Chapter 2: Cell References and Range Names

Objective:

After completing this chapter, you will be able to know

- Meaning and usage of cell references.
- Type of cell references.
- Usage of range names.

Why Use Different Types of References?

When we copy a reference from one cell to another, it gets updated automatically. Say, we have a reference in cell C1 as A1 and we copy the same to D1, it automatically updates itself to B1. Sometimes, we need to keep a part of the used cell references as constant. This can be done using different types of cell references.

Types of Cell Reference:

There are three types of cell references as mentioned below;

1) Relative cell references
2) Absolute cell references
3) Mixed cell references

Relative Cell References

Relative references are the default cell references in Excel. When you copy and paste a relative cell reference, it is updated automatically to suit the cell in which it is pasted. For Example,

If you want to calculate HRA as 50% of basic, you can write the formula =H2*50%

Figure 2.1

HRA Calculated for an employee, you may drag the formula down till the last record, as shown in **Figure 2.2**.

Figure 2.2

> **Tips**: Select the cells to fill and Press Ctrl + D to fill the range or double click on fill handle

Absolute Cell references

When you want to freeze a cell reference or you do not want a reference to change when you copy a formula, you can use absolute cell references. To make a cell reference absolute, we place a **dollar ($)** sign before the column name and row number of the reference.

Assume you want to calculate 10% of 1000, 2000, 3000, and 4000.

Figure 2.3

If you write as above, the formula when copied to the right would change itself to **C1*B2, D1*C2** etc. However, this is not the right calculation. We would need to freeze the cell reference **A2,** such that is remains the same each time we copy the formula.

Here, **A2** need to be changed to **A2** to achieve the required output.

Figure 2.4

Tips: First select the cells from B2 to F2 and then press Ctrl+R keys. This would copy the formula from B2 in C2, D2, E2 and F2.

Once this is done, we can see that, the formula when copied gives the required output as given in **Figure 2.5.**

	A	B	C	D	E	F	G
1		1000	2000	3000	4000	5000	
2	0.1	100	200	300	400	500	
3							

Figure 2.5

Mixed Cell References

However at times you may want to freeze only the row or column in a cell reference. In the below example, we need to calculate 10%, 20%, 30%, 40% and 50% of 1000, 2000, 3000, 4000…… and so on.

	A	B	C	D	E	F
1		1000	2000	3000	4000	5000
2	0.1	=B1*A2				
3	0.2					
4	0.3					
5	0.4					
6	0.5					

Figure 2.6

If you drag the formula towards the right it changes to **C2*B3, D2*C3** etc and once dragged down it would change to **B3*A4, B4*A5**etc

However these are not the right formulae.

	A	B	C	D	E	F
1		1000	2000	3000	4000	5000
2	0.1	=B1*A2	=C1*B2	=D1*C2	=E1*D2	=F1*E2
3	0.2	=B2*A3	=C2*B3	=D2*C3	=E2*D3	=F2*E3
4	0.3	=B3*A4	=C3*B4	=D3*C4	=E3*D4	=F3*E4
5	0.4	=B4*A5	=C4*B5	=D4*C5	=E4*D5	=F4*E5
6	0.5	=B5*A6	=C5*B6	=D5*C6	=E5*D6	=F5*E6
7						

Figure 2.**7**

If we observe **Figure 2.7** closely, we can see that, if we need to get the right answer, we would need to freeze the row number of **B2** (as it is common for all the formulae right and down) and the column name for **A3** (As it is common for all the formulae towards right and down). When copied, the resultant formulae would be as given in **Figure 2.8**.

Figure 2.8

And the answer would be as given in **Figure 2.9.**This type of references where either the row or the column number is frozen are called Mixed Cell References.

