Unit 4 Calculations in Worksheet

4.0 Introduction

Analysing data and manipulating text are important features in any spreadsheet. Excel also provides these facilities using functions for different categories of tasks, like manipulation of text, date and time, calculation of numbers, date and time.

Users might require to calculate percentage, average, interest. They want to look for a look for specific item in the large volume of data. All these tasks can be easily done either by typing in the functions based formulas or by using function wizards. The concept of cell references will be extensively used.

4.1 Objectives

After studying this unit , you are able to

Use formulas in calculations
Use functions and list the different categories of functions.

4.2 Formula Basics

Formulas are widely used in simple (like addition, subtraction, multiplication and division) and advanced computing. They provide the power to analyse data extensively.
Spreadsheets also provide an important feature of auto-recalculation every time a change is made in the cells. Any change made in one cell causes a ripple effect in all the dependent cells. There are basically two kinds of recalculations :

1. **Automatic -** This is the default mode in which the change in the value of the cell causes the recalculation of the whole worksheet automatically.
2. **Manual -** On selecting this option, the recalculation of the complete worksheet is done only on pressing **F9** key. This option can be selected by choosing Tools->Option and then click on Calculation tab.

4.2.1 Basic Properties of Formulas

1. A formula may consist of operators, cell references, range names, values and functions.
2. A formula always start with an equal to (=) sign.
3. When a formula is entered in the cell, after the Enter key is pressed, only the calculated result is displayed in the cell and not the formula.
4. If we make a cell, containing formula, as an active cell, though it still shows the value, but in the formula bar, the formula is displayed.

4.2.2 Operators in the Order of Precedence

	A	B	C	D	E	F
1						
2			SIZZLING FOODS LTD.			
3						
4	NAME	AGE	BASIC	HRA	DA	GROSS
5	JAMES	25	1500			
6	KIM	23	1450			
7	LOUIS	26	1700			
8	MARY	21	1400			
9	GEORGE	25	2000			

Operator	Description	Example
:	Range	B2:B5
Space	Intersection of Cells	
-	Negation (single operand)	=-10
%	Percentage	=25%
^	Exponential	=10^2
*	Multiplication (whichever)	=5*3
/	Division (comes first)	=24/3
+	Addition (whichever)	=55+80
-	Subtraction (comes first)	=40-25
&	Joining Text	=“work”&“book”
=	Equal to	=A1=5
<	Less than	=B3< 1000
>	Greater than	=B3>1000
<=	Less than or Equal to	=B3<=1000
>=	Greater than or Equal to	=A5>=250
<>	Not equal to	=A5<>100

4.2.3 How to Enter a Formula

To learn to enter the formulas, first enter the data as shown below :

1. In the cell D5, enter the formula as : =(40%)*C5
2. Copy this formula in cells D6 to D9.
3. In the cell E5, enter the formula as : =(20%)*C5

4. Copy this formula in cells E6 to E9.

5. In the cell F5, enter the formula as : =C5+D5+E5
6. Copy this formula in cells F6 to F9.

Formulas can be entered by referring to the values of other worksheets of the workbook, or by referring to the values stored in other workbook.

Example :

By referring to other worksheet cell =Sheet2!B3 + A2
(Sheet2!B3 refers to the value stored in the cell B3 of Sheet2 while you are working in Sheet1.)

By referring to the cell of other workbook = 100 ([Employee.xls] Sheet1!$D$2)
(In the formula given above, [Employee.xls]Sheet1!$D$2 refers to the cell D2 of Sheet1 of workbook Employee.xls.)

This also creates a link between worksheets and workbooks. Therefore, while making changes in these linked worksheets and workbooks one has to be careful as the change will affect the dependent and linked cells also.

4.2.4 Editing Formula

The formulas can be edited in the similar way as you have been editing text or number entries.

1. You can edit the formula by pressing **F2** key, and make changes directly in the cell.
2. Type the changes in the formula bar.
3. Double-click on the cell containing the cell and make changes as the formula is displayed in the cell.

4.3 Functions

The built-in formulas are called functions. The users have to provide the cell references or addresses only. Theses are called arguments of the function that are given between a pair of parenthesis like ( ). The functions perform the operation on the given values and return the result that is displayed in the same cell where the function was entered. The use of functions also shortens the formula.
Example : Suppose you want to add the values of cells C10 through C20. You can enter the formula as := C10 + C11 + C12 + C13 + C14 + C15 + C16 + C17 + C18 + C19 + C20.

