

Spreadsheets I



Senior Computer Studies

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Introduction

In this topic we will discuss the following:

- Definition of spreadsheet.
- Types of spreadsheets.
- Features of electronic spreadsheets.
- Electronic spreadsheet window (case: MS Excel).
- Benefits of electronic spreadsheets.
- Workbook and worksheet.
- Cells, columns, and rows.
- Cell referencing.
- Quiz 1



Note!: to the instructor/teacher:

- Make sure the lessons are carried out in a computer lab and demonstration to the students is a **must**.
- MS Excel package is a minimum requirement for this course.

Note!: to the student:

- Study, Practice, Repeat.

Definition

- A spreadsheet is a document used to organize, analyze, and store data in a **tabular format**.
- It can also be defined as 'an accounting ledger book in which data is organized in **rows** and **columns**'.
- **Figure 1** on the right shows an example of a simple spreadsheet.

| | A | B | C | D |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |

Figure 1: Simple Spreadsheet

Types of Spreadsheets

- We have **two** main types of spreadsheets, namely:
 - **Manual** spreadsheets
 - **Electronic** spreadsheets
- A good example of a manual spreadsheet is a **ledger book**.
- **Figure 2** below shows a ledger book as an example of a traditional spreadsheet.

Manual Spreadsheet

- This type of spreadsheet is made up of sheets of paper divided into rows and columns on which data is entered manually.
- A manual spreadsheet is also called a **traditional spreadsheet**.



Figure 2: Ledger book – Manual spreadsheet

Types of Spreadsheets

Electronic Spreadsheet

- This is an **application software** made up of **rows and columns** used to organize, calculate, and analyze numerical data.
- It can also be defined as a **digital** document used to organize, analyze, and store data in a **tabular format**.
- Examples of electronic spreadsheets include:
 - *Microsoft Excel, Google Sheets, Apple Sheets, OpenOffice Calc, LibreOffice Calc, and Lotus 1-2-3.*

- **Figure 3** below shows a sample Microsoft Excel spreadsheet as an example of an electronic spreadsheet.

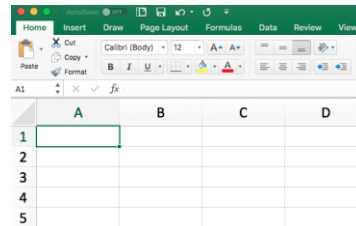


Figure 3: Microsoft Excel – Electronic spreadsheet

Features of an electronic spreadsheets

- When it comes to software/applications like spreadsheets, features **refer to the distinct functionalities, capabilities, or characteristics that a software/application offers to its users.**
- Features of a software/application may include elements such as **user interface, functionalities, security measures, integration, and customization options.**
- On the right are some of the features of electronic spreadsheets:
 - a. Cell** – this is the intersection between a row and a column. In a spreadsheet, a cell is identified by a **cell address** for example **A3**, where **A** is a **column** designator and **3** is a **row** designator. Cells organize data in rows and columns, allowing easy input, organization, and manipulation of data.
 - b. Cell Reference** – this is also called cell address. It is the combination of the column position and row position. Allows linking between cells.

Features of an electronic spreadsheets.

