

TOPIC 10: SPREADSHEET II (MICROSOFT EXCEL)

Senior Three ICT | Advanced Functions, Referencing, Charts, Filtering & Error Handling

By: Emmanuel Gidudu

Prior Knowledge – Connecting to Spreadsheet I (Topic 5)

- **Before we begin, confirm you can answer YES to all of the following:**
 - I can enter, edit, and format data in a spreadsheet.
 - I know the basic functions: SUM, AVERAGE, and COUNT.
 - I understand cell references and can write simple formulas.
 - I have experience creating basic charts from data.
- **WHAT IS NEW IN SPREADSHEET II?**
 - Advanced functions: IF, SUMIF, COUNTIF, AVERAGEIF, RANK, VLOOKUP, HLOOKUP, MATCH, SUMPRODUCT, RANDBETWEEN, PRODUCT.
 - Cell referencing: Relative, Absolute, and Mixed references.
 - Error handling: Understanding and fixing Excel errors.
 - Data filtering and advanced charting.

 **Quick Recall:** In cell C2 you type =SUM(A2:B2). If you copy this formula to C3, what does it become? Why? This question connects directly to what we learn today about referencing.

What You Will Learn in This Topic

- **By the end of Topic 10, you should be able to:**
 - Use advanced Excel functions: IF (including nested IF), SUMIF, COUNTIF, AVERAGEIF, RANK, VLOOKUP, HLOOKUP, MATCH, SUMPRODUCT, RANDBETWEEN, and PRODUCT.
 - Distinguish between relative, absolute, and mixed cell references and apply each correctly.
 - Toggle formula view, set print areas, and understand Excel error codes.
 - Create, format, and customise bar/column, pie, and line charts.
 - Apply AutoFilter and custom filters to analyse data subsets.
 - Build a comprehensive mark sheet with grades, ranks, totals, and lookups.

The Mark Sheet – Your Data for This Entire Topic

- **ALL exercises in this topic use the following mark sheet. Create it in Excel FIRST before proceeding.**
- Sheet name: STUDENT_DATA. Columns: StudentID | Student Name | Maths (/100) | English (/100) | History (/100) | Total | Average | Grade | Rank

The Mark Sheet – Your Data for This Entire Topic

StudentID	Student Name	Maths (/100)	Student ID	Student Name	Maths (/100)
S001	Alice Nakato	78	S011	Kemi Akello	83
S002	Brian Ssali	45	S012	Linda Nassuna	14
S003	Caroline Auma	92	S013	Moses Mukasa	96
S004	David Ochieng	31	S014	Norah Atim	52
S005	Eva Nalwoga	65	S015	Oscar Onen	68
S006	Fred Kayiwa	88	S016	Pam Nabirungi	43
S007	Grace Namukasa	22	S017	Richard Otim	77
S008	Henry Ssenoga	57	S018	Sarah Nakimuli	35
S009	Irene Namutebi	71	S019	Tom Ssebuliba	61
S010	James Kibuuka	39	S020	Ursula Akello	89

Excel Functions – Overview

- **A FUNCTION is a PREWRITTEN FORMULA that takes values (arguments), performs an operation, and returns a result.**
- All functions follow the syntax: =FUNCTIONNAME(argument1, argument2, ...)
- **FUNCTIONS COVERED IN THIS TOPIC:**

Excel Functions – Overview

Function	What It Does	Quick Example
IF	Returns one value if condition is TRUE, another if FALSE	=IF(C2>=50,"Pass","Fail")
SUMIF ()	Adds values in a range that meet a condition	=SUMIF(D2:D21,">60")
COUNTIF	Counts cells in a range that meet a condition	=COUNTIF(D2:D21,">50")
AVERAGEIF	Averages cells in a range that meet a condition	=AVERAGEIF(D2:D21,">3")

