

# Excel Functions

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# This Presentation and the Sample Data

- [depts.ttu.edu/itts/training/shortcourses/handouts.php](https://depts.ttu.edu/itts/training/shortcourses/handouts.php)

## Microsoft

- Access I
- Access II
- Excel
- Excel Charts
- Excel Data Analysis
- Excel Formulas & Functions
  - Practice File
- Excel PivotTable



# Material Notes

- Information here may apply to other spreadsheet software tools (LibreOffice, OpenOffice, Google Sheets, etc.).
  - These other tools are not approved for use with TTU data.
- All sample data here is either fully anonymized and random OR publicly available.
  - Any connection to real TTU data / events is not intentional.
  - I do not intend to make any statements with the sample data presented.
- I don't know your data – so my examples may not be 100% accurate with your processing.
- There are more functions in Excel than what is covered here.
- I may move quickly and cover a lot of info, but I'm hoping you can reference this presentation and the test data outside of this presentation.



# Outline

- Excel Basics
- Function Basics
- Functions
  - String
  - Date
  - Math
  - Logical
  - XLookup



# Excel Basics



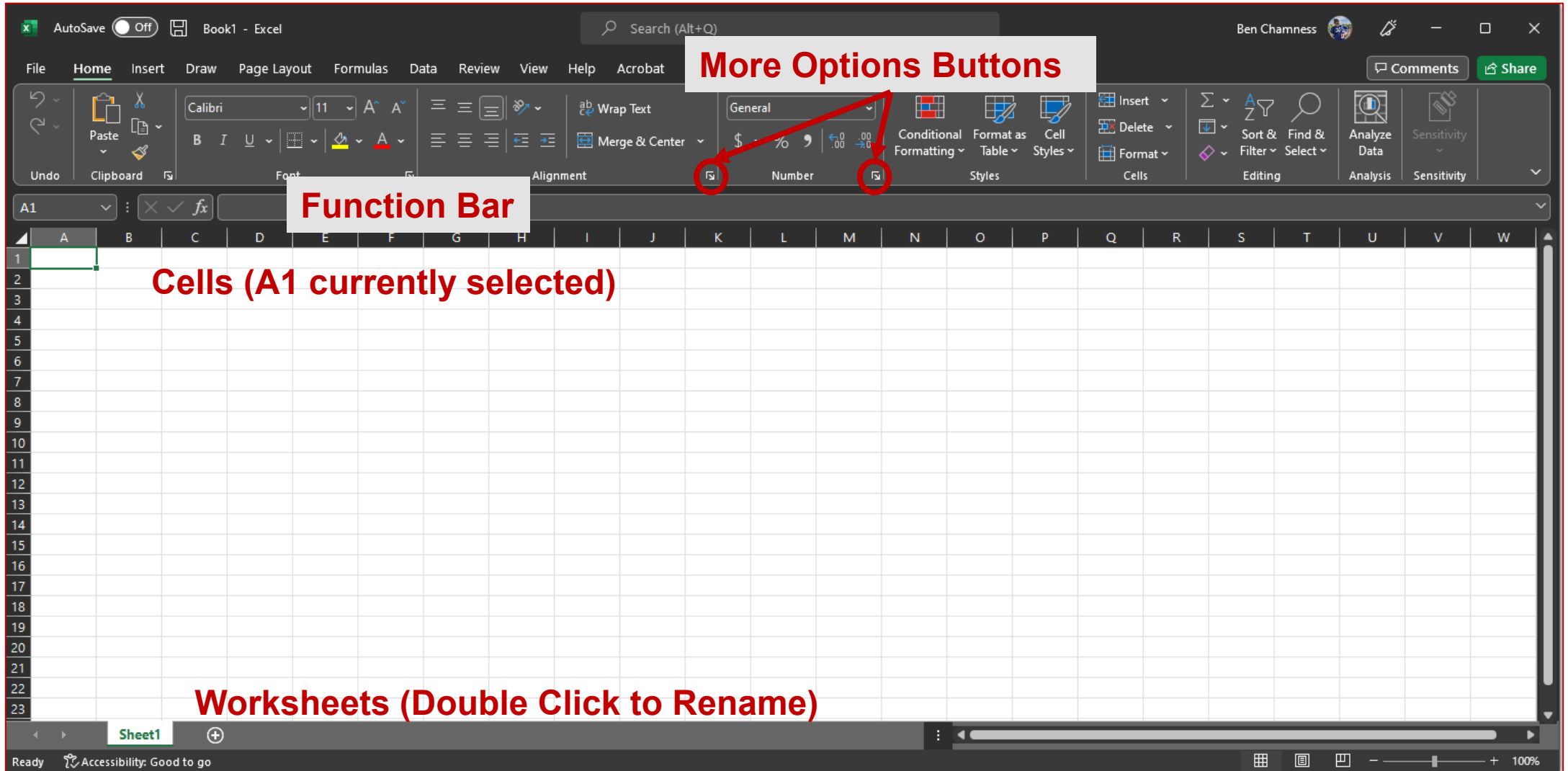
# Outline

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# Parts of Excel

Ribbon



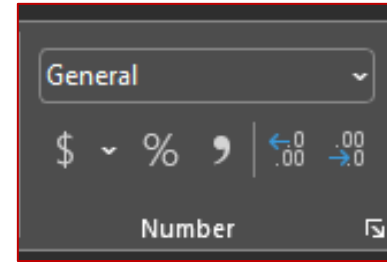
