

Physical Landscapes and the Geosphere (ACNA 4007)

How to Plot Particle Size Distribution Curve in Excel

Background

There are several main ways of plotting sediment data. These are histograms, grain size distributions, ternary plots. A list of grain size analysis programs can be found here: [USGS Science Center for Coastal and Marine Geology Located in Woods Hole, MA](https://www.usgs.gov/science-center-coastal-and-marine-geology-located-woods-hole-ma).

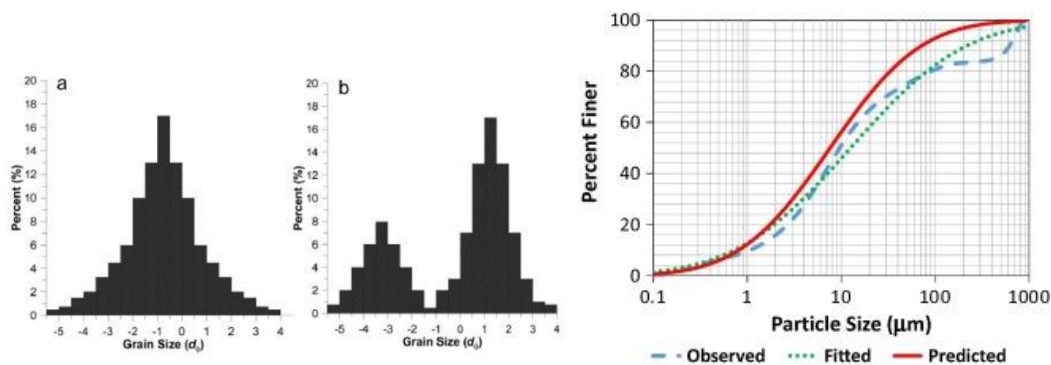


Figure 1. Examples of ways to plot grain size data. a) Histograms for uni-modal and bi-modal grain size distributions (from Rhoads), b) grain size distribution curve.

What Is Particle Size Distribution Curve?

The **Particle Size Distribution** curve helps determine the arrangement of different sizes of particles in a sample. By considering their sizes we can determine the average particle size easily, the particle of size smaller than the average size will be considered as smallest particle size, and the particles having a larger size than the average size is known as the largest particle size. In the particle size distribution curve, we will try to combine these various sizes of particles to give an idea about the particles remaining in the sample.

5 Steps to Plot Particle Size Distribution Curve in Excel

Here, we have the following dataset containing **Sieve No.**, **Particle Size (mm)**, and **Mass Retained (g)** of some particles in a sample. By using this dataset, we will calculate the **Percent Finer** of these particles and then plot these values with respect to the **Particle Size (mm)** of the particles.

	A	B	C	D	E
1		Particle Size Distribution			
2					
3		Sieve No.	Particle Size (mm)	Mass Retained (g)	
4		4	4.75	0	
5		10	2	25.6	
6		20	0.85	50.5	
7		40	0.425	99.6	
8		60	0.25	85.1	
9		100	0.15	96	
10		200	0.075	51	
11					

Step-1: Calculation of Percent Finer to Plot Particle Size Distribution Curve in Excel

Firstly, we will calculate the **Percentage Finer** values in the **% Finer** column, and to get the values we will need the **Percentage Retained** values in the **% Retained** column.

	A	B	C	D	E	F
1		Calculation of Percent Finer				
2						
3		Sieve No.	Particle Size (mm)	Mass Retained (g)	% Retained	% Finer
4		4	4.75	0		
5		10	2	25.6		
6		20	0.85	50.5		
7		40	0.425	99.6		
8		60	0.25	85.1		
9		100	0.15	96		
10		200	0.075	51		
11		Total				
12						
13						

To get the values in the **% Retained** column, we will need to get the total retained mass of the particles first.

- Enter the following formula in cell **D11**.

=SUM(D4:D10)

Here, **the SUM function** will determine the added value of the range **D4:D10**.

Excel screenshot showing the calculation of the total mass retained (407.8 g) in cell D11. The formula bar shows $=\text{SUM}(D4:D10)$.