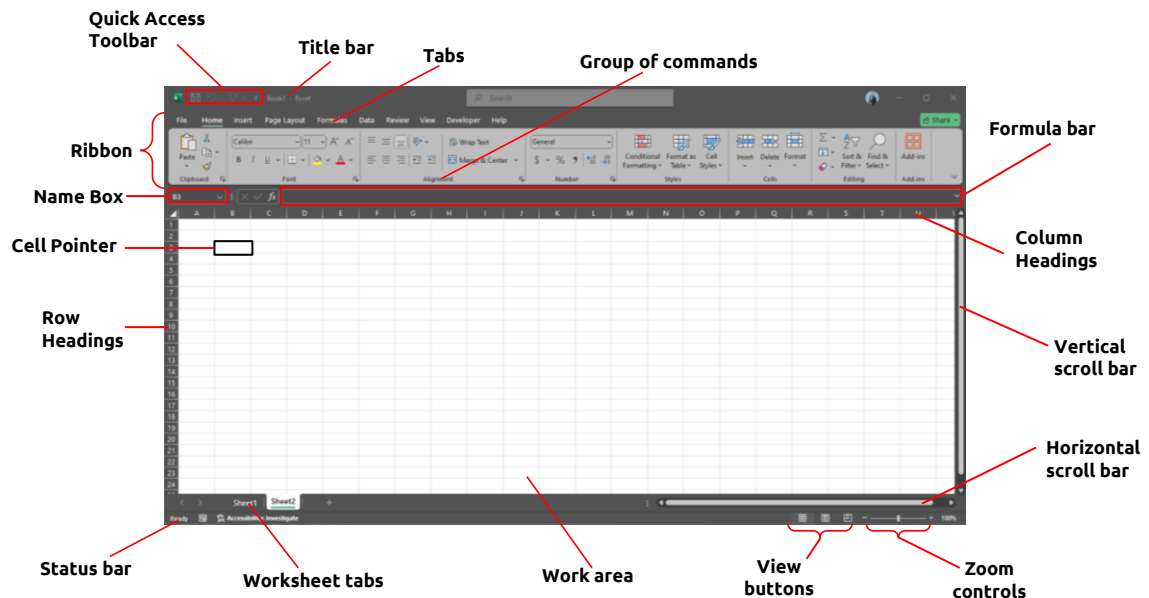
- c. **Worksheet** – this is a single **work area** in a spreadsheet file. It is made up of a grid of cells organized into rows and columns. The work area is a space where you enter, calculate, manipulate, and analyse data.
- d. **Workbook** – this is a spreadsheet file that **contains** one or more **worksheets**. It saves as a container for organizing and managing related worksheets (data) in a single document. In MS Excel workbooks are assigned names such as **Book1**, **Book2**, and so on, unless saved by another name by the user.
- e. **Formulas and Functions** – allows automatic calculations and data analysis. Examples of built-in functions in a spreadsheet are **SUM**, **IF**, **SUMIF**, **MAX**, **AVERAGE**, and **COUNT**.
- f. **Macros and Automation** – allows users to record and execute (run) repetitive tasks automatically as such saving time and reducing errors.
- g. **Data validation** – ensures that only accurate data is entered by restricting the types of data that can be input into cells.

Features of an electronic spreadsheets..

- h. **Name box** – identifies and displays the cell name (cell address) of the **active cell**. An active cell is one surrounded by a **border** in the work area. The border is called a **cell pointer**.
- i. **Formula bar** - displays the contents of the active cell.
- j. **Title bar** - displays the name of the workbook and the type of software being used, for example, in MS Excel it will display: **Book1 – Excel**. (if the file is not saved under a different name)
- k. **Data formatting** – allows users to customize the appearance of data such as font styles, colours, borders, and number formats.
- l. **Vertical and horizontal scroll bars** – allow the user to scroll the worksheet (work area) up and down or side by side within the workbook.
- m. **Ribbon** – a **user-interface** element mostly found in applications such as MS Excel and other software, that organizes commands and tools into a set of **tabs** and **groups of commands**, making it easier for users to find and use features.

Features of an electronic spreadsheets...

- n. **Quick Access Toolbar (QAT)** – this is a customizable toolbar located above or below the ribbon of an application. It provides quick access to frequently used commands, such as the **save**, **redo**, and **undo** commands.
 - o. **Worksheet tabs** – identify the various worksheets in a workbook. Allows the user to move from one worksheet to another.
 - p. **Data filtering and sorting** – allows the user to easily organize and view data according to a specific criteria.
 - p. **Charts and Graphs** – allows the user to visualize data through various chart types such as bar, column, line, area, and pie charts for easy data interpretation.
 - q. **Pivot tables** – enable users to summarize and analyse large datasets interactively making it easier to identify trends and patterns.
- Note:** *a pivot table is a data analysis tool that is provided by most spreadsheet applications to analyse large datasets interactively.*



