

# Intro to Excel

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# We will learn:



Implement formulas



Implementing Uncertainty Propagation



Plotting data

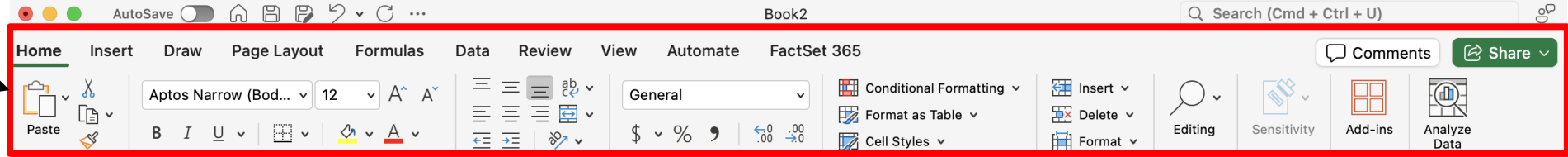


Exporting

Now...FOLLOW ALONG!

# Basics

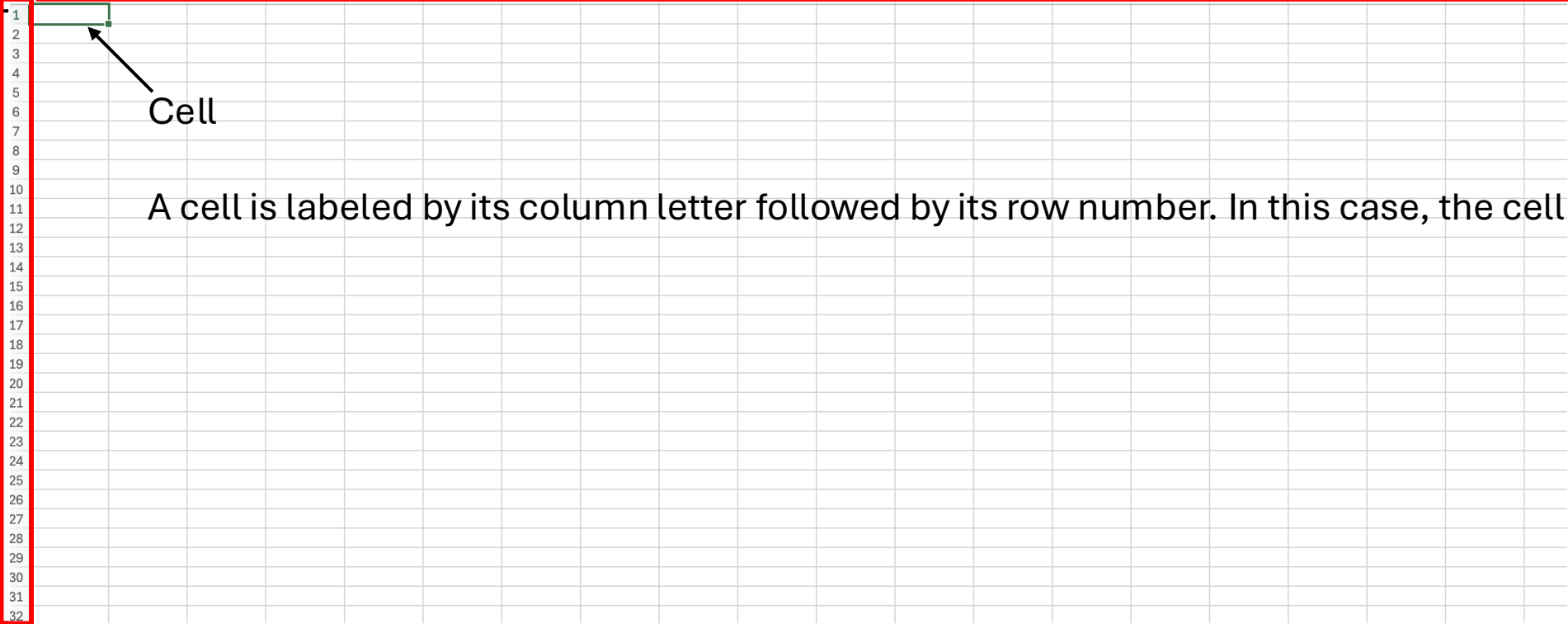
Toolbar



Column labels



Cell



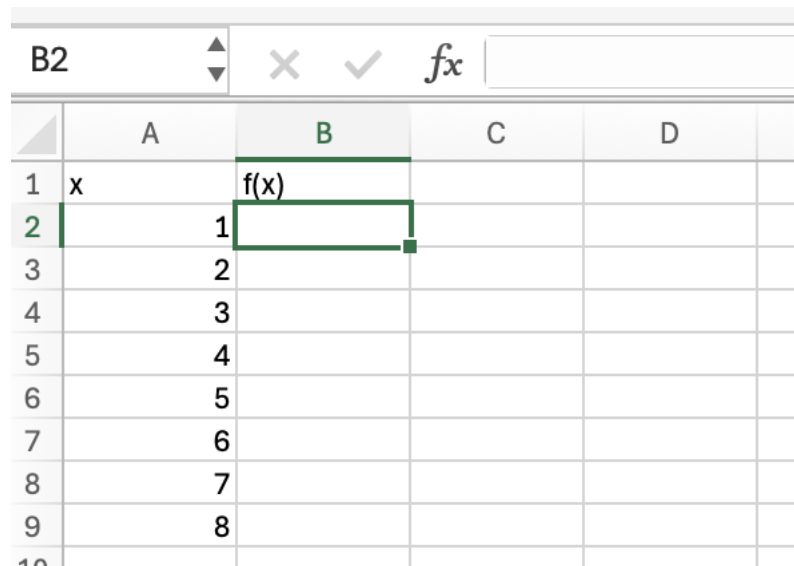
A cell is labeled by its column letter followed by its row number. In this case, the cell selected is A1.

