Excel for Data Cleaning

What is a spreadsheet?
A tool for holding data in rows and columns.

Why use spreadsheets?
For disposable data-cleanup or visualization…

Reference: Naidoo, H (Hush Naidoo Jade Photography), October 2020, Unsplash License, https://unsplash.com/photos/SutAduhzdRQ

Agenda

FIELD MUSEUM

Examples of Spreadsheet Tools

Excel is Microsoft's standalone **spreadsheet** program. Available with the Office suite.

LibreOffice Calc is the "Document Foundation" free open-source spreadsheet program. Available here: www.LibreOffice.org

Google Sheets is part of the Google Apps Suite. If you have a Gmail and Google Drive, you have it.

What Can/Can’t Excel Do?

	Excel	LibreOffice Calc	Google Slides
Formulas	☑	☑	☑
Charts & Graphs	☑	☑	☑
Auto-formats fields	⚠		⚠
Allow creation of lookup lists	☑	☑	☑
Allow character sets besides Latin1 (e.g., UTF-8)	Limited	☑	☑
Track changes after closing	Limited	Limited	☑
Maintain integrity between rows and columns	Limited	Limited	Limited
Enforce referential integrity between different sheets	Limited	Limited	Limited

Spreadsheet Don’ts

What should you **AVOID** doing in a spreadsheet?

- Mixing multiple datasets in a single spreadsheet
- Using multiple tabs in a workbook
- Not filling in zeros
- Using problematic null values (e.g., -999, +/-, Null, NA)

- Using visual formatting [color-highlights, fonts, borders] to convey information
- Using visual formatting to make the data sheet look pretty

- Placing comments or units in cells
- Entering more than one piece of information in a cell
- Using problematic field names

- Using special characters in data (e.g., line breaks, em-dashes, quotation marks)
- Inclusion of metadata in data table

P.S. DO NOT MERGE CELLS. *DO NOT*. BAD. SHAME.

github.com/datacarpentry/spreadsheet-ecology-lesson/blob/gh-pages/_episodes/02-common-mistakes.md

Tables vs. Spreadsheets

Tables:

- = **records & attributes**
  - = actual structure
  - = *safer data*…

Spreadsheets:

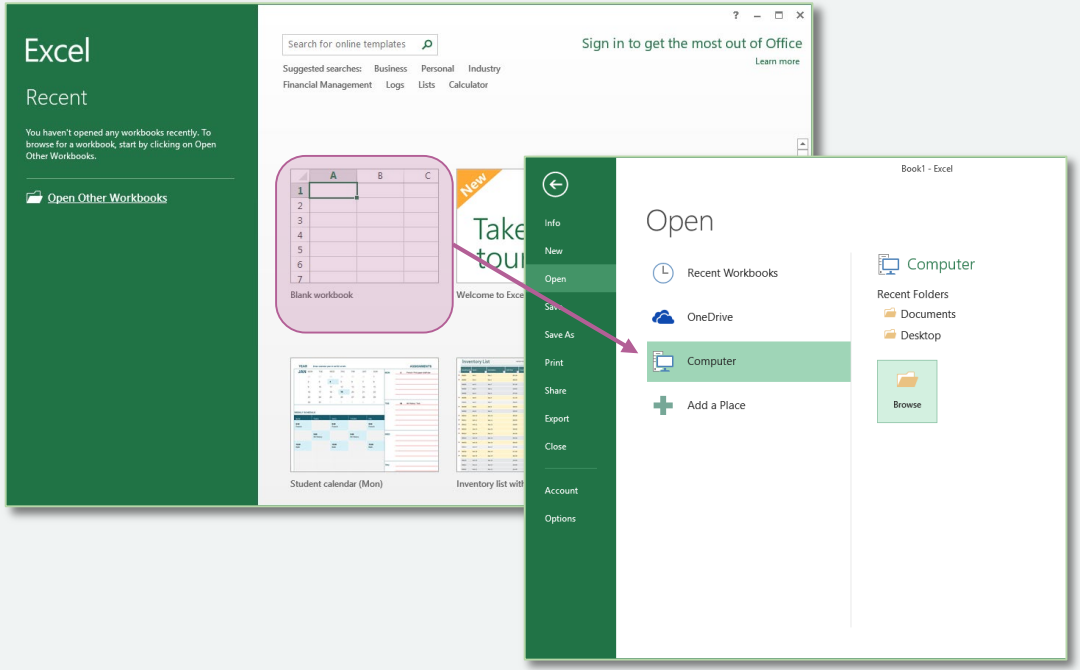
- = **rows & columns**
  - = illusion of structure
  - = *accident-prone data*…

- 1 Excel file can hold multiple spreadsheets = more *illusion...*

Getting Data into Excel

[the not-safe way]