Sieve No.	Particle Size (mm)	Mass Retained (g)	% Retained	% Finer
4	4.75	0		
10	2	25.6		
20	0.85	50.5		
40	0.425	99.6		
60	0.25	85.1		
100	0.15	96		
200	0.075	51		
Total		407.8		

Now, move to the calculation of the **Percent Retained** values.

- Apply the following formula in cell E4.

$$=(D4/\$D\$11)*100$$

Here, the value of the mass of the particle in cell **D4** will be divided by the total mass in cell **D11**, and then the quotient will be multiplied by **100**. By using **absolute referencing** in cell **D11** we are fixing this cell for the formulas of the rest of the cells.

- Drag down the **Fill Handle**

Excel screenshot showing the formula $=(D4/\$D\$11)*100$ applied to cell E4. The formula bar shows $=(D4/\$D\$11)*100$. The Fill Handle is shown dragging down from cell E4 to fill the rest of the % Retained column.

Sieve No.	Particle Size (mm)	Mass Retained (g)	% Retained	% Finer
4	4.75	0	0	
10	2	25.6		
20	0.85	50.5		
40	0.425	99.6		
60	0.25	85.1		
100	0.15	96		
200	0.075	51		
Total		407.8		

In this way, we will get percentages of the retained particles in the **%Retained** column.

	A	B	C	D	E	F
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Sieve No.	Particle Size (mm)	Mass Retained (g)	% Retained	% Finer
4	4.75	0	0	
10	2	25.6	6.277587052	
20	0.85	50.5	12.38352133	
40	0.425	99.6	24.42373713	
60	0.25	85.1	20.86807258	
100	0.15	96	23.54095145	
200	0.075	51	12.50613046	
	Total	407.8		

Lastly, we will now determine the **percentage finer** of the particles to plot the curve.

- Enter the following formula in cell **F4**.

=100-E4

Here, the value in cell **E4** will be subtracted from **100**.

Sieve No.	Particle Size (mm)	Mass Retained (g)	% Retained	% Finer
4	4.75	0	0	100
10	2	25.6	6.277587052	
20	0.85	50.5	12.38352133	
40	0.425	99.6	24.42373713	
60	0.25	85.1	20.86807258	
100	0.15	96	23.54095145	
200	0.075	51	12.50613046	
	Total	407.8		

- In cell **F5**, write down the following formula.

=F4-E5

Here, we are subtracting the **% Finer** in cell **F4** to the **% Retained** of cell **E5** of the following row (Row 5).

- Drag down the **Fill Handle** tool to copy this formula pattern throughout the rest of the cells.

F5						
	A	B	C	D	E	F
1	Calculation of Percent Finer					
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						

Eventually, you will have the **% Finer** of the particles for all of the sieve numbers.

	A	B	C	D	E	F
1	Calculation of Percent Finer					
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Step-2: Inserting Chart to Plot Particle Size Distribution Curve in Excel

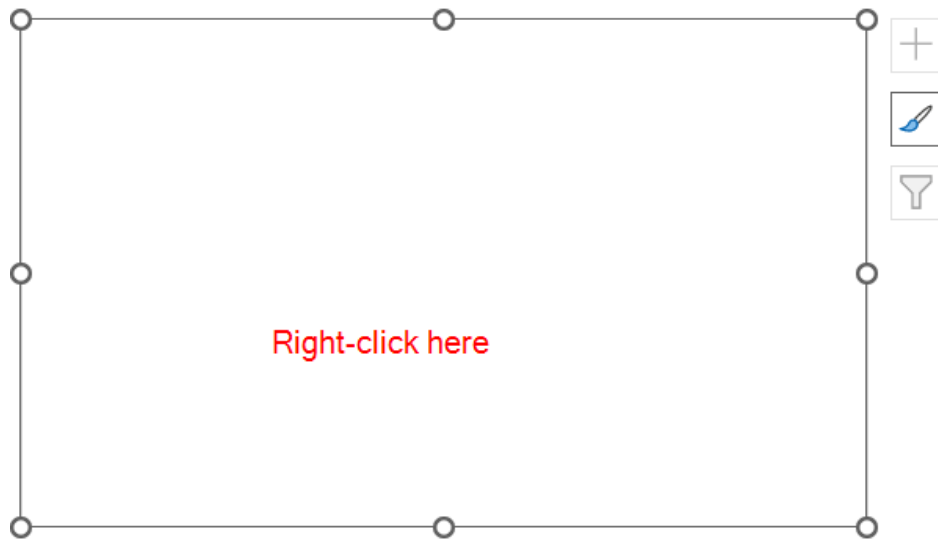
In this section, we will insert a **chart** using the **Particle Size** and **% Finer** columns to form the **Particle Size Distribution** curve.

