

2

FORMULAS, FUNCTIONS AND CHARTS IN EXCEL



Your Aim

to learn about:



- Formula basics
- Cell referencing in formulas and its types
- Charts in Excel
- Order of operation
- Functions

INTRODUCTION

In this chapter, you will learn how to create a basic formula in Excel. One of Excel's most useful feature is that it allows users to create formulas in order to perform calculations on data. Excel also contains built-in formulas called **functions** that make it easy to perform common calculations on data.

FORMULA BASICS

Formulas in MS Excel begin with an equals (=) sign. When the contents of a cell begin with equal to sign, MS Excel understands that user has given a formula here. If you don't enter the equals sign, Excel will treat your entry as text and the calculation will fail.

To show how formulas work, we'll begin with a simple exercise by selecting blank cell A1.

Then type = 5 + 5, and press Enter key. As you press the Enter key, Excel performs the calculation and produces the result as 10 in cell A1.

Enter some more formula in other cells and see what results are shown by Excel.

1. =8 - 5 2. =8 * 5 3. =8/5 4. =8 ^ 5

The results will be 3, 40, 1.6 and 32768 respectively.

Some formulas based on BEDMAS rule can be entered as:

1. =(8 + 5) - (2 + 3) ^ 2 2. =(9/3) * (4 ^ 2) - 5

Clickipedia

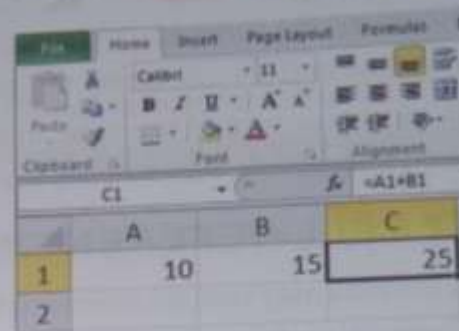
MS Excel follows BEDMAS rule for doing mathematical calculations, where B stands for Brackets, E for Exponentiation, D for Division, M for Multiplication, A for Addition and S for Subtraction.

You can also use cell addresses to perform calculation in the following way:

	A	B	C
1	10	15	=A1+B1

Notice that when the cell C1 is selected in the **Formula bar** shows the formula you just typed.

- * What appears in the cell is the **result**.
- * What appears in the formula bar is the value, which is a formula in this case.



	A	B	C
1	10	15	25
2			

TECH

FUNDA

You can also calculate the sum of adjacent cells by pressing the **Alt+=** keys together after selecting the cells.

The elements of a formula are:

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

Operators – Symbols (+, -, *, /, ^, \$, %, etc.) that specify the calculations to be performed.

Constants – Numbers or text values that do not change.

Copying a Formula

There are two methods to copy a formula:

Using the Fill Handle

- * Select the cell that contains the formula, then position the mouse pointer over the lower-right corner of the cell until the black cross (+) appears.
- * Drag the fill handle over the cell or cells to which you want to copy the formula, then release the mouse button.

Using Copy and Paste

- * Select the cell that contains the formula, and on the **Home** tab, click **Copy**.
- * Select the cell or cells that you want to copy it to.
 - To copy the formula and any formatting, on the **Home** tab, click **Paste**.
 - To copy the formula only, on the **Home** tab, click on drop-down arrow of **Paste** tool and select **Paste Special**, and then select **Formulas** and click on OK button.

ORDER OF OPERATION

When performing calculations using a formula, Excel follows certain rules of precedence:

- * Excel calculates expressions within parentheses '(' , ')' first.
- * Excel calculates multiplication and division before addition and subtraction.
- * Excel calculates consecutive operators with the same level of precedence from left to right.

For example, the formula $= 10 + 10 * 2$ gives a result of 30 as Excel multiplies 10 by 2 and then adds 10.

However, the formula $= (10 + 10) * 2$ produces a result of 40. This is because Excel calculates the expression $(10 + 10)$ within the parentheses first. It then multiplies by 2. If you are unsure of the order in which Excel calculates, use parentheses even if the parentheses aren't necessary. Parentheses also make your formulas easier to read.

CELL REFERENCING IN FORMULAS AND ITS TYPES

A formula may contain reference to contents of other cells. In such case, the result of the formula depends on the values in the referenced cells. The contents of cell where referencing has been used change automatically when the values in the referenced cells change.

