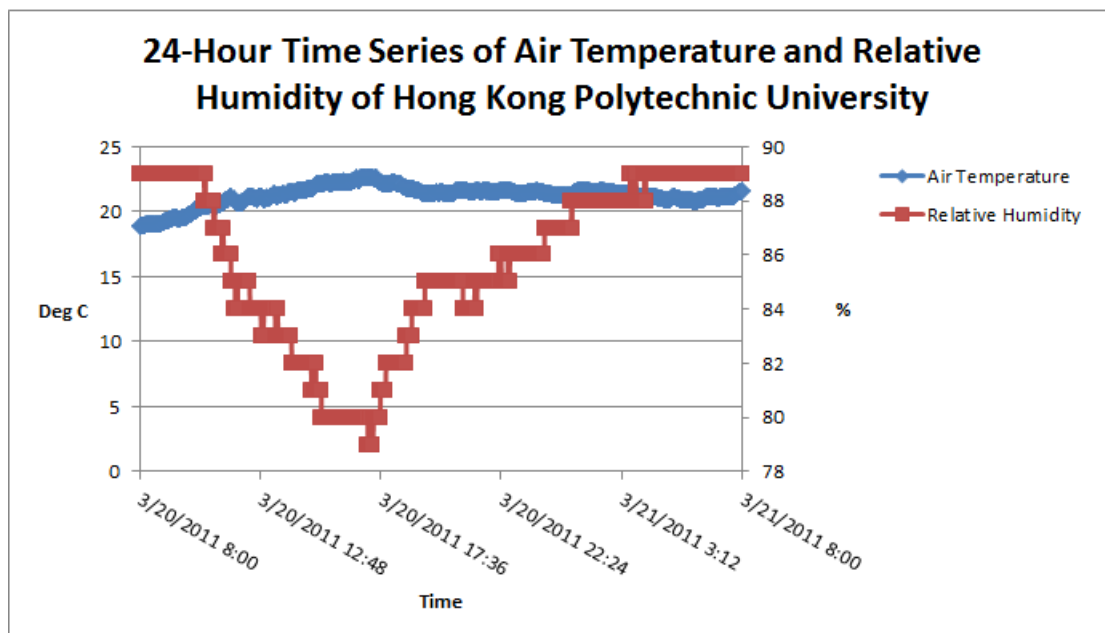


Co-WIN Data Download and Analysis Tutorial

This tutorial intends to help users of the Co-WIN web interface (<http://weather.ap.polyu.edu.hk>) to understand how to download archived Co-WIN data via the web interface, and how to use the data to create time series. The data downloaded from the Co-WIN web interface is in CSV format. Although this tutorial uses Microsoft Excel to create time series, other software such as Matlab, OpenOffice, etc. are equally capable of creating such plots from the data downloaded from Co-WIN.

In this tutorial, we'll be creating a 24-hour time series of air temperature and relative humidity (on the same plot) using the data downloaded from Co-WIN web interface. The end result will be a 24-hour time series of the air temperature and relative humidity of the automatic weather station at the Hong Kong Polytechnic University between March 20, 2011 08:00 and March 21, 2011 08:00.

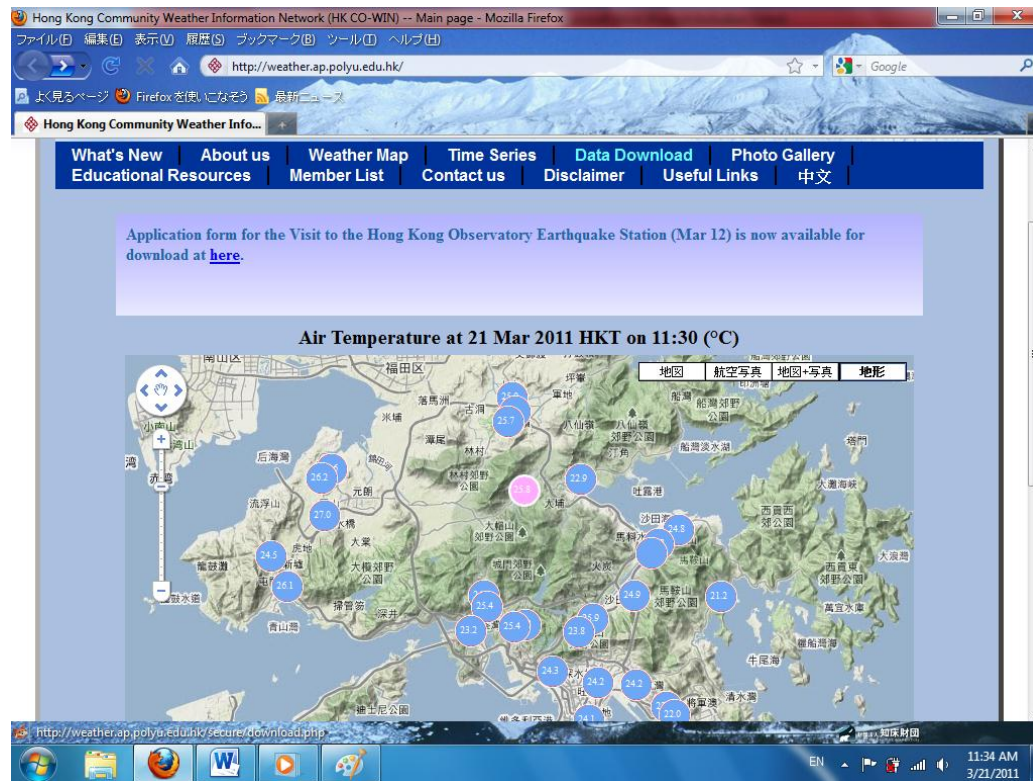


The following topics will be covered in this tutorial:

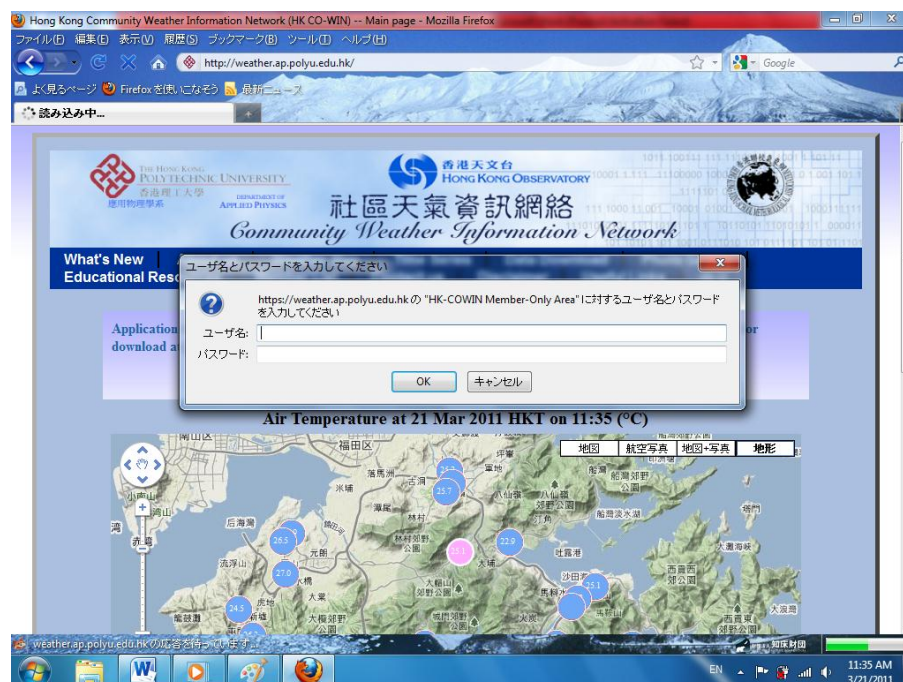
- 1) Downloading data from Co-WIN web interface.
- 2) Creating two time series on the same graph.
- 3) Adding a secondary y-axis to the graph.
- 4) Slanting the x-axis (time axis) label by 30 degrees.
- 5) Manually setting the start point and end point of the x-axis (time axis).
- 6) Adding graph title, axis titles, legend, and other chart-related accessories.

1. Downloading data from Co-WIN web interface:

1.1. In the Co-WIN web interface (<http://weather.ap.polyu.edu.hk>), click the menu item “Data Download” to access the Co-WIN data download page.