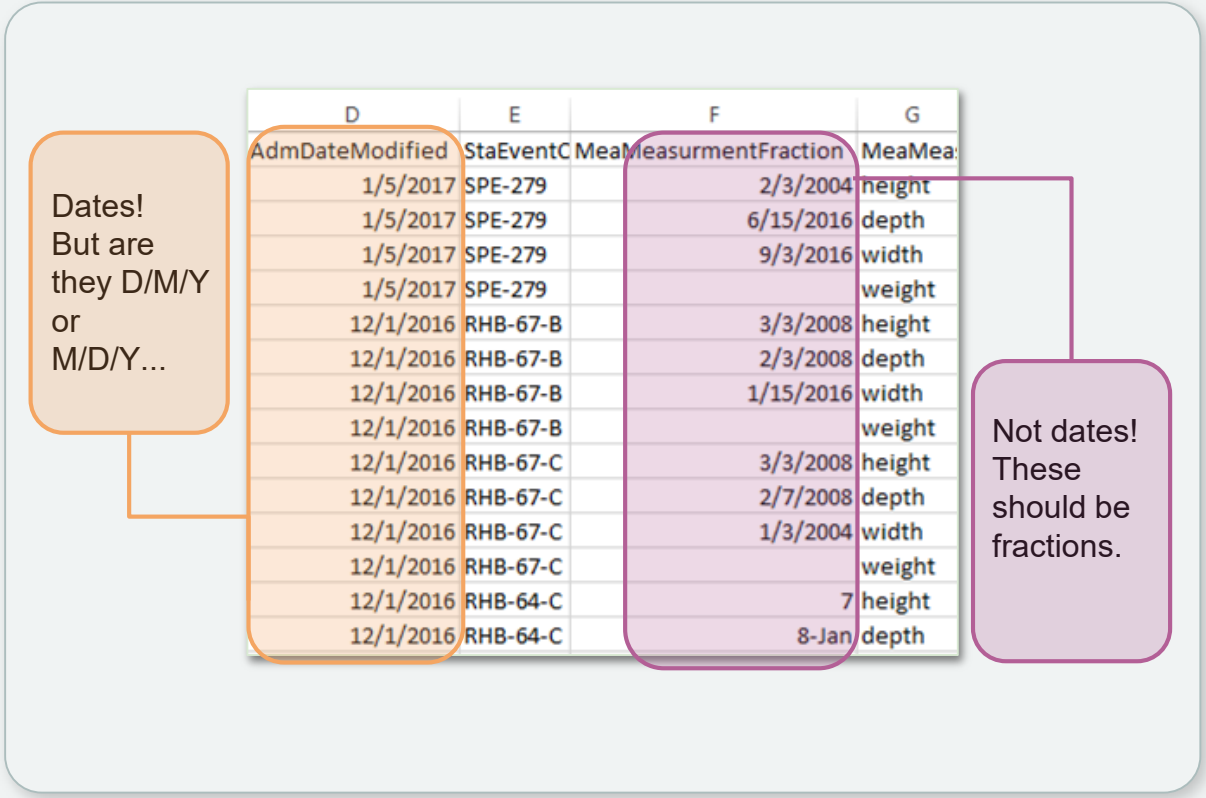
- File → Open…



Getting Data into Excel

[the not-safe way]

- File → Open…
- can **subtly mangle** CSV data.



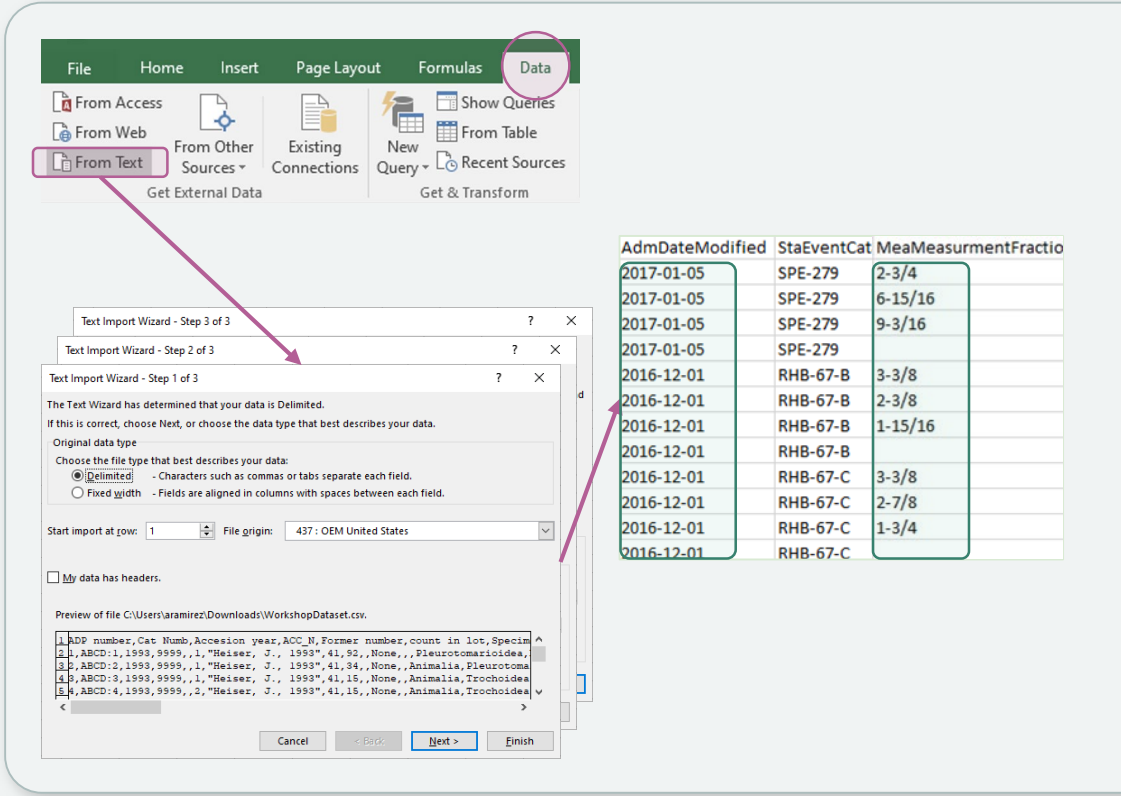
D	E	F	G
AdmDateModified	StaEventC	MeaMeasurmentFraction	MeaMea
1/5/2017	SPE-279	2/3/2004	height
1/5/2017	SPE-279	6/15/2016	depth
1/5/2017	SPE-279	9/3/2016	width
1/5/2017	SPE-279		weight
12/1/2016	RHB-67-B	3/3/2008	height
12/1/2016	RHB-67-B	2/3/2008	depth
12/1/2016	RHB-67-B	1/15/2016	width
12/1/2016	RHB-67-B		weight
12/1/2016	RHB-67-C	3/3/2008	height
12/1/2016	RHB-67-C	2/7/2008	depth
12/1/2016	RHB-67-C	1/3/2004	width
12/1/2016	RHB-67-C		weight
12/1/2016	RHB-64-C	7	height
12/1/2016	RHB-64-C	8-Jan	depth