More Options Buttons


Function Bar

Cells (A1 currently selected)

Worksheets (Double Click to Rename)

# Data Formats

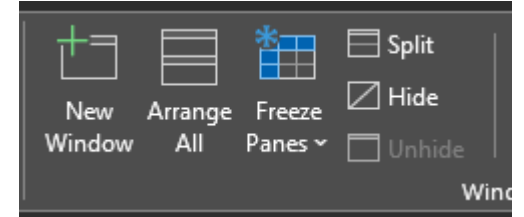


- Your data may be a mix of formats:
  - Text / Strings
  - Numbers
  - Dates
  - Currency
  - Percentages
- Different Functions work with different data types
- Excel offers preset ways to format this data
- Apply a specific style with "Data Format" dropdown
- See even more options by clicking the "More Options" icon 





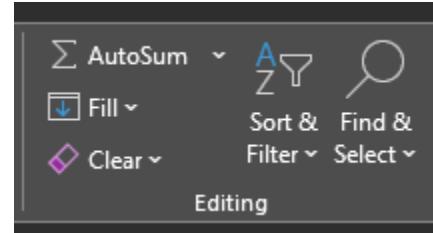
# Viewing an Excel Document



- "New Window" button
  - Let's you see the same workbook in a second Excel window
  - This is helpful if you are working from multiple sheets at the same time
- "Freeze Panes" button
  - Stops certain rows and/or columns from moving when you scroll – useful for large spreadsheets
  - Helpful to keep column headers and/or first column identifiers (name, ID, etc) present as you scroll around a spreadsheet



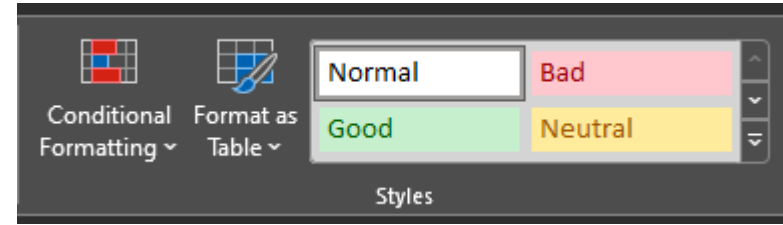
# Sort and Filter Data



- Sort
  - Allows you to sort your data on a single column or by multiple columns.
  - Examples:
    - Sort a roster by last name, then first name.
    - Sort a list of expenses by total cost.
- Filter
  - Allows you to see records matching specific criteria in your data.
  - Examples:
    - Filter a list of students down to a specific major / college.



