Chapter 1: What is Excel?

Introduction to Excel

Microsoft Excel is a **powerful spreadsheet application** developed by Microsoft that allows users to:

- Organize and manipulate data.
- Perform calculations using formulas and functions.
- Visualize data through charts and graphs.
- Create interactive dashboards and reports.
- Perform statistical, financial, and logical analysis.

Excel is used across industries such as business, finance, data analysis, engineering, marketing, education, and more.

📌 Key Concepts in Excel

✅ 1. Workbook

- A **workbook** is an Excel file that contains one or more worksheets.
- File extension: `.xlsx` (modern) or `.xls` (older).
- Think of it as a container or folder for your entire project.

✅ 2. Worksheet

- A **worksheet** is a single spreadsheet (grid of rows and columns) within a workbook.
- Each worksheet has a name (Sheet1, Sheet2…) and can be renamed (e.g., "Sales2024").
- You can have multiple worksheets in one workbook.

✅ 3. Cell

- A **cell** is the basic unit of a worksheet where you enter data.
- It is identified by a **cell reference**, such as `A1` (Column A, Row 1).
- Data types: Text, Numbers, Formulas, Dates, etc.

✅ 4. Range

- A **range** is a group of two or more cells. It can be:
  - Vertical: `A1:A5`
  - Horizontal: `A1:E1`
  - Rectangular block: `A1:C5`

✅ 5. Formula

- A **formula** is a user-defined equation in Excel.
- Every formula starts with an equals sign =
- Example: `=A1+B1` adds the values in cells A1 and B1.

✅ 6. Function

- A **function** is a predefined formula that simplifies complex calculations.
- Common functions include:
  - `=SUM(A1:A5)` — Adds values from A1 to A5.
  - `=AVERAGE(B1:B5)` — Finds the mean.
  - `=MAX(C1:C5)` — Finds the highest value.
  - `=MIN(D1:D5)` — Finds the lowest value.

✅ 7. Charts

- Excel allows you to create visual representations of your data like:
  - Bar/Column Chart
  - Pie Chart
  - Line Chart

✅ 8. Pivot Table

- A powerful tool to **summarize, group, and analyze** large datasets.
- Allows drag-and-drop analysis without changing the original data.

✅ 9. Conditional Formatting

- Automatically format cells based on rules.
- Example: Highlight all values above 100 in green.

✅ 10. Data Validation

- Restrict the type of data that can be entered in a cell.
- Example: Allow only dates or only numbers between 1–100.

Practical Exercises

▶ Exercise 1: Explore the Excel Interface

Objective: Understand the structure of Excel.

1. Open Microsoft Excel.
2. Observe the **Workbook** name on the top (e.g., Book1.xlsx).
3. Look at the **Worksheet tabs** at the bottom (Sheet1, Sheet2…).
4. Click on any **cell** (e.g., A1) and observe the row and column headers.

5. Identify:
    o Active Cell (highlighted box)
    o Column Labels (A, B, C…)
    o Row Numbers (1, 2, 3…)

▶ Exercise 2: Write a Simple Formula

Objective: Learn how to write a basic formula.

1. In cell A1, type `10`
2. In cell B1, type `20`
3. In cell C1, type the formula: `=A1+B1`
4. Press **Enter**
5. Observe that Excel calculates the sum and displays `30` in cell C1.

Tip: You can also use subtraction `=A1-B1`, multiplication `=A1*B1`, or division `=A1/B1`.

▶ Exercise 3: Use the SUM Function

Objective: Practice using a built-in function.

1. In cells A2 to A6, enter: `5`, `15`, `20`, `10`, `25`
2. In cell A7, enter: `=SUM(A2:A6)`
3. Press **Enter**
4. Excel will display the total: `75`

Bonus:

- Try `=AVERAGE(A2:A6)` to find the average.
- Try `=MAX(A2:A6)` and `=MIN(A2:A6).`

Knowledge Check Questions

1. What is the difference between a workbook and a worksheet?
2. What symbol must every formula start with in Excel?
3. What function would you use to calculate the total of a column?
4. Which Excel tool allows you to visually analyze trends?
5. How would you reference a range of cells from A1 to A10?