	A	B	C	D	E	F
1		Inserting Chart				
2						
3		Sieve No.	Particle Size (mm)	Mass Retained (g)	% Retained	% Finer
4		4	4.75	0	0	100
5		10	2	25.6	6.277587052	93.72241295
6		20	0.85	50.5	12.38352133	81.33889161
7		40	0.425	99.6	24.42373713	56.91515449
8		60	0.25	85.1	20.86807258	36.0470819
9		100	0.15	96	23.54095145	12.50613046
10		200	0.075	51	12.50613046	0
11		Total		407.8		
12						

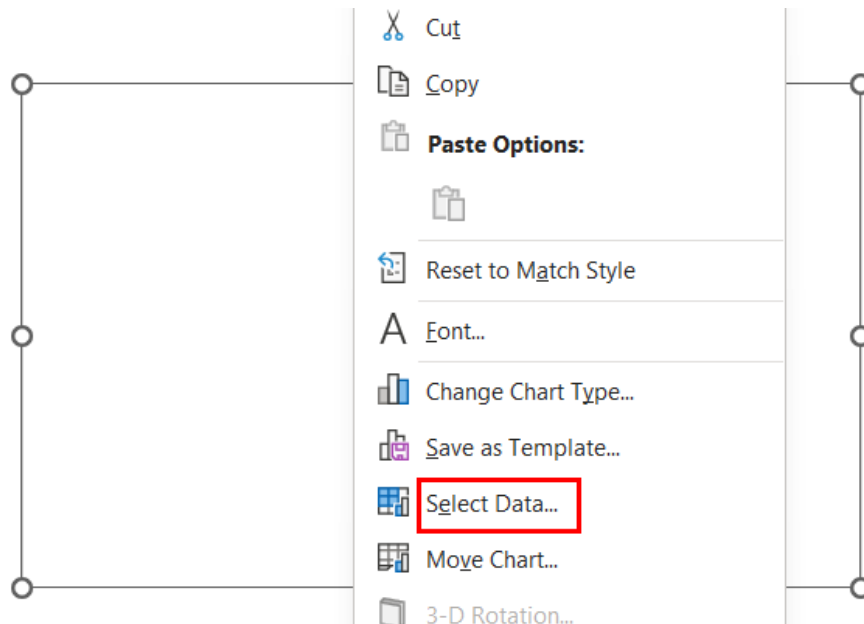
- Go to the **Insert** tab >> **Charts** group >> **Insert Scatter (X, Y) or Bubble Chart** dropdown >> **Scatter with Smooth Lines and Markers**.

The screenshot shows the Microsoft Excel interface with the **Insert** tab selected. In the **Charts** group, the **Scatter** dropdown menu is open, and the **Scatter with Smooth Lines and Markers** option is selected. The chart area is highlighted with a red box and a red circle. The background shows the same data table as above.

After that, we will get this blank chart and to get the full chart **Right-click** here.



- Choose the **Select Data** option.



- Click on the **Add** option of the **Select Data Source** dialog box.

Select Data Source

Chart data range:

Switch Row/Column

Legend Entries (Series)

Add Edit Remove ^ v

Horizontal (Category) Axis Labels

Edit

Hidden and Empty Cells

OK Cancel

Then, you will have the **Edit Series** dialog box.

- Choose the range **\$C\$4:\$C\$10** as **Series X values** and the range **\$F\$4:\$F\$10** as **Series Y values** and finally press **OK**.