# Conditional Formatting



- Highlight cells based on their value.
- Useful to callout cells that are above or below a given criteria.
  - "Show me all people with more than 50 volunteer hours."
- Can also give a range of colors showing how records rank on a given column.
  - "Let me see who has done the most / fewest volunteer hours easily."



Let's Try It!



# Function Basics



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# Referencing Cells

- Cells are referenced by their coordinates
  - A1 is the cell in the first column (A) and the first row (1)
- A range of cells can be described by the top left and bottom right cells, separated by a colon
  - A1:C3 is a range containing A1, A2, A3, B1, B2, B3, C1, C2, and C3
- You can select an entire column(s) or row(s) by referencing its column letter or row number
  - D:F is a range containing data from all rows for columns D through F
  - This allows your functions to continue working as your data grows
- You can also reference cells in another worksheet
  - 'Sheet2'!A1 will reference the A1 cell of the worksheet named Sheet2
- Can reference cells in a different Excel document
  - I'm paranoid and would rather just copy the needed data over to my current document.
- More simply, you can just click or click and drag to select the cells you want



# Using \$

- After entering a function or value, the small box in the bottom corner of your cell allows you to fill the data to other columns or rows.
- If you're using a function, you may want to reference a specific row, column, or cell.
- Putting a \$ in front of the column, row, or both will prevent that value from changing if the function is copied.





# Function Notation

= sum ( A1 : A4 )

- All functions begin with an "=" sign.
- Next will be the name of a function followed by an open parenthesis.
- Next will be one or more parameters.
  - Parameters give the function the information it needs to do its job.
  - You must put double quotes around any text you want it to use.
  - Any of the parameters can be entered directly or a cell reference.
- Once you are done, your function should end with a closed parenthesis.
- You can "nest" functions by putting one inside another.



# Functions



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# String Functions

- A "String" is some bit of text.
- It can contain numbers, but it isn't meant to be added, subtracted, compared, or other similar "math" functions.
- These functions are meant to change values in a string or extract certain values from a string.
- Examples:
  - Left, Mid, Right
  - Concatenate
  - Substitute



# Left, Right

- Return some number of characters from the left/right of a string.
- Examples and Syntax:
  - =left( [string] , [number of characters] )
  - =right( [string] , [number of characters] )

| Example                   | Output   |
|---------------------------|--|
| =left( "ENGL 1301" , 4 )  | ENGL   |
| =right( "R12345678" , 8 ) | 12345678   |
| =left( B2 , 2 )           | Outputs as whatever the first 2 characters are from B2 |



# Mid

- Return some number of characters from the middle of a string.
- Examples and Syntax:
  - =mid( [string] , [starting character number] , [number of characters] )

| Example                    | Output   |
|----------------------------|--|
| =mid( "ABCDEFGH" , 2 , 3 ) | BCD  |
| =mid( "BL-0123a" , 4 , 4 ) | 0123   |
| =mid( A2 , B2 , C2 )       | Outputs characters from A2, starting at the value of B2 and ending after C2 characters |



# Concatenate (concat, &)

- Combine 2 or more strings of data
- Examples and Syntax
  - =concatenate( [string1] , [string2] , [string3] ,....., [stringN] )

| Example                                | Output  |
|--|---|
| =concatenate ("Ben", " ", "Chamness")  | Ben Chamness  |
| =concatenate ("Chamness", ", ", "Ben") | Chamness, Ben   |
| =concatenate ("Your balance is ", B2)  | "Your balance is " followed by whatever value is in B2. |
| =concat("Hello", " ", "World")         | Hello World   |
| = "Hello" & " " & "World"              | Hello World   |