You can get the same result if you use the function instead, like = SUM(C10:C20)
Complex formulas can be created using functions. Some of the tasks can be accomplished through functions only.

Example : To display the current date and time, you have to use **TODAY()** or **NOW()** functions.

4.3.1 Categories of Functions

Excel provides you with the various categories of functions that are as below :

Arithmetic -

These functions are used for simple mathematical calculations of number data.

SUM(num1, num2, ...)
Returns the sum of all the numbers in the list of arguments.
Example : =SUM(A3,G3)

=SUM(B5:K5)

SUMIF(range, criteria, sum_range)

Adds the cells specified by a given criteria.

Range

Range - is the range of cells you want evaluated.

Criteria

Criteria - is the criteria in the form of a number, expression, or text that defines which cells will be added.

Example : =SUMIF(A1:A4,">100",B1:B4)

ABS(number)

Returns the absolute value of a number. The absolute value of a number is the number without its sign.

Number - is the real number of which you want the absolute value.

Example : =ABS(-162)
=ABS(D7)

EVEN(number)

Returns number rounded up to the nearest even integer. Regard less of the sign of number, a value is rounded up when adjusted away from zero. If number is an even integer, no rounding occurs.

Number - is the value to round.

Example : =EVEN(5.5)
=EVEN(5)
=EVEN(6)
=EVEN(-15)

EXP(number)

Returns e raised to the power of number. The constant e equals 2.71828182845904, the base of the natural logarithm.

Number - is the exponent applied to the base e.

Example : = EXP(3)

INT(number)

Rounds a number down to the nearest integer.

Number - is the real number you want to round down to an integer.

Example : =INT(6.2)

=INT(6.2)

FACT(number)

Returns the factorial of a number. .

Number - is the non-negative number you want the factorial of. If number is not an integer, it is truncated.

Example : = FACT(5)

MOD(number, divisor)

Returns the remainder after number is divided by divisor. The result has the same sign as divisor.

Number - is the number for which you want to find the remainder.

Divisor - is the number by which you want to divide number.

Example : =MOD(15, 2)
=MOD(15, -2)

PRODUCT(number1, number2, ...)

Multiplies all the numbers given as arguments and returns the product.

Number1, Number2,... - are 1 to 30 numbers that you want to multiply.

Example : =PRODUCT(B5:F5)

ROUND(number, num_digits)

Rounds a number to a specified number of digits.

Number - is the number you want to round.

Num_digits - specifies the number of digits to which you want to round number.

Example : =ROUND(96.54,0)

SQRT(number)

Returns a positive square root.

Number - is the number for which you want the square root. If number is negative, SQRT returns the #NUM! error value.

Example : =SQRT(100)

CEILING(number, significance)

Returns number rounded up to the nearest multiple of significance.

Number - is the value you want to round.

Significance - is the multiple to which you want to round.

Example : =CEILING(97.8,1)

RAND( )

Returns an evenly distributed **random number** greater than or equal to 0 and less than 1. A new random number is returned every time the worksheet is calculated. If you want to use RAND to generate a random number but don't want the numbers to change every time the cell is calculated, you can enter = RAND() in the formula bar and press F9 to change the formula to a random number.

Example : To generate a random number greater than or equal to 0 but less than 100: =RAND()*100

LOG(number, base)

Returns the logarithm of a number to the base you specify.

Number - is the positive real number for which you want the logarithm.
Base - is the base of the logarithm. If base is omitted, it is assummed to be 10.
Example : =LOG(16, 2)

Text - These functions are used to manipulate textual data.

CONCATENATE (text1, text2, ...)

Joins several text items into one text item. The "&" operator can be used instead of CONCATENATE to join text items.

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.

Example : =CONCATENATE("Soft", "ware")

EXACT(text1, text2)

Compares two text strings and returns TRUE if they are exactly the same, otherwise FALSE. It is case-sensitive but ignores formatting differences.

Text1 - is the first text string.

Text2 - is the second text string.

