7   Electronic Spreadsheet

In this chapter you will learn

- fundamental functions and operations of spreadsheets
- identifying the components of a worksheet
- entering and editing data in a worksheet
- simple mathematical operators and building a formula using values
- use of function and cell address for writing formulae
- formatting a worksheet
- use of relative and absolute cell addresses,
- creating charts.

7.1   Introduction

Perhaps in our day-to-day life or at work we need to perform calculations. We use various methods to perform such calculations. Depending on the nature of calculations we use our fingers or mental calculations to perform simple calculations while we use calculators or paper based systems to compute complex calculations. In order to do calculations easily and accurately let us learn how electronic spreadsheets can be used.

We usually use a square ruled book to perform systematic calculations. Every page in this book consists of pages with rows and columns. Electronic Spreadsheets which consist of multiples of rows and columns based on this model of square ruled books.

Using Electronic Spreadsheets we can accurately and efficiently perform the following activities:

- Simple and complex calculations
- Presentation of data in charts
- Show data in ascending and descending order
- Segregate only the required data
- Check the validity of data
- Protection of data using passwords
- Saving for future use

7.1.1 Electronic Spreadsheet Application Software

The table 7.1 below illustrates some of the Electronic Spreadsheet Application Software developed by different companies.

Table 7.1 - Some Spreadsheet Applications and the and organizations

Software	Company
Excel	Microsoft Corporation
Numbers	Apple Inc
Libreoffice Calc	The Document Foundation
Openoffice Calc	Apache Foundation

7.1.2 Using Spreadsheet Software

Out of the many spreadsheet software, we discuss only about Microsoft Office Excel 2010 and LibreOffice Calc in this unit. Please note that the method of starting an spreadsheet software may vary according to the operating system and its versions.

For Microsoft Office Excel 2010

Start → Programs→ Microsoft Office→ Microsoft Office Excel 2010

For LibreOffice Calc

Start → Programs → LibreOffice LibreOffice Calc →

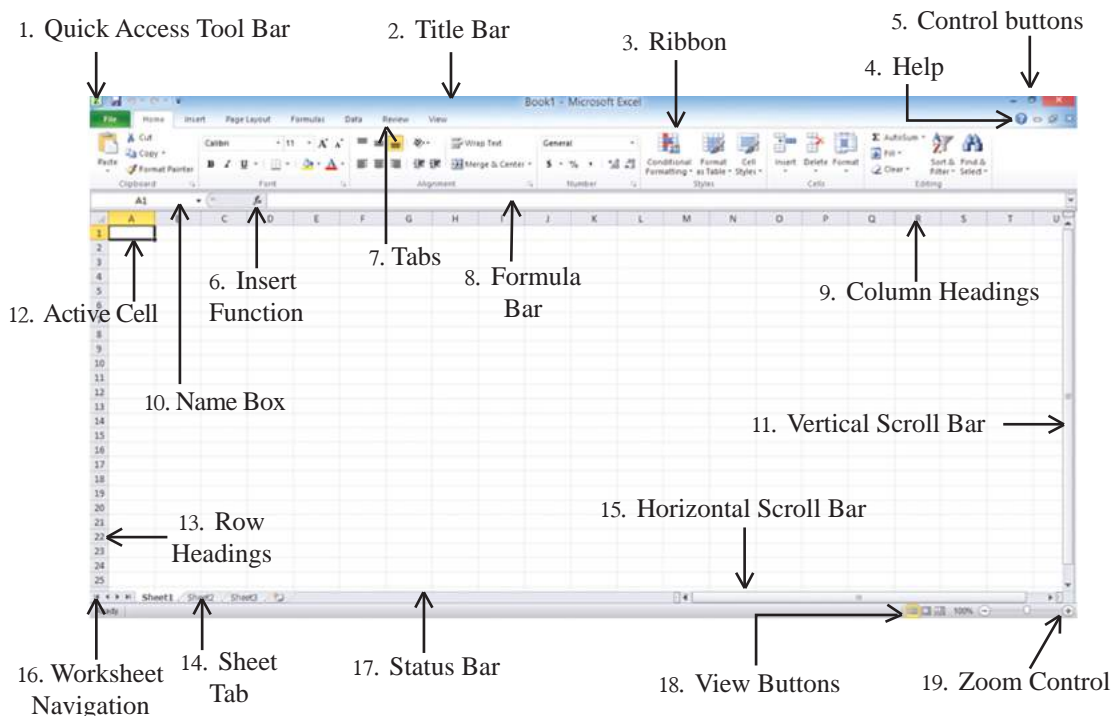# 7.1.3 The user interface and the components of Microsoft Excel 2010

Figure 7.1- The user interface of Microsoft Excel 2010

Table 7.2 - Components of Microsoft Excel 2010

Component	Funtion
1. Quick Access Tool Bar	Contains commonly used commands such as Save , Print Preview, Undo , New etc
2. Title Bar	Shows the name of the Application Software
3. Ribbon	Contains a toolbar with, Home, Insert, Page layout
4. Help	Provides help functions
5. Control Buttons	To minimize, open or to expand the worksheet window
6. Insert Functions	Opens dialog box to create formulae.
7. Tabs	Changes ribbon
8. Formulae Bar	Views the formula and displays the contents of a cell.

|		
9. Column Heading	Shows column name	
10. Name Box	Shows active cell address	
11. Vertical Scroll Bar	Scrolls the worksheet vertically	
12. Active Cell	Displays the cell in which data is entered	
13. Row Heading	Shows row number	
14. Sheet Tabs	Represents the worksheet	
15. Horizontal Scroll Bar	Scrolls the worksheet horizontally	
16. Sheet Tab Scroll Button	Changes the worksheet	
17. Status Bar	Displays the status of the worksheet	
18. View Button	Enables to change the view of the worksheet	
19. Zoom Control	Zooms in or zooms out the view of a worksheets	

7.1.4 The user interface and the components LibreOffice Calc
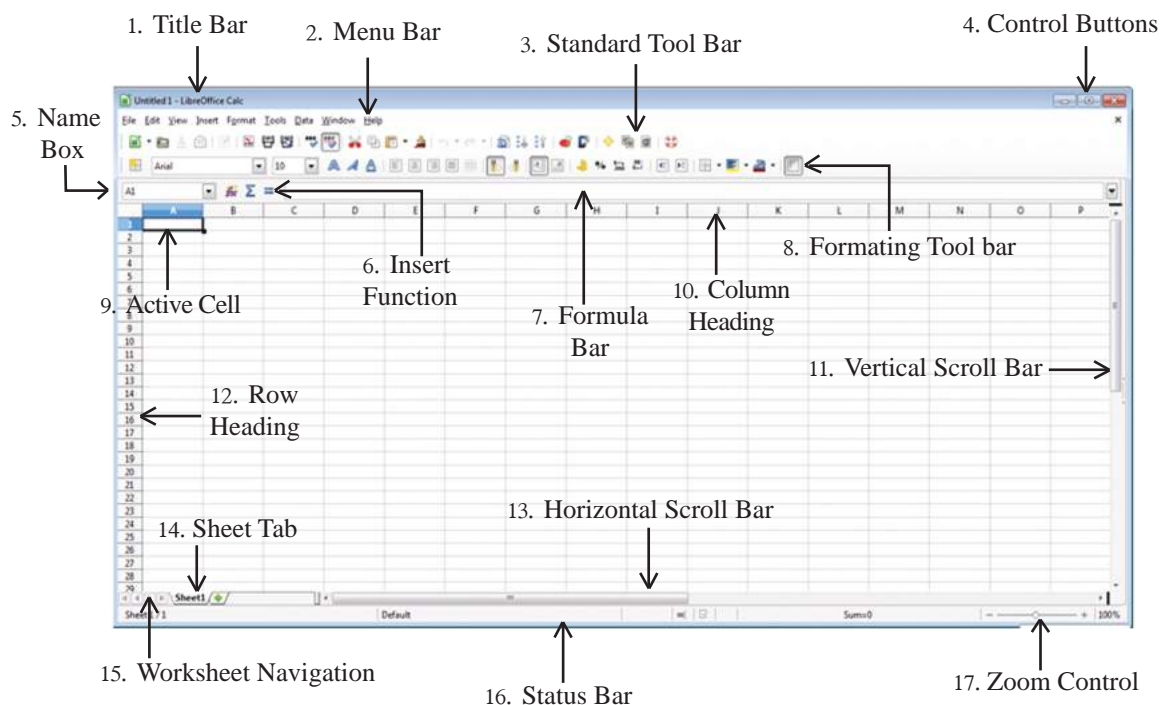
Figure 7.2 - User interface of LibreOffice Calc 4.1