Inserting Chart

Sieve No.	Particle Size (mm)	Mass Retained (g)	% Retained	% Finer
4	4.75	0	0	100
10	2	25.6	6.277587052	93.72241295
20	0.85	50.5	12.38352133	81.33889161
40	0.425	99.6	24.42373713	56.91515449
60	0.25	85.1	20.86807258	36.0470819
100	0.15	96	23.54095145	12.50613046
200	0.075	51	12.50613046	0

Total

Edit Series

Series name:

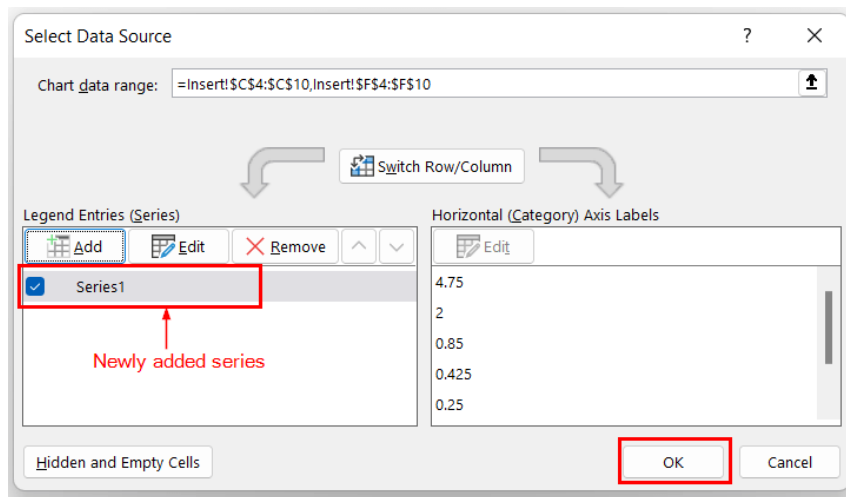
Series X values: 1 = 4.75, 2, 0.85,...

Series Y values: 2 = 100, 93.722412...

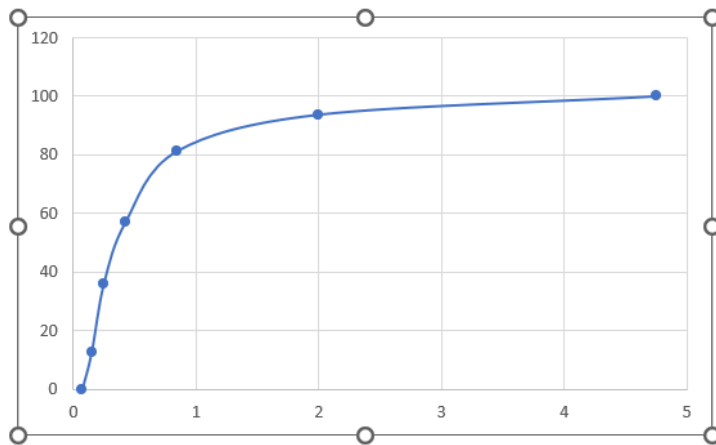
3 OK Cancel

After that, you will be taken to the **Select Data Source** dialog box again where you will see the newly created series named **Series 1**.

- Press **OK**.

