1. Click the File tab to access Backstage view.

2. Click Export, then select Change File Type.

3. Select a common file type, then click Save As.

4. The Save As dialog box will appear. Select the location where you wish to export the workbook, enter a **file name**, and then click **Save**.

Challenge!

5. Create a **new blank workbook**.
6. Use the **Save** command to save the workbook to your desktop.
7. Save the workbook to **OneDrive** and **invite someone else** to view it.
8. **Export** the workbook as a **PDF** file.

3. Cell Basics

Whenever you work with Excel, you'll enter information, or **content**, into **cells**. Cells are the basic building blocks of a worksheet. You'll need to learn the basics of **cells** and **cell content** to calculate, analyze, and organize data in Excel.

3.1. Understanding Cells

Every worksheet is made up of thousands of rectangles, which are called **cells**. A cell is the **intersection** of a **row** and a **column**. Columns are identified by **letters (A, B, C)**, while rows are identified by **numbers (1, 2, 3)**.
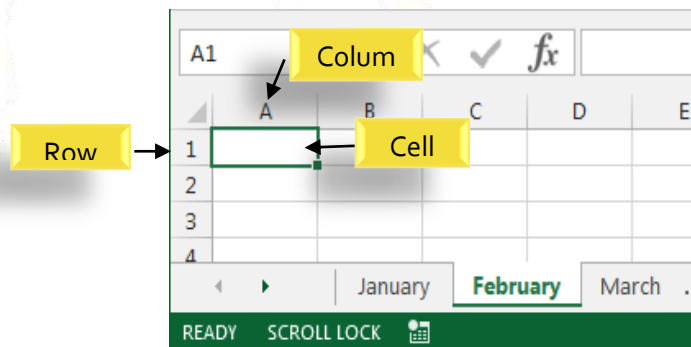
Each cell has its own **name**, or **cell address**, based on its column and row. In this example, the selected cell intersects **column C** and **row 5**, so the cell address is **C5**. The cell address will also appear in the **Name box**. Note that a cell's **column** and **row headings** are **highlighted** when the cell is selected.
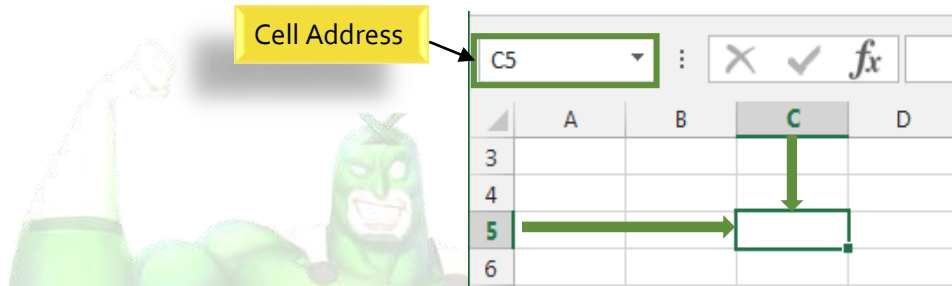

You can also select **multiple cells** at the same time. A group of cells is known as a **cell range**. Rather than a single cell address, you will refer to a cell range using the cell addresses of the **first** and **last** cells in the cell range, separated by a **colon**. For example, a cell range that included cells A1, A2, A3, A4, and A5 would be written as **A1:A5**.

In the images below, two different cell ranges are selected:

- Cell range **A1:A8**
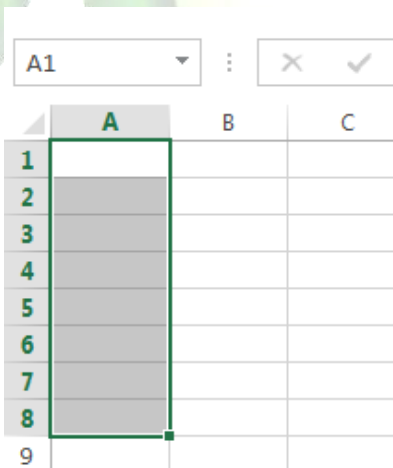
- Cell range **A1:B8**
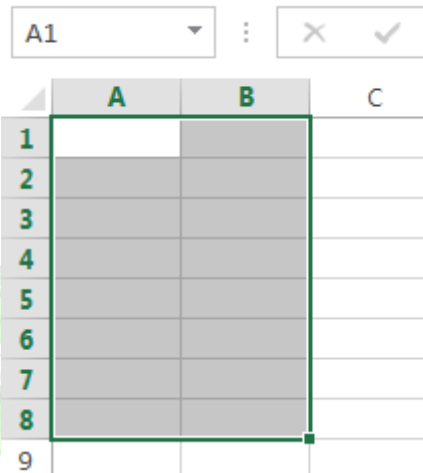
To select a cell range

Sometimes you may want to select a larger group of cells, or a **cell range**.

1. Click, hold, and drag the mouse until all of the **adjoining cells** you wish to select are **highlighted**.

2. Release the mouse to **select** the desired cell range. The cells will remain **selected** until you click another cell in the worksheet.

3.2.   Cell Content

Any information you enter into a spreadsheet will be stored in a cell. Each cell can contain several different kinds of **content**, including **text, formatting, formulas,** and **functions**.

❑ **Text**

Cells can contain **text**, such as letters, numbers, and dates.

	A	B	C
1	Date	Sales	Percentage of Total
2	5/6/2013	65	0.71
3	5/7/2013	78	0.78
4	5/8/2013	112	0.86
5	5/9/2013	54	0.28
6	5/10/2013	99	0.49
7	5/11/2013	189	0.65
8	5/12/2013	120	0.57
9			

❑ Formatting Attributes

Cells can contain **formatting attributes** that change the way letters, numbers, and dates are **displayed**. For example, percentages can appear as 0.15 or 15%. You can even change a cell's **background color**.

❑ Formulas and Functions

Cells can contain **formulas** and **functions** that calculate cell values. In our example, SUM(B4:B7) adds the value of each cell in cell range B4:B7 and displays the total in cell B8.

B8	▾ ⋮ ✕ ✓ *fx*	=SUM(B4:B7)		
	A	B	C	D	E
3	Date	Students	Percentage		
4	1/2/2015	36	36%		100
5	1/3/2015	50	50%		
6	1/4/2015	14	14%		
7	1/5/2015	55	55%		
8		155			

To insert content

1. Click a **cell** to select it.

	A	B	C
1	✛		
2			

2. Type **content** into the selected cell, then press **Enter** on your keyboard. The content will appear in the **cell** and the **formula bar**. You can also input and edit cell content in the formula bar.

| A1	▾ ⋮ ✕ ✓ *fx*	First		
	A	B	C	D	E
1	First				
2					
3					
4					
5					

Content appears in cell and formula bar

To delete cell content

1. Select the **cell** with content you wish to delete.

2. Press the **Delete** or **Backspace** key on your keyboard. The cell's contents will be deleted.

To delete cells

There is an important difference between **deleting the content of a cell** and **deleting the cell itself**. If you delete the entire cell, the cells below it will **shift up** and replace the deleted cells.
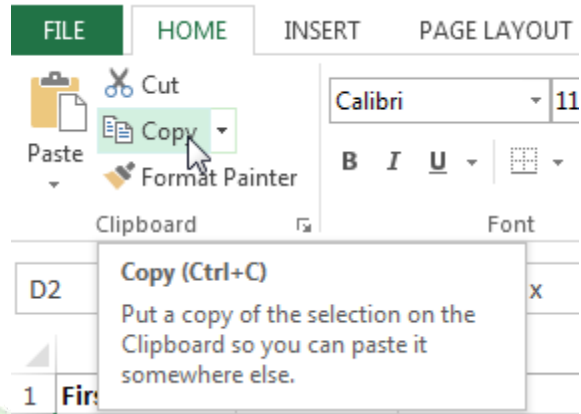
1. Select the **cell(s)** you wish to delete.

2. Select the **Delete** command from the **Home** tab on the **Ribbon**.

3. The cells below will **shift up**.
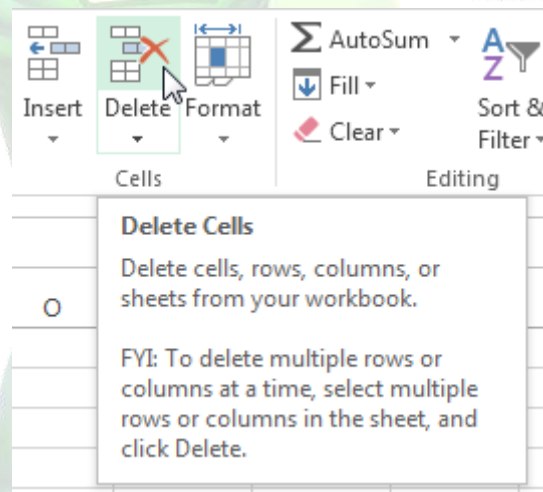
To copy and paste cell content

Excel allows you to **copy** content that is already entered into your spreadsheet and **paste** that content to other cells, which can save you time and effort.

1. Select the **cell(s)** you wish to **copy**.

2. Click the **Copy** command on the **Home** tab, or press **Ctrl+C** on your keyboard.

3. Select the **cell(s)** where you wish to **paste** the content. The copied cells will now have a **dashed box** around them.

4. Click the **Paste** command on the **Home** tab, or press **Ctrl+V** on your keyboard.

5. The content will be **pasted** into the selected cells.

To access more paste options

You can also access **additional paste options**, which are especially convenient when working with cells that contain **formulas** or **formatting**.