Figure 2.9

Press F4 key in cell reference

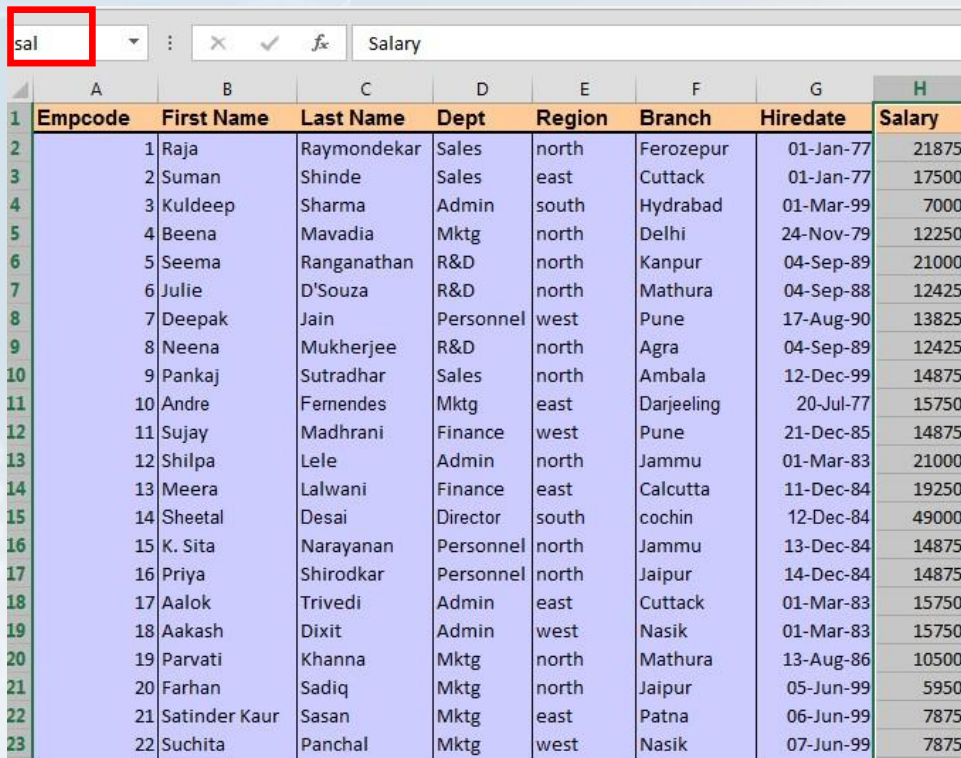|	
One Time	A3
Second Time	A$3
Third Time	$A3
Fourth Time	A3

Named Ranges

Many a times, when we write formulas/functions, we need to select a range of cells. However, doing this can be time consuming. Excel allows us to use a cell or a group of cells by its name. E.g. **Sum(Basic)** sounds much easier compared to **sum(H2:H101)**.However to do this, first we would need to name the range **H2:H10** as **Basic**.

Creating a Named Range

To name a range, we may use one of the following procedures

1) Select the range (e.g.: H2:H101) and type the name (e.g.: Sal) in the name box (see **Figure 2.10**).

2) If you want to name the cells with the value in one of the cells, you may select the range along with the name, click on "Create from Selection" in the Formulas Tab, select one of the options and click Ok.

3) You may also create a named range by clicking on "Define name" in Formulas Tab. Write the name for the range in the name box , click on the refers to box, select the range you wish to name and click Ok.

Figure 2.10

Now you may use the name instead of the range anywhere in the workbook. The usage of named range can be seen in **Figure 2.10**

Editing or Deleting

Sometimes we would redefine a named range. from Formulas Tab. In the "Name Manager". It gives Dialog box as shown in

Named Ranges

need to rename or This can be done "Formulas" Tab, click a Name Manager **Figure 2.12.**

Figure 2.11
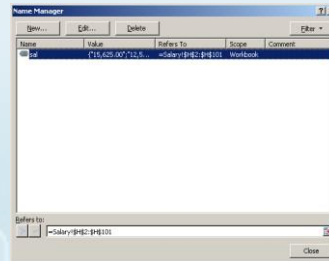

Figure 2.12

To edit a named range, click on the Named Range that you want to edit and click on the Edit button. An Edit Name dialog box as shown in **Figure 2.13** appears where you may rename or redefine the range name.
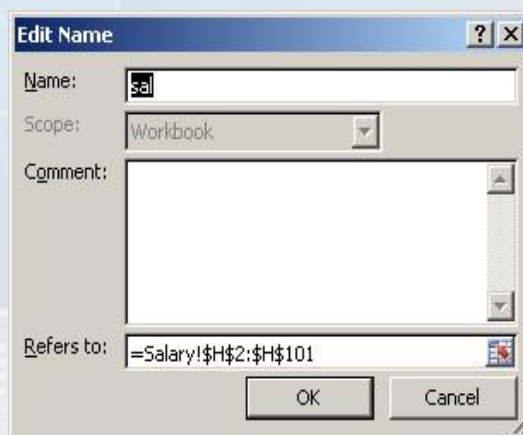

Figure 2.13

To delete a range, select the range from the Name Manager list and click Delete.

