

Electronic spreadsheets

Introduction to spreadsheets

Throughout the ages, people have always needed to calculate. Tools such as the Abacus were invented by the early Chinese to help keep track of large numbers. About thirty years ago, students only had pen, paper, slide rule and mathematical tables to help them in tier mathematics exams. There were no such things as calculators and certainly no personal computers. Calculators eventually became everyday tools and certainly helped to speed up calculations and improve accuracy. Even then, they weren't really good enough to solve complex problems or deal with large amounts of repetitive work. With advancement in technology, spreadsheets were developed. **A spread sheet is software where numeric data can be typed and manipulated.** Spread sheets are generally used for manipulation of numerical data. Spread sheet software is used to organize data in row and columns and perform calculations in the data. A spreadsheet is software which is used to work out calculations.

Advantages of using electronic spreadsheets

- It is easy to make corrections and changes to the data on a worksheet
- Operations are fast with the help of the built in functions
- Calculations are always accurate provided the data and formula entered are correct
- It is easy to create different kinds of charts and to change the chart types
- Electronic spread sheets are larger than manual spread sheets because they contain hundreds of columns and thousands of rows
- Electronic spread sheets can perform mathematical, statistical and financial calculations quickly and accurately.
- Electronic spread sheets can be stored and retrieved for repeated use.
- Electronic spread sheets have better document formatting capabilities.
- Electronic spread sheet utilize the powerful aspects of a computer like speed, accuracy, and efficiency
- Electronic spread sheets enable the user to produce neat work since traditional paper; pencil and rubber are put aside.
- In electronic spreadsheet there are automatic adjustments of the results of the formula if the values in the work sheet are changed

Features of spreadsheet programs

- Spread sheets recalculate the rest of the work sheet whenever it is changed.
- Have ability to print work sheets, portions of work sheet or several work sheets
- Have chart facilities therefore enabling a user to display data in graphical form
- Have data sorting and filtering capabilities.
- Have ability to adjust column width and row height as well as hide rows and columns
- Have data formatting abilities such as the font and font sizes
- Spreadsheets have built in functions that allow the user to add, multiply and count
- Have data validation facilities that allow correct data to be entered
- Ability to summarize, consolidate data using pivot tables
- Spread sheets are characterized by templates that is pre formatted elements like charts
- Ability to perform what if analysis which can be used to find out the effect of performances of organization

Examples of spreadsheet programs

-

- Microsoft Excel
- VisiCalc
- Lotus 1-2-3
- MS-DOS spreadsheets
- OpenOffice.org Calc

Functions of spreadsheets

- Entering data
- Retrieving data
- Saving data
- Printing data
- Formatting data

Application areas of spreadsheets

- Sales can be recorded, invoices produced and statements compiled.
- Management can keep track of the current payments from customers in relation to goods dispatched.
- Regular printouts of aged debtors, that is people who have owed you money for more than the period in your terms of business can be detected.
- Researchers can compile and analyse their results.
- Teachers can easily create tables of figures and manipulate them quickly as required.

Note the following

A cell is the intersection between a row and a column.

A row is the horizontal arrangement of cells or horizontal division of a worksheet identified by numbers (row headers).

A column is the vertical arrangement of cells or vertical division of a worksheet identified by letters (column headers).

An active cell is a cell currently selected for either data entry or editing.

A cell pointer is rectangular in shape and marks the position of the current cell.

A cell address is the reference given to a particular cell.

Working with spreadsheets

Data entry

There are several data types that can be entered in spreadsheets

a) **Numbers:** These are constant values containing-0,1,2,3,4,5,6,7,8,9. You can enter integers such as 24973. You can enter decimal numbers such as 908.25, 0.745. You can enter integer fractions and you can enter scientific notation such as 5.8713E+3. To enter numbers, select the cell in which you want the numbers to appear, type the number into the cell. To enter a fraction, type an integer followed by a space and then the fraction. If you are entering only the fraction part, type a zero. To enter a **negative number**, precede the number with a **minus sign (-)** and press enter. When numbers are entered, they are aligned to the **right** of the cell.

b) Text

Text entries include a combination of alphabetical characters, numbers and symbols. To enter numbers as text, type an apostrophe (') followed by the numbers for example '39000. Text is aligned to the left.

c) Date and time

Dates and time can be entered using any of these formats.

