Lecture 6

Learning outcomes:

- *Introduction, Basic and Intermediate Excel Skills*

Introduction

- Microsoft Excel is one of the renowned tools offered by Microsoft, which is most widely used among students and professionals across every type of industry to generate reports and deal with projects.

- Microsoft Excel is a valuable spreadsheet software program that can help with many data entry and analytics tasks, and provides a wide range of advanced formulas for calculations and predictions. Excel's capabilities extend further to visualization, helping people quickly make sense of data for informed decision-making.

- You can use Excel for data management, including analyzing patterns and relationships between variables. It can also help you create reports and automate repetitive tasks.

- Excel proficiency falls into one of three categories: ***basic, intermediate and advanced***. It's essential to determine your current skill level to find out how you can advance your Excel knowledge further.

Excel - Basic skills

- The basic skills in Excel include a deep understanding of all the tools relevant to three ribbon tabs – namely Home, Page Layout, and the View tab.
- Additionally, users at this level should be comfortable with using basic spreadsheet formatting and different tool options.
- ***Here are a few examples portraying Basic skills in Excel:***

1) Data Entry

2) Presenting the data summary and printing process

3) Basic calculations like addition, subtraction, multiplication, and division

4) Building and applying formulas using SUMIF, COUNTIF, AVERAGE, and ROUND formulas within worksheets

Addition

Addition is one of the fundamental operations in arithmetic and mathematics. In Excel, you can perform addition in several ways, depending on your needs and the complexity of your calculations. Here's a guide to the most common methods for adding numbers in Excel:

- ***Basic Addition Using the + Operator***

You can simply use the + operator to add numbers together.

✓Example: This formula returns 8.

=5 + 3

- ***Adding Values in Cells***

To add values from different cells, you can use the + operator between cell references.

✓Example:

=A1 + B1

If A1 contains 10 and B1 contains 20, the formula returns 30.

- ***Using the SUM Function***

The SUM function is useful for adding a range of numbers or multiple numbers.

✓Example:

=SUM(A1:A10)

This formula adds all numbers from cells A1 through A10.

Subtraction

Subtraction in Excel is just as straightforward as addition. You can use the - operator to subtract values, and there are several methods and techniques for handling subtraction, depending on your needs.

- ***Basic Subtraction Using the - Operator***

For simple subtraction, you can directly use the - operator.

✓Example: This formula returns 6.

=10 - 4

- ***Subtracting Values in Cells***

To subtract values from different cells, use cell references with the - operator.

✓Example:

=A1 - B1

If A1 contains 15 and B1 contains 7, the formula returns 8.

Multiplication

Multiplication in Excel is straightforward and can be accomplished using the * operator, as well as through several functions and methods that offer flexibility depending on the complexity of your needs.

- ***Basic Multiplication Using the * Operator***

For simple multiplication, you can use the * operator directly between numbers or cell references.

✓Example: This formula returns 15.

=5 * 3

- ***Example with Cell References:***

=A1 * B1

If A1 contains 8 and B1 contains 12, this formula returns 96.

Division

Division in Excel is straightforward and can be accomplished using the / operator. There are also various methods and functions for handling division, especially when dealing with more complex scenarios. Here's a comprehensive guide:

- ***Basic Division Using the / Operator***

For simple division, you can use the / operator directly between numbers or cell references.

✓Example: This formula returns 5.

=10 / 2

- ***Example with Cell References:***

=A1 / B1

If A1 contains 20 and B1 contains 4, this formula returns 5.

SUMIF

The SUMIF function in Excel is a powerful tool used to sum the values in a range that meet a specific condition or criteria. This function is particularly useful when you need to add up numbers based on specific conditions.

- ***Syntax of SUMIF:***

SUMIF(range, criteria, [sum_range])

❑Arguments:

➢range:

- The range of cells that you want to evaluate against the criteria.
- Example: A2:A10

➢criteria:

- The condition that must be met for a cell to be included in the sum. This can be a number, expression, cell reference, or text string.
- Example: ">50", "Apples“.

➢sum_range (optional):

- The actual cells to sum if the range cells meet the criteria. If this is omitted, Excel sums the cells specified in the range.
- Example: B2:B10

➢ Examples of SUMIF:

✓ Sum values greater than a specific number: This formula adds up all the numbers in the range A2:A10 that are greater than 50.

=SUMIF(A2:A10, ">50")

✓ Sum values based on a text match: This formula sums up the values in B2:B10 where the corresponding cell in A2:A10 equals "Apples".

=SUMIF(A2:A10, "Apples", B2:B10)

❖***Using Wildcards in SUMIF:***

* (asterisk): Matches any number of characters.