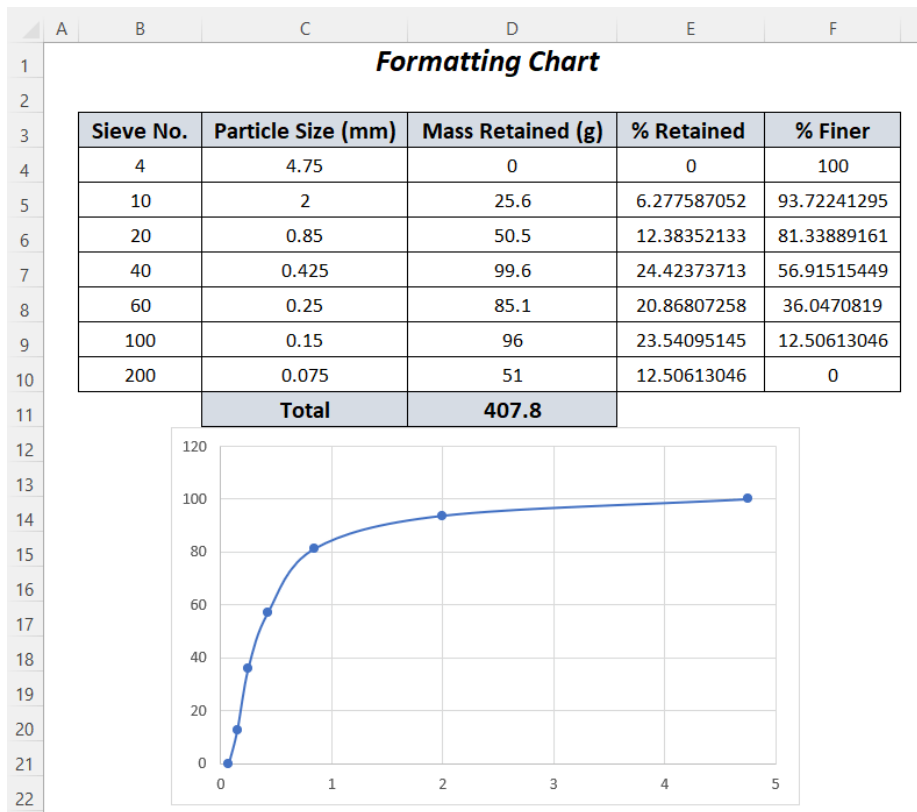


Eventually, we will get the following chart.

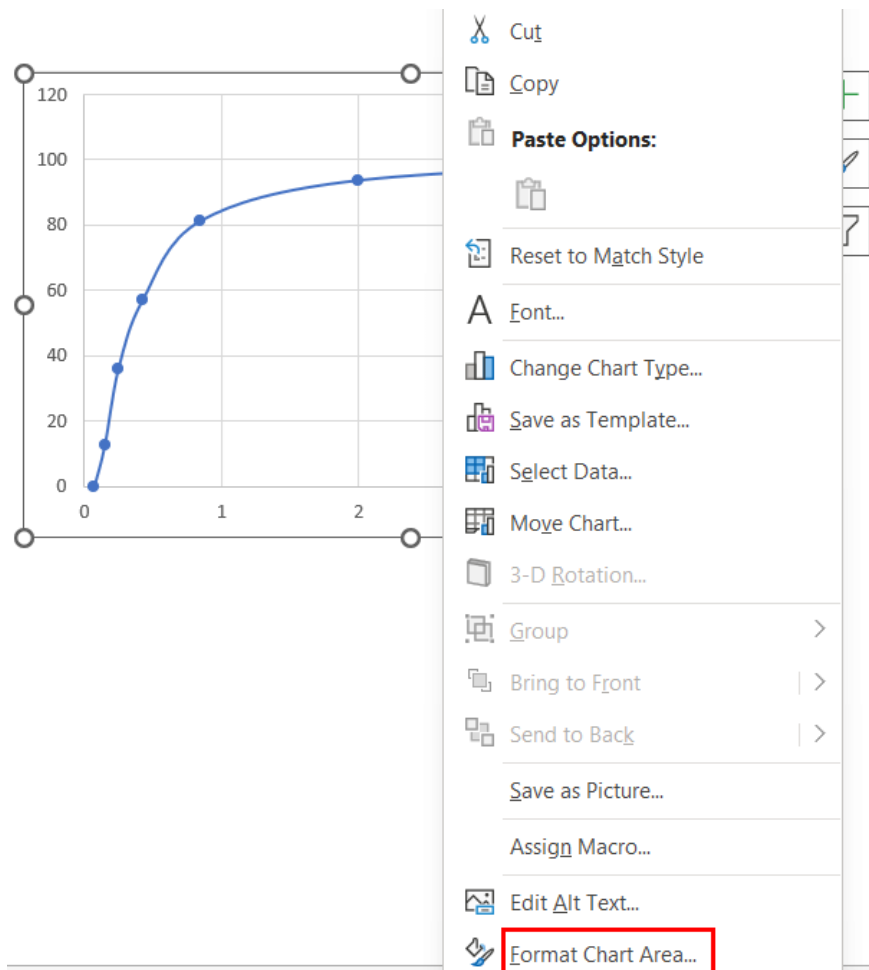


Step-3: Formatting Chart Area

Here, we will format the chart to make it more understandable.

