

LEARNING IN THIS CHAPTER

- Formulas and its Elements
- Basic Formula and Compound Formula
- Text Formula and Using a Range in Formula
- Types of Cell References: Relative, Absolute, and Mixed
- Cell Reference of another Worksheet
- Naming and Changing Colour of a Sheet tab
- Functions and Rules to enter a Function
- Using Common Functions, Formula Errors

In previous class, you have learnt about various editing and formatting features of Microsoft Excel. In this chapter you will be learning how to perform calculations in Microsoft Excel using formulas.

FORMULAS are used to perform calculations involving addition, subtraction, division and multiplication. It establishes a relationship between two or more cells. A formula is an expression that can include cell addresses, numbers, arithmetic operators and parenthesis. We can perform simple as well as complex calculations using functions.

Formula must begin with equal to (=) symbol followed by cell references and operators. It may contain a few or all the mentioned elements.

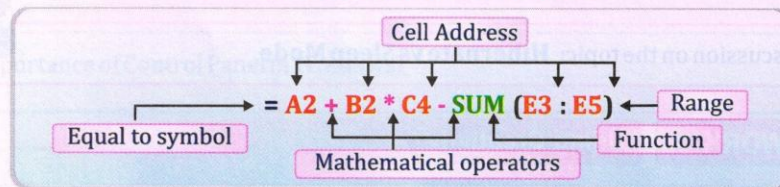
References : A cell or a range of cells that you want to use in your calculation.

Operators : Symbols (+, -, *, ^, %, \$, #, etc.) that specify the calculation to be performed.

Constants : Numbers or text values that do not change.

Functions : Predefined formulas in Excel.

ELEMENTS OF FORMULAS IN EXCEL



CREATING A BASIC FORMULA

Basic formulas involve only one operator in a formula. Let us calculate the sum of the numbers in B4, B5, ... B9 and display the result in B11.

Follow the steps:

- ◆ Click on the cell B11 where you want to display the total. Type = sign.
- ◆ Click on the cell B4. The address will appear in cell B11. Type + sign after that.
- ◆ Further repeat the steps till B9 or Type: =B4+B5+B6+B7+B8+B9 in B11.
- ◆ Press the Enter key. Cell B11 will display the total of all the values from B4 to B9.

Month	Sales	Expenses	Incentive Amount	Actual Expenses
Jan	1,000			
Feb	2,000			
Mar	15,000			
Apr	3,000			
May	1,900			
Jun	2,000			
Total	=B4+B5+B6+B7+B8+B9			

Figure 3.1: Using Basic Formula

USING COMPOUND FORMULA

Compound formulas are used when you need more than one operator to perform calculation. Let us calculate the Simple Interest using the formula 'P * R * T/100'. Enter the data as shown in the Figure 3.2. Follow the given steps:

- Click on the cell B6 and type =.
- Click on the cell B2. The cell address B2 appears in the cell B6.
- Type * sign and click on the cell B3.
- Type * sign in B6 and click on the cell B4. Type / sign and 100 in the cell B6. Press the Enter key. The cell B6 displays the calculated result of Simple Interest.
- Note that the result appears in the cell, but the actual formula appears on the Formula bar.

	A	B	C
1			
2	Principal	4500	
3	Rate	5	
4	Time (in year)	3	
5			
6	Simple Interest	=B2*B3*B4/100	
7			

Figure 3.2: Using Compound Formula

Let's Know More

Formulas in Microsoft Excel are not case sensitive i.e., B5 is same as b5.

Know the Fact

A range spans a cell or a group of cells adjacent to each other on a worksheet. The range can be used in formulas.

USING TEXT FORMULA

We can perform addition on character and string data type. Except for addition, other operations like subtraction, multiplication, division, etc., are not allowed. We use the ampersand symbol (&) for addition. Joining two or more text values together is called **Concatenation**. Follow the steps given below:

- Enter two string type values in cell A1 and B1, say **Kips** in A1 and **India** in B1.
- Enter the formula = "Kips"&"India" in cell C1 and press Enter.
- It will display Kips India in the cell C1.

	A	B	C	D	E	F
1	Kips	India	KipsIndia			

NOTE

In Formula bar, type the text within double quotes in order to create a text value. If you want to leave a blank space after each word, then leave a space before closing the double inverted commas.

For example: " I "&" Love "&" Computer "
I Love Computer

Quick View

To enter or modify a formula in a cell, you can also press F2 after selecting the cell.

Let Us Recall

In Microsoft Excel, how do we define formulas?

USING A RANGE IN FORMULA

You can assign multiple cells to a formula by creating a reference or a range. Use of a range saves a lot of time. For example, if you want to calculate the sum of columns or rows, it is always better to define a range.

- Type the data as shown in the Figure 3.3, click on the cell B11 and type the formula =SUM (B4:B9).
- Press the Enter key. The Sum value will be displayed in the cell B11.