☑ To access more paste options, click the **drop-down arrow** on the **Paste** command.
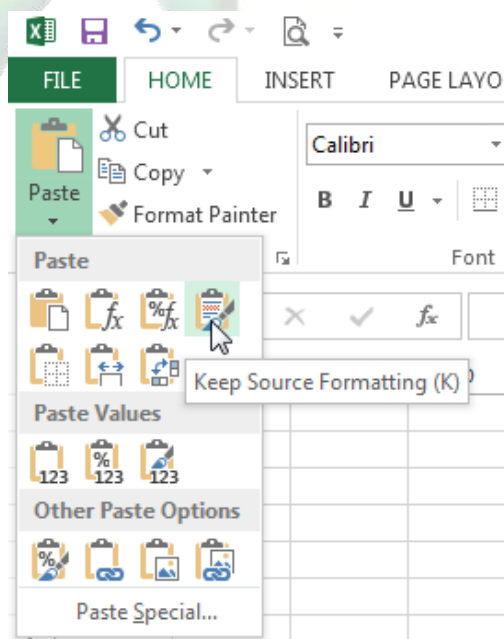
🖉 TIP: Rather than choosing commands from the Ribbon, you can access commands quickly by **right-clicking**. Simply select the **cell(s)** you wish to **format**, then right-click the mouse. A **drop-down menu** will appear, where you'll find several **commands** that are also located on the Ribbon.
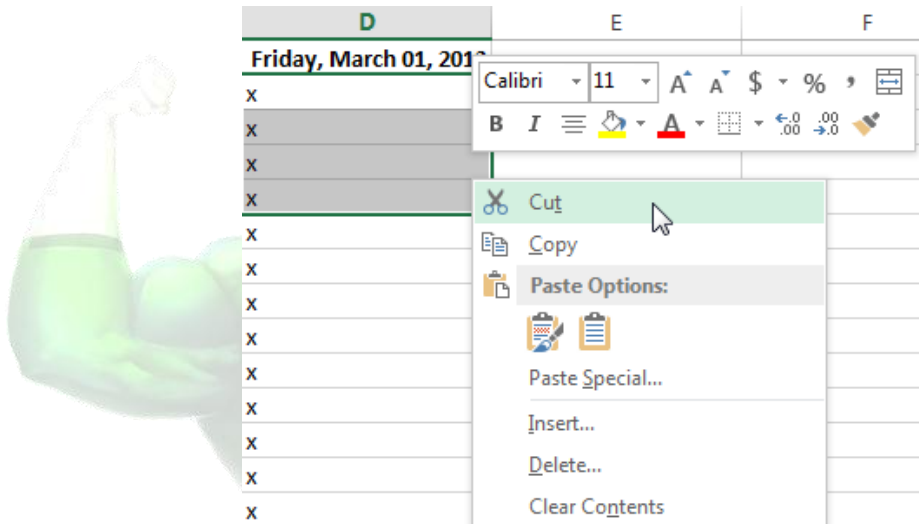

To drag and drop cells

Rather than cutting, copying, and pasting, you can **drag and drop** cells to move their contents.

1. Select the **cell(s)** you wish to **move**.

2. Hover the mouse over the **border** of the selected cell(s) until the cursor changes from a **white cross** to a **black cross with four arrows**.

3. Click, hold, and drag the cells to the **desired location**.

4. Release the mouse, and the cells will be **dropped** in the selected location.
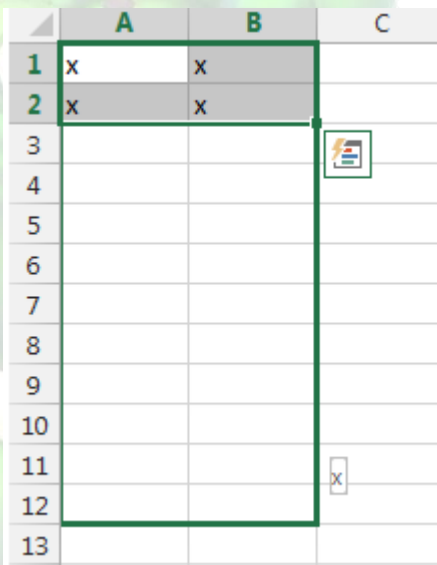
To use the fill handle

There may be times when you need to copy the content of one cell to several other cells in your worksheet. You could **copy and paste** the content into each cell, but this method would be very time consuming. Instead, you can use the **fill handle** to quickly copy and paste content to **adjacent cells** in the same row or column.

1. Select the **cell(s)** containing the content you wish to use. The **fill handle** will appear as a small square in the bottom-right corner of the selected cell(s).
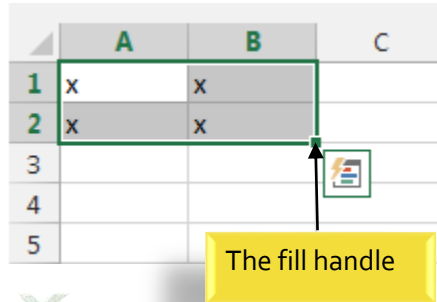
The fill handle

2. Click, hold, and drag the **fill handle** until all of the cells you wish to fill are **selected**.

3. Release the mouse to **fill** the selected cells.

To continue a series with the fill handle

The fill handle can also be used to **continue a series**. Whenever the content of a row or column follows a sequential order, like **numbers (1, 2, 3)** or **days (Monday, Tuesday, Wednesday)**, the fill handle can guess what should come next in the series. In many cases, you may need to select **multiple cells** before using the fill handle to help Excel determine the series order. In our example below, the fill handle is used to extend a series of **dates** in a column.
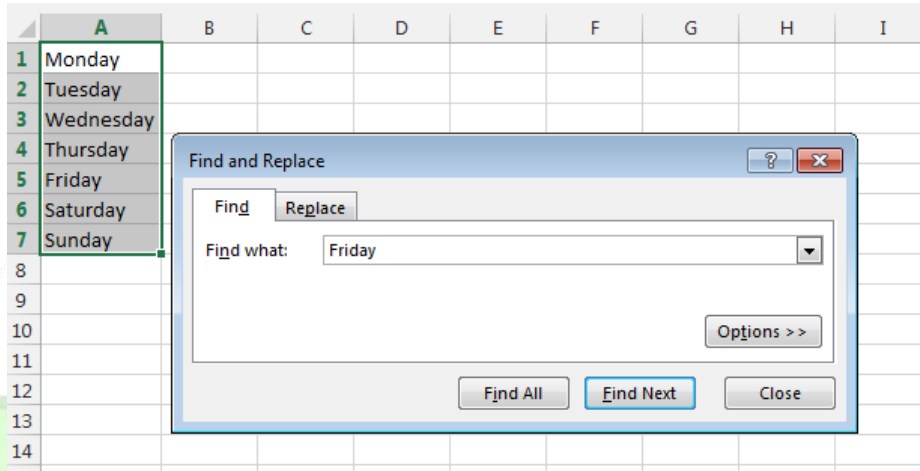
3.3. Find and Replace

When working with a lot of data in Excel, it can be difficult and time consuming to locate specific information. You can easily search your workbook using the **Find** feature, which also allows you to modify content using the **Replace** feature.

To find content

1. From the **Home** tab, click the **Find and Select** command, then select **Find...** from the drop-down menu.
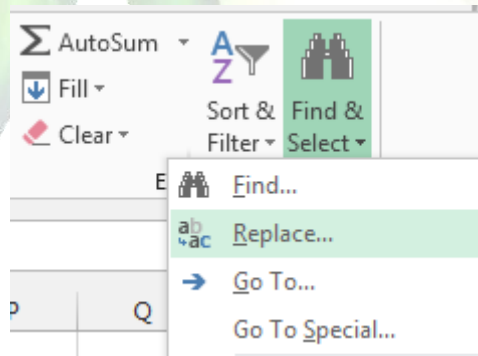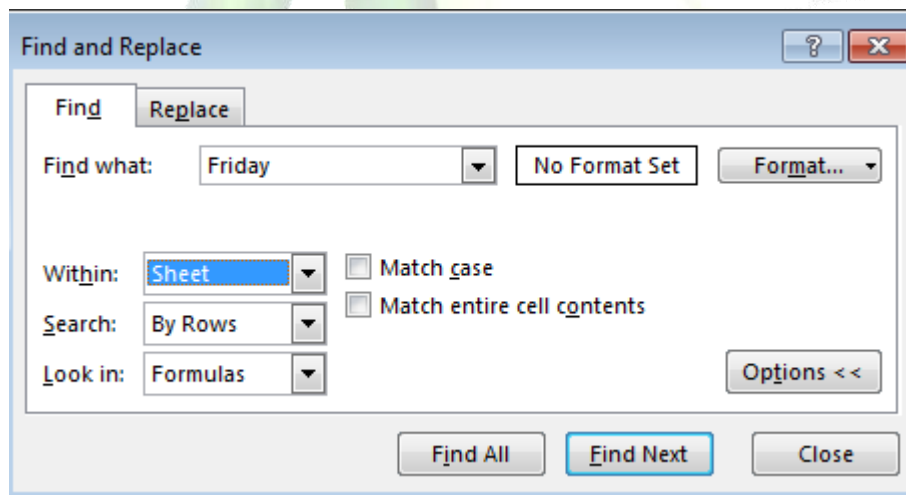

2. The **Find and Replace** dialog box will appear. Enter the **content** you wish to find.

3. Click **Find Next**. If the content is found, the cell containing that content will be **selected**.

4. Click **Find Next** to find further instances or **Find All** to see every instance of the search term.

5. When you are finished, click **Close** to exit the Find and Replace dialog box.

✐ TIP: You can also access the Find command by pressing **Ctrl+F** on your keyboard.

✐ TIP: Click **Options** to see advanced search criteria in the Find and Replace dialog box.

To replace cell content

At times, you may discover that you've repeatedly made a mistake throughout your workbook (such as misspelling someone's name), or that you need to exchange a particular word or phrase for another. You can use Excel's **Find and Replace** feature to make quick revisions.