Chapter 2: Manage Data in Cells and Ranges

Overview

In Excel, **managing data** involves entering, formatting, sorting, filtering, and performing calculations on values stored in cells and ranges. These foundational skills allow users to analyze and extract insights from datasets efficiently.

📌 Key Concepts

✅ 1. Entering Data

- You can type text or numbers directly into cells.
- Press **Tab** to move right and **Enter** to move down.

✅ 2. Selecting a Range

- Click and drag to select a group of cells.
- Use `Shift` + Arrow Keys or `Ctrl` + Click for advanced selections.

✅ 3. Sorting Data

Sorting helps arrange your data in a meaningful order.

- **Ascending (A-Z or smallest to largest)**
- **Descending (Z-A or largest to smallest)**

Example: Sort employees by Age or sales by amount.

Steps to Sort:

1. Select your data (include column headers).
2. Go to the **Home** tab → Click **Sort & Filter** → Choose `Sort A to Z` or `Sort Z to A`.
3. For custom sorting (e.g., multiple columns), choose **Custom Sort**.

✅ 4. Filtering Data

Filtering allows you to display only rows that meet specific criteria.

Example: View only rows where `Score > 70`.

Steps to Apply Filter:

1. Select your data range (with headers).
2. Go to the **Data** tab → Click on **Filter**.
3. Click the drop-down arrow in the `Score` column.
4. Choose **Number Filters > Greater Than…** → Enter `70`.

✅ 5. Calculating with Formulas

Excel formulas perform calculations using cell references.

Example Formulas:

- `=A1+B1` → Adds values in A1 and B1.
- `=A1*B1` → Multiplies values.
- `=AVERAGE(C2:C6)` → Finds the average of scores.

Commonly Used Functions:

- `SUM(range)` → Adds all values.
- `AVERAGE(range)` → Finds the mean.
- `MAX(range)` → Largest value.
- `MIN(range)` → Smallest value.

Practical Hands-On Exercises

▶ Exercise 1: Create a Simple Dataset

Objective: Enter and manage tabular data.

1. Open a new worksheet.
2. In cell **A1**, type `Name`
3. In **B1**, type `Age`
4. In **C1**, type `Score`
5. Fill the table like this:

Name	Age	Score
Alice	24	88
Brian	21	67
Carol	23	73
Daniel	25	91

Name Age Score
Esther 22   64

▶ Exercise 2: Sort by Age

Objective: Organize data by a numerical field.

1. Select the full table (A1:C6).
2. Go to **Home > Sort & Filter > Sort A to Z** (on `Age` column).
3. The table should now show the youngest to oldest.

Extension: Try `Sort Z to A` for descending order.

▶ Exercise 3: Filter for Scores Above 70

Objective: Use filters to extract relevant information.

1. Select A1:C6
2. Go to the **Data** tab → Click **Filter**
3. Click the drop-down arrow on **Score**
4. Choose `Number Filters > Greater Than`
5. Enter `70` → Click OK

✅ Now only students with scores above 70 are shown.

▶ Exercise 4: Calculate Average Score

Objective: Use the AVERAGE function to analyze data.

1. Below the data (e.g., in cell C8), type:

   ```
   =AVERAGE(C2:C6)
   ```

2. Press Enter.
3. Excel returns the average of all the student scores.

Bonus Calculations:

- Highest Score: `=MAX(C2:C6)`
- Lowest Score: `=MIN(C2:C6)`
- Total Score: `=SUM(C2:C6)`

Knowledge Check Questions

1. What's the difference between sorting and filtering?
2. How do you apply a filter to view only high-performing students?
3. Write the formula to calculate the average age.

4. How would you highlight all students younger than 23?

Chapter 3: Excel Functions (Trainer Notes)

Overview

Excel **functions** are **predefined formulas** that perform specific calculations or operations. They save time and reduce errors when working with repetitive or complex calculations.