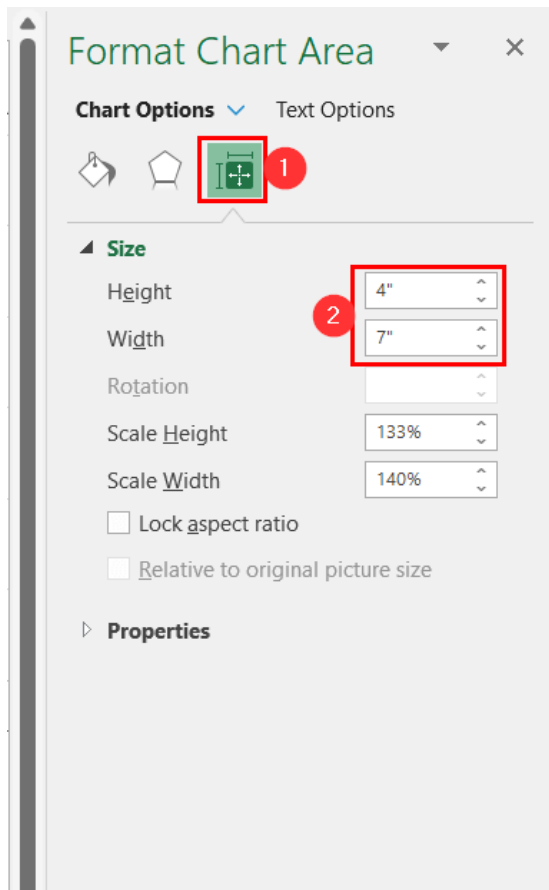


- **Right-click** on the chart and then select the **Format Chart Area**

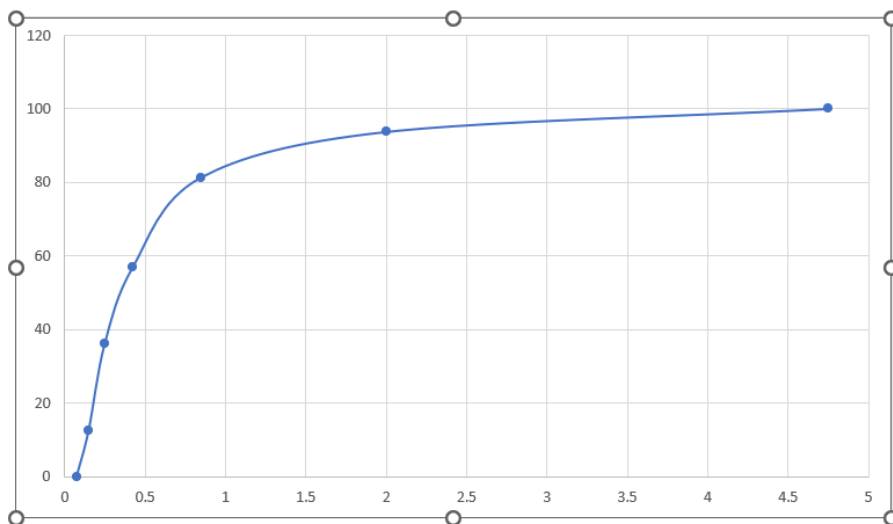


Afterward, the **Format Chart Area** wizard will appear on the right side of your worksheet.

- Go to the **Size & Properties** tab and then use **4 inches** as **Height** and **7 inches** as **Width**.