1. From the **Home** tab, click the **Find and Select** command, then select **Replace...** from the drop-down menu.

2. The **Find and Replace** dialog box will appear. Type the text you wish to find in the **Find what:** field.

3. Type the text you wish to replace it with in the **Replace with**: field, then click **Find Next**.

4. If the content is found, the cell containing that content will be **selected**.

5. **Review** the text to make sure you want to replace it.

6. If you wish to replace it, select one of the **replace** options:

- **Replace** will replace individual instances.

- **Replace All** will replace every instance of the text throughout the workbook. In our example, we'll choose this option to save time.

7. A dialog box will appear, confirming the number of replacements made. Click **OK** to continue.
8. When you are finished, click **Close** to exit the Find and Replace dialog box.

Challenge!

1. Open an existing Excel 2013 workbook.
2. Select cell D3. Notice how the **cell address** appears in the **Name box** and its **content** appears in both the cell and the **Formula bar**.
3. Select a cell, and try inserting **text** and **numbers**.
4. **Delete** a cell, and note how the cells below **shift up** to fill in its place.
5. **Cut** cells and **paste** them into a different location.
6. Try **dragging** and **dropping** some cells to other parts of the worksheet.
7. Use the **fill handle** to fill in data to adjoining cells both vertically and horizontally.
8. Use the **Find** feature to locate content in your workbook.

4. Formatting Cells

All cell content uses the same **formatting** by default, which can make it difficult to read a workbook with a lot of information. Basic formatting can customize the **look and feel** of your workbook, allowing you to draw attention to specific sections and making your content easier to view and understand. You can also apply **number formatting** to tell Excel exactly what type of data you're using in the workbook, such as percentages (%), currency ($), and so on.

4.1.   Font Formatting

To change the font

By default, the font of each new workbook is set to Calibri. However, Excel provides a variety of other fonts you can use to customize your cell text. In the example below, we'll format our **title cell** to help distinguish it from the rest of the worksheet.

1. Select the **cell(s)** you wish to modify.

2. Click the **drop-down arrow** next to the **Font** command on the **Home** tab. The **Font** drop-down menu will appear.

3. Select the desired **font**. A **live preview** of the new font will appear as you hover the mouse over different options.
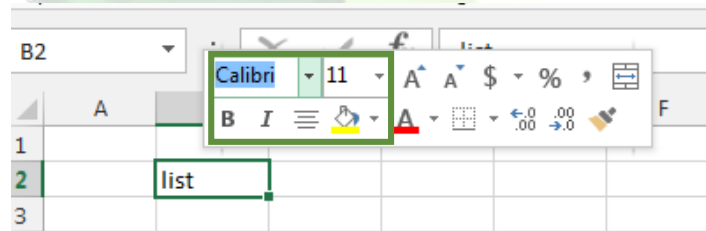

4. The text will change to the **selected font**.

🖉 TIP: When creating a workbook in the workplace, you'll want to select a font that is easy to read. Along with Calibri, standard reading fonts include Cambria, Times New Roman, and Arial.

To change the font size

1. Select the **cell(s)** you wish to modify.

2. Click the **drop-down arrow** next to the **Font Size** command on the **Home** tab. The **Font Size** drop-down menu will appear.

3. Select the desired **font size**. A **live preview** of the new font size will appear as you hover the mouse over different options.

4. The text will change to the **selected font size**.

🖉 TIP: You can also use the **Increase Font Size** and **Decrease Font Size** commands or enter a **custom font size** using your keyboard.
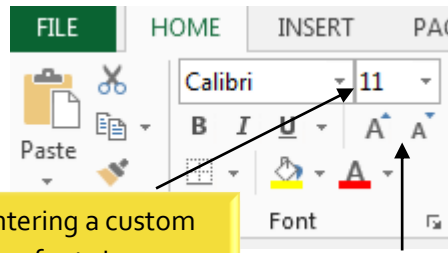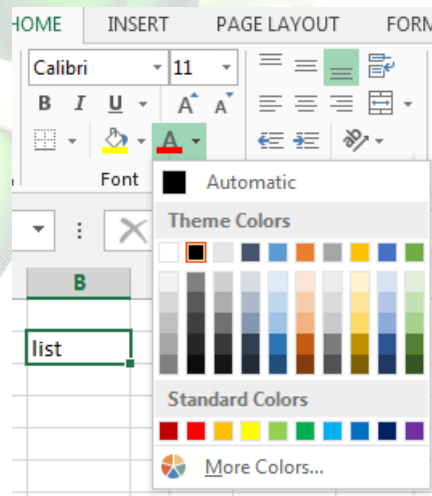
Entering a custom font size

Increase and Decrease Font Size commands

To change the font color

1. Select the **cell(s)** you wish to modify.

2. Click the **drop-down arrow** next to the Font Color command on the **Home** tab. The **Color** menu will appear.

3. Select the desired **font color**. A **live preview** of the new font color will appear as you hover the mouse over different options.

4. The text will change to the **selected font color**.

To use the Bold, Italic, and Underline commands

1. Select the **cell(s)** you wish to modify.

2. Click the Bold (**B**), Italic (*I*), or Underline (U) command on the **Home** tab. In our example, we'll make the selected cells **bold**.
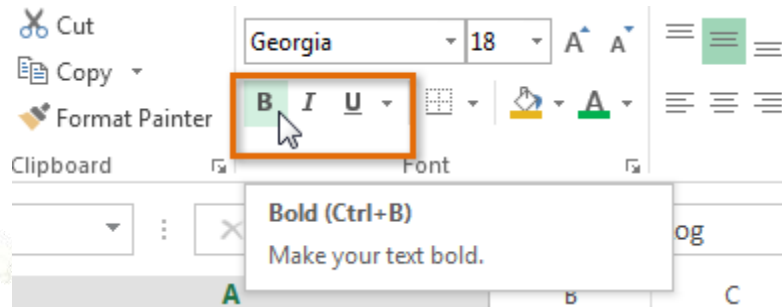
3. The **selected style** will be applied to the text.

🖉 <u>TIP</u>: You can also press **Ctrl+B** on your keyboard to make selected text **bold**, **Ctrl+I** to apply **italics**, and **Ctrl+U** to apply an **underline**.

4.2. Text Alignment

By default, any text entered into your worksheet will be aligned to the bottom-left of a cell. Any numbers will be aligned to the bottom-right of a cell. Changing the **alignment** of your cell content allows you to choose how the content is displayed in any cell, which can make your cell content easier to read.

To change horizontal text alignment

1. Select the **cell(s)** you wish to modify.

2. Select one of the three **horizontal alignment** commands on the **Home** tab. In our example, we'll choose **Center Align**.
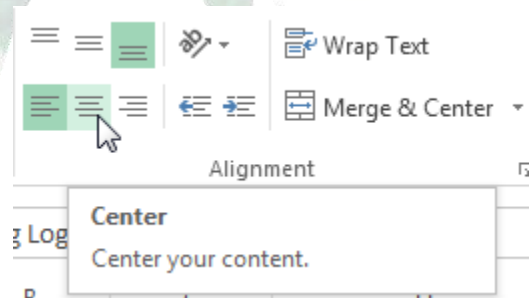
3. The text will **realign**.

To change vertical text alignment

1. Select the **cell(s)** you wish to modify.

2. Select one of the three **vertical alignment** commands on the **Home** tab. In our example, we'll choose **Middle Align**.
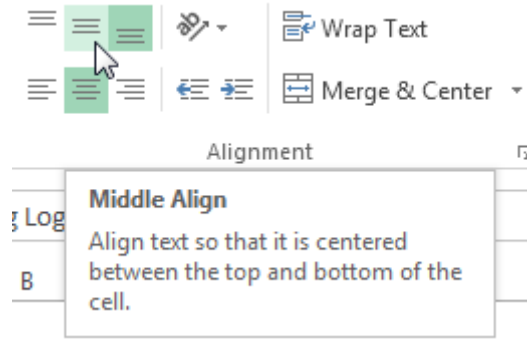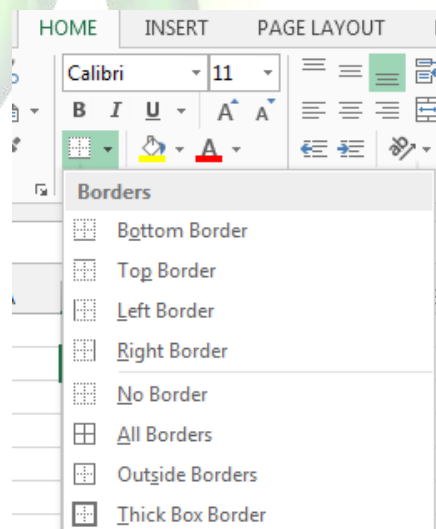
3. The text will **realign**.

4.3. Cell borders and fill colors

Cell borders and **fill colors** allow you to create clear and defined boundaries for different sections of your worksheet.
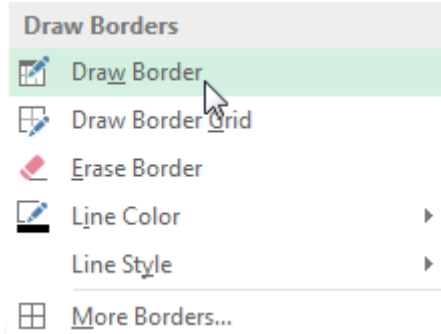
To add a border

1. Select the **cell(s)** you wish to modify.

2. Click the **drop-down arrow** next to the **Borders** command on the **Home** tab. The **Borders** drop-down menu will appear.

3. Select the **border style** you want to use.

4. The **selected border style** will appear.

✎ TIP: You can draw borders and change the **line style** and **color** of borders with the **Draw Borders** tools at the bottom of the Borders drop-down menu.

Draw Borders

Draw Border

Draw Border Grid

Erase Border

Line Color   ▶

Line Style   ▶

More Borders...

