the content with the check mark. **Notice** the additional updating that occurs in **D11** and **C12**.

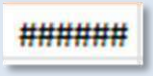
2. **Insert** another row above row 12.
   a. In **A12**, **type** **Loans**.
   b. **Tab** to **B12** and **enter** **75**.
   c. **Tab** to **C12** and **enter** **75**.
   d. **Commit** the content with the **check mark**.
3. **Note** that the formulas in **row 13** automatically updated the range 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.

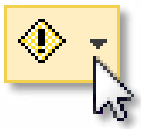
Why did I end up with this in a cell? 

It means your cell is not wide enough to display the content. Adjust the column width.

Trace Errors

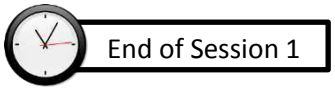
We have encountered **Trace Errors** after moving our Miscellaneous row above the Total row. Trace errors are called out by **green triangles** in the cells containing errors. It is important to investigate any trace errors that appear.

1. **Notice** the **green triangles** in cells **B13** and **C13**. These triangles alert us to an error in the formula.
2. **Click** in one of these cells. **Notice** how a **Trace Error button** appears (pictured at right).
3. **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.

4. To correct an error in a cell, **click** in the cell and, to get options, **click** on the **Trace Error button**.
5. 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**.
6. **Correct** the error in **C13**.
7. 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 - a **sort warning box** appears.
3. 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. In this instance, neither option in the sort warning box will give us the results we seek. Let's try each of them.
5. **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**.
6. **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**.
7. 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**.
8. Select cells **A3** through **E11**.
9. **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 (Fig. 3), 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.

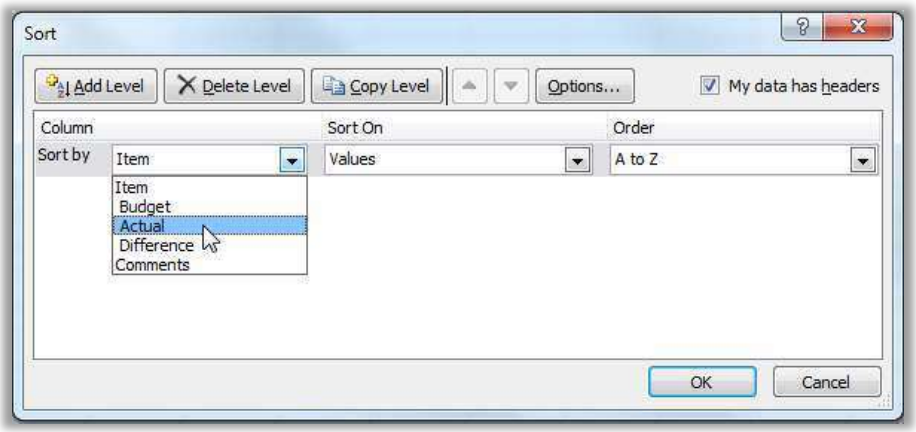


Fig. 3

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

See Handout 3 | Show Slide 13

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.

This is called **Precedence of Operations** (also called **Order of Operations**). This states that certain operators are evaluated before others. In the table on the right (Fig 4), operators closer to the top are evaluated first.

Fig. 4

Precedence of Operations	
Operator	**Description**
( )	Parentheses
^	Exponents
* and /	Multiplication and Division
+ and -	Addition and Subtraction

The most important thing to take away from this is that **multiplication and division are done before addition and subtraction**.

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 **correct answer is 11** because we have to first evaluate 2 * 3 (6), and then add 5 to that (5 + 6 = 11).

```
5 + 2 * 3 = ?
```

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

```
(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.

You can use the phrase "**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally" to help you remember the order (**P**arenthesis, **E**xponents, **M**ultiplication, **D**ivision, **A**ddition, **S**ubtraction).

Other examples:

```
11 - 5 + 3     = 6 + 3    = 9
11 - (5 + 3)   = 11 - 8   = 3
11 - 5 - 3     = 6 - 3    = 3
-(1 + 2) ^ 4   = -3 ^ 4 = 81
```

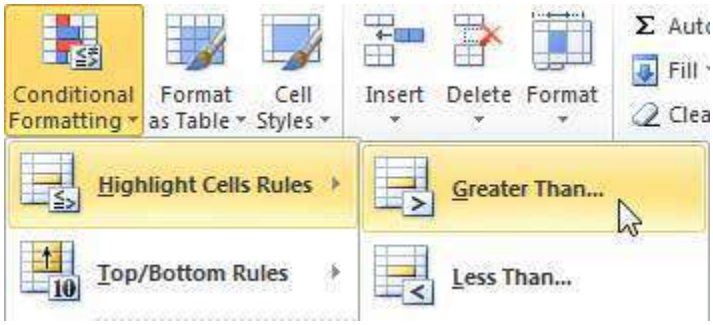
```
15 / 3 + 2     = 5 + 2    = 7
15 / (3 + 2)  = 15 / 5 = 3
15 / 3 * 2     = 5 * 2    = 10
                40 * 50% = 20
```

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.

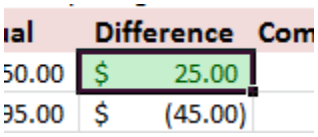
In our spreadsheet we'd like to draw attention, through the use of color formatting, to any item in the **Difference** column that represents overspending and also to items where we have underspent. We will use conditional formatting to highlight cells in **red** when our spending **exceeds** our budget 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.**

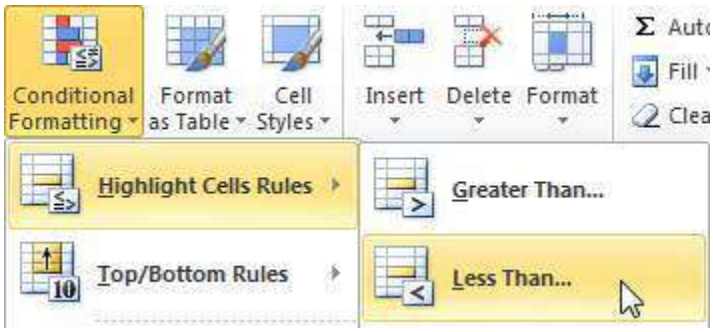


    c. In the **Greater Than** dialogue box, **enter** a **0** into the textbox on the left.
    d. **Select** "**Green Fill with Dark Green Text**" in the dropdown list on the right.
    e. **Click OK** in the **Greater Than** dialogue box.

    f. **Note** that cell **D3** now has a **green fill color** because we spent less on **Clothing** than we budgeted for.

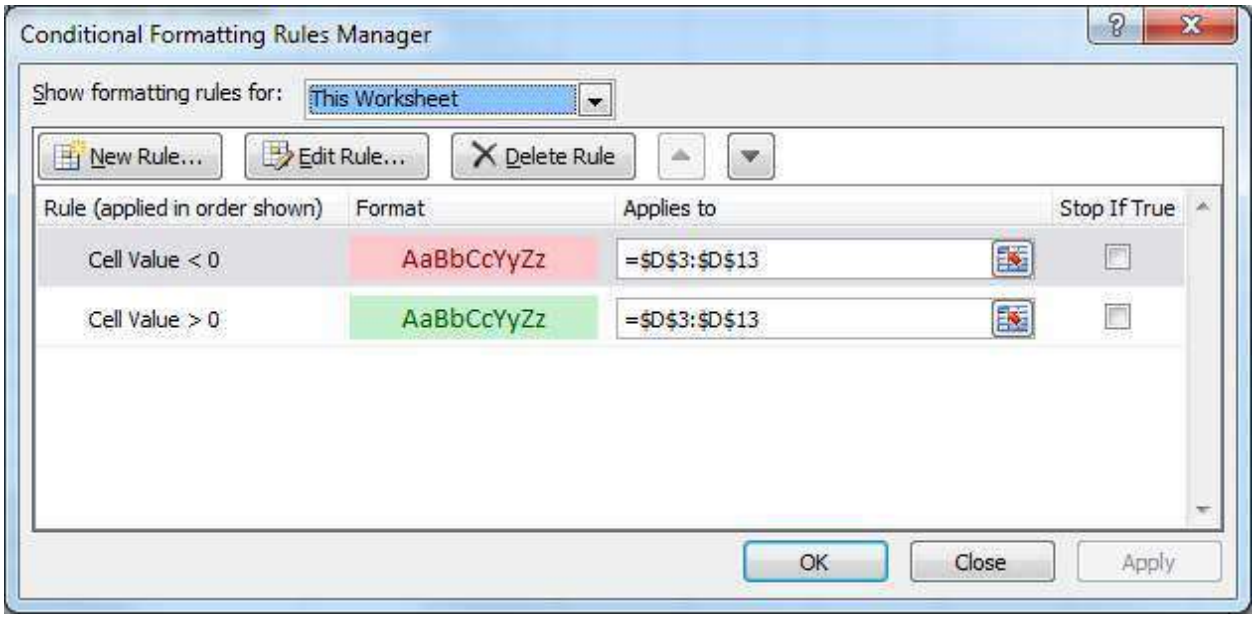


2. The second rule will apply to the value in **D3** when it represents spending that **exceeds** our budget.
    a. **Make sure** cell **D3** is still **selected**.
    b. On the Home tab, in the **Styles** group, **click** on **Conditional Formatting** again. Then, **click** on **Highlight Cell Rules** 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?
    d. 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.
    e. **Select** "**This Worksheet**" from the dropdown list to view all the rules defined in the worksheet.
    f. **Click Close** to close the dialog.



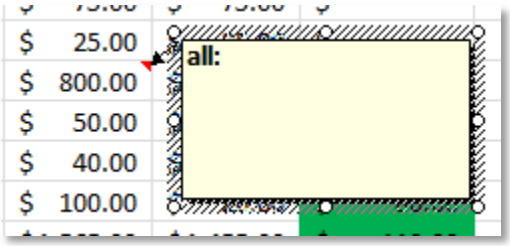
Comments

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.

See Handout 3, Fig 2

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**.

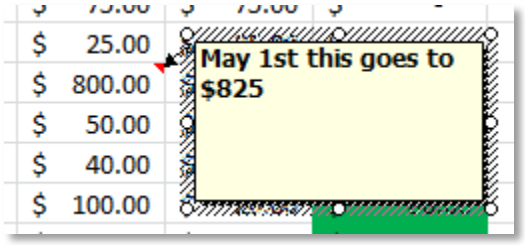
4. **Notice** how a small, yellow text box has appeared. This is where our comment will go.
5. **Also notice** how the text box is populated with the word "**all**" (home students will see something different). Excel **automatically** populates all new comments with your **Microsoft Office user name** (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.



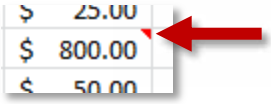
Why does Excel add your user name to each new comment?

By adding your user name to each comment, it's easier to keep track of who made what comment when you are collaborating with multiple people on the same spreadsheet.

6. **Use** the Backspace key to **remove** the user name (optional).
7. **Type** the "**May 1st this goes to $825**" comment into the comment box.



8. **Click** into a clear cell. **Note** the comment box is no longer visible.
9. **Note** the small red triangle in the upper-right corner of cell **B9**. This indicates that the cell contains a comment.



10. **Point** to the cell and the comment will appear.
11. **Point away** and it is no longer visible. This is because the comment's visibility is set to "hidden".
12. 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 menu, **click** on **Show/Hide Comments.**
    c. **Use** the **move** tool and **resize** tool to **move** and **resize** the text box so it is not covering up any other data. (See Handout 4, Fig. 2).
13. Using the instructions above, **follow** these steps to create and format a comment regarding our budgeted amount for Utilities.
    a. **Insert** a comment into cell **B11**. The comment should say "**Look into new windows**".
    b. **Unhide** the comment.
    c. **Move** the comment and **resize** it to match Figure 2 on Handout 4.
14. Note that it's possible to apply a limited amount of **formatting** to a comment.
    a. **Select** the text "May 1st" inside the first comment.

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