	A	B	C	D	E
1		Incentive Percentage			
2		Charity Amount			
3	Month	Sales	Expenses	Incentive Amount	Actual Expenses
4	Jan	1,000	200		
5	Feb	2,000	100		
6	Mar	15,000	300		
7	Apr	3,000	250		
8	May	1,900	175		
9	Jun	2,000	275		
10					
11	Total	=SUM(B4:B9)			

Figure 3.3: Using a Range in Formula



Quick View

To copy the formula from the above cell, press Ctrl + ' (apostrophe).

- ◆ Similarly, calculate sum in the cell C11.



Range basically shortens the length of the formula. For example, if you wish to add values from B4 to B9 you can either write as =SUM(B4,B5,B6,B7,B8,B9) or =SUM(B4:B9)

➔ TYPES OF CELL REFERENCES

The cell address in the formula is known as the cell reference. For example, A1, B6, etc., where A denotes the Column name and 1 denotes the Row number. With references, you can use the data from different parts of the worksheet. There are three types of cell references:

RELATIVE REFERENCE

When you create a formula, references to a cell or ranges are usually based on the position relative to the cell. When you copy or move the formula to other cells, the reference cell automatically gets changed. For example, if the formula in A3 is =A1+A2 and when you copy the formula from A3 to B3, Excel automatically changes the reference to match the location of cells, i.e., =B1+B2. Follow these steps:

- ◆ Select the cell B11, in which formula =SUM(B4:B9) is written. Click on the **Copy** button.
- ◆ Select C11. Click on the **Paste** button.
- ◆ Note that C11 has the cell reference from C4 to C9 instead of B4 to B9.

Month	Sales	Expenses	Incentive Amount	Actual Expenses
Jan	1,000	200		
Feb	2,000	100		
Mar	15,000	300		
Apr	3,000	250		
May	1,900	175		
Jun	2,000	275		
Total	24,900	1,300		

Figure 3.4: Using Relative Reference

ABSOLUTE REFERENCE

Absolute reference is used when we do not want to change the address of the cell on copying the formula to another cell. To make absolute reference of a formula, add dollar (\$) sign before the column and row number =**\$A\$1+\$A\$2** is an example of Absolute Reference. Let us calculate the incentive at the rate of 10% on monthly sales.

- ◆ Type 10% in cell D1.
- ◆ Click on cell D4.
- ◆ Type =B4*\$D\$1 and press the Enter key.
- ◆ The cell D4 displays the value 100. The first cell address has no dollar sign, so it is relative reference and the second cell address is fully absolute. Therefore when the cell is copied, the first one will change the reference in the new location but second will remain the same i.e., \$D\$1.
- ◆ Now copy the formula when the pointer changes to a copy pointer (+) symbol. Drag the selected formula to the rest of the cells.

Month	Sales	Expenses	Incentive Amount	Actual Expenses
Jan	1,000	200	100	
Feb	2,000	100	200	
Mar	15,000	300	1,500	
Apr	3,000	250	300	
May	1,900	175	190	
Jun	2,000	275	200	
Total	24,900	1,300	2,390	

Figure 3.5: Using Absolute Reference

MIXED REFERENCE

It is a combination of Relative and Absolute reference. In this type of reference, either row or column has to remain fixed. \$A1 + A\$2 is an example of Mixed Reference. Let us calculate the actual monthly expenses:

- ◆ Type 50 in cell D2. Click on cell E4.

- Type $=\$C4-D\2 . Press the Enter key.
- You can calculate the Actual Expenses of other cells by dragging the mouse pointer to rest of the cells when pointer changes to a copy pointer symbol.

tip Range names are not case sensitive. The first character must be a letter, an underscore or a backslash. The range name must not be the same as a cell address.

Month	Sales	Expenses	Incentive Amount	Actual Expenses
Jan	1,000	200	100	=C4-D\$2
Feb	2,000	100	200	
Mar	15,000	300	1,500	
Apr	3,000	250	300	
May	1,900	175	190	
Jun	2,000	275	200	

Figure 3.6: Using Mixed Reference

Let's Know More
The easiest way to define names for cells is to click on the Name Box at the left end of Formula Bar. Type a name for the range and press Enter.

CELL REFERENCE OF ANOTHER WORKSHEET

You can use the cell reference of one worksheet in another worksheet. This can be done in two ways.

USING COPY-PASTE OPTION

- Click on the Sheet2 tab and enter the data as shown in the figure.
- Click on the Sheet1 tab. Now, click on cell B11 where the SUM function is used.
- Copy the formula using **Ctrl+C**.
- Click on the Sheet2 tab and click on cell B11. Paste the formula using **Ctrl+V**.

