Chapter 5

Word Watch

- Formulas
- Functions
- Cell Reference
- Range
- Operator
- Reference Operators
- Arguments
- Autosum

FORMULAS AND FUNCTIONS

Learning Objectives

After completing this chapter, you should be able to:

- explain what formulas and functions are;
- calculate data with formulas and functions;
- create formulas;
- reference absolute and relative cell;
- copy formulas; and
- apply functions.

Understanding Formulas

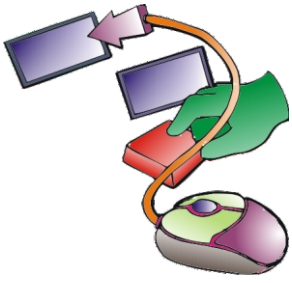
Formulas and functions are the real driving force of Excel's spreadsheet capabilities. You can use formulas to perform all kinds of calculations on your Excel data. You can build formulas using mathematical operators, values, and cell references. For example, you can add the contents of a column of monthly sales figures to calculate a total number of sales. If you are new in writing formulas, this section explains all the basics required to build your own formulas in Excel.

Formula Structure

Ordinarily, when you write a mathematical formula, you will write the values and the operators, followed by an equal sign, such as 2 + 2 =. In Excel, formula structure works a bit differently. All Excel formulas begin with an equal sign (=), such as =2+2. The equal sign immediately tells Excel to recognize any subsequent data as a formula rather than a regular cell entry.

Referencing Cells

Although you can enter specific values in your Excel formulas, you can also easily reference data in specific cells. For example, you can add two cells together or multiply the contents of one cell by a value. Every cell in a worksheet has a unique address, also called a cell reference. By default, cells are identified by a specific column letter and row number, so cell D5 identifies the fifth cell down in column D. To help making your worksheets easier to use, you can assign your own unique names to cells. For example, if a cell contains the figure of the total weakly sales. you can name one cell as sales.



Cell Ranges

A group of related cells in a worksheet is called a range. Cell ranges are identified by their anchor points, the upper left corner of the range and the lower right corner of the range. The range reference includes both anchor points separated by a colon. For example, the range name A1:B3 includes cells A1, A2, A3, B1, B2, and B3. You can also assign unique names to your ranges to make it easier to identify their contents. Range names must start with a letter or underscore and can include uppercase and lowercase letters. Spaces are not allowed in range names.

Calculating Data with Formulas and Functions

Mathematical Operators

You can use mathematical operators in Excel to build formulas. Basic operators include the following:

Operator	Operation
+	Addition
-	Subtraction
*	Multiplication
/	Division
%	Percentage
^	Exponentiation
=	Equal to
<	Less than
≤	Less than or equal to
>	Greater than
≥	Greater than or equal to
<>	Not equal to

Operator Precedence

Excel performs a series of operations from left to right, which gives some operators precedence over others. When you are creating equations, the order of operations determines the results. For example, if you want to determine the average of values in A2, B2, and C2, and you enter the equation **=A2+B2+C2/3** , you will calculate the wrong answer. This is because Excel divides the value in cell C2 by 3, and then adds that result to the A2+B2. Following operator precedence, division takes precedence over addition. The correct way to type the average formula is **=(A2+B2+C2)/3** . By enclosing the values in parentheses, Excel adds the cell values first before dividing the sum by 3. The following table gives order of operator precedence:

First	All operations enclosed in parentheses
Second	Exponential equations
Third	Multiplication and division
Fourth	Addition and subtraction

Reference Operators

You can use Excel's reference operators to control how a formula groups cells and ranges to perform calculations. For example, if your formula needs to include the cell range D2:D10 and cell E10, you can instruct Excel to evaluate all the data contained in these cells using a reference operator. Your formula might look like this: **=SUM(D2:D10,E10).**

Operator	Example	Operation
:	=SUM(D3:E12)	**Range operator**. Evaluates the reference as a single reference, including all the cells in the range from both corners of the reference.
,	=SUM(D3:E12,F3)	**Union operator**. Evaluates the two references as a single reference.
Spacebar	=SUM(D3:D20 D10:E15)	**Intersect operator**. Evaluates the cells common to both references.
Spacebar	=SUM(Totals Sales)	**Intersect operator**. Evaluates the intersecting cell(s) of the column labeled Totals and the row labeled Sales.

Creating Formulas

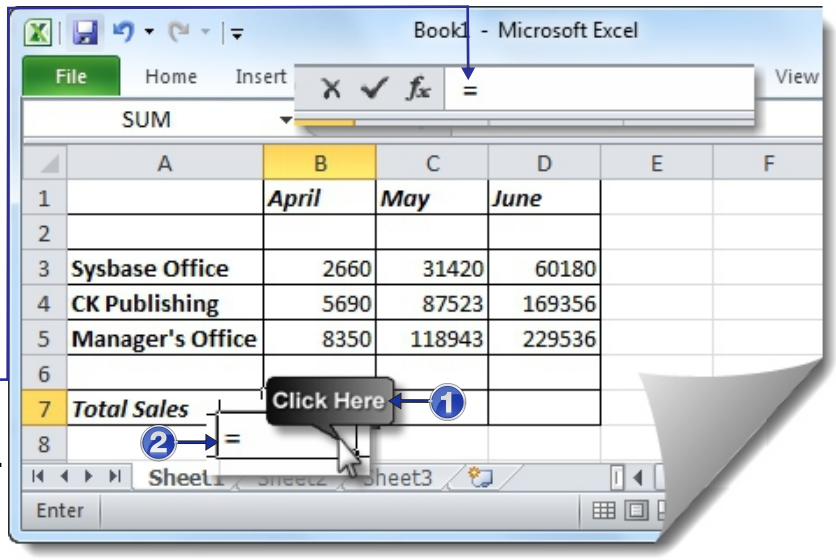
You can write a formula to perform a calculation on data in your worksheet cells. All formulas in Excel begin with an equal sign (=). You can reference values in cells by entering the cell name, also called a cell reference. For example, if you want to add the contents of cells C3 and C4 together, your formula would look like this: =C3+C4.