Functions are categorized into:

- **Mathematical functions**: Perform arithmetic.
- **Statistical functions**: Analyze data sets.
- **Text functions**: Manipulate and format text.
- **Logical functions**: Make decisions.
- **Lookup functions**: Search and return values from tables.

📌 Key Excel Functions Explained

✅ 1. Mathematical & Statistical Functions

SUM(range)

Adds all numbers in a range.

Example: `=SUM(B2:B6)` totals values from B2 to B6.

AVERAGE(range)

Calculates the mean of a group of numbers.

Example: `=AVERAGE(C2:C6)`

COUNT(range)

Counts how many cells in a range contain numbers.

Example: `=COUNT(B2:B6)`

MAX(range) / MIN(range)

Returns the highest or lowest number in a range.

Example: `=MAX(B2:B6)` or `=MIN(B2:B6)`

✅ 2. Text Functions

`CONCATENATE(text1, text2,...)` *(or `TEXTJOIN`/ & operator)*

Combines text from multiple cells into one.

Example: `=CONCATENATE(A2, " ", B2)` → joins first and last name.

`LEFT(text, num_chars)` / **`RIGHT(text, num_chars)`**

Extracts a specific number of characters from the beginning or end of a string.

`=LEFT(A2, 3)` returns the first 3 characters of cell A2.

✅ 3. Logical Functions

`IF(logical_test, value_if_true, value_if_false)`

Makes a decision based on a condition.

Example: `=IF(C2>=50, "Pass", "Fail")`

`AND(condition1, condition2,...)`

Returns TRUE if **all** conditions are true.

`=AND(B2>20, C2>60)`

`OR(condition1, condition2,...)`

Returns TRUE if **any** condition is true.

`=OR(B2>20, C2>90)`

✅ 4. Lookup Functions

`VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])`

Searches for a value in the first column of a table and returns a value from a specified column.

`=VLOOKUP("Pen", A2:C6, 2, FALSE)` → finds "Pen" and returns its price.

`XLOOKUP(lookup_value, lookup_array, return_array)`

Newer, flexible lookup replacing VLOOKUP.

`=XLOOKUP("Pen", A2:A6, B2:B6)`

Hands-On Practical Exercises

▶ Dataset Preparation

Enter the following data into Excel:

Product	Price	Stock	First Name	Last Name
Pen	25	100	Alice	Mumo
Pencil	15	50	Brian	Kiptoo
Book	120	30	Carol	Otieno
Ruler	10	80	Daniel	Mwangi
Eraser	5	70	Esther	Wanjiru

▶ Exercise 1: Use MAX and MIN

Objective: Analyze the extremes in your dataset.

1. In cell F1, type: `Highest Price`
2. In cell F2, enter:

   `=MAX(B2:B6)`

3. In cell G1, type: `Lowest Stock`
4. In cell G2, enter:

   `=MIN(C2:C6)`

✅ Result: Returns the highest price and lowest stock value.

▶ Exercise 2: Join First and Last Names

Objective: Use CONCATENATE to form full names.

1. In cell E2, enter:

   `=CONCATENATE(D2, " ", E2)`

2. Press **Enter** and drag the formula down.

✅ Result: Full names like "Alice Mumo", "Brian Kiptoo"...

Alternative: Use `=D2 & " " & E2` or `=TEXTJOIN(" ", TRUE, D2, E2)`

▶ Exercise 3: Lookup Price using VLOOKUP

Objective: Search for a product and return its price.

1. In cell H1, type: `Enter Product`
2. In H2, type a product name like `Book`
3. In I1, type: `Price`
4. In I2, enter:

```excel
CopyEdit
=VLOOKUP(H2, A2:C6, 2, FALSE)
```

✔ Result: Returns the price of the product typed in H2.

💡 Bonus Exercises

- Use `COUNT(B2:B6)` to count how many prices are listed.
- Use `IF(B2>50, "Expensive", "Affordable")` to classify products.
- Use `XLOOKUP` to find stock levels:

```
=XLOOKUP("Book", A2:A6, C2:C6)
```

Knowledge Check Questions

1. What is the difference between `MAX` and `MIN`?
2. How do you merge a first name and last name into one cell?
3. What does `FALSE` do in a VLOOKUP function?
4. Write a formula to return "Low" if stock is <50, and "OK" otherwise.
5. Which function would you use to search for a value horizontally?