To see how this works:

- * Enter **10** in cell **A1**
- * Now select cell **A2**
- * and type $=A1*2$, and
- * press **ENTER** key.

The value in cell **A2** is **20**.

If you change the value in cell A1 from 10 to any value, the value in cell A2 will also change.

Cell references are especially helpful when you create complex formulas.

There are three types of cell references used in Excel:

Relative References

In relative reference, you actually refer to cell that is above or below or left or right to a number of rows or columns.

For example, if you refer to cell **D2** from **F2**, you are actually referring to a column that is two columns to the left of cell **D2** and in the same row (the second '2' row).

When a formula that possesses a relative reference is copied from one cell to another cell, the value in the copied cell also changes, i.e., if you copy a formula $= C2 + D2$ from **E2** to the cell **F2**, then formula in **F2** adjusts in such a way that when the cell **F2** is dragged downwards by one row, the formula automatically changes to $= C3 + D3$ and places the resulting value of $C3 + D3$ in cell **F3**.

Absolute References

In case, if you wish to maintain the original references as they were, then you should make use of the absolute references. If you want to make the above example retain the original reference when it is copied, then you should precede the columns reference and the row reference by a Dollar (\$) symbol, i.e., you should use the formula as $= \$C\$2 + \$D\2 so that when you copy the formula the original reference is retained.

For example, if you copy or fill an absolute reference in cell **B2** to cell **B3**, it stays the same in both cells $= \$B\2 .

Mixed References

In some situations, you may need to make the cell reference as 'Mixed' reference, so that you can lock either a column or a row by preceding it with a Dollar (\$) symbol. It is basically a combination of relative and absolute references.

For example if you use a formula as = **\$D\$4 + E4**, then you are making the value that is present in cell **D4** as absolute and the value in cell **E4** as Relative.

References to Other Worksheets

You can refer to cells in other worksheets within the same workbook just as easily as you refer to cells in the same worksheet.

For example, to enter a reference to cell **A2** in **Sheet2** into cell **A1** in **Sheet1**, do this:

- * Select cell **A1** in **Sheet1**, and type an equals (=) sign.
- * Click the **Sheet2** tab.
- * Click cell **A2**, and then press **Enter** key.

After you press **Enter** key, **Sheet1** is now active. Select cell **A1**, and you will see that it contains the formula = **Sheet2! A2**.

The exclamation point separates the worksheet portion of the reference from the cell portion.

TECH

FUNDA

Pressing **[F4]** repeatedly over a reference (cell) will allow you to switch between making the column, the row, or nothing 'Absolute'.

Other Workbook References

You can refer to cells in worksheets in other workbooks in the same way you refer to cells in other worksheets within the same workbook. These references are called **external references**.

For example to enter a reference to **Book2** in **Book1**, follow these steps:

- * Create two workbooks named **Book1** and **Book2**.
- * Select cell **A1** in **Sheet1** of **Book1**, and type an equals (=) sign.
- * Switch to **Book2** by pressing **Alt + Tab** keys from the keyboard. Click to select cell **A2**.
- * Press **Enter** keys.

After you press **Enter** key, your formula in **Book1**, Cell **A1**, should be

= **[Book2] Sheet1! \$A\$2**.

This reference has 3 parts:

1. The workbook **Book2** in square brackets,
2. The worksheet **Sheet 1** followed by ! sign
3. The cell having absolute reference.

Hence, referencing cells in external workbooks is done by selecting the workbook, then worksheet, and then the cell you want to link reference to.

FUNCTIONS

Functions are predefined formulas in Excel to perform both simple and complex calculations. They accept arguments and return values. Arguments are input to functions. These values can be number or text. The values are given in parenthesis. Return values display the function output.

Rules for using Functions

- * All Excel functions must begin with = sign
- * Function name must be a valid Excel name.
- * Function must be followed by opening and closing parenthesis.
- * Functions must contain an argument within it.