Table 7.3 - Components of LibreOffice Calc 4.1

Component	Funtion
1. Title Bar	Shows the name of the application software
2. Menu bar	Helps to select commands
3. Standard tool bar	Useful to select standard tools
4. Control buttons	Minimizes, opens or to maximize the worksheet window
5. Name box	Shows the address of the active cell
6. Insert Functions	Opens dialog box to make formulae.
7. Formulae bar	To view formula and display the contents of a cell.
8. Formatting tool bar	Helps to format worksheet
9. Active cell	Displays cell in which data is entered
10. Column heading	Shows column name
11. Vertical scroll bar	Scrolls worksheet vertically
12. Row heading	Shows row number
13. Horizontal scroll bar	Scrolls worksheet horizontally
14. Sheet tabs	Represents worksheet.
15. Tab scroll button	Changes worksheet.
16. Status Bar	Displays the status of worksheet.
17. Zoom Control	Zooms in or zooms out view of a worksheet

7.1.5 Worksheet

A worksheet is made up of a multitude of cells made by columns and rows on a two dimensional plane. Each worksheet is denoted by a sheet tab.

7.1.6 Naming the columns in a worksheet

Each column of a worksheet is assigned an English letter or a combination of letters as shown below: See Figure 7.3

A,B,C,D,......................upto Z
AA,AB,AC.AD,AE,.................upto AZ
BA,BB,BC,BD,BF.................upto BZ

Each row of a worksheet is assigned a row number as 1,2,3,4,5... etc as shown below: See Figure 7.3
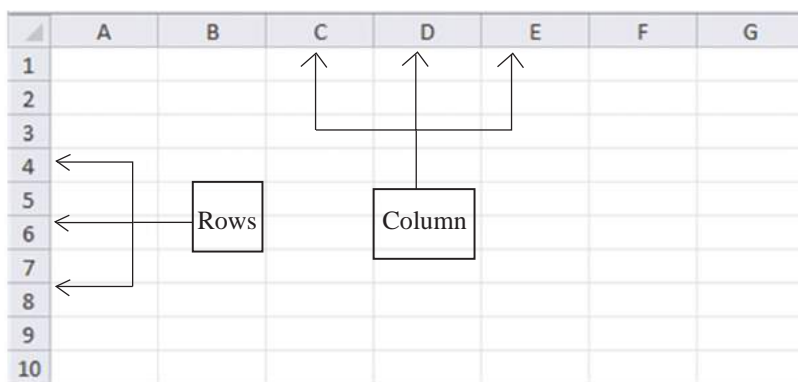

Figure 7.3 - Positions of rows and coumns in a worksheet

Usually the number of rows and columns of a worksheet is a power of two.

Worksheet application	Number of rows	Number of columns
Microsoft Excel 2003	65536 (2^{16})	256 (2^{8})
Microsoft Excel 2007/2010	1048576 (2^{20})	16384 (2^{14})
LibreOffice Calc 4.1	1048576 (2^{20})	1024 (2^{10})

7.1.8 Active Cell

It is needed to select the cell before entering data in it. A currently selected cell is called an active cell. B3 is the active cell in the worksheet below. An active cell always has a thick border. See Figure 7.4
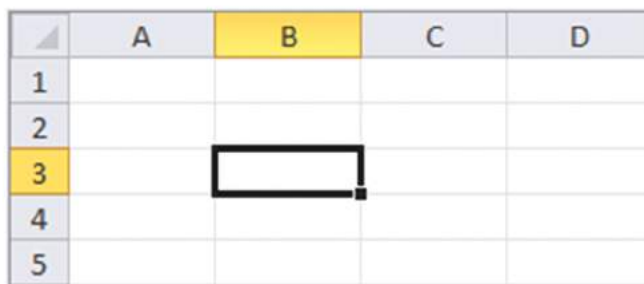

Figure 7.4 - Active cell in a worksheet

7.2 Scrolling in a worksheet

In order to enter data the cell, it should be selected. Active cell in a worksheet can be moved and selected by the keys or a combination of keys.

Key/combination of keys	Result
Arrow keys	Move a single cell in any direction (left, right, up, down)
Ctrl + Arrow Keys	Moves the cell to the end of the data range in a particular direction
Home	Moves to column A along the row where the active cell is
Ctrl + Home	Moves the cell to A1 position
Ctrl + End	Moves to bottom right cell of the data range
Page Up	Moves the worksheet one screen up
Page Down	Moves the worksheet one screen down

7.2.1 Cell Address

A cell address is denoted first by the column letter and secondly by the row number. The address of the active cell is displayed in the name box.

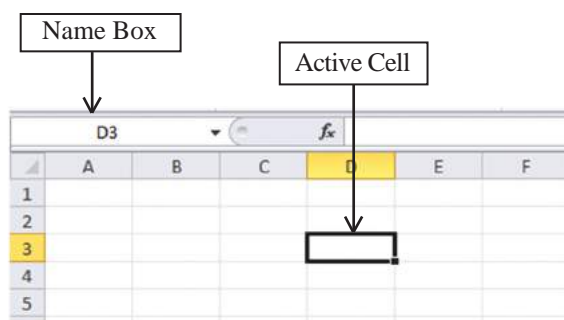Ex: A cell at D column and 3rd row would be named D3. See Figure 7.5

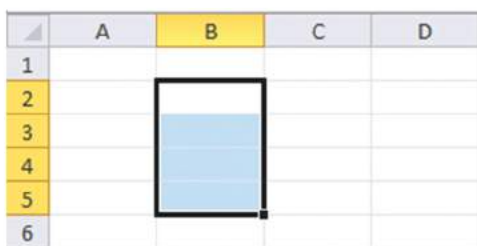Figure 7.5 - Cell address of a worksheet

Activity

The cell address KD74 is situated in row number ……. and column letter ……

7.2.2 Range of Cells

A block of adjacent cells in a worksheet which is highlighted or selected is called a range of cells. Observe the worksheets below.
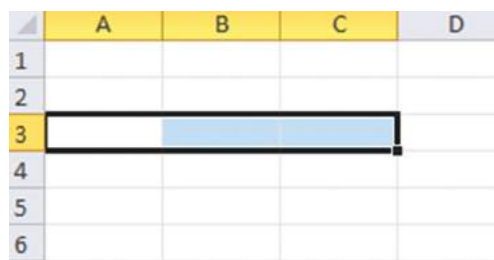

Figure 7.6 - A range of cells in a column (B2: B5)

This range of cells consists of the cells namely B2,B3,B4,B5. The range of cells starts in B2 and ending in B5. Column letter is constant in a cell range along a column. The cell range in figure 7.6 is represented by B2:B5.
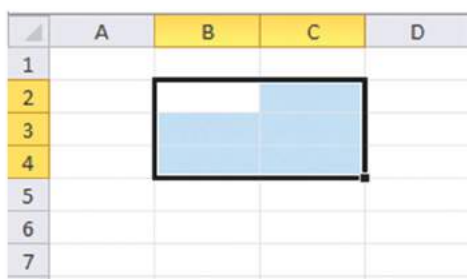
This range of cells is represented as A3:C3. The range in Figure 7.7 consists of the cells A3,B3,C3. See Figure 7.7. This range of cells is represented as A3:C3. Row number is constant in a cell range along a row. For this cell range in Figure 7.7, cells; B2, B3, B4, C2, C3, and C4 are included.