Chapter 4: IF, IFS, and SWITCH

Overview

Excel's **logical functions** are used to evaluate data and return results based on certain conditions. These are essential when you want Excel to "make decisions" within your spreadsheet.

This chapter focuses on:

- `IF` → Handle **one condition**
- `IFS` → Handle **multiple conditions**
- `SWITCH` → Match a **single expression** to **multiple outcomes**

📌 Key Concepts

✅ 1. IF Function

Purpose: Tests a condition and returns one value if TRUE and another if FALSE.

Syntax:

```
=IF(logical_test, value_if_true, value_if_false)
```

Example:

```
=IF(B2>=50, "Pass", "Fail")
```

- If B2 is greater than or equal to 50, return "Pass"; otherwise, return "Fail".

✅ 2. IFS Function

Purpose: Tests **multiple conditions** and returns a value for the **first TRUE** condition.

Syntax:

```
=IFS(condition1, result1, condition2, result2, ...)
```

Example (Grading):

```
=IFS(B2>=90, "A", B2>=80, "B", B2>=70, "C", B2>=60, "D", TRUE, "F")
```

- Checks the first condition that is TRUE and returns its corresponding result.

✅ 3. SWITCH Function

Purpose: Compares **one value or expression** against a list of values and returns the matching result.

Syntax:

```
=SWITCH(expression, value1, result1, value2, result2, ..., [default])
```

Example (Department):

```
=SWITCH(A2, "HR", "Human Resources", "IT", "Information Technology", "FIN",
"Finance", "Unknown")
```

- If A2 is IT, result is "Information Technology".

Practical Exercises

▶ Dataset Preparation

Enter the following into a worksheet:

Name	Score	Grade	Code
Alice	92		IT
Brian	76		HR
Carol	45		FIN
Daniel	61		IT
Esther	89		OPS

▶ Exercise 1: Use IF to Classify Pass/Fail

Objective: Use the IF function to determine whether a student passed (score ≥ 50).

1. In cell D2, enter:

   ```
   =IF(B2>=50, "Pass", "Fail")
   ```

2. Drag the formula down to D6.

✓ Output:

- If Score $\geq 50 \rightarrow$ "Pass"
- If Score $< 50 \rightarrow$ "Fail"

▶ Exercise 2: Use IFS to Assign Grades

Objective: Use IFS to assign letter grades.

Grading Scheme:

- A: 90 and above
- B: 80–89
- C: 70–79
- D: 60–69
- F: Below 60

1. In cell E2, type:

   ```
   =IFS(B2>=90, "A", B2>=80, "B", B2>=70, "C", B2>=60, "D", TRUE, "F")
   ```

2. Drag the formula down to E6.

✅ Output: Students receive grades based on scores.

▶ Exercise 3: Use SWITCH to Translate Department Codes

Objective: Use `SWITCH` to convert department codes to full names.

1. In cell F1, type `Department`
2. In F2, enter:

```
=SWITCH(C2, "IT", "Information Technology", "HR", "Human Resources",
"FIN", "Finance", "OPS", "Operations", "Other")
```

3. Drag the formula down to F6.

✅ Output: IT → "Information Technology", HR → "Human Resources", etc.

Knowledge Check Questions

1. What is the main limitation of the `IF` function when handling many conditions?
2. How is `IFS` more efficient than nested `IF` functions?
3. When should you use `SWITCH` instead of `IFS`?
4. Write an `IF` formula that returns "Above Average" if a score is above 70, otherwise "Below Average".
5. Modify the grading scale to include "A+" for scores ≥ 95 using `IFS`.

Chapter 5: Conditional Formatting and Data Validation

Objective:

- Learn how to **visually emphasize data** using Conditional Formatting.
- Use **Data Validation** to restrict or control data input in cells.

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1. Conditional Formatting – Highlight Scores Less Than 40

Goal:

Visually identify all scores that are less than 40 (e.g., failing scores).