MS Excel provides the following categories of functions:

- * **Statistical Functions:** Calculates the maximum, minimum, average etc., of a set of numeric data.
- * **Financial Functions:** Calculates interest on a loan, number of instalments of a loan, the amount of every instalment etc.
- * **Date and Time Functions:** Calculates the day, month and year in a date and the hour, minute and second in a particular time.
- * **Mathematical Functions:** Calculates the square root or absolute value of a number, product of numbers etc.
- * **Logical Functions:** Evaluates conditions such as $X > 5$ and give the result as true or false.
- * **Text Functions:** Performs a number of operations on strings (i.e. a collection of characters like 'hello', 'friend', 'computer', etc.) such as finding the length of a string, joining two strings, searching for one string inside another etc.
- * **Database Functions:** Query a database based on the data contained in the database.
- * **Information Functions:** Provides information about a specific cell such as the type of data it contains that is textual or numeric.
- * **Lookup and Reference Functions:** Locates specific values in specific cells.

Let us discuss some of these categories in detail.



Mathematical Functions

Functions	Purpose	Example
SUM(range)	It returns the sum of a range.	Input: =SUM(4,8,12,16) Output: 40
PRODUCT(range)	It multiplies the values in a range of cells.	Input: =PRODUCT(4,2,8) Output: 64
MOD(number, divisor)	It returns the remainder after a number is divided by the divisor.	Input: =MOD(8,5) Output: 3
SQRT(number)	It returns the square root of the given number.	Input: =SQRT(81) Output: 9
INT(number)	It rounds number to an integer value.	Input: =INT(14.25) Output: 14
POWER(number, power)	It returns the result of a number raised to some power.	Input: =POWER(5,3) Output: 125
COUNT(range)	It returns the count of the number of values in the cell	Input: =COUNT(4,8,12) Output: 3

Text Functions

Functions	Purpose	Example
CONCATENATE(text1, text2)	It joins together two or more different text strings.	Input: =CONCATENATE("Touch", "pad") Output: Touchpad
LEFT(text, num_chars)	It returns the specified number of characters from the left side of the text string.	Input: =LEFT("Touch",3) Output: Tou
RIGHT(text, num_chars)	It returns the specified number of characters from the right side of the text string.	Input: =RIGHT("Touch",3) Output: uch
LEN(text)	It returns the length of the text string.	Input: =LEN("Touch") Output: 5
UPPER(text)	It converts the text string into upper case.	Input: =UPPER("Touch") Output: TOUCH
LOWER(text)	It converts the text string into lower case.	Input: =LOWER("Touch") Output: touch



Logical Functions

Functions	Purpose	Example
MAX(range)	It returns the largest value in the given range.	Input: =MAX(4,16,12,9) Output: 16
MIN(range)	It returns the smallest value in the given range.	Input: =MIN(4,16,12,9) Output: 4
AVERAGE(range)	It gives the average of the given numbers in a range.	Input: =AVERAGE(12,3,6) Output: 7

Date Functions

Functions	Purpose	Example
TODAY()	It returns the current date.	Input: =TODAY() Output: 7/23/2019
MONTH(TODAY())	It returns the current month.	Input: =MONTH(TODAY()) Output: 7
YEAR(TODAY())	It returns the current year.	Input: =YEAR(TODAY()) Output: 2019
DAY(TODAY())	It returns the current day.	Input: =DAY(TODAY()) Output: 23

Clickipedia

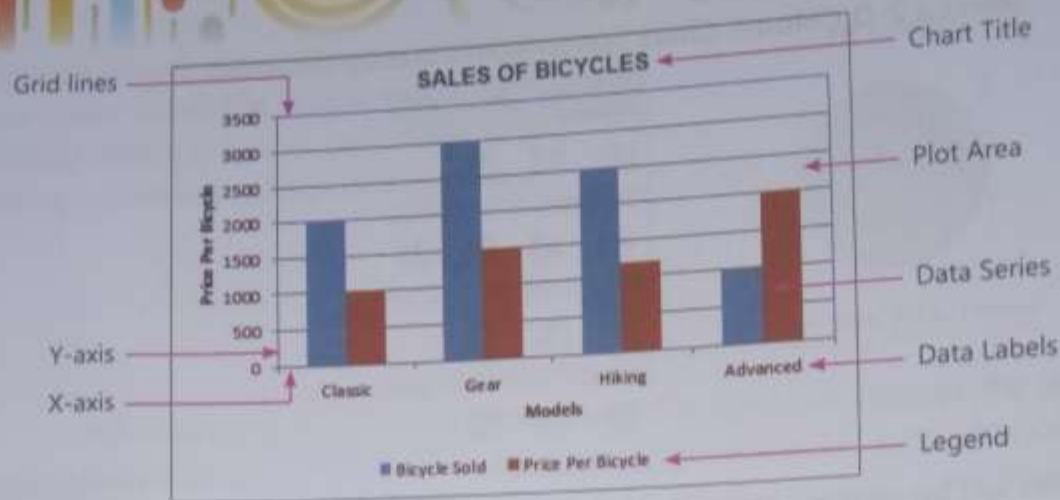
- * The common functions like SUM, AVERAGE, MAX, MIN, can be used by using the down arrow of the AutoSum command.
- * To use other functions click on More Functions option.