To add a fill color

1. Select the **cell(s)** you wish to modify.

2. Click the **drop-down arrow** next to the **Fill Color** command on the **Home** tab. The **Fill Color** menu will appear.

3. Select the **fill color** you want to use. A **live preview** of the new fill color will appear as you hover the mouse over different options. In our example, we'll choose **Light Green**.
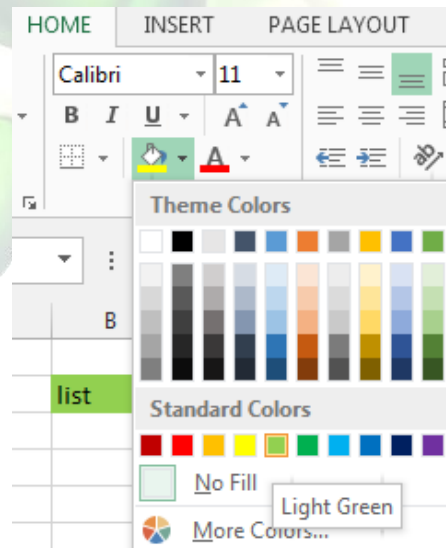
4. The **selected fill color** will appear in the selected cells.

4.4.   Cell styles

Rather than formatting cells manually, you can use Excel's **predesigned cell styles**. Cell styles are a quick way to include professional formatting for different parts of your workbook, such as **titles** and **headers**.

To apply a cell style

1. Select the **cell(s)** you wish to modify.

2. Click the **Cell Styles** command on the **Home** tab, then choose the **desired style** from the drop-down menu.
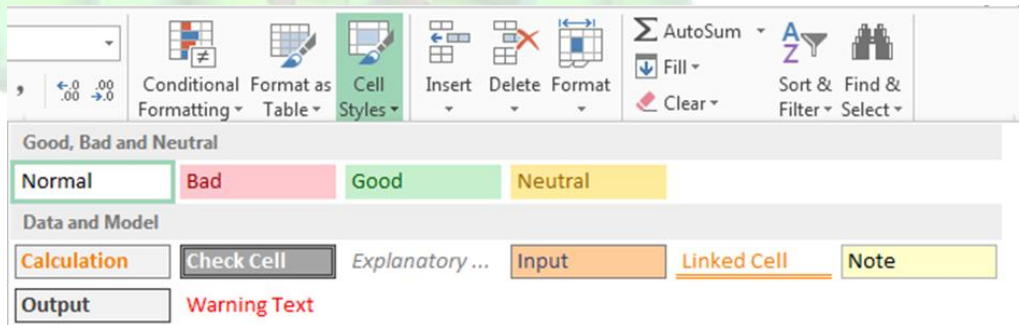
3. The **selected cell style** will appear.

✎ TIP: Applying a cell style will **replace** any existing cell formatting except for text alignment. You may not want to use cell styles if you've already added a lot of formatting to your workbook.

4.5.   Formatting text and numbers

One of the most powerful tools in Excel is the ability to apply specific formatting for text and numbers. Instead of displaying all cell content in exactly the same way, you can use formatting to change the appearance of dates, times, decimals, percentages (%), currency ($), and much more.

To apply number formatting

1. Select the **cells(s)** you wish to modify.

2. Click the drop-down arrow next to the **Number Format** command on the **Home** tab. The Number Formatting drop-down menu will appear.

3. Select the **desired formatting option**.

4. The selected cells will change to the new **formatting style**.

General is the default format for any cell. When you enter a number into the cell, Excel will guess the number format that is most appropriate.

ABC 123 — **General** No specific format

12 — **Number** list

Number formats numbers with **decimal places**.

Currency formats numbers as currency with a **currency** symbol.

Currency list

Accounting list

Accounting formats numbers as monetary values like the Currency format, but it also aligns currency symbols and decimal places within columns.

Short Date formats numbers as **M/D/YYYY**.

Short Date list

Long Date formats numbers as **Weekday, Month DD, YYYY**.

Long Date list

Time list

Time formats numbers as **HH/MM/SS** and notes **AM** or **PM**.

Percentage formats numbers with **decimal** places and the **percent sign**.

% — **Percentage** list

½ — **Fraction** list

Fraction formats numbers as fractions separated by the **forward slash**.

Scientific formats numbers in **scientific notation**.

10^2 — **Scientific** list

ABC — **Text** list

Text formats numbers as text, meaning that what you enter into the cell will appear exactly as it was entered.

You can easily customize any format in **More Number Formats**.
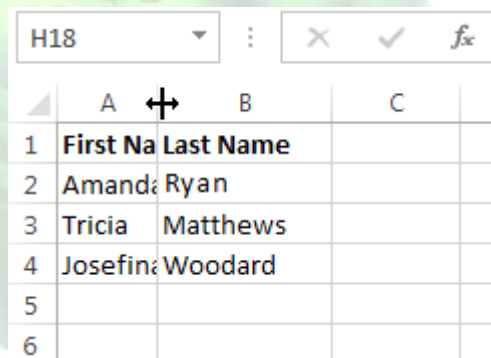
More Number Formats...

Challenge!

1. Open an existing Excel 2013 workbook.
2. Select a **cell** and change the **font style, size, and color** of the text.
3. Apply **bold**, **italics**, or **underline** to a cell.
4. Try changing the **vertical** and **horizontal text alignment** for some cells.
5. Add a **border** to a cell range.
6. Change the **fill color** of a cell range.
7. Try changing the **formatting** of a number.

5. Modifying Columns, Rows and Cells

By default, every row and column of a new workbook is always set to the same **height** and **width**. Excel allows you to modify column width and row height in different ways, including **wrapping text** and **merging cells**.

To modify column width

1. Position the mouse over the **column line** in the **column heading** so the **white cross** becomes a **double arrow**.

2. Click, hold, and drag the mouse to **increase** or **decrease** the column width.

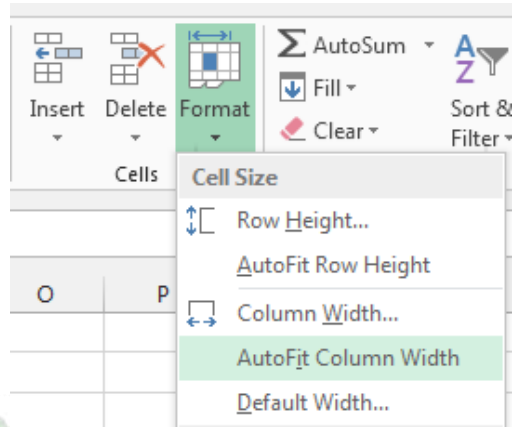3. Release the mouse. The **column width** will be changed.

✎ TIP: If you see **pound signs** (#######) in a cell, it means that the column is not wide enough to display the cell content. Simply **increase the column width** to show the cell content.

To AutoFit column width

The **AutoFit** feature will allow you to set a column's width to fit its content **automatically**.

1. Position the mouse over the **column line** in the **column heading** so the **white cross** becomes a **double arrow**.

2. Double-click the mouse. The **column width** will be changed automatically to fit the content.

✎ TIP: You can also AutoFit the width for several columns at the same time. Simply select the columns you would like to AutoFit, then select the **AutoFit Column Width** command from the **Format** drop-down menu on the **Home** tab. This method can also be used for **Row height**.
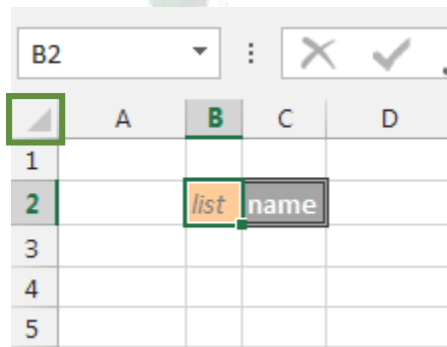
To modify row height

1. Position the cursor over the **cursor** over the **row line** so the **white cross** ✛becomes a **double arrow** ✛.

2. Click, hold, and drag the mouse to **increase** or **decrease** the row height.

3. Release the mouse. The **height** of the selected row will be changed.

To modify all rows or columns

Rather than resizing rows and columns individually, you can modify the height and width of every row and column at the same time. This method allows you to set a **uniform size** for every row and column in your worksheet.

1. Locate and click the **Select All** button ◢ just below the **formula bar** to select every cell in the worksheet.


2. Position the mouse over a **row line** so the **white cross** ✛becomes a **double arrow** ✛.

3. Click, hold, and drag the mouse to **increase** or **decrease** the row height.

4. Release the mouse when you are satisfied with the **new row height** for the worksheet.

5.1.   Inserting, deleting, moving, and hiding rows and columns

After you've been working with a workbook for a while, you may find that you want to **insert new** columns or rows, **delete** certain rows or columns, **move** them to a different location in the worksheet, or even **hide** them.

To insert rows

1. Select the **row heading** below where you want the new row to appear.

2. Click the **Insert** command on the **Home** tab.
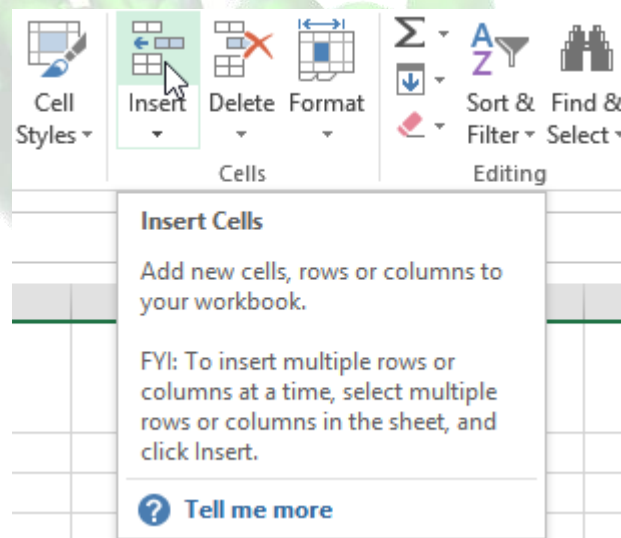
3. The **new row** will appear **above** the selected row.