Excel Functions – Overview

RANK	Returns the rank of a number in a list	=RANK(F2,\$F\$2:\$F\$21,0)
VLOOKUP	Looks up a value vertically in a table	=VLOOKUP(C2,\$I\$2:\$J\$6,2,TRUE)
HLOOKUP	Looks up a value horizontally in a table	=HLOOKUP(C1,table,2,FALSE)
MATCH	Returns position of a value in a range	=MATCH(90,D3:D18,0)
SUMPRODUCT	Multiplies arrays and sums the results	=SUMPRODUCT(C3:C18,D3:D18)
RANDBETWEEN	Returns a random integer between two values	=RANDBETWEEN(1,100)
PRODUCT	Multiplies all given numbers together	=PRODUCT(C2:F2)

The IF Function – Making Decisions in Excel

- The IF function checks a **CONDITION** and returns one value if **TRUE** and another if **FALSE**.
- **SYNTAX:** **=IF(logical_test, value_if_true, value_if_false)**
 - **logical_test** – **REQUIRED**. Any expression that evaluates to **TRUE** or **FALSE**. (e.g., **C2>=50**)
 - **value_if_true** – **OPTIONAL**. What to return when the condition is **TRUE**. (e.g., **"Pass"**)
 - **value_if_false** – **OPTIONAL**. What to return when the condition is **FALSE**. (e.g., **"Fail"**)

=IF(C2>=50, "Pass", "Fail")

If the Maths score in C2 is 50 or above → returns "Pass". Otherwise → returns "Fail".

NESTED IF (for multiple conditions):

```
=IF(C2>=80,"A",IF(C2>=60,"B",IF(C2>=40,"C",IF(C2>=20,"D",  
"F"))))
```



IF Function – Practice Activity

- Using your mark sheet, practice the following in the Grade column (column D):
- TASK 1 – SIMPLE IF: Write a formula in D2 that returns 'Pass' if Maths (C2) is 50 or above, otherwise 'Fail'. Copy for all 20 students.
- **TASK 2 – NESTED IF for grades: Write a formula that assigns:**
 - A for 80 and above | B for 60–79 | C for 40–59 | D for 20–39 | F for below 20
- TASK 3 – NESTED IF with a third outcome: Write:
`=IF(C2>90,"Distinction",IF(C2>=50,"Pass","Fail"))`
- **PREDICT BEFORE YOU TYPE: Without typing in Excel, predict the grade for each score:**
 - Score 78 → ? Score 45 → ? Score 92 → ? Score 31 → ?
Score 22 → ?
- **DISCUSSION: Can you nest more than 3 IFs? What is the maximum? What happens if you miss a bracket?**

Lesson 2

SUMIF and COUNTIF – Conditional Calculations

- **SUMIF – Adds values in a range that meet a specified condition.**
- **SYNTAX: =SUMIF(range, criteria, [sum_range])**
 - range – REQUIRED. The cells evaluated against the criteria.
 - criteria – REQUIRED. The condition (e.g., ">50", "A", B3).
 - sum_range – OPTIONAL. The cells to actually add. If omitted, uses range.
- **COUNTIF – Counts cells in a range that meet a specified condition.**
- **SYNTAX: =COUNTIF(range, criteria)**
 - range – REQUIRED. Cells to count.
 - criteria – REQUIRED. Condition defining which cells to count. Case-insensitive.

=SUMIF(C3:C18, ">33") → Adds all Maths scores above 33

=SUMIF(D2:D21, "A", C2:C21) → Total Maths score for students with grade A

=COUNTIF(C3:C18, ">40") → Counts students scoring above 40 in Maths

AVERAGEIF and SUMPRODUCT

- **AVERAGEIF** – Returns the average of all cells in a range that meet a given criteria.
- **SYNTAX: =AVERAGEIF(range, criteria, [average_range])**
 - range – REQUIRED. Cells evaluated against the criteria.
 - criteria – REQUIRED. Condition defining which cells to average.
 - average_range – OPTIONAL. The actual cells to average. If omitted, uses range.
- **SUMPRODUCT** – Multiplies corresponding values in arrays and returns the SUM of those products.
- **SYNTAX: =SUMPRODUCT(array1, [array2], [array3], ...)**
 - array1 – REQUIRED. First array whose components are multiplied then added.
 - array2, array3, ... – OPTIONAL. Up to 255 arrays.