Row Numbers

# Implementing Formulas: Example 1

Let's try an easy example. I have the set of data below and I want to square each of the values. Instead of taking the time and doing that to each value, let's implement a formula.

- Start by clicking on the first cell where you would like your result to be. In this case, cell B2.



	A	B	C	D
1	x	f(x)		
2	1			
3	2			
4	3			
5	4			
6	5			
7	6			
8	7			
9	8			

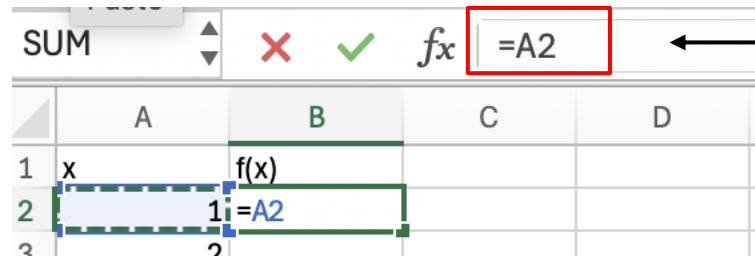
# Implementing Formulas: Example 1

- Anytime you want to implement a formula, you must begin by typing an equal sign, '=', in the cell.

SUM <span>▲▼</span> <span>✖</span> <span>✓</span> <i>fx</i> =				
	A	B	C	D
1	x	f(x)		
2		1 =		
3		2		
4		3		
5		4		
6		5		
7		6		
8		7		
9		8		

# Implementing Formulas: Example 1

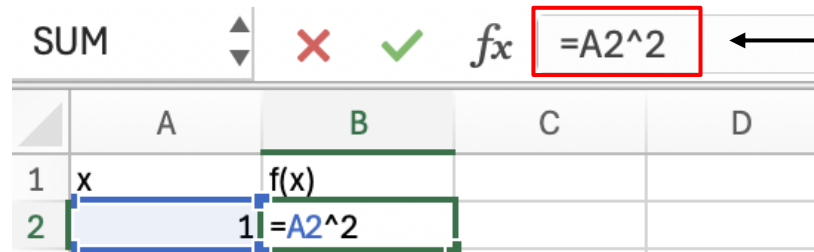
- Now click on the cell you want to square; in this case it will be A2.



The image shows an Excel interface. The formula bar at the top displays '=A2' in a red box, with a red 'X' and a green checkmark icon to its left. Below the formula bar is a spreadsheet grid with columns A, B, C, and D, and rows 1 and 2. Cell A2 is selected, and its content '=A2' is visible in the formula bar.

	A	B	C	D
1	x	f(x)		
2	=A2			

- Now use the carrot symbol, '^', which is used to raise any number to an exponent.



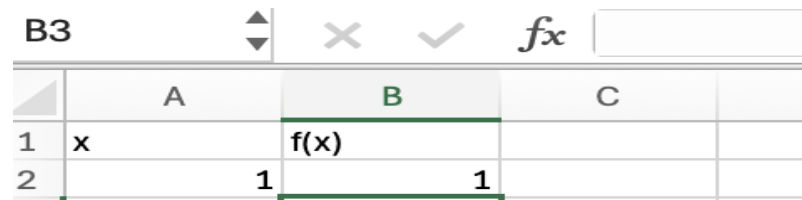
The image shows an Excel interface. The formula bar at the top displays '=A2^2' in a red box, with a red 'X' and a green checkmark icon to its left. Below the formula bar is a spreadsheet grid with columns A, B, C, and D, and rows 1 and 2. Cell A2 is selected, and its content '=A2^2' is visible in the formula bar.

	A	B	C	D
1	x	f(x)		
2	=A2^2			

Notice that what you are typing in the cell also appears here. You can edit any formula you implement here.