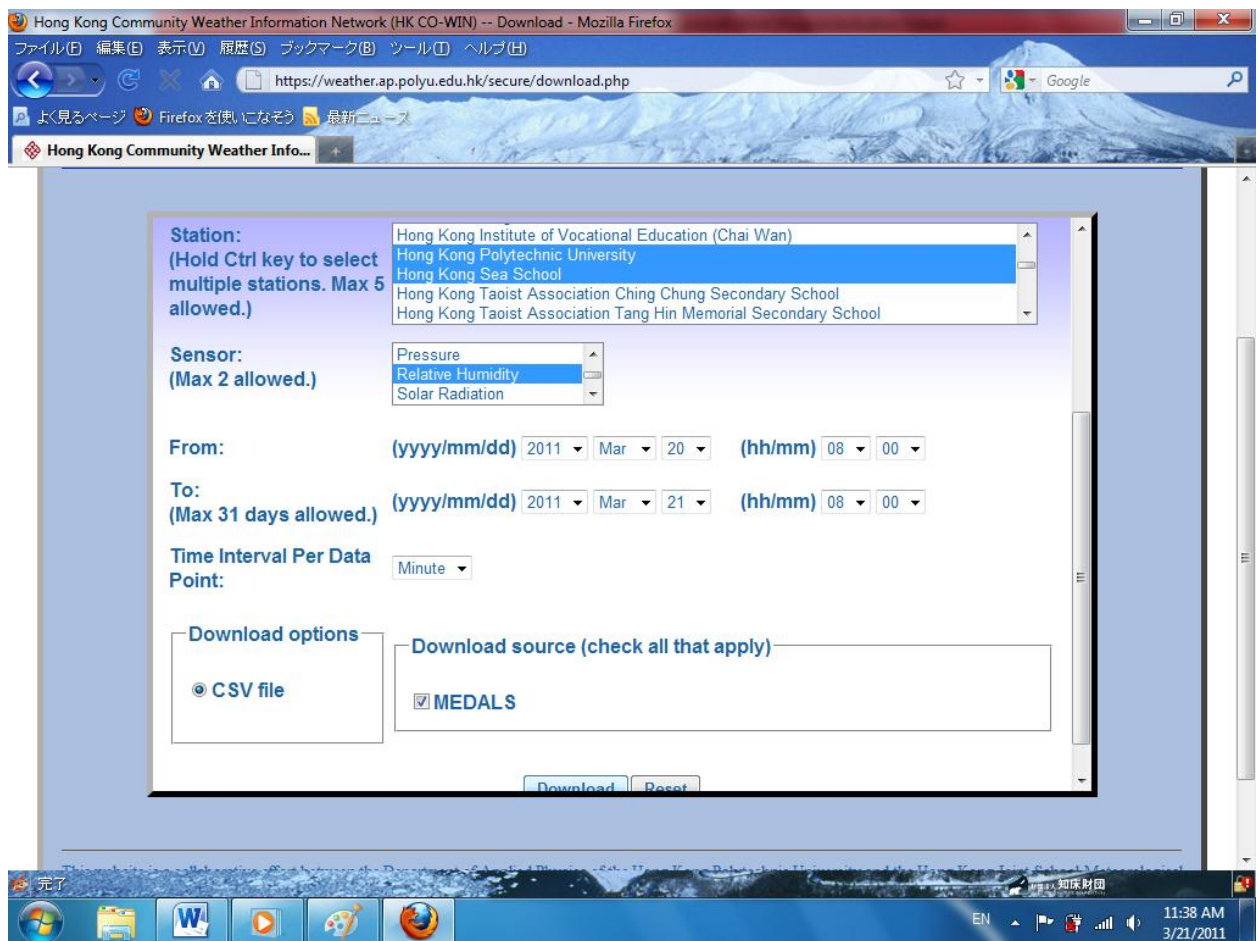


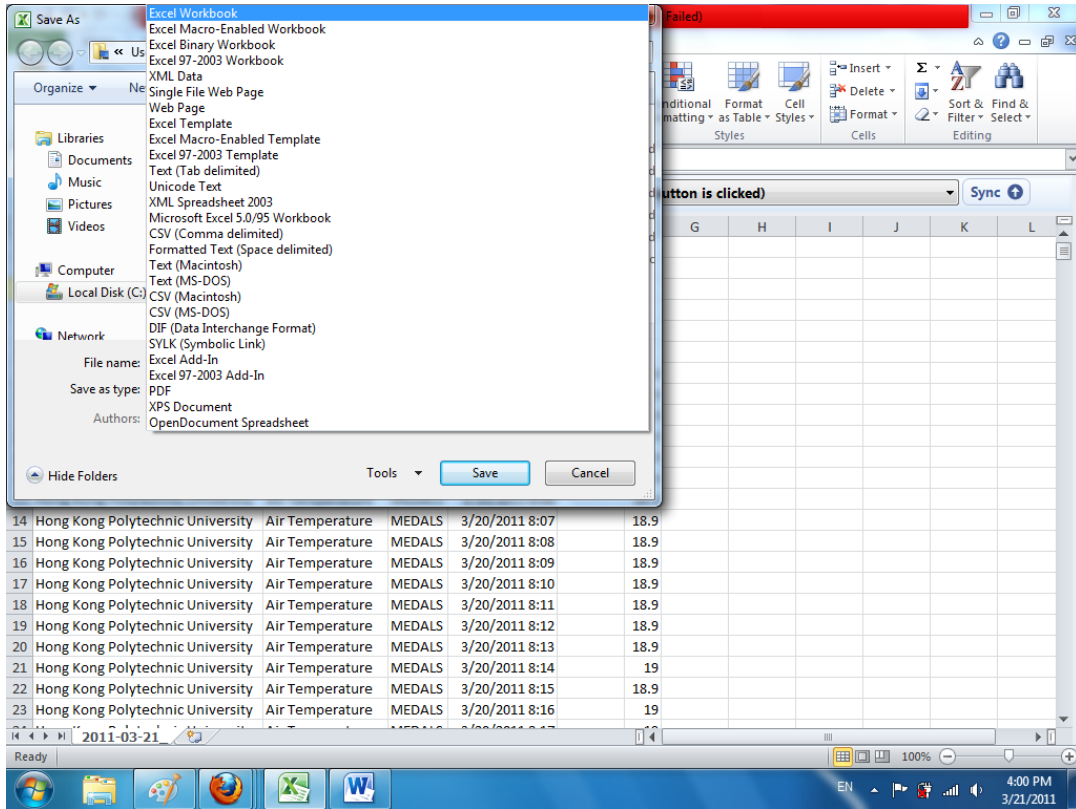
1.2. In the password dialog, enter the username and password assigned by Co-WIN. (All Co-WIN members are eligible to receive their own username and password for downloading data. If you have not created your own username/password yet, please contact Co-WIN at apnihon@polyu.edu.hk.)



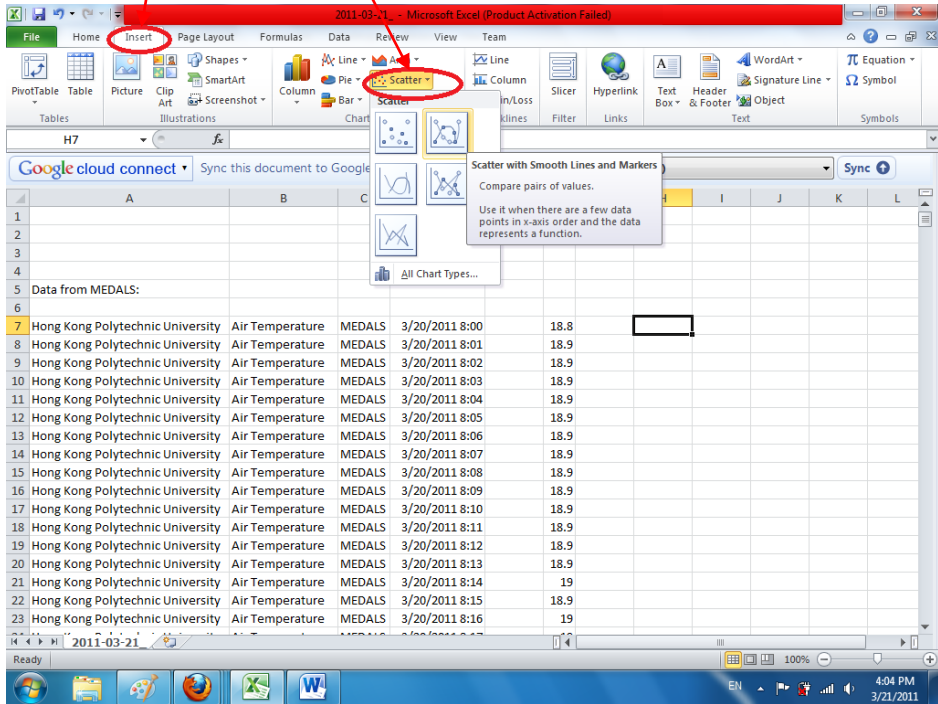
1.3. In the Data Download page:

- i) Station field: Select “Hong Kong Polytechnic University” for the Station field (press Ctrl and left mouse click together to select more than one station).
- ii) Sensor field: Select both “Air temperature” and “Relative Humidity”. (This can be done by selecting Air Temperature first, and then use Ctrl-key and left mouse click together to select the Relative Humidity).
- iii) From field: Select March 20, 2011 08:00
- iv) To field: Select March 21, 2011 08:00
- v) Time Interval Per Data Point: Select 1 minute (this means that the downloaded data will display data on a per minute basis).
- vi) Download Options field: Select CSV (download data in comma-separated-value format, which can be opened with Excel).
- vii) Download Source field: Select MEDALS (all weather data from Co-WIN members’ automatic weather stations are transmitted through the MEDALS system currently, so be sure to select this option or else you’ll download an empty file)

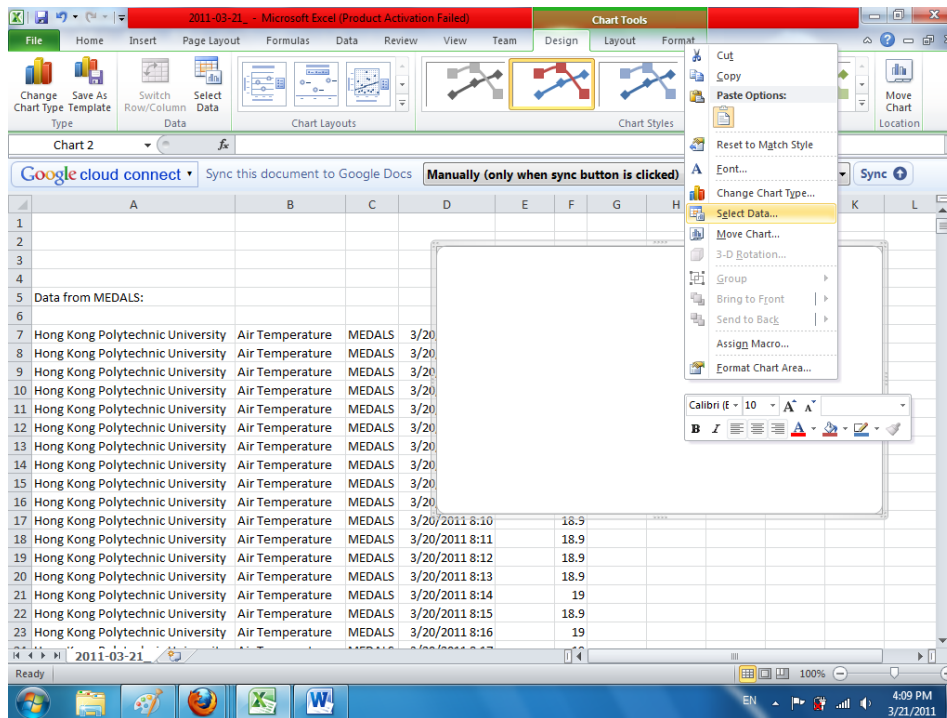




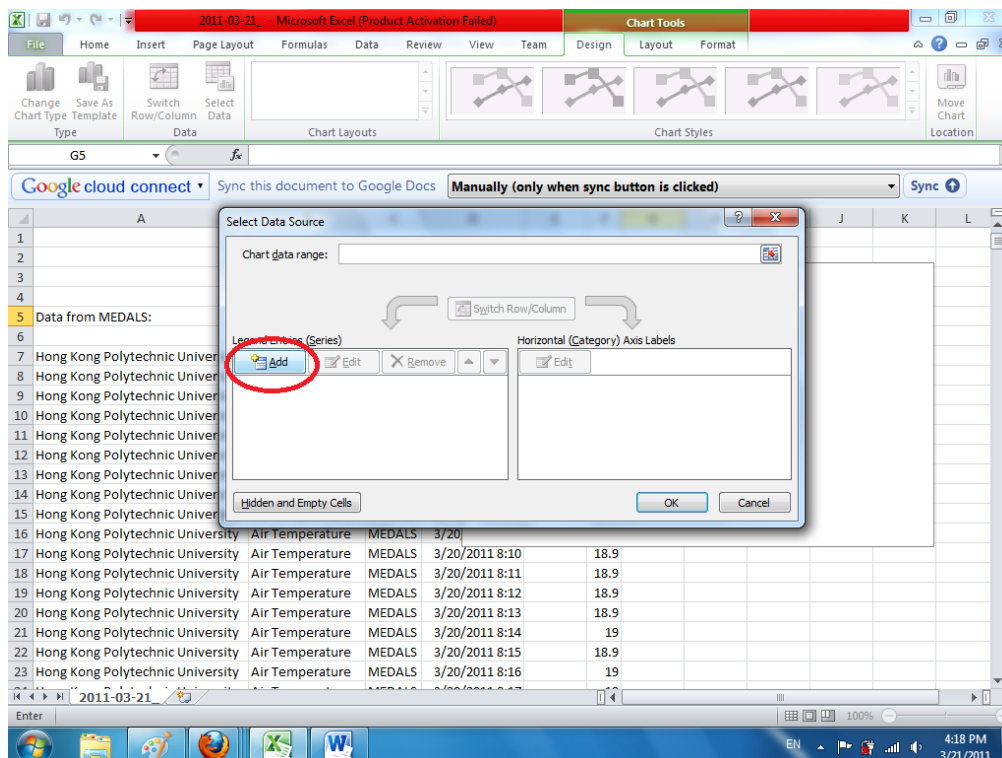
2.4. Click Insert > Scatter to select Scatter plot for the time series plot type. The frequently used line plot type is not selected in creating time series because line plot is not able to recognize datetime values, which will be used for the x-axis of our time series.