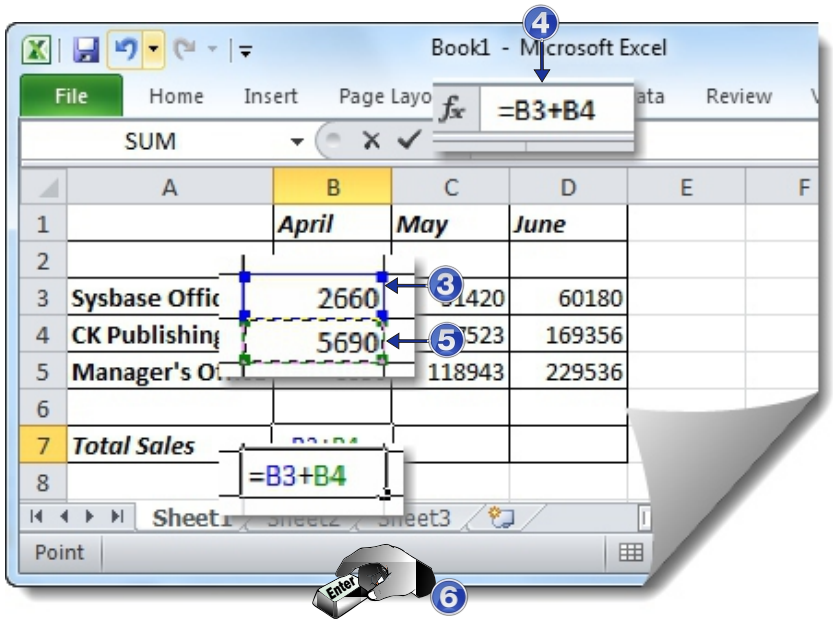
You can create a formula in the Formula bar at the top of the worksheet. Formula results always appear in the cell in which you assign a formula.

Create Formulas

Work File: Formulas.xlsx

1. Click the cell to which you want to assign a formula.
2. Type =
   Excel displays the formula in the Formula bar and in the active cell.
3. Click the first cell that you want to reference in the formula.
   Excel inserts the cell reference into the formula.
4. Type an operator for the formula.
5. Click the next cell you want to reference in the formula.
   Excel inserts the cell reference into the formula.
6. Press Enter to accept your changes.





- You can also click Enter (☑) on the Formula bar to accept changes.
- You can click Cancel (☒) to cancel the formula. The formula results appear in the cell.
- To view the formula, simply click the cell. The Formula bar then displays any formula assigned to the active cell.

Note: If you change any of the values in the cells referenced in your formula, the formula results automatically update to reflect the changes.

Referencing Absolute and Relative Cells

By default, Excel treats the cells you include in formulas as relative locations rather than set locations in the worksheet. This is called relative cell referencing. For example, when you copy a formula to a new location, the formula automatically adjusts using relative cell addresses. If you want to address a particular cell location no matter where the formula appears, you can assign an absolute cell reference. Absolute references are preceded with a $ sign in the formula, such as =D2+E2.