- 11.6.97
- 6-Nov

- 21:41
- 21:41:25
- 9:45pm

Renaming, inserting, deleting and saving worksheets

A **worksheet** is a combination of rows and columns in which data can be types and manipulated.

A **worksheet** is one sheet in a workbook and is where data is entered and manipulated.

A **workbook** is a collection/group of many worksheets.

Sheet tabs indicate worksheets in the workbook and help you to move from one worksheet to another.

Renaming worksheets

Click on format in the menu bar, choose sheet and click on rename, then type the new name for your worksheet. On the sheet tab, right click the sheet tab you want to rename and then click rename, select the current name and type the new name for your worksheet.

Inserting worksheets

Click on insert in the menu bar, click on worksheet to insert a new worksheet. Right click on an existing sheet tab and choose insert for a new worksheet to be inserted.

Deleting a worksheet

Right click the sheet tab of the worksheet that you want to delete and then click delete.

Saving workbooks

If you are saving the workbook for the first time, click on file, click on save as, in the dialog box- type the name of the work book, specify where you want to save it and click save. To save changes made to an existing workbook, click on file and click on save.

Managing worksheets

Inserting rows, columns and cells in a worksheet

Inserting and deleting rows

In a list of information, you can insert a row if you want to add a new record of data. To insert a row, select the row header of the row you want to move down when you insert the new row and choose insert in the menu bar and click on rows.

Deleting rows

You can delete a row if you no longer want to include a specific record in the list. To delete a row, select the row header of the row you want to delete and choose edit and click on delete.

Inserting and deleting columns

Inserting columns

If you forgot to add a category, you can insert it between existing columns of data. Select the column header of the column you want to move to the right when you insert the new column, choose insert and click on columns.

Deleting columns

You might want to delete a column containing outdated information. Select the column header of the column you want to delete, choose edit and click on delete.

Inserting and deleting cells

Inserting cells

You can insert new blank cells anywhere in the worksheet. Highlight the cell where you want to insert a cell and choose insert cells, select which direction to move existing cells in the worksheet, and then click OK.

Deleting cells

When you delete cells from a worksheet, you delete the contents of the cells and the actual cells themselves. The remaining cells shift to fill the space left by the deleted cells. Highlight the cell you want to delete, choose edit, click on delete and select which direction to move the remaining cells in the worksheet; then click OK.

Selecting cells and ranges

A range is a group of adjacent cells.

A cell is the intersection between a row and a column.

A single cell

Click the cell, or press the arrow keys to move to the cell.

A [range](#) of cells

Click the first cell of the range, and then drag to the last cell.

A large range of cells

Click the first cell in the range, and then hold down SHIFT and click the last cell in the range. You can scroll to make the last cell visible.

All cells on a worksheet

Click the **Select All** button.

Nonadjacent cells or cell ranges

Select the first cell or range of cells, and then hold down CTRL and select the other cells or ranges.

An entire row or column

Click the row or column heading.

Adjacent rows or columns

Drag across the row or column headings. Or select the first row or column; then hold down SHIFT and select the last row or column.

Nonadjacent rows or columns

Select the first row or column, and then hold down CTRL and select the other rows or columns.

More or fewer cells than the active selection

Hold down SHIFT and click the last cell you want to include in the new selection. The rectangular range between the [active cell](#) and the cell you click becomes the new selection.

Cancel a selection of cells

Click any cell on the worksheet.

Moving and copying cell data

[Move or copy cell contents](#)

Double-click the cell that contains the data you want to move or copy. In the cell, select the characters to move or copy. To move or copy the selection, click on the **Cut** tool or click on the **Copy** tool on the **Standard toolbar**. In the cell click where you want to paste the characters or double-click another cell to move or copy the data. Click **Paste**. Press ENTER.

When you copy data, you create a duplicate of data in a cell or range of cells. To copy data: select the cell(s) that you want to copy, click the copy button on the standard toolbar or select edit/copy from the edit menu. Select the cell where you want to place the data. Click the paste button.

To copy data to another worksheet or workbook, change to that worksheet or workbook first.


You can copy the same data to several places by repeating the paste command. When copying or moving data, be careful not to paste the data over existing data unless you intend to do so.

Using drag and drop

The fastest way to copy data is to drag and drop it. Select the cells you want to copy, hold down the Ctrl key and drag the border of the range you selected. When you release the mouse button at the new location, the contents are copied there.

Auto fill tool or copy handle tool

This tool enables you to enter sequences of values automatically.