`=AVERAGEIF(G3:G18, ">3")` → Average of G3:G18 values where
G3:G18 > 3

`=SUMPRODUCT(C3:C18, D3:D18)` → Multiplies each Maths×English
pair, then sums all products

RANDBETWEEN and PRODUCT

- **RANDBETWEEN** – Returns a **RANDOM INTEGER** between two numbers you specify.
- A new random number is generated EVERY TIME the worksheet is recalculated (F9 key).
- **SYNTAX: =RANDBETWEEN(bottom, top)**
 - bottom – REQUIRED. The SMALLEST integer it will return.
 - top – REQUIRED. The LARGEST integer it will return.
- **PRODUCT** – Multiplies ALL numbers given as arguments and returns the product.
- **SYNTAX: =PRODUCT(number1, [number2], ...)**
 - number1 – REQUIRED. First number or range to multiply.
 - number2, ... – OPTIONAL. Up to 255 additional numbers or ranges.
 - NOTE: Empty cells, logical values, and text are IGNORED by PRODUCT.

=RANDBETWEEN(1, 100) → Returns a random integer between 1 and 100

=PRODUCT(C2:C6) → Multiplies all values in C2 through C6 together

The RANK Function – Ranking Students

- **RANK** – Returns the RANK (position) of a number relative to other values in a list.
- **SYNTAX:** =RANK(number, ref, [order])
 - number – REQUIRED. The number whose rank you want to find.
 - ref – REQUIRED. An array or range containing the list of numbers to rank against.
 - order – OPTIONAL.
 - 0 (or omitted) → DESCENDING order (highest value = rank 1). USE THIS FOR MARK SHEETS.
 - Any nonzero value → ASCENDING order (lowest value = rank 1).
- **IMPORTANT:** The ref range **MUST** be made **ABSOLUTE (\$)** so it does not shift when the formula is copied down.

=RANK(F2, \$F\$2:\$F\$21, 0) → Ranks student F2's Total against all Totals in F2:F21

Descending order (0): Moses Mukasa scores 96 → Rank 1

VLOOKUP – Searching a Table Vertically

- **VLOOKUP** searches for a value in the **FIRST COLUMN** of a table and returns a corresponding value from a **SPECIFIED COLUMN** in the same row.
- **V** stands for **VERTICAL** — it searches **DOWN** a column.
- **SYNTAX:** **=VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])**
 - **lookup_value** – **REQUIRED**. The value to search for (e.g., the student's score).
 - **table_array** – **REQUIRED**. The range containing the data to search (make it **ABSOLUTE**: \$I\$2:\$J\$6).
 - **col_index_num** – **REQUIRED**. Column number to return from the table (1 = first column, 2 = second, etc.).
 - **range_lookup** – **OPTIONAL**. **TRUE** = approximate match (table must be sorted ascending). **FALSE** = exact match.

`=VLOOKUP(C2, $I$2:$J$6, 2, TRUE)` → Looks up student's Maths score in grade table, returns Grade

Grade table: 0=F | 20=D | 40=C | 60=B | 80=A

VLOOKUP Grade Table – Setting It Up

- Create this **GRADE LOOKUP TABLE** in a separate area of your sheet (e.g., cells I1:J6):
- **IMPORTANT:** For approximate match (**TRUE**), the **FIRST COLUMN must be in ASCENDING ORDER**.
- The formula `=VLOOKUP(C2,$I$2:$J$6,2,TRUE)` works as follows:
 - It finds the largest value in column I that is **LESS THAN OR EQUAL TO** the score in C2.
 - Score 78 → finds 60 in the table → returns 'B'. Score 92 → finds 80 → returns 'A'.

Score Range (Col I)	Grade (Col J)	Meaning
0	F	Score 0–19
20	D	Score 20–39
40	C	Score 40–59
60	B	Score 60–79
80	A	Score 80–100

 **Tip:** Always lock the table_array with \$ signs: `$I$2:$J$6`. If you forget, the reference will shift when you copy the formula down and return wrong results.