Figure 7.7 - A range of cell in a row

The cell range in figure 7.8 is represented by B2: C4 The column letter and the row number vary in a range of cells spanning several rows and columns.

Figure 7.8 - A range of cells in a worksheet spanning several rows and columns

Note: The control key is used to select more than one 'range of cells' in a worksheet. The control key is marked 'Ctrl' on the key board.

Activity

Answer the questions based on the worksheet shown on Figure 7.9

Figure 7.9 - Range of cells in a worksheet

(1) What is the address of the first cell represented by R1cell range?
(2) What is the address of the last cell represented by R1cell range?
(3) Write the cell range represented by R1.
(4) Write the cell range represented by R2.
(5) What is the name of the cell range along a row?
(6) What is the name of the cell range along a column?
(7) Write the cell range represented by R3.
(8) Give the number of cells in the cell range represented by R3.

7.2.3 Entering Data

Before entering data in a worksheet, we need to select the required cell. We can enter the data once it is selected. The contents of a cell would be either a label, value or formula.

1. Label

A combination of letters, numbers, special symbols or the text entered using a keyboard are called labels. By default the labels are left aligned.

Figure 7.10 below shows how labels are left aligned.

Note: The telephone numbers would not be displayed in the same way as shown below. (The first letter '0' is not displayed). You need to specify the range of cells where the telephone numbers to be entered as 'Text'. Formatting cells would be discussed in a later lesson.

◢	A	B	C	D	E	F
1	Name	District	Province	Telephone Number	E - mail	
2	Piumi Kaushalya	Kegalle	Sabaragamuwa	03512232438	Piumi@gmail.com	
3	A.Mallikadevi	Kandy	Central	08350632867	maldevi@yahoo.com	
4	Dilisha Gamhewa	Colombo	Western	01278643563	Dilesha@hotmal.com	
5	Hakeem Anver	Matara	Southern	01369589596	anwerhac@live.com	
6						

Figure 7.10 - labels in a worksheet are left aligned

2. Values

The data with numerical figure are called values. By default value is right aligned. Figure 7.11 shows various ways how data are represented as values.

◢	A	B
1	Integer	23
2	Decimal	5.72
3	Fractional	3 1/4
4	Percentage	65%
5	Scientific	4.37E+04
6	Date	5/12/2007
7	Time	2.45 PM
8	Currency	Rs 400.00

Figure 7.11 - values are right aligned

Note: When entering half numbers a space needs to be entered after the full number.

3. Formulae

The expressions beginning with an equals '=' mark using values, cell address and functions are called a formula. When a formula is entered in a cell in a worksheet the value of the equation is displayed in the cell and the formula is shown in the formula bar.

Example: Getting the total value of cells A1 and B1 into cell C1 (See Figure 7.12)

C1	▾	f_x	=A1+B1

◢	A	B	C	D	E	F	G
1	2	3	5				
2							
3							
4							
5							

Formula bar

Formula entered in cell C1

value obtained from the formula

Figure 7.12 - showing values and formula

7.3 Mathematical operators used in formulae

Operator	Meaning
+	addition
-	subtraction
*	multiplication
/	division
^	exponentiation (power)

Note: The order of evaluation can be changed by using brackets. (The expressions within the brackets are evaluated first).

Operator precedence:

First	( )
Second	^
Third	* , /
Fourth	+ , -

reduce top to bottom.

7. 3.1 Simple calculations using values and operators

Table 7.4 below shows a few formulae written using values and operators

Table 7.4 - Writing simple formul

Operator		Formula	Result
Addition	(+)	= 2+4	6
Subtraction	(-)	= 5-2	3
Multiplication	(*)	= 4*5	20
Division	(/)	= 12/6	2
Exponentiation	(^)	= 2^4	16

There can be more than one operator in a formula. Let us learn how to evaluate the operators in order. See the tables 7.5 and 7.6

Table 7.5 - Use of brackets in simple equations

Formula	Evaluation method	Result
= 2+4*3	= 2+12	= 14
= (2+4)*3	= 6*3	= 18
= 4*3^2	= 4*9	= 36
= (4*3)^2	= 12^2	= 144

Table 7.6 - Methods of evaluation of equations

Examples	= 5+2*3^2/6-3	= 5+2*3^2/(6-3)	= 8/2*3-2^3+5
Steps of evaluation	= 5+2*3^2/6-3	= 5+2*3^2/(6-3)	= 8/2*3-2^3+5
	= 5+2*9/6-3	= 5+2*3^2/3	= 8/2*3-8+5
	= 5+18/6-3	= 5+2*9/3	= 4*3-8+5
	= 5+3 - 3	= 5+18/3	= 12-8+5
	= 8-3	= 5+6	= 4+5
Answer	= 5	= 11	= 9

Note: When brackets are not used operators in the same level such as multiplication (*) and subtraction (-) and addition (+) and subtraction (-) are executed from left to right.

Activity

Evaluate the following equations.

(1) = 6-4/2   (6) = 4+5*2^3   (11) = 5/2+1^3*4
(2) = 5*4+3   (7) = 8/4*2   (12) = 3-4*3/2
(3) = 3+4*5   (8) = -4/2+2   (13) = 6/3*2^1-3
(4) = 2^5+3   (9) = 1+2^2*3   (14) = 3*(2+4)/9+1
(5) = 3+5^2   (10) = 3*4/2   (15) = 2^3/(5-1^3)*5

7.3.2 Formulas with cell addresses and operators

The main advantage of entering formulae using cell addresses and operators is when the values of the cells concerned change, the results obtained by the formulae also get updated accordingly.

Example 1

In order to calculate the perimeter and area of a rectangle, let us enter the length and breadth of the rectangle in cells A2 and B2 respectively. The formulae to derive the perimeter are entered in cells C2,C3,C4 and the formula to derive the area is entered in cell D2. See Figure 7.13

	A	B	C	D
1	Length of the Rectangle	Breadth of the Rectangle	Perimeter	Area
2	45	24	=A2+A2+B2+B2	=A2*B2
3			=A2*2+B2*2	
4			=(A2+B2)*2	
5				

Figure 7.13 - The perimeter and area of a rectangle

Activity

Create a worksheet in your spreadsheet application based on the image 7.13. Observe the changes in values obtained from the formulae in column C and D when you enter different values in cells A2 and B2.

Important: In cell D2 if you write the formula D2=A2*B2 it would be taken as a label and hence calculations do not happen. Therefore it is important to remember that nothing should be written on the left side of the equal sign ('='). (See image 7.15).

C	D	E
	D2=A2*B2	✗

Figure 7.14 - The incorrect way of writing the formula

C	D	E
	=A2*B2	✓

Figure 7.15 - The correct way of writing the formula

Example 2

See the formulae in the worksheet given in Figure 7.16 when the price of each pencil and book are given.

	A	B	C
1	Price of a Book	48	
2	Price of a Pencil	12	
3	Price of book and pencil	=B1+B2	
4	Difference between the price of a book and a pencil	=B1-B2	
5	Price of 4 books	=B1*3	
6	Price of 4 books and 2 pencils	=B1*4+B2*2	
7			

Figure 7.16 - Price calculation

Activity

Prepare the worksheet shown in Figure 7.16 using a Spreadsheet application. Change the values in cells B1 and B2. Observe the results obtained from the formulae in cells B3, B4, B5 and B6.

Example 3

Calculating the area and volume of a cube when the length of one side is given. (See Figure 7.17)

	A	B	C
1	Side length of the Cube	8	
2	Side area of the Cube	=B1^2	
3	Total area of the Cube	=6*B1^2	
4	Volume of the Cube	=B1^3	
5			

Figure 7.17 - Finding the area and volume of a cube

Activity

Create a the worksheet shown in Figure 7.17 using a Spreadsheet application. Change the values in the cell B1 and observe the results obtained from the formulae in the cells B2, B3 and B4.