The fill handle is the small black square in the lower-right corner of the selection.  (When you point to the fill handle, the pointer changes to a black cross.) If you want the series 2, 3, 4, 5..., enter 2 and 3 in the first two cells. If you want the series 2, 4, 6, 8..., enter 2 and 4. To specify the type of series, use the right mouse button to drag the fill handle over the range, and then click the appropriate command on the [shortcut menu](#).

Freezing and unfreezing panes

Freeze panes

Freezing [panes](#) allows you to select data that remains visible when scrolling in a sheet.

Rows and columns can be frozen so they remain visible as you scroll through the data in case the data is too big to fit on one screen.

To freeze panes move the cell pointer to the cell immediately below the rows and to the right of the columns you want to freeze and then:

Click on the **Window** menu

Click **Freeze Panes**.

Unfreeze panes

To remove non-scrolling "frozen" panes, click **Unfreeze Panes** on the **Window** menu.

Adjusting column width and row height

Adjusting column width

This helps you to improve the appearance of your worksheet by fitting the data contained in those columns and to fit more data on-screen or in a printout.

To adjust column width, follow the steps below:

- Move the pointer onto the right boundary of the column heading, move the pointer onto the line between the headers. The pointer changes to a two headed horizontal arrow.
- Drag the width left or right until you reach the desired width then release the mouse button.

You can use format/column width to adjust the column width precisely.

Adjusting row height

The height of a row automatically adjusts to the largest font size applied to a cell in a row unless you manually change the height of the row. If you adjust the height of a row so that it is too small to display the font, the tops of the characters are cut off at the boundary of the cell(s) above.

To adjust row heights, follow the steps below.

- Move the pointer onto the bottom boundary of the row heading. The pointer changes to a two-headed vertical arrow.
- Drag the row up or down until you reach the desired row height, then release the mouse button.

Centering across multiple cells

This enables you to center worksheet titles within a range of selected cells into a single cell.

- Type and format the title in the left cell of the range in which you want the title centered. Select the cells across which you want the text centered.
- Choose format/cells; then click the alignment tab
- In the horizontal drop-down list, select the center across selection option, and then click OK.

You may click on the merge and center button.

Rotating text

You can also align text so that letters are stacked, reading top to bottom, reading sideways, bottom to top or top to bottom.

- Select the cell or range containing data you want to rotate. Choose format/cells; then click the alignment tab.
- In the orientation area, drag the pointer in the second box up or down to change the orientation of the text or specify a value in the degrees box between 90 and -90 degrees. Then click OK.

Shrinking text to fit in a cell

If you need to fit text in a cell without widening the column containing the text, you can shrink the size of the text by using the shrink to fit alignment option.

- Select the cell or range containing data you want to format
- On the format menu, click cells and then click the alignment tab
- In the text control area select the shrink to fit check box. Then click OK

Wrapping text in a cell

If you enter a long text entry in a cell, you can wrap the text so that it forms a paragraph that fits inside that cell. The cell's height increases to accommodate multiple lines of text.

- Select the cell or range containing data you want to format
- On the format menu, click cells
- In the text control area select the wrap text check box. Then click OK

Changing font attributes

To assign font attributes like bold, italic and underline, select the cell or range of cells and use the font attributes buttons on the formatting toolbar.

If you want to access a greater number of font format options, use the font tab of the format cells dialog box.

- Select the cells or range of cell that contain the text you want to format
- Select format/cells and click on the font tab.
- Select the font attribute you want and click OK

Borders and lines

You can place borders around cells or use borders as limits or to add emphasis, to define data entry areas or to mark totals and sub totals. When combined with shading, borders make your worksheet easier to read and add interest.

- Select the cell or range to which you want to add borders
- Click the down arrow next to the borders on the formatting toolbar, a palette of border selection appears. Click the desired border.

Headers and footers

You can add information to the top and bottom margins of the printed page.

- Select view
- Select headers and footers

- Select custom header or custom footer and type a footer or header

Formulae and functions

A formula is an entry used to perform calculations.

A function is a built-in entry that is used to carry out complex calculations.

Types of operators used in spreadsheets

An operator is a symbol used in an expression.

An operand is a value used in an expression.