HLOOKUP – Searching a Table Horizontally

- HLOOKUP searches for a value in the **FIRST ROW** of a table and returns a value from a **SPECIFIED ROW** in the same column.
- H stands for **HORIZONTAL** — it searches **ACROSS** a row.
- **SYNTAX:** =HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup])
 - lookup_value – **REQUIRED**. The value to find in the first row of the table.
 - table_array – **REQUIRED**. The table where data is stored (rows instead of columns).
 - row_index_num – **REQUIRED**. The row number to return from. Row 1 = first row, Row 2 = second, etc.
 - range_lookup – **OPTIONAL**. TRUE = approximate match. FALSE = exact match (returns #N/A if not found).
- **VLOOKUP vs HLOOKUP:**
 - VLOOKUP → data arranged in **COLUMNS** (most mark sheets).
 - HLOOKUP → data arranged in **ROWS**.



Try it: Create a horizontal table with subject names in row 1 and subject averages in row 2. Use HLOOKUP to retrieve the average for a specific subject.

The MATCH Function – Finding a Position

- **MATCH** searches for a value in a range and returns its **RELATIVE POSITION** (row or column number).
- Use MATCH when you need the POSITION of an item, not the item itself. Often used with INDEX.
- **SYNTAX: =MATCH(lookup_value, lookup_array, [match_type])**
 - lookup_value – REQUIRED. The value to find.
 - lookup_array – REQUIRED. The range being searched.
 - match_type – OPTIONAL:
 - 1 or omitted → finds largest value $\leq$ lookup_value. Array must be ASCENDING.
 - 0 → finds EXACT match. Array can be in any order.
 - -1 → finds smallest value $\geq$ lookup_value. Array must be DESCENDING.

`=MATCH(90, D3:D18, 1)` → Returns the position of the value closest to 90 in D3:D18

`=MATCH(90, D3:D18, 0)` → Returns the EXACT position of value 90 in D3:D18



Functions Quick Check – What Would Excel Return?

- **WITHOUT** using Excel, predict what each formula returns. Then **verify on the computer**.
- Data: Maths scores in C2:C21 = {78, 45, 92, 31, 65, 88, 22, 57, 71, 39, 83, 14, 96, 52, 68, 43, 77, 35, 61, 89}
- (1) =IF(78>=80, "A", "B") → ?
- (2) =COUNTIF(C2:C21, ">50") → ?
- (3) =RANK(96, C2:C21, 0) → ?
- (4) =SUMIF(C2:C21, ">60") → ?
- (5) =RANDBETWEEN(1, 100) → ? (Why can't you predict this one?)
- (6) =PRODUCT(2, 3, 4) → ?
- **CHALLENGE:** Write the full nested IF formula that assigns A/B/C/D/F grades. Test it against score 31 and score 65.

Exercise 2.3 – Functions on the Mark Sheet

- **Using your STUDENT_DATA mark sheet, complete ALL tasks:**
- 1. IF (Grade Column): Use a NESTED IF to assign A (80+), B (60–79), C (40–59), D (20–39), F (below 20) based on Maths score.
- 2. SUMIF: Calculate the TOTAL Maths score for all students who received grade A.
- 3. COUNTIF: Count how many students scored ABOVE 50 in each subject (Maths, English, History).
- 4. RANK: Add a RANK column that ranks each student by their Total score (highest = Rank 1). Use ABSOLUTE referencing for the range.
- 5. VLOOKUP: Create a separate grade lookup table (as shown in slide 13) and use VLOOKUP to automatically assign grades based on each student's Total score.
- 6. HLOOKUP: Create a HORIZONTAL reference table showing subject averages. Use HLOOKUP to retrieve the average for a given subject name.
- **SAVE AS: Functions_YourName.xlsx**

Cell Referencing – Relative, Absolute, and Mixed

- When you **COPY** a formula in Excel, cell references can **CHANGE** (relative) or **STAY THE SAME** (absolute). Understanding this is **ESSENTIAL** for correct formulas.
- **THE THREE TYPES:**

Type	Syntax	Behaviour When Copied	Example
Relative	=A1	ADJUSTS automatically based on new position	=C2+D2 → becomes C3+D3 when copied down
Absolute	=\$A\$1	NEVER changes — always refers to the same cell	=\$C\$22 always refers to cell C22
Mixed (row fixed)	=A\$1	Column adjusts, row stays fixed at row 1	=B\$1 → column changes, row 1 stays
Mixed (col fixed)	=\$A1	Column stays fixed at A, row adjusts	=\$A2 → column A stays, row changes

 **Shortcut:** Press F4 while the cursor is on a cell reference in a formula to **TOGGLE** between A1 → \$A\$1 → A\$1 → \$A1. Press F4 repeatedly to cycle through all four options.