Note: The results obtained from a formula (based on cell addresses) always get updated antomellrcella when the values of these cells mentioned in the formula change.

Activity

Study the worksheet (Figure 7.18) and the table 7.7 containing formulae. Now calculate the result of each formula shown in table 7.7 in accordance with the Precedence of Operators and write the results under the 'results' column.

	A	B	C	D	E
1	7	5	4	2	
2	3	1	9	4	
3	6	2	4	8	
4					

Figure 7.18 - Worksheet with data

Formula	Result
=A1+B1	12
=C1+C2+C3	17
=B2+C3+B3	7
=A2*C1	12
=C2/A2*D1	6
=B3^A2+D1	10

Table 7.7

| Formula	Result
=A1*B1-D2	
=D1-C2/A2	
=B3^C3-A3	
=A1*C1/C3	
=D2*C4*E1	
=A3/B3+A2*D1	
=A1+(B2*C2)-B3+C2/B2	
=B2-B3+B1*(D1+D2^B1)	
=A2^B3-C2+A3*(B3+C1)	
=A3/C3*(D2*D1)	
=D3/C3/B3*A3+B2	
=(D3/(A1+B2))^C2	

7.4   Use of functions to do calculations

When there is a large quantity of data it becomes a difficult and complex task to write formulae using only the cell addresses. In this kind of situation functions are used. The spreadsheet applications contain different functions to meet the requirements of different fields. Let us learn some of basic functions which are commonly used. (See table 7.8)

Table 7.8

Name of function	Syntax	Use
SUM	=SUM(Number 1,Number2......)	Adds the values contained in a range of cells.
AVERAGE	=AVERAGE(Number1,Number2.......)	Finds out the average of the values contained in a range of cells.
MAX	=MAX(Number1,Number2.......)	Finds out the largest value contained in a range of cells.
MIN	=MIN(Number1,Number2......)	Finds out the smallest value contained in a range of cells.
COUNT	=COUNT(Number1,Number2.....)	Counts the number of cells within a range of cells.

For example, look at the methods 1 and 2 given below. In order to find out the sum of the values of cells A1 to A10, method 1 uses cell addresses whereas method 2 uses a function. The same results are obtained from both methods. However, when there is a large range of cells, the formula shown by method 2 is simple and easy compared to both the methods.

=A1+A2+A3+A4+A5+A6+A7+A8+A9+A10 ⟶ ①

=SUM(A1:A10) ⟶ ②

=A1+A2+A3+A4+A5+A6+A7+A8+A9+A10

=SUM(A1: A10)
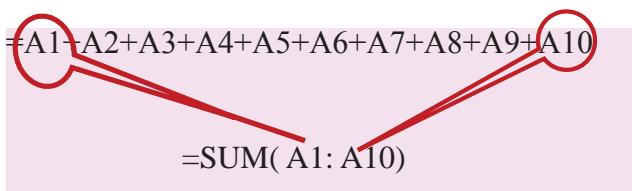
      Only the starting cell address and the last cell address in a function need to be included.

Create a function based formulae based on the worksheet given in 7.19.

	A	B	C	D
1	2	6	4	
2	5	3	7	
3	5	9	12	
4				

Figure 7.19 - Worksheet

Let us identify the various ways in which a function can be used.

SUM function (See table 7.9)

Table 7.9

Formula	Details	Result
= SUM(A1,B1,C1)	The sum of cells A1,B1 and C1	12
= SUM(A1:C1)	The sum of cells in the range of cells from A1 to C1	12
= SUM(A1:C1,B2)	The sum of cells in the range of cells from A1 to C1 and B2	15
= SUM(B1:C2)	The sum of cells in the range of cells from B1 to C2	20
= SUM(A1:A3,C1:C3)	The sum of cells in the range of cells from A1 to A3 and C1 to C3	35

AVERAGE function (See table 7.10)

Table 7.10

Formula	Details	Result
= AVERAGE(A1,B1,C1)	The average of cells A1, B1 and C2	4.00
= AVERAGE(A1:C1)	The average of cells in the range of cells from A1 to C1	4.00
= AVERAGE(A1:C1,B2)	The average of cells in the range of cells from A1 to C1 and B2	3.75
= AVERAGE(B1:C2)	The average of cells in the range of cells from B1 to C2	5.00
= AVERAGE(A1:A3,C1:C3)	The average of cells in the range of cells from A1 to A3 and C1to C3	5.83

Note: When the average is calculated a decimal number with several decimal places may be used. You need the required decimal places in the relevant cell range.

MAX function (See table 7.11)

Table 7.11

Formula	Details	Result
= MAX(A1,B2,C1)	Finds out the largest value among cells A1,B2 and C1	4
= MAX(A2:C2,B3)	Finds out the largest value among the range of cells from A2 to C2 and the cell B3	9
= MAX(A1:C1)	Finds out the largest value among the range of cells from A1 to C1	6
= MAX(A1,B1:C2)	Finds out the largest value among the range of cells from A1 to B1 and the cell C2	7

MIN function (See Table 7.12)

<div align="center">Table 7.12</div>

Formula	Details	Result
= MIN(A1,B2,C1)	Finds out the smallest value among cells A1, B2 and C1	3
= MIN(A2:C2,B3)	Finds out the smallest value among the range of cells from A2 to C2 and the cell B3	3
= MIN(A1:C1)	Finds out the smallest value among the range of cells from A1 to C1	2
= MIN(A1,B1:C2)	Finds out the smallest value among the range of cells from B1 to C2 and the cell A1	2

COUNT function (See Table 7.13)

<div align="center">Table 7.13</div>

Formula	Details	Result
= COUNT(A1,B1)	Counts the number of cells that contain numbers among cells A1, B1	2
= COUNT(A1:C1)	Counts the number of cells that contain numbers in the range of cells from A1 to C1	3
= COUNT(A1:A4)	Counts the number of cells that contain numbers in the range of cells from A1 to A4	3
=COUNT(A1:C1,B2)	Counts the number of cells that contain numbers in the range of cells from A1 to C1 and B2	4
= COUNT(B1:C3)	Counts the number of cells that contain numbers in the range of cells from B1 to C3	6
=COUNT(A1:A3,C1:C3)	Counts the number of cells that contain numbers in the range of cells from A1 to A3 and the range of cells from C1 to C3	6

The Figure 7.20 shows marks obtarned in different terms by ICT students of grade 6.

◢	A	B	C	D	E
1	Student Name	Term 1	Term 2	Term 3	
2	K.Bhanu Somarathna	57	79	66	
3	Wasantham Jayaraj	45	57	60	
4	Mohommad Niyas	89 ab		76	
5	R.Ganga Kumari	71	62	78	
6	P.Vasuki Devi	60	70	65	
7	M.M.Fawsiya	42	58	67	
8					

Figure 7.20 - Marks scored by grade 6 students for ICT

Provide answers using functions.

1) What is the formula to be inserted in F2 to find the total marks scored by K. Bhanu Somarathne?

2) What is the formula to be inserted in F3 to find the average marks scored by Wasantham Jayaraj?

3) What is the formula to be inserted in cell B8 to find the highest score made in 1st Term.

4) What is the formula to be inserted in cell C8 to find the total number of students who appeared for the Term 2?

5) What is the formula to be inserted in cell D8 to find the lowest score make in the 3rd Term.

7.5 Formatting the worksheet

In order to format the labels and value in a worksheet formatting tool bar or cell formatting window can be used.