Example : =EXACT("poor", "pour")

FIND(find_text, within_text, start_num)

Finds one string of text within another string of text and returns the number of the character at which find_text first occurs.

Find_text - is the text you want to find.

Within_text - is the text containing the text you want to find.

Start_num - specifies the character at which to start the search. If you do not specify the start_num, it is taken as 1 - the first character of within_text.

Example : =FIND("&", "Jack & Jill")
LEFT(text, num_chars)

Returns the first (or leftmost) character or characters in a text string.

Text - is the text string containing the characters you want to extract.
Num_chars - specifies how many characters you want LEFT to return. Num_chars must be greater than or

equal to zero.

Example : =LEFT("Salesman", 5)

RIGHT(text, num_chars)

Returns the last (or rightmost) character or characters in a text string.

Text - is the text string containing the characters you want to extract.

Num_chars - specifies how many characters you want to extract.

Example : =RIGHT("Salesman", 3)

LEN(text)

Returns the number of characters in a text string.

Text - is the text whose length you want to find. Spaces count as characters.

Example : =LEN("ABRACADABRA")

LOWER(text)

Converts all uppercase letters in a text string to lowercase.

Text - is the text you want to convert to lowercase. LOWER does not change characters in text that are not letters.

Example : =LOWER("Limit")

UPPER(text)

Converts text to uppercase.

Text - is the text you want converted to uppercase. Text can be a reference or text string.

Example : =UPPER("limit")

MID(text, start_num, num_chars)

Returns a specific number of characters from a text string, starting at the position you specify.

Text - is the text string containing the characters you want to extract.

Start_num - is the position of the first character you want to extract in text. The first character in text has start_num 1, and so on.

Num_chars - specifies how many characters to return from text.

Example : =MID("Microwave", 3, 4)

PROPER(text)

Capitalises the first letter in text and any other letters in text that follow any character other than a letter. It converts all other letters to lowercase.

Text - is text enclosed in quotation marks, a formula that returns text, or a reference to a cell containing the text you want to partially capitalise.

Example : =PROPER("the high QUALITY")

REPLACE(old_text, start_num, num_chars, new_text)

Replaces part of a text string with a different text string.

Old_text - is text in which you want to replace some characters.

Start_num - is the position of the character in old_text that you want to replace with new_text.

Num_chars - is the number of characters in old_text that you want to replace with new_text.

New_text - is the text that will replace characters in old_text.

Example : =REPLACE("Near", 1, 1, "P")

SEARCH(find_text, within_text, start_num)

Returns the number of the character at which a specific character or text string is first found, reading from left to right. It is not case - sensitive.

Find_text - is the text you want to find.

Within_text - is the text in which you want to search for find_text.

Start_num - is the character number in within_text, counting from the left, at which you want to start searching.
Example : =SEARCH("L", "Quality")

TRIM(text)

Removes all spaces from text except for single spaces between words.

Text - is the text from which you want spaces removed.

Example : TRIM(" First Quarter Earnings ")

SUBSTITUTE(text, old_text, new_text, instance_num)

Substitutes new_text for old_text in a text string.

Text - is the text or the reference to a cell containing text for which you want to substitute characters.

Old_text - is the text you want to replace.

New_text - is the text you want to replace old_text with.

Instance_num - specifies which occurrence of old_text you want to replace with new_text.

Example : =SUBSTITUTE("Sale Price", "Sale", "Cost")

Date and Time - Excel stores Date and Time as serial numbers.

Though the values are displayed in the appropriate format which is recognised by the user. The functions to manipulate date and time are :

DATE(year, month, day)

Returns the serial number of a particular date.

Year - is a number from 1900 to 2078 in Microsoft Excel for Windows

Month - is a number representing the month of the year.

Day - is a number representing the day of the month.

Example : =DATE(97, 2, 12)

DATEVALUE(date_text)

Returns the serial number of the date represented by date_text. **Date_text -** is text that returns a date in a Microsoft Excel date format.

Example : =DATEVALUE("22-AUG-96")

DAY(serial_number)

Returns the day of the month corresponding to serial_number. The day is given as an integer ranging from 1 to 31.

Serial_number - is the date-time code used by Microsoft Excel for date and time calculations.
Example : =DAY("16-JAN")

MONTH(serial_number)

Returns the month corresponding to serial_number. The month is given as an integer, ranging from 1 (January) to 12 (December).