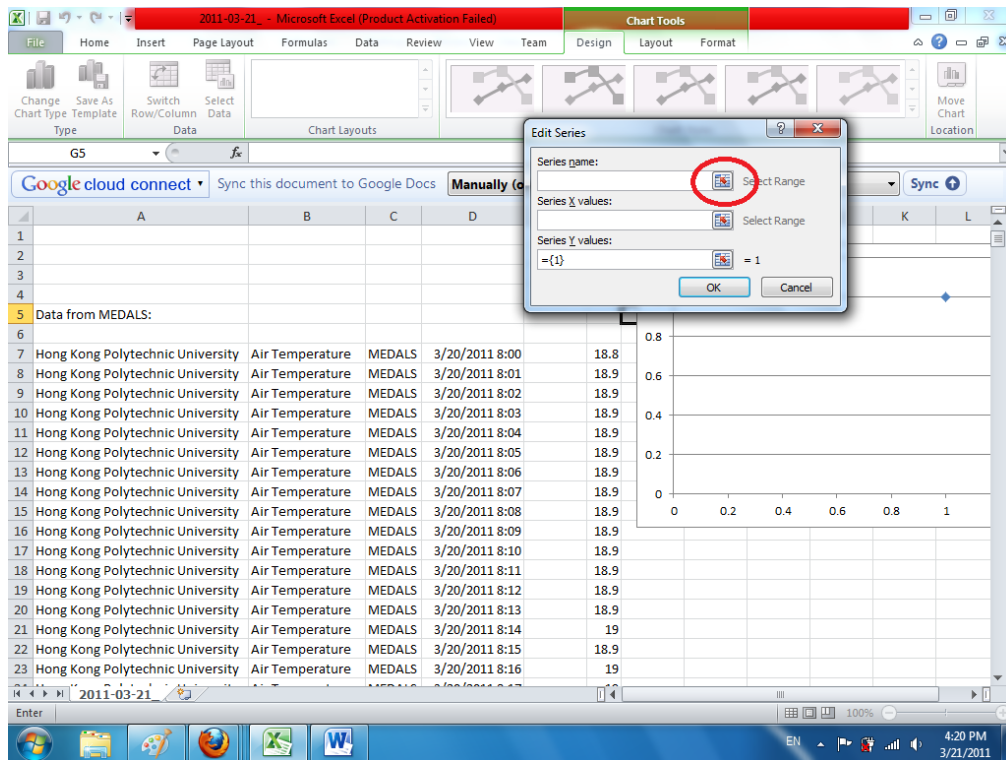
2.5. Right-click anywhere within the Chart area and select “Select Data” in the resulting popup menu.



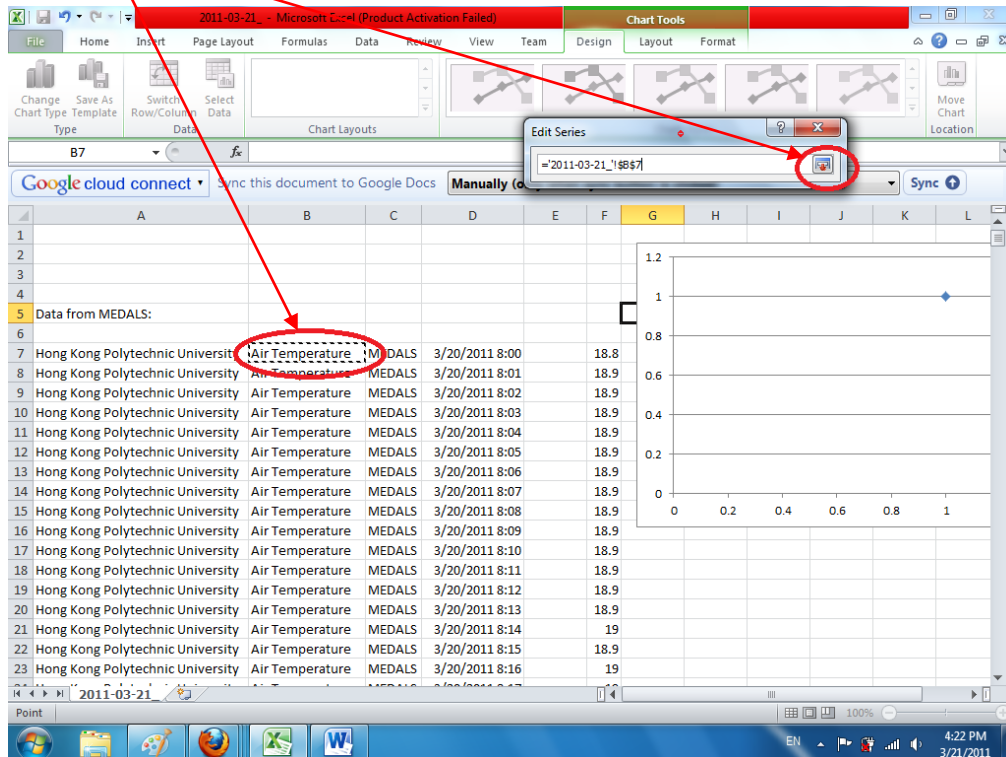
2.6. We'll be adding the time series for Air Temperature of PolyU station first, and the time series for Relative Humidity of PolyU next. To add the time series for air temperature, click the Add button under Legend Entries in the Select Data Source dialog box.



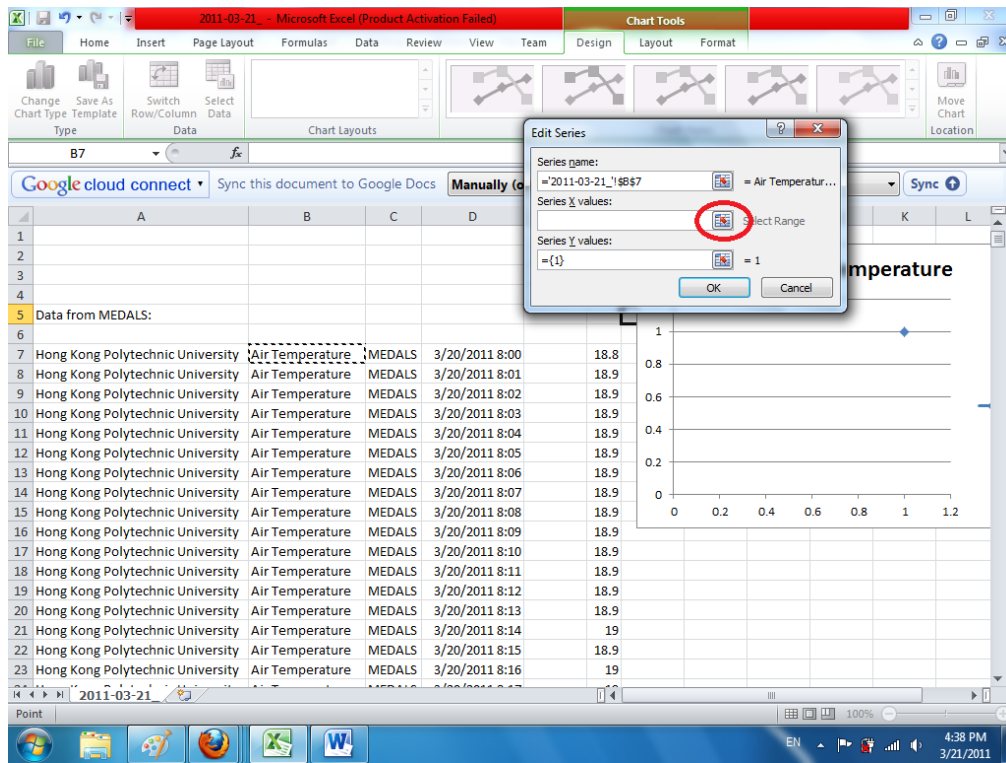
2.7. In the resulting Edit Series dialog box, click on the little button on the right of the Series Name field.



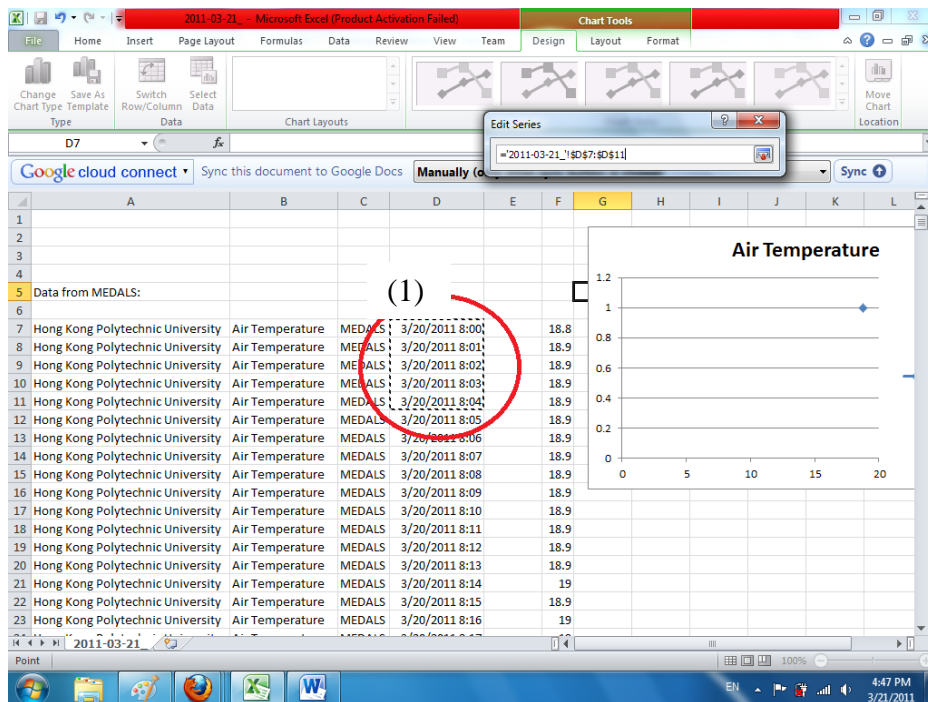
2.8.(1) Select any of the cell containing the words “Air Temperature “. This will cause the words “Air Temperature” to be displayed in the legend of the finished product. (2) Then click on the little button in Edit Series again.

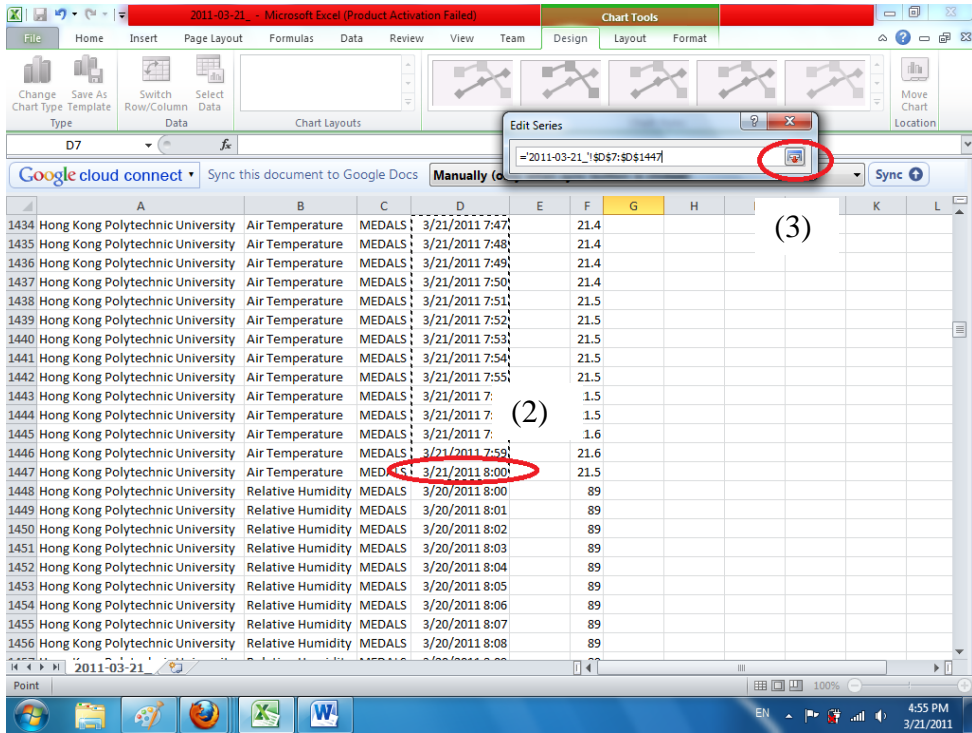


2.9. Click on the little button on the right of the Series X Values field to select the values used for the x-axis of the air temperature time series.