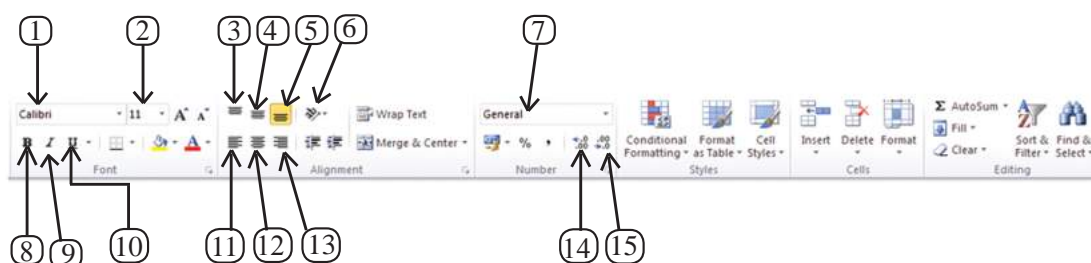## 7.5.1 Ribbon with formatting tools in Microsoft Excel 2010

Figure 7.21 - Formatting tools in Microsoft Excel 2010

Table 7.14

No	Tool	Details
1	Font	Apply different font types in a worksheet
2	Font Size	Apply different font sizes in a worksheet
3	Vertical Top Alignment	Align text to the top of a cell
4	Vertical Middle Alignment	Align text to the middle of a cell
5	Vertical Bottom Alignment	Align text to the bottom of a cell
6	Orientation	Rotate the text to diagonal angle or vertical orientation
7	Number Format	Choose how the values in a cell are displayed
8	Bold	Make the selected text bold
9	Italic	Italicize the selected text
10	Underline	Underline the selected text
11	Left Alignment	Align text in a cell to the left
12	Center Alignment	Align text in a cell to the center
13	Right Alignment	Align text in a cell to the right
14	Increase decimal places	Show more precise value by showing more decimal places
15	Decreased decimal places	Show less precise decimal places

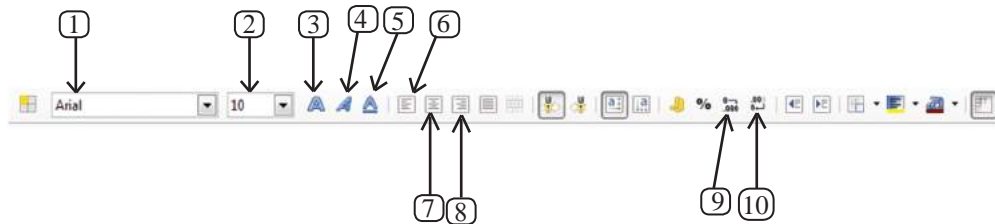## 7.5.2 Formatting tool bar in LibreOffice Calc

Figure 7.22 - Formatting tool bar in Libre Office Calc 4.1

Table 7-15

No	Tool	Details
1	Font	Apply different font types on a worksheet
2	Font Size	Apply different font sizes on a worksheet
3	Bold	Make the selected text bold
4	Italic	Italicize the selected text
5	Underline	Underline the selected text
6	Left Alignment	Align text in a cell to the left
7	Center Alignment	Align text in a cell to the center
8	Right Alignment	Align text in a cell to the right
9	Increase decimal places	Show more precise value by showing more decimal places
10	Decreased decimal places	Show less precise decimal places

7.5.3 Use of dialog boxes to format values

The formal cells dialog box' in the tool bar can be used to find more about formatting a cell or range of cell.

In Microsoft Office Excel 2010
Home Tab → Number Group

Figure 7.23 - Format cells dialog box

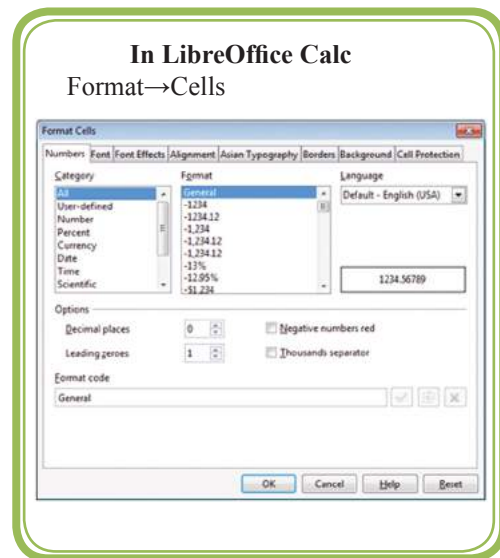**In LibreOffice Calc**
Format→Cells

Figure 7.24 - Format cells dialog box

7.5.4 Formatting a range of cells with decimal places

When division of numbers are performed, different numbers of decimal places are made. In such instances it is necessary to format the number to a fixed number of decimal places.

	A	B	C
1	Before Formatting	After Formatting with two decimal places	
2	2.4	2.40	
3	1.857142857	1.86	
4	3	3.00	
5	6.666666667	6.67	
6			

Figure 7.25 - Formatted to two decimal places

Follow the steps below in order to follow a cell to the required number of decimal places.

In Microsoft Office Excel 2010	In LibreOffice Calc
1. Select the range of cells 2. Open the 'format cells dialog' box 3. Click the 'Number' tab 4. Select the 'Number' 5. Change the decimal places as required 6. Click 'OK'	1. Select the range of cells. 2. Open the 'format cells dialog' box 3. Click the 'Number' tab 4. Select the 'Number' 5. Change the decimal places as required 6. Click 'OK'

7.5.5 Formatting a range of cells to be seen as labels.

A telephone number consists of 10 digits. But in spreadsheets the zero ('0') inserted as the first digit will not be displayed. This is because the telephone number is stored as a numeric value. Therefore, there is need to format the whole range of cells where the phone numbers are to be inserted as 'text'. See figure 7.26 and column D of figure 7.10

◢	A	B	C
1	Display as values	Inputs after the Formatting	
2	714365759	0714365759	
3	778746853	0778746853	
4			

Figure 7.26 - Formatting a range of cells as
Text

Follow the steps below in order to format a range of cells as text.

In Microsoft Office Excel 2010	In LibreOffice Clac
1. Select the range of cells. 2. Open the 'Format cells dialog' box 3. Click the Number tab 4. Select Text 5. Click 'OK' 6. Enter numbers	1. Select the range of cells 2. Open the 'format cells dialog' box 3. Click the Number tab 4. Select Text 5. Click 'OK' 6. Enter numbers

7.5.6 Formatting a range of cells as percentage

When a number is divided, a quotient can be represented as percentage by formatting. The monthly profit earned by a school book shop in the first term is given below in table 7.27

	A	B	C	D
1	Month	Income	As Percentage	
2	January	Rs. 24,500.00	36.62%	
3	February	Rs. 14,000.00	20.93%	
4	March	Rs. 21,600.00	32.29%	
5	April	Rs. 6,800.00	10.16%	
6				

Table 7.27 - Formatting of a range of cell percentage

Follow the steps below in order to format a range of cells as a percentage

In Microsoft Office Excel 2010

1. Select the cell range.
2. Open the 'format cells dialog' box
3. Click the 'Number' tab
4. Change the decimal places required
5. Click 'OK'

In LibreOffice Calc

1. Select the range cells.
2. Open the 'format cells dialog' box
3. Click the 'Number' tab
4. Select the percentage category
5. Click the 'Ok'

7.5.7 Formatting a range of cells as scientific notations

Spredsheets can be used to calculate very small to very large numbers. Sometimes it is somewhat difficult tounderstand or express these numbers. But when these numbers are converted into scientific format, all numbers can be represented by common format which is easy to understand.

	A	B	C
1	Description	Value	Scientific Format
2	One Tera bytes in bits(2^43)	8796093022208	8.80E+12
3	Floppy disk capacity in Terabytes(1.44/2^20)	0.000001373291015625	1.37E-06
4			

Figure 7.28 - Scientific Format

Follow the steps below in order to format a range of cells as a percentage

In Microsoft Office Excel 2010

1. Select the cell range.
2. Open the 'format cells dialog' box
3. Click the 'Number' tab
4. Select 'Scientific'
5. Change the decimal places as needed
6. Click 'OK'

In Libre Office Celc

1. Select the range of cells
2. Open the format cells dialog box
3. Click the 'Number' tab
4. Select 'Scientific'
5. Change the decimal places as needed
6. Cilick 'OK'

7.5.8 Formatting of a cell range as scientific

In a computer (Date) 5/12/2014 means that it is 12th date of May 2014. This is the American Format; (mm/dd/yyyy) (mm-month, dd-date, yyyy-year). Date can be displayed in many different formats in a spreadsheet. See figure 7.29

	A	B
1	Display Date as different formats	
2	5/12/2014	
3	Friday, September 12, 2014	
4	05/12/14	
5	12-May-14	
6		

Figure 7.29 - various date formats

Follow the below steps in order to format a cell range.

