

Excel Functions




Objectives

The aim of this course is to show you how to.

- Work with formulas.
- Use the built-in functions to perform calculations and manipulate text.

Prerequisites

You should have a working knowledge of *Microsoft Excel*, including how to enter data, work with cells and ranges, and navigate a worksheet. You should also be familiar with the Windows desktop and with general concepts of manipulating windows such as menus, scrollbars and dialog boxes.

SYMBOL KEY	
	Tip
	Note
	Activity

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Introduction to Formulas

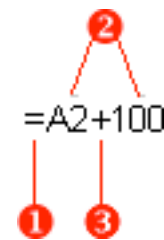
1-A: The Components of an Excel Formula

The distinguishing feature of a spreadsheet program such as *Microsoft Excel* is that it allows you to create mathematical formulas and execute functions. Using formulas and functions will save you time in calculating data. *Excel* will automatically update formulas whenever you change the numbers in your worksheet.

A **formula** is a set of instructions that you enter in a cell to perform calculations on values entered into the cells of a worksheet. Formulas consist of the addresses of the cells containing the values and the appropriate mathematical operators.

All formulas include three key elements:

1. An equal sign (=) to begin the formula.
2. The cell references or values you wish to include in the calculation.
3. The mathematical operator(s) to be used in the calculation.



Formulas begin with an equal sign (=). The equal sign prevents *Excel* from interpreting the formula as text, since cell addresses begin with letters. The formula then includes the **values** to be calculated with appropriate **mathematical operators** placed in between. For example, to add the values in cells A1 and A2, you would type the formula `=A1+A2`.

Values in a formula can be:

- A constant value (120)
- A cell (B2)
- A range of cells (B2 : B10)
- A worksheet function (SUM)

Mathematical operators that can be used in an Excel formula are:

- + Plus sign for addition.
- Minus sign for subtraction.
- * Asterisk for multiplication.
- / Front slash for division.
- ^ Caret symbol for exponents.
- () Open and close parentheses to group operations.

Order of Operations

Excel calculates a formula from left to right. When more than one mathematical operator appears in a formula, *Excel* calculates according to the standard mathematical order of operations. This order determines which operations are carried out first.

The table below details the mathematical order of operations.

Order	Operation	Description
1st	Parentheses	Computations enclosed in parentheses are performed first, no matter where they appear in the formula.
2nd	Exponents	Computations involving exponents are performed second.
3rd	Multiplication and Division	<i>Excel</i> performs multiplication and division operations third. Because they are commutative, <i>Excel</i> performs them in the order in which it encounters them (from left to right).
4th	Addition and Subtraction	<i>Excel</i> performs these operations last. Addition and subtraction are also commutative, so <i>Excel</i> also performs these operations in the order in which it encounters them (from left to right).

Parentheses

To change the order of evaluation, enclose in parentheses the part of the formula to be calculated first. If the outcome of the equation is not changed by rearranging the parentheses, the law of associativity holds. For example:

$=6+4-8$ The solution to this formula is 2.
 $=(6+4)-8$ If parentheses are added or rearranged, the outcome is still the same.
OR
 $=6+(4-8)$

This is not true for all equations. In some equations the law of associativity does not hold. That is, the location of parentheses can change the outcome of the formulas. For example:

$=5+2*3$ This formula produces “11” because *Excel* calculates multiplication before addition. The formula multiplies 2 by 3 and then adds 5 to the result.
 $=(5+2)*3$ In contrast, if you use parentheses to change the order of operations, *Excel* first adds 5 and 2 together and then multiplies the result by 3 to produce “21”.



If you have trouble remembering the ordering of operations the mnemonic phrase: “**P**lease **E**xcuse **M**y **D**ear **A**unt **S**ally” may help you. The first letter of each word in the phrase corresponds to one of the operations: **P**arentheses, **E**xponents, **M**ultiplication, **D**ivision, **A**ddition, and **S**ubtraction.

1-B: Entering Formulas

Formulas are used to obtain answers based on mathematical equations that you design. Formulas can be as simple as “=2+2” or as complex as calculating the depreciation of fixed assets. When creating formulas, you may use actual values, cell addresses, or a combination of the two.

Examples of Formulas

A formula using constants as values	=5+2*3
A formula using cell references as values	=A3*(B3-C3)
A formula using cell references and constants as values	=A3+B3*2

When you enter a formula in a cell, you can either type the cell addresses or use the mouse to select the cells and allow *Excel* to enter the cell addresses into the formula automatically.

The steps for entering a formula are outlined below:

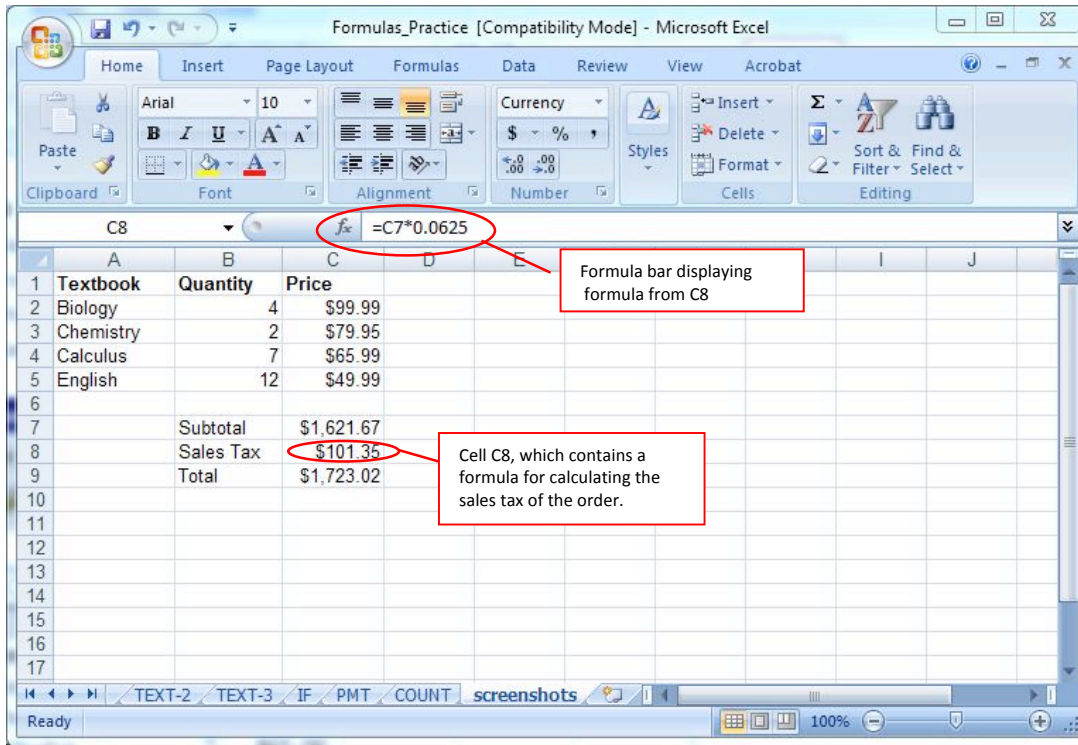
1. Click the cell in which you want the result of the formula to appear.
2. Type the equal sign [=].
3. Enter the appropriate constant values and/or cell references along with the mathematical symbol(s) for performing your calculation(s).
4. Press [Enter].

Formulas are entered in the cell where you want the result to appear. Once the formula has been entered:

- The **result** will be displayed in the current cell
- The **formula** will be displayed in the **Formula bar**

The Formula Bar

After a formula is entered into the cell, the calculation executes immediately and the formula itself is visible in the Formula bar. In the example below, the formula for calculating the subtotal of number of textbooks is displayed in the formula bar. The formula multiplies the quantity and price of each textbook and adds the subtotal for each book.



1-1: The Formula Bar

You can also enter a formula in a cell by selecting the cell, and typing the formula directly into the **Formula bar**.



You will find that you cannot see the true contents of a cell containing a formula just by looking at it. What you see in the cell is the result based on the formula entered. In order to view the formula, you must select the cell in which it is stored and then view the formula contents in the Formula bar.



Activity 1-1: Entering Formulas Using Constants

In this activity you will practice associativity, using parentheses, and the order of operations with constants. Create the following formulas either by typing directly in a cell or into the formula bar. Use the worksheet entitled “Constants.”

When the Presence and Location of Parentheses Do Not Matter (Associativity)

1. In cell A1 add together the numbers 12 and 18, then subtract 5 (no parentheses).
2. In cell A2, add together the number 12 and 18 inside parentheses, then subtract 5.
3. In cell A3, add 12 to 18 minus 5. Surround the 18 minus 5 with parenthesis.
4. What do you notice about these three formulas:

When the Presence and Location of Parentheses Do Matter

1. In cell C1, multiply 3 and 4, then add 5 (no parentheses).
2. In cell C2, enclose 3 times 4 in parentheses, then add 5.
3. In cell C3, enclose multiply 3 times the sum of 4 and 5 (parentheses around 4 plus 5).
4. What do you notice about these three formulas:

Nested Parentheses

Create formulas in *Excel* to find the sum of the following equations.

1. $((4*10)+8)/3$
2. $(4*(10+8))/3$
3. $(4*10)+(8/3)$
4. $4*((10+8)/3)$

1-C: Cell References in Formulas

A reference identifies a cell or a range of cells on a worksheet and tells *Excel* where to look for the data you want to use in a formula. With references, you can use data contained in different parts of a worksheet in one formula or use the value from one cell in several formulas. You can also refer to cells on the other sheets in the same workbook, and to other workbooks.

Excel uses the A1 reference style, which refers to columns with letters and refers to rows with numbers. These letters and numbers are called row and column headings. To refer to a cell, enter the column letter followed by the row number. For example, “B2” refers to the cell at the intersection of column B and row 2.

To refer to:	Use:
The cell in column A and row 10	A10
The range of cells in column A and rows 10 through 20	A10:A20
The range of cells in row 15 and columns B through E	B15:E15
All cells in row 5	5:5
All cells in rows 5 through 10	5:10
All cells in column H	H:H
All cells in columns H through J	H:J
The range of cells in columns A through E and rows 10 through 20	A10:E20



- Formulas containing **constant values** will produce a result that will never change. The formula “=3*4” produces the result “12”.
- A formula containing **cell references** produces a result that may change if the data in those cells changes. The formula “=B2+C2” will produce a result based upon the values in cells B2 and C2.



Activity 1-2: Entering Formulas Using Cell References

You have enrolled in two courses this semester. You want to track your course expenses in an *Excel* worksheet. In the worksheet “Courses,” create a formula in cell C5 that adds the cost of the three Writing Creative Nonfiction textbooks in cells C2, C3, and C4.