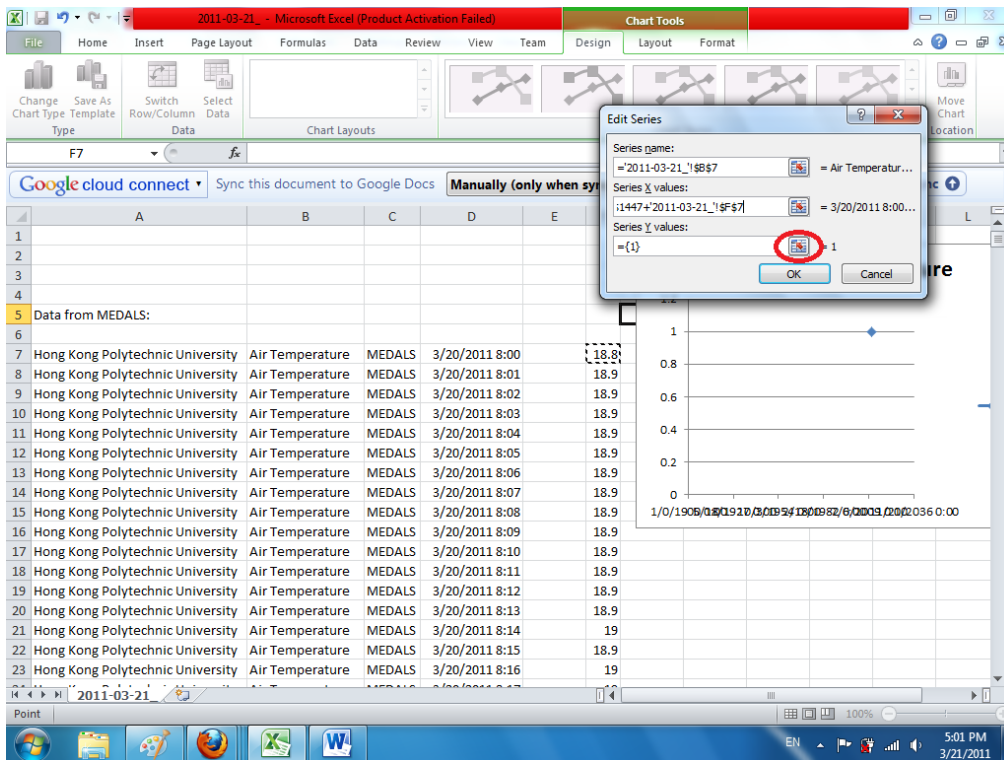


2.10. Select the datetime values of the air temperature of the PolyU station (D7 to D1447). This can be done by selecting the first couple of rows in timestamp column (column D), then scroll down to row 1447 where the last air temperature value of PolyU station is, then left-click cell D1447 simultaneously with the SHIFT button. This will automatically select the entire cell range from D7 to D1447. Then click the little button on the Edit Series dialog box again.

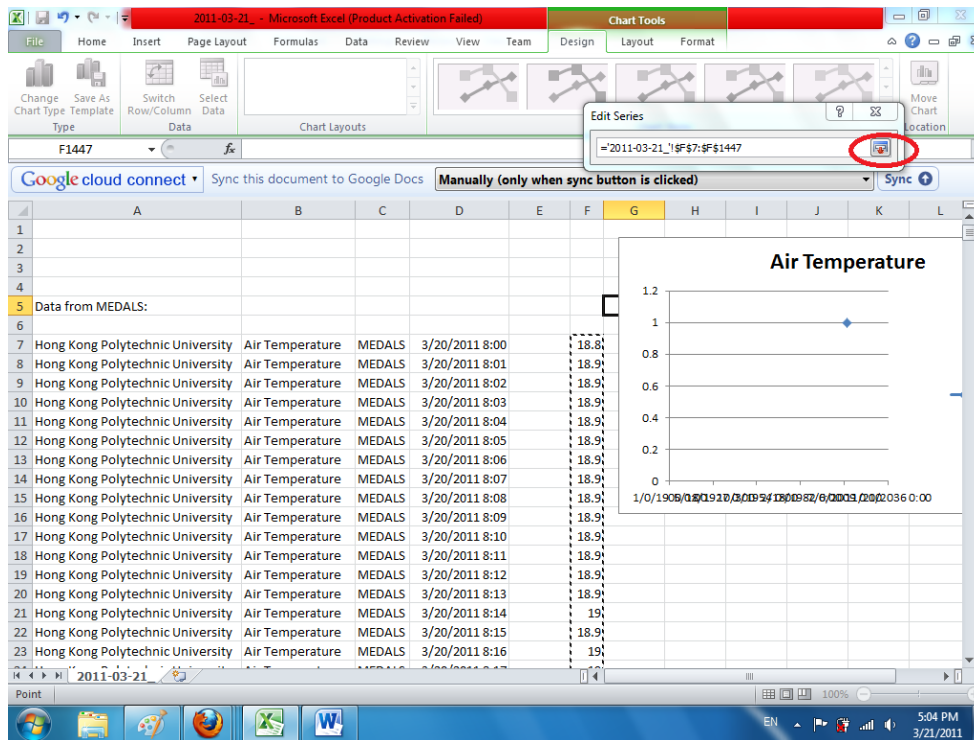




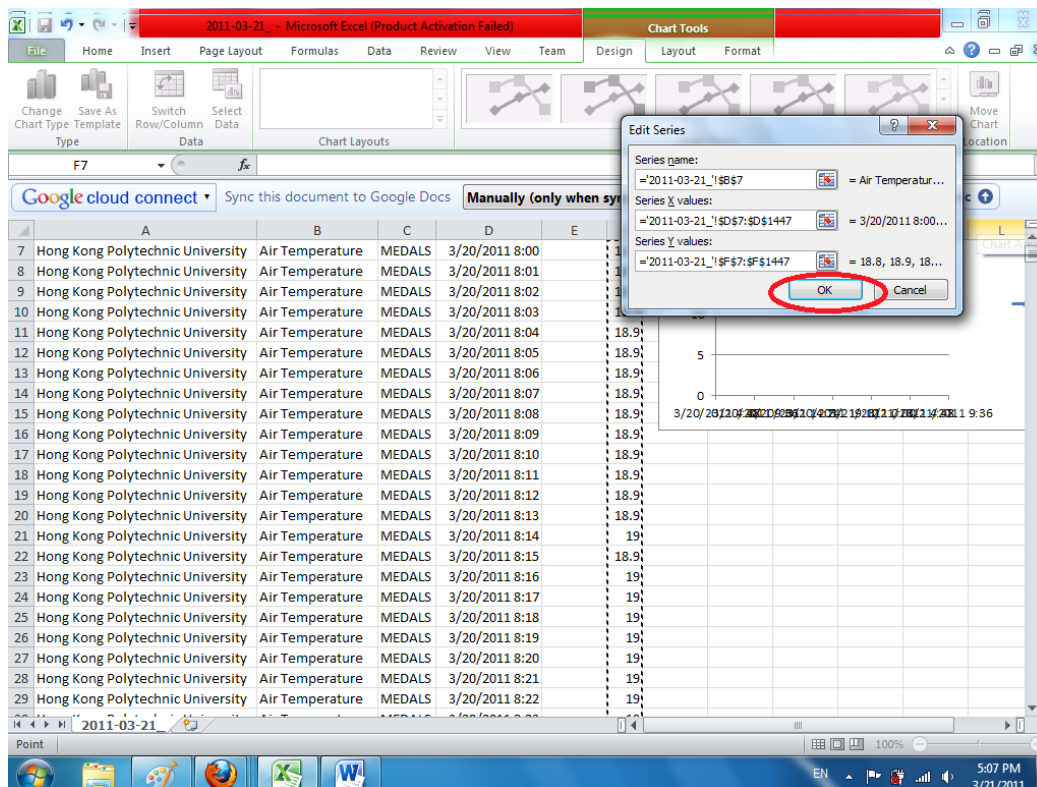
2.11. Click on the little button on the right of the Series Y Values field to select the values used for the y-axis of the air temperature time series.