Steps in Excel:

1. Select the range of cells containing the scores (e.g., `B2:B20`).
2. Go to the **Home** tab.
3. Click on **Conditional Formatting** > **Highlight Cells Rules** > **Less Than**.
4. In the dialog box:

- o Enter `40`.
- o Choose a format (e.g., Light Red Fill with Dark Red Text).
5. Click **OK**.

✅ **Result:**

Any cell in your selected range with a score less than 40 will now be highlighted, helping you quickly spot low scores.

2. Data Validation – Create a Dropdown List with Yes, No, Maybe

Goal:

Restrict user input to only allow **Yes**, **No**, or **Maybe** in selected cells.

Steps in Excel:

1. Select the cells where the user should input a response (e.g., `C2:C20`).
2. Go to the **Data** tab.
3. Click on **Data Validation**.
4. In the dialog box:
   - o Under the **Settings** tab:
     - ▪ Allow: **List**
     - ▪ Source: `Yes,No,Maybe`
   - o (Optional) Under the **Input Message** tab:
     - ▪ Title: **Response Required**
     - ▪ Input message: **Please select Yes, No, or Maybe from the list.**
   - o (Optional) Under the **Error Alert** tab:
     - ▪ Style: **Stop**
     - ▪ Title: **Invalid Entry**
     - ▪ Error message: **Only Yes, No, or Maybe are allowed.**
5. Click **OK**.

✅ **Result:**

Users will now see a dropdown list in each selected cell and can only choose **Yes**, **No**, or **Maybe**—preventing invalid data entries.

Summary Table

Feature	Use Case	Key Benefit
Conditional Formatting	Highlight scores < 40	Quickly identify failing students
Data Validation	Restrict input to Yes/No/Maybe	Prevent incorrect or inconsistent data entry

Chapter 6: Working with Excel Tables

Objective:

- Understand how to convert a data range into an Excel Table.
- Use built-in features like sorting, filtering, and structured formulas for easier and more dynamic data analysis.

Why Excel Tables?

Excel Tables offer powerful advantages:

- **Automatic formatting and filtering**
- **Structured referencing** (you can use column names in formulas)
- **Dynamic range expansion** as data is added
- **Better readability and usability**

Exercises

1. Convert Data to a Table

✅ Goal:

Turn your plain range of data into an Excel Table for better management and formatting.

🔧 Steps:

1. Select your entire data range (e.g., `A1:D20`).
2. Go to the **Insert** tab on the Ribbon.
3. Click **Table**.
4. Ensure the checkbox **"My table has headers"** is checked (if your data includes headers).
5. Click **OK**.

💡 Result:

Your data is now an Excel Table with built-in filters and alternate row shading. You can now manage and analyze your data more effectively.

2. Sort and Filter Table Data

✅ Goal:

Sort and filter the data to find relevant information quickly.

🔧 Steps:

1. After converting to a Table, each column header will have a dropdown arrow.
2. Click the dropdown on any column (e.g., **"Score"**).
3. Choose:

- o **Sort Smallest to Largest** (for numerical columns),
- o **Sort A to Z** (for text),
- o or use **Filters** (e.g., show only rows where Score > 50).

💡 **Tip:**

You can also apply multiple filters across columns. For example, filter **"Status"** = Yes and **"Score"** > 60 at the same time.

3. Use Structured Formula to Sum a Column

✅ **Goal:**

Use structured references to sum a specific column (e.g., the "Score" column).

🔧 **Steps:**

1. Click on a blank cell below or beside the table (outside the table area).
2. Type the structured formula:

```
=SUM(Table1[Score])
```

- o Replace `Table1` with the actual name of your table if different (you can find it under **Table Design** > **Table Name**).
- o `Score` is the column header in the table.
3. Press **Enter**.

💡 **Note:**

- Structured references use column names inside square brackets.
- Excel auto-completes table names and column headers as you type.

✅ **Final Result:**

Action	Benefit
Convert to Table	Easier formatting, filtering, and referencing
Sort and Filter	Quickly analyze and view specific data
Structured Formula	Clean and readable formulas that update dynamically