Tips: Press Ctrl + F3 to get a Name Manager dialog box

Objectives

In this chapter we would learn

- Effective usage of formulae and functions.
- If Functions.
- Logical Functions.

Using Formulas in a Worksheet

Formulas are equations that perform calculations on values. A formula starts with an equal sign (=). It contains at least two operands and at least one operation. For example, the following formula multiplies 2 by 3 and adds 5 to the result.

=5+2*3

Operand in a formula can be functions, references or constants. Operators may be any arithmetic or logical operator.

> **Note**: Excel follows BODMAS rule to solve a formula when multiple operators are involved.

Array Formulae

Observe Figure 3.a. Here we have quantity and price of five products. We need to find the Total Sales which is the result of adding together the product of quantity and price for all products. In a normal scenario we would individually calculate the amount for each product and add them to get the answer. However, to make things simpler we may also use Array Formulae.

Select **B8** and write sum (**A2:A6*B2:B6)** and press **Ctrl + Shift + Enter** key combination to fill the formula **{=sum(A1:A3*B1:B3)}** in the selected cell (**Figure 3.2**). This calculates quantity*price for all the products in the cell B8.

> **Note**: Curly Brackets ({}) around the formula indicates that it is applied to an array.

Using functions

Performing calculations on each value in a range of cells can be complicated and time-consuming. Forexample, if you have a range consisting of 20 cells, a formula that adds each of these values will be very long. Excel Functions simplify complex tasks. A function is a predefined formula that performs a specific calculation or other action on a number or a text string and returns a value. You may specify the values on which the function performs calculations.

The syntax of a function begins with the function name, followed by an opening parenthesis, the arguments for the function separated by commas and a closing parenthesis. If the function starts a formula, type an equal sign (=) before the function name. As you create a formula that contains a function, the Formula Palette will assist you.
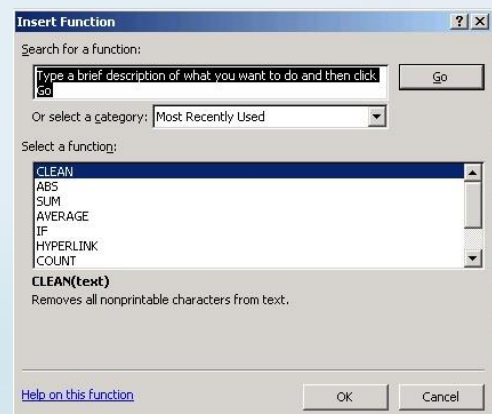
Figure 3.3

> **Tips**: From an empty cell, you may click on the **fx** symbol near the formula bar to see all the available functions in excel.

The syntax of a function is as follows

> **=Function name (argument1, argument2, ….)**

Example:

=SUM (A10, B5: B10, 50, 37)

You don't need to memorize all the functions available and the arguments necessary for each function. Instead, you can use Sigma sign (**Σ**) which is used for sum or click on the drop down for some more function like Max, Min, etc. Excel prompts you for required and optional arguments.

> **Tips**: You can use "Alt + =" key combination to get the sum function on your worksheet.

IF function

In Chapter 2, we have seen how to calculate the income heads like HRA and DA. The formula we saw was the same for the entire database. However, sometimes we need to decide the formula to apply in a cell according to certain conditions. For example, incentives may be calculated according to the department. This is where conditional functions like "IF" come in to the picture.

You can use the IF function to evaluate a condition. The **IF** function returns different values depending on whether the condition is true or false. The syntax for the IF function is:

> **If(logical_test, [Value_if_true], [Value_if_false])**

The first argument is the condition that you want the function to evaluate.The second argument is the value to be returned if the condition is true and the third argument is the value to be returned if the condition is false. Second and third parameters are optional.

Nested IF

A Nested IF function is when a second IF function is placed inside the first in order to test additional conditions.

The syntax for the Nested IF function is:

If(logical_test, [Value_if_true], If(logical_test, [Value_if_true], [Value_if_false]))

Examples:

You can use nested IF functions to evaluate complex conditions. For example, if the Salary <5000 then tax is 5%, if salary between 5000 and 1000 then it is 10% else 15%.

Since we have already given name range to salary column as sal so one can also use sal instead of h2

=if(sal<5000,salary*.05,if(sal<10000,salary*.10,sal*.15))

Suppose you want to assign letter grades to numbers referenced by the name Average Score. See the following table.