Serial_number - is the date-time code used by Microsoft Excel for date and time calculations.

Example : =MONTH("6-MAY")

YEAR(serial_number)

Returns the year corresponding to serial_number. The year is given as an integer in the range 1900-2078.

Serial_number - is the date-time code used by Microsoft Excel for date and time calculations.

Example : =YEAR("7/5/96")

WEEKDAY(serial_number, return_type)

Returns the day of the week corresponding to serial_number. The day is given as an integer, ranging from 1 (Sunday) to 7 (Saturday).

Serial_number - is the date-time code used by Microsoft Excel for date and time calculations.

Return_type - is a number that determines the type of return value.

Example : =WEEKDAY("2/12/97")

HOUR(serial_number)

Returns the hour corresponding to serial_number. The hour is given as an integer, ranging from 0 (12:00 A.M.) to 23 (11:00 P.M.).

Serial_number - is the date-time code used by Microsoft Excel for date and time calculations.

Example : =HOUR("3:35 PM")

MINUTE(serial_number)

Returns the minute corresponding to serial_number. The minute is given as an integer, ranging from 0 to 59.

Serial_number - is the date-time code used by Microsoft Excel for date and time calculations.

Example : =MINUTE("3:35 PM")

NOW( )

Returns the serial number of the current date and time.

Example : =NOW()

TODAY( )

Returns the serial number of the current date.

Example : =TODAY()

Lookup and References - These functions are used to search for the values in the table.

HLOOKUP(lookup_value, lookupref, columnno, nearest)

Searches the top row of an array for a particular value, and returns the value in the indicated cell. Use this function when your comparison values are located in a row across the top of a table of data and you want to look down a specified number of rows.

Lookup_value - is the value to be found in the first row of the table.

Lookupref - is a table of information in which data is looked up. **Columnno -** is the row number in table_array from which the matching value should be returned.

Nearest - Is a logical value that specifies whether you want HLOOKUP to find an exact match or an approximate match. If FALSE, HLOOKUP will find an exact match.

Example : = HLOOKUP("BASIC", C4:E9, 6, FALSE)

BASIC	HRA	DA
1500	600	300
1450	580	290
1700	680	340
1400	560	280
2000	800	400

VLOOKUP(lookup_value, lookupref, columnno, nearest)

Searches the leftmost column of an array for a particular value, and return the value in the cell indicated. Use this function when the comparison values are located in a column to the left or right of the data you want to find.

Lookup_value - is the value to be found in the first column of the table.

lookupref - is the table of information in which data is looked up.

Columnno - is the column number in table from which the matching value should be returned.

Nearest - is a logical value that specifies whether you want LOOKUP to find an exact match or an approximate match.

Example : = VLOOKUP(“KIM”, A4:B9, 2, FALSE)

4	NAME	AGE
5	JAMES	25
6	KIM	23
7	LOUIS	26
8	MARY	21
9	GEORGE	25

Logical -These functions are used to test the conditions. They return the logical value as TRUE or FALSE.

AND(logical1, logical2, ...)

Returns TRUE if all its arguments are TRUE; returns FALSE if one or more arguments are FALSE.

Logical1, logical2,... - are 1 to 30 conditions you want to test that can be either TRUE or FALSE.

Example : =AND(14>12, 4=4)

OR(logical1, logical2, ...)

Returns TRUE if any argument is TRUE; returns FALSE if all arguments are FALSE.

Logical1, logical2,... - are 1 to 30 conditions you want to test that can be either TRUE or FALSE.

Example : =OR(2<8, 5>3, 6=2)

NOT(logical)

Reverses the value of its argument. Use NOT when you want to make sure a value is not equal to one particular value.

Logical - is a value or expression that can be evaluated to TRUE or FALSE. If logical is FALSE, NOT returns TRUE; if logical is TRUE, NOT returns FALSE.

Example : = NOT(5>3)

IF(logical_test, value_if_true, value_if_false)

Returns one value if logical_test evaluates to TRUE and another value if it evaluates to FALSE. Up to seven IF functions can be nested

Logical_test - is any value or expression that can be evaluated to TRUE or FALSE.

Value_if_true - is the value that is returned if logical_test is TRUE.