✎ TIP: When inserting new rows, columns, or cells, you will see the **Insert Options** button next to the inserted cells. This button allows you to choose how Excel formats these cells. By default, Excel formats inserted rows with the same formatting as the cells in the row above. To access more options, hover your mouse over the **Insert Options** button, then click the **drop-down arrow**.
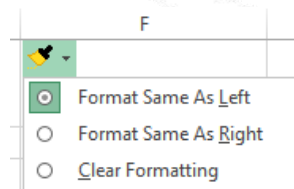
To insert columns

1. Select the **column heading** to the right of where you want the new column to appear.

2. Click the **Insert** command on the **Home** tab.
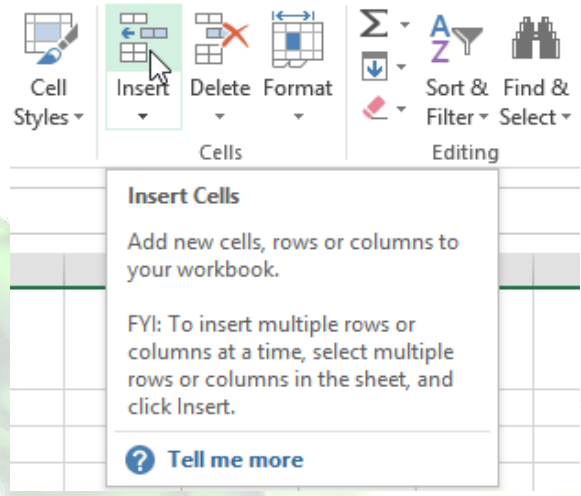
3. The **new column** will appear **to the left** of the selected column.

✎ TIP: When inserting rows and columns, make sure you select the entire row or column by clicking the **heading.** If you select only a cell in the row or column, the **Insert** command will only insert a new cell.

To delete rows

It's easy to **delete** any row that you no longer need in your workbook.

1. Select the **row(s)** you want to delete.

2. Click the **Delete** command on the **Home** tab.
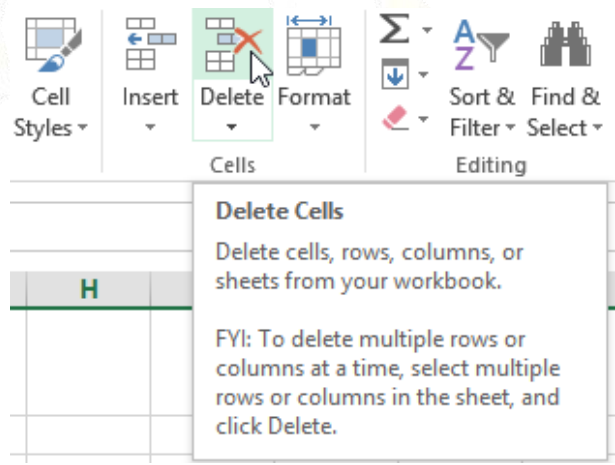
3. The **selected row(s)** will be deleted, and the rows below will **shift up**.

To delete columns

1. Select the **columns(s)** you want to delete.

2. Click the **Delete** command on the **Home** tab.
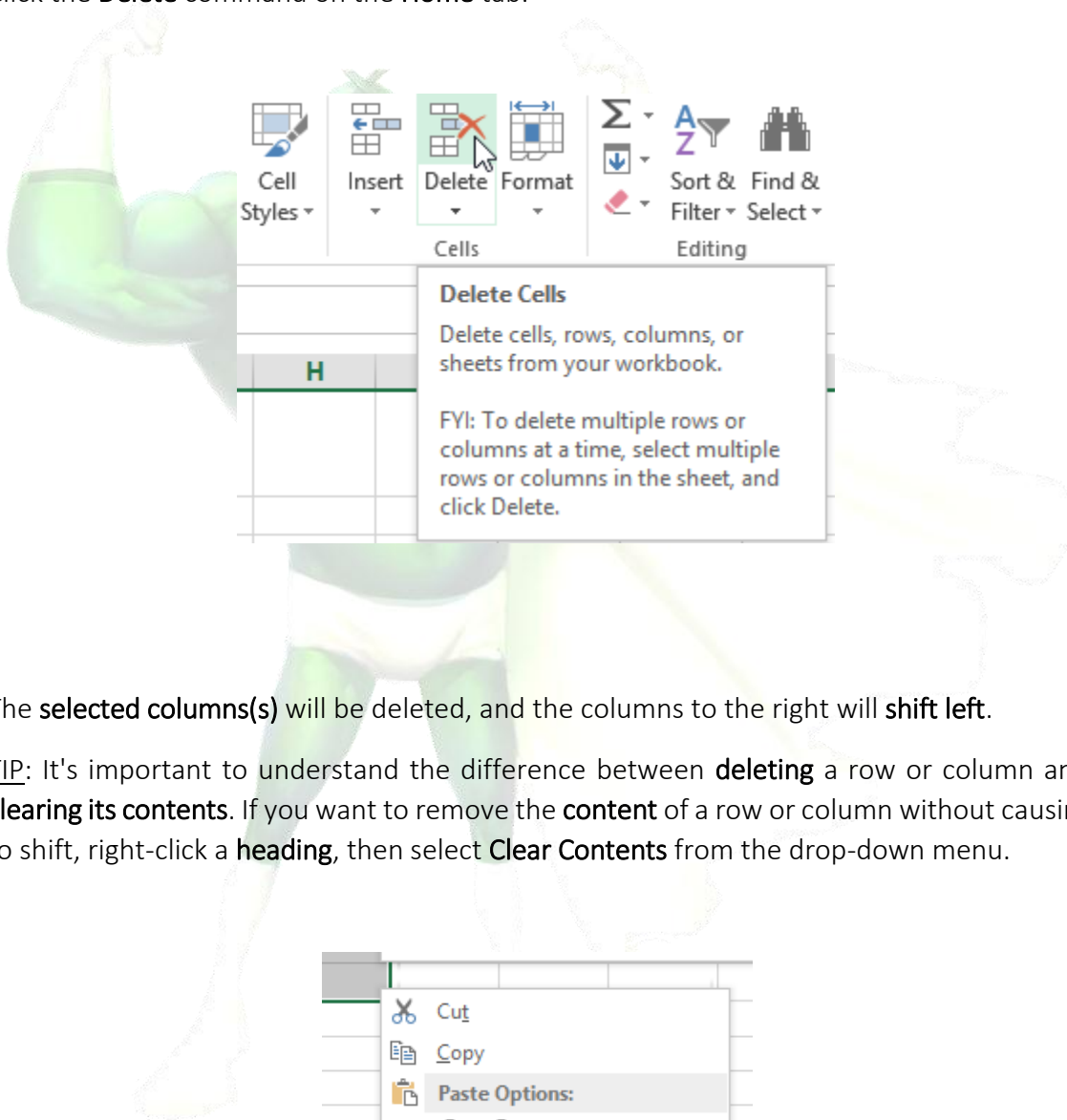
3. The **selected columns(s)** will be deleted, and the columns to the right will **shift left**.

✎ TIP: It's important to understand the difference between **deleting** a row or column and simply **clearing its contents**. If you want to remove the **content** of a row or column without causing others to shift, right-click a **heading**, then select **Clear Contents** from the drop-down menu.
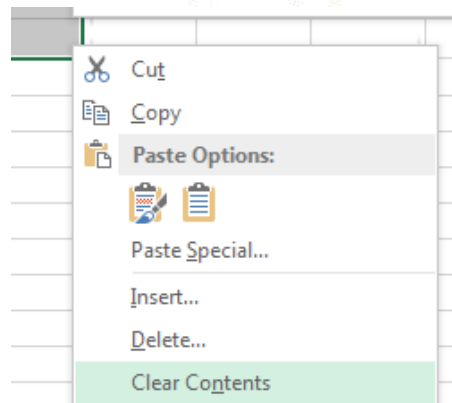
To move a row or column

Sometimes you may want to **move** a column or row to rearrange the content of your worksheet.

1. Select the desired **column heading** for the column you wish to move, then click the **Cut** command on the **Home** tab or press **Ctrl+X** on your keyboard.

2. Select the **column heading** to the right of where you want to move the column. For example, if you want to move a column between columns B and C, select column C.

3. Click the **Insert** command on the **Home** tab, then select **Insert Cut Cells** from the drop-down menu.

4. The column will be **moved** to the selected location, and the columns to the right will **shift right**.

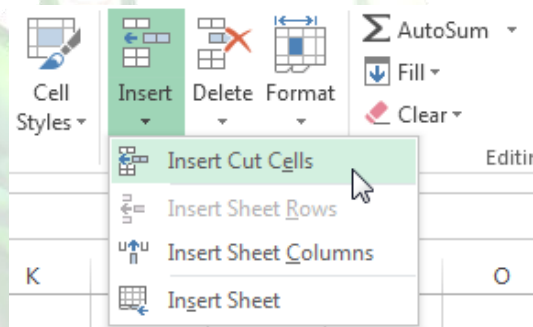🖉 TIP: You can also access the **Cut** and **Insert** commands by right-clicking the mouse and then selecting the **desired commands** from the drop-down menu.

To hide and unhide a row or column

At times, you may want to **compare** certain rows or columns without changing the organization of your worksheet. Excel allows you to **hide** rows and columns as needed.