Constructing Formulas with the Point Method

Sometimes, not all of the cells you wish to reference in a formula are visible in the Excel window. In this case, it is more accurate to use the mouse to select cells while creating a formula. You only need to type the equal sign (=) to start the formula and type each of the other mathematical operators in the formula.

The key to the point method is to point and click the cells to be included and to type the operators where appropriate. The following example provides instructions for a simple addition of two cells “=cell1+cell2” using the point method.

1. Click the cell in which you want to enter the formula.
2. To start the formula, press [=].
3. Point and click on the first cell to be added.
4. Press [+].
5. Point and click on the second cell to be added.
6. Press [Enter].



Instead of pressing [Enter] to complete formulas in *Excel*, you can click the check mark in the **Formula bar** [].



Activity 1-3: Entering Formulas Using Cell References

Now you will write a formula to subtotal the text book expenses for the Techniques of Successful Writing course. In the “Courses” worksheet, write a formula in cell C10 that adds together the textbooks in cells C8 and C9. Use the pointing method to select the cells.

Reference to Another Worksheet

You may want to use the value from a cell in another worksheet within the same workbook in a formula. In the following example, the Average worksheet function calculates the average value for the range B1:B10 on the worksheet named Marketing in the same workbook. Note that the name of the worksheet and an exclamation point precede the cell reference.

Name of the worksheet
Reference to cell or range of cells on the sheet

=AVERAGE(Marketing!B1:B10)

Separates the sheet reference
from the cell reference

Reference to Another Workbook

A link is a reference to another workbook. Linking is especially useful when it is not practical to keep large worksheets together in the same workbook. Formulas with links to other workbooks are displayed in two ways, depending on whether the source workbook, the one workbook that supplies data to a formula, is open or closed.

When the source is open, the link includes the workbook name in square brackets, followed by the worksheet name, an exclamation point (!), and the cells that the formula depends on. For example, the following formula adds the cells C10:C25 from the workbook named Budget.xls.

=SUM([Budget.xls]Annual!C10:C25)

When the source is not open, the link includes the entire path.

=SUM('C:\Reports\[Budget.xls]Annual'!C10:C25)

Formulas that link to a defined **name** (a word or string of characters that represents a cell, range of cells, formula, or constant value) in another workbook use the workbook name followed by an exclamation point (!), and the name. For example, the following formula adds the cells in the range named Sales from the workbook named Budget.xls.

=SUM(Budget!Sales)



If the name of the other worksheet or workbook contains nonalphanumeric characters you must enclose the name (or the path) within single quotation marks.

2

Introduction to Functions

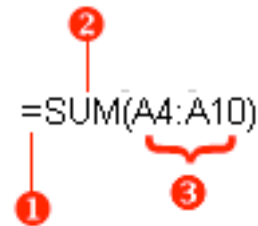
2-A: The Components of an Excel Function

A variety of functions are provided with *Excel* to carry out common calculations on data and manipulate text within a worksheet. These functions can often take the place of certain types of formulas. Functions can be a more efficient way of performing mathematical operations.

A **function** is a built-in *Excel* formula. You can use functions to simplify the process of entering formulas. For example, if you wanted to add the values of cells D1 through D10, you could type the formula “=D1+D2+D3+D4+D5+D6+D7+D8+D9+D10”. A shorter way would be to use the SUM function and simply type “=SUM(D1:D10)”.

All functions contain the same syntax:

1. An equal sign (=) at the beginning.
2. The **Function name** follows next.
3. The **Arguments** (the cell references to be used in the calculation enclosed in parentheses) come last.



Excel provides over 200 built-in formulas called functions. You can use a function by itself or in conjunction with other formulas or functions. Some of the most commonly used functions are described in the table below:

Function	Example	Description
Sum	=SUM(A4:A10)	Adds the values in cells A4 through A10.
Average	=AVERAGE(B1:B12)	Calculates the mean average of the values in cells B1 through B12.
Minimum	=MIN(C5:C20)	Finds the minimum value of the values in cells C5 through C20.
Maximum	=MAX(D1:D10)	Finds the maximum value of the values in cells D1 through D10.
Count	=COUNT(A2:A18)	Finds the number of numeric entries in cells A2 through A18.

2-B: Using the AutoSum Feature

One of the most commonly used functions in *Excel* is the **SUM** function, which calculates the total of the values in a range of cells. Using this function is easier than typing a formula and each individual cell address.




Since the **SUM** function is used frequently, there is an **AutoSum** button on the **Home** tab of the **Ribbon** that enters the formula in the active cell for you. The **AutoSum** button is an easy way to sum values in a row or column of a worksheet.

When you click the **AutoSum** button, a suggested range for the function is selected. This suggested range can be changed. If you click the **AutoSum** button at the end of a row, the row of values to the left of the active cell is selected. If you click the **AutoSum** button at the bottom of a column, the column of values above the active cell is selected. If there are values both above and to the left of the active cell, the column of values above the active cell is selected.

You can also use AutoSum, by first selecting the cells you want to add together then clicking the AutoSum button. This will put the answer in an empty cell right following the selected cells.

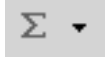
Excel's **AutoSum** feature allows you to quickly create sums, and other functions, without typing any function syntax.

To calculate a sum using AutoSum:

1. Click on the cell into which you want to calculate a sum.
2. Click the **AutoSum** button on the **Home** tab. 
3. *Excel* will highlight a range that it assumes you would like to sum.
 - If Excel has chosen the correct range, press **[Enter]**.
 - If Excel has chosen the incorrect range, simply click and highlight the correct range, and then press **[Enter]**.
4. *Excel* calculates and enters the sum.