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

15. Using the instructions above, **follow** these steps to create and format a comment regarding our budgeted amount for Vacation Club to remind us that the value in **B17** will be 0 for two months of the year.

    a. **Insert** a comment into cell **B17**. The comment should say "**This goes to 0 in November and December**".

    b. **Unhide** the comment.

    c. **Move** the comment and **resize** it to match Figure 2 on Handout 4.

16. 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.

	A	B	C	D	E
1	Monthly Budget				
2	**Item**	**Budget**	**Actual**	**Difference**	
3	Clothing	$ 75.00	$ 50.00	$ 25.00	
4	Food	$ 150.00	$ 195.00	$ (45.00)	
5	Insurance	$ 50.00	$ 50.00	$ -	
6	Leisure	$ 200.00	$ 130.00	$ 70.00	
7	Loans	$ 75.00	$ 75.00	$ -	
8	Medical	$ 25.00	$ 25.00	$ -	
9	Rent	$ 800.00	$ 800.00	$ -	
10	Transportation	$ 50.00	$ 60.00	$ (10.00)	
11	Utilities	$ 40.00	$ 50.00	$ (10.00)	
12	Miscellaneous	$ 100.00	$ 20.00	$ 80.00	
13	TOTAL	$1,565.00	$1,455.00	$ 110.00	
14					
15	INCOME	$2,500.00			
16	EXPENCES	$1,455.00			
17	VACATION CLUB	$ 150.00			
18	SAVINGS	$ 895.00			
19					
20					
21					
22					

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** the cells and press Delete on keyboard.
4. **Return** to the Normal view of the worksheet (key combination: Ctrl + ~).
5. **Rename** "Sheet 1" to "January".
6. **Make 2 copies** of the **Template** sheet (refer back to the "Copying a worksheet" section for instructions on how to make a copy).
7. **Rename** "Template (2)" to "February".

8. **Rename** "Template (3)" to "March".

Moving worksheets

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

1. **Click** 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. (Fig. 6) This triangle is the **drop point**.

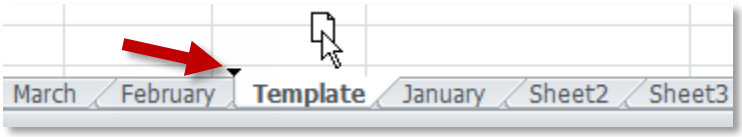


Fig. 6

2. As you move your mouse with the mouse button still held down (dragging), the drop point will move. In Fig. 7 the mouse has been dragged to the left and the drop point has also moved. 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.

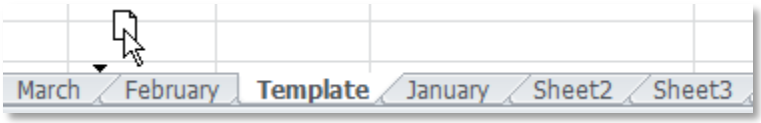


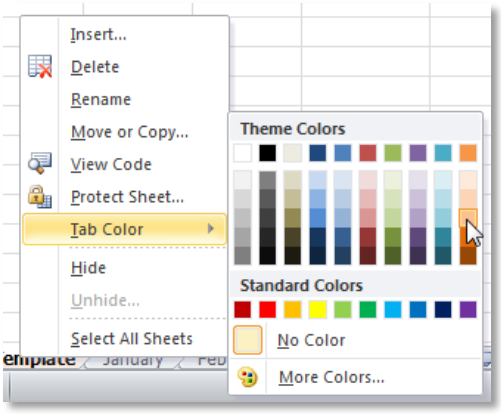
Fig. 7

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 through the use of 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**.

Note: When you delete a worksheet, Excel normally displays a confirmation dialog. We do not get this dialog because the two worksheets we are deleting are empty.

Inserting worksheets

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

1. **Look** for the Insert Worksheet button (Fig. 8) to the right of all the worksheet tabs.
2. **Click** the button to add a new worksheet.

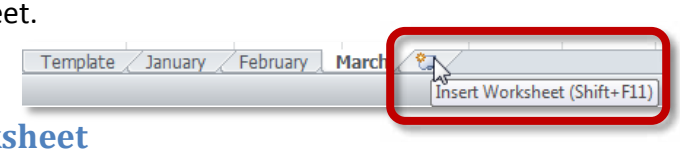


Fig. 8

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 4** 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.

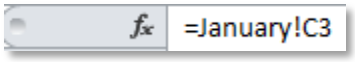
Copy and Paste between worksheets

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").

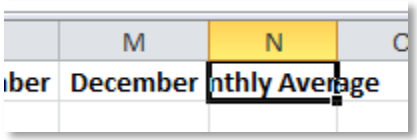


6. **Use** the **fill handle** to **copy** the reference from cell **B2** to cell **B11**.

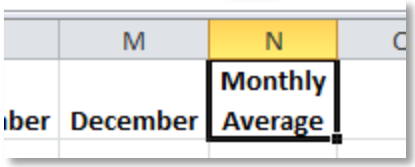
7. Using the same method, **reference** the actual cost of Clothing for Feb and **fill** it down:
    a. **Click** in cell **C2**.
    b. **Type** an =.
    c. **Click** on the tab for the February worksheet.
    d. **Click** into cell **C3**.
    e. **Click** on the check mark.
    f. **Use** the fill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

Wrapping text

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.
4. **Type** the word **Monthly Average** into cell **N1** and **commit** the content with the checkmark. **Do NOT** adjust the size of the column.

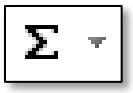


5. Instead of making column N wider in order to fit the heading, we are going to change the formatting of cell **N1** so that the text can use multiple lines. With cell **N1** selected **click** on **Wrap Text** in the **Alignment** group on the **Home** tab. 