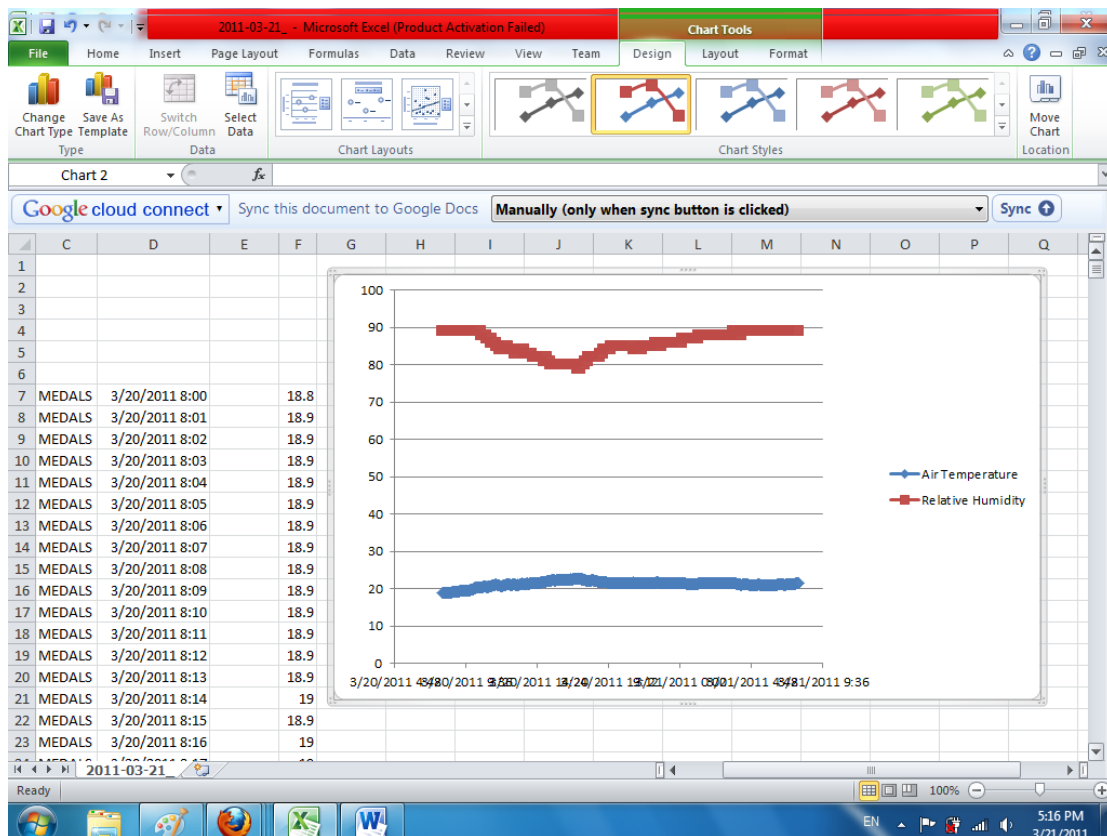
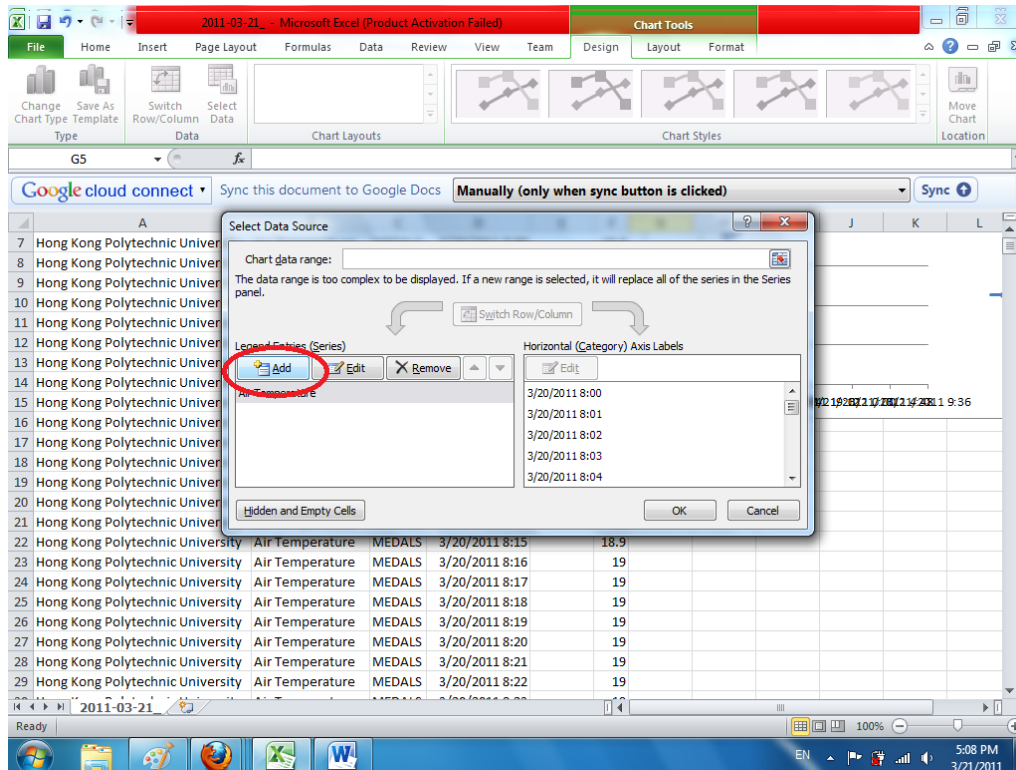
2.12. Select the temperature values of the air temperature of the PolyU station (cells F7 to F1447), then click the little button on the Edit Series dialog box again.



2.13. Click OK button in the Edit Series dialog box.



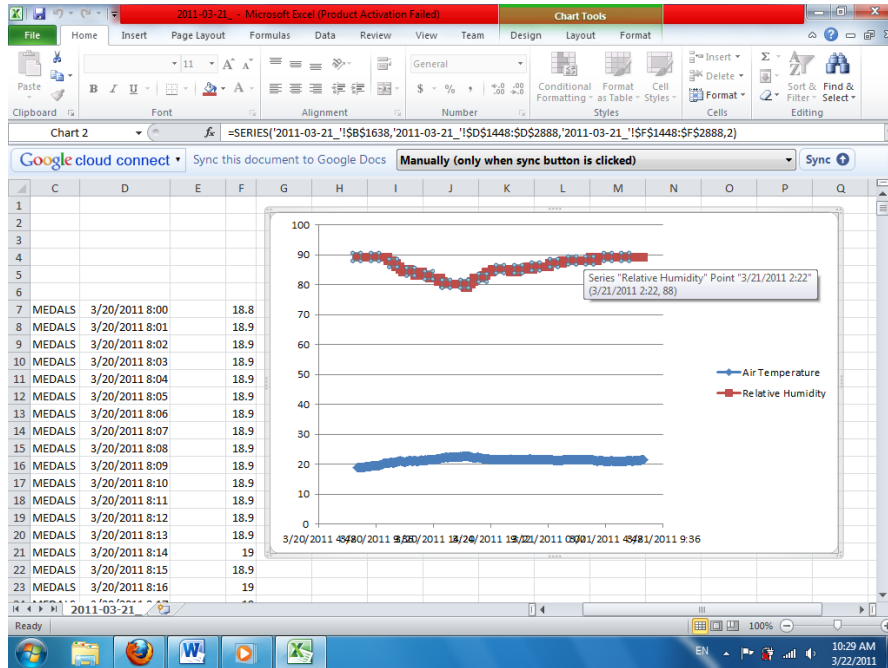
2.14. Now we have added the first time series of interest (air temperature time series of PolyU station). To add the second time series (relative humidity of PolyU station), click the Add button under Legend Entries again. Then create the time series line for relative humidity of PolyU station in a fashion similar to steps 2.7 to 2.13.



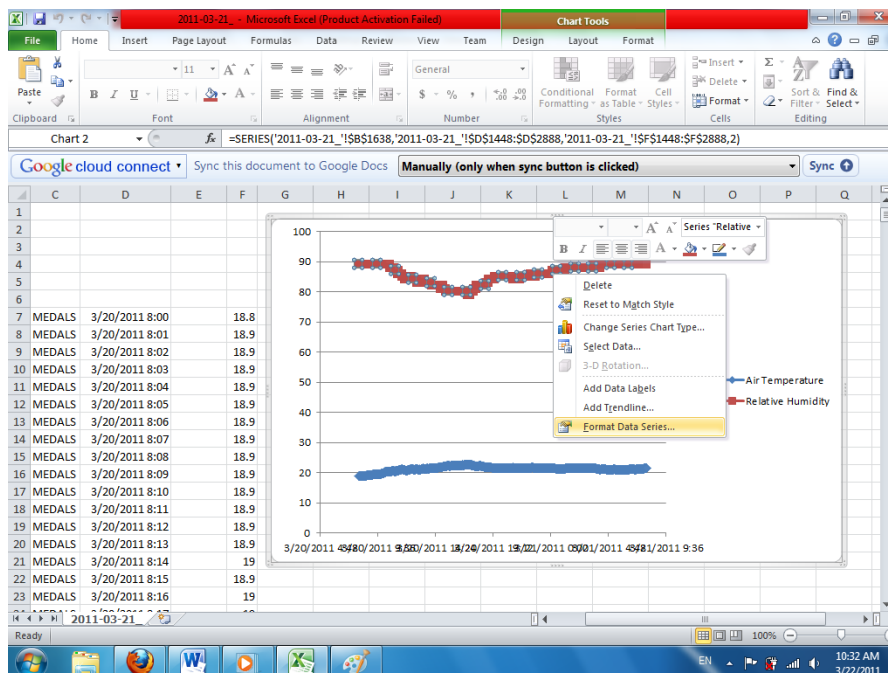
3. Adding a secondary y-axis to the graph

Now that we have the air temperature and relative humidity time series on the same graph, let's enhance the graph by adding a secondary y-axis to the right side of the graph. This allows for better observation between the relationship of the air temperature and relative humidity curves.

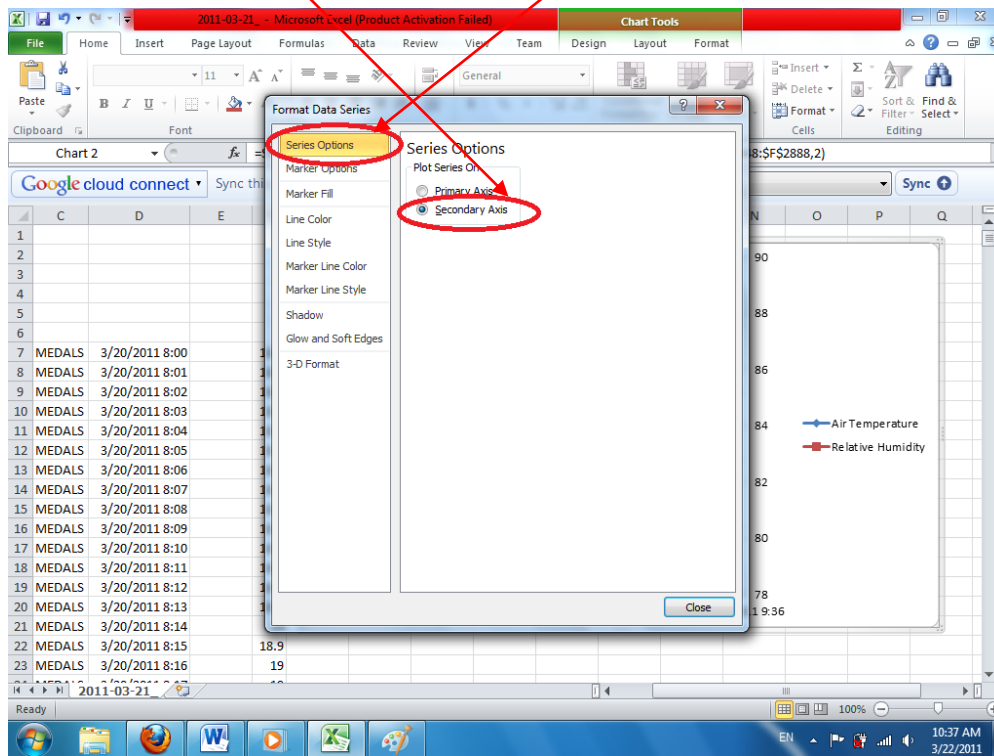
3.1. Click on the time series of the relative humidity. You should see lots of data point marks along the relative humidity time series after you click on it.