Other common functions, such as Average, Min, and Max are also available from the **AutoSum** button.

To access other common functions using AutoSum:

1. Click on the cell into which you want to calculate a sum.
2. Click the **AutoSum drop-down arrow** button on the **Home** tab. 
3. Select the **function** you want to use from the list of commonly used functions (or select **More Functions** to search for additional functions).
4. Excel will highlight a range that it assumes you would like to use in your calculation.
 - If Excel has chosen the correct range, press [Enter].
 - If Excel has chosen the incorrect range, simply click and highlight the correct range, and then press [Enter].
5. Excel calculates and enters the result.



Activity 2-1: AutoSum

One of your New Year's resolutions was to keep better accounting records for your personal financial budget. In addition to entering your course expenses in *Excel*, you will also be tracking your bill payments.

In this activity, you will total the amount paid for the months of January through June for each of your Utilities using the **AutoSum** button.



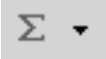
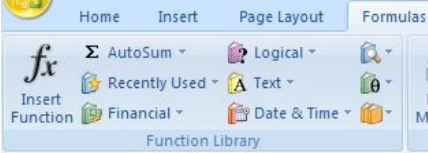
1. Select the worksheet **Bills** in the **Formulas_Practice** file.
2. For each of the utilities listed, find the total spent for the year using **AutoSum**.
3. Once you have found the total for each of utilities, using **AutoSum** find out how much you spent in total on utilities for the whole year.
4. Save your work.


2-C: Entering Basic Functions

There are multiple ways you can create a function. You can insert functions manually (by typing them), or you can select from available functions using the **Insert Function** dialog box or the **Functions List**.


The steps for entering a function are outlined below:

1. Click the cell in which you want to display the results of the function.
2. Press [=].
3. Enter the **Function Name** into the cell by one of the methods described in the table below.
4. Select or enter the **Function Arguments** (cell references to be used in the calculation enclosed in parentheses).
5. Press [Enter].

Method	Description
 <p>Use the Keyboard Only</p>	Type the entire function directly into the cell.
 <p>Use the Keyboard and Mouse</p>	Type the function name and the left parenthesis, use the mouse to select the range(s) as the argument(s), separating multiple arguments with commas, and type the right parenthesis.
 <p>Use the AutoSum feature</p>	Click the AutoSum drop-down arrow button located on the Home tab to display a list of common functions to select from.
 <p>Use the Formulas tab</p>	Click the Formulas tab to access the Function Library which contains all the functions available in <i>Excel</i> .



Once you type [=] in a cell, the **Functions List**



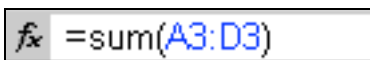
becomes available for you to select functions from.

Enter Functions Manually

To enter a function manually, you must first click in the cell in which you want the function to be placed, then type the formula as described in steps 1 through 6 below for each of the basic functions.

1. Press [=].
2. Type the **function name** [**sum, average, min, max, count**].
3. Press **left parenthesis** [(].
4. Enter the **reference to the cells** you wish to use in the calculation.
 - Press the **colon** [:] between the first and last cells in a range.
 - Press **comma** [,] if you are listing cells.
5. Press **right parenthesis** [)].
6. Press [**Enter**]. *Excel* will calculate and enter the result in the cell.

For example, in Figure 2-1 below, *Excel* calculates the sum of the range of cells beginning with cell A3 and ending with cell D3. In Figure 2-2 below, *Excel* calculates the average of cells H13 and H15.



The screenshot shows the Excel formula bar with the text "=sum(A3:D3)". The "fx" icon is on the left, and the formula is entered in a light blue box.

Figure 2-1: Calculate a Sum



The screenshot shows the Excel formula bar with the text "=average(H13,H15)". The "fx" icon is on the left, and the formula is entered in a light blue box.

Figure 2-2: Calculate an Average



Activity 2-2: Typing in a Function

You are considering purchasing a new car. In order to make an informed decision about what car to buy, you would like to calculate the average amount you spend monthly on gas and car maintenance for the car you currently own.

1. Find the average amount paid for gas for the months of January through June by entering the Average function manually. In the “Bills” worksheet, in cell **J13** find the average of cells C11 through H11 by typing in the average function.



Instead of typing the cell reference, click and select the range of cells you wish to calculate. *Excel* will enter the cell reference for you in the formula.

2. Find the average spent on auto maintenance.
3. Save your work.



If a cell in the range is **empty**, it is **NOT included** in calculating the average. If a cell in the range contains the number **zero**, it **IS included** in calculating the average.

The AutoCalculate Feature

The **AutoCalculate** feature is helpful when you want to spot-check your worksheet for accuracy. **AutoCalculate** performs a simple calculation on a selected range of cells without making you supply a formula. The results of the calculation appear on the **Status bar** along the bottom of the *Excel* worksheet window (Figure 2-3). These results are temporary and are not placed in the worksheet.