Referencing – When to Use Each Type

- **RELATIVE REFERENCE** — use when the formula should **ADJUST** as you copy it:
 - =C2+D2+E2 (Total for row 2). When copied to row 3, becomes =C3+D3+E3. CORRECT.
- **ABSOLUTE REFERENCE** — use when you need to **LOCK** a reference:
 - =RANK(F2,\$F\$2:\$F\$21,0) — the range \$F\$2:\$F\$21 is LOCKED. When copied down, it always compares against the SAME full list.
 - =(C2/\$C\$22)*100 — \$C\$22 holds the maximum mark and NEVER shifts.
- **MIXED REFERENCE** — use in **TABLES** where one dimension must stay fixed:
 - =\$A2*B\$1 — used in a 10x10 multiplication table.
 - \$A2: Column A is FIXED (row labels), row adjusts as you copy DOWN.
 - B\$1: Row 1 is FIXED (column headers), column adjusts as you copy RIGHT.

 **Common Mistake:** Forgetting to use \$ in a RANK formula. If you write =RANK(F2,F2:F21,0) and copy it down, the range shifts to F3:F22 for the next row — giving WRONG ranks.



Exercise 2.4 – Referencing Practice

- **Complete ALL tasks on your mark sheet:**
- **TASK 1 – PERCENTAGE WITH ABSOLUTE REFERENCE:**
 - In column H, calculate each student's Maths percentage:
$$=(C2/\$C\$22)*100$$
 where C22 contains the MAXIMUM score (100).
Copy for all 20 students. Verify that $\$C\$22$ stays fixed for every row.
- **TASK 2 – TOTAL WITH RELATIVE REFERENCE:**
 - Calculate the Total for each student using: $=C2+D2+E2$ (relative).
Copy for all 20 students and confirm each row's formula adjusts correctly.
- **TASK 3 – MULTIPLICATION TABLE WITH MIXED REFERENCE:**
 - Create a 10×10 multiplication table. In row 1 put 1–10 (headers). In column A put 1–10 (row labels). In the first data cell (B2), type:
$$=\$A2*B\$1$$
 Copy this SINGLE formula to fill the entire 10×10 grid.
- **DISCUSSION: In Task 3, why do we use $\$A2$ and NOT $\$A\$2$? What would happen?**

Formula View, Print Area, and Useful Tools

- **TOGGLING FORMULA VIEW** – see all formulas instead of calculated results:
 - Press Ctrl + ` (grave accent — key to the LEFT of the 1 key on most keyboards).
 - Alternative: Formulas tab → Show Formulas.
 - Press Ctrl + ` again to return to the normal value view.
 - **USE CASE:** Use formula view to CHECK all formulas before printing or submitting.
- **SETTING A PRINT AREA:**
 - Step 1 – SELECT the cells you want to print (e.g., A1:I21 for the full mark sheet).
 - Step 2 – Go to Page Layout tab → Print Area → Set Print Area.
 - Step 3 – Print: File → Print (Ctrl + P). Only the selected area will print.
 - Step 4 – To clear: Page Layout → Print Area → Clear Print Area.
- **WHY SET A PRINT AREA?** Prevents blank pages and charts from printing unintentionally.