# Implementing Formulas: Example 1

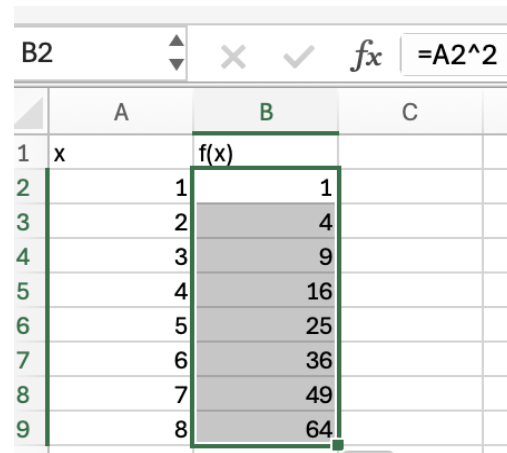
- Press 'Enter' and the result should now appear in the cell



The screenshot shows an Excel spreadsheet with columns A, B, and C. Row 1 has headers 'x' in A1 and 'f(x)' in B1. Row 2 has the value '1' in A2 and B2. The formula bar at the top shows 'B3' and the formula 'f(x)' is being entered into cell B3. The spreadsheet is currently showing the state before the formula is confirmed.

	A	B	C
1	x	f(x)	
2	1	1	

- To implement this formula to the other cells, click on the lower right corner of the cell you originally typed the formula in (in this case B2), and drag it down to all the cells you want the formula implemented in.

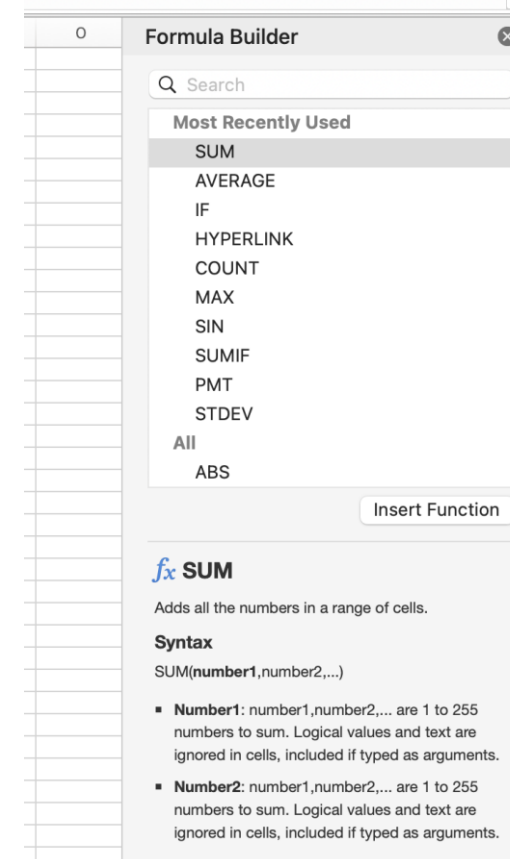
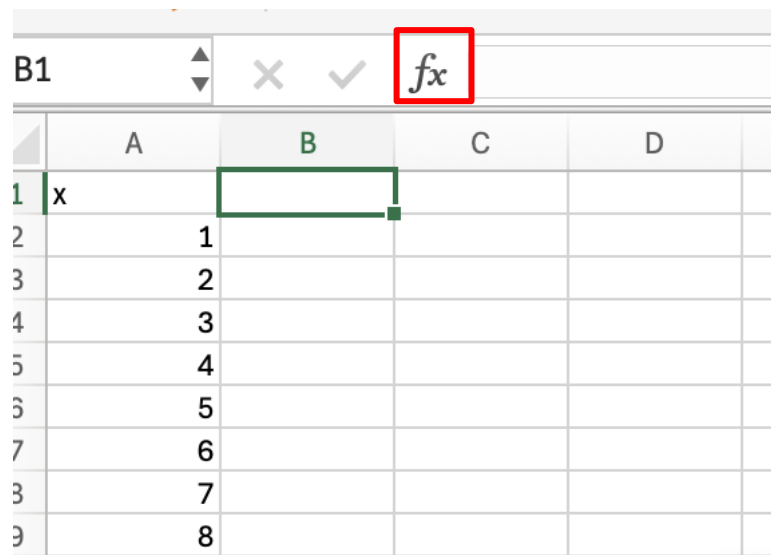


The screenshot shows the same Excel spreadsheet as before, but now the formula from cell B2 is being dragged down to cells B3 through B9. The formula bar at the top shows '=A2^2'. The cells B3 through B9 are highlighted, indicating they are being filled with the formula. The spreadsheet now shows the results of the formula being applied to the range B3:B9.

	A	B	C
1	x	f(x)	
2	1	1	
3	2	4	
4	3	9	
5	4	16	
6	5	25	
7	6	36	
8	7	49	
9	8	64	

# Implementing Formulas: Example 2

- Excel has a variety of pre-set formulas. These can be accessed by clicking on the 'fx' button shown below. Clicking this opens the following menu.








# Implementing Formulas: Example 2

Let's sum a set of numbers.

- Once again click on the cell you want the result to be in and type '=' in the cell.
- Now click on (in the menu shown previously) or type 'SUM' in the cell. The following will appear in the cell.

SUM    =SUM()				
	A	B	C	
1	x			
2	1			
3	2			
4	3			
5	4			
6	5			
7	6			
8	7			
9	8			
10				
11	Sum	=SUM()		

# Implementing Formulas: Example 2

- Now highlight all the values you want to sum up and click 'Enter'.