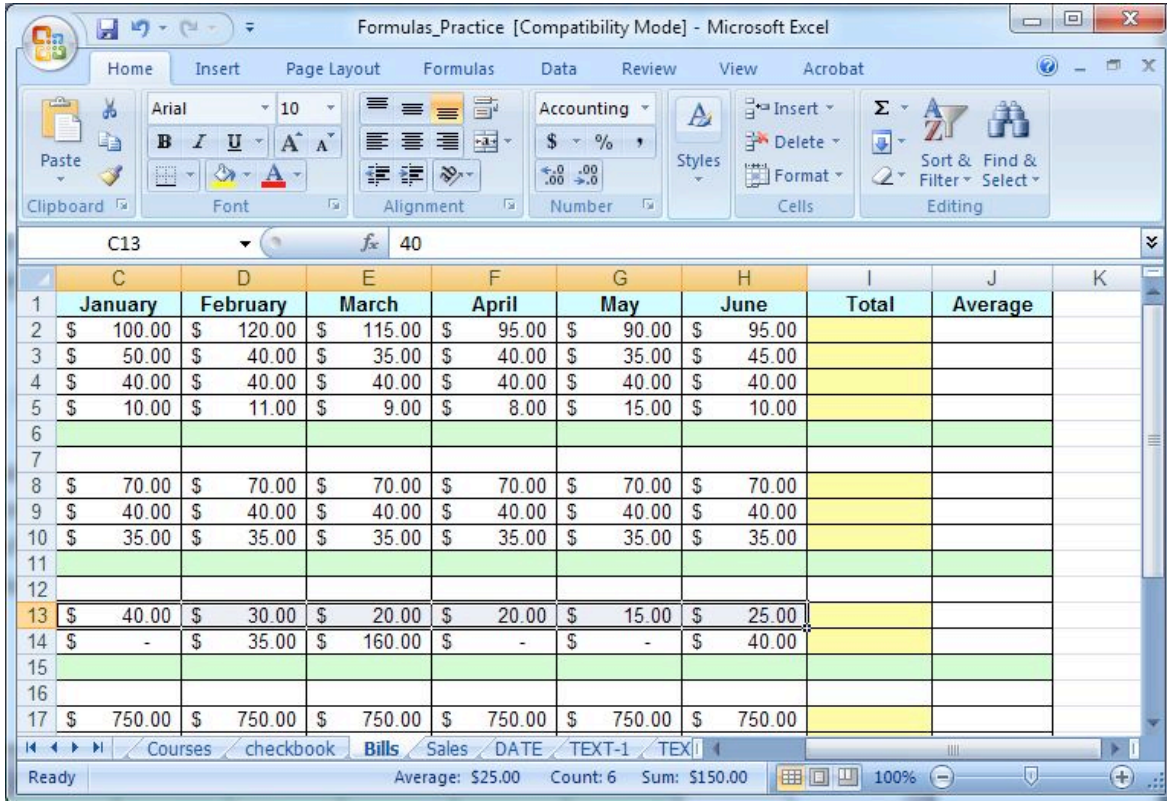


Figure 2-3: AutoCalculate in the Status Bar

To use the AutoCalculate feature:

- Click and highlight the **range of cells** you want results for.
- By default, average, count, and sum appear in the **Status bar**.

To change the calculations performed by AutoCalculate:

1. **Right-click** on the **Status bar** to access a shortcut menu.
2. Select/deselect the **function(s)** from the menu that you would like to use (Figure 2-4).



Figure 2-4: AutoCalculate Functions

2-D: Inserting Functions

If you are not sure of the proper syntax of a formula, or you need help entering a formula, select a formula from the **Functions library** on the **Formulas** tab.

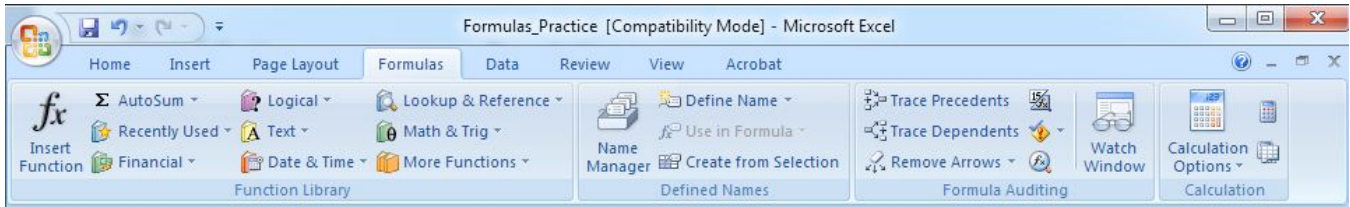


Figure 2-5: Function Library

To use a function from the Function Library, click on a category of functions then select the function you want to use from the list (Figure 2-6).

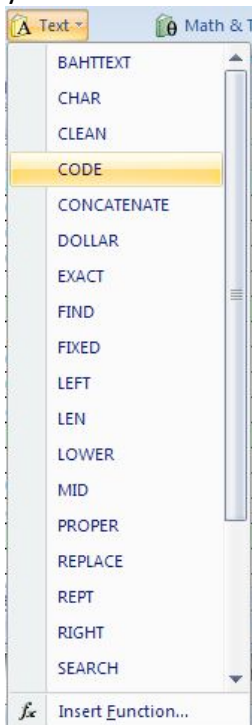




Figure 2-6: List of Text Functions



If you hover over a function in the list, a pop-up window appears explaining what the function does.

Once you choose a function, the **Function Arguments** dialog box (Figure 2-7) will open, providing you with a text box into which you can insert the cell range for the formula. Note that the fields in the dialog box will vary based on the function you select. Click the Collapse button  after each field to select the cells to include in your function. Once you have selected your cells, click the  to return to the dialog box.