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).

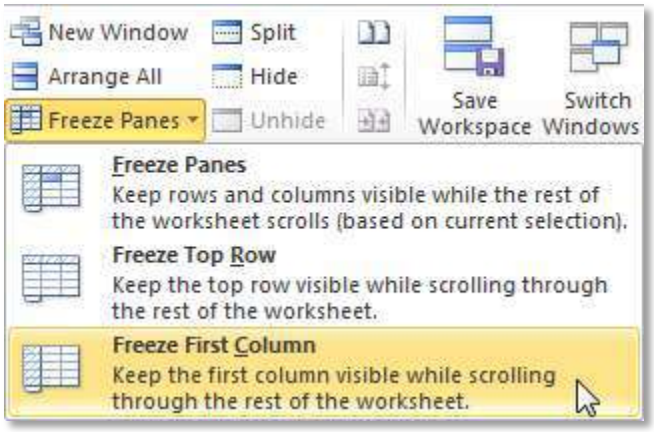


3. **Check** that the cell range is correct (cells **B2:M2**) and **commit** the formula with the checkmark.
4. **Use** the fill handle to find the average for rows 3 through 11.
5. **Note** that Excel has determined the average for the values in the 3 months. Let's enter a value for April. **Enter** **250** in cell **E2** and **click** the check mark. **Notice** how the average is recalculated based on the addition of a fourth value.

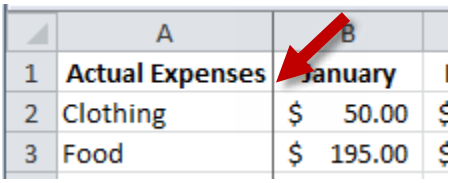
Freeze Panes

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**.

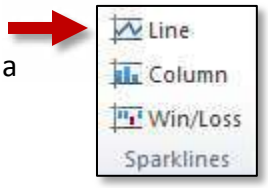
1. First, we need to tell Excel what columns and rows we want to freeze. To do this, **select** the cell that is **one column to the right** of the column(s) you want to freeze, and **one row below** the row(s) you want to freeze.
2. Because we want to freeze the row and the first column, we will **select**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

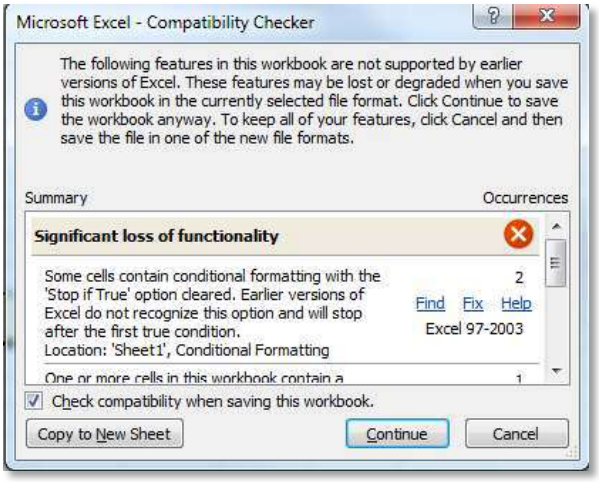
Older Excel File Format (.xls)

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**.

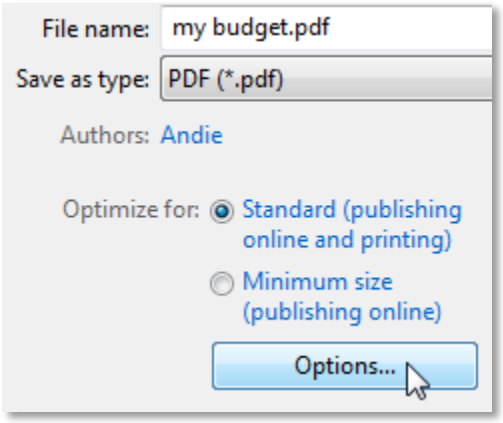
PDF

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.

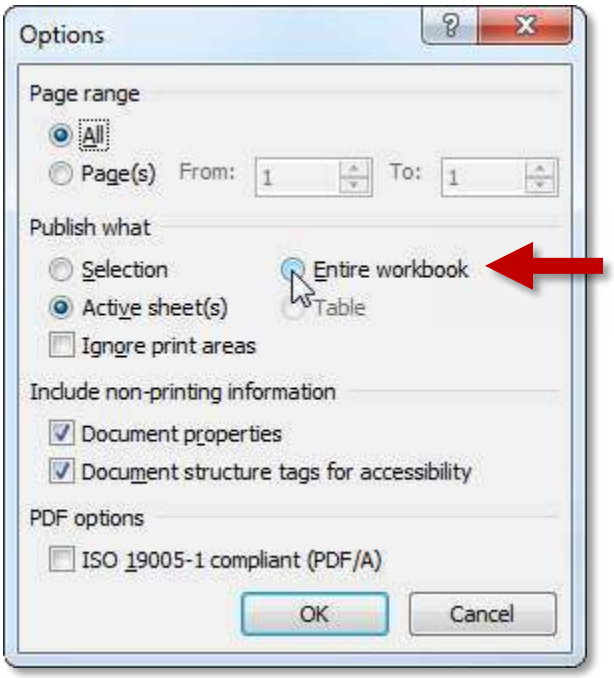
Another benefit to using PDFs is that they retain ALL of the formatting in your document. PDFs are designed to represent **printed pieces of paper**, so they act like an electronic "print-out".

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**
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**.

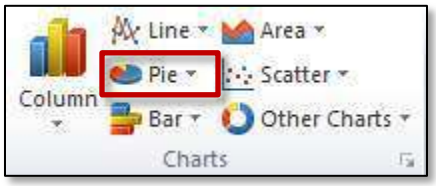


9. **Click** the **Save** button and **click** **Yes** to overwrite the PDF file we created previously.
10. After Adobe reader opens, **notice** that the PDF now has **multiple pages** and shows all the **worksheets**.
11. **Be aware** that, the PDF file you've created does NOT automatically update whenever 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.

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

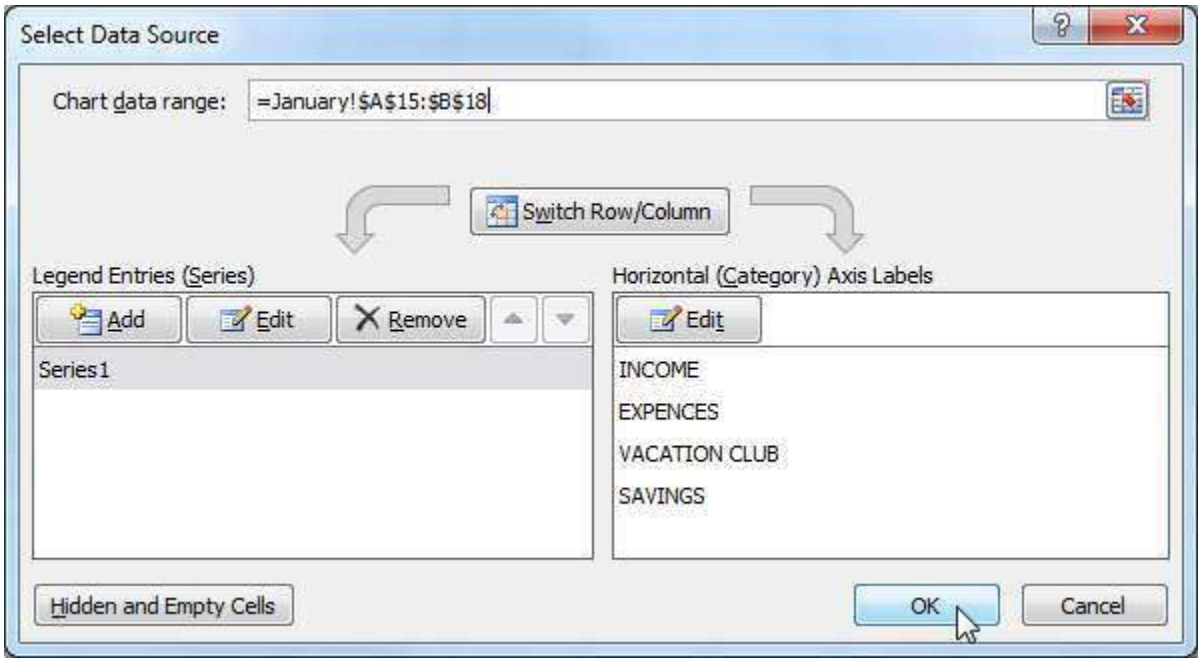


1. **Click** on the tab for the January worksheet.
2. **Click** in an **empty cell** in column G. **G4** works well.
3. On the **Insert** tab**,** in the **Charts** group, **click** on the **Pie** button.
4. **Mouse over** the pie chart styles until you find the **Exploded pie in 3D** and **click** on 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.

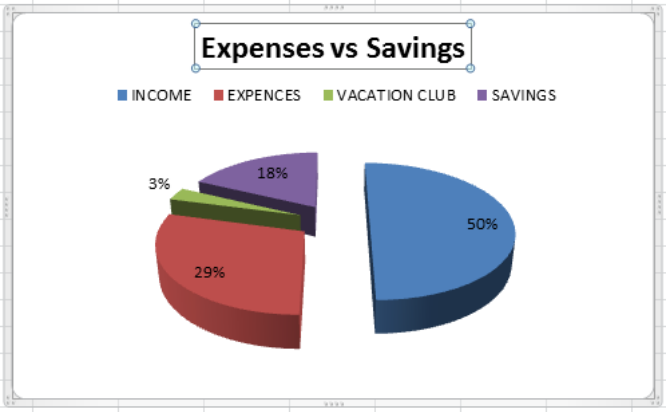
Select data for chart

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.

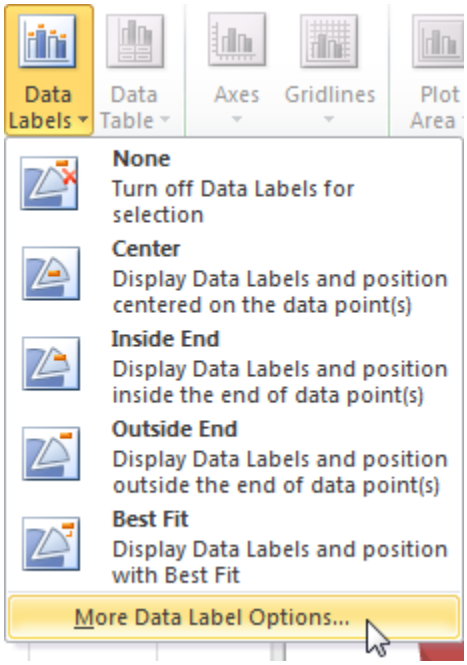


Format the chart

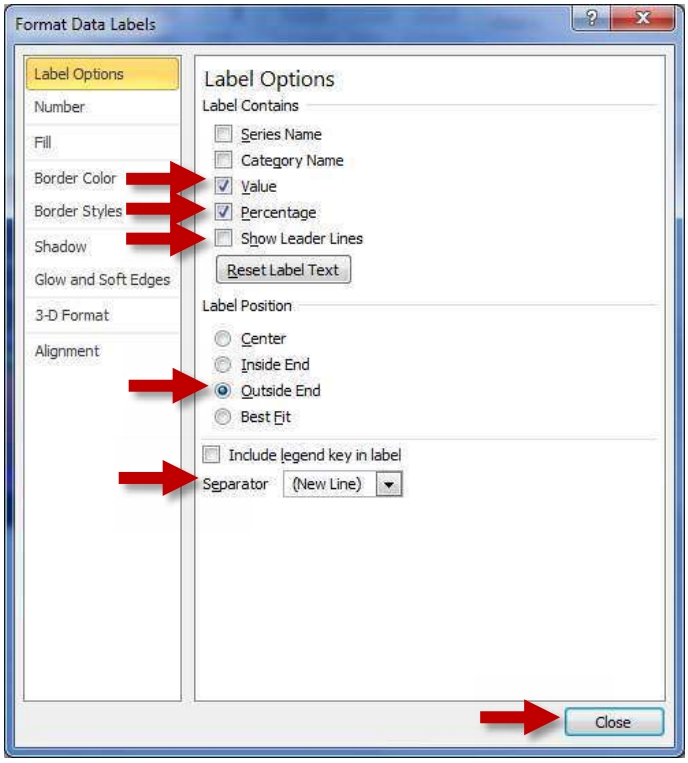
1. On the **Chart Tools Design** tab, in the **Chart Layouts** group**, find Layout 2** and **click** on it.
2. **Replace** the text in the **chart title** text box**.**
   a. **Click** where it says "**Chart Title**".
   b. **Type** "**Expenses vs Savings**". As you type, the letters will appear in 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.**

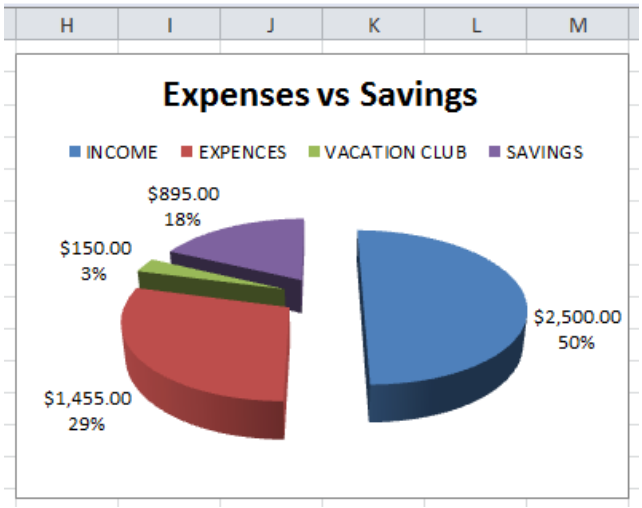


4. **Move** the dialogue box so it is not covering up the chart.
    a. Under **Label Options**, **check** **Value** and **Percentage** and **uncheck** **Show Leader Lines**.
    b. Under **Label Position**, **check** **Outside End**.
    c. Under **Separator**, **select** **(New Line)**.
    d. **Click** **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.

Teacher's note:
Ask the students what is missing from the print preview.

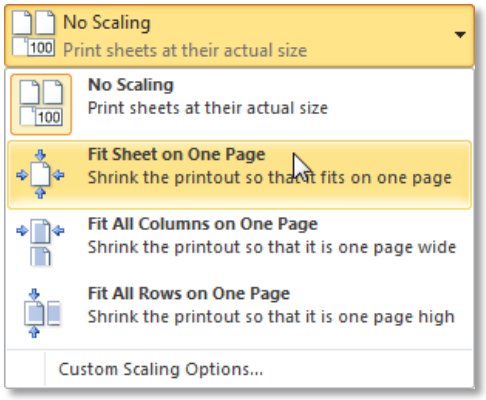
Viewing the Preview

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".

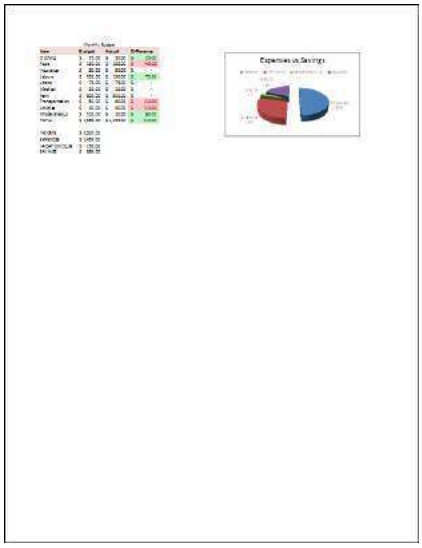
Scaling a printout

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**.



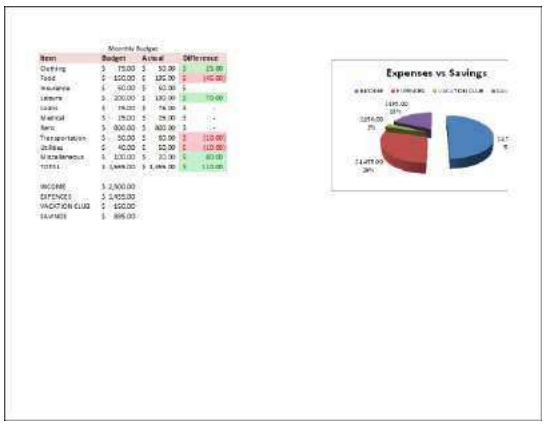
2. **Note** the data and chart sections of the worksheet are all on one page. However, the print is smaller.