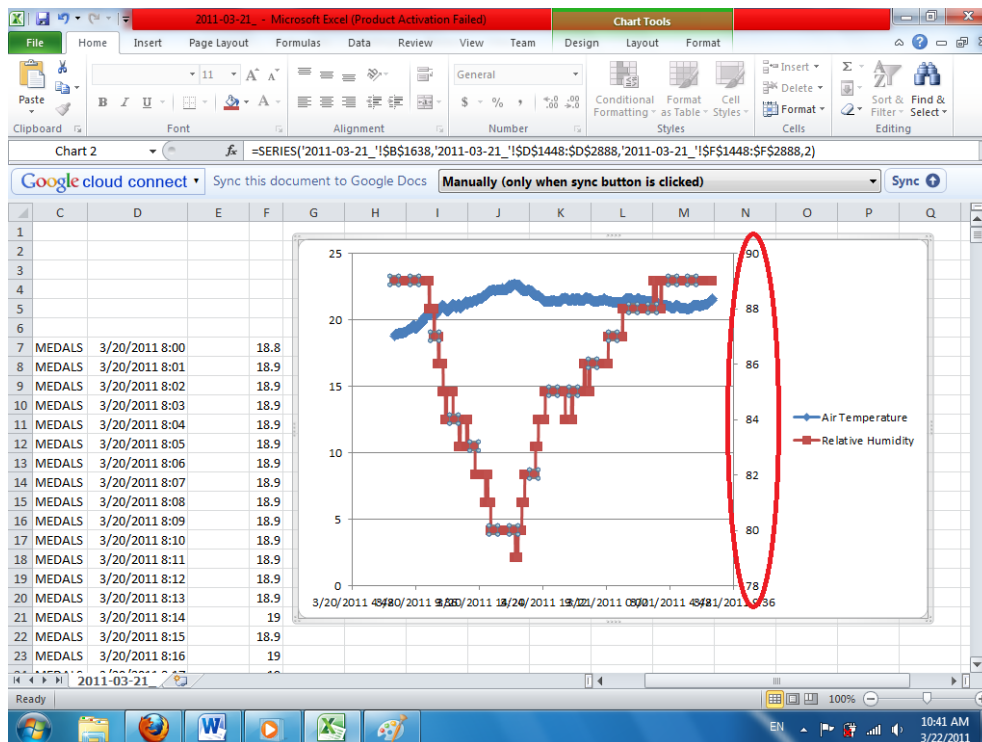
3.2. Right-click on the selected relative humidity time series and select the menu item "Format Data Series" from the popup menu.



3.3. In the resulting Format Data Series dialog box, (1) click on the Series Option tab on the left, and (2) select the Secondary Axis radio button. Then click the Close button.



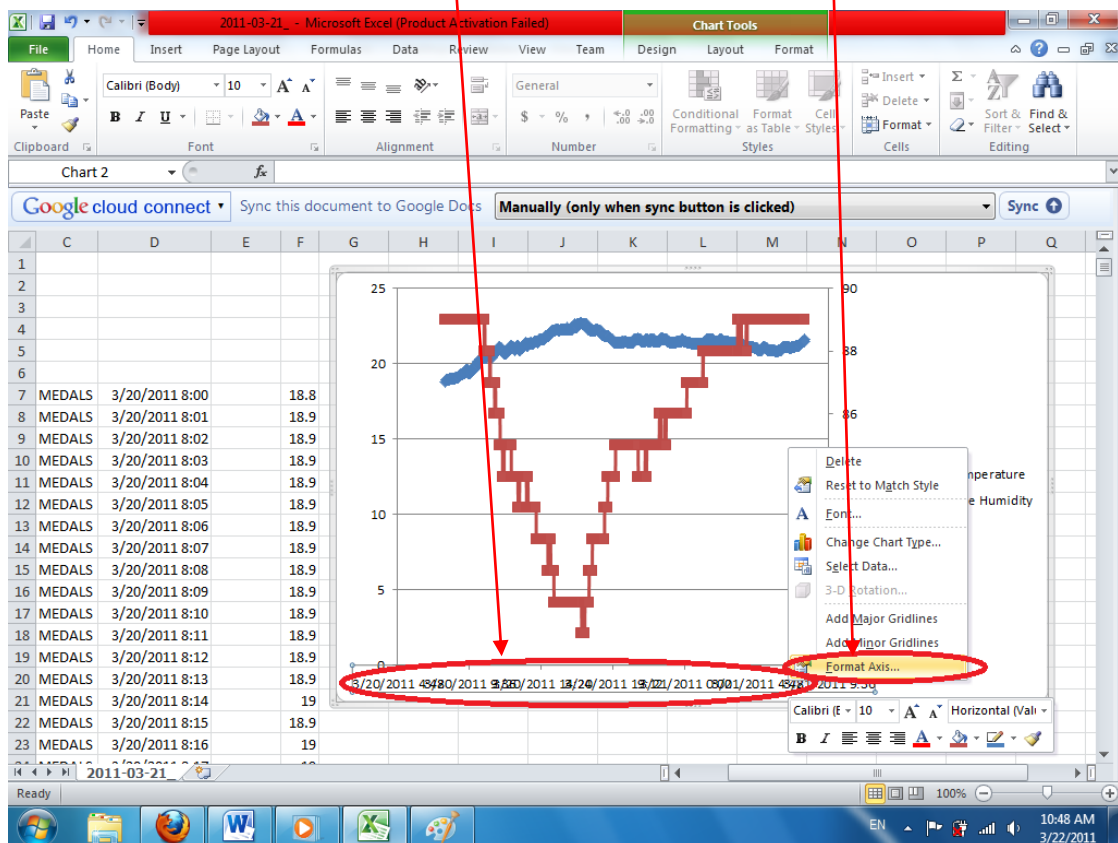
3.4. In the resulting graph, notice the newly added secondary axis for the relative humidity (circled in red). Also, note that the air temperature and relative humidity time series are closer together, facilitating the examination of the relationship between the two curves.



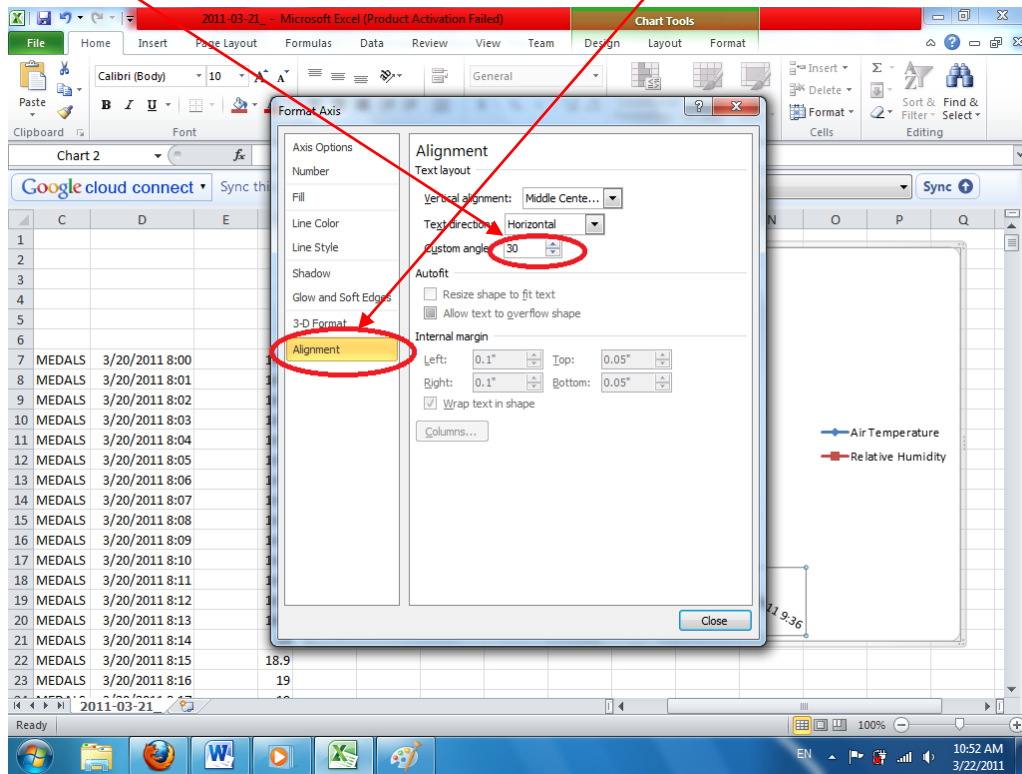
4. Slanting the x-axis (time axis) label by n degrees.

Next, note that the labels of the x-axis (time axis) are all jumbled up, almost like the motley of clothes just after laundry. This makes it difficult to read what time a particular data point occurs. One possible solution is to slant the angle of display of the x-axis labels by a certain number of degrees. (We'll slant it by 30 degrees in this tutorial.)

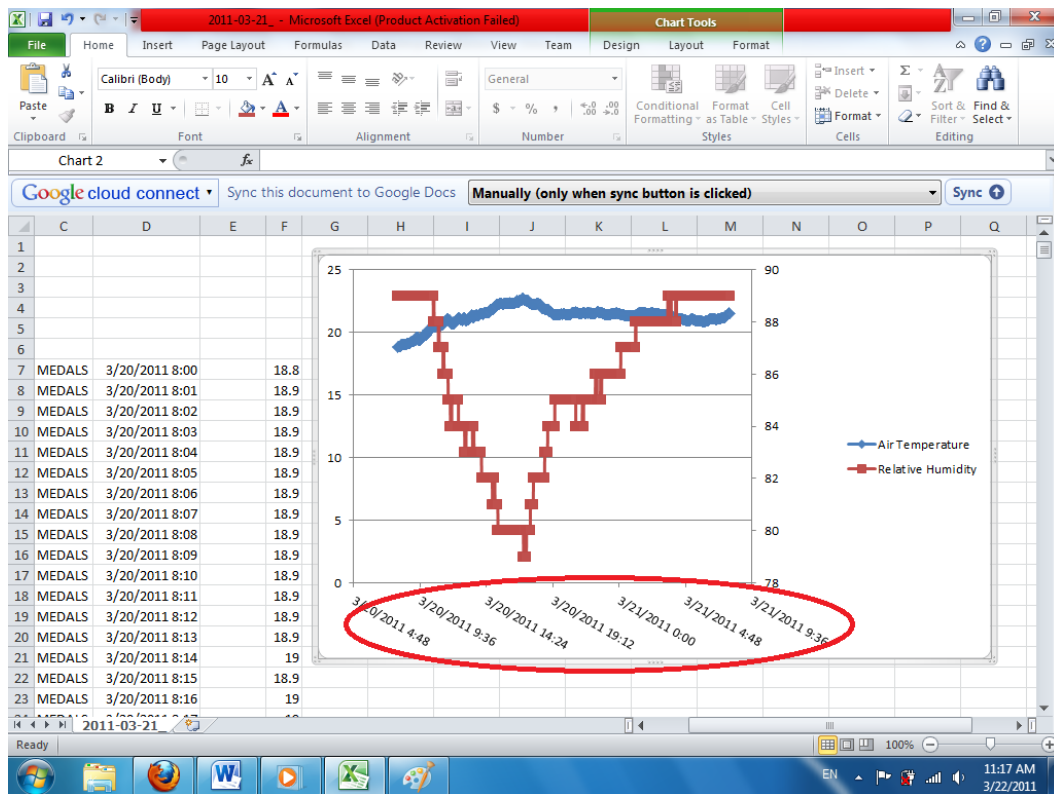
4.1. In the chart area, click on the (1) Horizontal (Value) Axis and then right-click to bring up on the popup menu. In the popup menu, click on the (2) menu item "Format Axis". This will bring up the Format Axis dialog box.



4.2. In the resulting Format Axis dialog box, click on the (1) Alignment tab on the left, then (2) enter value “30” in the Custom angle field. Press the Close button afterward.