Month	Salary
Jan	20000
Feb	35000
Mar	25000
Apr	27000
May	46000
Jun	32000
Total	185000

Figure 3.7: Using Copy and Paste Option

Quick View
To get the total of adjacent cells, press **Alt += (Equal)** key combination, instead of clicking **AutoSum** button.



USING SHEET REFERENCE

uses sheet number, exclamation mark and cell address. For example, Sheet1!D4. Let us try to use the Sheet reference.

- Click on the cell C4 of Sheet 2.
- Type $=B4+Sheet1!D4$ to add the 'Incentive Amount' of cell D4 of Sheet1 with Salary of the cell B4 of Sheet2. Press the Enter key.
- You can calculate the Total salary for other cells by dragging the mouse pointer to rest of the cells when pointer changes to a copy pointer symbol.

Month	Salary	Incentive Amount
Jan	20000	=B4+Sheet1!D4
Feb	35000	
Mar	25000	

Figure 3.8: Using Sheet Reference

Let's Know More
Microsoft Excel follows the **BEDMAS** rule to evaluate the mathematical expression. Excel uses this method automatically when a formula contains more than one operator.

NAMING A SHEET TAB

By default, Excel displays three sheets in a worksheet named as Sheet1, Sheet2 and Sheet3. But we can add as many sheets as we require. We can assign any name to these Sheet tabs.

Know the Fact
If you want to calculate the sum of multiple cells that are not in a range, separate each cell address by a comma. E.g., $=SUM(C4, C6, D8)$

- ◆ Right-click on the 'Sheet2' tab in the worksheet.
- ◆ A shortcut menu will appear. Click on the **Rename** option.
- ◆ The cursor will appear in Sheet2 tab. Type "KIPS" and press the Enter key.
- ◆ Note that the name of the Sheet2 has been changed to "KIPS".

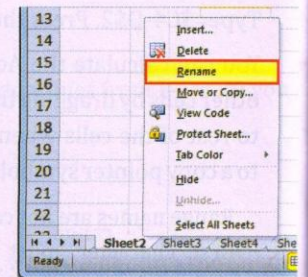


Figure 3.9: Naming a Sheet Tab

➔ CHANGING COLOUR OF A SHEET TAB



Figure 3.10: Applying Tab Color

- ◆ Right-click on the 'Sheet2' tab and select **Tab Color** option from the shortcut menu.
- ◆ Select any colour from the displayed choices and observe the change.

➔ FUNCTIONS

Functions are pre-designed formulas in Excel to perform both simple and complex calculations. Functions save time and eliminate the chance to write wrong formulas. They accept the Arguments and Return Values.

Arguments are input to functions, which accept values as numbers or text etc. The values are given within parenthesis. Return values display the Function output.

➔ RULES TO ENTER A FUNCTION

- ◆ All Excel functions must begin with = sign.
- ◆ Function name must be a valid Excel name. For example, SUM, AVERAGE.
- ◆ Function name must be followed by opening and closing parenthesis.
- ◆ Parenthesis contain arguments within it. For example, =SUM (A1:A5).

S.No.	Functions	Purpose
1.	SUM(range)	Gives the sum of a range.
2.	AVERAGE(range)	Finds the average of a range.
3.	ODD(number)	Returns the number rounded up to the nearest odd integer.
4.	INT(number)	Rounds a number to the nearest integer.
5.	Product(range):	Multiplies the values in a range of cells.
6.	ROUND(number, num_digit)	Rounds a number to the specified digits.
7.	EXP(number)	Returns (natural logarithm) raised to the power of a number.
8.	SQRT(number)	Returns a square root.
9.	POWER(number, power)	Returns the result of a number raised to some power.
10.	MOD(number, divisor)	Returns the remainder after a number is divided by the divisor.

USING THE AVERAGE FUNCTION

- Click on the cell where you want to place the average of values. Let us say E6.
- Type equal to sign (=). Type the function name AVERAGE.
- Type '(' i.e., the 'open parenthesis symbol'.
- You want to calculate the average of values of the range C6 to D6. Click on the cell C6 to define the starting cell of the range. The cell address C6 will appear within parenthesis.
- Drag the mouse pointer to cell D6.
- Formula bar or the cell E6 will display =AVERAGE(C6:D6).
- Type the 'closing parenthesis symbol' i.e., ')' and press the Enter key. The cell E6 will display the calculated result.

Student Progress Report			
	Marks		
	Oral(100)	Written(100)	
6	Anuj	80	75
7	Arshia	97	98
8	Naveen	65	70
9	Kahitij	90	85
10	Sarushi	73	65
11	Arpit	77	89
12	Muskan	40	60

Figure 3.11: Using Average Function

Know the Fact

The common functions like Sum, Average, Count Numbers, Max, Min, can be used using drop-down arrow of AutoSum button.

To use other functions, click on **More Functions** option.



COMMON FUNCTIONS

MAX()

It is used to find the largest value in the given range.