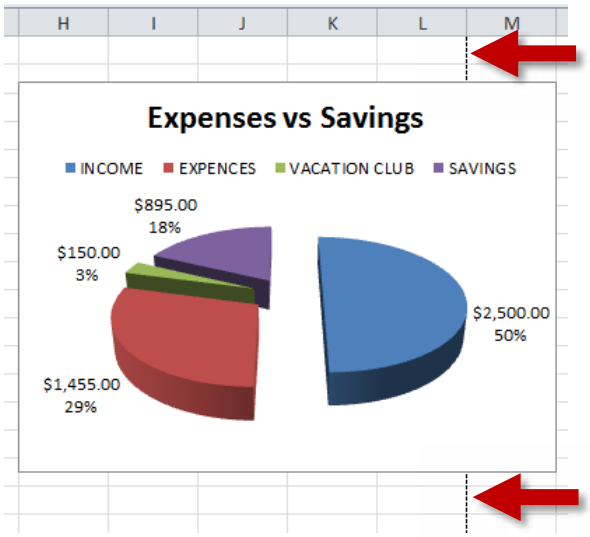
Changing Orientation of a printout

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

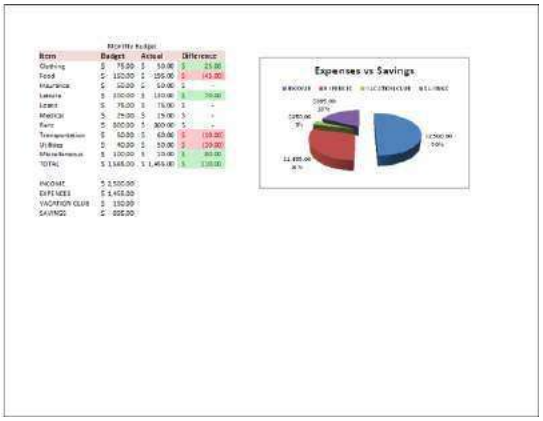
1. **Change** the **Scaling** back to **No Scaling**.
2. **Note** the setting that says **Portrait Orientation**. **Click** the **list arrow** for that section and **select** **Landscape Orientation**.
3. **Note** that a small part of the chart is still on page 2.



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



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. **Go back** to the **Home** tab and **deselect** the chart.
7. **Go** back to **File → Print** and **note** that everything fits on one printed page now, without any scaling.



Creating a Header and Footer for a printout

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

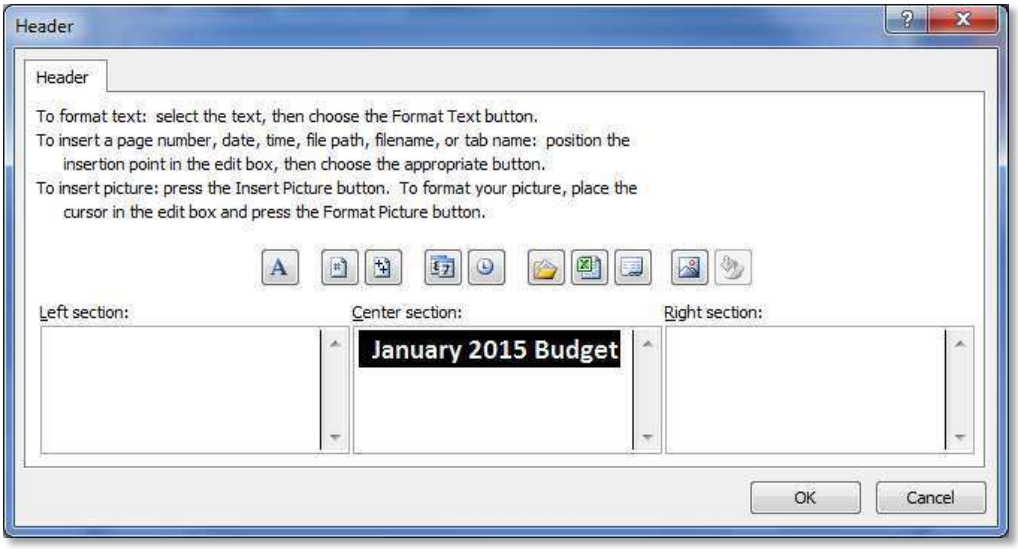
1. **Click** on the **Page Setup link** at the bottom of the **Print Settings** section.
2. **Click** on the **Header/Footer tab**.
3. **Click** on the **Custom Header** button. This will open the **Header** dialogue box.
    a. **Click** in the **Center section** and **type** **January 2016 Budget**.

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.



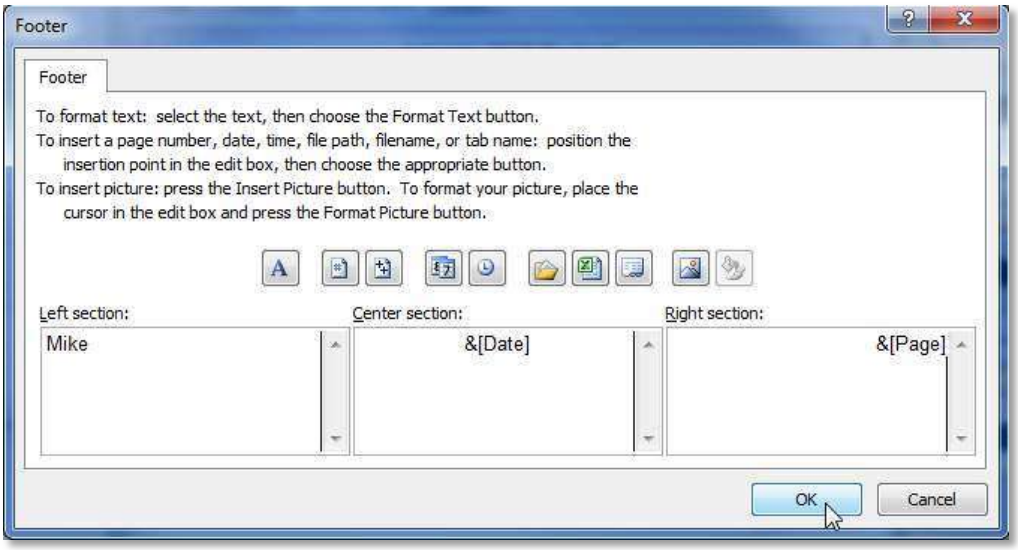
4. **Click** on **the Custom Footer** button.

a. In the **Footer dialogue box**, **click** in the **Left** section and **type** your name.

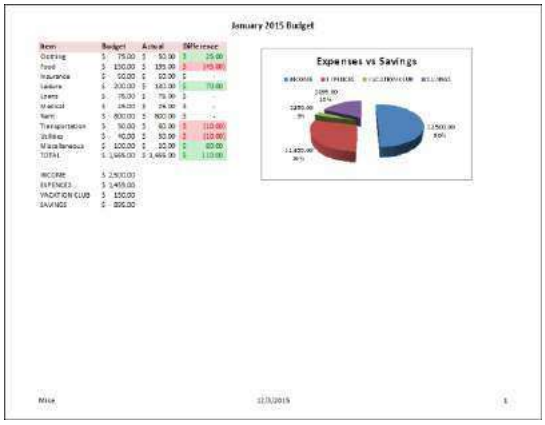
b. **Click** in the **Center** section. **Find** the **Insert Date button** and **click** it. This inserts special code that tells Excel to always display the current date.

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.

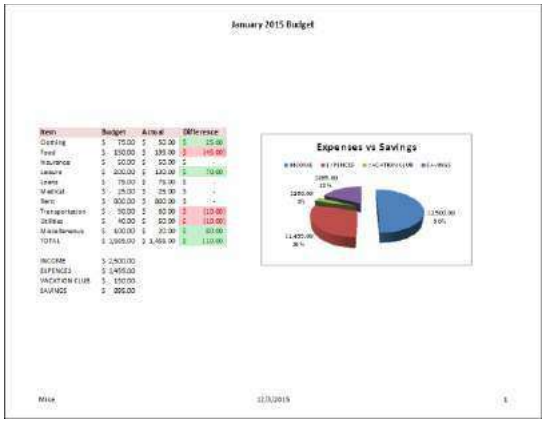


5. **Click OK** in the Page Setup dialogue box.
6. **Click** the **Home** tab and **delete Row 1**.
7. **Go back** to **File → Print** to view the results.



Note: If it is hard to read, click the "Zoom to page" button in the bottom-right corner of the screen. Click the button again to zoom out.

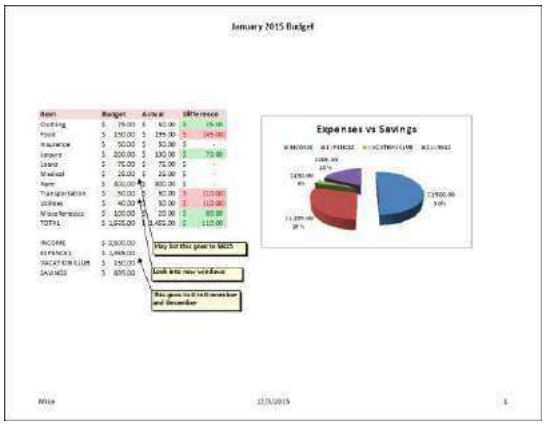
8. To **center** the content on the page:
   a. **Click** on **Page Setup**, then on the **Margins tab**.
   b. In the **Center on page** section, **click** in the **Vertically** checkbox.
   c. **Click OK**.



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**.



Linking Workbooks

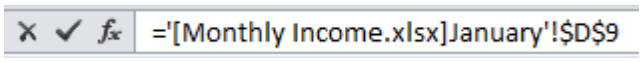
Excel spreadsheets can contain links to data or formulas in other workbooks. The links between workbooks are maintained as long as the file name for each workbook does not change, as well as the location where the workbook files are stored.

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:



    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**.

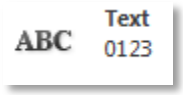
Number Formats (supplemental)

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 others ways data can be formatted.

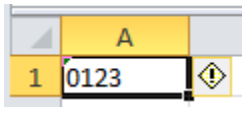
Formatting as Text

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

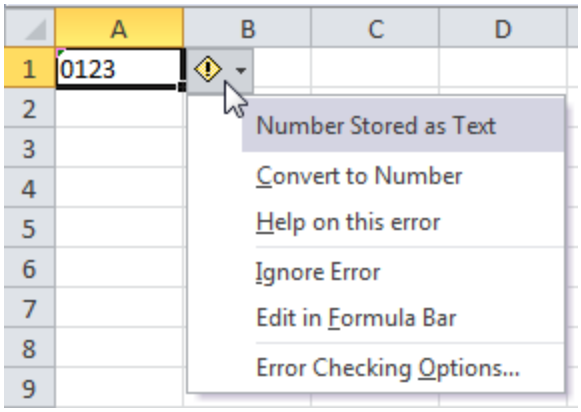
3. **Notice** how it says **General**. That means Excel will make a **guess** as to how you want to format the data.
4. **Type** "0123" into cell **A1** and **commit** with the checkmark.
5. **Notice** how the zero disappears and how the number is right-aligned. This is because Excel assumes you are typing a number, and numbers don't start with zeroes.
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. We will **ignore** this suggestion, because formatting it as a number will remove the zero, which is not what we want to do.

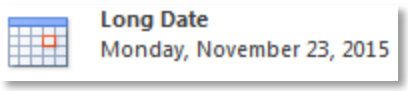


Formatting Dates

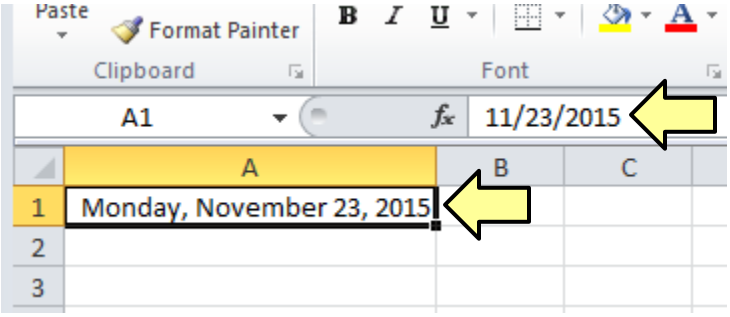
Excel allows you to customize the way dates are formatted.

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 "15" to "2015". This is because the default date format uses a four digit year.
7. **Select** "**Long Date**" from the Number Format dropdown.