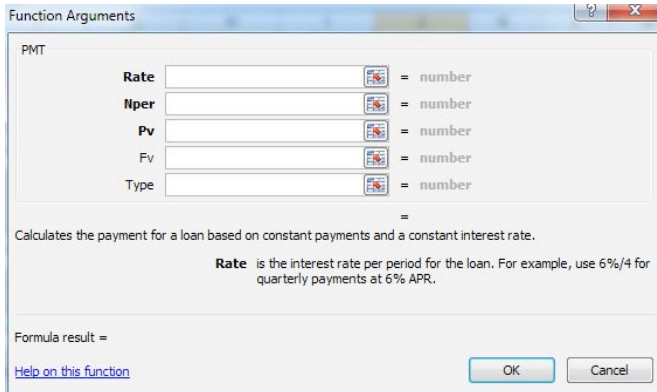





Figure 2-7: Example of a Function Arguments Dialog Box

 Note that certain function, for examples SUM, may not open up the Functions Arguments dialog box. Instead they will try to guess which cells you want in the formula and select them for you automatically. You can adjust the selection if needed.

 You can also insert a function using the **Function button**  in the Formula bar. Click the button to bring up a list of all available functions.



Activity 2-3: Using the Function Library

Your best friend has heard you speaking with pride and excitement about the *Excel* worksheets you have created to maintain your personal expenses. He has asked that you help him create a few formulas in one of his company sales worksheets to calculate the highest and lowest sales totals for the first and second quarters.

In this activity, you will calculate the highest sales totals reported for Quarters 1 and 2 at Benjamin of Brussels Company.

1. In the “Sales” worksheet in cell D18 use the function library to find the Maximum (MAX) sales for the Q1.
2. In cell E18 find the Maximum sales for Q2.

3

Working with Formulas

3-A: Relative vs. Absolute Cell Referencing

Understanding relative and absolute cell referencing is essential when copying and moving formulas. It is important to make sure that they refer to the correct cells.

Relative Referencing

Calling cells by just their column and row labels (such as A1) is called **relative referencing**. When a formula contains relative referencing and it is copied from one cell to another, *Excel* does not create an exact copy of the formula. It will change cell addresses relative to the row and column they are moved to. If you copy the formula across rows or down columns, the reference automatically adjusts.

By default, new formulas use relative references. For example, if you copy a relative reference in cell B2 to cell B3, it automatically adjusts from =A1 to =A2.

	A	B
1		
2		=A1
3		=A2

Figure 3-1: Relative Referencing

To prevent this change, cells must be called by **absolute referencing**.

Absolute Referencing

An absolute cell reference in a formula, such as \$A\$1, always refer to a cell in a specific location. If the position of the cell that contains the formula changes, the absolute reference remains the same. If you copy the formula across rows or down columns, the absolute reference does not adjust.

To create an **absolute reference**, place dollar signs "\$" within the cell addresses in the formula. For example:

\$A1	As this formula is copied, it will always reference the contents of column A, but the row may vary if the formula is copied down to a different row.
A\$1	As this formula is copied, it will always reference the contents of row 1, but the column may vary if the formula is copied across the spreadsheet.
\$A\$1	Regardless of where the formula is copied, it will always reference the contents of cell A1 in column A, row 1.


By default, new formulas use relative references. If you want them to use absolute referencing, you will need to change them manually. For example, if you copy an absolute reference in cell B2 to cell B3, it stays the same in both cells =\$A\$1.

	A	B
1		
2		=\$A\$1
3		=\$A\$1


Figure 3-2: Absolute Referencing

3-B: Copying Formulas

As you work in *Excel*, you will often want to reuse formulas in different parts of the worksheet. This will save you time because you won't have to retype them.

You can quickly and easily copy formulas into adjacent cells by using the **AutoFill Handle**  (the small black square in the lower-right corner of the selection).

To copy a formula using AutoFill:

1. Click anywhere inside the cell that you want to copy to select it.
2. Rest the mouse pointer on the **Fill Handle** at the lower-right corner of the selected cell.
3. The mouse pointer will change to a solid cross. 
4. Once the pointer has changed to a solid cross, click and hold the mouse button down and drag the **Fill Handle** to the adjoining cell(s) that you want to copy into.
5. Release the mouse button. *Excel* fills the cell(s) with the copied formula using relative referencing.

Example of **AutoFill** formula:

Commission	Commission
8,519.25	8,519.25
	13,665.00
	13,206.00
	11,430.00
	17,250.00
	17,958.30
	19,087.80
	18,081.75
	21,480.45
	12,782.55
	14,865.00

Figure 3-3: AutoFill Commission Formula

To copy a formula to a nonadjacent cell, use any of the copy/past functions in Excel:

Buttons on Home Tab



Keyboard

[Ctrl] + [C]

[Ctrl] + [V]



Activity 3-1: Using AutoFill to Copy a Formula

Your best friend is so happy with the work you did on his Benjamin of Brussels *Excel* worksheet. He wonders if it would be a lot of trouble for you to calculate the remaining highest sales totals for Quarters 3 and 4.

In this activity, you will use **AutoFill** to quickly calculate the highest sales totals reported for Quarters 3 and 4 at Benjamin of Brussels Company.

1. Select the worksheet.
2. Select cell **E18**, that contains the highest sales for Q2. This will be the formula you copy.
3. Use AutoFill to copy the formula across all the cells up to and including G18.

3-C: Editing Formulas

After entering formulas in your worksheet, you may find that you need to make some changes to them. When you enter or edit a formula in *Excel*, cell references and the borders around the corresponding cells are color-coded to guide you (Figure 3-7).