In Microsoft Office Excel 2010

1. Select the range of cells.
2. Open the 'format cells dialog' box
3. Click the 'Number' tab
4. Select the 'Date'
5. Select the date format
6. Click 'OK'

In LibreOffice Calc

1. Select the range of cells.
2. Open the 'Format cells dialog' box
3. Click the 'Number' tab
4. Select the 'Date' category
5. Select the date format
6. Click 'OK'

7.5.9 Formatting a range of cells to display times.

Time is indicated in a computer as 10;35;53 AM. The common format of this is hh;mm;ss AM/PM. See Figure 7.30. Here, hh means hours, mm means minutes and ss means second.

	A	B
1	Display Time as different formats	
2	10:35:53 AM	
3	10:35:53	
4	10:35 AM	
5	10:35	
6		

Figure 7.30 - Various time formats cell range

Follow the below steps in order to format a range of cells to display time.

In Microsoft Office Excel 2010
1. Select the cell range.
2. Open the 'format' cells dialog box
3. Click the 'Number' tab
4. Select the 'Time'
5. Select category time should be displayed
6. Click 'Ok'

In Libre Office Calc
1. Select the cell range
2. Open the 'format cells dialog' box
3. Click the 'Number' tab
4. Select the 'Time' category
5. Select category Time should be displayed
6. Click 'Ok'

7.5.10 Formatting a cell range to display currency

When a number denotes a monetary value the currency form such as; Dollar, Rupees should be displayed in front of the number. See column B of figure 7.28

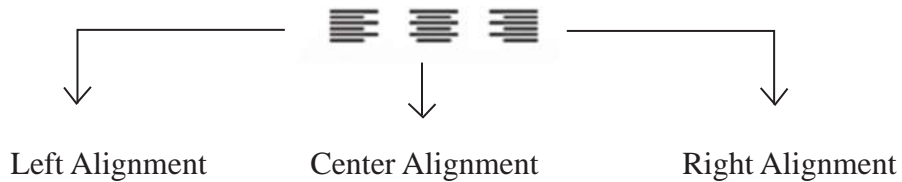**In Microsoft Office Excel 2010**
1. Select the cell range.
2. Open the 'format cell dialog' box
3. Click the 'Number' tab
4. Select the 'Currency'
5. Click 'Ok'

In Libre Office Calc
1. Select the cell range.
2. Open the 'format cells dialog' box
3. Click the 'Number' tab
4. Select the 'Currency'
5. Click 'Ok'

7.5.11 Formatting alignment of a cell range

The labels and values can be aligned to the left, center or right of a cell range.

Left Alignment   Center Alignment   Right Alignment

Follow the steps below in order to format a range of cells for alignment.

In Microsoft Office Excel 2010
1. Select the cell range
2. Open the 'format cells dialog' box
3. Click the 'Alignment' tab
4. Select left, right or center
5. Click 'Ok'

In Libre Office Calc
1. Select the range of cells
2. Open the 'format cells dialog' box
3. Click the 'Alignment' tab
4. Select left, right or center
5. Click 'Ok'

Activity

Create the worksheet shown in figure 7.31 using formatting tools and formulae.

	A	B	C	D	E	F	G
1		Useage of School Library as Section wise					
2	Section	January	February	March	Total	Average	
3	Art	14	20	16	50	16.67	
4	Commerce	10	13	14	37	12.33	
5	Scince	18	20	17	55	18.33	
6	Total	42	53	47			
7	Average	14.00	17.67	15.67			
8							

Figure 7.31 - Worksheet with various formats

1. Center align column A and row 2
2. Make row 2 Bold
3. Underline the heading in row. Make the font size 16
4. Italicize cells A3, A4, A5
5. Use function SUM and write a formula in B7 to calculate the total for the month of January.
6. Use function AVERAGE and write a formula in B7 to calculate the average for the month of January.
7. Copy the formulae in B6 and B7 and use them to calculate the total and average for other remaining months.
8. Use SUM function to get total of Arts Section in the cell E3.
9. Use AVERAGE function to get average of Arts section in the cell F3.
10. Copy the formulae in E3 and F3 and use them to calculate the total and average for other remaining departments.

7.6   Relative and absolute cell reference

7.6.1 Copying a formula

A class teacher to calculates the total and average of each student after the examinations of a term. However, using an electronic spreadsheet would make this task efficient. This is because one can copy the formulae once apply it to many other instances. Hence let us look at the steps on how to copy formulae along rows and columns.

7.6.2 Fill handle of a cell

The small black square in the bottom – right corner of the selected cell or range is called a fill handle. See figure 7.32
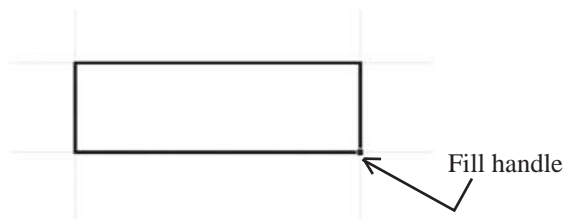

Fill handle

Figure 7. 32 - fill handle

7.6.3 Use of fill handle for copying formulae

Follow the steps below to copy formulae using the fill handle.

1. Select the cell which contains the formula
2. Click the small black square in the bottom-right corner of the selected cell
3. Drag the fill handle up to the required cell

7.6.4 Use of copy and paste commands for copying formulae

Follow the following steps to copy formulae using the copy – paste commands which contains the formula

(1) Select the cell
(2) Copy the contents of the selected cell (Ctrl+C)
(3) Select the cell to which the formula is to be pasted
(4) Paste the contents on the selected cell (Ctrl+V)

7.6.5 Relative and absolute cell reference

A cell address (reference) consists of a column letter and a row number. In a formula such a cell address is always called as a relative reference. The dollar sign ($) when sign is placed befor a row number absolute row is obtained, when ($) mark is placed before a column name an absolute column is obtained, when ($) is placed before column name and row uumber absolute column and row absolure can be obtained
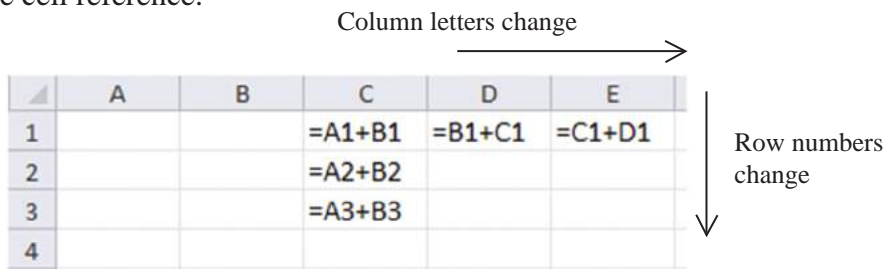
Example

H2   - Relative cell reference
H$2   - Row absolute cell reference
$H2   - Column absolute cell reference
$H$2   - Row and column absolute cell reference

7.6.6 Relative cell reference

If the row number and the column letter of the adjacent cells change accordingly when a formula is copied, such cell addresses are called relative cell reference.

Example

When the formula A1+B1 entered in C1 is dragged down along column C and dragged sideways along row 1, the cell references change accordingly as shown in image 7.33 below. Hence the cell references A1 and B1 could be considered relative cell reference.