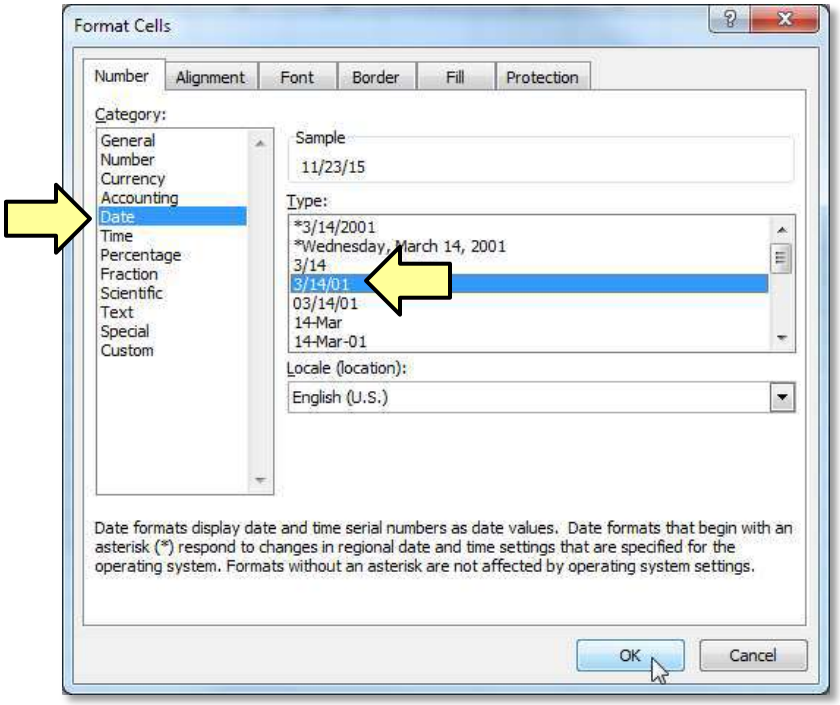


8. **Notice** how the cell now displays "Monday, November 23, 2015", but the formula bar still displays "11/23/2015". This is because we've told Excel to ***format*** the date a certain way. The actual cell ***value*** stays the same.



9. With cell **A1** still selected, **select** "**More Number Formats**" at the bottom of the Number Format dropdown.

10. A dialog box appears.



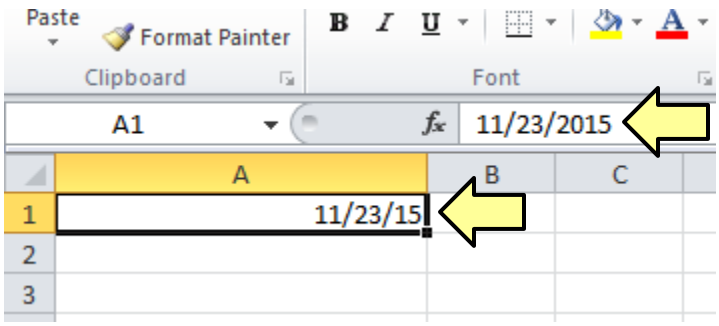
   a. **Notice** how "Date" is selected in the "Category" list box on the left side of the dialog. That's because our cell value is currently being treated as a date.

   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

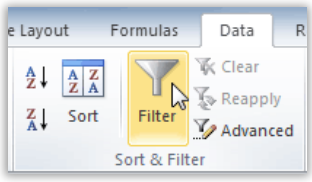
Filters can be applied in many different ways to improve the performance of your worksheet. You can filter text, dates, and numbers. You can even use more than one filter to further narrow down your results.

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.

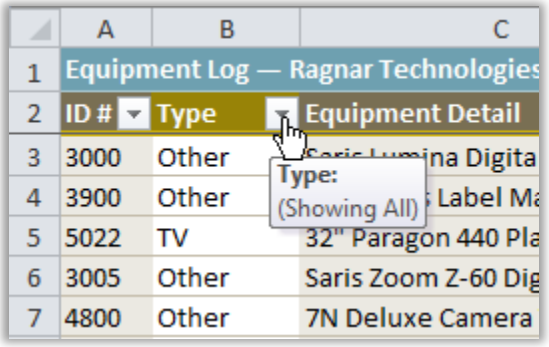
1. **Open** "**Equipment Log.xlsx**".
2. **Notice** how our worksheet has a **header row** (row 2) listing ID#, Type, Equipment Detail, etc.

	A	B	C	D
1	Equipment Log — Ragnar Technologies Inc.			
2	ID #	Type	Equipment Detail	Checked Out
3	3000	Other	Saris Lumina Digital Camera	12-May-14
4	3900	Other	U-Go Saris Label Maker	13-Jun-14
5	5022	TV	32" Paragon 440 Plasma TV	17-Jul-14
6	3005	Other	Saris Zoom Z-60 Digital Camera	27-Jul-14
7	4800	Other	7N Deluxe Camera Travel Bag	27-Jul-14
8	3800	Other	U-Go Saris DigiCam Printer II	04-Aug-14
9	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-14
10	5020	TV	32" Paragon 440 Plasma TV	11-Aug-14
11	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-14
12	6102	Projector	Omega VisX 1.0	22-Aug-14
13	1034	Laptop	17" Saris X-10 Laptop	25-Aug-14
14	6200	Projector	Saris Lux T-80	01-Sep-14
15	6302	Projector	Saris Lux T-81 Lite	08-Sep-14
16	6301	Projector	Saris Lux T-81 Lite	10-Sep-14

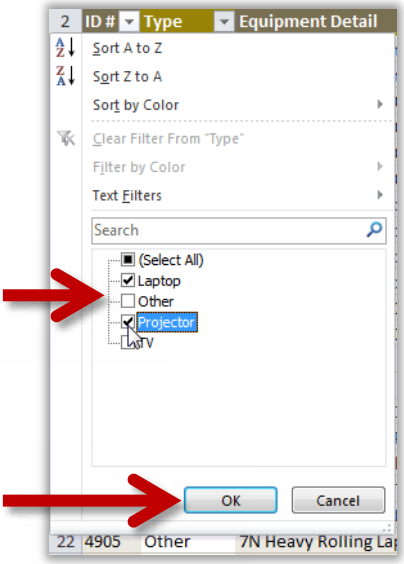


3. **Select** any cell that's within the table.
4. **Select** the **Data tab**, and **locate** the **Sort & Filter group**. **Click** the **Filter** button.

5. **Notice** how **drop-down arrows appear** in the header of each column.

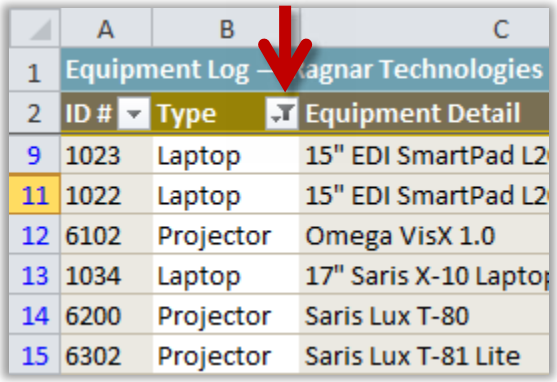


6. **Click** the **drop-down arrow** for the column you would like to filter. In this example, we will filter the **Type** column to view only certain types of equipment. The **Filter** menu appears.
7. **Uncheck** the boxes next to the data values you **don't** want to view. In this example, we only want to view "Laptop" and "Projector", so uncheck everything else.
8. **Click OK**. All other data will be filtered, or temporarily hidden. Only laptops and projectors will be visible.

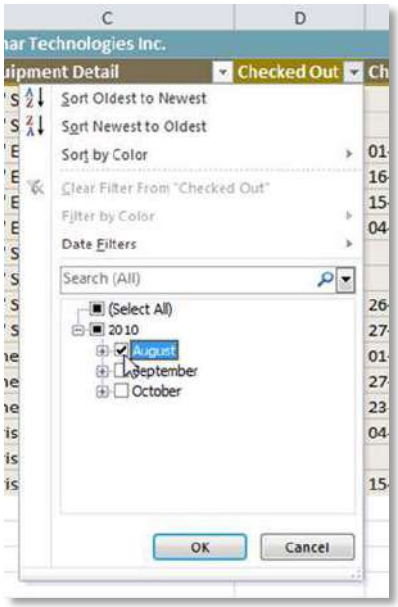


Notice the following things about the table:

- The row numbers are blue. This indicates that the table is being filtered.
- Some row numbers are missing. These are the rows that are being filtered out.
- The "Type" column's list arrow looks different. It has a "filter" icon inside of it.



To Add Another Filter

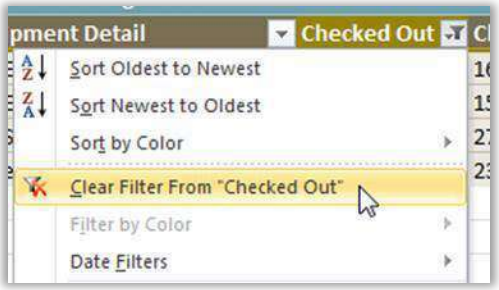


Filters are **additive**, meaning you can use as many as you need to narrow down your results. In this example, we will continue to work with our spreadsheet that has been filtered to display only laptops and projectors. Now we will display only laptops and projectors that were *checked out during the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

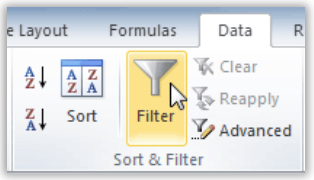
1. **Click** the **drop-down arrow** where you would like to add a filter. In this example, we will add a filter to the **Checked Out** column to view information by date.
2. **Uncheck** the boxes next to the data you don't want to view. In this example, we want to only show the rows whose Checked Out column is within the month of August, so **uncheck** everything except for "**August**".