Operators used in spreadsheets include the following:

^	Exponentiation	multiplies a value a given number of times
+	performs addition	
-	performs subtraction	
*	performs multiplication	
/	performs division	
%	percentage	
<	Less than	
>	Greater than	
=	equal to	
<>	not equal to	
<= or >=	greater than or equal to	
And, or, not, ()	parenthesis, true, false	

When dealing with operators, there is an order to follow:

1 st	exponent (6 [^])
2 nd	multiplication (*) and division (/)
3 rd	addition (+) and subtraction (-)

Types of cell references

Cell references identify a cell or range of cells on a worksheet.

With cell reference, you are able to do the following:

- Use data contained in different parts of a worksheet in a given formula
- Use a value from one cell for calculations
- Refer to cells in other cells on the same workbook
- Refer to data in other programs

References to cells in other workbooks are called external references while references to data in other programs are called remote references. Cell referencing helps to look for values or data that is needed to be used in a formula.

To refer to a cell, use the column letter followed by the row number for example A2, F12. This is called simple cell referencing.

You can refer to a cell using ranges: enter the reference for the cell in the upper left corner of the range followed by a colon and then the reference to the cell in the lower right corner of the range.

Exercise: Give the cell references for the following ranges

- The range of cells in column A row 10 through 20

- All cells in row 5
- All cells in row 5 through 10
- All cells in column H
- All cells in column H through J

Relative cell reference

This is applied when using a formula whose cell references keep on changing automatically depending on their position in the worksheet.

When you create a formula, references to cells or ranges are usually based upon their position relative to a cell that contains a formula.

When you copy a formula that uses relative references, the references in the pasted formula update and refer to different cells relative to the position of the formula.

Absolute cell references

These refer to cell references that always refer to cells in a specific location of a worksheet even if they are copied from one cell to another.

If you do not want references to change when you copy a formula to a different cell, use absolute references.

To make a formula absolute, add a dollar sign before the letter and/or number for example \$B\$10-in this case, both the column and row references are absolute.

Mixed cell references

For some cases you may have a formula that may contain cell addresses where you make the column absolute (unchanged) and the row relative (changing) or the column may be changing and the row absolute or unchanging.

A cell reference that is only partially absolute or relative is called a mixed reference for example A\$2, \$A2

When a formula contains a mixed reference is copied in another cell, only the relative part of the cell reference is changed.

Exercise

For each of the following cell references, state the type of reference.

\$F\$5

A5

H\$21

\$D7

B7

Using a formula to manipulate data

A formula is a user designed mathematical expression used for calculating data. A formula is an entry used to perform calculations like addition, subtraction, multiplication and division. A formula includes cell addresses that reference cells on which you want to perform a calculation. The formula begins with the equal sign (=) to tell the program that the information placed in the cell is meant to be calculated.

Example: =B3+D4 adds contents of B3 and D4 and returns the sum value in the current cell.

The formula uses cell addresses and operators.

Using functions to manipulate data

A function is a built-in entry that is used to carry out complex calculations. A function is a predefined formula used to perform common calculations.

Statistical functions

a) Average

This returns the average of a set of values or numbers. For example if the value 20 is in cell D10 and 30 is in E10 then:

=average(D10:E10) enter which returns 25 as the average of these two values.

b) Count

This counts the number of cells that contain values. **=count (D10:E10) enter**

c) Max

This returns the largest or highest value in a set of values. **=max (D10:C10) enter**

d) Min

This returns the smallest or lowest value in a set of values. **=min(D10:E10) enter**

e) Mode

This returns the most frequently accruing value in a set of values. **=mode (D10:E10) enter**

f) Standard deviation

This calculates the standard deviation of a range of numbers. **=STDV (D10:E10) enter**

g) RANK

This returns the rank of a number in a list by comparing its size relative to the others. **=Rank (H2,(SH\$2:SH\$8)**

h) Sum

This adds values in a range of cells as specified. **=Sum(A10:A15) enter**

i) Product

This multiplies values in a range of cells as specified.

j) Square root

This calculates the square root of values in a given cell.

k) Date and time values

=Today () returns the current date

l) Concatenate

This function joins cell values together into a single cell. The ampersand symbol (&) is used.

=First name&" "&Last name

m) Median

This returns the median of the given numbers. The median is the number in the middle of a set of numbers. **=MEDIAN (A2:A6)**

n) Frequency

This function calculates how often values occur within a range of values, and then returns a vertical array of numbers. For example, use FREQUENCY to count the number of test scores that fall within ranges of scores.

Syntax

FREQUENCY (data_array, bins_array)

Data_array is an array of or reference to a set of values for which you want to count frequencies. If data_array contains no values, FREQUENCY returns an array of zeros.