SUM				
✖ ✔ <i>fx</i> =SUM(A2:A9)				
	A	B	C	D
1	x			
2	1			
3	2			
4	3			
5	4			
6	5			
7	6			
8	7			
9	8			
10				
11	Sum	=SUM(A2:A9)		



B12			
✖ ✔ <i>fx</i>			
	A	B	C
1	x		
2	1		
3	2		
4	3		
5	4		
6	5		
7	6		
8	7		
9	8		
10			
11	Sum	36	
12			

# Implementing Formulas: Key Points

- To begin implementing a formula, always begin by typing the equal sign, '=', in the cell you want the result to appear.
- Excel has pre-set functions for basic computations such as summing, calculating the average, calculating the standard deviation, etc.
- Do not forget the order of operations when implementing a formula

Now you try...

- Find the sum, average, and implement the formula  $f(x) = 2x + 5$  to the following set of data

	A	
1	x	
2		2
3		5
4		7
5		12
6		8
7		36
8		57
9		3
10		1
11		9
12		10

# Implementing Uncertainty Propagation

Recall the formulas we will be using for uncertainty propagation...

- 1 variable,  $f(x)$

$$\Delta f = |f(x) - f(x + \Delta x)|$$

- 2 variables,  $f(x,y)$

$$\Delta f = \sqrt{|f(x, y) - f(x + \Delta x, y)|^2 + |f(x, y) - f(x, y + \Delta y)|^2}$$

# Implementing Uncertainty Propagation: Example

Let's say we have the following set of data,  $x$ , with an uncertainty  $\Delta x$ . The function  $f(x) = x * 3$ . We want to find the uncertainty in  $f(x)$ .

D13				
	A	B	C	D
1	x	$\Delta x$	$f(x)$	$\Delta f$
2	2.3	0.1	6.9	
3	2.1	0.1	6.3	
4	2.2	0.1	6.6	
5	2.2	0.1	6.6	
6	2.3	0.1	6.9	
7	2.1	0.1	6.3	
8	2	0.1	6	

# Implementing Uncertainty Propagation: Example

Let's implement the formula to calculate the uncertainty for a function dependent on 1 variable.

- Use pre-set function ABS for the absolute value.

D2				fx		=ABS(C2-((A2+B2)*3))	
	A	B	C	D	E	F	
1	x	$\Delta x$	$f(x)$	$\Delta f$			
2	2.3	0.1	6.9	0.3			
3	2.1	0.1	6.3	0.3			
4	2.2	0.1	6.6	0.3			
5	2.2	0.1	6.6	0.3			
6	2.3	0.1	6.9	0.3			
7	2.1	0.1	6.3	0.3			
8	2	0.1	6	0.3			

← Note how the formula was typed in.

# Plotting Data

A good, basic plot:

- Has **independent** variable on the **horizontal** axis and the **dependent** variable on the **vertical** axis
- Has labeled axes (with units next to the labels if applicable)
- Has a title (should tell us what the graph shows)
- Has a legend if there is more than one set of data on the plot
- Is large enough to read all the plot's components

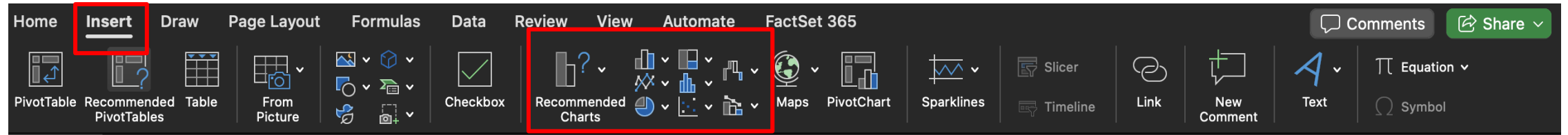
Extras that may be necessary:

- Data points
- Error bars
- Trend line



# Plotting Data


- In the toolbar, clicking on the 'Insert' tab takes use to the menu that has all the plotting tools



Plotting tools


# Plotting Data: Example

- Let's say we want to plot the following data in a scatter plot.



	A	B
1	x	f(x)
2	2	9
3	5	15
4	7	19
5	12	29
6	8	21
7	36	77
8	57	119
9	3	11
10	1	7
11	9	23
12	10	25