Reference Absolute and Relative Cells

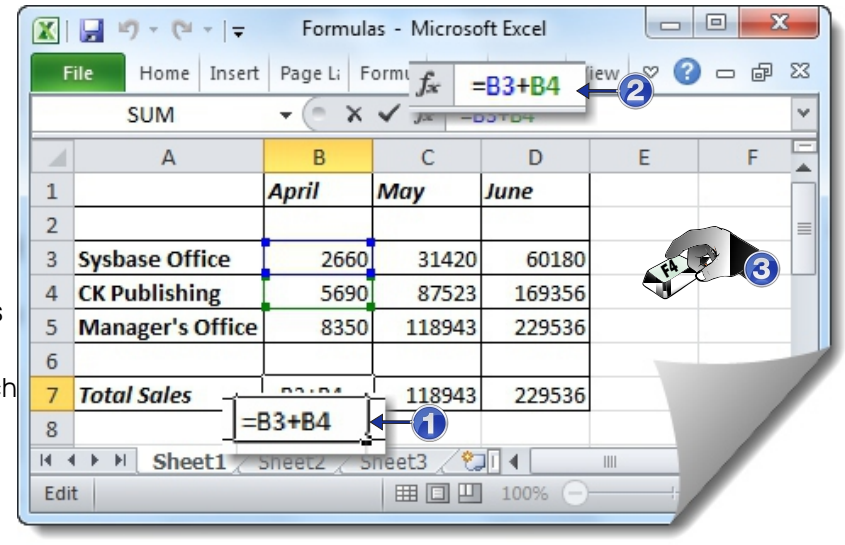
Work File: Formulas.xlsx

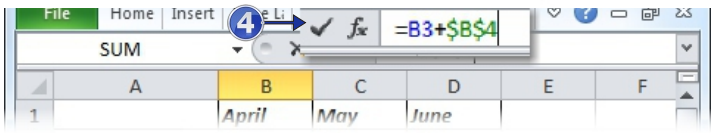
Assign Absolute References

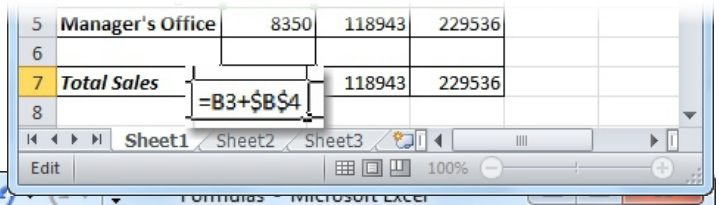
1. Click the cell containing the formula that you want to change.
2. Select the cell reference.
3. Press F4.
   - You can also type in the dollar signs to make a reference absolute.

   Excel enters dollar signs (**$**) before each part of the cell reference, making the cell reference absolute.
   - You can continue pressing to cycle through mixed, relative, and absolute references.
4. Press Enter or click ☑.

   Excel assigns the changes to the formula.

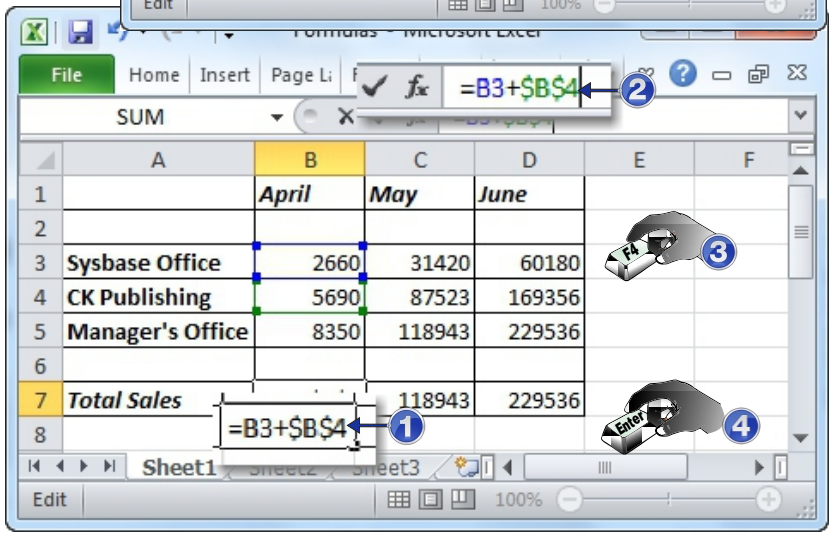






Assign Relative References

1. Click the cell containing the formula that you want to change.
2. Select the cell reference.
3. Press F4 to cycle to relative addressing.
   - You can press F4 multiple times to cycle through mixed, relative, and absolute references.You can also delete the dollar signs to make a reference relative.
4. Press Enter or click ☑.
   - Excel assigns the changes to the formula.



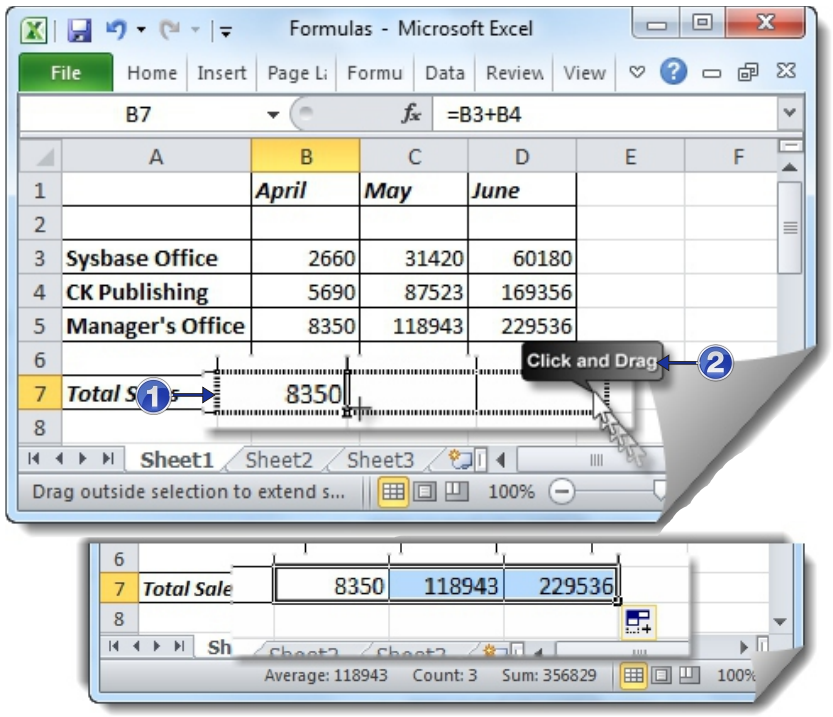
Copying Formula

You can use Excel's AutoFill feature to quickly copy formulas across rows or columns in your worksheets. If the cell references in a formula are relative, Excel automatically adjusts the formula for the destination cell.