Benefits of electronic spreadsheets

Electronic spreadsheets have the following benefits over the manual spreadsheet:

- i. Automated calculation** – electronic spreadsheets have inbuilt formulas (functions) that enable users to quickly manipulate mathematical data and reduce human error.
- ii. Speed and efficiency** – electronic spreadsheets utilize the computer's speed to allow rapid data entry, calculations, and updates as such saving time as compared to usage of manual spreadsheets.
- iii. Large data storage** – electronic spreadsheets utilize the computer's large storage space to save and retrieve data.
- iv. Automatic recalculation** – electronic spreadsheets has the ability to automatically adjust the results of a formula if the values used in the formula are changed.
- v. Data security and backup** – electronic spreadsheets can be password-protected and regularly backed up providing better security and disaster recovery.

Benefits of electronic spreadsheets

- vi. Neat work** – electronic spreadsheets allow users to produce neat work through their easy formatting and editing features.
 - vii. Large virtual sheets for data entry and manipulation** – electronic spreadsheets provide large virtual work areas as compared to manual spreadsheets.
 - viii. Data visualization** – it is very easy to produce charts, graphs, and pivot tables in electronic spreadsheets than in manual spreadsheets.
- Below are some of the uses of spreadsheets:**
- Budgeting and financial preparation.
 - Sorting and Filtering large volumes of data – arranging information.
 - Sales tracking and forecasting.
 - Statistical analysis.
 - Gradebook and student records.
 - Database management.
 - What if analysis – used in forecasting.

Workbook and Worksheet

These are the **basic** components of a spreadsheet that work together to organize and manage data effectively.

Workbook

- This is the entire spreadsheet application file that **contains** all worksheets.
- It is a container for multiple worksheets, allowing users to store related worksheets in one place.
- Each workbook is saved as a **single file** and it has an extension depending the spreadsheet application used.

- For example: MS Excel has file extension like **.xlsx**, **.xls**, **.xlsm**, LibreOffice Calc has an extension of **.ods**, and Google Sheets has an extension of **.gsheet**.

Worksheet

- This is a **single page** within a workbook.
- A worksheet is the **main working area** in a workbook.
- It is **made up** of **rows** and **columns**, which intersect to form **cells**.
- The cells are where users **enter**, **manipulate**, and **analyze** data.

Cells, Columns, and Rows

Cell

- This is where data is **entered**, **stored**, and **manipulated** in a worksheet.
- It is the **intersection** between a **column** and a **row**.
- An **active cell** is identified by a **cell pointer**.
- Each cell in a worksheet has a **unique address** called **cell address** or **cell reference**.
- Cell address is based on the **column letter** and **row number**, such as **B2**, **E4**, or **D10**.

Contents of a cell

A cell can contain **three** types of information:

1. Label

- This is also called **text**. It can be used as a heading to describe items in a worksheet.
- It contains a string of characters and numbers.
- A label **must only** start with a character (letter) that **does not** indicate a formula or number.
- Labels are **not** used in calculations

2. Number

- This is also called a **value**. It is used in calculations.
- A value includes **only** digits from 0 to 9.
- May also include special characters (symbols) such as: +, -, (), %, and more.

Cells, Columns, and Rows

3. Formula and Functions

- A formula is an instruction (command) that creates a relationship between two or more cell contents and returns a value.
- formulas and functions perform their actions on values and return a value as well.
- All formulas in MS Excel must start with an equal sign (=), for example, =(A2+A4)
- **Note:** A function is a **predefined** or an **inbuilt** formula such as =SUM(A2,A4)

Columns

- These are the vertical arrangements of cells in a worksheet.
- All columns in a worksheet are identified by letter headings: **A, B, C,...XFD**.