Getting Data into Excel

The Safer Way

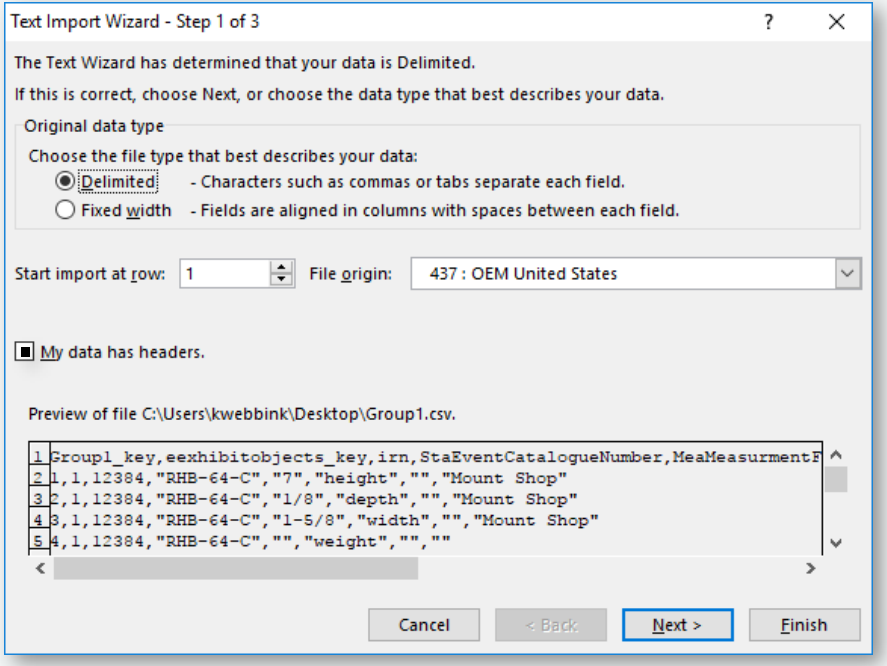
Import it as External Data…

1. Click the From Text option in the Get External Data group of the Data tab.
2. Follow three steps in the Text Import Wizard
3. The data should now display properly.



Text Import Wizard

Step 1 of 3



- Original data type:
  - "Delimited" for CSV files
  - Check "My data has headers"
- Check the preview:
  - …Does data look mangled? (e.g.: ◊, □, ?,)
  - …If so, check the File origin and try "65001 Unicode (UTF-8)" [requires Excel 2007 or later]
  - Double-check the Preview...

Getting Data into Excel

The safer way – but beware

Data files (CSV, XLS, TXT, etc.) are encoded in a specific character-set.

- Most commonly they are either **Latin-1** or **UTF-8.**
- **Pre-2007 versions of Excel only read/write Latin-1**.

Text Import Wizard

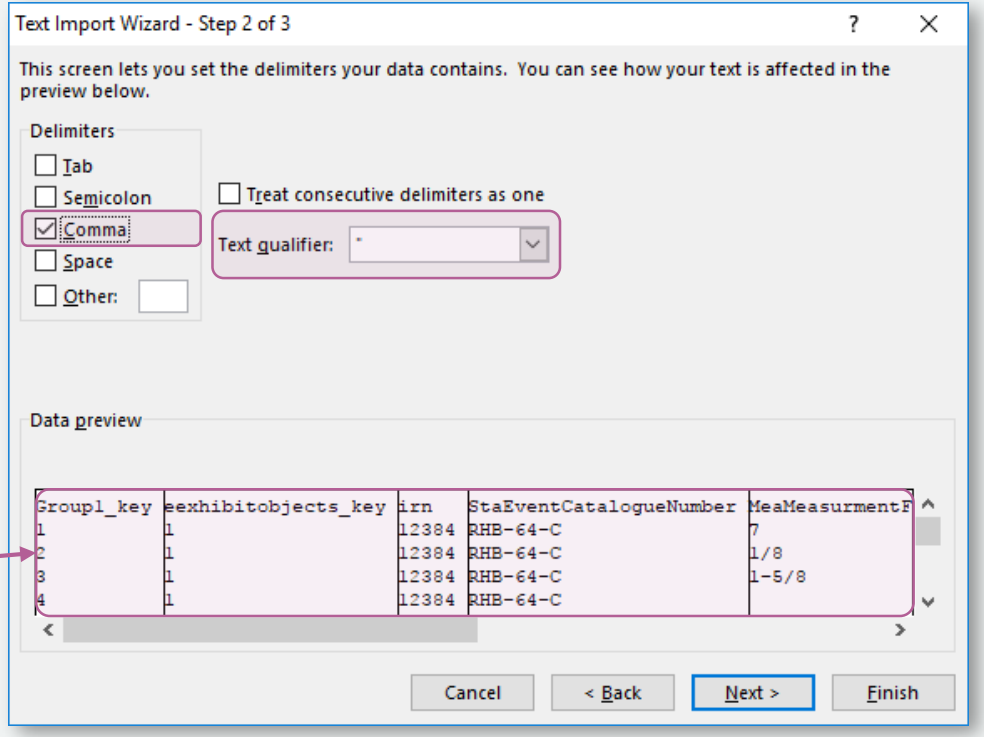
Step 2 of 3

1. Select Comma from the Delimiters options for CSV files
2. Select " from the Text qualifier options

Again, check the Data preview:

- Does data look mangled (columns run together)?
- If so, try different delimiters.

Double-check the Data preview.