Bins_array is an array of or reference to intervals into which you want to group the values in data_array. If bins_array contains no values, FREQUENCY returns the number of elements in data_array.

A	B
Scores	Bins
79	70
85	79
78	89
85	
50	
81	
95	
88	
97	

=FREQUENCY(A2:A10,B2:B5)

o) VAR

Estimates variance based on a sample.

Example

Suppose 10 tools stamped from the same machine during a production run are collected as a random sample and measured for breaking strength.

	A
1	Strength
2	1345
3	1301
4	1368
5	1322
6	1310
7	1370
8	1318
9	1350
10	1303
11	1299
=VAR(A2:A12)	726.861

Note: Logical functions

IF function

This function returns a specific value if a condition is evaluated and found to be true and another is false. This function performs a test and returns one value if the result of a test is true and another value if it is false.

=IF(A7>B7,"True""False)

Count IF

This function counts a number of cells in a specified range that meet a given condition. **=countif (A10:E10,"eggs") enter**

Sumif

This function adds a value in a cell specified by a given condition. **=sumif(A10:E10,">50") enter**

Interpreting error values

a) #DIV/0!

The formula is attempting to divide by zero. Check the cell references for blank cells or zeros that may have resulted if you deleted a cell referenced by the formula. **=50/0 enter**

b) ###

This means that the column is not wide enough for the results to be represented. **=1000*100000000 enter**

c) #N/A

The formula refers to a cell that contains no value. This error warns you that not all the data referenced by a formula is available.

d) #NAME?

This error occurs when the name you entered in a formula is not recognised. It means that the function name has been misspelt.

=SAM(D4:D8) enter instead of =SUM(D4:D8) enter

e) #REF!

This means that the formula references to cells that no longer exist because you deleted them. The cell reference in the formula is incorrect. Check for changes to cell references caused by deleting cells, rows or columns referenced by the formula.

f) #NULL!

The formula specifies two areas that do not intersect. Click to see if you entered the cell or range reference incorrectly. Remember to use commas (not spaces) between functions.

g) #NUM!

There is a problem with the number used in the formula. Check for the correct use of function arguments.

h) #VALUE!

The formula contains the wrong type of argument or operator. Check for the correct syntax of the formula. **=69:66 enter instead of =69+66 enter**

Creating charts

A chart refers to the graphical representation of data.

Terms used under charts

Data series: These are bars or lines that represent plotted values in a chart.

Categories: These reflect the number of elements in a series.

Axis: This refers to one side of a chart.

A legend: This defines the separate series of the chart and provides colour coding of the different data ranges in a chart.

Grid lines: These help you to determine a point's exact values.

A **chart title** tells you what the chart is about.

Data labels: These are used to explain the data points in the chart.

Types of charts

Pie chart: This is used to show a relationship among parts of a whole to compare items easily.

Column chart: This chart illustrates individual values at a specific point in time and is used to emphasize the difference between items.

Bar chart: This displays bars horizontally rather than vertically and is used to compare values at a given point in time.

Line chart: This is used to emphasize trends and changes of values over time.

Scatter (XY) chart: This is useful as a diagnosis tool when looking for occurrences or absences of data and is commonly used in scientific applications.

Area chart: This shows how volume changes over time and emphasizes the amount of change.

Number formats

General: have no specific number formats for example 3800, 2000

Number: used for general display of numbers.

Currency: used to display monetary values for example \$250, £500

Accounting: used to line up currency symbols and decimal points in a column.

Date: displays date and time serial numbers as date values for example 3/4/01

Time: displays time values for example 1:30pm

Percentage: multiplies the cell by 100 and displays the result with the percent symbol.

Data management

Sorting data

This is used to arrange data items into a particular order for easy access.

-
- Select the range
- Select data
- Specify the order in which to sort
- Select OK

Filtering data

This is a quick and efficient method of finding and working with a sub-set of data in a list.

Two commands are used: auto filter and advance filter.

Entering data using a form

Forms are already prepared so that the user can apply the forms to enter data and are convenient to use.

-
- Select the data
- Select data
- Select form
- Enter your data

Total/subtotal function

Subtotals work for several items each being needed to identify the amounts due to it and the grand total. The list should have labeled columns and should be sorted accordingly.

-
- Select the cells in the list
- Select data
- Select subtotals
- Select name from at each change in box
- Select sum from the use function box
- Select OK