

UNIT 2: DATA

2.3: DATA MODELLING

2.3.6 Cell Referencing

Cell referencing is the method of referring to specific cells in a worksheet to perform calculations or analyses. It is important because it allows formulas to update automatically when copied, saving time and reducing errors. **Relative cell references** change automatically when a formula is copied (e.g., B2). **Absolute cell references** remain fixed using the \$ symbol and do not change when copied (e.g., \$B\$2). **Mixed cell references** fix either the row or the column while allowing the other to change (e.g., \$B2 or B\$2). Correct use of these references ensures accurate and consistent calculations across datasets.

The screenshot shows three Excel cells with their formulas and reference types highlighted:

- Relative Cell Reference:** Cell I2 contains the formula `=G2*H2`. The cell I2 is highlighted in yellow, and the formula bar also shows `=G2*H2`.
- Mixed Cell Reference:** Cell G2 contains the formula `=SUMIFS(C2:C17,A2:A17,$F2,$B$2:$B$17,G$1)`. The cell G2 is highlighted in yellow, and the formula bar shows the full formula.
- Absolute Cell Reference:** Cell C1 contains the formula `=A1`. The cell C1 is highlighted in yellow, and the formula bar shows `=A1`.

The background shows a sales dataset with columns for Product, Unit Price, Units Sold, Sales Manager, and months Jan, Feb, Mar.

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The sheet CellReferencing contains students' marks and a bonus value. Use relative, absolute, and mixed references to calculate final marks correctly.

1. Open StudentData.xlsx and go to the CellReferencing sheet.
2. Check headers: **Student Name**, **Test 1**, **Test 2**, **Bonus**, **Final Marks**.
3. In cell **E2**, enter the formula `=B2+C2` to add Test 1 and Test 2 using **relative reference**.
4. In another cell (e.g., **F1**), the bonus value is given (same for all students).
5. Update the formula in **E2** to `=B2+C2+F1` to add bonus using an **absolute reference**.
6. Copy the formula down to apply it to all students.
7. Change the formula to `=B2+$C2+$F$1` to practice a **mixed reference** (column fixed, row changes).
8. Save the workbook.

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2.3.7 Data Calculations: SUM

The SUM function is used to add values in a range of cells efficiently. It is important because it simplifies calculations, especially for large datasets, ensuring accuracy and saving time. Core concepts include summing rows, columns, or specific ranges, and combining ranges in a single formula.

The screenshot shows a Microsoft Excel spreadsheet with data for five students across four subjects. The columns are labeled A through G, and the rows are numbered 1 through 6. Row 1 contains subject names: John, Ron, Harry, Jenifer, and Total. Rows 2 through 6 contain student names: Maths, English, Science, Economics, and Accounts respectively. The 'Total' column contains the formula =SUM(B2,C2) in row 2, which is then copied down to the other rows. The formula bar at the top shows =SUM(B2,C2). The cell F2 contains the result 187, and the formula bar also displays the formula =SUM(number1, [number2], [number3], ...).

	A	B	C	D	E	F	G
1	Subject Name	John	Ron	Harry	Jenifer	Total	
2	Maths	89	98	67	99	=SUM(B2,C2)	
3	English	90	87			SUM(number1, [number2], [number3], ...)	
4	Science	67	65	89	67		
5	Economics	65	54	54	98		
6	Accounts	90	65	87	78		
7							

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The sheet SumCalculation contains monthly sales for different products. Calculate the total sales for each product using SUM.

1. Open StudentData.xlsx and go to the SumCalculation sheet.
2. Check headers: **Product, January, February, March, Total Sales**.
3. In **Total Sales**, enter formula =SUM(B2:D2) for the first product.
4. Copy the formula down for all products.
5. Save the workbook.

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2.3.8 Conditional Summarization with SUMIF

SUMIF allows summing of values that meet a specific condition. It is important because it enables targeted calculations, such as totals for a category or group, without manual filtering. Core concepts include defining the criteria range, condition, and sum range.

	A	B	C	D	E	F
1	Item	Region	Sales		Region	North
2	Grapes	North	\$250		Sales	\$665
3	Apples	South	\$155			
4	Grapes	West	\$130			
5	Lemons	North	\$255			
6	Apples	North	\$160			
7	Grapes	South	\$280			
8	Lemons	East	\$170			
9	Apples	East	\$285			
10	Apples	West	\$110			

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The sheet SumIfExample contains student scores in different subjects. Calculate the total marks for students who are in Class 10 using SUMIF.

1. Open StudentData.xlsx and go to the SumIfExample sheet.
2. Check headers: **Student Name, Class, Math, Science, Total**.
3. In a new cell, enter formula `=SUMIF(B2:B11,"10",C2:C11)` to sum **Math** marks for Class 10.
4. Repeat for other subjects if needed.
5. Save the workbook.

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2.3.9 Calculating Mean Values with AVERAGE

The AVERAGE function calculates the arithmetic mean of a set of numbers. It is important because it helps summarize data and identify overall trends or typical values. Core concepts include averaging ranges, ignoring blank cells, and combining multiple ranges.