? (question mark): Matches any single character.

✓Example: This formula adds up all the values in B2:B10 where the corresponding cell in A2:A10 starts with "Banana".

=SUMIF(A2:A10, "Banana*", B2:B10)

- ***Points to Remember:***

✓If you don’t specify the sum_range, Excel will sum the values in the range itself.

✓The criteria can include logical operators like >, <, >=, <=, <> (not equal).

✓The SUMIF function can only apply one condition. If you need to sum based on multiple conditions, you can use the SUMIFS function, which allows for multiple criteria.

❖**Practical Example: Suppose you have the following data:**

A	B
Product	**Sales**
Apples	120
Oranges	80
Apples	90
Bananas	60
Oranges	150
Apples	130

✓To calculate the total sales of "Apples," you would use:

=SUMIF(A2:A7, "Apples", B2:B7)

This would sum the values in column B where the corresponding cell in column A is "Apples," giving a result of 340.

The SUMIF function is a versatile and widely used feature in Excel, especially in scenarios involving conditional summing based on criteria.

COUNTIF

The COUNTIF function in Excel is used to count the number of cells within a range that meet a specific condition or criteria. It's particularly useful for counting cells that contain specific values, text, or satisfy certain conditions.

- ***Syntax of COUNTIF:***

COUNTIF(range, criteria)

❑Arguments:

➢ range:

- The range of cells you want to apply the criteria to.
- Example: A2:A10

➢ criteria:

- The condition that must be met for a cell to be counted. This can be a number, expression, cell reference, or text string.
- Example: "Apples", ">50“.

➢Examples of COUNTIF:

✓Count cells that contain a specific number: This formula counts how many times the number 50 appears in the range A2:A10.

=COUNTIF(A2:A10, 50)

✓Count cells that contain specific text: This formula counts the number of times the word "Apples" appears in the range A2:A10.

=COUNTIF(A2:A10, "Apples")

✓Count cells with a condition using a comparison operator: This formula counts the number of cells in A2:A10 that contain values greater than 50.

=COUNTIF(A2:A10, ">50")

✓Count cells that are greater than or equal to a number: This counts the number of cells in the range A2:A10 with values greater than or equal to 100.

=COUNTIF(A2:A10, ">=100")

✓Count cells with text that matches part of a string using wildcards:

* (asterisk): Matches any number of characters.

? (question mark): Matches any single character.

Example: This formula counts the number of cells that start with "Banana" in the range A2:A10.

=COUNTIF(A2:A10, "Banana*")

- **Points to Remember:**

✓The criteria argument can include logical operators like >, <, >=, <=, and <> (not equal).

✓The criteria can be a text string, number, or even a cell reference.

✓COUNTIF is case-insensitive, meaning it treats "Apples" and "apples" as the same.

❖Practical Example: Suppose you have the following data:

A
Product
Apples
Oranges
Apples
Bananas
Oranges
Apples

✓To count the number of times "Apples" appears in column A, you would use:

=COUNTIF(A2:A7, "Apples")

This would count the occurrences of "Apples" in the range A2:A7, giving a result of 3.

The COUNTIF function is incredibly useful for quickly counting data that meets specific criteria, making it a staple in data analysis and reporting in Excel.

AVERAGE

The AVERAGE function in Excel is used to calculate the arithmetic mean (average) of a group of numbers. This is a basic yet essential function for data analysis, allowing you to find the central value of a set of numbers.

- ***Syntax of AVERAGE:***

AVERAGE(number1, [number2], ...)

❑Arguments:

➢number1, number2, ...:

These are the numbers, cell references, or ranges for which you want to calculate the average. You can input up to 255 arguments.

➢Examples of AVERAGE:

✓Calculating the average of a range of numbers: This formula calculates the average of all the numbers in the range A2:A10.

=AVERAGE(A2:A10)

✓Calculating the average of specific numbers: This formula calculates the average of the numbers 10, 20, and 30, resulting in 20.

=AVERAGE(10, 20, 30)

✓Calculating the average of a range and individual numbers: This formula averages the numbers in the range A2:A5 along with the numbers 20 and 30.

=AVERAGE(A2:A5, 20, 30)

✓Calculating the average of non-contiguous ranges: This formula calculates the average of the numbers in both ranges A2:A5 and C2:C5.

=AVERAGE(A2:A5, C2:C5)

- **Important Notes:**

✓Blank cells: The AVERAGE function ignores blank cells and cells containing text or logical values (like TRUE or FALSE).