Common Excel Errors – Causes and Fixes

Error	Cause	Fix
#N/A	Value NOT FOUND in lookup (VLOOKUP/HLOOKUP)	Check spelling of lookup value; verify table range is correct
#VALUE!	Wrong data type — e.g., adding text to a number	Ensure all cells in formula contain numbers, not text
#REF!	Formula refers to a cell that NO LONGER EXISTS (was deleted)	Re-enter formula with correct cell references
#DIV/0!	DIVIDING BY ZERO or an empty cell	Use =IF(B2=0, 0, A2/B2) to avoid dividing by zero
#NUM!	Invalid numeric value — e.g., square root of a negative number	Check input values for the formula
#NAME?	Excel doesn't recognise the formula name — usually a TYPO	Check spelling: VLOOKUP not VLOKUP; SUMIF not SUMIFF
#NULL!	Incorrect range operator — e.g., space instead of colon or comma	Replace incorrect operator with correct one (: or ,)
####	Column is TOO NARROW to display the value	Double-click the column border to auto-fit column width



Exercise 2.5 – Deliberately Creating and Fixing Errors

- For each error below: deliberately **CAUSE** it, then **DOCUMENT** the cause, and apply the **FIX**. Record everything in a comment in the cell.
- 1. #DIV/0! — Type =5/0 in a cell. Fix: =IF(A1=0, 0, 5/A1)
- 2. #VALUE! — Type =5+"hello" in a cell. Fix: ensure both values are numbers.
- 3. #REF! — Create a formula referencing C5, then DELETE row 5. Observe what happens.
- 4. #NAME? — Type =SUMM(A1:A5) (misspelled function). Fix: correct to =SUM(A1:A5).
- 5. ##### — Enter a large number (e.g., 9999999) in a very NARROW column. Fix: widen the column.
- 6. #N/A — Use VLOOKUP for a value that DOESN'T EXIST in your table.
- For each error, write in a cell **COMMENT: (a) What caused the error. (b) How you fixed it.**
- **SAVE AS: Errors_YourName.xlsx**

Charts – Data Visualisation in Excel

- **CHARTS** (also called graphs) present data **VISUALLY**, making it easier to identify patterns, trends, and comparisons.
- Excel supports many chart types. The **THREE** most important for this topic are:

Chart Type	Best Used For	Example in Our Mark Sheet
Bar / Column Chart	Comparing values ACROSS categories	Comparing Maths, English, and History scores for all 20 students
Pie Chart	Showing PROPORTIONS of a whole (parts of 100%)	Showing what percentage of students are in each grade (A, B, C, D, F)
Line Chart	Showing TRENDS OVER TIME	Showing top 5 students' score progress across 3 subjects

 **Think First:** Which chart type would you use to show: (a) how many students scored A, B, C, D, F? (b) one student's scores across all 3 subjects? (c) comparison of class averages per subject?

Step-by-Step: Creating a Bar / Column Chart

- Step 1 – SELECT the data to chart. For comparing all subjects: select column B (Student Name) + columns C, D, E (scores). Hold Ctrl to select non-adjacent columns.
- Step 2 – Go to the INSERT tab → Charts group → Insert Column or Bar Chart.
- Step 3 – Choose CLUSTERED COLUMN (for side-by-side comparison).
- Step 4 – The chart appears in the sheet. Click it to activate Chart Tools (Design and Format tabs).
- **FORMATTING YOUR CHART:**
 - Chart Title: Click the title → type new name (e.g., 'Student Scores by Subject').
 - Data Labels: Chart Tools Design → Add Chart Element → Data Labels → choose position.
 - Legend: Click to select → drag to reposition. Delete key removes it.
 - Axes: Right-click axis → Format Axis → set min, max, intervals.
 - Style/Colour: Chart Tools Design → Chart Styles → pick a preset.
 - Move to New Sheet: Chart Tools Design → Move Chart → New Sheet.

Step-by-Step: Creating a Pie Chart

- **PIE CHARTS** show proportions — every slice is a part of the whole (100%). Use for **GRADE DISTRIBUTION**.
- **STEP 1 – PREPARE THE DATA.** First use **COUNTIF** to count students per grade:
 - If grades are: 0–49 = E, 50–59 = D, 60–69 = C, 70–79 = B, 80–100 = A
 - Create a small table with columns: **GRADE | NO** (number of students in each grade)
 - Fill using **COUNTIF**: `=COUNTIF(D2:D21,"A")` for grade A, etc.
- **STEP 2 – SELECT the small GRADE / NO table (two columns only).**
- **STEP 3 – Go to Insert → Insert Pie or Doughnut Chart → choose 2D Pie or 3D Pie.**
- **STEP 4 – FORMAT:**
 - Add percentage data labels: **Chart Tools Design → Add Chart Element → Data Labels → More Options → check 'Percentage'**.
 - Edit title: Click chart title → type 'Grade Distribution'.

