

## How to Plot Data Using Excel

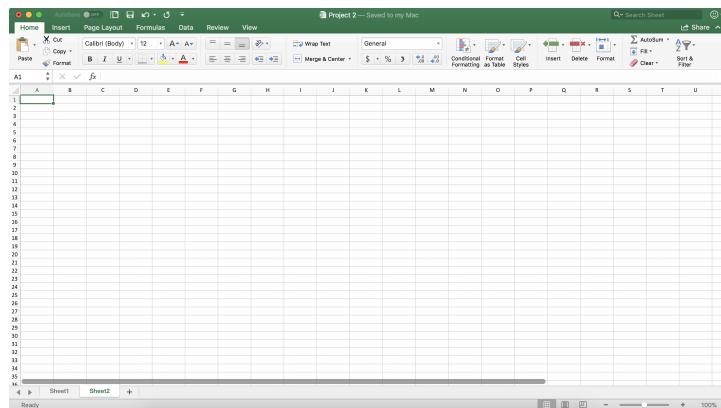
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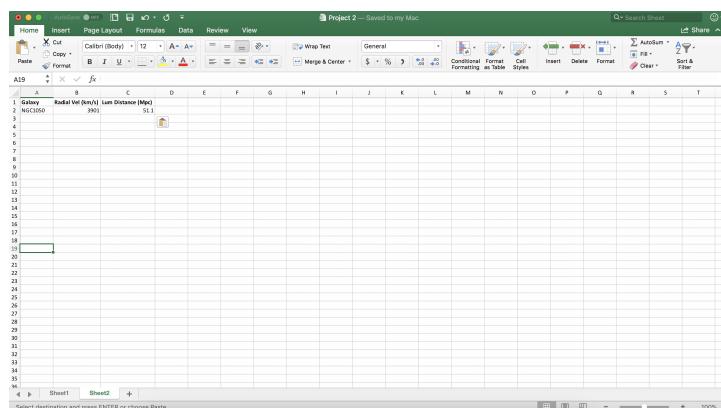
### Abstract

These notes illustrate how to plot data in Microsoft Excel, and assign a trendline to that data. The approach taken in these notes is essentially the same for Google Sheets; since Sheets and Excel aren't the same, there will be slight differences (obviously). Note that I'm using Excel for Mac OS; some buttons/options might have different names in Windows, but the differences are very slight.

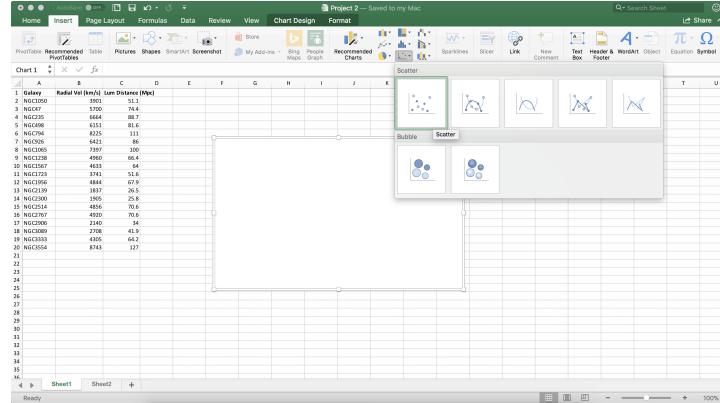
1. Start by opening a blank Excel file.



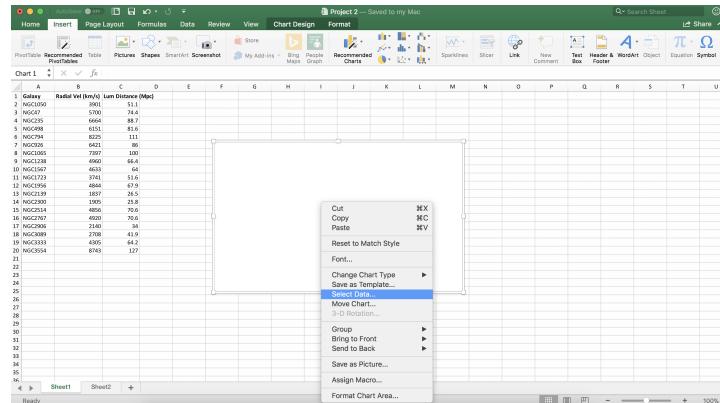
2. Label three columns: **Galaxy**, where the name of the galaxy will be entered, **Radial Velocity (km/s)**, where the radial velocity in km/s will be entered, and **Luminosity Distance (Mpc)**, where the distance in Mpc (megaparsecs) will be entered.



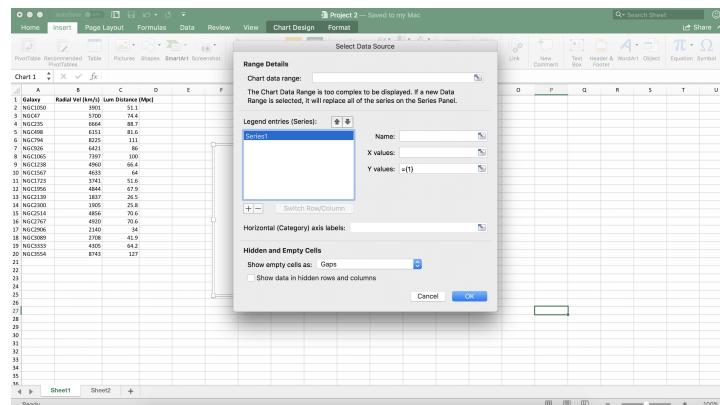
3. Once all the data is entered, go to **Insert** → **Chart** → **Scatter Plot**. This will insert a blank graph that the data will be entered into.