Column letters change

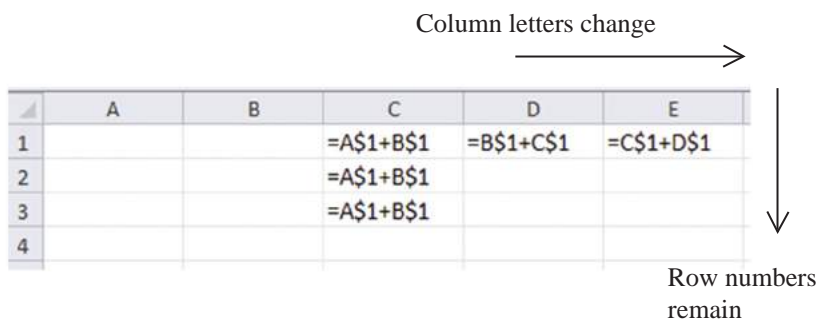| ◢	A	B	C	D	E
1			=A1+B1	=B1+C1	=C1+D1
2			=A2+B2		
3			=A3+B3		
4					

Row numbers change

Figure 7.33 - worksheet with reletive cell reference

7.6.7 Absolute cell reference

If the row number of the cells remain unchanged when a formulae is dragged sideways along a row, it is called row absolute cell reference.

Example

When the formula= A$1+ B$1 entered in C1, and is dragged down along column C and dragged sideways along row 1, as shown 7.34 only the column letters change relatively while the row numbers remain unchanged. Hence the cell reference A$1 and B$1 can be called row absolute cell reference.

Column letters change

◢	A	B	C	D	E
1			=A$1+B$1	=B$1+C$1	=C$1+D$1
2			=A$1+B$1		
3			=A$1+B$1		
4					

Row numbers remain

Figure 7.34 - Work sheet with absolute row cell reference

Example 2

See worksheet 7.35 where the price of many pencils are derived when we know the price of the pencil.

	A	B	C
1	Pencil	Price of a Pencil	Amount(Rs)
2	1	10.00	10.00
3	2		20.00
4	3		30.00
5	4		40.00
6	5		50.00
7	6		60.00

Figure 7:35 - Relative and absoute cell reference

=A2*B2 is the formula we need to enter in C2 to calculate the price of pencils along the column C relative to the number of pencils. Note that we cannot calculate the price of pencils by copying along column C. When the formula is being copied A2 should relatively change into A3,A4,A5 ets. But the cell B2 should always remain constant within the formula. Hence the correct formula to be written in cell C2 is = A2*B$2.

7.6.8 Column absolute cell reference

If the column letter of the cells remain unchanged when a formula is dragged down along a column, it is called column absolute cell reference.

Example 1

When the formula = $A1+$B1 entered in C1 is dragged down along column C and dragged sideways along row 1, as shown in figure 7.36 only the row numbers change relatively while the column letters remain unchanged. Hence the cell reference $A1 and $B1 can be called column absolute cell reference.

Column letters remain

	A	B	C	D	E
1			=$A1+$B1	=$A1+$B1	=$A1+$B1
2			=$A2+$B2		
3			=$A3+$B3		
4					

Row numbers change

Figure 7.36 - Worsksheet with column absolute cell reference.

Example 2

= SUM ($B2:B2) is the formula to be entered along row 3 at the end each Over, to calculate the total runs. This is shown in figure 7.37 below.

	A	B	C	D	E	F	G	H
1	No. of Overs	1	2	3	4	5	6	
2	Runs per Over	13	14	10	7	15	11	
3	Total	=SUM($B2:B2)	27	37	44	59	70	
4								

Figure 7.37 - Worsksheet with absolute cell reference and function column

When the formula is copied along row 3 it would appear as shown in figure 7.38 below.

	A	B	C	D	E	F	G
1	No. of Overs	1	2	3	4	5	6
2	Runs per Over	13	14	10	7	15	11
3	Total	=SUM($B2:B2)	=SUM($B2:C2)	=SUM($B2:D2)	=SUM($B2:E2)	=SUM($B2:F2)	=SUM($B2:G2)
4							

Figure 7.38 - Worsksheet with column absolute cell reference including formulae

7.6.9 Row and column absolute cell reference

If the row numbers and column letters of the cells remain unchanged when a formula is dragged sideways along a row, such cell addresses are known as row and column absolute cell reference.

Example 1

When the formula =A$1+$B$1 in C1 is copied along column A and row 1, the cell references do not change as shown in worksheet figure 7.39

Column letters remain unchanged →

	A	B	C	D	E	
1			=$A$1+$B$1	=$A$1+$B$1	=$A$1+$B$1	
2			=$A$1+$B$1			
3			=$A$1+$B$1			
4						

Row numbers remain unchanged.

Figure 7.39 - Worsksheet with row and column absolute cell reference

Hence when a formula with row and column absolute cell reference is copied along a row or column, the references within the cell remain unchanged.

Example 2

As per worksheet in figure 7.40, the prices of books as per quantity are to be calculated from D4 to 14 and prices of books as per the number of dozens are to be calculated from C5 to C10. Let us write all the formulas so that the relevant prices are displayed at once when we enter the unit price of a book in cell C1. We have C1 has to remain unchanged when the formula is copied along row 4 and along C. Hence we have to enter $C$1, withi the relevant formula.

	A	B	C	D	E	F	G	H	I
1		Price of a book							
2						No of books			
3				1	2	3	4	5	6
4			Price	=D3*$C$1	=E3*$C$1	=F3*$C$1	=G3*$C$1	=H3*$C$1	=I3*$C$1
5		1	=12*B5*$C$1						
6		2	=12*B6*$C$1						
7	No of Dozens	3	=12*B7*$C$1						
8		4	=12*B8*$C$1						
9		5	=12*B9*$C$1						
10		6	=12*B10*$C$1						
11									

Figure 7.40 - Row and Column absolute cell reference

Activity

1. How would the formula appears when formulae are copied.

	A	B	C	D
1	=D2*$E2+G$2	=E2*$E2+H$2	=F2*$E2+I$2	=G2*$E2+J$2
2	=D3*$E3+G$2			
3	=D4*$E4+G$2			
4	=D5*$E5+G$2			
5	=D6*$E6+G$2			

	A	B	C	D
1	=K3-M2+N4			
2				
3				
4				
5				

◢	A	B	C	D
1	=E2*F$2+$G2			
2				
3				
4				
5				

◢	A	B	C	D
1	=$G$2*$F2+G$2-H2			
2				
3				
4				
5				

2. Write the difference between absolute and relative cell addresses.

7.7 Creation of charts using spreadsheets

It is not easy to comprehend, compare, analyze or present data when they are represented as numbers. But when data are presented in the form of charts they become an effective tool to communicate. Let us learn how spreadsheet applications are used for this purpose.

Given below are the various types of charts.

Table 7.16 - Types of charts

Type of chart	basic form	Purpose of chart
Column Chart		Comparing classes of data items in group. Group comparison
Bar Chart		Comparing classes of data items in group. Group comparison
Line Chart		Comparing classes of data items in group. Group comparison
Pie Chart		Comparing classes of data items as percentage.
XY Scatter Chart		Comparing data in pairs

Let us use the worksheet below to create a column chart and a pie chart

	A	B	C	D	E	F	G	H
1	Name	Maths	Science	English	History	Sinhala	Total	
2	Ravidu	54	68	51	91	74	338	
3	Nadeshean	67	42	47	65	51	272	
4	Dinithi	78	56	72	52	53	311	
5	Ashwar	54	63	43	67	29	256	
6	Dilki	60	76	89	87	63	375	
7	Jayani	62	54	68	82	51	317	
8								

Figure 7.41 Worksheet with chart

Follow the steps below to create charts.

In Microsoft Office Excel 2010

1. Select the range of data (A1:F7)
2. Insert → Chart
3. Select the type of chart
4. Select the chart

In LibreOffice Calc

1. Select the range of data (A1:F7)
2. Insert → Chart
3. Select the type of chart
4. Select the chart
5. Click finish.

Follow the steps below to give a title to the chart.