✓Cells with zeros: If the range contains cells with a value of 0, those zeros will be included in the calculation, which could lower the average.

✓Error values: If any cell in the range contains an error (like #DIV/0!), the AVERAGE function will return an error unless you handle it using functions like IFERROR.

❖**Practical Example:** Imagine you have a list of test scores in cells A2 through A6:

A
Score
85
90
78
92
88

✓To calculate the average score, you would use:

=AVERAGE(A2:A6)

This formula would sum the values (85 + 90 + 78 + 92 + 88 = 433) and then divide by the number of values (5), resulting in an average of 86.6.

➢Handling Errors with AVERAGE:

If there are potential errors in your data range, you can use the AVERAGEIF or AVERAGEIFS functions to exclude those errors, or wrap your AVERAGE function in IFERROR:

=IFERROR(AVERAGE(A2:A10), "No valid data")

✓This will return "No valid data" if the average calculation encounters an error.

The AVERAGE function is a straightforward and commonly used tool for finding the mean of a dataset, making it essential for many types of analysis in Excel.

ROUND

The ROUND function in Excel is used to round a number to a specified number of digits. This function is useful when you need to control the precision of numerical data, ensuring that numbers are rounded appropriately for reporting or further calculations.

- ***Syntax of ROUND:***

ROUND(number, num_digits)

❑Arguments:

➢number:

- The number you want to round. This can be a specific number, a cell reference, or a formula result.
- Example: 123.456

➢num_digits:

- The number of digits to which you want to round the number.

✓If num_digits is greater than 0: Rounds the number to the specified number of decimal places.

✓If num_digits is 0: Rounds the number to the nearest whole number.

✓If num_digits is less than 0: Rounds the number to the left of the decimal point.

➢ Examples of ROUND: Using 2, 0, and -1

✓Rounding to two decimal places: This formula rounds 123.456 to 123.46, keeping two decimal places.

=ROUND(123.456, **2**)

✓Rounding to the nearest whole number: This formula rounds 123.456 to 123, removing all decimal places.

=ROUND(123.456, **0**)

✓Rounding to the nearest ten (negative num_digits): This formula rounds 123.456 to 120, rounding to the nearest ten.

=ROUND(123.456, **-1**)

✓Rounding the result of a calculation: If A1 contains 10 and B1 contains 3, this formula divides 10 by 3, then rounds the result (3.3333...) to 3.33.

=ROUND(A1/B1, **2**)

❖Practical Example: Suppose you have the following values:

A
Value
10.568
24.673
31.254
44.912

✓To round these values to one decimal place, you would use:

=ROUND(A2, 1)

Copying this formula down will round 10.568 to 10.6, 24.673 to 24.7, 31.254 to 31.3, and 44.912 to 44.9.

- **Points to Remember:**

✓Rounding Behavior: The ROUND function follows standard rounding rules: numbers 5 and above are rounded up, while numbers below 5 are rounded down.

✓Negative num_digits: Rounding with a negative num_digits will round the number to the left of the decimal point, effectively rounding to the nearest ten, hundred, thousand, etc.

✓Alternatives: If you need to always round up or down, you can use the ROUNDUP or ROUNDDOWN functions. If you need to round to a specific multiple, you can use the MROUND function.

The ROUND function is essential for controlling the precision of numbers, particularly when dealing with financial data, measurements, or any scenario where the exact number of decimal places is important.

Excel - Intermediate skills

- The intermediate skills comprise all the basic skills at a more advanced level and a clear understanding of the difference between function and formula in Excel.

- Excel formulas use one or more functions in a cell to get a value or a result. The functions can be considered as building blocks of formulas.

- The intermediate skills need an understanding of how Excel functions operate while using them across the sheets. And understand how the Excel functions behave when they copy, paste, or drag them in or through the cells.

The intermediate Excel skills include:

1) Understanding the formulas like XLOOKUP, VLOOKUP, CHOOSE, and more

2) Knowledge of charts

3) Manipulate dates and texts by using formulas

4) Knowledge of the Formula tab and Functions Library

XLOOKUP

The XLOOKUP function in Excel is a powerful tool for searching a range or array for a specified value and returning a corresponding value from another range or array. It was introduced as a more versatile replacement for functions like VLOOKUP, HLOOKUP, and LOOKUP.