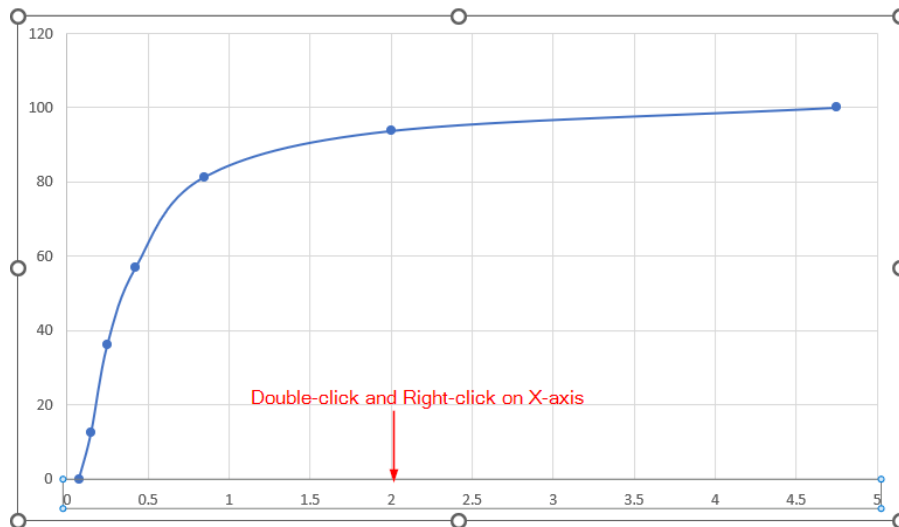
In this way, we have increased the chart area for a great visualization.



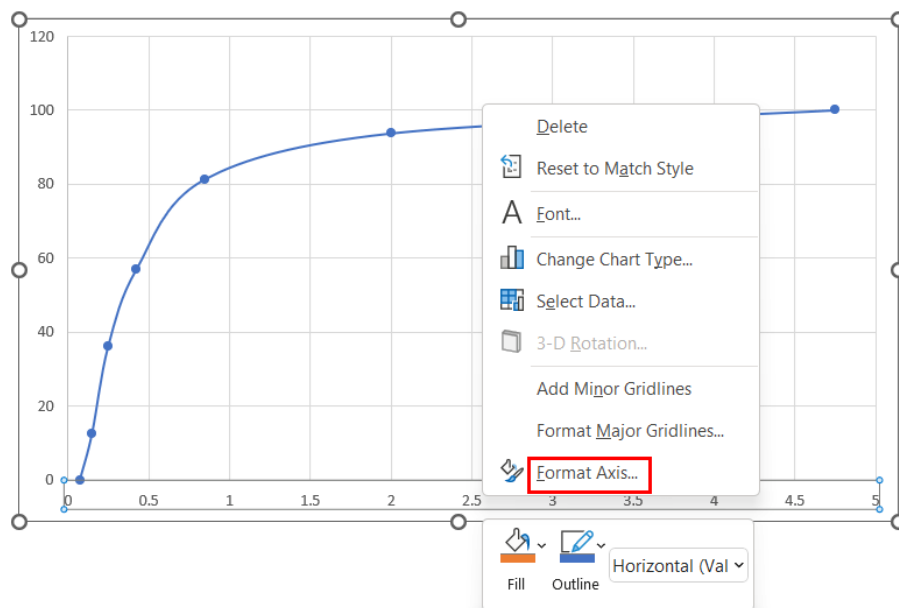
Read More: [Plot Normal Distribution in Excel with Mean and Standard Deviation](#)

Step-4: Formatting X-Axis and Y-Axis

- To edit the **X-axis**, **double-click** on this axis to select it and then **right-click** to bring the **Context Menu**



- Choose the **Format Axis**



Then, the **Format Axis** wizard will appear on the right side of your worksheet.