Copy Formula

Copy A Relative Formula

Work File: Formulas.xlsx



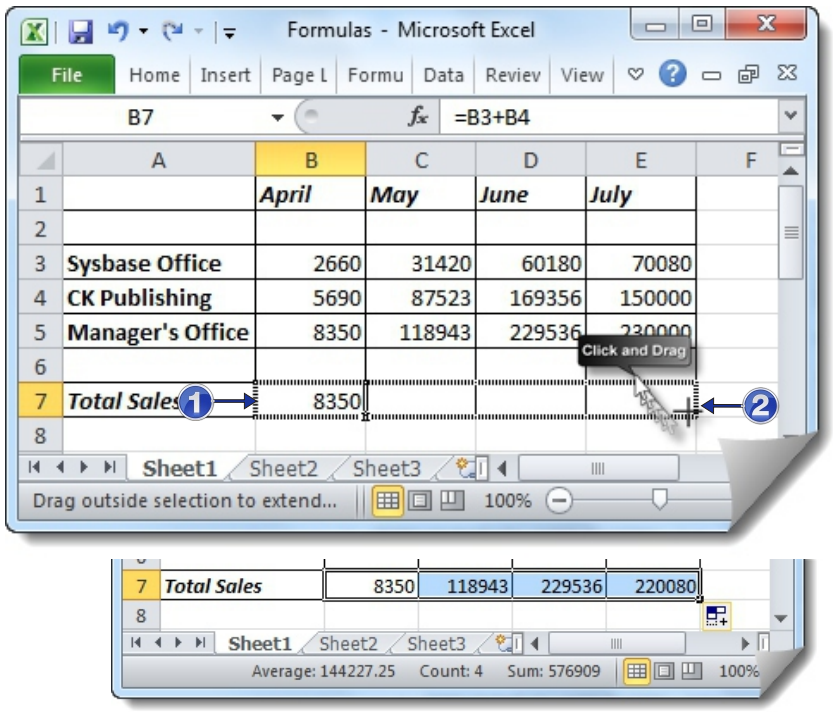
1. Click the cell containing the formula that you want to copy.
2. Click and drag the cell's fill handle across or down the number of cells to which you want to copy the formula.

Excel copies the formula into each cell you drag over. In the case of relative cell referencing, Excel adjusts the formula relative to each cell into which you copy the formula.

- In this example, the copied formula from cell B7 originally referred to cells in column B, but now refers to cells in column C.

Copy An Absolute Formula

Work File: Formulas.xlsx



1. Click the cell containing the formula that you want to copy.
2. Click and drag the cell's fill handle across or down the number of cells to which you want to copy the formula.

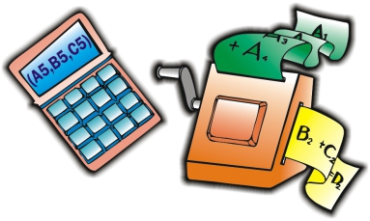
Excel copies the formula into each cell you drag over. In the case of absolute cell referencing, Excel keeps the absolute cell reference the same regardless of where you copy the formula.

- In this example, the copied formula from cell B16 originally referred to absolute cells in column B, and C14 now references the same absolute cells.

Understanding Functions

Excel has a collection of mathematical, financial, statistical and logical functions. If you are looking for a quicker way to enter formulas, you can tap into a wide variety of built-in formulas, called functions. Functions are ready-made formulas that perform a series of operations on a specified range of values. Excel offers over 300 functions you can use to perform mathematical calculations on your worksheet data.

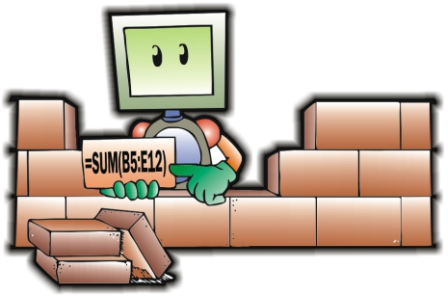
Function Elements



Functions are formulas, all functions must start with an equal sign (=). It is distinct and each function has name. For example, the function that sums data is called the SUM function, and the function for averaging values is AVERAGE. You can type functions directly into your worksheet cells or use the Formulas tab of the ribbon. You can also use the Insert Function Wizard or Function Argument dialog boxes to help construct functions. These offer help in selecting and applying functions to your data.

Constructing Arguments

Functions typically use arguments to indicate the cell addresses upon which you want the function to calculate. Arguments are enclosed in parentheses. When applying a function to individual cells in the worksheet, you can use a comma to separate the cell addresses, such as =SUM(A5,B5,C5). When applying a function to a range of cells, you can use a colon to designate the first and last cells in the range, such as =SUM(B5:E12). If your range has a name, you can insert the name, such as =SUM(Sales).



Common Functions

The table below lists some of the most popular Excel functions you can use with your own spreadsheet work.

