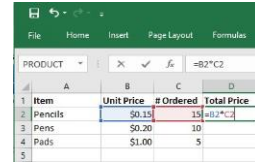


Spreadsheet III

Basic formulae and Built-in Functions

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	A	B	C	D
1	Item	Unit Price	# Ordered	Total Price
2	Pencils	\$0.15	15	=B2*C2
3	Pens	\$0.20	10	
4	Pads	\$1.00	5	
5				

Portfolio: <https://chafukira.github.io/portfolio/>

Introduction

In this topic we are going to discuss the following in a spreadsheet:

- Basic formulas
- Built-in functions
- Use formulas to solve practical problems
- Sort data
- Filter data



```
=SUM(A1:A5)
=COUNT(A1:A5)
=AVERAGE(A1:A5)
=MIN(A1:A5)
=MAX(A1:A5)
=IF(A1>33,"P","F")
```

Note!: to the instructor/teacher:

- Make sure the lessons are carried out in a computer lab and demonstration to the students is a **must**.
- MS Excel package is a minimum requirement for this course.

Note!: to the student:

- Study, Practice, Repeat.

Basic Formula

- A basic formula commonly just called '**a formula**' is a mathematical expression that performs calculations on values in cells of a given spreadsheet file.
- We can also define it as 'an arithmetic expression that performs calculations in a spreadsheet file'.
- **For example:** if you want to add the values in cells **A2** and **D3**, you would type the formula: **=A2+D3** in a cell where you want the results to appear.
- In this example the expression **=A2+D3** is a basic formula.
- The **=** sign at the start tells the spreadsheet you are entering a formula.
- The **=** sign is then followed by **cell addresses** which are separated by **arithmetic operators**.
- The arithmetic operators can also be called **basic math symbols** for **adding, subtracting, multiplying, and dividing**.

Basic Formula

Always remember the following when dealing with basic formulas in a spreadsheet:

- **Start with an = sign:** every formula in a spreadsheet begins with an equal sign.
- **Cell references:** always use cell addresses/ cell names instead of typing the actual values. – this helps in auto-recalculation if the values are changed.
- **Operators:** always use basic math operators between the cell addresses for calculations.

Below are some of the commonly used basic math operators when working with basic formulas:

- **Addition:** +
- **Subtraction:** -
- **Multiplication:** *
- **Division:** /
- **Exponentiation:** ^
- **Percent:** %
- **Comparison operators:** =, <>, >, <, >=, <=

Basic Formula: Example

Create the table shown below in a spreadsheet.

Subject	Marks
Mathematics	70
Computer Studies	80
Physics	75

- a. Calculate the **Total Marks** for the three subjects using a basic formula. we enter the formula: `'=B2 + B3 + B4'` in cell **B5**.

- b. Calculate the **Average** for the three subjects using a basic formula.

We enter the formula: `'=B5 / 3'` in cell **B6**.

•Your final table should look as the one shown below:

Subject	Marks
Mathematics	70
Computer Studies	80
Physics	75
Total Marks	225
Average	75

Basic Formula: Exercise

You are given the table below with student names and their scores in three subjects: **English**, **Math**, **Physics**, and **Computer**. Complete the table by using spreadsheet basic formulas.

Student	English	Math	Physics	Computer	Total Marks	Average Mark
Mphatso	80	75	85	89		
Madalitso	70	70	62	70		
Kumbu	65	85	82	69		
Alinafe	62	80	72	71		
Mbumba	90	95	65	84		

Built-in Functions

- A built-in function can be defined as a pre-defined formula that performs specific calculations or tasks automatically.
- Built-in function allows users to perform complex tasks easier and fast.
- In a spreadsheet file, a function has a **function name** followed by **arguments** inside parentheses ().
- The arguments are just **values** and **cell references** inside the parentheses.
- For example, consider the function below:

=SUM(A1:A5)

- **SUM** is the function name.
- **A1:A5** are the arguments.

Note:

- A function always starts with an equal sign followed by a function name, and then parentheses.
- The values or cell references to be calculated are placed inside the parentheses.

Built-in Functions

Below are some of the built-in functions in a spreadsheet:

- **SUM():** Adds up the values in a given range of cells. E.g.: **=SUM(A3:A6)** - *this will add the values in cells A3, A4, A5, and A6.*
- **AVERAGE():** Calculate the average/mean of a given range of values. E.g.: **=AVERAGE(A3:A6)** - *this will find the average value in cells A3, A4, A5, and A6.*
- **MIN():** Find the smallest value from a given range. E.g.: **=MIN(A3:A6)** - *this will return the smallest value from cells A3 to A6.*

- **MAX():** Find the largest value from a given range. E.g.: **=MAX(A3:A6)** - *this will return the largest value from cells A3 to A6.*
- **COUNT():** Count the number of cells that contain numbers in a given range. E.g.: **=COUNT(A3:A6)** - *will count how many cells in the range A3 to A6 that contain numbers.*
- **SQRT():** Calculate the square root of a given number. E.g.: **=SQRT(A3)** - *this will return the square root of the number in cell A3.*
- **IF():** Performs a logical test and returns one value if true and another if the value is false.