1. Select the **column(s)** you wish to **hide**, right-click the mouse, then select **Hide** from the **formatting** menu.
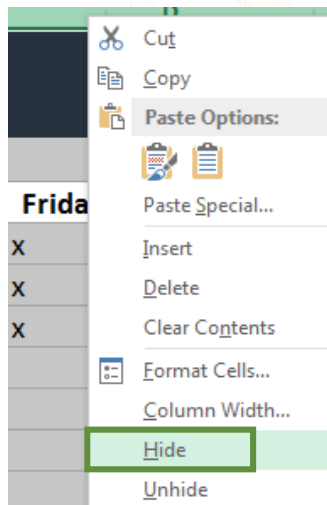
2. The columns will be **hidden**. The **green column line** indicates the location of the hidden columns.

Green column line
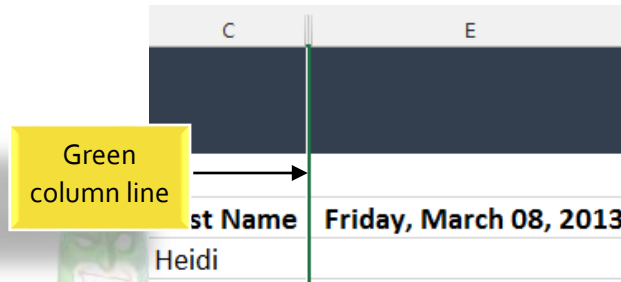
3. To **unhide** the columns, select the columns to the **left** and **right** of the hidden columns (in other words, the columns on **both sides** of the hidden columns).

4. Right-click the mouse, then select **Unhide** from the **formatting** menu. The hidden columns will reappear.

5.2. Wrapping text and merging cells

Whenever you have too much cell content to be displayed in a single cell, you may decide to **wrap the text** or **merge** the cell rather than resizing a column. Wrapping the text will automatically modify a cell's **row height**, allowing cell contents to be displayed **on multiple lines**. Merging allows you to combine a cell with adjacent, empty cells to create **one large cell**.

1. Select the cells you wish to wrap.

2. Select the **Wrap Text** command on the **Home** tab.
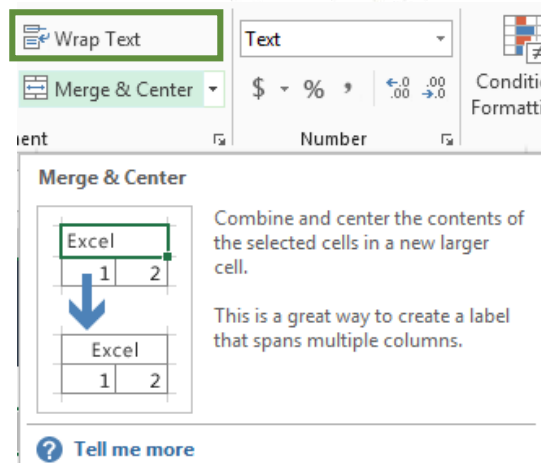
3. The text in the selected cells will be **wrapped**.

✎ TIP: Click the **Wrap Text** command again to **unwrap** the text.

To merge cells using the Merge & Center command

1. Select the **cell range** you want to merge together.

2. Select the **Merge & Center** command on the **Home** tab.
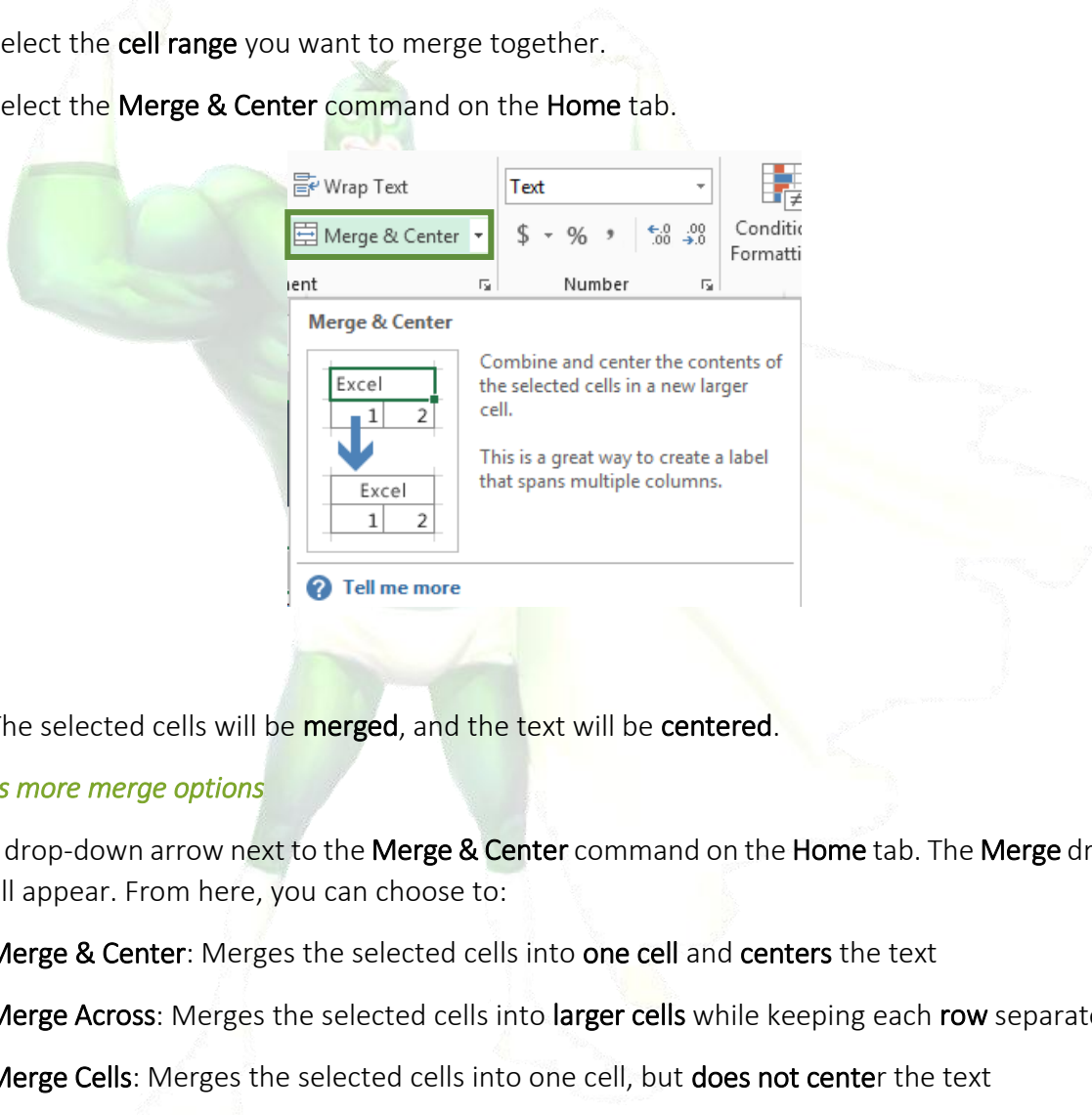
3. The selected cells will be **merged**, and the text will be **centered**.

To access more merge options

Click the drop-down arrow next to the **Merge & Center** command on the **Home** tab. The **Merge** drop-down menu will appear. From here, you can choose to:

- **Merge & Center**: Merges the selected cells into **one cell** and **centers** the text

- **Merge Across**: Merges the selected cells into **larger cells** while keeping each **row** separate

- **Merge Cells**: Merges the selected cells into one cell, but **does not cente**r the text

- **Unmerge Cells**: Unmerges selected cells
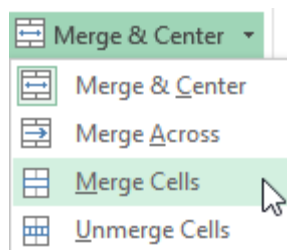
Challenge!

1. Open an existing Excel 2013 workbook.
2. Modify the **width** of a column.
3. **Insert** a column between column A and column B, then **insert** a row between row 3 and row 4.
4. **Delete** a column or a row.
5. **Move** a column or row.
6. Try using the **Text Wrap** command on a cell range.
7. Try **merging** some cells together.

6. Formulas and Functions

One of the most powerful features in Excel is the ability to **calculate** numerical information using **formulas**.

6.1. Simple Formulas

Just like a calculator, Excel can add, subtract, multiply, and divide. In this lesson, we'll show you how to use **cell references** to create simple formulas.

Mathematical operators

Excel uses standard operators for formulas, such as a **plus sign** for addition (**+**), a **minus sign** for subtraction (**-**), an **asterisk** for multiplication (*****), a **forward slash** for division (**/**), and a **caret** (**^**) for exponents.

Addition	+
Subtraction	-
Multiplication	*
Division	/
Exponents	^

All formulas in Excel must begin with an **equals sign** (**=**). This is because the cell contains, or is equal to, the formula and the value it calculates.

Understanding cell references

While you can create simple formulas in Excel manually (for example, **=2+2** or **=5*5**), most of the time you will use **cell addresses** to create a formula. This is known as making a **cell reference**. Using cell references will ensure that your formulas are always accurate because you can change the value of referenced cells without having to rewrite the formula.