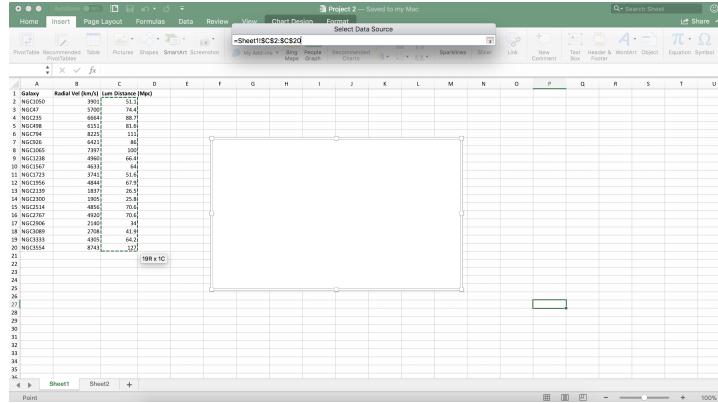
4. Click on the blank graph, then right-click on the graph, clicking on the option **Select Data**.



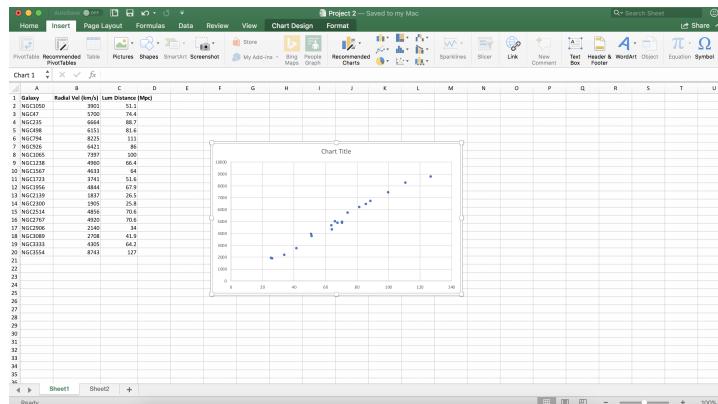
5. In the prompt, look for **Legend Entries (Series)**. There should be a series already available (typically called "Series1"); if not, add a series (using + in Mac OS).



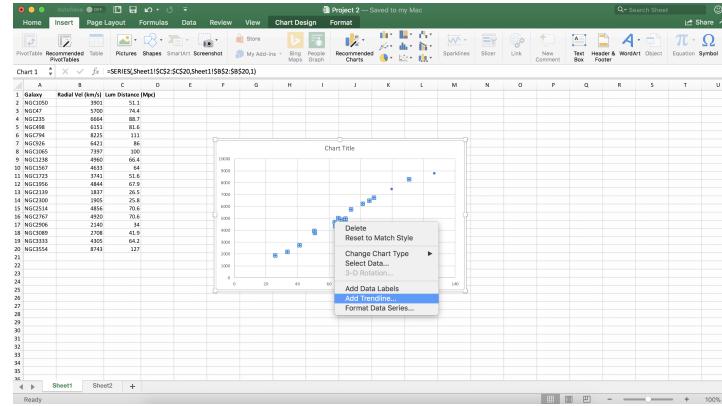
6. For the option **X values**, click on the button at the end of the blank entry box (the button looks like a spreadsheet with a red arrow in it pointing to the upper left). This allows you to select the data for the horizontal axis, which will be the **distance** data. After clicking the X values button, highlight the distance data.



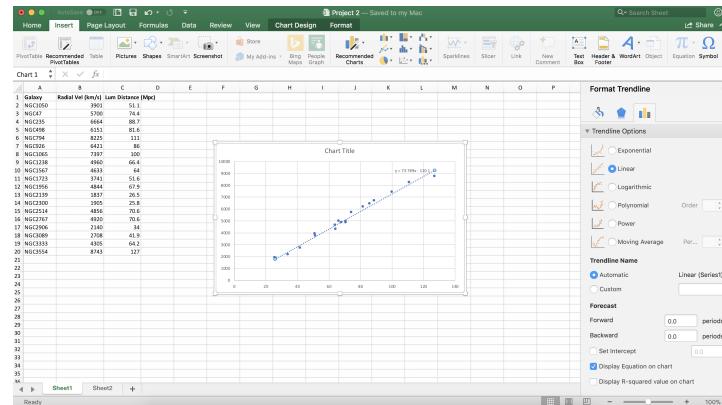
7. Repeat this selection of data for the **Y values**, for which you're going to select the velocity data. Click on the button at the end of the blank entry box for the Y values, which is the same button as for X values, then highlight and select the velocity data, as you did for the distance data for the X values.
8. Once the data is selected, click **Ok** on the Select Data prompt, to submit the data series that you've selected. As a result, the data should be plotted on the graph. Look through this data (comparing distance values to velocity values) to make sure that you've submitted the data series correctly. **The resulting data should be a straight line.**



9. Click on the actual data on the graph. (This will cause the data points on the graph to be highlighted.) Then right click on the data entries in the graph, and select **Add Trendline**.



10. The trendline should be linear by default (a straight line), with all the correct options already chosen. The only option you need to select that isn't pre-selected is the option to **Display equation on chart**. This will give the equation for the trendline in the  $y = mx + b$  form.



11. The last thing to do is to **format the graph**. The equation for the trendline is typically displayed with a very small font; select it and increase the font so that it's more clearly visible. Add a title to graph by selecting the "Chart Title" already present on the graph and re-naming it. If you go to **Chart Design → Add Chart Element**, you can add a **Horizontal Axis Title** and a **Vertical Axis Title**, which allows you to complete the formatting of the graph.