

## CHAPTER E3

### OUTCOMES OF THIS CHAPTER ARE TO BE ABLE TO:

- ◆ Use formulas in Excel
- ◆ Use functions in Excel
- ◆ Move and copy data in a workbook

### INTRODUCTION TO FORMULAS and FUNCTIONS

In Excel we can use formulas and functions to quickly calculate values from the data contained in cells of the workbook.

#### IMPORTANT TERMS

- A *prefix* is a character that indicates that a formula / function will be following. The most commonly used prefixes in Excel, are **+** and **=**
- *Operators* are used to indicate arithmetic calculations i.e.
  - +** used for addition
  - used for subtraction
  - \*** used for multiplication
  - /** used for division
- *Cell addresses* are letters and numbers that refer to a cell's location in the spreadsheet i.e. A4, B7, etc.
- A *range of cells* is a reference that indicates a contiguous block of cells i.e. A1:A50 indicates all the cells from cell A1 to cell A50.
- A *constant* is a fixed number used in calculations.

#### FUNCTIONS

Functions are *pre-defined modules* that are built into the spreadsheet and can be used to do calculations. Most functions consist of a *prefix, function name and range*. An example of a function is

**=SUM(B1:B5)**

In the example,

- the prefix is **=**
- the name is **SUM**
- the range is **B1:B5**

## FORMULAS

Formulas are arithmetic expressions that consist of a *prefix, operators, relevant cell addresses and / or constants*. It is used to calculate values. Formulas could also include functions. An example of a formula is: =C5 + D3

Both formulas and functions are created by starting to type the prefix = or +

Functions and formulas could be understood better by studying some examples. Consider each of the following formulas /functions and the explanation of what result it will calculate:

Formula	Formula/function	Description
+C3+C7	Formula	Add the contents of cell C3 to the contents of cell C7
=sum(B1:B10)	Function	Add all the values of range B1 to B10
=average(F5:F50)	Function	Determine the average of the values in the range
=sum(A1:F1)/6*100	Formula	Calculate the sum of the values in the range; then divide by 6 and then multiply by 100

## THE ORDER OF CALCULATIONS

If you combine several operations in a single formula / function, Excel will perform the operations according to the order of the operators as listed in the table below:

Operator	Description
( )	Expressions in parenthesis will be evaluated first
:	Range
Space	Intersection
`	Union
-	Negation
%	Percentage
^	Exponentiation
* and /	Multiplication and Division
+ and -	Addition and Subtraction
&	Text joining
= < > <= >= <>	Comparison

If the formula / function contains more than one operator with the same priority level, Excel will evaluate the operators in the formula / function from left to right. However, parenthesis can be used to alter the order of evaluation. Consider the following examples:

$$+3+6*5 = +3+30 = 33 \quad \text{BUT} \quad +(3+6)*5 = +9*5 = 45$$

**TO CREATE A FORMULA BY TYPING**

1. Select the cell where you want the result of the formula / function to appear.
2. Type the **+** (**plus sign**).
3. Type the desired cell addresses and mathematical operators.
4. Press **Enter**.

**TO CREATE A FORMULA BY POINTING**

1. Select the cell where you want the result of the formula / function to appear.
2. Type the **+** (**plus sign**).
3. Click with the mouse or move with the arrows to the first cell required in the formula / function.
4. Press the desired **mathematical operator (+, \*, -, /)**.
5. Click with the mouse or move with the arrows to the next cell required in the formula / function.
6. Repeat steps 4 and 5 until the formula / function has been finalised.
7. Press **Enter**.

**TO CREATE A FUNCTION BY TYPING**

Every function is typed by starting with the prefix **=** (**equal sign**).

Most functions have the following format: **=FUNCTIONNAME( RANGE )** where:

- the prefix is usually **=**
- *FUNCTIONNAME* is the name of the function i.e. *SUM*, *MAX* or *MIN*.
- *RANGE* specifies the range of values in the spreadsheet that should be used.

The following table gives a summary of functions that are often used by end users:

<b>Function</b>	<b>Description</b>	<b>Example</b>
=SUM(RANGE)	Calculate the sum of the values in the specified range	=SUM(A1:A20)
=MIN(RANGE)	Determine the smallest value in the specified range	=MIN(B7:B15)
=MAX(RANGE)	Determine the highest value in the specified range	=MAX(C1:C10)
=AVERAGE(RANGE)	Calculate the average of the values in the specified range	=AVERAGE(A1:A30)

**USING SPEEDSUM**

The most efficient way to calculate the sum of a group of cells is by clicking the Speed Sum icon on the standard Tool bar.