The formula in cell A3 refers to the value in cell A1 plus the value in cell A2

The formula calculates and displays the answer to the equation A1 plus A2

By combining a mathematical operator with cell references, you can create a variety of simple formulas in Excel. Formulas can also include a combination of cell references and numbers, as in the examples below:

=A1+A2	Adds cells A1 and A2
=C4-3	Subtracts 3 from cell C4
=E7/J4	Divides cell E7 by J4
=N10*1.05	Multiplies cell N10 by 1.05
=R5^2	Finds the square of cell R5

To create a formula

1. Select the **cell** that will contain the formula.

2. Type the **equals sign (=)**. Notice how it appears in both the **cell** and the **formula bar**.

Formula will appear in both the cell and the formula bar.
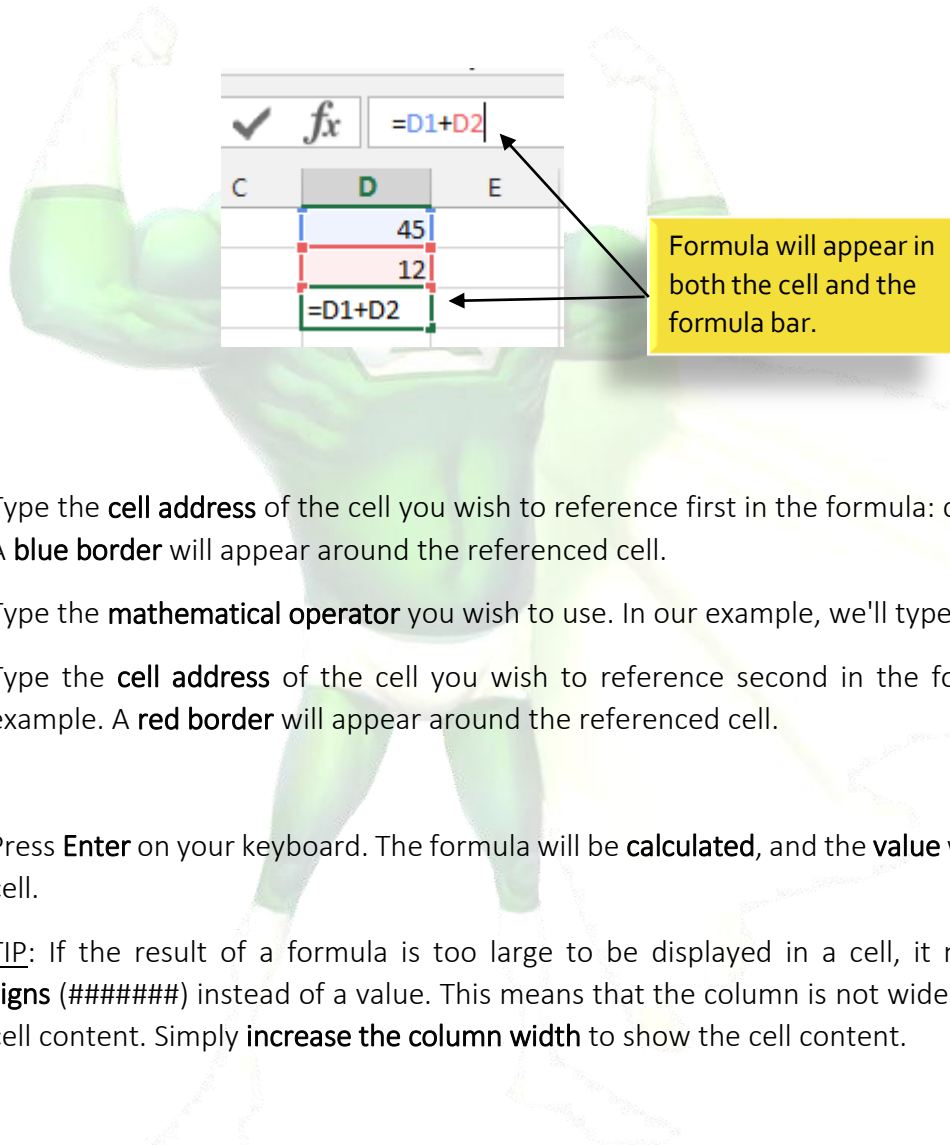
1. Type the **cell address** of the cell you wish to reference first in the formula: cell **D1** in our example. A **blue border** will appear around the referenced cell.

2. Type the **mathematical operator** you wish to use. In our example, we'll type the **addition sign (+)**.

3. Type the **cell address** of the cell you wish to reference second in the formula: cell **D2** in our example. A **red border** will appear around the referenced cell.

4. Press **Enter** on your keyboard. The formula will be **calculated**, and the **value** will be displayed in the cell.

   🖉 TIP: If the result of a formula is too large to be displayed in a cell, it may appear as **pound signs (#######)** instead of a value. This means that the column is not wide enough to display the cell content. Simply **increase the column width** to show the cell content.

Modifying values with cell references

The true advantage of cell references is that they allow you to **update data** in your worksheet without having to rewrite formulas.

   🖉 TIP: Excel **will not always tell you** if your formula contains an error, so it's up to you to check all of your formulas.

To create a formula using the point-and-click method

Rather than typing cell addresses manually, you can **point and click** on the cells you wish to include in your formula. This method can save a lot of time and effort when creating formulas. In our example below, we'll create a formula to calculate the cost of ordering several boxes of plastic silverware.

1. Select the **cell** that will contain the formula. In our example, we'll select cell **D3**.

2. Type the **equals sign (=)**.

3. Select the **cell** you wish to reference first in the formula: cell **B3** in our example. The **cell address** will appear in the formula, and a **dashed blue line** will appear around the referenced cell.

4. Type the **mathematical operator** you wish to use. In our example, we'll type the **multiplication sign (*)**.

5. Select the **cell** you wish to reference second in the formula: cell **C3** in our example. The **cell address** will appear in the formula, and a **dashed red line** will appear around the referenced cell.

6. Press **Enter** on your keyboard. The formula will be **calculated**, and the **value** will be displayed in the cell.

Formulas can also be **copied** to adjacent cells with the **fill handle**, which can save a lot of time and effort if you need to perform the **same calculation** multiple times in a worksheet.

To edit a formula

Sometimes you may want to modify an existing formula. In the example below, we've entered an incorrect cell address in our formula, so we'll need to correct it.

1. Select the **cell** containing the formula you wish to edit.

2. Click the **formula bar** to edit the formula. You can also **double-click** the cell to view and edit the formula directly within the cell.

3. A **border** will appear around any referenced cells.

4. When finished, press **Enter** on your keyboard or select the **Enter** command ✔ in the formula bar.

5. The formula will be **updated**, and the **new value** will be displayed in the cell.

   ✎ TIP: If you change your mind, you can press the **Esc** key on your keyboard or click the **Cancel** command ✕ in the formula bar to avoid accidentally making changes to your formula.

✐ TIP: To show all of the formulas in a spreadsheet, you can hold the **Ctrl** key and press ` (grave accent). The grave accent key is usually located in the upper-left corner of the keyboard. You can press **Ctrl+`** again to switch back to the normal view.

Challenge!

1. Open an existing Excel workbook.
2. Create a simple addition formula using **cell references**.
3. Try modifying the **value** of a cell referenced in a formula.
4. Try using the **point-and-click method** to create a formula.
5. **Edit** a formula using the formula bar.

6.2.   Complex Formulas

A simple formula is a mathematical expression with one operator, such as **7+9**. A **complex formula** has more than one mathematical operator, such as **5+2*8**. When there is more than one operation in a formula, the **order of operations** tells Excel which operation to calculate first. In order to use Excel to calculate complex formulas, you will need to understand the order of operations.

Order of operations

Excel calculates formulas based on the following **order of operations**:

1. Operations enclosed in **parentheses**

2. **Exponential** calculations (3^2, for example)

3. **Multiplication** and **division**, whichever comes first

4. **Addition** and **subtraction**, whichever comes first

Creating complex formulas

In the example below, we will demonstrate how Excel solves a complex formula using the order of operations. Here, we want to calculate the cost of **sales tax** for an invoice. To do this, we'll write our formula as **=(D2+D3)*0.075** in cell **D4**. This formula will add the prices of our items together and then multiply that value by the 7.5% tax rate (which is written as 0.075) to calculate the cost of sales tax.

✏ TIP: It is especially important to enter complex formulas with the correct order of operations. Otherwise, Excel will not calculate the results accurately. In our example, if the **parentheses** are not included, the multiplication is calculated first and the result is incorrect. Parentheses are the best way to define which calculations will be performed first in Excel.

Challenge!

1. Open an existing Excel workbook.
2. Create a complex formula that will perform addition before multiplication.

6.2.1. Relative and Absolute Cell References

There are two types of cell references: **relative** and **absolute**. Relative and absolute references behave differently when copied and filled to other cells. Relative references **change** when a formula is copied to another cell. Absolute references, on the other hand, remain **constant**, no matter where they are copied.