Function	Category	Description	Syntax
SUM	Math & Trig	Adds values	=SUM(number1,number2,...)
ROUND	Math & Trig	Rounds a number specified by the number of digits	=ROUND(number,number_digits)
COUNT	Statistical	Returns a count of text or numbers in a range	=COUNT(value1,value2,...)
AVERAGE	Statistical	Averages a series of arguments	=AVERAGE(number1,number2,...)
MIN	Statistical	Returns the smallest value in a series	=MIN(number1,number2,...)
MAX	Statistical	Returns the largest value in a series	=MAX(number1,number2,...)
MEDIAN	Statistical	Returns the middle value in a series	=MEDIAN(number1,number2,...)
PMT	Financial	Finds the periodic payment for a fixed loan	=PMT(interest_rate,number_of_periods, present_value,future_value,type)
RATE	Financial	Returns an interest rate	=RATE(number_of_periods,payment, present_value,future_value,type,guess)
DAYS360	Date & Time	Returns the number of days between two dates using a 360-day calendar	=DAYS360( )
IF	Logical	Returns one of two results you specify based on whether the value is TRUE or FALSE	=IF(logical_text,value_if_true,value_if_false)
AND	Logical	Returns TRUE if all the arguments are true, and False if any are false	=AND(logical1,logical2,...)
OR	Logical	Returns TRUE if any argument is true and FALSE if all arguments are false	=OR(logical1,logical2,...)

Applying a Function

Functions are ideal to use to speed up your Excel calculations. You can use the Insert Function dialog box to look for a particular function from among function categories.

Apply a Function

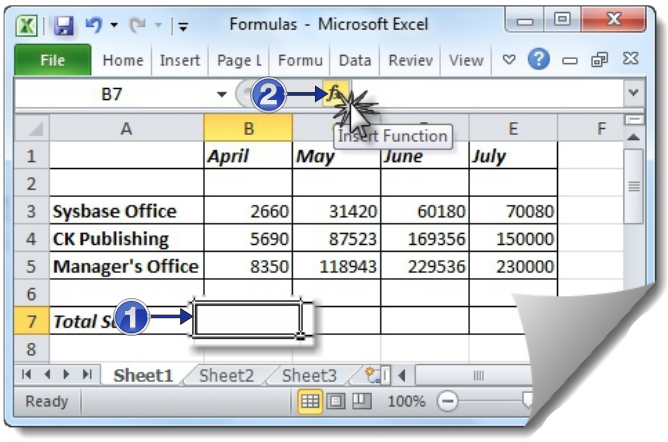
1. Click the cell to which you want to assign a function.
2. Click the Insert Function icon (*fx*) on the Formula bar.

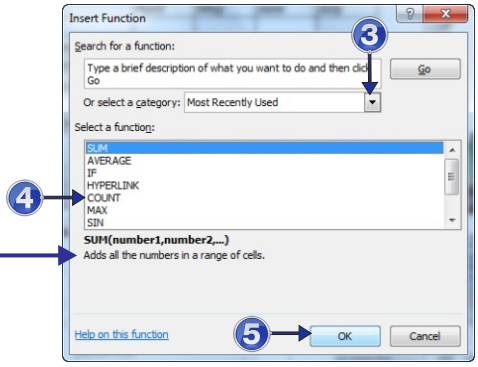
   Excel inserts an equal sign automatically to denote a formula and displays the Insert Function dialog box.

   - You can also click the Formulas tab and click (*fx*).
3. Click to select a category.
   - Excel's built-in functions are grouped into ten categories.
4. Click the function that you want to apply.

   A description of the function appears here.
5. Click OK.

Work File: Formulas.xlsx



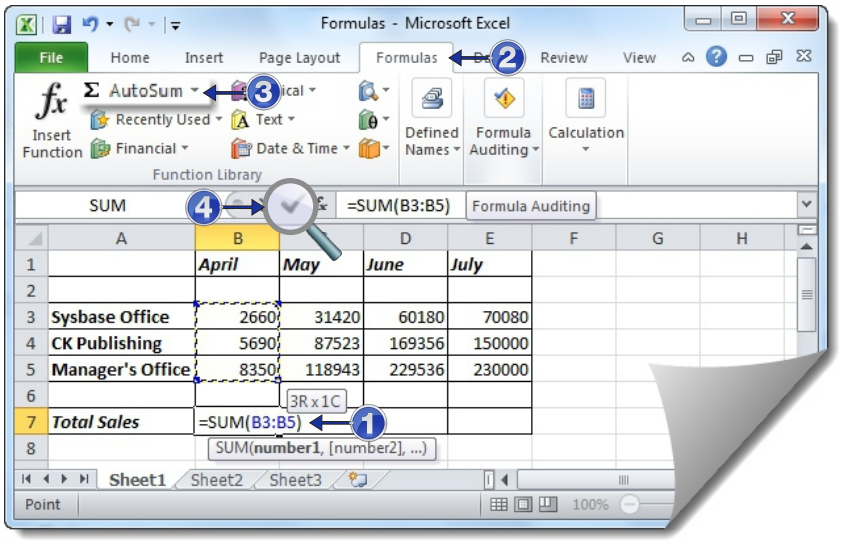


Applying AutoSum Function

One of Excel's popular functions available is the AutoSum function. AutoSum automatically totals the contents of cells. For example, you can quickly total a column of sales figures quickly. AutoSum works by guessing which surrounding cells you want to total, or you can specify exactly which cells to sum.

Apply Autosum Function

Work File: Formulas.xlsx



1. Click in the cell where you want to insert a sum total.
2. Click the Formula tab.
3. Click AutoSum.

   AutoSum immediately attempts to total the adjacent cells.

   - To sum another range of cells instead of AutoSum's guess, select the cells that you want to include in the sum.

4. Press Enter or click ☑.

   •Excel totals the selected cells.