Text Import Wizard

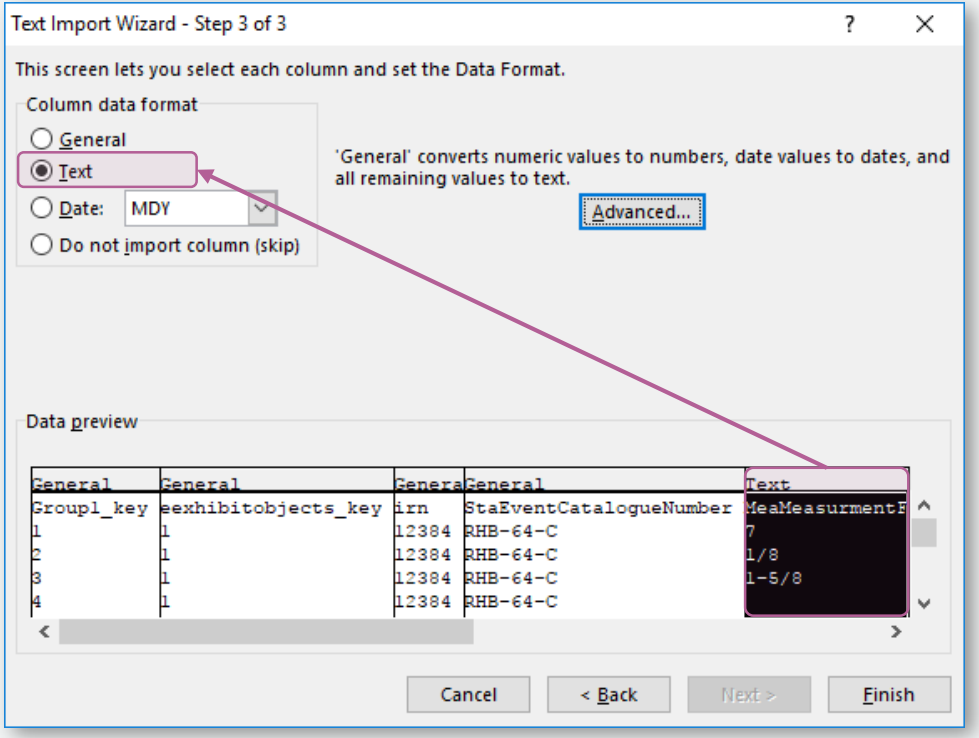
Step 3 of 3

1. Make sure to check each column's data-type (Column data format).

2. If a column appears to be specially-formatted numeric data (dates, fractions, etc.):

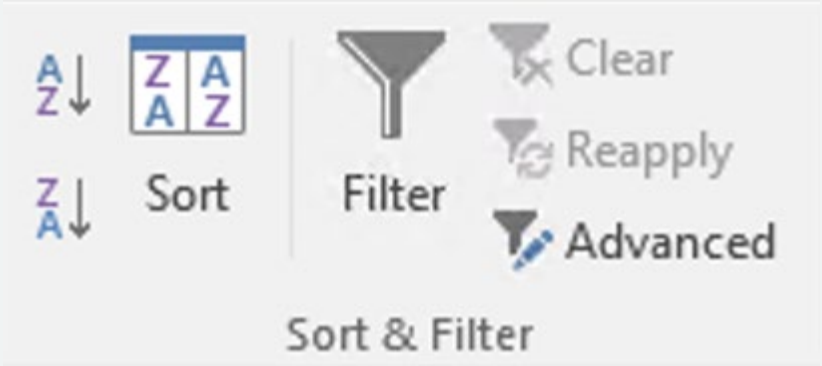
   a. Click on the column in the Data preview to select it

   b. Change its data format to Text.



Summarizing Data in Excel

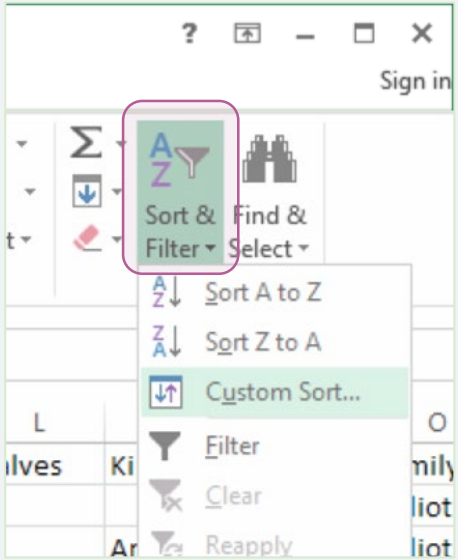
Sorting and Filtering



Summarizing Data in Excel

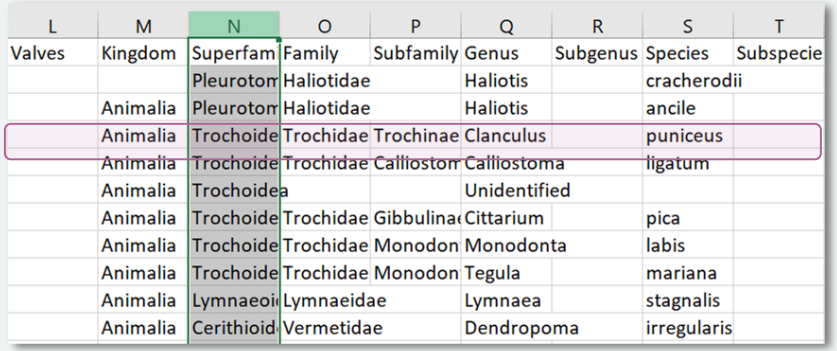
Sorting

- Beware of grabbing only part of your dataset
- Beware of one-way trips…to bad places…



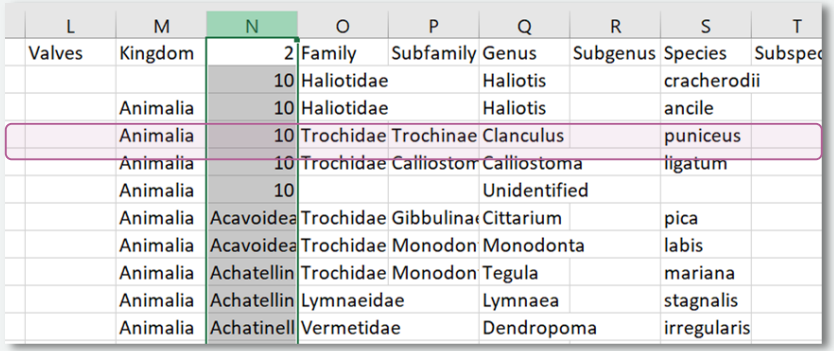
Sorting Errors

Before Sort:



L	M	N	O	P	Q	R	S	T
Valves	Kingdom	Superfam	Family	Subfamily	Genus	Subgenus	Species	Subspecie
		Pleurotom	Haliotidae		Haliotis		cracherodii	
	Animalia	Pleurotom	Haliotidae		Haliotis		ancile	
	Animalia	Trochoide	Trochidae	Trochinae	Clanculus		puniceus	
	Animalia	Trochoide	Trochidae	Calliostom	Calliostoma		ligatum	
	Animalia	Trochoidea			Unidentified			
	Animalia	Trochoide	Trochidae	Gibbulina	Cittarium		pica	
	Animalia	Trochoide	Trochidae	Monodon	Monodonta		labis	
	Animalia	Trochoide	Trochidae	Monodon	Tegula		mariana	
	Animalia	Lymnaeoi	Lymnaeidae		Lymnaea		stagnalis	
	Animalia	Cerithioid	Vermetidae		Dendropoma		irregularis	