Example on Function

• You are provided the receipt as shown on the right. Use built in functions to calculate the following:

- Total price for each item.
- Subtotal price.
- Total price if VAT (Value Added Tax) is 16.5%
- Total items bought.
- Average price.
- Total price.
- Total number of items on the receipt.
- Higher price on all prices.
- Lower price on all prices.

Item No.	Name	Quantity	Price	Total Price
001	Bread	2	2000.00	
014	Sugar	1	2400.00	
222	Sobo 2L	1	5595.50	
990	Plastic bag	1	150.00	
Subtotal				
VAT (16.5%)				
Total				

IF Function

• This is a built-in function in a spreadsheet that is used to perform logical tests.

• This function return one value if the test is true and another value if the test is false.

• This function enables uses to implement decision making in their spreadsheet files.

• Below is a structure of the IF function:

`=IF(logical test, value if true, value if false)`

• Structure breakdown:

- IF – this is the function name.
- Logical test – this is a condition to be tested.
- Value if true – this is the result to get if the condition is true.
- Value if false – this is the result to get if the condition is false.

Note:

• The logical test makes use of comparison operators such as: =, >, <, >=, <=, and <>.

Nested IF Function

• This is an if function placed inside another if function.

• This allows a spreadsheet file to test multiple conditions in a sequence.

• Nested if function allows users to be able to do more complex decision making by checking multiple criteria and returns different results based on each condition.

• Below is a sample syntax for a nested if:

```
=IF(logical test, value if true, IF(logical test, value if true, value if false))
```

How it works

• In a nested IF statement, when the first condition is false, the function checks the next condition (inside the next IF), and this process continues until one of the conditions is true or all are false.

Example: Age Category Classification

In a spreadsheet file, classify a person's age into three categories as:

- Child: Age less than 12
- Teenager: Age between 12 and 17
- Adult: Age 18 and above

```
=IF(A1 < 12, "Child", IF(A1 < 18, "Teenager", "Adult"))
```

Try

You are given a simple student report card below: complete it by using **built-in functions**. Do:

- The Marks entered should be an integer from **0** to **100** only.
- Use the following grading system in the Grade column: **A**(80-100), **B**(65-79), **C**(55-64), **D**(40-54), and **F** (0-39).
- Use the Remarks '**PASS**' for marks equal to and greater than 50, and '**FAIL**' for marks less than 50.
- The Final remark should be **PASS** if the Average is equal to and greater than 50, and **FAIL** if the Average is less than 50

SIMPLE STUDENT REPORT CARD			
Student:	Mbumba	Class:	2A
Subject	Marks	Grade	Remark
English	75		
Math	80		
Science	90		
Total Marks			
Average Mark			
Final Remark			

SUMIF Function

- This is a built-in function in a spreadsheet application that is used to add the values in a specified range that meet a given condition or criteria.
- This function combines the functionality of the SUM function and the logical function IF, to only add values that meet a specified condition set by the user.
- Below is a syntax of a SUMIF function:

`=SUMIF(range, criteria, [sum_range])`

Syntax breakdown:

- **SUMIF** = function name
- **range** = cells to evaluate using the criteria
- **criteria** = condition that determine which cells from the given range to include in the sum
- **sum_range** = this is an **optional** argument. It specifies the actual cells to sum, which is different from the given range. If this is not provided, the function sums the cells in the range.

SUMIF Function example

- You have been provided with a table of sale in a spreadsheet file as shown below.

	A	B
1	Item	Sales(bags)
2	Maize	50
3	Beans	120
4	Soya	81
5	Rice	79

- Use a function to find the total of all the sales greater than **80**.

- To find the Total of all sales greater than 80, we use the SUMIF function below:

`=SUMIF(B2:B5, ">80")`

Note

- Criteria can be numbers, texts, or logical expressions.
- Consider the example on the next slide where the criteria is **text**.

SUMIF Function example

- You have been provided with a table of Prices for different fruits in a spreadsheet file as shown below.
- To find the total price for Apples from all the shops we use the function

`=SUMIF(A2:A5, "Apple", C2:C5)`

	A	B	C
1	Item	Shop	Price
2	Apple	Chipiku	50.00
3	Banana	Chipiku	150.00
4	Apple	Sana	45.00
5	Orange	Shopleft	120.00

- Use a function to find the total price for Apples from all shops.

Sorting in a spreadsheet

- **Sorting** refers to the process of arranging data in a specific order.
- This process can be done in **ascending** or **descending** order, based on **one or more columns**.
- Sorting is **very important** because it makes it **easier** to:
 - Analyse data.
 - Identify trends and patterns.
 - Organise information logically.
- We have **two** types of sorting in a spreadsheet, namely:
 - **Ascending order:** this type of sorting arranges data from the smallest to largest or alphabetically from A to Z.
 - **Descending order:** this type of sorting arranges data from the largest to smallest or alphabetically from Z to A.