In Microsoft Office Excel 2010
1. Select the type of chart
2. Layout→ Chart Title→ Above chart
3. Type a title

In LibreOffice Calc
1. Select the type of chart
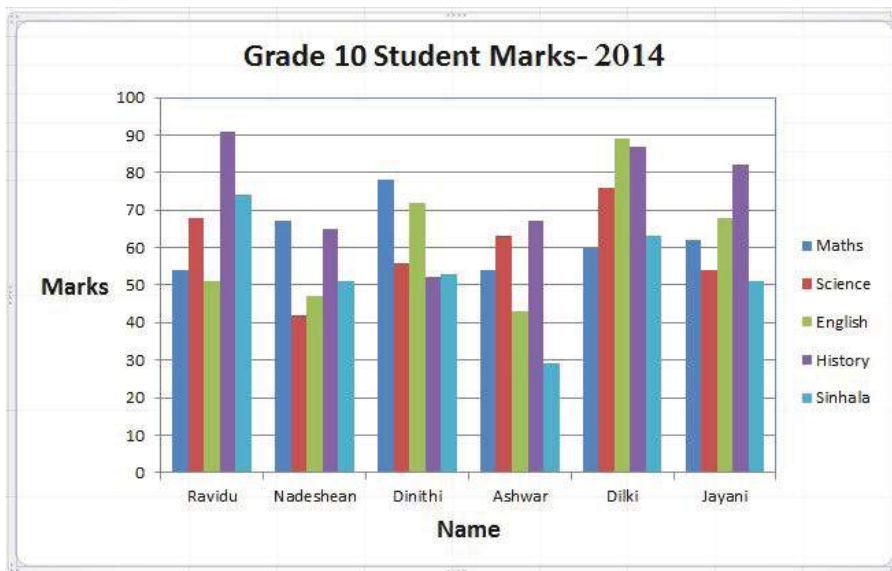2. Insert → Title
3. Type a title
4. Click OK

Follow the steps below to name the axis of the graph.

In Microsoft Office Excel 2010
1. Select the type of chart 2. Layout→ Axis Title 3. Name Axis Type (Vertical or Horizontal)

In LibreOffice Calc
1. Select the type of chart 2. Insert → Title 3. Name Axis 4. Cilck OK

Let us display the marks of the students in a pie chart

In Microsoft Office Excel 2010
1.Select the data ranges A1:A7 and   G1:G7 2. Insert→ Chart → Pie chart

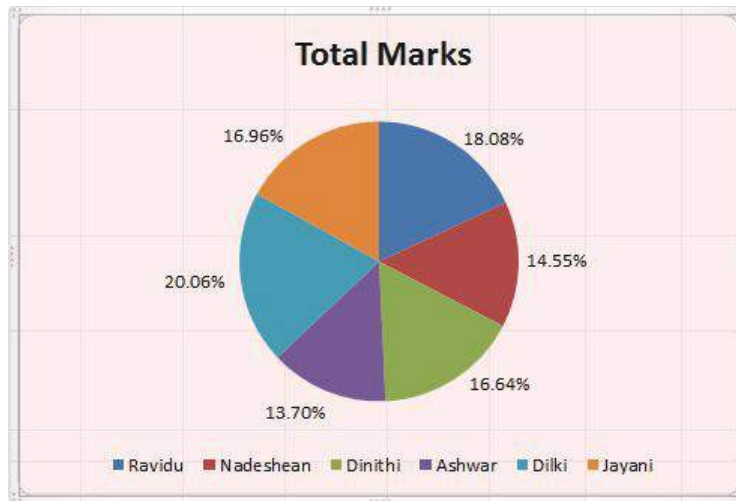| In LibreOffice Calc |
| --- |
| 1.Select the data ranges A1:A7 and
   G1:G7
2. Insert→ Chart → Pie chart |

Figure 7.43 Ravidu Nadeshan Dinithi Aswar Dilki Jayani

Example: Drawing Y=X2-5X-3 quadratic function chart

	A	B	C	D	E	F	G	H	I	J	K	L
1	X	-2	-1	0	1	2	3	4	5	6	7	
2	Y	11	3	-3	-7	-9	-9	-7	-3	3	11	
3												

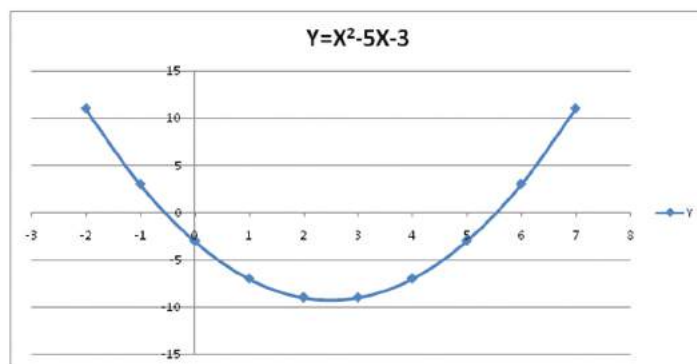1 Step: Enter the values 2 to 7 in axis as shown in worksheets.

2 Step: Enter the formula below in cell B2.

    $= B1 \char`\^2-5*B1-3$

3 Step: Copy the formula entered in B2 upto K2

4 Step: Mark A1:A2 a data range

5 Step: Insert → Chat → XY Scatter

Exercise

1)   Provide answers based on the worksheet below.

	A	B	C	D	E
1	1	2	3	4	
2	5	6	7	8	
3	9	10	11	12	
4	13	14	15	16	
5					

Figure 7.44

(1)   Name the cell range where 2,6,10,14 are present.
(2)   Name the cell range where 9,10,11,12 are present.
(3)   Name the cell range where 6,7,8,10,11,12 are present.
(4)   Write the formula in A5 using only cell addresses to calculate the total of the values from A1 to A4.
(5)   Write the formula in A3 using function to calculate the total of the values from A3 to D3.
(6)   Write how you would copy the formula in E3 to E4
(7)   Write the formula in A5 using function to calculate the average of the values from A3 to D3.

Activity

Create the below worksheet using a spreadsheet. Those who were absent are marked 'ab'.

	A	B	C	D	E	F	G	H
1	Name	Maths	Science	English	History	Sinhala	Total	Average
2	M.Saman Kumara	54	68	51	91	74		
3	K.Rajarathnam	67	81	47	65	ab		
4	A.Dinithi Udeshika	78	56	72	52	53		
5	M.U.Mifraj	ab	63	69	67	89		
6	A.Dilki Ridmika	60	76	89	87	ab		
7	T.Jayani Saranga	62	54	68	82	51		
8								
9	Maximum Marks							
10	Minimum Marks							
11	No. of Present Students							
12	Average Marks of a Subject							
13								

Figure 7-45 Marks List

Use a single function and create the formulae
(1) Enter the formula in G2 to calculate the total marks scored by Saman Kumara
(2) Enter the formula in H2 to calculate the average scored by Saman Kumara.
(3) Enter the formula in B9 to find out the highest score obtained for Mathematics.
(4) Enter the formula in B10 to find out the lowest score obtained by students in each subject.
(5) Enter the formula in B11 to find out the number of students present for each subject.
(6) Enter the formula in B12 to find out the average score of each subject

Summary

- A worksheet is composed of vertical columns and horizontal rows in two diamentional plane.
- Columns in a worksheet are named with English letters or combination of English letters.
- Rows in a worksheet are named with numbers.
- Cells are named firstly by column letter and secondly by row number.
- Cell content is either a label, value or a fomulae.
- A formulae is initiated with equals sign (=).
- There is a presedence of operators.
- Formulas are made with cell addresses, operators and functions.
- Formatting tools are used to format labels and values.
- The fill handle is used to copy formulae.
- Dollar sign ($) is used to make absolute cell reference.
- Several chat types are available in spreadsheet applications.