If Average Score is	Then return
Greater than 89	A
From 80 to 89	B
From 70 to 79	C
From 60 to 69	D
Less than 60	F

You can use the following nested IF function:
IF(AverageScore>89,"A",IF(AverageScore>79,"B",IF(AverageScore>69,"C",IF(AverageScore>59, "D","F")

)))

Tips: You can nest up to sixty four levels of If functions in a single formula.

IF with AND

AND is a logical function in excel which returns the combined truth value of two arguments or conditions. It returns false only when all the conditions listed are false.

Syntax

AND(logical1, logical2...)

If there is a scenario where we have two conditions whose combined truth value would decide the output of an IF function, we can use AND with IF.

Syntax using AND with If

> **If(and(Condition1, condition2....), True, False)**

Example:

If we need to give 10% of his basic salary as incentive to every one working in "Sales" department "North" region, we would use the following formula.

> **=IF (AND (Department="sales", Region="north"), 10%*Basic Salary, 0)**

IF with OR

OR is a logical function in excel which returns False if any one of the arguments returns false.

Syntax

> **OR(logical1, logical2...)**

If there is a scenario where we have two conditions of which any one of the conditions is false, the if should return the value in the false argument, we may use OR with IF.

Syntax using OR with If

> **If(OR(Condition1, condition2....), True, False)**

Example:

If the employee is in Sales, Mktg or Hrd, then hra is 50% of Basic salary otherwise, it is 30% of Basic salary. **if(or(Department ="Mktg",Department ="Sales",Department="Hrd"),Basic salary*.5,Basic salary*.3)**

IF with NOT

Not is a logical function used to negate an argument.

Syntax

> **NOT(logical)**

If we have a condition which when not satisfied we need to apply the formula, we may use **NOT** with

IF.

Syntax using NOT with If

> **If(NOT(Condition), True, False)**

Example:

If we need to give an incentive to everyone but people working in the "Marketing" department we may use the following formula.

IF(NOT(Department="Mktg"),10%*salary,0)

> **Tips**: There can be maximum 255 conditions which can be passed to AND/OR function and we can pass only one condition to NOT.

We may also use multiple not inside if.

Example

If you need to give an incentive to everyone but people from the sales ad admin department, you may use the following function.

If(and(not(department="Sales"),not(department="admin")),10%*salary,0)

Lookup Functions

Sometimes, we need to search for a value in a database based on a lookup value. For example, given Employee Id, how can I look up the incentive value from some other sheet or some other file? In such scenarios, depending on the source database, we may use one of the following lookup functions.

1) V-lookup (If the database is vertical as in **Figure 3.6**)
2) H-lookup (If the database is horizontal as in **Figure 3.7**)

S/N	FUNCTION	CATEGORY	DESCRIPTION	USAGE
01	AND	Logical	Checks multiple conditions and returns true if they all the conditions evaluate to true.	=AND(1 > 0,ISNUMBER(1)) The above function returns TRUE because both Condition is True.
02	FALSE	Logical	Returns the logical value FALSE. It is used to compare the results of a condition or function that either returns true or false	FALSE()
03	IF	Logical	Verifies whether a condition is met or not. If the condition is met, it returns true. If the condition is not	=IF(ISNUMBER(22),"Yes", "No")

			met, it returns false. **=IF(logical_test,[value_if_true],[value_if_false])**	22 is Number so that it return Yes.
04	IFERROR	Logical	Returns the expression value if no error occurs. If an error occurs, it returns the error value	=IFERROR(5/0,"Divide by zero error")
05	IFNA	Logical	Returns value if #N/A error does not occur. If #N/A error occurs, it returns NA value. #N/A error means a value if not available to a formula or function.	=IFNA(D6*E6,0) N.B the above formula returns zero if both or either D6 or E6 is/are empty
06	NOT	Logical	Returns true if the condition is false and returns false if condition is true	=NOT(ISTEXT(0)) N.B. the above function returns true. This is because ISTEXT(0) returns false and NOT function converts false to TRUE
07	OR	Logical	Used when evaluating multiple conditions. Returns true if any or all of the conditions are true. Returns false if all of the conditions are false	=OR(D8="admin", E8="cashier") N.B. the above function returns true if either or both D8 and E8 admin or cashier
08	TRUE	Logical	Returns the logical value TRUE. It is used to compare the results of a condition or function that either returns true or false	TRUE()

Figure 3.6

Figure 3.7