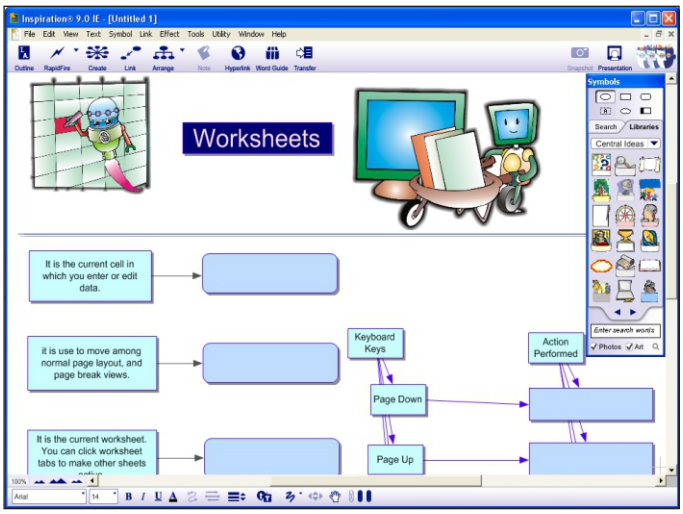
Chapter 4 **Worksheets**

Exercise 51 **Please Describe**

Directions:

1. Launch Inspiration.
2. Open and answer **Worksheets**.
3. Identify what is being described about worksheets. Type your answer in the box provided and give the action performed in each keyboard navigation.
4. Save the exercise as its document name and place it to your own folder.

Preview:



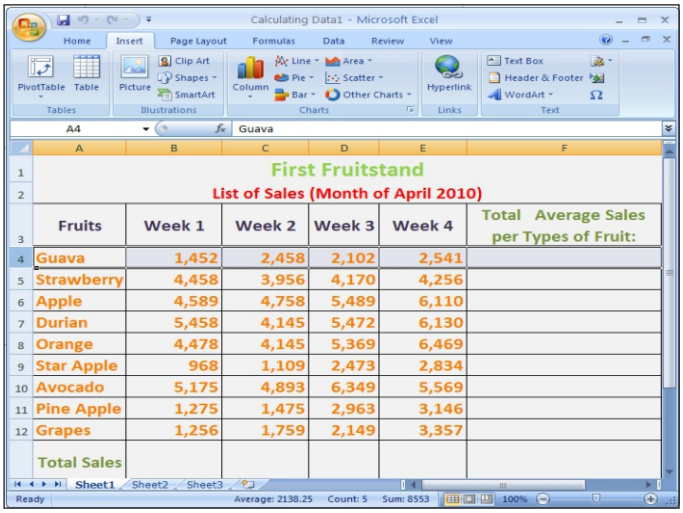
Chapter 5 **Formulas and Functions**

Exercise 52 **Arithmetic in Worksheets**

Directions:

1. Launch **Microsoft Excel**.
2. Open the **Calculating Data** spreadsheet.
3. Follow the steps on how to calculate data with formulas and functions.
4. Compute the following:
   a. Total average sales of strawberry answer: _____
   b. Total sales in weeks 3 and 4 answer: _____
   c. Total sales in weeks 2 and 1 answer: _____
   d. Total average sales in a week answer: _____
5. Save the worksheet as its document name and place it to your own folder.

Preview:



First Fruitstand
List of Sales (Month of April 2010)

Fruits	Week 1	Week 2	Week 3	Week 4	Total Average Sales per Types of Fruit:
Guava	1,452	2,458	2,102	2,541	
Strawberry	4,458	3,956	4,170	4,256	
Apple	4,589	4,758	5,489	6,110	
Durian	5,458	4,145	5,472	6,130	
Orange	4,478	4,145	5,369	6,469	
Star Apple	968	1,109	2,473	2,834	
Avocado	5,175	4,893	6,349	5,569	
Pine Apple	1,275	1,475	2,963	3,146	
Grapes	1,256	1,759	2,149	3,357	
Total Sales					

TIPS

How do I edit a formula?
To edit a formula, simply click the cell containing the formula and make any corrections in the Formula bar. You can also double-click the cell to make edits directly to the formula within the cell rather than the Formula bar. You can use Backspace and Delete to make changes to the formula and type new values or references as needed. When finished with the edits, press Enter or click ☑ on the Formula bar.

What happens if I see an error message in my formula?
If you see an error message, such as #DIV/0!, double-check your formula references, making sure you referenced the correct cells. Also make sure you did not attempt to divide by 0, which always produces an error.

Chapter 5 **Formulas and Functions**

Exercise 53 **Formula Setup**

Directions:

1. Launch **Microsoft Excel**.
2. Open the **Creating Formulas** worksheet.
3. Follow the steps on how to create formulas.
4. Specifically, do the following:
   a. Create a formula to sum up automatically the total votes and the cast votes when you enter any numbers in each column.
   b. Finish first the formula of each place and candidate and type in the data below.
5. Make sure that the total votes and the total cast votes should automatically sum up.
6. Save the worksheet as its document name and place it to your own folder.