# Substitute

- Replace part of a string with a new value
  - =substitute( [text] , [text to replace] , [new text] )

| Example  | Output        |
|--|---------------|
| =substitute( "BL-0123a" ,"BL-" , "Bledsoe " )    | Bledsoe 0123a |
| =substitute ( "ENGL 1301" , "ENGL" , "English" ) | English 1301  |





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# Date Functions

- Excel stores a date value as the number of days between the date entered and December 31, 1899.
- This can be annoying, but it allows your computer to easily add and subtract dates.
- Examples:
  - Today, Now
  - Month, Day, Year, Hour, Minute, Second
  - DateDif
  - NetWorkDays



# Today, Now

- Returns the current date (today) or the current date and time (now)
  - =today()
  - =now()

| Example  | Output         |
|----------|----------------|
| =today() | 3/1/2022       |
| =now()   | 3/1/2022 15:25 |



# Date Parts (Month, Day, Year, Hour, Minute, Second)

- Return the given component of a date, time, or date and time.

| Example                        | Output |
|--------------------------------|--------|
| =month( "3/1/2022 15:51:25" )  | 3      |
| =day( "3/1/2022 15:51:25" )    | 1      |
| =year( "3/1/2022 15:51:25" )   | 2022   |
| =hour( "3/1/2022 15:51:25" )   | 15     |
| =minute( "3/1/2022 15:51:25" ) | 51     |
| =second( "3/1/2022 15:51:25" ) | 25     |



# DateDif

- Calculate the difference between two dates in the unit specified
  - =datedif( [start date] , [end date] , [unit ( "Y" , "M" , or "D" )] )

| Example                                       | Output |
|---|--------|
| =datedif( "03/01/2021" , "03/01/2022" , "D" ) | 365    |
| =datedif( "03/01/2021" , "03/01/2022" , "M" ) | 12     |
| =datedif( "03/01/2021" , "03/01/2022" , "Y" ) | 1      |



# NetWorkDays

- Returns the number of work days between two dates.
  - =networkdays( [start date] , [end date] , [Optional: Range of Holidays] )

| Example   | Output  |
|---|---|
| =networkdays( "03/01/2021", "03/01/2022")         | 262 days  |
| =networkdays( "03/01/2021", "03/01/2022", A1:A11) | 252 days, where cells A1 to A11 lists the 11 TTU HR holidays in that date range |



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# Math Functions

- Math Functions perform some calculation on your data.
- Examples
  - Math symbols ( + - \* / ^ )
  - Sum
  - Max / Min
  - Average
  - Count / CountIf



# Math Symbols ( + - \* / ^ )

- Performs the calculation following the Order of Operations
- Nice to put parenthesis around items to ensure items are calculated in order you expect.

| Example                                     | Output   |
|---|--|
| $= ( ( A2 * B2 ) + C2 - D2 ) / ( E2 ^ A2 )$ | Will perform the calculation as written.<br><br>If $A2 = 2$ , $B2 = 3$ , $C2 = 7$ , $D2 = 9$ , $E2 = 4$ , the calculation is:<br>$((2 * 3) + 7 - 9) / (4^2) = 4 / 16 = 0.25$ |



# Sum, Average, Max, Min

- Sum: total of all cells
- Average: average of all cells
- Max: greatest value of cells
- Min: smallest value of cells

Sample Data:

|   | A  |  |
|---|----|--|
| 1 | 6  |  |
| 2 | 7  |  |
| 3 | 8  |  |
| 4 | 9  |  |
| 5 | 10 |  |
| 6 |    |  |

| Example         | Output                          |
|-----------------|---------------------------------|
| =sum(A1:A5)     | Total value of the cells: 40    |
| =average(A1:A5) | Average value of the cells: 8   |
| =max(A1:A5)     | Greatest value of the cells: 10 |
| =min(A1:A5)     | Smallest value of the cells: 6  |