The screenshot shows a Microsoft Excel interface. In the formula bar, the formula `=AVERAGE(B2:B11)` is entered. Below the formula bar, a table is displayed with columns labeled A, B, C, D, E, and F. The table has 11 rows, with rows 1 through 10 containing data and row 11 being a header. Row 1 contains headers "Date of Delivery" and "Quantity". Rows 2 through 10 contain dates from 19/2/2019 to 29/2/2019 and corresponding quantities 55, 12, 21, 12, 23, 55, 67, 1, 34, and 56 respectively. Row 11 is a header row with "Average Formula" in cell E11 and the value "33.6" in cell F11, which is highlighted with a red arrow pointing to it. To the right of the table, the "Function Library" dialog box is open. The search bar contains "AVERAGE". The category dropdown is set to "Statistical". Under "Select a function", "AVEDEV" is listed first, followed by "AVERAGE", "AVERAGEA", "AVERAGEIF", "AVERAGEIFS", "BETA.DIST", and "BETA.INV". A large preview window on the right shows the formula `=AVERAGE()` and its description "AVERAGE(number1, [number2], ...)".

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The sheet AverageCalculation contains students' scores for 3 tests. Calculate the average score for each student.

1. Open StudentData.xlsx and go to the AverageCalculation sheet.
2. Check headers: **Student Name, Test 1, Test 2, Test 3, Average**.
3. In the **Average** column, enter formula `=AVERAGE(B2:D2)` for the first student.
4. Copy the formula down for all students.
5. Save the workbook.

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2.3.10: MAX / MIN

MAX returns the largest value in a range, while MIN returns the smallest value. These functions are important because they quickly identify extremes in datasets, such as top scores or lowest sales. Core concepts include applying MAX/MIN to rows, columns, or ranges, and combining with other functions for analysis. They are commonly used in performance comparisons, rankings, and data validation. Using MAX and MIN helps detect outliers and understand the overall spread of data values.

D1	A	B	C	D	E	D2	A	B	C	D
1	Sales		Maximum	974		1	Sales		Maximum	974
2	469					2	469		Minimum	122
3	444					3	444			
4	273					4	273			
5	316					5	316			
6	318					6	318			
7	122					7	122			
8	824					8	824			
9	974					9	974			
10	514					10	514			
11	849					11	849			
12	690					12	690			
13						13				

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The sheet MaxMinExample contains test scores for students. Find the highest and lowest scores in each test.

1. Open StudentData.xlsx and go to the MaxMinExample sheet.
2. Check headers: **Student Name, Test 1, Test 2, Test 3**.
3. In a new cell, enter formula =MAX(B2:B11) to find the highest score in Test 1.
4. In another cell, enter formula =MIN(B2:B11) to find the lowest score in Test 1.
5. Repeat for other tests as needed.
6. Save the workbook.

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2.3.11 Data Sorting

Data sorting is arranging data in a specific order, such as ascending, descending, or by custom criteria. It is important because it allows quick identification of trends, rankings, or patterns in datasets. Core concepts include single-column sorting, multi-level sorting, and sorting numerical or text data. Sorting helps prepare data for analysis and reporting.

The screenshot shows a Microsoft Excel spreadsheet titled 'Marks'. The 'Data' tab is selected in the ribbon. In the 'Sort & Filter' group of the ribbon, there are two 'Sort' buttons highlighted with red boxes: one for 'A to Z' and one for 'Z to A'. Below the ribbon, the table has a green header row labeled 'Student Name', 'Course Name', 'Start Date', 'Marks Secured', and 'House Assigned'. The 'Marks Secured' column is highlighted with a green background and has a red arrow pointing to it from the ribbon. The 'Selected Column' header is also highlighted with a green background and has a red arrow pointing to it from the ribbon. The table contains six rows of data with student names, course names, start dates, marks secured, and house assigned.

	A Student Name	B Course Name	C Start Date	D Marks Secured	E House Assigned
1	James	Basic Java	09-03-2013	65	
2	Sally	Fine Arts	28-02-2013	78	
3	Patrick	Economics	23-04-2013	91	
4	Gia	Physics	28-03-2013	87	
5	Patrick	Maths	05-05-2013	88	

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The sheet DataSorting contains students' scores and class information. Sort students by Class and then by total marks in descending order.

1. Open StudentData.xlsx and go to the DataSorting sheet.
2. Check headers: **Student Name, Class, Total Marks**.
3. Click anywhere in the dataset and go to **Data → Sort**.
4. First, sort by **Class** in ascending order.
5. Add a level to sort by **Total Marks** in descending order.
6. Apply the sort and review results.
7. Save the workbook.

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Lesson Summary

Cell Referencing enables formulas to dynamically link worksheet data using **Relative**, **Absolute (\$)**, and **Mixed References**, ensuring accuracy and reusability across datasets. Using references like `=B2+C2` allows efficient calculation of totals while copying formulas with the **Fill Handle** maintains consistency. The **SUM** function simplifies adding values across rows or ranges, such as `=SUM(B2:D2)`, saving time and reducing errors in large datasets. **SUMIF** supports conditional calculations by applying criteria, making it useful for grouped analysis like summing marks for a specific **Class**. The **AVERAGE** function calculates mean values to identify typical performance and overall trends while ignoring blank cells. **MAX** and **MIN** functions quickly detect highest and lowest values, helping identify extremes, rankings, and outliers. **Data Sorting** organizes information in **Ascending**, **Descending**, or **Multi-level** order to reveal patterns and rankings. Together, these tools support efficient **Data Modelling**, accurate analysis, and structured reporting in spreadsheets.

Excel Data Analysis Skills Sequence