After Sort:

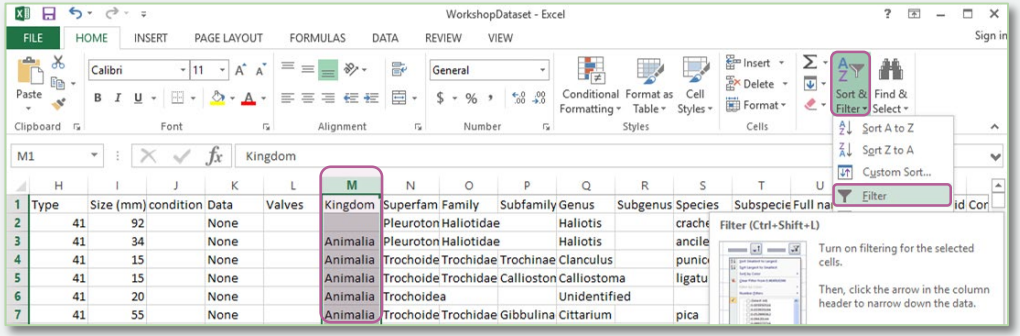


L	M	N	O	P	Q	R	S	T
Valves	Kingdom	2	Family	Subfamily	Genus	Subgenus	Species	Subspec
		10	Haliotidae		Haliotis		cracherodii	
	Animalia	10	Haliotidae		Haliotis		ancile	
	Animalia	10	Trochidae	Trochinae	Clanculus		puniceus	
	Animalia	10	Trochidae	Calliostom	Calliostoma		ligatum	
	Animalia	10			Unidentified			
	Animalia	Acavoidea	Trochidae	Gibbulina	Cittarium		pica	
	Animalia	Acavoidea	Trochidae	Monodon	Monodonta		labis	
	Animalia	Achatellin	Trochidae	Monodon	Tegula		mariana	
	Animalia	Achatellin	Lymnaeidae		Lymnaea		stagnalis	
	Animalia	Achatinell	Vermetidae		Dendropoma		irregularis	

If you sort without expanding the selection, only the highlighted column will reorder, leading to mismatched data that is no longer connected to its record.

Summarizing Data in Excel

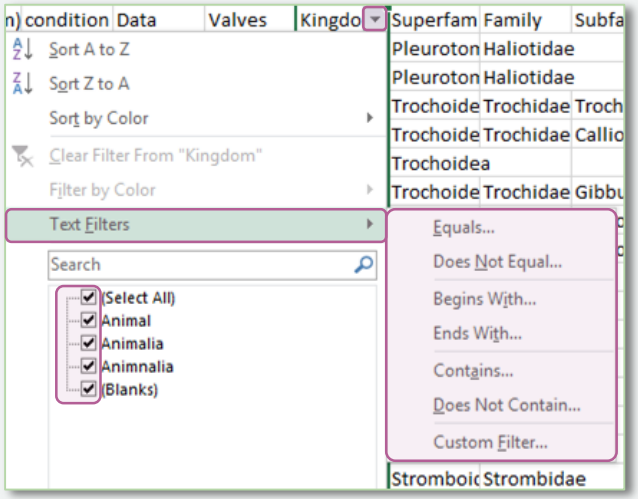
Filtering



- Select the desired column by clicking on its header, e.g., `M`.
- Click the **Sort & Filter** button in the **Home** or **Data** tab and select **Filter** from the dropdown menu.

Summarizing Data in Excel

Filtering



- Click the dropdown button and use the checkboxes to select and exclude values.
- Hover over the **Text Filters** to change the text filter condition from the default Equals….

Manipulating/Mangling Data in Excel

Functions

Build your own:

- concatenate
- vlookup

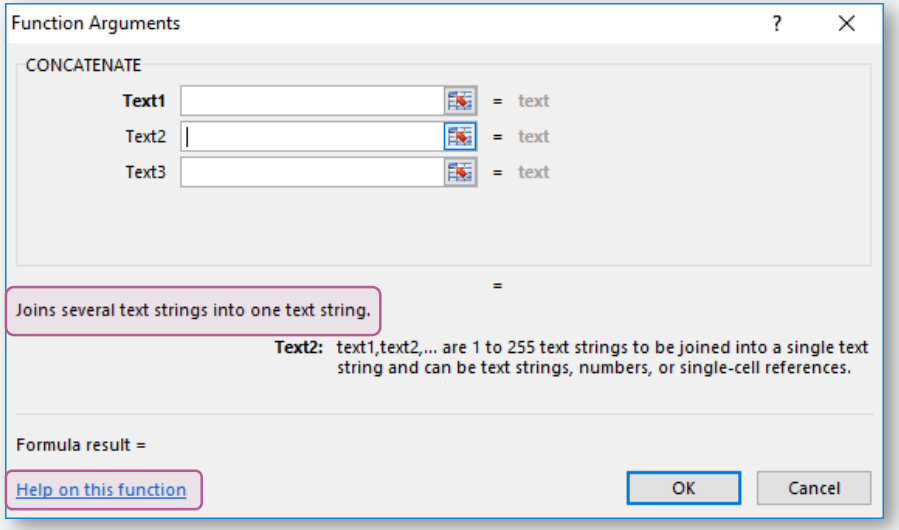
Built-in:

- Split Text-to-Columns
- Deduplication

Functions

Build your own:
CONCATENATE

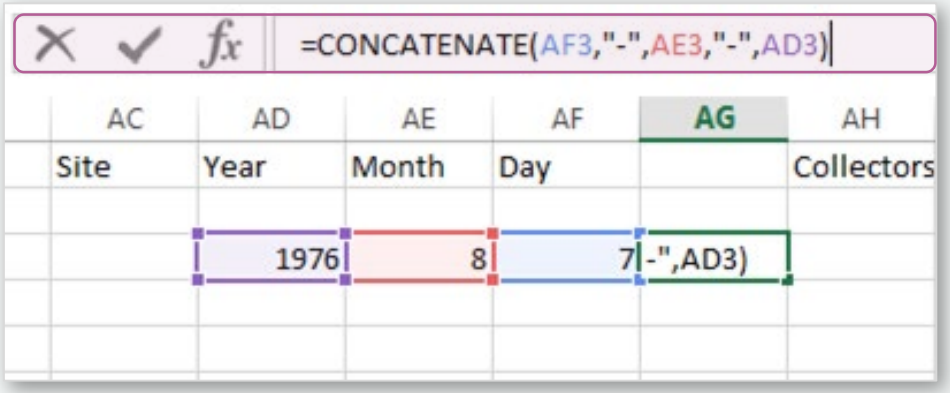
- The general syntax for function is:
  `=FUNCTIONNAME(argument1, …)`
  - The Function wizard takes care of the syntax, with users needing only to input the arguments.
  - The wizard offers built-in help and a a link to a help page.