Here’s a basic overview of how XLOOKUP works:

- ***Syntax:***

XLOOKUP(lookup_value, lookup_array, return_array, [if_not_found], [match_mode], [search_mode])

- lookup_value: The value you want to search for.
- lookup_array: The range or array to search within.
- return_array: The range or array from which to return a value.
- [if_not_found]: (Optional) What to return if the lookup_value isn't found. Defaults to #N/A if omitted.
- [match_mode]: (Optional) Defines the type of match:
  - ✓0 – Exact match (default)
  - ✓-1 – Exact match or next smaller
  - ✓1 – Exact match or next larger
  - ✓2 – Wildcard match (e.g., *, ?)
- [search_mode]: (Optional) Defines the direction of the search:
  - ✓1 – Search from first to last (default)
  - ✓-1 – Search from last to first

➢**Example:**

Suppose you have a table of employee names and their IDs, and you want to find the name of an employee given their ID.

A	B
ID	Name
101	Alice
102	Bob
103	Charlie

✓To find the name of the employee with ID 102: This will return "Bob".

=XLOOKUP(102, A2:A4, B2:B4)

❑Handling Errors:

If the ID 104 does not exist and you want to return "Not Found" instead of #N/A:

=XLOOKUP(104, A2:A4, B2:B4, "Not Found")

❑Benefits of XLOOKUP:

- ➢No need for column index numbers: Unlike VLOOKUP, XLOOKUP doesn’t require you to specify a column index number, making it more straightforward and flexible.
- ➢Works with both vertical and horizontal lookups: XLOOKUP can replace both VLOOKUP and HLOOKUP.
- ➢Searches in either direction: You can search from the last item to the first, or use wildcards.
- ➢Returns exact matches by default: Reduces the risk of returning incorrect results if your data isn’t sorted.

VLOOKUP

VLOOKUP is one of Excel's most commonly used functions for looking up data in a table. It allows you to search for a value in the first column of a table and return a value in the same row from a specified column.

- ***Syntax:***

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

- lookup_value: The value you want to search for in the first column of the table_array.
- table_array: The range of cells that contains the data. The first column should contain the values you want to look up.
- col_index_num: The column number in the table_array from which to retrieve the value. The first column in the range is 1, the second column is 2, and so on.
- [range_lookup]: (Optional) A logical value that specifies whether you want an exact match or an approximate match:
  - ✓TRUE or omitted – An approximate match (data should be sorted in ascending order).
  - ✓FALSE – An exact match.

❖**Example: Suppose you have the following data:**

A	B
ID	Name
101	Alice
102	Bob
103	Charlie

✓To find the name of the employee with ID 102: This will return "Bob".

=VLOOKUP(102, A2:B4, 2, FALSE)

➢**Explanation:**

✓102 is the lookup_value.

✓A2:B4 is the table_array.

✓2 indicates that the value should be retrieved from the second column of the table_array.

✓FALSE specifies that an exact match is required.

CHOOSE

The CHOOSE function in Excel is a versatile tool for selecting from a list of values based on an index number. It allows you to pick one of several values or expressions based on a specified index.

- ***Syntax:***

CHOOSE(index_num, value1, [value2], ...)

- index_num: The position of the value to return. This must be a number between 1 and the number of values provided.
- value1, value2, ...: The values or expressions from which to choose. You can provide up to 254 values.

❖**Example: Suppose you want to choose a month name based on a number from 1 to 12.**

=CHOOSE(3, "January", "February", "March", "April", "May", "June", "July", "August", "September", "October", "November", "December")

✓In this example, CHOOSE(3, ...) will return "March" because the index number is 3.

❖**Usage Scenarios:**

1. Simple Selection: If you have a small list of options and want to select one based on an index, CHOOSE is straightforward. For instance, choosing a day of the week:

=CHOOSE(5, "Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday")

✓This will return "Thursday".

2. Dynamic Lists: You can use CHOOSE with other functions to create dynamic lists. For example, using CHOOSE with MATCH to select a value based on a lookup result:

=CHOOSE(MATCH(A1, {"Red", "Green", "Blue"}, 0), "Apple", "Broccoli", "Sky")

✓If A1 contains "Green", this formula will return "Broccoli".

3. Combining with Other Functions: You can use CHOOSE with functions like IF or SWITCH to make complex decisions:

=CHOOSE(IF(B1 > 100, 2, 1), "Low", "High")

✓If B1 is greater than 100, it returns "High". Otherwise, it returns "Low".

4. Data Validation: CHOOSE can be used in conjunction with data validation to create dropdown lists:

=CHOOSE(A1, "Option 1", "Option 2", "Option 3")

✓If A1 contains 2, it will display "Option 2".

❖**Notes:**

- Index Number: If index_num is less than 1 or greater than the number of values provided, CHOOSE will return an error.
- Flexibility: CHOOSE can handle a wide range of data types, including text, numbers, and formulas.