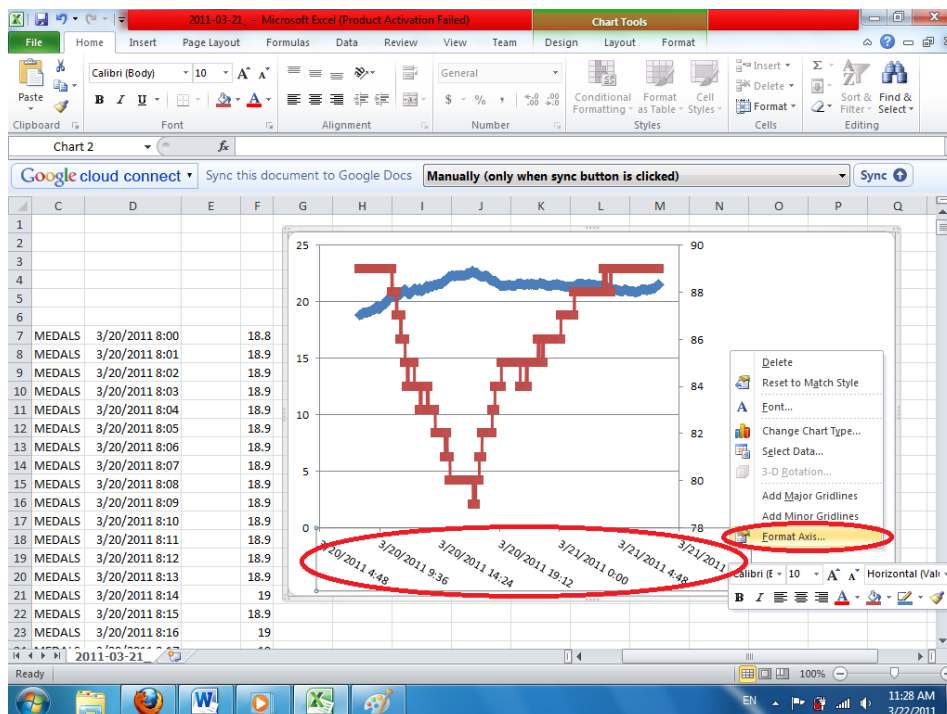
Note that in the resulting graph, the readability of the x-axis labels has been greatly improved.



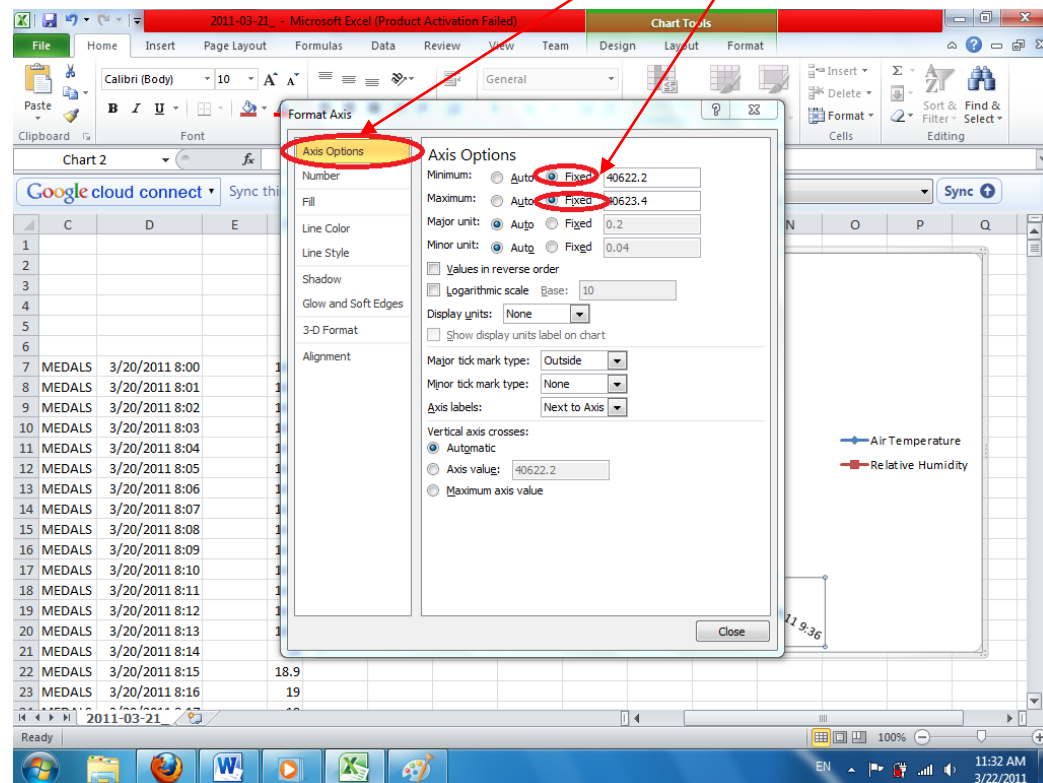
5. Manually setting the start point and end point of the x-axis (time axis)

Recall that our data begins at March 20, 2011 at 8:00 and ends at March 21, 2011 8:00, so you'll probably expect the x-axis (time axis) to begin at March 20 08:00 and end at March 21 08:00 as well. However, contrary to expectation, the time axis on the graph begins at March 20, 2011 at 4:48 and ends at March 21, 2011 9:36. Why? This is Excel leaves a margin before the starting point and after the ending point of the x-axis if you ask Excel to automatically render the start and end points, which is the default behaviour. So to have the x-axis begins at March 20, 2011 8:00 and ends at March 21, 2011 8:00, you'll need to manually set at the start and end points of the x-axis. This section of the tutorial goes through how to do this.

5.1. First, select the Horizontal (Value) Axis, then right-click to bring up the popup menu, where we click on the menu item "Format Axis". This brings up the Format Axis dialog box.



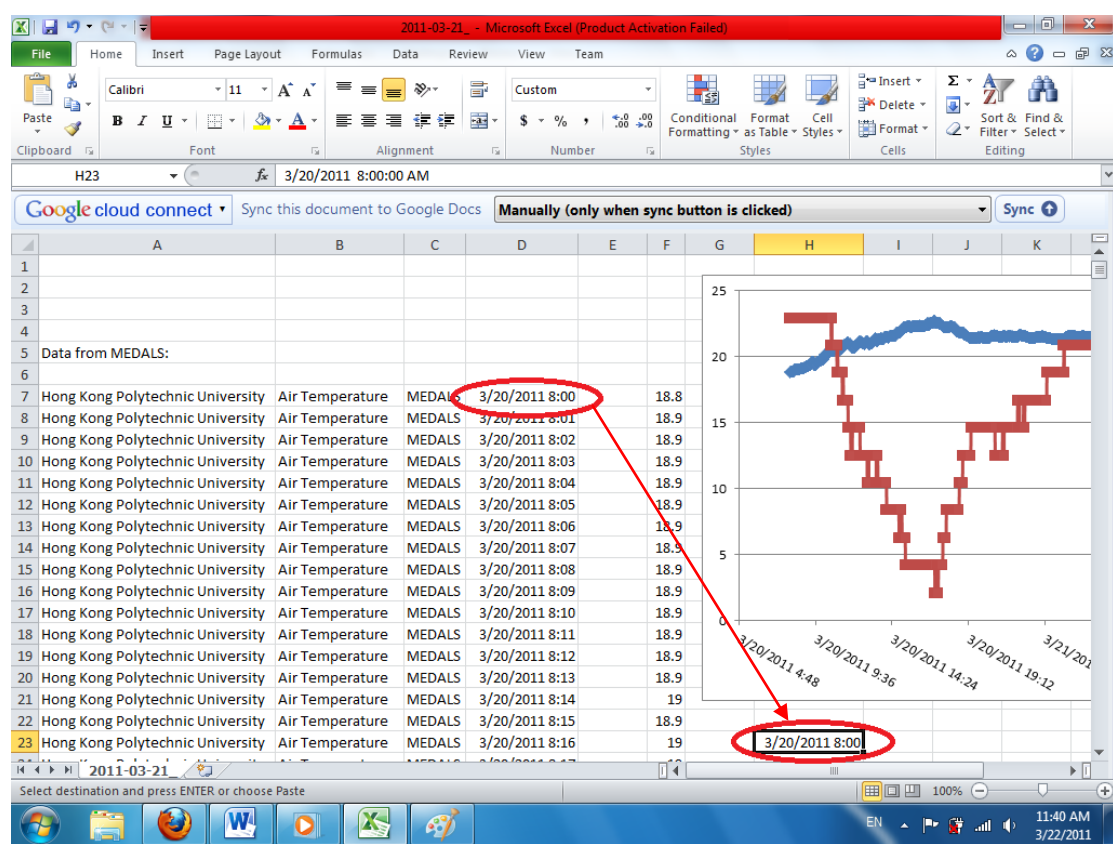
5.2. In the resulting Format Axis dialog box, click on the tab Axis Options tab on the left, then select the Fixed radio buttons for both Minimum and Maximum. This tells Excel that you are manually setting the min and max of the x-axis instead of letting Excel automatically handle it.



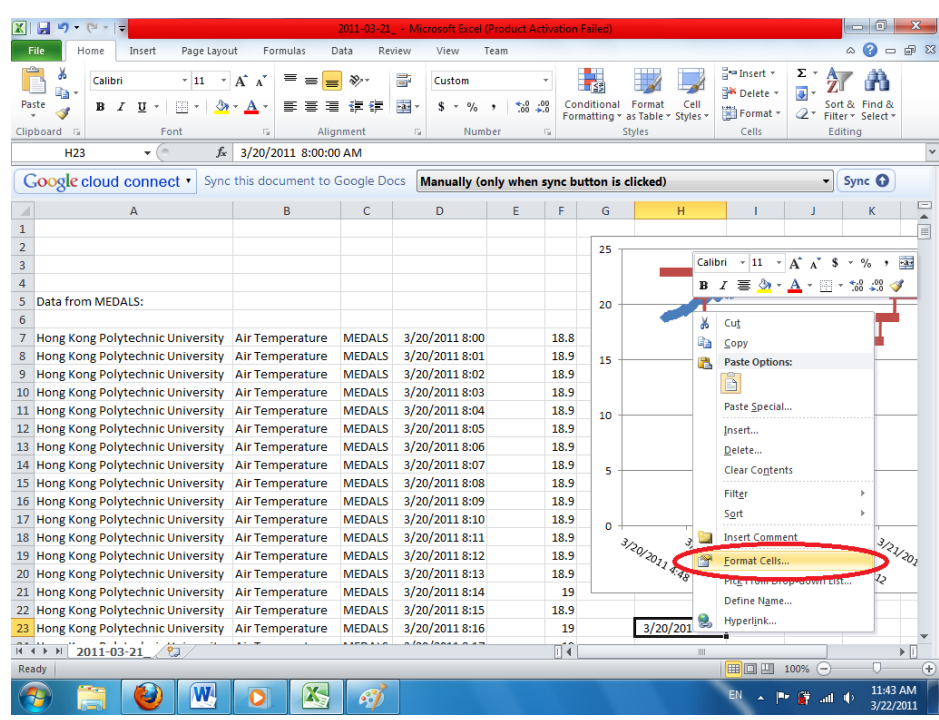
Note that the values in the Minimum and Maximum fields are displayed in a decimal number, not in datetime format. Excel is only able to recognize decimal numbers in all its axis. So to manually set the min and max of the x-axis (time axis), you'll need to manually convert the required datetime value to the corresponding decimal number yourself.

Fortunately, there is a trick in Excel that can perform this conversion on your behalf.