CHARTS IN EXCEL

A chart is an effective way to display data in a pictorial form. It makes it easier to draw comparison and analyse the growth, relationship and trends among the values in a table.

Components of a Chart

- Chart Title** – Chart title describes the main aim and content of the chart, which represents your chart.
- X-axis** – X-axis is the horizontal axis of the chart. It is also called the **category axis**.
- Y-axis** – Y-axis is the vertical axis of the chart. It is also called the **value axis**.
- Plot Area** – It is the rectangular area bounded by the two axis. It contains the actual chart and includes the plotted data, data series, category and value axis.



Components of a Chart

- Data Series** – Data series is related to the set of values. It is represented by the bars or slices that represent the data values.
- Data Labels** – Data labels includes data values, category name, series name, legend keys and values from cells.
- Gridlines** – These can be either horizontal or vertical lines depending on the selected chart type. It makes it easier to read and understand the values.
- Legend** – Legend is a key which shows the meanings of symbols and colours used in the chart.
- Chart Area** – The area that includes all objects and elements in a chart.

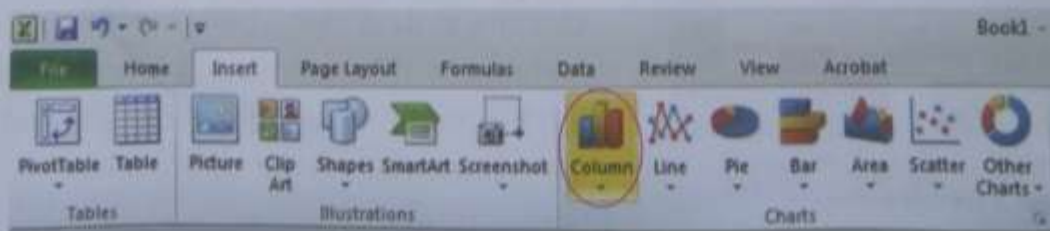
Creating a Chart

To create a chart, follow these steps:

Step 1 Select the range of cells, for example **A1:C5**, in this case.

	A	B	C
1	Model	Bicycle Sold	Price Per Bicycle
2	Classic	2000	1000
3	Gear	3000	1500
4	Hiking	2500	1200
5	Advanced	1000	2000

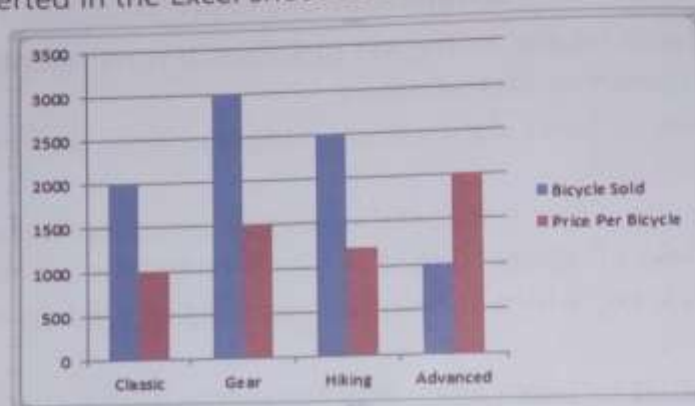
Step 2 Click on **Column** chart from **Charts** group under **Insert** tab.



Step 3 Select a **2-D Column Chart** option from the drop-down list.