Value_if_false - is the value that is returned if logical_test is FALSE.

Example : =IF(35>20, 35, 0)

FALSE( )

Returns the logical value FALSE.

Example : =FALSE()

TRUE( )

Returns the logical value TRUE.

Example : =TRUE()

4.3.2 Function Wizard

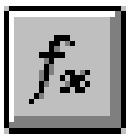
Excel also provides you with its built-in functions through Function Wizard. This guides you through all the steps of writing a function and its arguments. The results and examples are shown as you work on it. To use Function Wizard follow the given steps :

1. Enter the given data.

	A	B	C	D
1	ITEM CODE	RATE	STOCK	STOCK LEFT
2	A001	50	370	
3	A002	45	200	
4	AOO3	20	620	
5	A004	35	390	
6	A005	90	100	

2. Activate the cell D2.
3. Open the Function Wizard in either of the following ways -
   Click on the Function Wizard Tool on Standard Toolbar

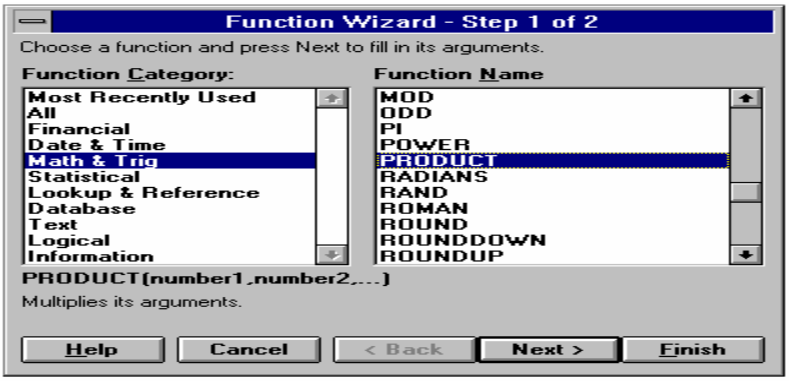
or

Choose Insert -> Function  command

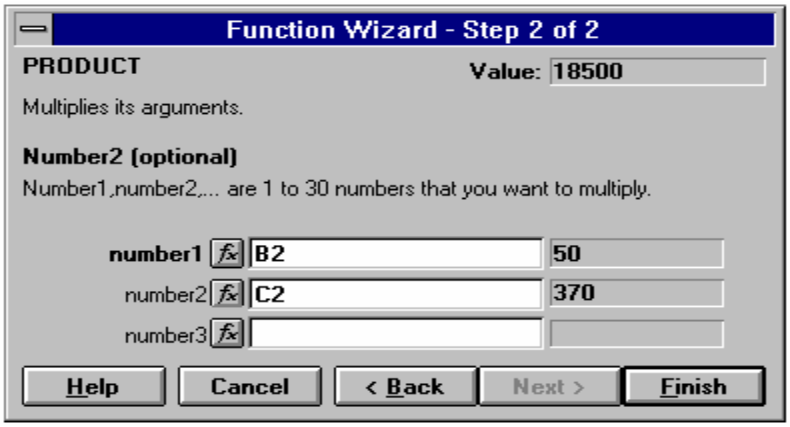
or

Press **Shift** + **F3**

4. Click on **Math & Trig in Function** Category.
5. Scroll down to choose **Product** from the list of Function Name.
   (observe that the formula is shown in the Formula Bar)



6. Click on Next button.
7. Click on cell B2 while the cursor is in **number1** box.
8. Goto **number2** box and click on cell C2.



9. Click on Finish. (The result is shown in the cell D2)

10. Copy this formula to cells D3 to D6.

4.4 Summary

In this section, you learned to enter formulas and Functions. These are very helpful in calculations and analysing data.

1. Formulas can be used with functions also to form complex equation.
2. Excel provides with the large collection of functions for different categories like text, math, logical, date and time, lookup and reference, etc..
3. Function Wizard guides you at each step to enter functions.

4.5 Exercise :

1. What is the significance of formulas in calculations ?
2. Explain the recalculation feature of MS-Excel.
3. Give the basic properties of formulas.
4. What are functions ?
5. Give two examples for each category of functions.
6. Differentiate between VLOOKUP() and HLOOKUP() functions.
7. What is Function Wizard ?