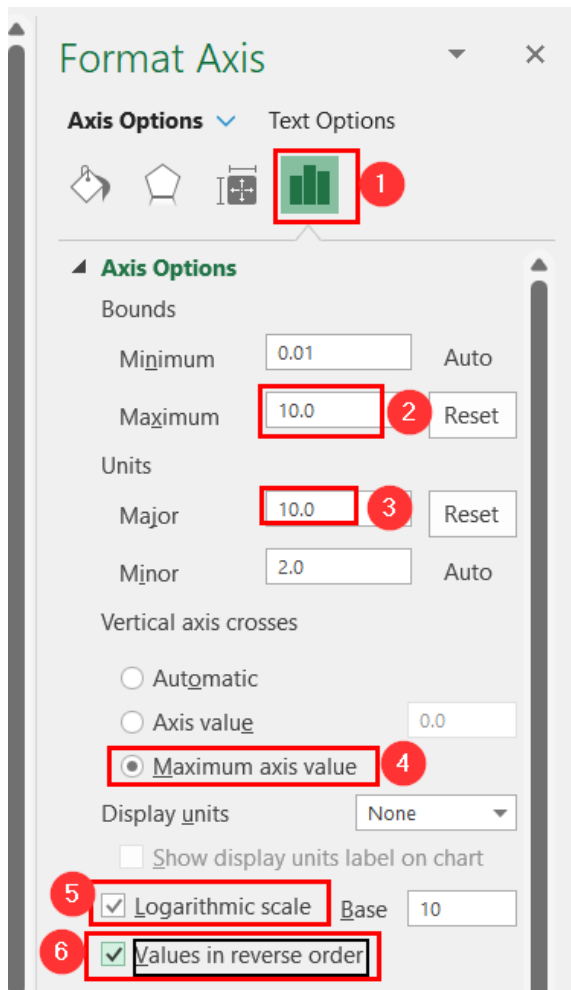
- Go to the **Axis Options** tab and then do the followings.

Bounds → **Maximum** → **10.0**

Units → **Major** → **10.0**

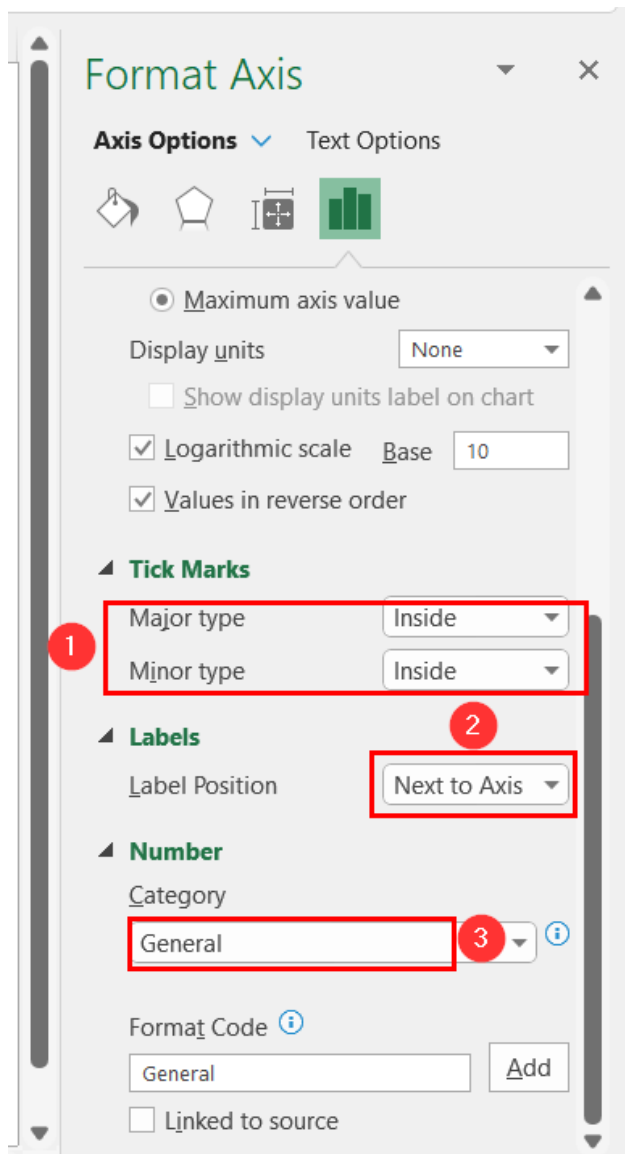
Vertical Axis Crosses → click on **Maximum axis value**

- Check the boxes of the **Logarithmic scale** option and the **Values in reverse order**



Now, scroll down to see the remaining options.

- Select the **Inside** option of the **Major type** and **Minor type** *Tick Marks*, the **Next to Axis** option as *Label Position*, and **General** as the **Category** of **Number**.



Then, our chart will turn into like the following and we have to edit the **Y-axis** now by **right-clicking** here and selecting the **Format Axis** option.

Feel free to ask questions!