- Click on the cell F4 and type =MAX(B4:E4) and press the Enter key.
- The maximum value in the range B4:E4 will be displayed in the cell F4.

Month	Sales	Expenses	Incentive amount	Actual Expense
4 Jan	1000	200	100	150
5 Feb	2000	100	200	50
6 Mar	15000	300	1500	250
7 Apr	3000	250	300	200
8 May	1900	175	190	125

Figure 3.12: Using Max and Min Function

Let's Know More

To copy the formula to all cells in the selected range, press F2 and then press **Ctrl + Enter** key.



Similarly, **Min()** finds the lowest value in the range and **count()** will count the number of elements in a given range (elements, like words, numbers, etc).

TODAY()

It is used to display the current date.

- Type =**TODAY()** in the cell and press the Enter key.
- The **TODAY()** function will display the current date in the selected cell.

Similarly, you can insert the current day, month, and year in a cell.

To display the values in number form:

- For month: =**MONTH(TODAY())** For year: =**YEAR(TODAY())**
- For day: =**DAY(TODAY())**

To display the values in text form:

- For month: =**TEXT(TODAY(),"MMM")** For day: =**TEXT(TODAY(),"DDDD")**



Let's Discuss

Relative vs Absolute Cell Reference.



FORMULA ERRORS

In Microsoft Excel, if any formula is entered incorrectly, then Excel displays an error message instead of the value and assists you in identifying and fixing the problem. Some of the common errors along with their possible reasons are listed below.

This error occurs if the column is not having enough space to accommodate the value.

Error

	A	B	C
1	7,00,000		
2	#####		
3	500,000		
4			

It occurs if the formula is used incorrectly.

#NAME? Error

	A	B	C
1	4		
2			
3	3		
4	#NAME?		

#VALUE Error

	A	B	C
1	4		
2	5		
3	Hi		
4	#VALUE!		

It occurs if the formula contains invalid data.

#DIV/0! Error

	A	B	C
1	4		
2	0		
3	#DIV/0!		
4			

This error occurs if the number is divided by zero.



Recap of the Chapter

- Formulas are used to perform calculations involving addition, subtraction, division and multiplication. It is an expression that can include cell addresses, numbers, arithmetic operators and parenthesis.
- The cell address in the formula is known as cell reference. There are three types of cell references: Relative, Absolute and Mixed.
- You can assign multiple cells to a formula by creating a reference or a range.
- Functions are pre-designed formulas in Excel to perform both simple and complex calculations.
- In Microsoft Excel, if any formula is entered incorrectly, then Excel displays an error message instead of the value and assists you in identifying and fixing the problem.

Brain DEVELOPER

A. Fill in the blanks:

- Formulas are used to perform
- A formula always begins with an sign.
- The cell address in a formula is also called
- The cell address in a formula that does not change on copying is considered as
- To use the Sheet reference, you need to enter sheet number, and

6. _____ are input to functions, which accept values as number or text.

7. A function must be followed by opening and closing _____

HINTS

- =
- Cell reference
- Exclamation mark
- Parenthesis
- Arguments
- Cell address
- Absolute reference
- Calculations

B. State True or False:

1. Formulas must begin with ? sign.
2. In Absolute Referencing, the relative position of rows and columns changes where you copy a formula.
3. Combined Reference is a type of cell reference.
4. In Absolute Referencing, '\$' sign is used before the cell co-ordinates.
5. A range can be used in a formula.
6. Sheet tab cannot be renamed.
7. SUM function is used to find sum of values.

C. Application Based Questions:

1. A Sports teacher has measured the height of the students in a class. Saumya has been given the assignment to find the maximum and minimum height of the students. Suggest the function, which she should use to accomplish the task.

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2. Ms Priya and her friends got a raise of 10% in their salaries. Find the total amount if the present salary is ₹15,000. Calculate the salary by using the formula.

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D. Multiple Choice Questions:

1. To use the Sheet reference, which address is appropriate out of the following options.

- a. D4! Sheet1 b. Sheet1, D4 c. Sheet1! D4

2. Which key combination is used to get the total of adjacent cells?

- a. SUM() b. Ctrl + ' c. Alt + =

3. Which function finds the largest number in a range?

- a. Average () b. Count () c. Max ()

4. Which function returns the remainder after a number is divided by the divisor?
a. MOD b. POWER c. SUM
5. Which of the given cell reference can be included in relative reference?
a. \$D6 b. A3 c. A\$1

E. Answer the following:

1. What is a Formula? Explain with the help of examples.

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2. What is Cell Reference? Mention its types.

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3. What do you know about Absolute Reference? Explain with the help of an example.

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4. How will you rename a Sheet tab?

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5. What is a Range?

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6. What do you mean by Function? Name some of the functions.

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7. What are the rules to enter a function?

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