Rows

- These are the horizontal arrangements of cells in a worksheet.
- All rows in a worksheet are identified by number headings: **1, 2, 3,...1048576**.



Cell Referencing

- Cell referencing refers to the way cells are **identified** and used in formulas and functions to perform calculations and **link** data.
- In this class, we are going to focus on the first three types of cell references:

Relative Referencing

- Cell referencing allows users to use values in one cell or a range of cells in another part of your worksheet without having to re-enter the data.
- This is the default type of cell referencing in a spreadsheet, for example, A1,A2, D40.
- It is a cell reference in a formula or function whose location is interpreted by the spreadsheet about the position of the cell that contains the formula or function.
- We have the following types of cell references in spreadsheets: **Relative referencing, Absolute referencing, Mixed Referencing, Range referencing, and 3D referencing**.
- Consider the example below:

Cell Referencing

| | A | B | C | D | E | F |
|---|--------|-------------|-------|-------|-------------|---|
| 1 | | Score Board | | | | |
| 2 | | Day 1 | Day 2 | Day 3 | Total Point | |
| 3 | Team A | 3 | 5 | 2 | | |
| 4 | Team B | 5 | 1 | 3 | | |
| 5 | | | | | | |

- In the Excel snippet above, to calculate the total points in cell **E3**, we can use the formula **=B3+C3+D3**
- The formula **=B3+C3+D3**, uses relative referencing, in such a way that cell **E3** is using the references **B3**, **C3**, and **D3** to get the position and contents of the cells.

• With relative referencing, when the formula is copied, the referenced cells automatically adjust (change) to reflect the new position and cell contents.

• For example, if the formula in **E3** is copied to **E4**, then the formula in **E4** will adjust to **=B4+C4+D4**.

• So in **E3** the value will be **10**, and in **E4** it will be **9**.

Question:

- What will be the formula in **E5** if we replicate it from **E3**?
- What will be the value in **E5**?

Cell Referencing

Absolute Referencing

- This type of cell referencing keeps the exact row and column **fixed, no matter where the formula is copied**.
- This cell referencing uses the dollar signs (\$), for example: **\$A\$3**.
- Absolute referencing is very useful when the user wants to reference a specific cell consistently in calculations.
- Consider the example on the right:

| | A | B | C | D | E |
|---|----------------------------------|---------|--------|------------|---|
| 1 | Product | Price | VAT | Total Cost | |
| 2 | Bread | 2100.00 | 16.50% | | |
| 3 | Sugar | 2300.00 | | | |
| 4 | Cooking Oil | 7000.00 | | | |
| 5 | | | | | |
| 6 | note: VAT = Value Added Tax rate | | | | |
| 7 | | | | | |

• Imagine you have a list of products and their prices as shown above, and you need to calculate their **Total cost** including the fixed VAT rate of 16.5% on every product.

Cell Referencing

- In this case we want the value and position of the VAT rate to remain the same (**not changed**) even if the formula will be copied, as such we use absolute referencing for the VAT rate.
- Note that the VAT value is in **C2**.
- So the formula to calculate the **Total Cost** for the first product (Bread), including the VAT will be: **=B2+(B2*\$C\$2)**.
- So, even if this formula is replicated in the other products, the value and position of the VAT rate will not be changed.
- Absolute referencing provides consistent and accurate calculations without manually entering the same value each time.

Mixed Referencing

- This type of referencing combines absolute and relative referencing.
- In this referencing, a row or a column is fixed, but **not both**. Thus: **\$A4** or **A\$4**.
- This type of referencing offers more flexibility when copying formulas.

Quiz One

1. a. Define the term 'Spreadsheet'. (1)
b. Describe the **two** types of spreadsheets. (4)
2. a. List any **two** cell contents of a spreadsheet. (2)
b. Explain the difference between a worksheet and a workbook. (2)
3. a. Mention **three** types of cell referencing in spreadsheets. (3)
b. Explain any **three** uses of spreadsheets. (6)

next: spreadsheets II

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