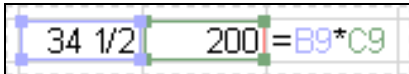


Figure 3-7: Color-coded Cell References

To change cell references in a formula:

1. **Double-click** the cell that contains the formula you want to change. *Excel* highlights each cell or range of cells with a different color.
2. Do one of the following:
 - **To move a cell or range reference to a different cell or range:** drag the color-coded border of the cell or range to the new cell or range.
 - **To include more or fewer cells in a reference:** drag a corner of the border.
 - In the formula, select the reference, and **type a new one**.
3. Press [**Enter**].

Deleting Formulas

To delete a formula:


1. Click the cell that contains the formula.
2. Press [**Delete**].

3-D: Making Sense of Error Messages

When you enter an incorrect formula, operand, value, reference, etc., *Excel* displays an error value in the cell. Error values always begin with a pound sign (#). Below is a list of common errors:

- #VALUE!** The cells used in the formula or function contains numbers that will not return a logical value amount. Recheck all the values you used in the formula.
- #NAME!** Excel doesn't understand the function name that is entered in the cell. Make certain that you used the correct name.
- #DIV/0** The formula is attempting to divide by 0. Have you referenced a blank cell or range? Or deleted a value needed in the formula?

Error Checking Smart Tag

A smart tag  appears when you create a formula which *Excel* believes may be incorrect. The notification comes to you in the form of a green triangle in the corner of the cell that may contain the error. When you select the cell, the Error Checking button appears. Hover your mouse over the button to display a tool tip that describes the possible problem. Click the drop-down arrow next to the Error Checking button to display a list of options available to correct the potential problem.

Appendi

x

More Useful Functions

A-1: Working with Dates

The DATE Function

Using the **DATE** function returns the sequential serial number that represents a particular date. If the cell format was **General** before the function was entered, the result is formatted as a date.

Syntax:

DATE(year,month,day)

Year The year argument can be one to four digits. Microsoft *Excel* interprets the year argument according to the date system you are using. By default, *Excel* for *Windows* uses the 1900 date system; *Excel* for the *Mac* uses the 1904 date system.

Month is a number representing the month of the year. If month is greater than 12, month adds that number of months to the first month in the year specified. For example, **DATE(2008,14,2)** returns the serial number representing February 2, 2009.

Day is a number representing the day of the month. If day is greater than the number of days in the month specified, day adds that number of days to the first day in the month. For example, **DATE(2008,1,35)** returns the serial number representing February 4, 2008.

Excel offers a variety of different ways to include dates and times into your worksheets. Static and dynamic are two types of dates and times. Static dates and times will not change but dynamic dates and times will change as time progresses. Nevertheless, both static and dynamic dates and times are useful.

Example: Inserting Dynamic Dates

Dynamic dates are updated every time *Excel* recalculates, which is, by default, every time **[Enter]** is pressed. This is useful if you would like the current date to be displayed every time the worksheet is viewed or printed.

1. Select the cell in which you want the date to appear.
2. In the cell, type: **=today()**
3. Press **[Enter]**.

The current date appears in the cell and will be updated every time *Excel* recalculates.

Example: Inserting Static Dates

Static dates are not updated. The date that is inserted into the cell is the date immediately after the command is entered into the cell. This can be used to enter the date when the worksheet has been created.

1. Select the cell in which you want the date to appear.
2. Press [**Ctrl**] and [;].

The current date appears in the cell and will not be updated.

Example: Calculate the Number of Days Between Two Dates

You do not have to use the **DATE** function, or any other function, to calculate the number of days between two dates. Use the subtraction (-) operator to do this.

	A	B	C
1	Today's Date	Birthday	Days in between
2	4/13/2005	5/15/2005	32



=B2-A2

Figure 4-1: Calculate the Difference between two dates



Remember to change the Format for the “Days in between” cell to the **Number** format. Select **Format > Cells** and choose the **Number** Category.

A-2: Working with Text

UPPER, LOWER and PROPER Functions

You may want to convert text from uppercase to lowercase or from lowercase to proper case to make it more readable. To change the case of text, use the UPPER, LOWER, or PROPER functions.

Syntax:

UPPER(text) Changes text to all uppercase.

LOWER(text) Changes text to all lowercase.

PROPER(text) Changes text to title case.

Examples:

	A	B	C	D
1		=UPPER(A2)	=LOWER(A2)	=PROPER(A2)
2	joe Smith	JOE SMITH	joe smith	Joe Smith

TRIM Function

TRIM function returns a text value with the leading and trailing spaces removed.

Syntax: TRIM(text)

where text is the text value to remove the leading and trailing spaces from.

Examples:

	A	Function	Result
1	joe Smith	=TRIM(A1)	joe Smith
2	Jean JONES	=TRIM(A2)	Jean JONES

PROPER and TRIM Functions combined:

Functions can be combined to complete multiple tasks at once.

Example:

	A	Function	Result
1	joe Smith	=PROPER(TRIM(A1))	Joe Smith
2	Jean JONES	=PROPER(TRIM(A2))	Jean Jones



Paste Special

Often when using functions to clean up data, you want the results of the function to replace the original range of data. Remember in the example below, cell B2 actually holds the function: =Proper(A1) and not the result: Joe Smith. If you were to delete column A, the function would no longer work.

The solution is to use Paste Special>Values.