Functions

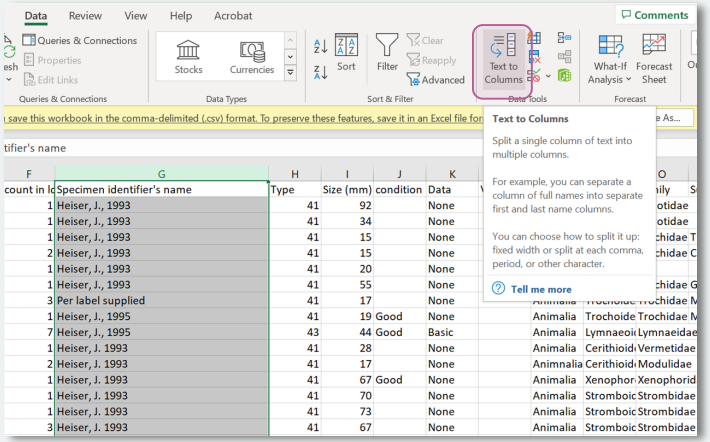
Build your own:
CONCATENATE

```
=CONCATENATE(arguments)
```

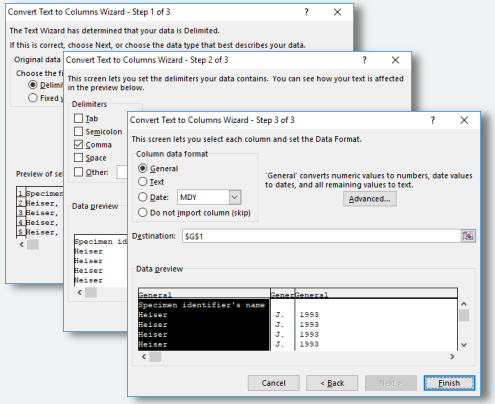


Functions

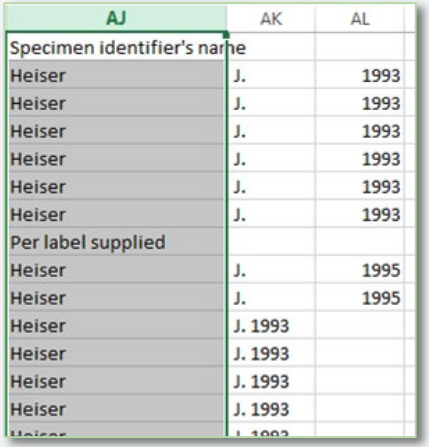
Built-in: Split Text → Columns



Select Text to Column from the Data menu.



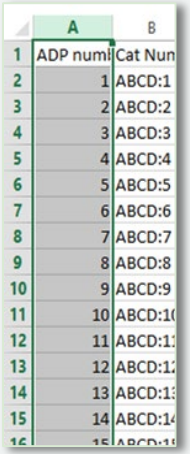
Follow the steps in the Text to Column Wizard. Make sure the right delimiter is selected (typically a , . “ ” or ;) by previewing the data in the bottom window.

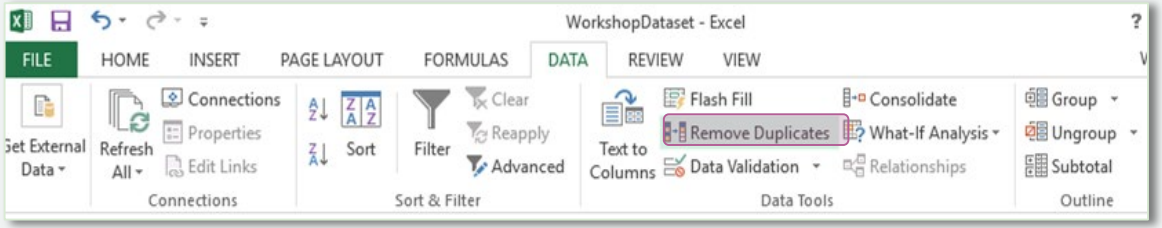


AJ	AK	AL
Specimen identifier's name		
Heiser	J.	1993
Heiser	J.	1993
Heiser	J.	1993
Heiser	J.	1993
Heiser	J.	1993
Heiser	J.	1993
Per label supplied		
Heiser	J.	1995
Heiser	J.	1995
Heiser	J. 1993	
Heiser	J. 1993	
Heiser	J. 1993	
Heiser	J. 1993	
Heiser		

Functions

Built-in: Deduplicating Rows



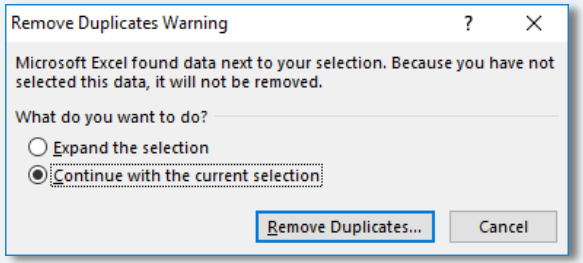


To deduplicate rows, first highlight the column you wish to remove duplicates from. Under the Data heading, click Remove Duplicates.

Functions

Built-in: Deduplicating Rows

the scary way:



Excel will ask if you want to expand the selection. If you say no, only the duplicates from one column will be cleaned. The rest of the data will remained unchanged, and the cleaned column will no longer line up with the same entries.