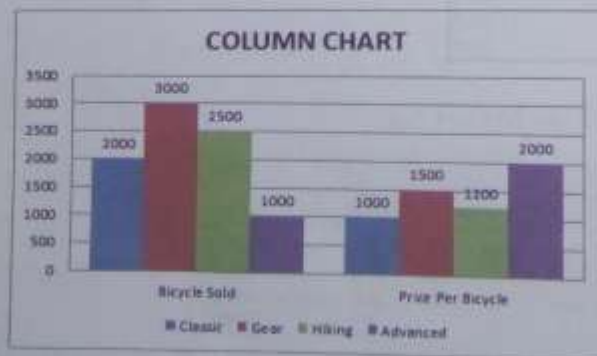
A chart will be inserted in the Excel sheet as shown.



Types of Charts in MS Excel

MS Excel provides a variety of different chart formats such as Bar, Column, Pie, Line, Area, Doughnut, Scatter, Surface, or Radar.

Line Chart: It is used to show trends over a period of time. It is similar to plotting a graph on a graph paper with its values on X and Y axis. It uses connecting dots to display trends over a period of time.



Column Chart: It is usually used to display the data in the form of vertical bars. It is used to show the changes in data over a period of time or comparison among the different data items. The categories are represented on the horizontal axis and the values are represented on the vertical axis.

Pie Chart: It is a circular chart divided into sectors where each sector shows the relative size of each value. It always shows only one data series. It is useful when you want to emphasis on a significant element.



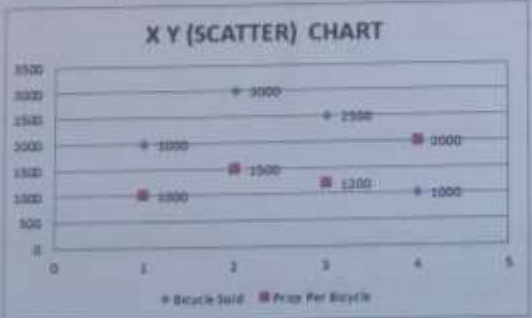
Bar Chart: The bar chart displays the data in the form of long rectangular rods also called bars. These bars can be placed horizontally on the chart area. It illustrates the comparisons amongst the individual items. In this chart, categories are represented on the vertical axis and values are represented on the horizontal axis.



Area Chart: It is used to display the quantitative magnitude of the data graphically. These charts are based on the features of the line chart. They basically emphasise the area between the line and the axis with the help of the colours, textures, pictures, etc.



Scatter Chart: Scatter charts also known as XY scatter plot charts. They show the correlations between the two sets of values. The x and y axis is used to represent the data plots on the chart.



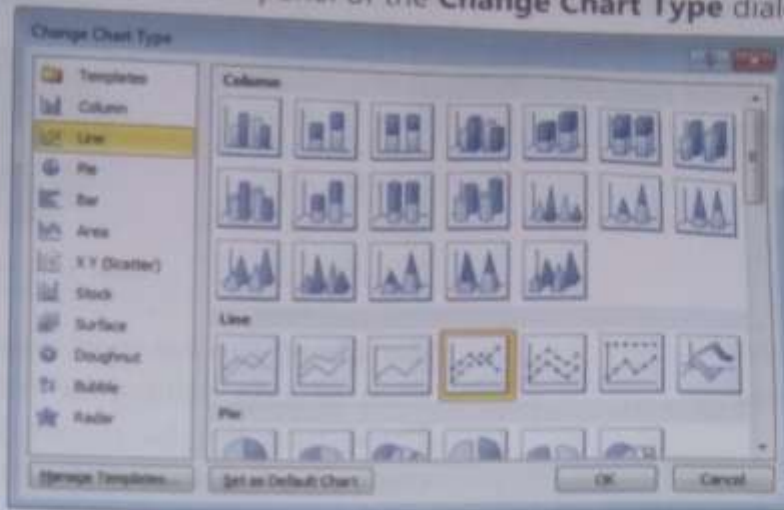
Change Chart Type

You can change the type of an existing chart at any time. Perform the following steps to change the chart type:

- Step 1 Select the chart.
- Step 2 Click **Change Chart Type** command from **Type** group under the **Design** tab.



Step 3 Click on **Line** from the left panel of the **Change Chart Type** dialog box.



