

TOPIC 5: SPREADSHEETS USING EXCEL

Organising, Analyzing, and Visualizing Data

Senior Two | ICT
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By the end of this topic you will be able to: use Excel to enter, calculate, format, sort, and chart data.

Prior Knowledge Check

Think-Pair-Share (3 minutes)

- Have you ever used a table to organise numbers? Where?
- What is Microsoft Word used for? How do you think Excel is different?
- Have you seen a spreadsheet before — at home, school, or in a shop?
- What do you think the word 'formula' means in computing?

 *Teacher Note: Cold-call 3–4 students. Write their ideas on the board — revisit at the end of the lesson.*

What Is a Spreadsheet?

A spreadsheet is a grid of rows and columns that accepts data entry, allows editing and formatting, and performs calculations automatically.

Key Vocabulary

Term	Meaning
WORKBOOK	A spreadsheet file — can contain many sheets (.xlsx)
WORKSHEET	A single page/tab inside a workbook
ROW	Horizontal lines — labelled with numbers (1, 2, 3...)
COLUMN	Vertical lines — labelled with letters (A, B, C...)
CELL	The box at the intersection of a row and column e.g. B3
RANGE	A group of adjacent cells e.g. B1:B6

Types of Spreadsheets

There are two main types:

1. MANUAL SPREADSHEET

- ✓ Cheap and easy to get
- ✓ No electricity needed
- ✓ No computer skills needed
- ✗ Slow and error-prone
- ✗ Cannot auto-calculate
- ✗ Hard to insert/delete rows

2. ELECTRONIC SPREADSHEET

- ✓ Built-in formulas & functions
- ✓ Automatic recalculation
- ✓ Sort, filter, chart data
- ✗ Requires electricity
- ✗ Needs computer skills
- ✗ Costs money to buy

Examples: Microsoft Excel, Lotus 1-2-3, VisiCalc, Quattro Pro, LibreOffice Calc

Quick Check — Slide 5

Match the Term to its Meaning (Individual — 2 minutes)

#	Term	Write the correct meaning here
1	WORKBOOK	
2	WORKSHEET	
3	CELL	
4	RANGE	
5	COLUMN	

Bank of meanings: a single page in a file | group of adjacent cells | vertical line labelled A,B,C | intersection of row and column | a file containing many sheets

Swap with a partner and mark each other's answers.

The Excel Interface

Interface Element	What It Does
Title Bar	Shows the name of the current workbook at the very top
Ribbon	Toolbar with tabs (Home, Insert, Formulas, Data...) — all commands are here
Formula Bar	Shows what is typed or calculated in the selected cell
Name Box	Shows the address of the selected cell, e.g. A1, C5
Column Headers	The letters A, B, C... across the top of the grid
Row Headers	The numbers 1, 2, 3... down the left side of the grid
Active Cell	The currently selected cell — shown with a highlighted border
Sheet Tabs	At the bottom — switch between worksheets in the same workbook
Status Bar	Bottom bar — shows Sum, Average, Count of selected cells
Scroll Bars	Move up/down or left/right to see more of the spreadsheet

Activity: Open Excel and locate EVERY element above. Tick each one as you find it!

Key Features of Electronic Spreadsheets

- Autofill — fills cells with sequential data (dates, numbers, months) using the fill handle (small black square, bottom-right of a cell)
- Sorting — arranges records in ascending (A-Z, 1–9) or descending (Z-A, 9–1) order
- Filtering — displays only records that meet a set condition
- What-if Analysis — change a value and watch all linked formulas update instantly
- Freezing Panes — lock rows/columns so headings stay visible when scrolling large datasets
- Graphs/Charts — turn numbers into visual pictures (bar, pie, line charts etc.)
- Password Protection — secure your workbook from unauthorised access
- Cell Referencing — link cells together so data flows automatically between sheets

Real-life uses: school budgets, attendance registers, payroll, crop yield records, shop inventories, scientific data, survey results.

Entering Data in Excel

There are 4 types of data in Excel:

Data Type	Description	Example	Default Alignment
Text (Labels)	Names, titles, headings	Student Name, January	Left
Numbers (Values)	Numeric data — scores, prices	85, 1500, 3.14	Right
Formulas	Calculations — always start with =	=A1+B1, =SUM(C1:C10)	Right (result)
Dates	Stored as numbers, displayed as dates	25/05/2025	Right

Navigation Keys

- Enter — move to the cell below
- Tab — move to the cell to the right
- Arrow keys — move in any direction
- Ctrl + Home — jump to cell A1

Try It!