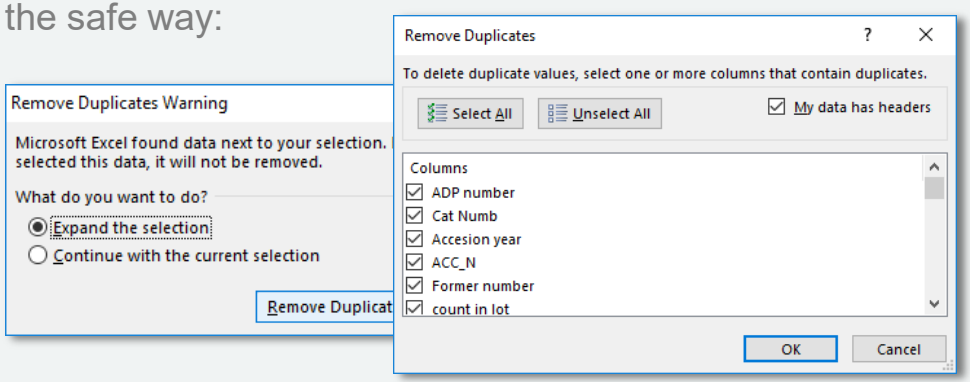
	ADP numb	Cat Nur	Accesion y	ACC_N
2	1	ABCD:1	1993	9999
3	2	ABCD:2	1993	9999
4	3	ABCD:3	1993	9999
5	4	ABCD:4	1993	9999
6	5	ABCD:5	1993	9999
7	6	ABCD:6	1993	9999
8	7	ABCD:7	1993	9999
9	8	ABCD:8	1993	9999
10	9	ABCD:9	1993	9999
11	10	ABCD:10	1993	9999
12	11	ABCD:11	1993	9999
13	12	ABCD:12	1993	9999
14	13	ABCD:13	1993	9999
15	14	ABCD:14	1993	9999
16	15	ABCD:15	1993	9999
17	16	ABCD:16	1993	9999
18	17	ABCD:17	1993	9999
19	18	ABCD:18	1993	9999
20	19	ABCD:19	1993	9999

	ADP numb	Cat Nur	Accesion y	ACC_N	F
2	1	ABCD:1	1993	9999	
3	2	ABCD:2	1922	9999	
4	3	ABCD:3	1984	9999	
5	4	ABCD:4	1981	9999	
6	5	ABCD:5	1942	9999	
7	6	ABCD:6	1982	9999	
8	7	ABCD:7	1979	9999	
9	8	ABCD:8	1975	9999	
10	9	ABCD:9	1753	9999	
11	10	ABCD:10	1995	9999	
12	11	ABCD:11	1978	9999	
13	12	ABCD:12	1921	9999	
14	13	ABCD:13	1941	9999	
15	14	ABCD:14	1985	9999	
16	15	ABCD:15	9999	9999	
17	16	ABCD:16	1944	9999	
18	17	ABCD:17	1943	9999	
19	18	ABCD:18	1956	9999	
20	19	ABCD:19	1983	9999	

Functions

Built-in: Deduplicating Rows

the safe way:

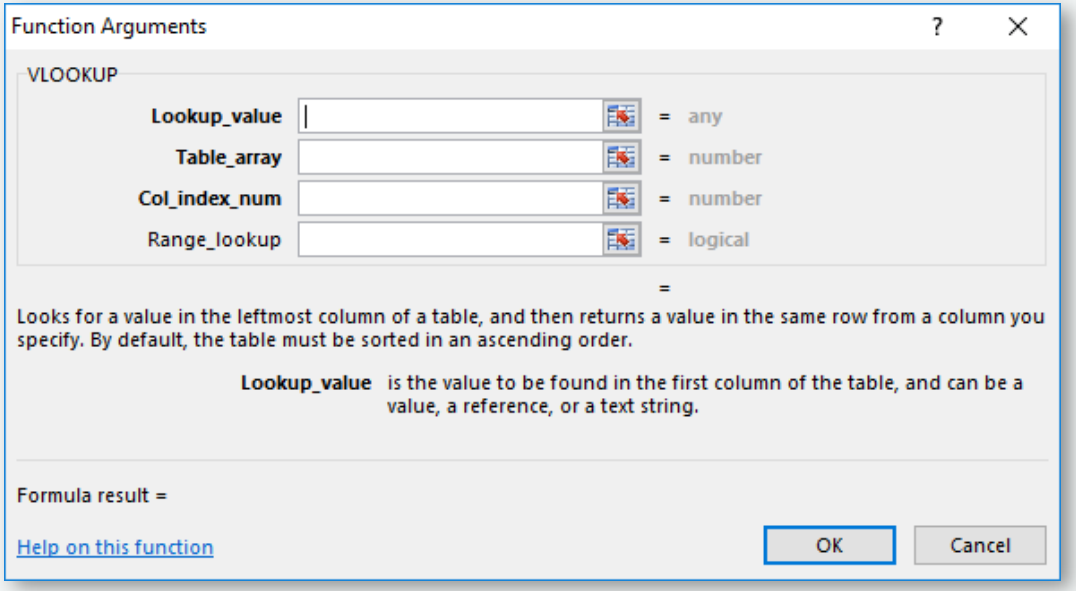


If you expand the selection, all the data will be cleaned at once. The rows will remain intact.