Step 4 Click on **Line with Markers** option from the right panel under **Line** group. The chart will change to **Line Chart** similar to this.



Change Chart Layout

You can change the layout of your chart. This means that you can format, move and even add components of a chart. Perform the following steps to change the chart layout:

Step 1 Select the chart.

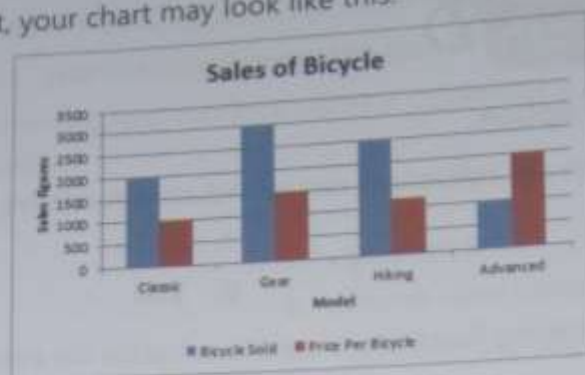
Step 2 Click on **Chart Title** command from **Labels** group under the **Layout** tab. From the drop-down list, click on **Above Chart** option to add a title at the top center of your chart.

Step 3 Using the **Axis Titles** command under the **Layout** tab, you can add titles to both x-axis and y-axis. Remember, x-axis is the horizontal axis and y-axis is the vertical axis.

Step 4 The **Legend** command under the **Layout** tab is used to move the legend of the chart to left or bottom. It is also used to hide the legend in case there is only one series of data.



After changing the layout, your chart may look like this.



Change Chart Design

MS Excel 2010 has some in-built chart styles. These styles are listed in the **Chart Layouts** group of the **Design** tab. You can select the chart and click on any of these layouts to change the design of your chart.

You can also change the colour scheme of the bars of your chart. Select a scheme from **Chart Styles** group under the **Design** tab. A 3-D effect can also be applied to the chart using these **Chart Styles**. A 2-D and 3-D chart styles may look like these.



2-D chart style



3-D chart style

Reboot

- * MS Excel allows users to create custom formulas to perform calculations on their data.
- * Formulas in Microsoft Excel begin with an equals sign.
- * The equals sign tells Excel that the succeeding characters constitute a formula.
- * Range is a rectangular area consisting of a group of cells, adjacent to each other. It can be an entire worksheet as well.
- * When performing calculations using a formula, Excel follows certain rules of precedence.
- * Excel also contains built-in formulas called functions that make it easy to perform common calculations on data. that is statistical, mathematical, etc.
- * Charts make it easier to draw comparisons, analyse growth and relationship among the values.



A. Tick (✓) the correct option.

- Which one of the cell references can be included in relative reference?

a. A3	<input type="checkbox"/>	c. \$A\$4	<input type="checkbox"/>
b. A\$1	<input type="checkbox"/>	d. \$D6	<input type="checkbox"/>
- Which of the following functions is used to calculate the average of a range of values?

a. AVERAGE	<input type="checkbox"/>	c. SUM	<input type="checkbox"/>
b. AVG	<input type="checkbox"/>	d. None of these	<input type="checkbox"/>
- The cell address in the formula is known as

a. Range	<input type="checkbox"/>	c. Cell reference	<input type="checkbox"/>
b. Mixed reference	<input type="checkbox"/>	d. None of these	<input type="checkbox"/>
- The key combination used to get the sum of adjacent cells is

a. SUM()	<input type="checkbox"/>	c. Ctrl +	<input type="checkbox"/>
b. Alt + =	<input type="checkbox"/>	d. None of these	<input type="checkbox"/>
- is the vertical axis that is used to plot the values.

a. Bar	<input type="checkbox"/>	c. Data	<input type="checkbox"/>
b. Value Axis	<input type="checkbox"/>	d. Formulas	<input type="checkbox"/>

B. Write 'T' for true and 'F' for false. Correct the false statements.

- Excel calculates expressions within parentheses first.
- Excel calculates multiplication and division, before addition and subtraction.
- Combined reference is a type of cell reference.
- We cannot create Bar chart in MS Excel.
- Excel calculates consecutive operators with the same level of precedence from left to right.