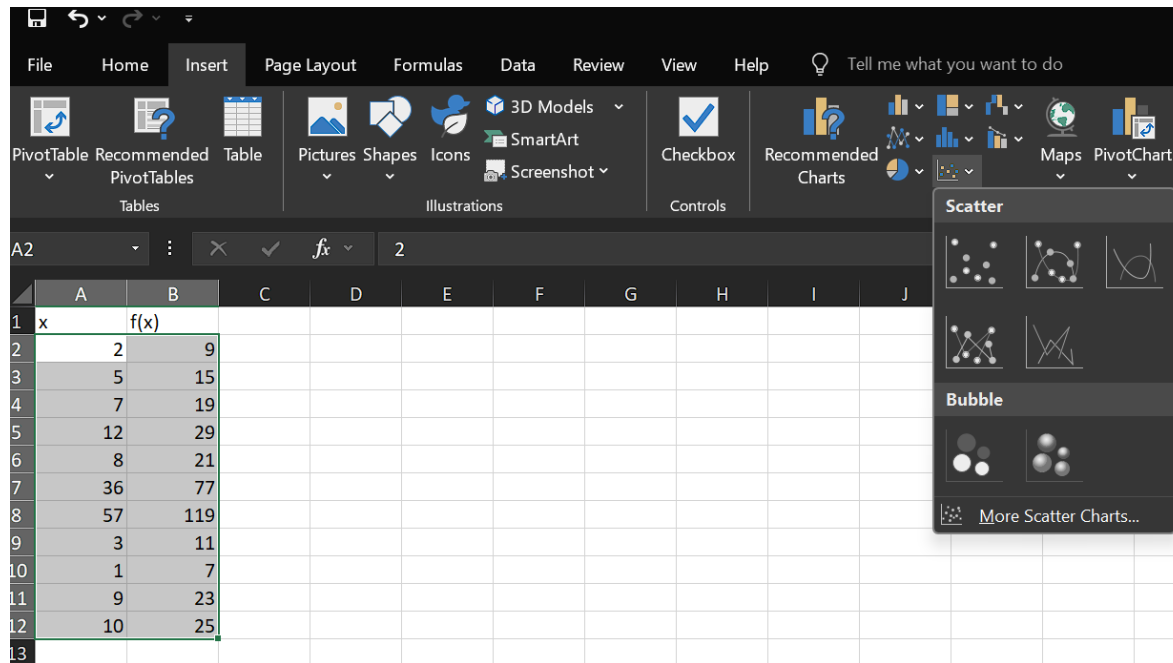
- First, highlight both columns.
  - It's important to note that the column on the left (the one I have labeled, 'x') will automatically be taken as your independent variable in the plot.



	A	B
1	x	f(x)
2	2	9
3	5	15
4	7	19
5	12	29
6	8	21
7	36	77
8	57	119
9	3	11
10	1	7
11	9	23
12	10	25

# Plotting Data: Example

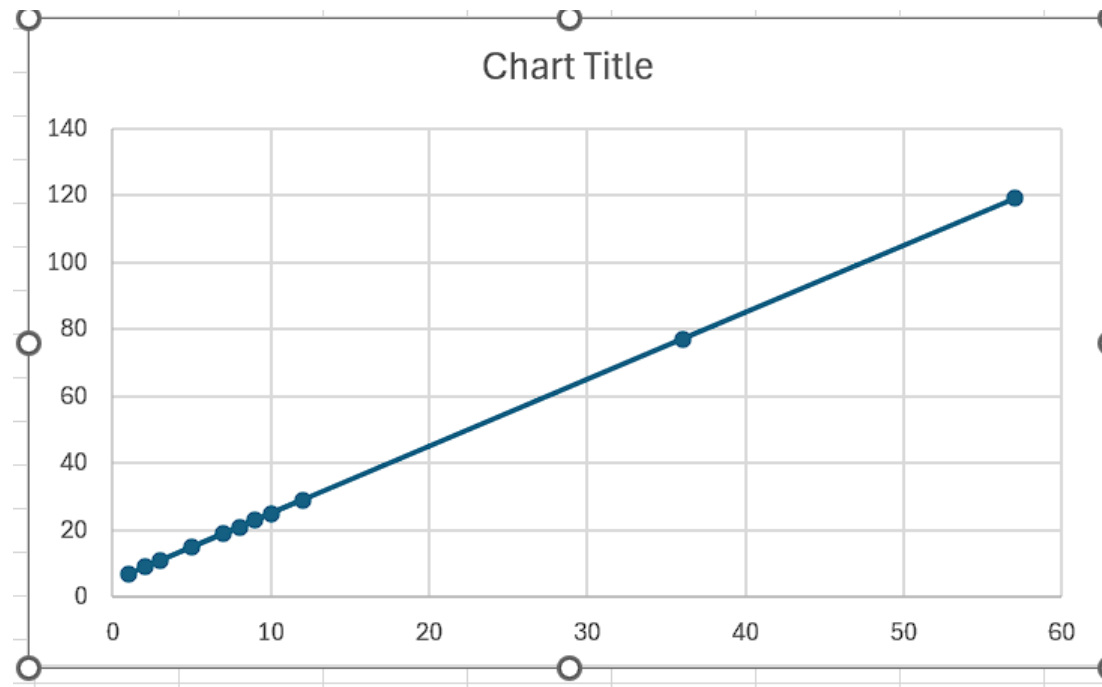
Now we go to the plotting tools and select the scatter plot icon.



We can now select the type of scatter plot we want from the options.

# Plotting Data: Example

After selecting the scatter plot of our choice. The following graph will be generated.