Open Excel. In cell A1 type your name. Press Enter. Type today's date in A2. Press Tab to move to B2 and type your class. What do you notice about alignment?

Cell References

A cell reference is the address of a cell, e.g. A2, B6, G20. There are three types:

1. Relative Reference

Adjusts automatically when you copy a formula.

Form: A1, B17, G20

Example: Copy $=A1+B1$ down one row → becomes $=A2+B2$

2. Absolute Reference

Does NOT change when copied.

Form: $\$A\$1$, $\$D\$6$, $\$B\$3$

Use for fixed values like tax rate or pass mark.

Shortcut: Press F4 after clicking a cell.

3. Mixed Reference

One part fixed, one part flexible.

Form: $\$G17$, $B\$14$

The \$ locks only the row OR column — not both.

Scenario: You have a tax rate in cell B1. You need to multiply 10 different prices by that same tax rate. Which type of reference should you use for B1? Why?

Discuss with a partner for 2 minutes, then share with the class.

Operators in Excel

An operator tells Excel what type of calculation to perform.

Arithmetic Operators

Operator	Meaning	Example
+	Addition	=A1+B1
-	Subtraction	=A1-B1
*	Multiplication	=A1*B1
/	Division	=A1/B1
%	Percent	=20%
^	Exponentiation (power)	=3^2 → 9

Comparison Operators

Operator	Meaning
=	Equal to
>	Greater than
<	Less than
>=	Greater than or equal to
<=	Less than or equal to
<>	Not equal to

Order of operations in Excel: Brackets → Exponentiation → Multiplication/Division → Addition/Subtraction
=2+3*4 gives 14 (not 20). Use brackets to change order: =(2+3)*4 gives 20.

Writing Formulas in Excel

Every formula MUST start with the equals sign =

Method: Click the result cell → type = → click cells or type values → press Enter

Operation	Formula Example	What it does
Addition	=A1+B1	Adds values in A1 and B1
Subtraction	=C4-D4	Subtracts D4 from C4
Multiplication	=A1*B1	Multiplies A1 by B1
Division	=E10/G10	Divides E10 by G10
Combined	=(A3+B3+C3+D3)/4	Sum of 4 values divided by 4 (average)
Direct numbers	=5+10	Adds 5 and 10 directly

Group Challenge: Without a computer, write the Excel formula for each:

a) Total of marks in cells B2, C2, D2 b) Find profit if Revenue is in E5 and Cost in F5 c) Calculate 15% of the value in G3

Excel Functions — The 5 Essentials

A function is a pre-written formula. Syntax: =FUNCTIONNAME(arguments)

Function	Syntax	What it does	Real-life Use
SUM	=SUM(B2:B6)	Adds all values in the range	Total marks, total sales, total expenses
AVERAGE	=AVERAGE(B2:B6)	Calculates the arithmetic mean	Class average, monthly rainfall
MIN	=MIN(B2:B6)	Finds the smallest value	Lowest score, cheapest price
MAX	=MAX(B2:B6)	Finds the largest value	Highest score, peak temperature
COUNT	=COUNT(B2:B6)	Counts cells that contain numbers	Number of students, number of items
MODE	=MODE(B3:B18)	Most frequently occurring value	Most common score or age
MEDIAN	=MEDIAN(B3:B18)	Middle value in sorted data	Typical salary in a dataset

TIP: After typing a formula in the first cell, drag the fill handle (small black square, bottom-right corner) downward to apply the same formula to other rows automatically!

The SUM Function — In Detail

- Syntax: `=SUM(number1, [number2], ...)` — up to 255 arguments

SUM Type	Formula	What happens
Constant arguments	<code>=SUM(345, 897)</code>	Adds $345 + 897 = 1242$ directly
Range of cells	<code>=SUM(B3:B18)</code>	Adds all numbers from B3 to B18
Range + constant	<code>=SUM(B3:B18, 32)</code>	Adds the range result plus 32
Separate cells	<code>=SUM(B3, B10, 23)</code>	Adds $B3 + B10 +$ the number 23
Mixed with text/logic	<code>=SUM("60", 29, TRUE)</code>	Text "60" $\rightarrow$ 60; TRUE $\rightarrow$ 1; result = 90

Important Notes:

- Non-numeric cells in a range are ignored automatically
- Always separate arguments with a comma (,)
- A cell range is written with a colon (:) between the first and last cell, e.g. B3:B18
- You can mix ranges and individual values in the same SUM

Excel Error Alerts

Excel shows an error when it cannot calculate a formula. Learn to recognise and fix them:

Error Code	Meaning	How to Fix It
#####	Column too narrow to display the value	Widen the column by dragging its right border
#DIV/0!	Formula divides by zero or an empty cell	Check the denominator — ensure it is not zero
#VALUE!	Wrong data type used (e.g. text where number expected)	Check that all cells in formula contain numbers
#REF!	Cell reference is not valid (deleted or moved)	Update the formula to point to the correct cells
#NAME?	Excel does not recognise the function name	Check spelling — e.g. SUUM instead of SUM
#NUM!	Invalid numeric value in formula	Check the numbers used make mathematical sense
#N/A!	Value not available to the function	Ensure all required data is present
#NULL!	Incorrect range (e.g. space used instead of colon)	Use colon for ranges: A1:A10 not A1 A10

Activity: In pairs, create one formula that produces each of three different errors, then show your partner how to fix it.

Exercise 1 — Creating a Student Mark Sheet

Open a new Excel Workbook. Save it as MarkSheet.xlsx

Step 1 — Enter the following headings in Row 1:

A1: Student Name	B1: Maths	C1: English	D1: Science	E1: Social Studies	F1: Total	G1: Average
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Step 2 — Enter this data starting from Row 2:

Name	Maths	English	Science	Social Studies
Alice	78	85	72	90
Bob	65	70	88	76
Carol	92	88	95	91
David	55	60	70	65
Eve	80	75	83	78

- Step 3 — In cell F2, type: =SUM(B2:E2) then drag the fill handle down to F6
- Step 4 — In cell G2, type: =AVERAGE(B2:E2) then drag down to G6
- Step 5 — Below the data, add formulas for MAX, MIN, AVERAGE, COUNT on the Total

Challenge: Format marks below 60 with a RED cell background. Use Conditional Formatting (Home → Conditional Formatting → Highlight Cell Rules → Less Than).

Spreadsheet Formatting Features

Formatting changes the APPEARANCE of data — it does NOT change the data itself.

Feature	How To Apply	Shortcut
Bold / Italic / Underline	Home tab → Font group	Ctrl+B / Ctrl+I / Ctrl+U
Font Size & Colour	Home → Font group	Alt+H+FC for font colour
Cell Background Colour	Home → Fill Color button (paint bucket)	Alt+H+H
Borders	Home → Borders dropdown	Ctrl+Shift+& (outline)
Alignment (L/C/R)	Home → Alignment group	Ctrl+E for centre
Merge & Centre	Home → Alignment → Merge & Centre	Select cells first
Number Formatting	Home → Number group (Currency, %, Date)	Ctrl+Shift+\$ / Ctrl+Shift+%
Column Width	Double-click column border to auto-fit	Or drag to resize
Wrap Text	Home → Alignment → Wrap Text	Alt+H+W
Freeze Panes	View → Freeze Panes	Keep headings visible when scrolling

Discussion: Without any formatting, would a spreadsheet be easier or harder to read? Give 2 reasons.

Logical Functions

Logical functions evaluate conditions and return TRUE or FALSE — or perform actions based on conditions.

Function	Description	Example
IF	Returns one value if condition is TRUE, another if FALSE	=IF(B2>=50,"Pass","Fail")
AND	Returns TRUE only if ALL conditions are TRUE	=AND(B2>=50, C2>=50)
OR	Returns TRUE if ANY condition is TRUE	=OR(B2>=50, C2>=50)
NOT	Reverses TRUE to FALSE and FALSE to TRUE	=NOT(B2>=50)
IFERROR	Returns a custom value if the formula produces an error	=IFERROR(A1/B1,"Error!")

Worked Example: A student passes if they score 50 or more in Maths (B2) AND English (C2).

Formula: =IF(AND(B2>=50, C2>=50), "PASS", "FAIL")

Add this to column H of your MarkSheet.xlsx. Test it with different scores!

Sorting Data in Excel

Sorting organises data in a meaningful order. It does NOT delete any data.