Preview:

Candidates	Lanao Del Sur	Misamis Oriental	Bukidnon
Benigno Aquino	20,000	21,500	26,600
Joseph Estrada	19,950	20,000	24,140
Gilbert Teodoro	18,000	19,000	25,000
Manny Villar	16,790	18,870	19,660
Nicanor Perlas	18,050	19,110	20,750
Richard Gordon	20,000	19,960	23,000

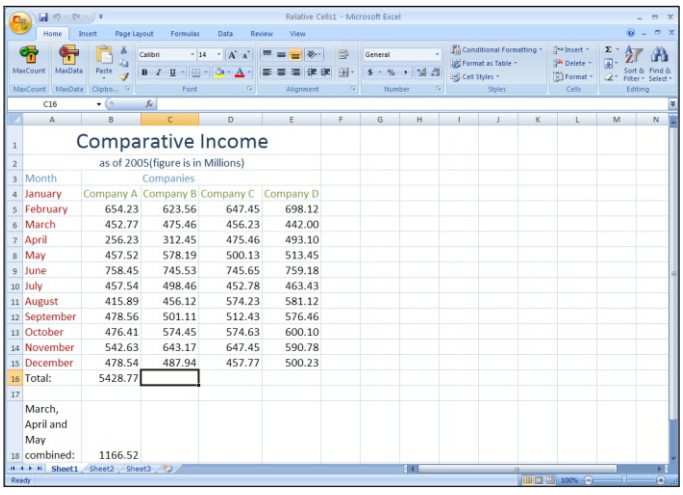
Chapter5 **Formulas and Functions**

Exercise 54 **Cells Talk**

Directions:

1. Launch **Microsoft Excel**.
2. Open the **Relative Cells** worksheet.
3. Follow the steps on how to assign absolute references and relative cells.
4. Specifically, do the following:
   a. Type the dollar sign in each figure.
   b. Assign absolute references and relative references.
5. Save the worksheet as its document name and place it to your own folder.

Preview:



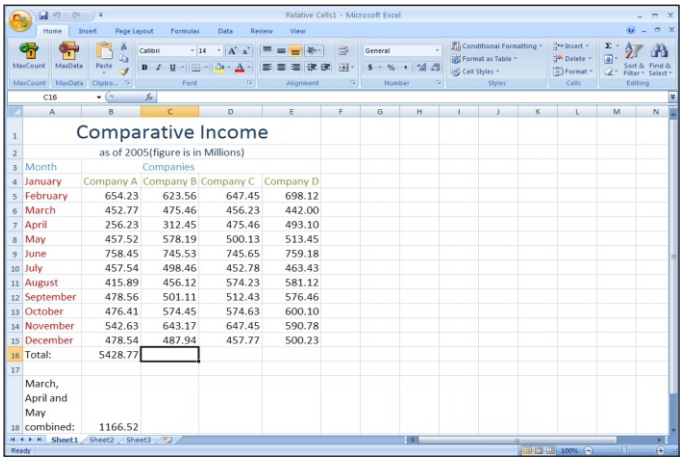
Chapter 5 **Formulas and Functions**

Exercise 55 Relatively Absolute

Directions:

1. Launch **Microsoft Excel**.
2. Open the **Relative Cells** worksheet.
3. Follow the steps on how to copy a relative formula and absolute formula.
4. Specifically, do the following:
   a. Copy a relative formula from the total sales of company A to sum up the total sales of the remaining companies. Do the same process to sum up the sales combination of March, April and May.
   b. Copy an absolute formula from the combined month sales and place it in cell B20.
5. Save the worksheet as **Copy Formula** and place it to your own folder.

Preview:



Comparative Income
as of 2005(figure is in Millions)

Month	Companies			
January	Company A	Company B	Company C	Company D
February	654.23	623.56	647.45	698.12
March	452.77	475.46	456.23	442.00
April	256.23	312.45	475.46	493.10
May	457.52	578.19	500.13	513.45
June	758.45	745.53	745.65	759.18
July	457.54	498.46	452.78	463.43
August	415.89	456.12	574.23	581.12
September	478.56	501.11	512.43	576.46
October	476.41	574.45	574.63	600.10
November	542.63	643.17	647.45	590.78
December	478.54	487.94	457.77	500.23
Total:	5428.77			
March, April and May combined:	1166.52			

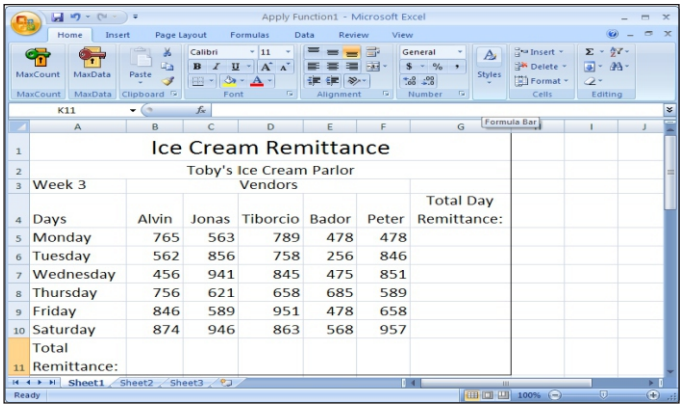
Chapter 5 **Formulas and Functions**

Exercise 56 Do The Functions

Directions:

1. Launch **Microsoft Excel**.
2. Open the **Applying Function** worksheet.
3. Follow the steps on how to apply a function and AutoSum. Refer to your textbook for your guide.
4. Answer the following questions by applying function and AutoSum.
   a. Find the average of Alvin's remittance. answer:
   b. Find the maximum of Jonas' remittance. answer:
   c. Find the minimum of Tiburcio's remittance. answer:
   d. Find the sum or total of the remittances using Autosum. answer:
5. Save the exercise as its document name and place it to your own folder.