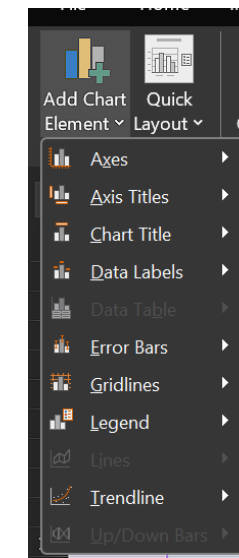
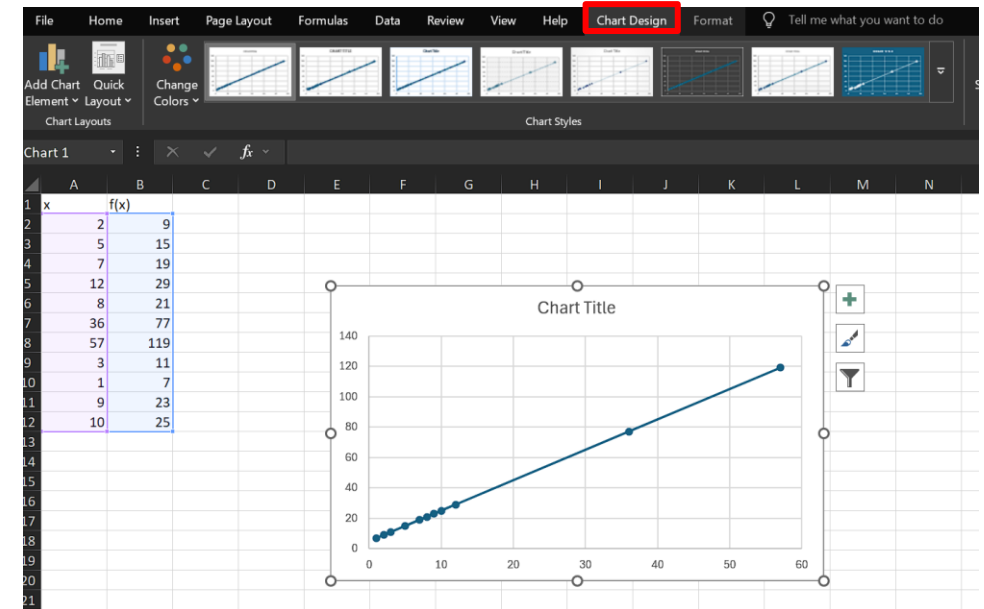


**Notice the lack of  
title and axes  
labels!**

We must add  
them.

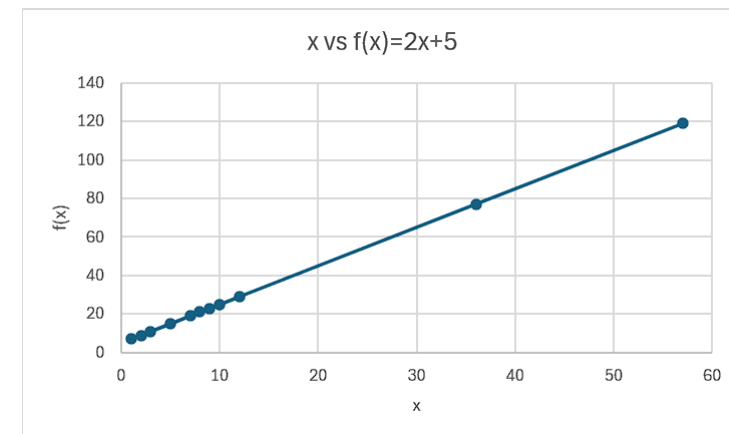
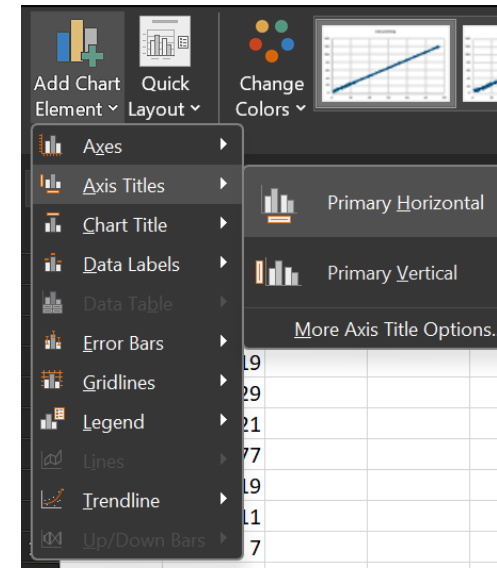
# Plotting Data: Example - Adding Labels

- To add axes labels, legends, etc., click on the plot and then click on the 'Chart Design' tab in the toolbar.
- From there, click on 'Add Chart Element'. This will produce the following menu.



# Plotting Data: Example - Adding Labels

- From this menu, we can add a variety of elements to the chart. In this case, we can add labels to the horizontal and vertical axes.
- Doing so, and renaming the axes and title, leaves my plot complete.