Using a Secondary Axis on Charts

- **When TWO DATA SERIES have VERY DIFFERENT SCALES (e.g., scores 0–100 and attendance 0–30), one series gets squashed and is unreadable.**
- **SOLUTION: Add a SECONDARY AXIS so each series uses its own scale.**
- **HOW TO ADD A SECONDARY AXIS:**
 - Step 1 – Right-click on the data series that should use the secondary axis (e.g., the attendance bars).
 - Step 2 – Select 'Format Data Series'.
 - Step 3 – Under Series Options, select 'Secondary Axis'.
 - Step 4 – A SECOND vertical axis appears on the RIGHT side of the chart.
 - Step 5 – Format both axes to set appropriate scales (right-click each axis → Format Axis).
- **WHEN TO USE THIS: Comparing student scores (0–100) with attendance (days: 0–30) on the same chart.**

💡 **Practical Tip:** After adding the secondary axis, always double-check that both series are clearly visible and the legend labels them correctly. Rename data series if needed.

Exercise 2.1 – Charts

- **Using your mark sheet, create all THREE charts:**
- **CHART 1 – CLUSTERED COLUMN CHART:**
 - Compare Maths, English, and History scores for ALL 20 students. Add: title ('Student Scores by Subject'), legend, and data labels. Move to its own sheet named 'Column Chart'.
- **CHART 2 – PIE CHART:**
 - Show the number of students in each grade (A, B, C, D, E/F). Use COUNTIF first. Add PERCENTAGE data labels. Move to sheet named 'Pie Chart'.
- **CHART 3 – LINE CHART:**
 - Show the TOP 5 students' scores across 3 subjects (lines show each student). Move to sheet named 'Line Chart'.
- **FORMATTING REQUIREMENTS FOR ALL CHARTS:**
 - All charts must have: a descriptive title | a legend | data labels | customised colours/styles.
- **SAVE AS: Charts_YourName.xlsx**

Data Filtering – Displaying Only What You Need

- **FILTERING** allows you to display **ONLY THE ROWS** that meet **specified criteria**, **HIDING** rows that do not match.
- Useful for analysing subsets: 'show only students who passed', 'show only grade A students', etc.
- **STEP-BY-STEP: APPLYING AUTOFILTER:**
 - Step 1 – Click ANY CELL inside your data table.
 - Step 2 – Go to the DATA tab → Filter (OR press Ctrl + Shift + L).
 - Step 3 – DROP-DOWN ARROWS appear in each column header.
 - Step 4 – Click the drop-down arrow for the column you want to filter.
 - Step 5 – Choose filter criteria: uncheck values to hide rows, OR use Number Filters for conditions like 'greater than', 'between', 'top 10', etc.
- **TO REMOVE FILTER:** Data → Filter again, OR click the funnel icon → Clear Filter.
- **NOTE:** Charts linked to your data **AUTOMATICALLY UPDATE** when you filter. The chart reflects only the visible data.

Custom Filter Examples – Mark Sheet Scenarios

What You Want to Show	Steps to Apply the Filter
Students scoring > 50 in Maths	Maths column drop-down → Number Filters → Greater Than → enter 50
Students with English score between 25 and 50	English column → Number Filters → Between → enter 25 and 50
Students whose name starts with 'A'	Name column → Text Filters → Begins With → type A
Top 5 students by Total	Total column → Number Filters → Top 10 → change 10 to 5 → select Top
Students with History ≤ 40	History column → Number Filters → Less Than Or Equal To → 40
Students with grade 'A'	Grade column → uncheck all except 'A' in the dropdown list

 **Key Observation:** When you sort 'Smallest to Largest' via the filter dropdown, your column chart automatically re-orders too — the bars slope upward. This is a powerful visual for class analysis.