Preview:



Ice Cream Remittance
Toby's Ice Cream Parlor
Week 3 Vendors

Days	Alvin	Jonas	Tiborcio	Bador	Peter	Total Day Remittance:
Monday	765	563	789	478	478	
Tuesday	562	856	758	256	846	
Wednesday	456	941	845	475	851	
Thursday	756	621	658	685	589	
Friday	846	589	951	478	658	
Saturday	874	946	863	568	957	
Total Remittance:						

TIPS

When would I use absolute cell references?
You can use absolute referencing to always refer to the same cell in the worksheet. For example, perhaps your worksheet contains several columns of pricing information that refer to one discount rate disclosed in cell G10. When you create a formula based on the discount rate, you want to make sure the formula always refers to cell G10, even if the formula is moved or copied to another cell. By making the reference to cell G10 absolute instead of relative, you can always count on an accurate value for the success of your formula.

When would I use mixed cell references?
You can use mixed referencing to reference different relative cells within the same row or column, such as $C6, which keeps the column from changing but leaves the row relative. If the mixed reference is C$6, the column is relative but the row is absolute. You can press while writing a formula to cycle through absolute, mixed, and relative cell referencing, or you can type in the dollar signs ($) as needed.

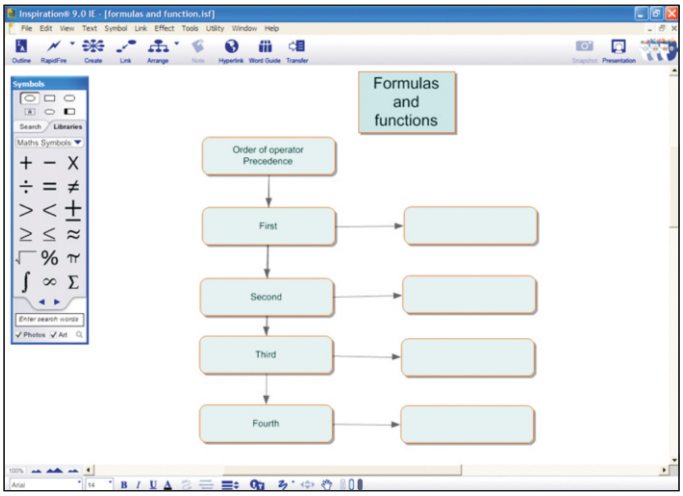
Chapter 5 **Formulas and Functions**

Directions:

1. Launch Inspiration.
2. Open and answer **Formulas and Functions**.
3. Do the following:
   a. Give the operator precedence in the given order.
   b. Answer the given mathematical problems.
   c. Give the name of each mathematical symbol.
4. Save the exercise as its filename and place it to your own folder.

Exercise 57 **Operator's Go**

Preview:



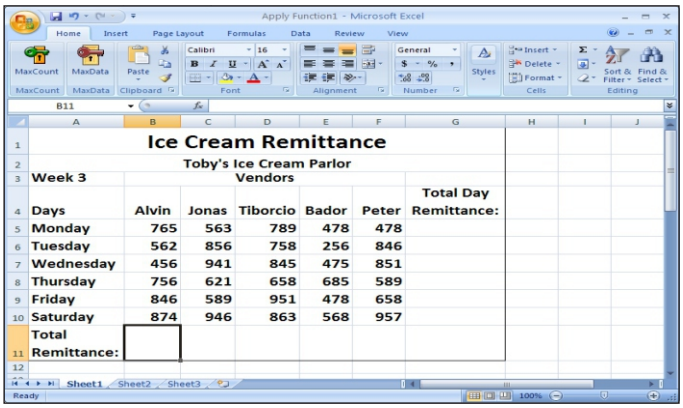
Chapter 6 **Worksheet Data**

Directions:

1. Launch **Microsoft Excel**.
2. Follow the steps on how to move and copy data, delete data or cells, add columns and rows and delete columns and rows.
3. Do the following:
   a. Copy the "Ice Cream Remittance" data and paste them in cell A14.
   b. From the new table that you have copied, delete the data of "Answers of Any Function Used" and "Total Day Remittance".
   c. Delete all the cells in "Tuesday" remittance row.
   d. Add a column in column A.
   e. Add a row in "Tuesday" row.
   f. Delete the column and row that you have just inserted.
4. Save the worksheet as **Move to Delete** and place it to your own folder.

Exercise 58 **Copy Cut**

Preview:



Ice Cream Remittance

Toby's Ice Cream Parlor

Week 3	Vendors					
Days	Alvin	Jonas	Tiborcio	Bador	Peter	Total Day Remittance:
Monday	765	563	789	478	478	
Tuesday	562	856	758	256	846	
Wednesday	456	941	845	475	851	
Thursday	756	621	658	685	589	
Friday	846	589	951	478	658	
Saturday	874	946	863	568	957	
Total Remittance:						

TIPS

What kind of results can I expect with Excel functions?

Most of the time, the functions you create produce number results because functions use different types of arguments, however, some functions produce different types of results:

Result	***Description***
Number	Number results can include any integer or decimal number.
Time and date	When applying time and date functions, you can expect time and date results.
Logical values	Logical arguments produce results such as TRUE, FALSE, YES, NO, 1, 0.
Text	Any text results always appear surrounded by quotation marks.
Arrays	An array is a column or table of cells that is treated as a single value, and array formulas operate on multiple cells.
Cell references	Some function results display references to other cells rather than actual values.
Error values	If a function uses error values as arguments, the results appear as error values as well. Error values are not the same as error messages.