Note:

- Sorting can be done based on **text**, **numbers**, or **dates**.

- Below is an icon symbol for sort & filter command:



Sorting in a spreadsheet

Single-column and Multi-column sorting

- **Single column sorting** arranges data in one column while keeping related data in other columns intact.
- **Multi column sorting** arranges data based on multiple criteria in relation to its related data in other columns.

Note

- Always remember to choose the **custom sort** option when you want to sort based on multiple column.

Steps to follow when sorting data in a spreadsheet.

- Select or highlight the columns that you want to sort.
- On the Ribbon, in the **Editing** group of commands, click on the Sort & Filter command.
- Select the types of sorting you want to apply, thus **Sort A to Z**, **Sort Z to A** or **Custom Sort**.
- If you have data in more than one column select how you want to sort on the **Sort Warning dialog** box.

Sorting in a spreadsheet

Thus:

- Expand the selection:** this will extend the sorting to the other columns (related columns).
- Continue with the current selection:** this will only sort the data in the selected column.


Example

- Create a spreadsheet file and save it as 'Student details'
- Enter the data as shown in the table below

Name	Gender	Age	Address
Kaliati	F	50	Ku 44
Odala	M	25	City Centre
Chakwera	M	13	Ku State
Angella	F	60	Ku 18

- Change the font type to Candara.
- Make the column headings board.
- Sort the information based on Age.
- Insert your name as a left footer.
- Print the document.

Filtering in a spreadsheet

- Filtering is the process of displaying **only** the row that meet a specified criteria while hiding the other rows in a workbook.
- This feature of a spreadsheet allows users to only focus on specific data as such making it easier to analyse information in workbooks.
- In a workbook, information can be filtered based on: **values, text, dates** and other **custom specified conditions**.
- Filtering can be grouped into the following types:
 - a. **Text filters:** this will display rows containing or excluding certain word or phrases.
 - b. **Number filters:** this will display rows based on numerical conditions.
 - c. **Date filters:** this will display rows within a specific date range.
 - d. **Custom filters:** this uses comparison operators to combine multiple conditions.
- Below is a **symbol** for the filter command: 

Filtering in a spreadsheet

Steps to follow when filtering data in a spreadsheet:

- a. Select or **highlight** the data range. (make sure you include the headers)
- b. In the **ribbon** click on the **data tab**, and select the **filter** command under the Sort and Filter group of commands.
- c. Choose the **filter criteria** by clicking on the dropdown arrow on the column headers and specify the data you want to see.
- d. Click **Ok** to apply the filter.

Example:

Consider the spreadsheet snippet below:

Salesperson	Gender	District	Sales
Linga	F	Zomba	100
Chimwewe	M	Blantyre	0
Alice	F	Blantyre	130
Sophie	F	Mzuzu	120
Mirrie	F	Balaka	0
Steve	M	Lilongwe	200
Boon	M	Lilongwe	560

Filtering in a spreadsheet

- Sort the data in the table based on Sales in ascending order.
- Filter the data to show female salesperson only.
- In the Filtered data, filter again to show only those with 0 sales.
- Insert today's date as a left footer
- Change the page orientation to landscape.
- Print the document.

Advanced Filtering

- This is a spreadsheet feature that allows users to filter data based on more complex criteria than the standard filter.
- This feature allows the use of multiple conditions and logical operators.
- This feature is very useful when we want to have very precise, multi-condition filtering for efficient data analysis when dealing with very large data sets.
- The icon command for advanced filter is:



Filtering in a spreadsheet

Steps to follow when applying advanced filter.

- Specify your criteria on a in a different columns from the data source.
- Select or highlight the data to be filtered (data source).
- In the ribbon, click on the data tab, then on Advanced filter in the Sort & Filter group of commands.
- Select the criteria range on the Advanced filter dialog box.
- Select the Action on the Advanced filter

dialog box

- **Filter the list, in-place:** this filters the data on the same worksheet and replaces the original data source.
 - **Copy to another location:** this allows the filtered data to be displayed on a different location on the same worksheet or a different worksheet.
- Based on the selection in e, specify the copy to location.
 - Click **Ok** to filter the data.

Filtering in a spreadsheet

Example

Consider the following spreadsheet snippet below:

Name	Department	Salary	Years of experience
Allan	IT	7,000	8
Mwayi	Sales	6,500	2
Linga	HR	6,800	6
Boom	IT	7,000	6
Grace	Sales	5,500	5
Mtombi	IT	6,800	2

- Create a workbook named 'Codegiya'.
- In the workbook create two worksheets, one named 'Staff', and the other 'Senior IT Staff'.
- In the Staff worksheet enter the data as shown on the snippet.
- Filter the data so that only IT staff with years of experience greater than 3 are displayed. The filtered data shown be displayed in the Senior IT Staff worksheet.

Next: Charts in spreadsheets.