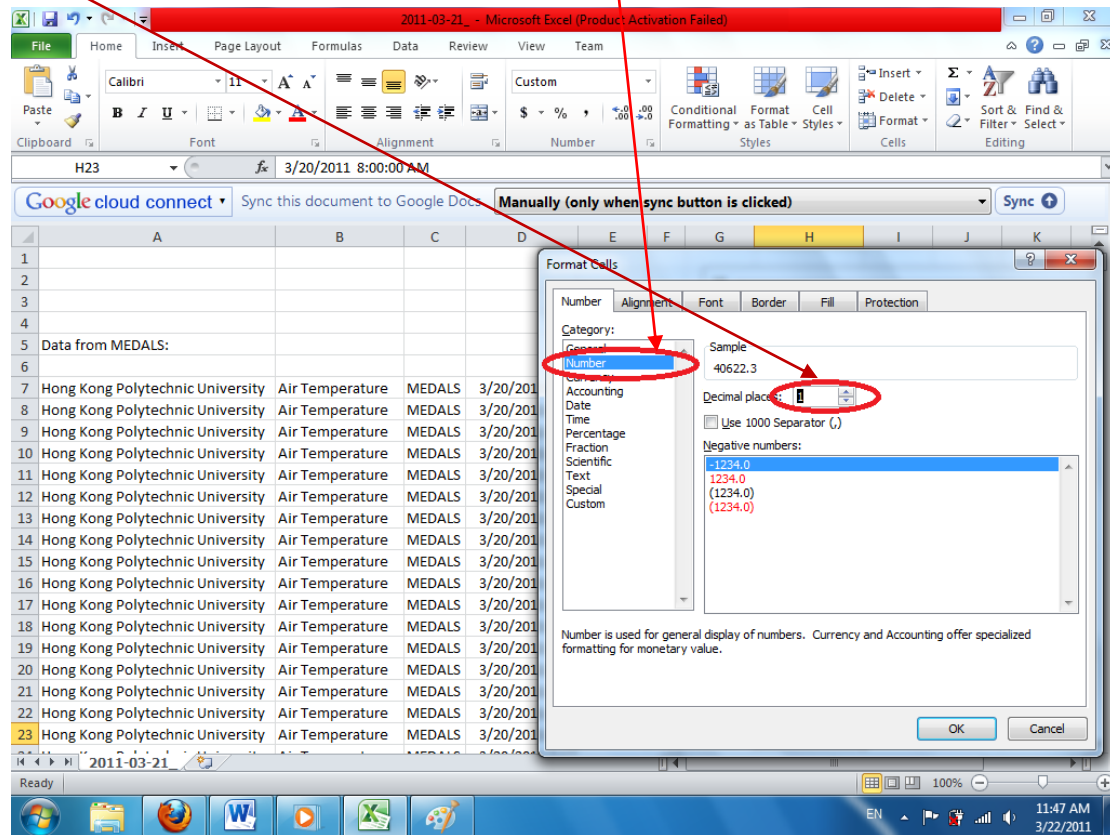
5.3. First, press the Close button to close the Format Axis dialog box. Then copy the beginning timestamp (i.e. March 20, 2011 08:00) from Cell D7 to another currently unused cell (we chose cell H23 in this tutorial).



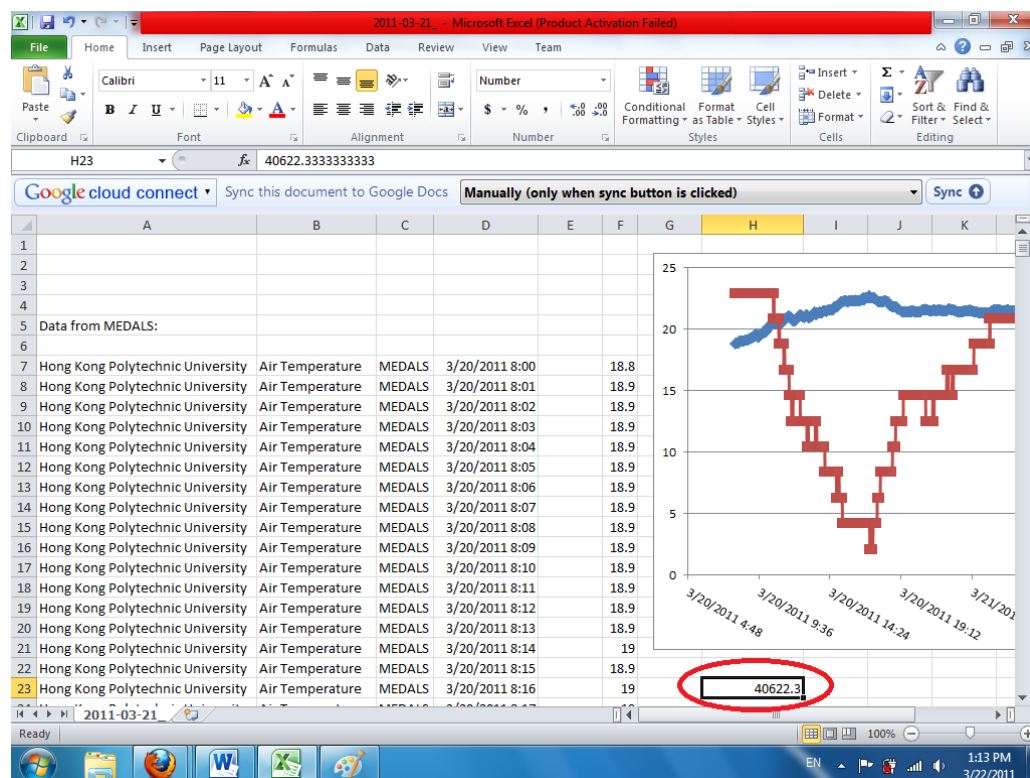
5.4. Next, in the cell where you just copied the beginning timestamp to (cell H23 in this tutorial), right-click the cell and click on the menu item "Format Cells" in the resulting popup menu. This brings up the Format Cells dialog box.



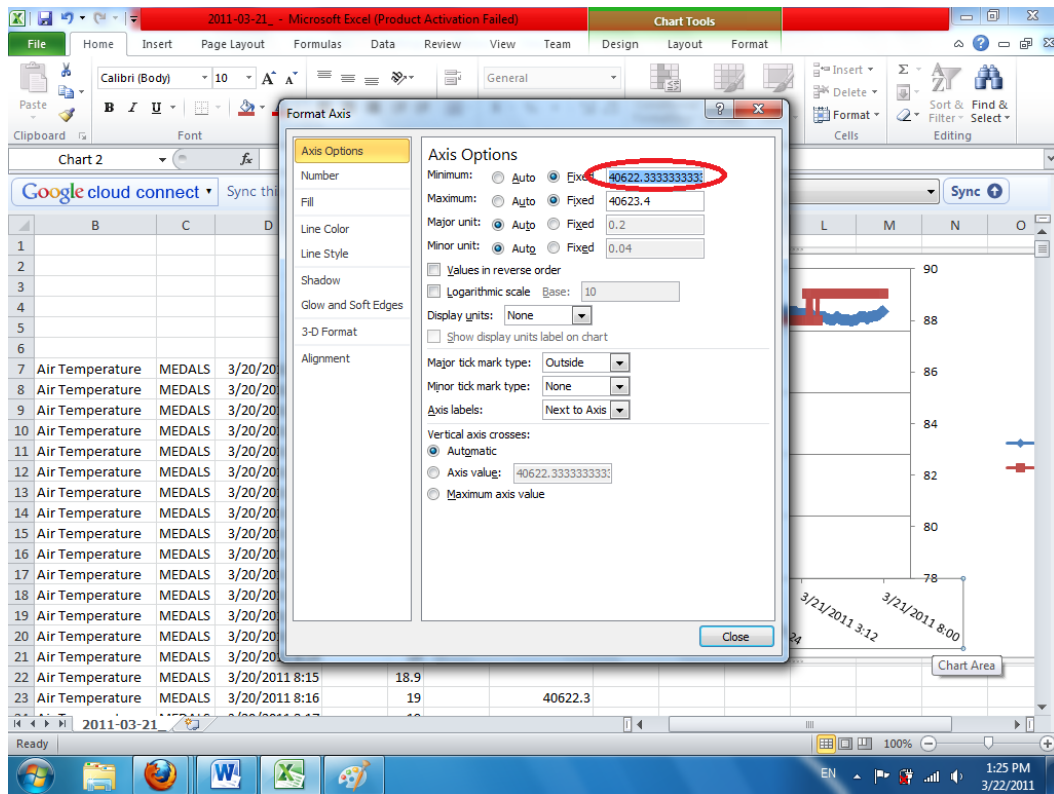
5.5. In the resulting Format Cells dialog box, (1) select Number under Category, and (2) enter “1” in the spinner “Decimal places”. Press the OK button afterward.



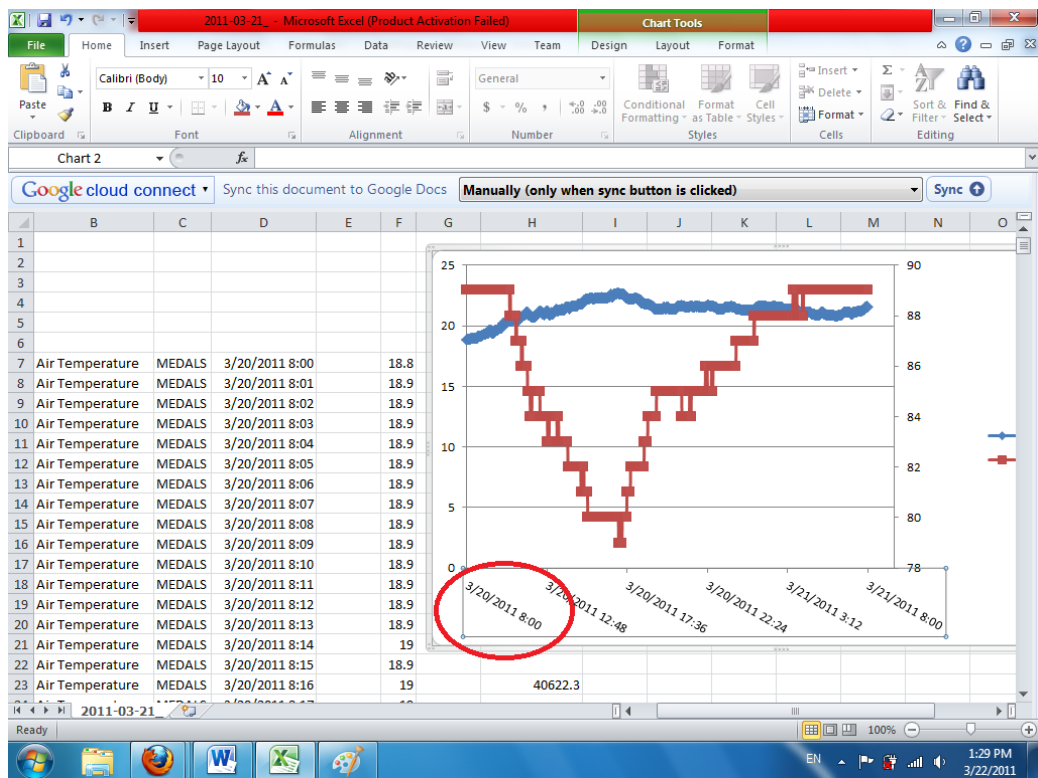
5.6. In the spreadsheet, note that the timestamp value has now been changed to a decimal number.



5.9. In the resulting Format Axis dialog box, paste the value into the Minimum textbox under Axis Options. Then press the Close button.



5.10. In the graph, you can see that x-axis now starts at March 20, 2011 08:00 instead of 04:48. You can repeat the same procedure in this section for manually setting the endpoint of the x-axis.



6. Adding graph title, axis titles, legend, and other chart-related accessories.

To add other chart-related accessories such as graph title, axis titles, legend, etc, first click anywhere on the chart area. Excel will show the Chart Tools in the menu bar (see the red circles in the figure below). Feel free to explore the Chart Tools menu to add chart-related accessories. They should be pretty intuitive to use. We'll leave this as an exercise for readers to explore.