Sort Type	Used For	Example
A to Z (Ascending)	Text data — alphabetical order	Alice, Bob, Carol, David, Eve
Z to A (Descending)	Text — reverse alphabetical	Eve, David, Carol, Bob, Alice
Lowest to Highest	Numbers — smallest first	55, 65, 78, 80, 92
Highest to Lowest	Numbers — largest first (for rankings)	92, 80, 78, 65, 55 ← Rank 1 = 92

Steps to Sort:

- Click any cell inside the column you want to sort
- Go to: Data tab → Sort A to Z (ascending) or Sort Z to A (descending)
- Dialog box: choose 'Expand the selection' if you want ALL columns to move together
- For multi-level sorting: Data → Sort → Add Level (e.g. sort by Class, then by Name)

Activity — Sorting and Ranking

Using your MarkSheet.xlsx, complete all tasks below:

- 1. Sort the student names (Column A) in alphabetical order A to Z. What do you notice?
- 2. Sort by Total (Column F) in Descending order. Who comes 1st, 2nd, and 3rd?
- 3. Add a new column labelled 'Rank' and manually number students 1 to 5 by their Total.
- 4. Sort by Maths score in Ascending order. Which student had the lowest Maths mark?
- 5. DISCUSS: Why is sorting useful in real life? Give THREE examples from your community.

Hint for Question 5: Think about a hospital patient list, a business stock list, a race results sheet, a school fees payment record, or a market price list.

Extension Challenge: Can you sort by TWO columns at once — e.g. sort by Class, then within each class sort by Total? Use Data → Sort → Add Level.

Inserting and Deleting Rows & Columns

INSERTING

Insert a Row:

- Right-click row number → Insert
- OR: Home → Insert → Insert Sheet Rows
- Shortcut: Ctrl + Shift + +
(new row appears ABOVE the selected row)

Insert a Column:

- Right-click column letter → Insert
- OR: Home → Insert → Insert Sheet Columns
(new column appears to the LEFT)

DELETING

Delete a Row:

- Right-click row number → Delete
- OR: Home → Delete → Delete Sheet Rows
- Shortcut: Ctrl + –

Delete a Column:

- Right-click column letter → Delete
- OR: Home → Delete → Delete Sheet Columns

⚠ WARNING: Deletion is permanent unless you immediately press Ctrl+Z to Undo!

Practice: Open your MarkSheet.xlsx. Insert a blank row between Row 1 (headings) and Row 2 (first student). Then delete that row using Ctrl+Z or the Delete method.

Creating Charts in Excel

Charts turn numbers into pictures. A well-designed chart tells a story that rows of numbers cannot.

Chart Type	Best Used For	School/Life Example
Pie Chart	Showing proportions — how parts make up a whole	How a student's marks are spread across 4 subjects; market share between companies
Bar / Column Chart	Comparing quantities across different categories	Comparing scores of 5 students; monthly sales of different products
Line Chart	Showing trends over time	Daily temperature over 7 days; student performance over 3 terms

How to Create a Chart — Step by Step

- Step 1: Select the data (including headings). Use Ctrl+Click for non-adjacent columns.
- Step 2: Click Insert tab → Charts group → choose chart type (Pie, Bar, Line, etc.)
- Step 3: Add a Chart Title (click placeholder and type)
- Step 4: Add Axis Titles — Chart Design → Add Chart Element → Axis Titles
- Step 5: Add Data Labels — to show values on bars or pie slices
- Step 6: Resize by dragging corner handles; move by dragging the chart

Exercise 2 — Creating Three Charts

Using your MarkSheet.xlsx, create all three charts below:

CHART 1 — PIE

- Select Column A (names) and Column B (Maths)
- Insert → Pie Chart
- Title: 'Distribution of Maths Scores'
- Add % labels on each slice
- Use different colours per student

Question: Which student has the largest slice? Why?

CHART 2 — BAR

- Select names + Total column
- Insert → Clustered Column Chart
- Title: 'Student Total Scores'
- Add data labels above each bar
- Sort data descending before creating

Question: Who scores highest overall?

CHART 3 — LINE

- Create a new sheet: Jan–Jun data for 2 students
- Insert → Line Chart with markers
- Title: 'Performance Trend Jan–Jun'
- Label both axes
- Add legend

Question: Is either student improving or declining?

Present your charts to the class and explain what each chart shows and WHY you chose that chart type.

Useful Excel Keyboard Shortcuts

Memorise these — they will save you time every day!