C. Fill in the blanks using the words given below.



Hints

Functions, equals, Dollar (\$), square root, column

- are predefined formulas in MS Excel.
- Formulas in MS Excel begin with the sign.

3. The SQRT function returns the..... of the given number.
4. The chart usually displays the data in the form of vertical bars.
5. In Mixed Referencing, you can lock either a column or a row by preceding it with a symbol.

D. Match the columns.

Column A

1. Area chart
2. Pie chart
3. XY Scatter Plot chart
4. Line chart

Column B

- a. Trends over period of time
- b. Quantitative magnitude of data
- c. Sector showing relative size of each value
- d. Correlation between two sets of values

Let's Do It



A. Short answer type questions.

1. What is cell reference?
2. Define the following terms:
 - a. Data Series
 - b. Legend

B. Long answer type questions.

1. What do you mean by Formula? Explain with examples.
2. What are the certain rules of precedence that Excel follows?
3. What is the use of the LEN function? Explain with example.
4. What are rules to enter a function?
5. Differentiate between Column chart and Scatter chart.

Crack The Code



A. Application based questions.

1. Suman wants to present the information in the form of a chart. She has a data of single series and the graph must show relative circular size of each value. Which chart type must she use?
2. Nidhi has made a spreadsheet for the marks obtained by the students of her class in different subjects. Which feature should she use to keep the mark-sheet updated if she has to change marks in one of the subjects for any student?

A. Short answer type questions.

Qu. 1	What is cell reference?
Ans.	<p>A formula may contain reference to contents of other cells. In such case, the result of the formula depends on the values in the referenced cells. The contents of cell where referencing has been used change automatically when the values in the referenced cell change.</p> <p>To see how this works.</p> <ul style="list-style-type: none"> • Enter 10 in cell A1 • Now select cell A2 • and type = A1*2 and • press Enter key. <p>The value in cell A2 is 20</p>
Qu. 2	Define the following terms – a. Data Series b. Legend
Ans.	<p>a. <u>Data Series</u> – Data series is related to the set of values. It is represented by the bars or slices that represent the data values.</p> <p>b. <u>Legend</u> – Legend is key which shows the meanings of symbols and colours used in the chart.</p>

B. Long answer type questions.

Qu. 1	What do you mean by Formula? Explain with examples.
Ans.	<p>Formulas in MS Excel begin with an equals (=) sign. When the contents of a cell begin with equal to sign, MS Excel understands that user has given a formula here. If you don't enter the equals sign, Excel will treat your entry as text and the calculation will fail.</p> <p>To show how formulas work, we'll begin with a simple exercise by selecting blank cell A1,</p> <p>Then type = 5 + 5, and press enter key, as you press the enter key, excel performs the calculation, and produces the result as 10 in cell A1.</p>
Qu. 2	What are the certain rules of precedence that Excel follows?
Ans.	<p>Excel follows certain rules of precedence –</p> <ul style="list-style-type: none"> • Excel calculates expressions within parentheses ('(',')' first. • Excel calculates multiplication and division before addition and subtraction. • Excel calculates consecutive operators with the same level of precedence from left to right.
Qu. 3	What is the use of the LEN function? Explain with examples.
Ans.	<p>LEN function is a text function in excel that returns the length of a string/ text. LEN Function in Excel can be used to count the number of characters in a text string and able to count letters, numbers, special characters, non-printable characters, and all spaces from an excel cell.</p> <p>Input = LEN("Touch")</p> <p>Output : 5</p>

Qu. 4	What are rules to enter a function?
Ans.	<p><u>Rules for using Function –</u></p> <ul style="list-style-type: none"> • All excel functions must begin with = sign • Function name must be a valid Excel name • Function must be followed by opening and closing parenthesis • Functions must contain an argument within it
Qu. 5	Differentiate between Column chart and Scatter chart.
Ans.	<p><u>Column Chart –</u></p> <p>It is usually used to display the data in the form of vertical bars. It is used to show the changes in data over a period of time or comparison among the different data. Items. The categories are represented on the horizontal axis and the values are represented on the vertical axis.</p> <p><u>Scatter Chart –</u></p> <p>Scatter charts also known as XY scatter plot charts. They show the correlations between the two sets of values. The x any y axis is used to represent the data plots on the chart.</p>

Activity -