3. **Click OK**. In addition to the original filter, the new filter will be applied. The worksheet will be narrowed down even further.

	A	B	C	D
1	Equipment Log — Ragnar Technologies Inc.			
2	ID #	Type	Equipment Detail	Checked Out
9	1023	Laptop	15" EDI SmartPad L200-3	08-Aug-14
11	1022	Laptop	15" EDI SmartPad L200-3	14-Aug-14
12	6102	Projector	Omega VisX 1.0	22-Aug-14
13	1034	Laptop	17" Saris X-10 Laptop	25-Aug-14

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.



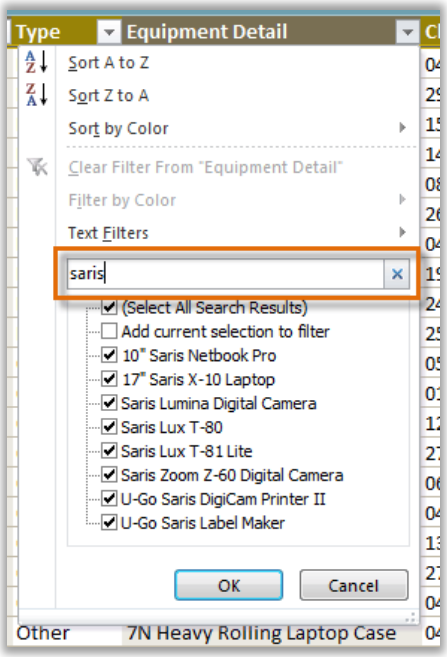
3. **Click** on the **Filter** button on the **Data** tab. This will instantly clear **all filters** from your worksheet.

Advanced Filtering

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.
   Teacher: **Click** into cell **C9** in order to demonstrate the dark line that appears when a select cell gets filtered out.
2. From the **Data** tab, **click** the **Filter** command.
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.



	A	B	C	D
1	Equipment Log — Ragnar Technologies Inc.			
2	ID #	Type	Equipment Detail	Checked Out
3	3000	Other	Saris Lumina Digital Camera	12-May-14
4	3900	Other	U-Go Saris Label Maker	13-Jun-14
6	3005	Other	Saris Zoom Z-60 Digital Camera	27-Jul-14
8	3800	Other	U-Go Saris DigiCam Printer II	04-Aug-14
13	1034	Laptop	17" Saris X-10 Laptop	25-Aug-14
14	6200	Projector	Saris Lux T-80	01-Sep-14
15	6302	Projector	Saris Lux T-81 Lite	08-Sep-14
16	6301	Projector	Saris Lux T-81 Lite	10-Sep-14
18	1032	Laptop	17" Saris X-10 Laptop	19-Sep-14
19	1033	Laptop	17" Saris X-10 Laptop	24-Sep-14
23	1012	Laptop	10" Saris Netbook Pro	29-Sep-14
26	1011	Laptop	10" Saris Netbook Pro	04-Oct-14
27	1031	Laptop	17" Saris X-10 Laptop	04-Oct-14

Note

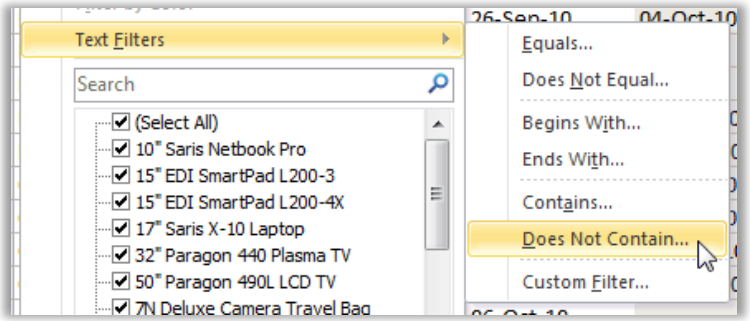
When you filter a table, you may see a dark, horizontal line in your table (see screenshot).

This means that the currently selected cell has been **filtered out** and is not visible.

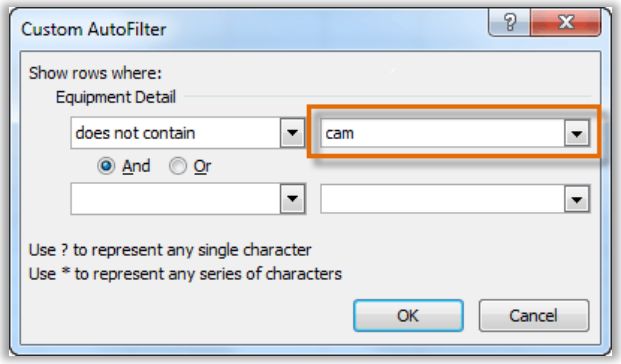
Advanced Text Filters

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 **cam**eras, **cam**corders, **cam**era bags, and the digi**cam** printer.

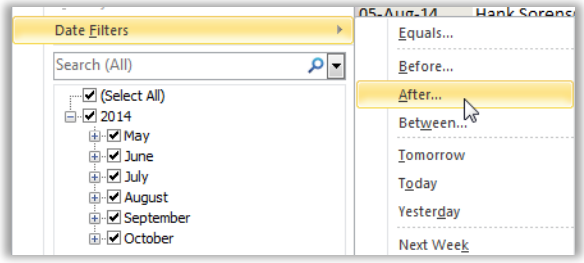


6. **Click** **OK**. The data will be filtered according to the filter you chose and the text you specified.

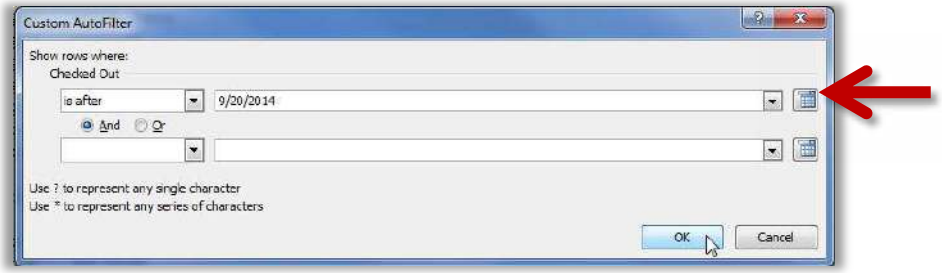
Advanced Date Filters

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. **Click** on the "Date Picker" button to the right of the first text box and select **9/20/14**, then click "**OK**".

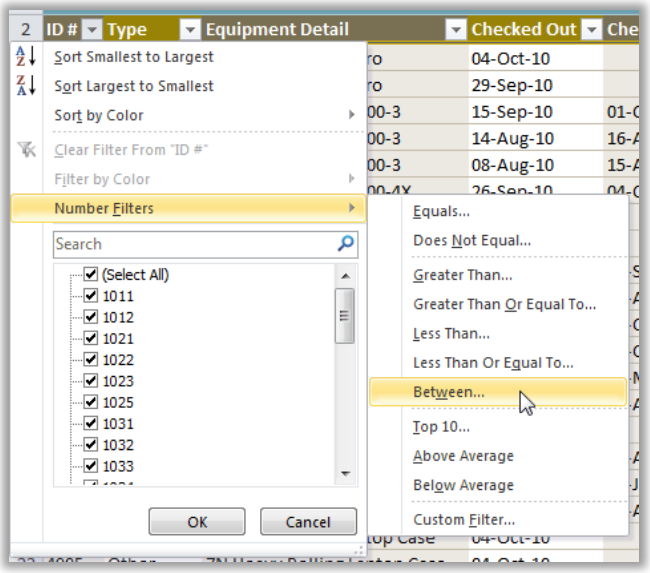


	A	B	C	D	E	F
1	Equipment Log — Ragnar Technologies Inc.					
2	ID #	Type	Equipment Detail	Checked Out	Checked In	By Whom
19	1033	Laptop	17" Saris X-10 Laptop	24-Sep-14	26-Sep-14	George D'Agosta
20	1025	Laptop	15" EDI SmartPad L200-4X	26-Sep-14	04-Oct-14	Min Seung
21	6101	Projector	Omega VisX 1.0	26-Sep-14	27-Sep-14	Michael Earley
22	6100	Projector	Omega VisX 1.0	28-Sep-14	01-Oct-14	Win Armitage
23	1012	Laptop	10" Saris Netbook Pro	29-Sep-14		August Zorn
24	2051	Other	EDI SmartBoard L500-1	01-Oct-14	05-Oct-14	Sofie Ragnar
25	5023	TV	50" Paragon 490L LCD TV	01-Oct-14	01-Oct-14	Margaret Lisbon
26	1011	Laptop	10" Saris Netbook Pro	04-Oct-14		Jay Peralta
27	1031	Laptop	17" Saris X-10 Laptop	04-Oct-14		Nick Ortiz
28	4900	Other	7N Light Rolling Laptop Case	04-Oct-14		Jay Peralta
29	4905	Other	7N Heavy Rolling Laptop Case	04-Oct-14		Nick Ortiz
30	2050	Other	EDI SmartBoard L500-1	05-Oct-14	06-Oct-14	Anthony Liddell
31	3070	Other	Omega PixL Digital Camcorder	06-Oct-14		Min Seung

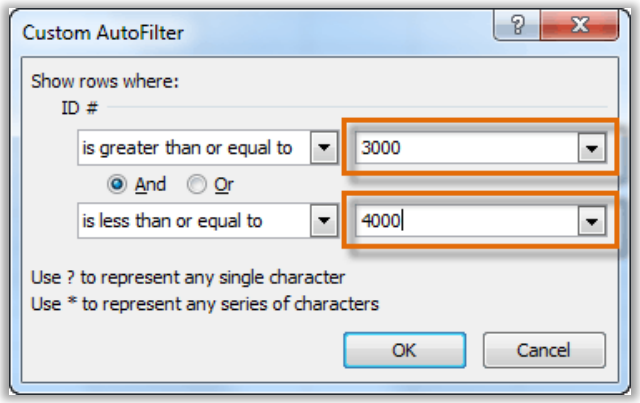
To Use Advanced Number Filters:

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.

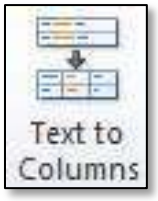


6. **Click OK**. The data will be filtered according to the filter you chose and the numbers you specified.

	A	B	C	D
1	Equipment Log — Ragnar Technologies Inc.			
2	ID #	Type	Equipment Detail	Checked Out
3	3000	Other	Saris Lumina Digital Camera	12-May-14