6.2.2. Relative cell references
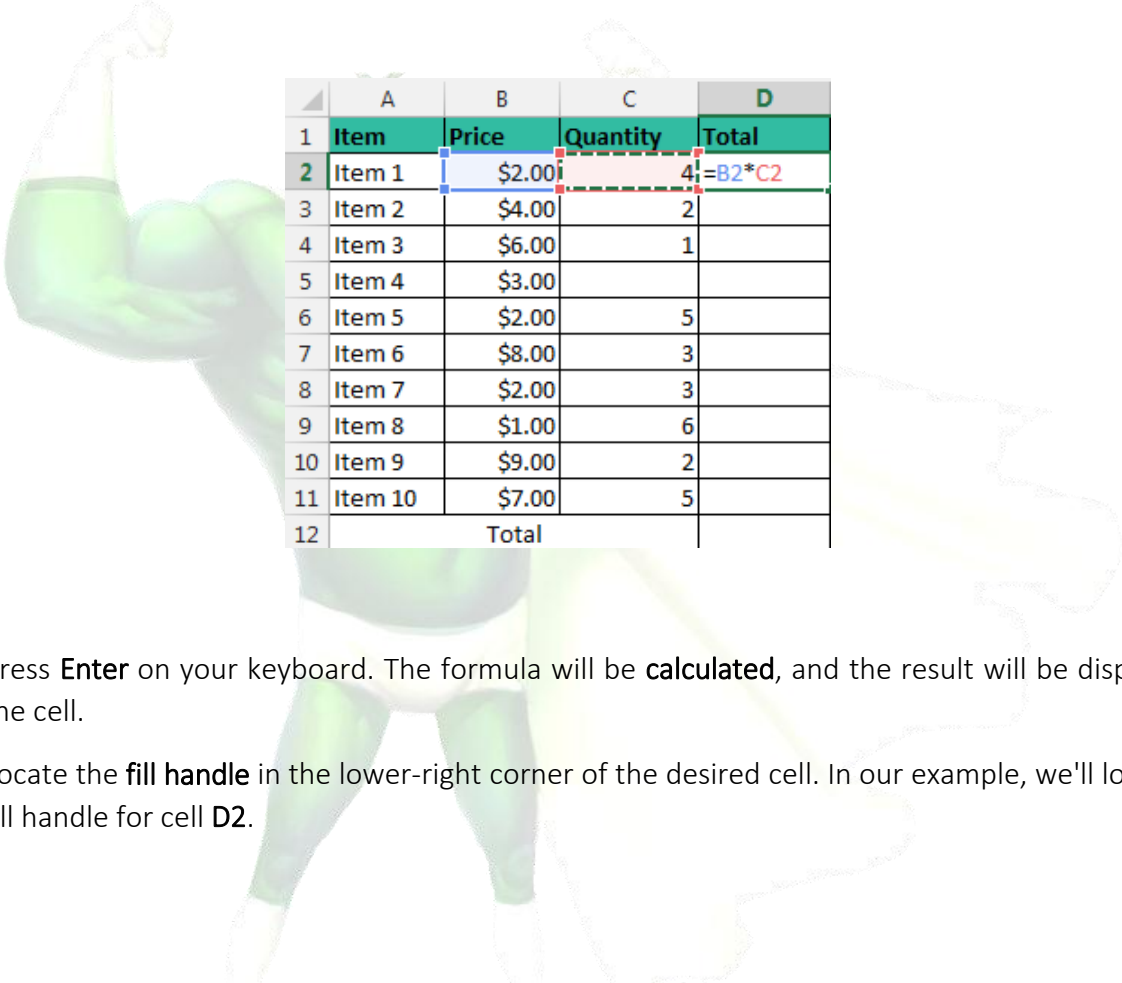
By default, all cell references are **relative references**. *When copied across multiple cells, they change based on the relative position of rows and columns.* For example, if you copy the formula **=A1+B1** from row 1 to row 2, the formula will become **=A2+B2.** Relative references are especially convenient whenever you need to **repeat** the same calculation across multiple rows or columns.

To create and copy a formula using relative references

In the following example, we want to create a formula that will multiply each item's **price** by the **quantity**. Rather than creating a new formula for each row, we can create a single formula in cell **D2** and then copy

it to the other rows. We'll use relative references so the formula correctly calculates the total for each item.

1. Select the **cell** that will contain the formula. In our example, we'll select cell **D2**.

2. Enter the **formula** to calculate the desired value. In our example, we'll type **=B2*C2**.

	A	B	C	D
1	Item	Price	Quantity	Total
2	Item 1	$2.00	4	=B2*C2
3	Item 2	$4.00	2	
4	Item 3	$6.00	1	
5	Item 4	$3.00		
6	Item 5	$2.00	5	
7	Item 6	$8.00	3	
8	Item 7	$2.00	3	
9	Item 8	$1.00	6	
10	Item 9	$9.00	2	
11	Item 10	$7.00	5	
12			Total	

3. Press **Enter** on your keyboard. The formula will be **calculated**, and the result will be displayed in the cell.

4. Locate the **fill handle** in the lower-right corner of the desired cell. In our example, we'll locate the fill handle for cell **D2**.

	A	B	C	D
1	Item	Price	Quantity	Total
2	Item 1	$2.00	4	$8.00
3	Item 2	$4.00	2	
4	Item 3	$6.00	1	
5	Item 4	$3.00		
6	Item 5	$2.00	5	
7	Item 6	$8.00	3	
8	Item 7	$2.00	3	
9	Item 8	$1.00	6	
10	Item 9	$9.00	2	
11	Item 10	$7.00	5	
12			Total	

The fill handle

5. Click, hold, and drag the **fill handle** over the cells you wish to fill.

6. Release the mouse. The formula will be **copied** to the selected cells with **relative references**, and the values will be calculated in each cell.

✎ TIP: You can double-click the **filled cells** to check their formulas for accuracy. The relative cell references should be different for each cell, depending on their rows.

6.2.3. Absolute cell references

There may be times when you do not want a cell reference to change when filling cells. Unlike relative references, ***absolute references*** *do not change when copied or filled.* You can use an absolute reference to keep a row and/or column **constant**.

An absolute reference is designated in a formula by the addition of a **dollar sign ($)**. It can precede the column reference, the row reference, or both.

A2	The column and the row do not change when copied
A$2	The row does not change when copied
$A2	The column does not change when copied

You will generally use the **A2** format when creating formulas that contain absolute references. The other two formats are used much less frequently.

> 🖉 <u>TIP</u>: When writing a formula, you can press the **F4** key on your keyboard to switch between relative and absolute cell references. This is an easy way to quickly insert an absolute reference.

To create and copy a formula using absolute references

In our example, we'll use the 7.5% sales tax rate in cell **E1** to calculate the sales tax for all items in **column D**. We'll need to use the absolute cell reference **E1** in our formula. Since each formula is using the same tax rate, we want that reference to remain constant when the formula is copied and filled to other cells in column D.

1. Select the **cell** that will contain the formula. In our example, we'll select cell **D3**.

2. Enter the **formula** to calculate the desired value. In our example, we'll type =**(B3*C3)*E1**.

3. Press **Enter** on your keyboard. The formula will calculate, and the result will display in the cell.

	A	B	C	D	E
1	Sales Tax				7.50%
2	Item	Price	Quantity	Total	Tax
3	Item 1	$2.00	4	$8.00	=(B3*C3)*E1
4	Item 2	$4.00	2	$8.00	
5	Item 3	$6.00	1	$6.00	
6	Item 4	$3.00		$0.00	
7	Item 5	$2.00	5	$10.00	
8	Item 6	$8.00	3	$24.00	
9	Item 7	$2.00	3	$6.00	
10	Item 8	$1.00	6	$6.00	
11	Item 9	$9.00	2	$18.00	
12	Item 10	$7.00	5	$35.00	
13		Total			

4. Locate the **fill handle** in the lower-right corner of the desired cell.

5. Release the mouse. The formula will be **copied** to the selected cells with an **absolute reference**, and the values will be calculated in each cell.

Challenge!

1. Open an existing Excel workbook.
2. Create a formula that uses a **relative reference**. Double-click a cell to see the copied formula and the relative cell references.
3. Create a formula that uses an **absolute reference**.
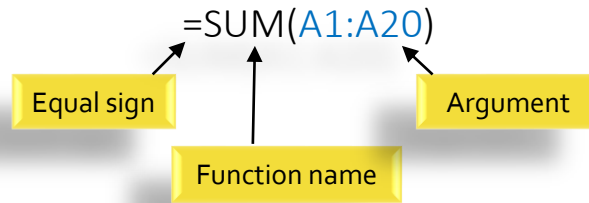
6.3.   Functions

A **function** is a **predefined formula** that performs calculations using specific values in a particular order. Excel includes many common functions that can be useful for quickly finding the **sum**, **average**, **count**, **maximum value**, and **minimum value** for a range of cells. In order to use functions correctly, you'll need to understand the different **parts of a function** and how to create **arguments** to calculate values and cell references.

Formula =A1+A2+A3+A4+A5+A6+A7+A8

Function =SUM(A1:A8)

The parts of a function

In order to work correctly, a function must be written a specific way, which is called the **syntax**. The basic syntax for a function is an **equals sign (=)**, the **function name** (SUM, for example), and one or more **arguments**. Arguments contain the information you want to calculate.

=SUM(A1:A20)

Equal sign

Function name

Argument

Working with arguments

Arguments can refer to both **individual cells** and **cell ranges** and must be enclosed within **parentheses**. You can include one argument or multiple arguments, depending on the syntax required for the function.

For example, the function **=AVERAGE(B1:B9)** would calculate the **average** of the values in the cell range B1:B9. This function contains only one argument.

Multiple arguments must be separated by a **comma**. For example, the function **=SUM(A1:A3, C1:C2, E2)** will **add** the values of all the cells in the three arguments.

6.3.1. Creating a function

Excel has a variety of functions available. Here are some of the most common functions you'll use:

- **SUM**: This function **adds** all of the values of the cells in the argument.

- **AVERAGE**: This function determines the **average** of the values included in the argument. It calculates the sum of the cells and then divides that value by the number of cells in the argument.

- **COUNT**: This function **counts** the number of cells with numerical data in the argument. This function is useful for quickly counting items in a cell range.

- **MAX**: This function determines the **highest cell value** included in the argument.

- **MIN**: This function determines the **lowest cell value** included in the argument.

To create a basic function

In our example below, we'll create a basic function to calculate the **average price per unit** for a list of recently ordered items using the AVERAGE function.

1. Select the **cell** that will contain the function.

2. Type the **equals sign (=)** and enter the desired **function name**. You can also select the desired function from the list of **suggested functions** that will appear below the cell as you type. In our example, we'll type **=AVERAGE**.

3. Enter the **cell range** for the **argument** inside **parentheses**. In our example, we'll type **(D3:D12)**.

4. Press **Enter** on your keyboard. The function will be **calculated**, and the **result** will appear in the cell.

To create a function using the AutoSum command

The **AutoSum** command allows you to automatically insert the most common functions into your formula, including SUM, AVERAGE, COUNT, MIN, and MAX. In our example below, we'll create a function to calculate the **total cost** for a list of recently ordered items using the SUM function.

1. Select the **cell** that will contain the function.

2. In the **Editing** group on the **Home** tab, locate and select the **arrow** next to the **AutoSum** command and then choose the **desired function** from the drop-down menu. In our example, we'll select **Sum**.