File & Editing

Ctrl + N	New Workbook
Ctrl + S	Save
Ctrl + Z	Undo
Ctrl + C	Copy
Ctrl + X	Cut
Ctrl + V	Paste
Ctrl + A	Select All
Delete	Clear cell content
N avigation	Edit cell

Formulas & Formatting

Alt + =	AutoSum (inserts SUM)
F4	Toggle absolute reference
Ctrl + B	Bold
Ctrl + I	Italic
Ctrl + U	Underline
Ctrl + 1	Format Cells dialog
Ctrl + Shift + \$	Currency format
Ctrl + Shift + %	Percentage format
Ctrl + `	Show/hide formulas

Ctrl + Home	Go to cell A1
Ctrl + End	Go to last used cell
Ctrl + Arrow	Jump to last filled cell in direction
Ctrl + Page Down/Up	Switch worksheet

Group Activity — Creative Data Presentation

In groups of 3–4 students. Time: 30 minutes.

Step 1 — Choose ONE real-life scenario to collect data about:

- Option A: Survey 10 classmates about their favourite subject. Count responses per subject.
- Option B: Estimate the daily temperature for 7 consecutive days.
- Option C: Count the number of boys and girls in 5 different classes in your school.

Step 2 — In Excel:

- Enter your data with proper headings
- Calculate SUM, AVERAGE, MIN, MAX, and COUNT for your numbers
- Create TWO different chart types to represent the data
- Format your spreadsheet with colours, borders, and a clear title

Step 3 — Present to the class:

- What does your data show?
- Which chart type represents it best — and WHY?
- What did you discover that surprised you?

Uses and Applications of Spreadsheets

Spreadsheets are used in many careers and daily life situations:

- Finance & Business — budgets, cash flow analysis, payroll, stock control, tax records
- Education — mark sheets, attendance registers, result analysis, fee records
- Science & Research — recording experimental data, statistical computations (standard deviation)
- Health — patient records, medicine stock, disease tracking
- Agriculture — recording crop yields, calculating profits, tracking weather patterns
- Government — census data, population statistics, election results
- Personal Use — tracking monthly expenses, saving goals, sports statistics

Real-World Connection: A market vendor in Kampala uses a phone spreadsheet to track daily income and expenses, so they know exactly how much profit they make each week.

Think-Pair-Share: How could YOU use a spreadsheet in your own life right now or in your future career?

Revision Questions

Answer these questions individually in your exercise book:

- 1. What is the difference between a WORKBOOK and a WORKSHEET?
- 2. State THREE differences between a manual and an electronic spreadsheet.
- 3. What does the formula =AVERAGE(B2:B6) do?
- 4. Write an Excel formula to add the values in cells A1, B1, and C1.
- 5. What error does #DIV/0! mean? How would you fix it?
- 6. A shopkeeper wants to find the total monthly sales from January to December (cells B2 to B13). Write the correct SUM formula.
- 7. What is the difference between a relative cell reference and an absolute cell reference? Give an example of each.
- 8. Name THREE types of charts in Excel. For each, state when it is most appropriate to use it.
- 9. A student has marks: 72, 85, 60, 90, 78. Using Excel functions, write formulas to find the total, average, highest mark, and lowest mark.
- 10. Describe the steps to sort a list of student names in alphabetical order in Excel.

Bonus: Open a new workbook and actually answer Questions 6 and 9 using real Excel formulas!

Topic Summary — What You Have Learned

By the end of this topic, you should be able to:

- ✓ Explain what a spreadsheet is and state its key components (cell, row, column, range, worksheet, workbook)
- ✓ Compare manual and electronic spreadsheets with advantages and disadvantages
- ✓ Open, navigate, and save an Excel workbook
- ✓ Enter text, numbers, and dates correctly into a spreadsheet
- ✓ Write and apply formulas using +, -, *, / operators
- ✓ Use Excel functions: SUM, AVERAGE, MIN, MAX, COUNT, MODE, MEDIAN, IF
- ✓ Apply relative, absolute, and mixed cell references correctly
- ✓ Format a spreadsheet: fonts, colours, borders, alignment, number formats
- ✓ Sort data alphabetically and numerically
- ✓ Create, label, and interpret Pie, Bar, and Line charts
- ✓ Identify and correct common Excel error messages

Next Topic: Topic 6 — Database Management Systems

You will apply similar data organisation skills in a dedicated database environment.

END OF TOPIC 5

SPREADSHEETS USING EXCEL

Senior Two | ICT Comprehensive Handbook
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