Functions

Build your own: Lookup Lists with VLOOKUP

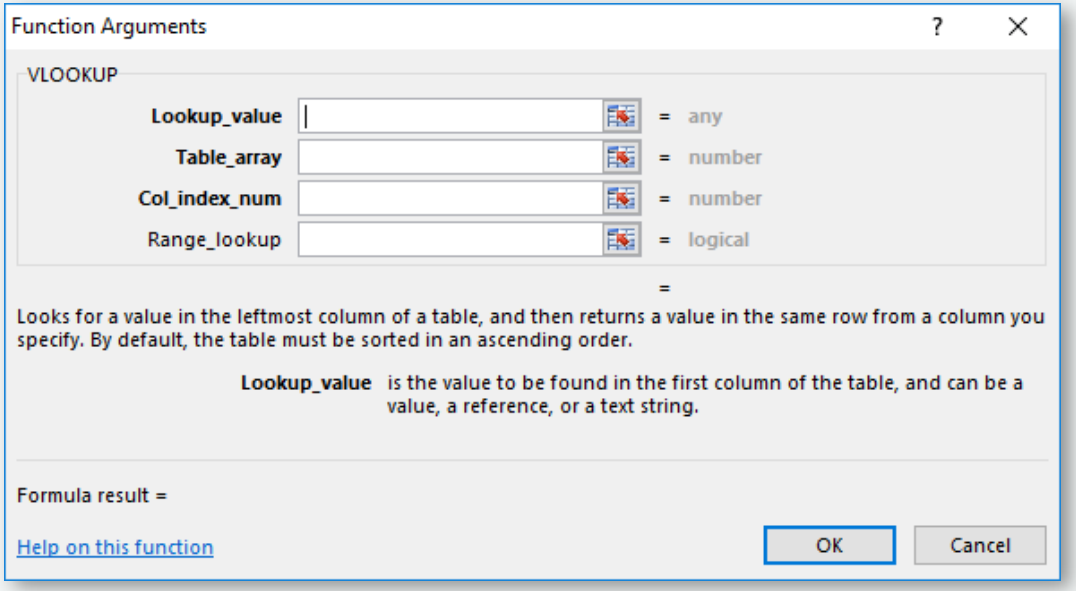
- The `VLOOKUP` function can be used to find a value in a range or table by row.
  - For example, look up scientific name by IRN.



Functions

Build your own: Lookup Lists with VLOOKUP

- The VLOOKUP function requires four arguments:
  - The `Lookup_value` argument is used to define the value you want to look up. It can be a value, reference or text string.
  - The `Table_array` argument is used to define the table or range (via reference or table name) where you want to look for the lookup value.

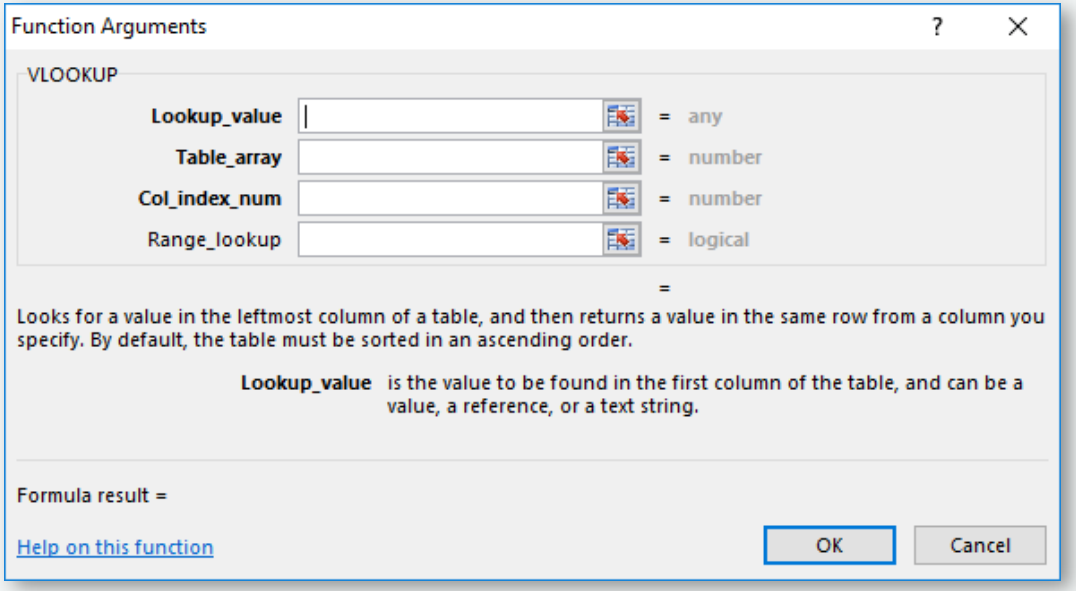


NOTE: If the `Lookup_value` is a value or text string, it must be located in the leftmost column of the table or range.

Functions

Build your own: Lookup Lists with VLOOKUP

- The VLOOKUP function requires four arguments:
  - The `Col_index_num` argument is used to define the column number of the column that contains the value to be returned.
  - The `Range_lookup` argument is used to return an approximate or exact match. Use `0/FALSE` to prevent approximate matches.

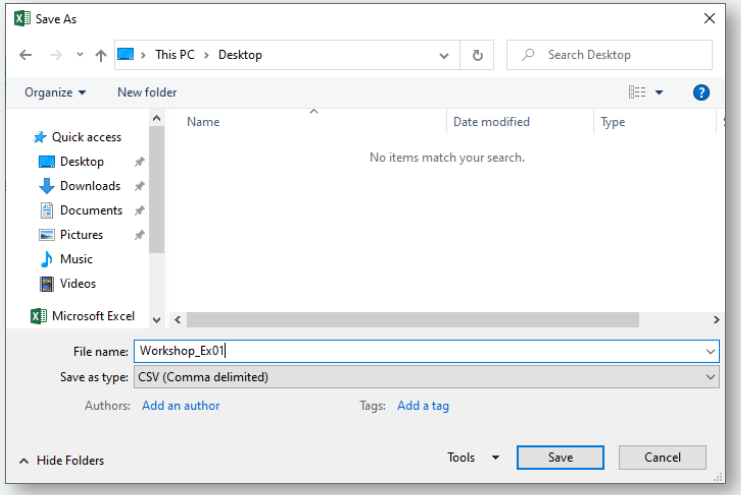


NOTE: The column number for `Col_index_num` is specific to the selected table or range. Remember Excel uses one-based indexing.

Getting Data Out of Excel

The Safe Way

…without mangling date-type data.



Differences between:

- A true CSV
  - where text-delimiter is specified and applied to all fields
- An Excel CSV
  - where text-delimiter is specified but only applied to text fields

Recap

- Data in spreadsheets:
  - Good for one-time-use
  - Not good for maintaining
  - …Is it structured? No.

- Alternatives to Excel:
  - Google Sheets
  - LibreOffice
  - Not using spreadsheets…?

Thank you!

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