1. Select the range of cells that must be added – including one empty cell.
2. Click on the **Speed Sum icon**. Excel will automatically enter the **=SUM-function** with the appropriate range and place the result in the blank cell.
3. Press **Enter**.

**TUTORIAL E3.1**

	A	B	C
1	MY BUDGET 2000		
2			
3	EXPENSE	INCOME	JAN
4		R2000-00	
5	Car		R600-00
6	House		R600-00
7	Petrol		R100-00
8	Food		R300-00
9	Clothes		R50-00
10			
11	Total		Rxxxx-xx
12			

1. Open the file BUDGET3 that was created in TUTORIAL E2.2.
2. Type the text “Total” in cell A11.
3. Use a function in cell C11 to calculate the total expenses of the “JAN” column. (the Rxxxx.xx indicates that a formula / function is used in this cell)
4. Change the value of cell C8 to 300. (Note that the total is adjusted automatically)
5. Save the spreadsheet as BUDGET4.

**COPYING DATA FORMULAS / FUNCTIONS**

Data (including formulas and functions) in any cell or range of cells can be copied or moved to another cell / range of cells.



**TO COPY DATA**

1. Select the data to be copied.
2. Click on the **Copy icon**.
3. Click on the cell or select the range where data has to be copied to.
4. Click on the **Paste icon**.



## TO MOVE DATA

Data in any cell or range of cells can be moved to another cell / range of cells.

1. Select the data to be moved.
2. Click on the **Cut icon**. 
3. Click on the cell or select the range where data has to be copied to.
4. Click on the **Paste icon**. 

**NOTE:** Formulas and functions can also be copied from one cell to another cell or to a range of cells by using the same procedure as described above. Keep the following in mind:

## REFERENCES

A reference identifies a cell or group of cells in a spreadsheet. There are two basic types of references in Excel i.e. *relative references* and *absolute references*. If you want to refer to cells relative to a cell containing a formula / function, then a relative reference should be used. If you want to refer to a cell by its exact location, then an absolute reference should be used.

- To indicate a *relative reference* type the formula / function as usual i.e.  $+A1 + A2$  or  $=SUM(A1:A10)$
- To indicate an *absolute reference*, type a \$-sign in front of the cells that should not be changed when copied i.e.  $+\$A\$1 + A2$  or  $=SUM(\$A\$1:\$A\$10)$ . The \$-sign indicates that the reference to the cell is absolute. The result will be that when the formula / function is copied to other cells, the cell address  $\$A\$1$  will not be changed but will be repeated exactly in the new position.

*Summary:* When you copy a relative cell address, the cell address in the copied formula / function will change accordingly. When you copy an absolute cell address, the cell address in the copied formula /function will stay the same.

## Example:

	A	B	C	D	E	F
1			Yearmark	Gr 12	2000	
2						
3	NAME	CLASS	MARCH	JUNE	SEPT	YEARMARK
4						
5	Smith K	A	70	80	70	73.33
6	Naidoo R	B	60	65	70	65.00
7	Clamini W	A	55	75	70	66.67
8						

Assume the following function is typed into cell C6 **=sum(C3:C5)** and it is copied to cell D6 then it will be changed to **=sum(D3:D5)**. The reason is that the cell references are relative.

If the function were typed as `=sum($C$3:$C$5)` and then copied to cell D, it will remain to be displayed as `=sum($C$3:$C$5)` because the cell references were typed as absolute references.

### TUTORIAL E3.2

	A	B	C	D
1	MY BUDGET 2000			
2				
3	EXPENSE	INCOME	JAN	FEB
4		R2000-00		
5	Car		R600-00	R600-00
6	House		R600-00	R600-00
7	Petrol		R100-00	R150-00
8	Food		R300-00	R250-00
9	Clothes		R50-00	R150-00
10				
11	Total		Rxxxx-xx	Rxxxx-xx
12	Difference		Rxxxx-xx	Rxxxx-xx

1. Work with the file BUDGET4 that was created in TUTORIAL E3.1.
2. Enter the new data, as shown above, in column D.
3. Copy the function that was used in C11 to cell D11. (Note how the cell references change when the formula is copied.)
4. Type the text "Difference" in Cell A12.
5. Use a formula and absolute referencing in cell C12 to determine the difference between the Income given in cell B4 and the total Expenses given in cell 11.
6. Copy the formula from cell C12 to cell D12. (Note how the absolute cell references stay the same when the formula is copied.)
7. Save the file as BUDGET5.
8. Print the spreadsheet.