	A	B
1	joe Smith	Joe Smith <=PROPER(A1)>

In the example above, if you would like to replace column A with the cleaned version (the results of the function in column B), you would click on the “B” to select the entire column and select Copy. Then you would click on the “A” to select the entire A column and choose Paste Special> Values.

CONCATENATE Function

The **CONCATENATE** function creates a text string by pulling data from specified fields. This function can join information such as first and last names, or names and scores, which are in separate fields. Up to 30 fields may be added together in this fashion.

Syntax:

CONCATENATE (text1,text2,...)

Text1, text2, ... are 1 to 30 text items to be joined into a single text item. The text items can be text strings, numbers, or single-cell references.

To add supplementary text between fields, type the text in quotation marks.

To add a space between fields, type " ".

Example: Concatenate First and Last Names

	A	B	C
1	Last Name	First Name	Full Name
2	Silva	Serene	Serene Silva



=CONCATENATE(B2," ",A2)

Figure 4-2: Concatenate First and Last Names



The "&" operator can be used instead of **CONCATENATE** to join text items.

A-3: Using the IF Function

The **IF** Function checks a condition that must be either true or false. If the condition is true, the function returns one value. If the condition is false, the function returns another value.

The function has three arguments:

- (1) The condition you want to check.
- (2) The value to return if the condition is true.
- (3) The value to return if the condition is false.

Syntax:

IF(logical_test,value_if_true,value_if_false)

Logical_test is any value or expression that can be evaluated to TRUE or FALSE. For example, $A10=100$ is a logical expression; if the value in cell A10 is equal to 100, the expression evaluates to TRUE. Otherwise, the expression evaluates to FALSE.

Value_if_true is the value that is returned if logical_test is TRUE. For example, if this argument is the text string "Within budget" and the logical_test argument evaluates to TRUE, then the IF function displays the text "Within budget". If logical_test is TRUE and value_if_true is blank, this argument returns 0 (zero). To display the word TRUE, use the logical value TRUE for this argument. Value_if_true can be another formula.

Value_if_false is the value that is returned if logical_test is FALSE. For example, if this argument is the text string "Over budget" and the logical_test argument evaluates to FALSE, then the IF function displays the text "Over budget". If logical_test is FALSE and value_if_false is omitted, (that is, after value_if_true, there is no comma), then the logical value FALSE is returned. If logical_test is FALSE and value_if_false is blank (that is, after value_if_true, there is a comma followed by the closing parenthesis), then the value 0 (zero) is returned. Value_if_false can be another formula.

Formula	Description (Result)
<code>=IF(A2<=100,"Within budget","Over budget")</code>	If the number above is less than or equal to 100, then the formula displays "Within budget". Otherwise, the function displays "Over budget" (Within budget)
<code>=IF(A2=100,SUM(B5:B15),"")</code>	If the number above is 100, then the range B5:B15 is calculated. Otherwise, empty text ("") is returned ()

A-4: Using the PMT Function

The **PMT** Function calculates the payment for a loan based on constant payments and a constant interest rate.

Syntax:

PMT(rate,nper,pv,fv,type)

Rate is the interest rate per period for the loan. (For example, use **6%/4** for quarterly payments at 6% APR.)

Nper is the total number of payments for the loan.

Pv is the present value, or the total amount that a series of future payments is worth now; also known as the principal.

Fv is the future value, or a cash balance you want to attain after the last payment is made. If **fv** is omitted, it is assumed to be 0 (zero), that is, the future value of a loan is 0.

Type is the number 0 (zero) or 1 and indicates when payments are due.

Example: Calculating Loan Payments

=PMT(5.75%/12,60,19000)

The diagram illustrates the components of the PMT function formula. A red bracket underlines the first argument, 5.75%/12, with the label "Rate" below it. A vertical line connects the second argument, 60, to the label "Nper" below it. Another vertical line connects the third argument, 19000, to the label "Pv" below it.

A-5: Count Functions

COUNT and COUNTA

Counts the number of entries in a range of cells.

Syntax:

=COUNT(range)

- COUNT is included as an AutoSum Feature.
- COUNT WILL NOT count blank cells or cells that contain text.

Syntax:

=COUNTA(range)

- Use COUNTA to evaluate cells that contain text.

Grading example:

COUNT is useful if you have a large class and want to determine how many students have turned in a particular assignment.

COUNTBLANK

Counts the number of blank cells in a particular range.

Syntax:

=COUNTBLANK(range)

COUNTIF

Syntax:

Counts the number of cells that are the same as a particular search string.

=COUNTIF(range, "string")

Example:

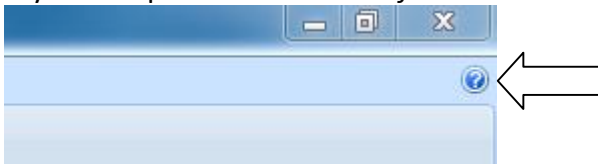
=COUNTIF(range, "A-")

=COUNTIF(range, "A")

=COUNTIF(range, "B+")

For more information on *Excel*:

- Try the Help built into *Microsoft Excel*.



- Use the online *Excel* resources available from *Microsoft*: <http://office.microsoft.com/excel>
- Take free, online training courses: <http://www.bc.edu/mselearning>

This course book was created by ITS Training & Communications.

For more information about training at Boston College please visit www.bc.edu/training

Documentation related to computing at BC is available at www.bc.edu/help

Questions related to technology can be directed to 617-552-HELP or help.center@bc.edu

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