4	3900	Other	U-Go Saris Label Maker	13-Jun-14
6	3005	Other	Saris Zoom Z-60 Digital Camera	27-Jul-14
8	3800	Other	U-Go Saris DigiCam Printer II	04-Aug-14
31	3070	Other	Omega PixL Digital Camcorder	06-Oct-14

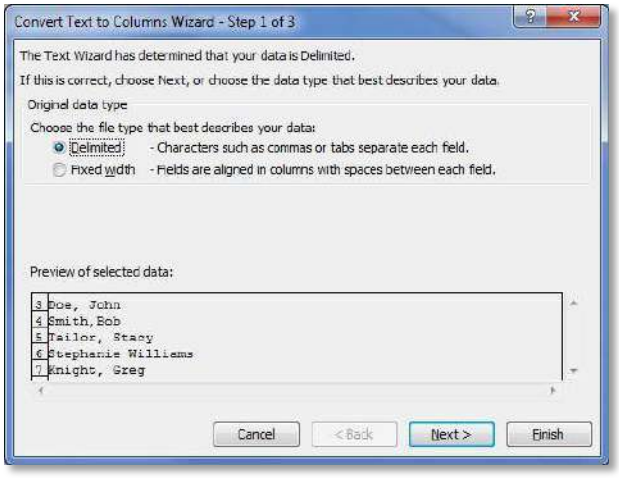
Text to Columns (supplemental content)

Takes: 5min



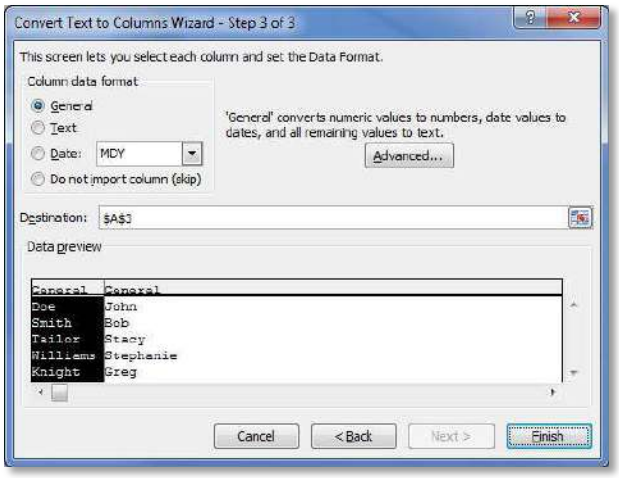
The "text to columns" feature allows you to break up the contents of a single cell into multiple cells.

1. **Open** **Conference Registrants.xslx**.
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.
   c. **Click Next**.

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



Data Validation (supplemental content)

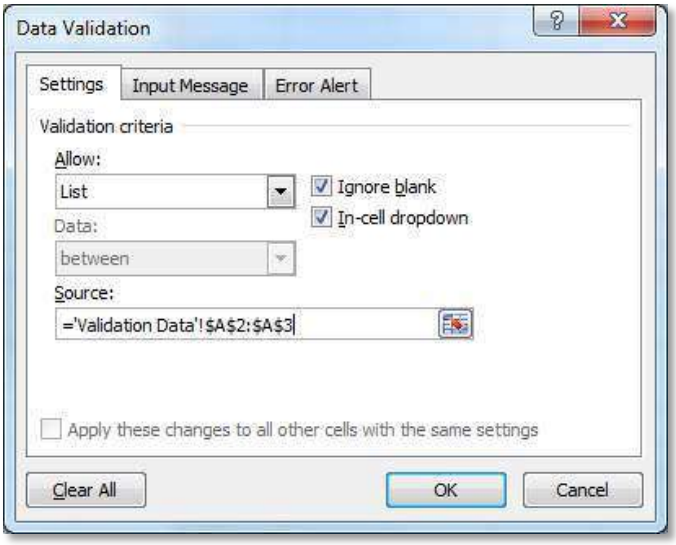
Takes: 10min

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.

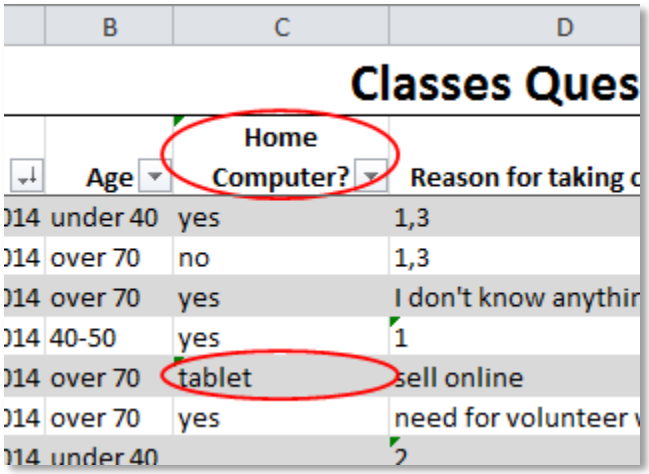
1. **Open** **Questionnaire Statistics.xslx**. This spreadsheet is used to keep track of the answers that people give to our new student questionnaire.
2. **Notice** how the **Home Computer?** column consists of mostly **yes/no values**. We will add data validation to this column to enforce this.
3. 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.



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.

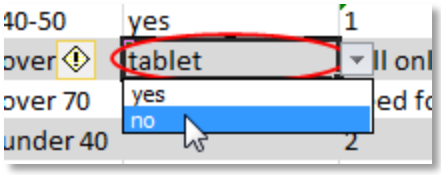
      iv. **Click** **OK**.

   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**.

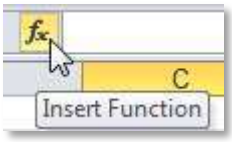
Now, try to do the same for **column B**. This column should be validated for the following list of values: under 40, 40-50, 51-60, 61-70, over 70.

IF Function (supplemental content)

Takes: 30min

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:
   a. The first section, **Tax Rate**, shows the tax rate in this imaginary land – everyone is supposed to pay 15% of their income.
   b. The second section, **W2s**, has the income and tax withheld for our married couple.
   c. The third section is the **Tax Calculation**.
5. Let's start with "Line 1, Wages, salaries, and tips" in the Tax Calculation section. 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`
6. 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.
   English: Add lines 1, 2, and 3.
   Formula: `=SUM(C14,C15,C16)` or `=SUM(C14:C16)`



7. 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!
8. 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)`

> **Remember:** Always begin your formulas with an = sign.

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

a. **Click** in cell **C18**.

b. **Click** on the "Insert Function" button.

c. **Select** "IF" from the function list and click **OK**.

d. A "Function Arguments" dialog will open.

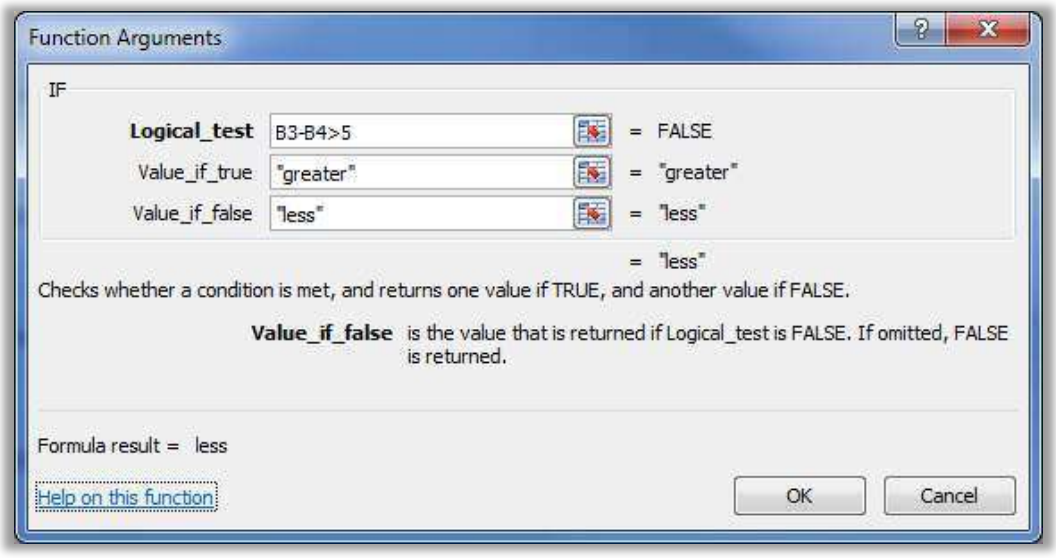
i. **Click** in the "**Logical_test**" textbox.

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". 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".

iv. **Click OK**.



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

f. Let's test out the formula further

i. **Change** the number in cell **B3** to 11

ii. Because the difference is greater than 5, the word greater displays this time

iii. **Change** cell **B3** back to 10

6. With formula #4, we are going to closely approximate the formula for the Taxable Income line (line 6) of the Tax Form.
   Formula: `=IF(B4>B3,0,B3-B4)`

   a. **Click** 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.

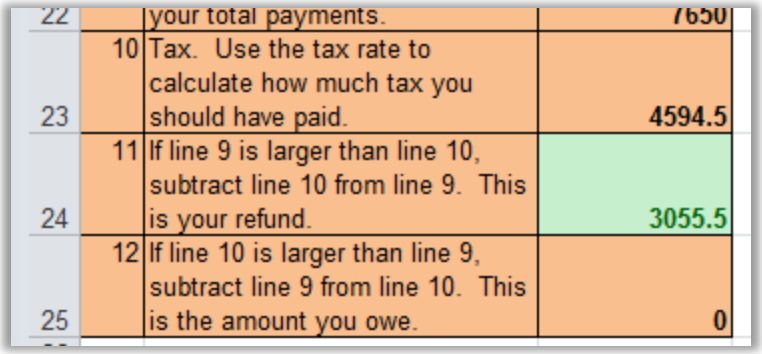
   English: If the Standard Deduction > Adjusted Gross Income, display 0, otherwise display Adjusted Gross Income -Standard Deduction.
   Formula: `=IF(C18>C17,0,C17-C18)`

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.



22		your total payments.	7650
23	10	Tax. Use the tax rate to calculate how much tax you should have paid.	4594.5
24	11	If line 9 is larger than line 10, subtract line 10 from line 9. This is your refund.	3055.5
25	12	If line 10 is larger than line 9, subtract line 9 from line 10. This is the amount you owe.	0

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.