# Count / Countif

- The "Count" function counts all data points in a given range.
  - =count( [value1] , [value2] , [value3] ,....., [valueN] )
- The "Countif" function only counts data points in a given range that meet a specific criteria.
  - =countif( [range] , [criteria] )

| Example                    | Output   |
|----------------------------|--|
| =count( A1:A4 )            | Counts the values in cells A1, A2, A3, and A4.                       |
| =countif( A1:A4, ">50" )   | Counts the values in A1, A2, A3, and A4 if they are greater than 50. |
| =countif( A1:A4, "Pass" )  | Counts the values in A1, A2, A3, and A4 if their value is "Pass".    |
| =countif( A1:A4, "ENGL*" ) | Counts the values in A1, A2, A3, and A4 if they BEGIN with "ENGL".   |



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# Logical Functions

- Logical Functions mostly deal with seeing if a given statement is "True" or "False".
- These functions may do one thing if a statement is "True", and something else if it is "False".
- Examples:
  - If / Ifs
  - And / Or





# If / Ifs

- If a condition is true, return a given value
  - =if( [condition] , [value if true] , [value if false] )
  - =ifs( [condition] , [value if true] , [condition] , [value if true], ..... )

| Example  | Output   |
|--|--|
| =if( A2 > 70 , "Pass" , "Fail" )                     | Will return "Pass" if A2 is greater than 70, otherwise it will return "Fail".                            |
| =if( A2 >= 90 , "A" , if ( A2 >= 80, "B", "Fail" ) ) | Will return "A" if A2 is greater than 90, "B" if A2 is between 80 and 90, and "Fail" in all other cases. |
| =ifs(A2 >= 90, "A", A2 >= 80, "B", 1=1, "Fail")      | Will return "A" if A2 is greater than 90, "B" if A2 is between 80 and 90, and "Fail" in all other cases. |



# AND/OR

- AND reports "True" if all conditions are "True".
  - =and([condition1],[condition2],..., [conditionN])
- OR reports "True" if at least one condition is "True".
  - =or([condition1],[condition2],..., [conditionN])

| Example   | Output   |
|---|--|
| =and( A2 = "Eligible", B2 = "Confirmed" )   | Will return "True" if A2 is "Eligible" and B2 is "Confirmed", otherwise will return "False".                         |
| =or( A2 = "Medical Hardship", A2 = "Financial Hardship")                                | Will return "True" if A2 is either "Medical Hardship" or "Financial Hardship", otherwise will return "False".        |
| =if(or( A2 = "Medical Hardship", A2 = "Financial Hardship") , "Exempt" , "Not Exempt" ) | Will return "Exempt" if A2 is either "Medical Hardship" or "Financial Hardship", otherwise will return "Not Exempt". |



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# XLookup

- Helps you lookup the value in one table and find a corresponding value in another table.
  - =XLookup ( [value to lookup] , [column to look it up in] , [column to return if match found] , [value to return if no match found] )
- Example:
  - You have a data set with a course prefix (“ENGL”) in one column and want the full academic department name (“English”).
  - Somewhere else in your file, you have a table with course prefixes (“ENGL”) and their corresponding department names (“English”).
- Works best when your “lookup” table has only 1 row per identifier

| Example                                 | Output  |
|---|---|
| =XLookup( A2 , F:F , G:G , “Not Found”) | Search column F for the value in A2. If a value is found, report the value at the same row in column G. If no value is found, report “Not Found”. |



# XLookup or VLookup

- VLookup requires the value you are matching to be the first column of the “look up” table
- VLookup can only return one column, where XLookup can return many
- XLookup defaults to an exact match search
- XLookup has a built in “Not Found” parameter



Let's Try It!



# Resources

- Office Support - <https://support.microsoft.com/en-us/excel>
- Exceljet.net - <https://exceljet.net/>
- Favorite Search Engine (search for “XLookup Excel”)
- YouTube
- Stack Overflow (forum site with good tips)





Questions? Answers?  
Favorite Formulas to Share?