# Now you try...

Implement the formula, calculate the uncertainty, and plot y vs x ( aka width vs length)

	A	B	C	D	E	F
1	x=length [cm]	$\Delta x$ [cm]	y=width [cm]	$\Delta y$ [cm]	Area=length x width	$\Delta A$ [cm <sup>2</sup> ]
2	4.1	0.1	2.2	0.1		
3	4.3	0.1	2.3	0.1		
4	4.2	0.1	2.2	0.1		
5	4.3	0.1	2.2	0.1		
6	4.3	0.1	2.1	0.1		
7	4.1	0.1	2.2	0.1		
8	4.1	0.1	2.3	0.1		

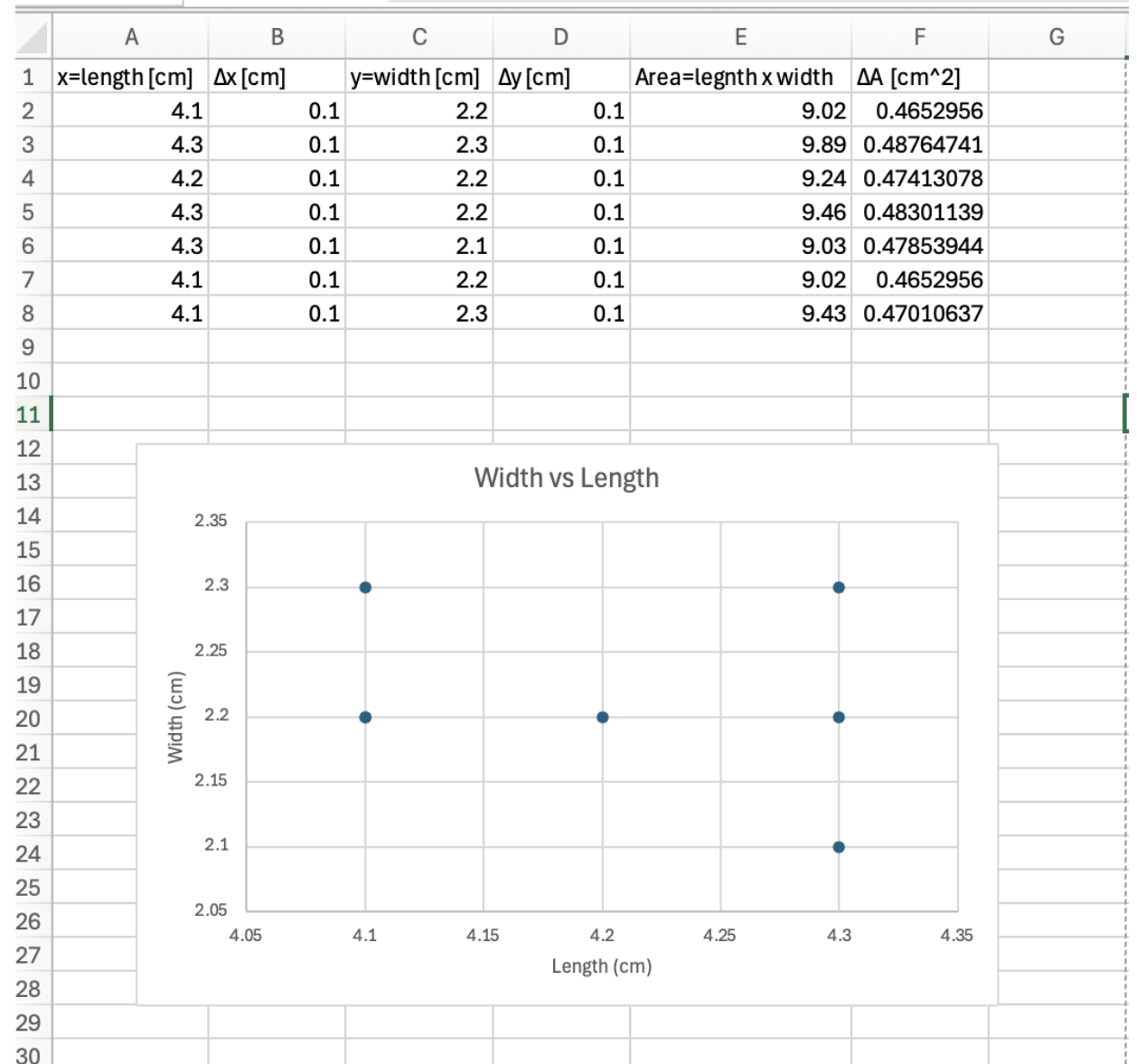
# Exporting

- When reporting data...
  - only report the most necessary data.
    - Plots
    - Data tables with relevant calculations
  - **Make sure plots and data tables are large enough to be legible!!**
- Do not report raw data in reports. You may attach it at the end in the appendix.