Exercise 2.2 – Data Filtering

- **Apply each filter to your mark sheet. Take a SCREENSHOT of each filtered result and paste into a Word document for submission.**
- FILTER 1: Show only students who scored MORE THAN 30 in Maths.
- FILTER 2: Show students with English scores BETWEEN 25 and 50.
- FILTER 3: Show students whose History score is LESS THAN OR EQUAL TO 40.
- FILTER 4 (CUSTOM): Show students whose name CONTAINS the letter 'a' AND who scored ABOVE 60 in any subject.
- FILTER 5 (SORT): Sort the entire sheet by Total score from LARGEST to SMALLEST. Observe how the column chart changes.
- **BONUS ANALYSIS QUESTIONS:**
 - (a) After Filter 1: How many students scored above 30 in Maths?
 - (b) After Filter 5: Who are the TOP 3 students? Who needs the most support?



Homework 3 – Final Spreadsheet Project

- Using the 20-student mark sheet as your base, create a **COMPREHENSIVE EXCEL WORKBOOK with FIVE SHEETS:**
 - SHEET 1 – 'Data': Full mark sheet with StudentID, Name, Maths, English, History, Total, Average, Grade (nested IF), Rank.
 - SHEET 2 – 'Charts': Column chart (all subjects), Pie chart (grade distribution), Line chart (top 5 students). All formatted.
 - SHEET 3 – 'Analysis': Use SUMIF and COUNTIF to summarise class performance per grade per subject.
 - SHEET 4 – 'Lookup': A VLOOKUP grade table and an HLOOKUP subject reference table.
 - SHEET 5 – 'Errors': Documented table of all 8 error types with cause and fix.
- **REQUIREMENTS:**
 - Set print area for the data sheet (rows 1–21). Use absolute referencing in RANK formula. Include a formula view screenshot pasted into the workbook. All charts must have titles, legends, and data labels.
- **DUE: End of spreadsheet section. SAVE AS: FinalSpreadsheet_YourName.xlsx**



Revision Questions – Topic 10

- **Answer the following questions in your exercise book:**
- 1. Write the syntax of: (a) IF (b) SUMIF (c) COUNTIF (d) RANK (e) VLOOKUP. State what each argument does.
- 2. Write a nested IF formula that assigns grades A/B/C/D/F for scores in cell C5.
- 3. Explain the difference between VLOOKUP and HLOOKUP. When would you use each?
- 4. A formula =RANK(F2,F2:F21,0) gives wrong results when copied down. Why? How do you fix it?
- 5. What is the difference between relative, absolute, and mixed referencing? Give one example of each.
- 6. Press F4 on a cell reference. What are the FOUR forms it cycles through?
- 7. What does the ##### error mean? What is the fix?
- 8. What is the keyboard shortcut to toggle formula view? When would you use it?
- 9. Which chart type would you use to: (a) compare scores across subjects? (b) show grade distribution? (c) show score trends over time?
- 10. What does AutoFilter do? Give TWO examples of filter criteria you can apply.



Key Terms – Topic 10 Glossary

Term	Definition
Function	A prewritten formula that takes arguments, performs an operation, and returns a result.
IF Function	Returns one value if a condition is TRUE and another value if FALSE.
Nested IF	An IF function placed inside another IF to handle multiple conditions/outcomes.
SUMIF	Adds values in a range that meet a specified condition.
COUNTIF	Counts cells in a range that meet a specified condition.
RANK	Returns the rank (position) of a number relative to other values in a list.
VLOOKUP	Searches the first column of a table vertically and returns a value from a specified column.
HLOOKUP	Searches the first row of a table horizontally and returns a value from a specified row.
Relative Reference	A cell reference that ADJUSTS automatically when a formula is copied (e.g., A1).
Absolute Reference	A cell reference that NEVER changes when copied (e.g., \$A\$1).
Mixed Reference	Combines absolute and relative: one part fixed, one adjusts (e.g., \$A1 or A\$1).
AutoFilter	A feature that displays only rows matching specified criteria, hiding non-matching rows.
#N/A	Error returned when a lookup function cannot find the specified value in the table.
#DIV/0!	Error returned when a formula attempts to divide a number by zero or an empty cell.

End of Topic 10

Spreadsheet II – Microsoft Excel

Save your work: FinalSpreadsheet_YourName.xlsx