# Exporting

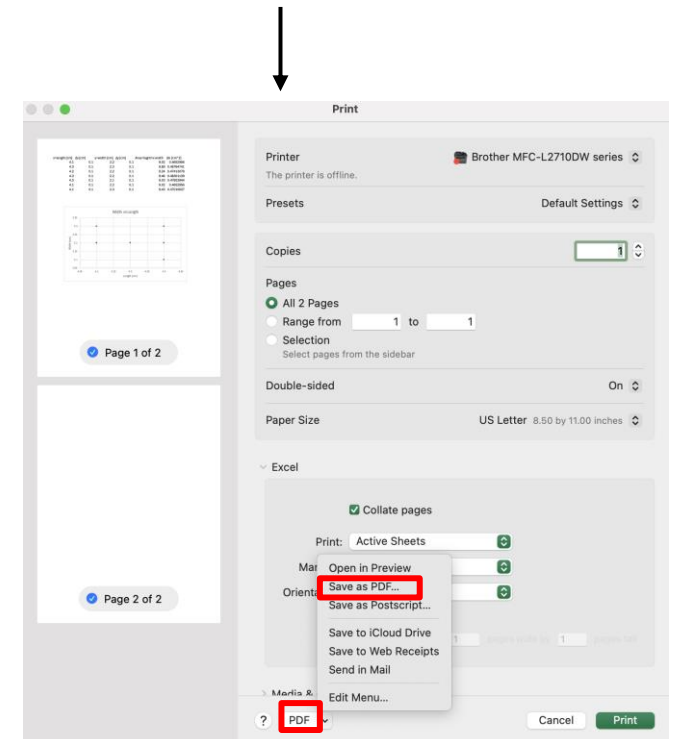
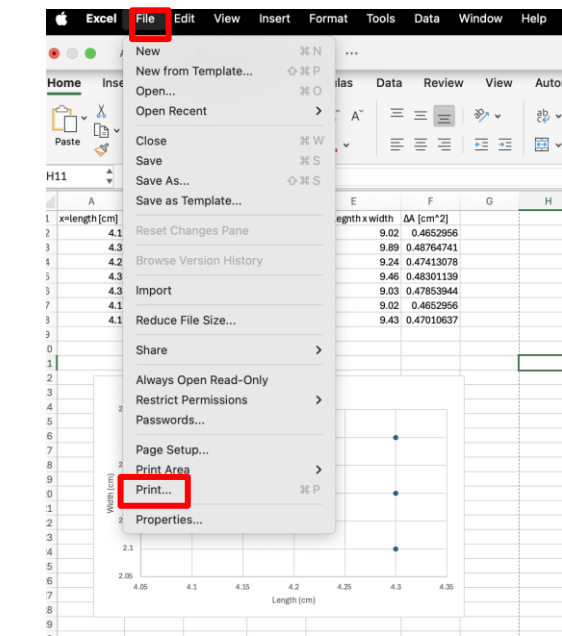
- Let's say we want to export the following workbook to a PDF to add to your report.
- 2 methods:
  - Screenshot
  - Export entire workbook



# Exporting

- Method 1: Screenshot (then copy and paste into report)
  - Mac: Shift + Command + 4
  - Windows: Windows key + Shift + S
- Method 2: Exporting workbooks (Mac)
  - Go to 'File' then 'Print'
  - At the bottom of the print menu, click on the drop down that says 'PDF'.
  - Select 'Save as PDF'

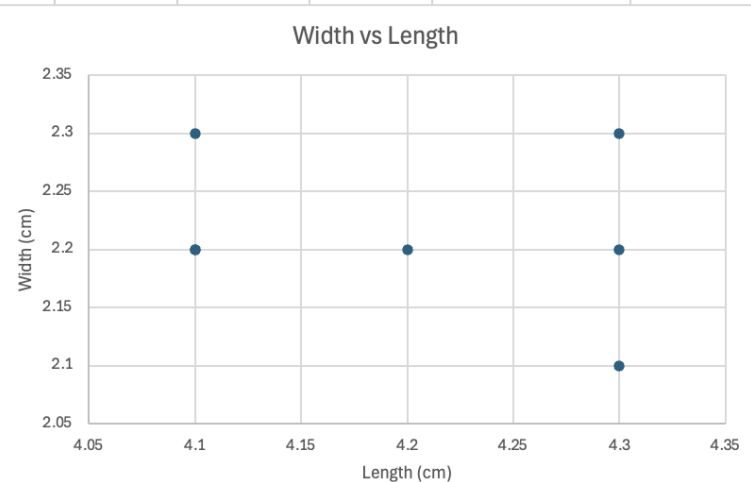
Note: Windows may have an Export button in the 'File' menu



# Exporting

## Screenshot

x=length [cm]	$\Delta x$ [cm]	y=width [cm]	$\Delta y$ [cm]	Area=length x width	$\Delta A$ [cm <sup>2</sup> ]
4.1	0.1	2.2	0.1	9.02	0.4652956
4.3	0.1	2.3	0.1	9.89	0.48764741
4.2	0.1	2.2	0.1	9.24	0.47413078
4.3	0.1	2.2	0.1	9.46	0.48301139
4.3	0.1	2.1	0.1	9.03	0.47853944
4.1	0.1	2.2	0.1	9.02	0.4652956
4.1	0.1	2.3	0.1	9.43	0.47010637



## Exporting Workbook as PDF

x=length [cm]	$\Delta x$ [cm]	y=width [cm]	$\Delta y$ [cm]	Area=length x width	$\Delta A$ [cm <sup>2</sup> ]
4.1	0.1	2.2	0.1	9.02	0.4652956
4.3	0.1	2.3	0.1	9.89	0.48764741
4.2	0.1	2.2	0.1	9.24	0.47413078
4.3	0.1	2.2	0.1	9.46	0.48301139
4.3	0.1	2.1	0.1	9.03	0.47853944
4.1	0.1	2.2	0.1	9.02	0.4652956
4.1	0.1	2.3	0.1	9.43	0.47010637

