EEN118 LAB EIGHT

This lab is all about data-processing. You will be reading information from a file that contains thousands of individual pieces of data, far too much for a person to deal with, but displaying it in a form that is very easy to understand.

On the class web site, associated with this lab, there are 76 data files each containing a year's worth of weather observations from a different city in the U.S. Choose one of them and down-load it to the computer you are using.

Each of the files has one line of data for each day of a particular year (but beware: this is real data, so some observations may be missing). Each line contains nine numbers. As an example, this is the line of data for the 4th of July 2003 from the file for Yellowstone, Wyoming:

```
2003 07 04 34 55 72 -1 0 12
```

The first three numbers give the year, month, and date of the observations. The remaining numbers are

4. The minimum temperature recorded on that day (Fahrenheit)
5. The average temperature throughout that day (Fahrenheit)
6. The maximum temperature recorded on that day (Fahrenheit)
7. The depth of new snow that fell (tenths of an inch)
8. The total amount of precipitation on that day (tenths of an inch)
9. The maximum wind speed on that day (miles per hour)

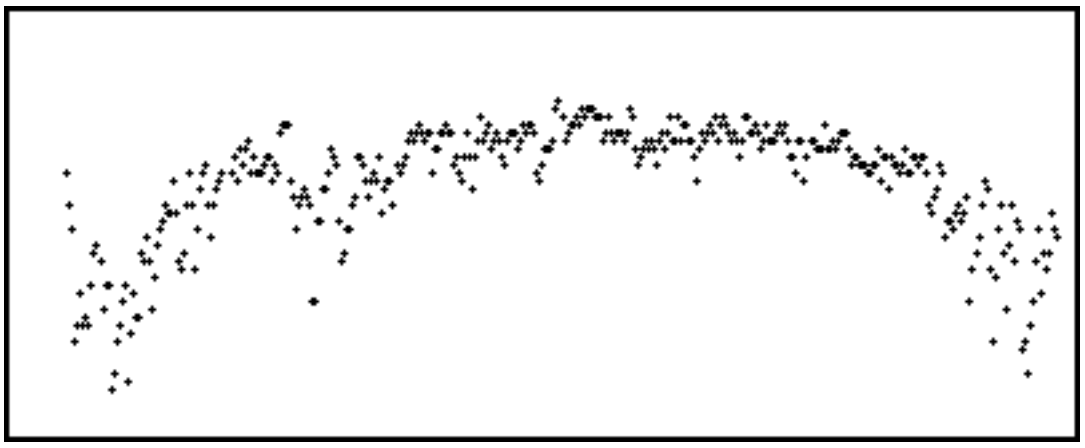
The value `-1` is used to indicate "no new snowfall" or "the wind-speed monitor wasn't working".

1. Display every average temperature recording on a convenient graph.

Write a program that opens a graphics window of a suitable size. The horizontal axis will represent the day of the year (so you need a minimum of 365 pixels) and the vertical axis will represent temperature.

Read every record from the file, and draw a graph of `x`=day-of-year, `y`=temperature.

To simplify the calculations, pretend that every month is 31 days long, so day `d` of month `m` becomes day `(m-1)*31+d` of the year. If you pick a reasonably sized pen, you should produce a graph looking something like this, depending on the location you chose:



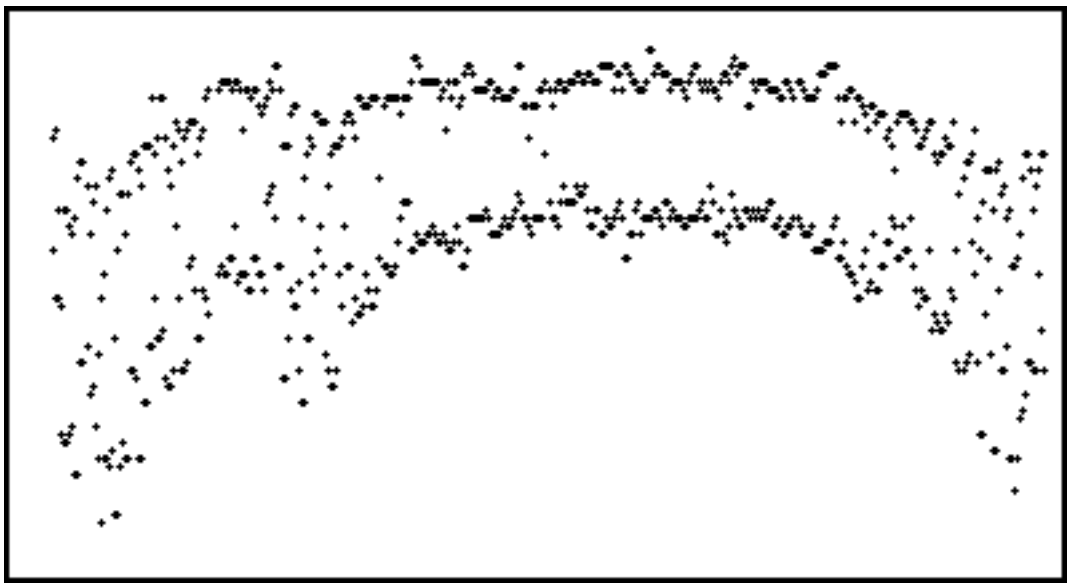
2. Get the dates right.

There aren't really 31 days in each month, and that simplifying assumption leaves gaps in the graph. Sometimes, the large gap at the end of February can be quite noticeable. You need to be able to convert day and month to the true day of the year. Fortunately, you wrote a program that performs that calculation for an earlier lab. Just copy that bit of program to get the right day-of-year number, then you can make a graph without unnatural gaps in it.

3. Make it more informative.

The average temperature for a day isn't as useful as it seems. People deciding what to pack for a trip would usually prefer to know the minimum and maximum.

Modify your program so that for each day it plots points: one showing the highest temperature on that date, and the other showing the lowest.

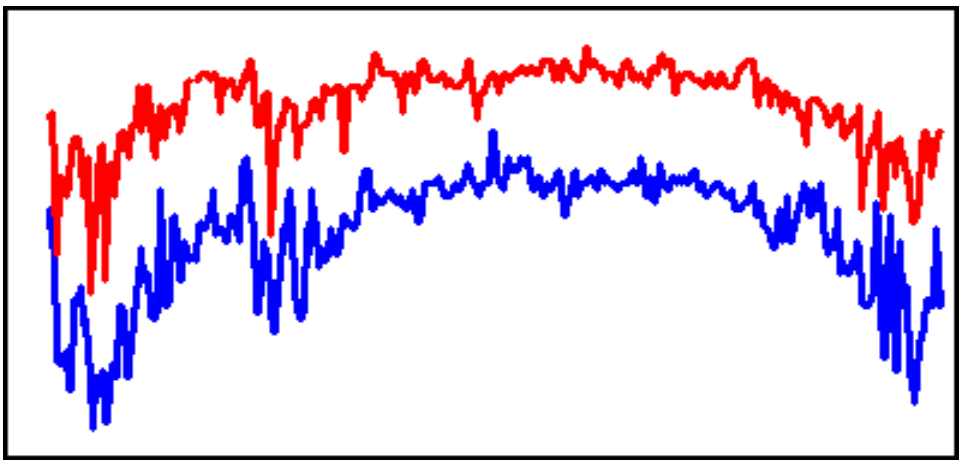


4. Improve it.

In the summer, it is easy to tell which points are for the minima and which are for the maxima. In the winter, as you can see, they can get very confused. To make the graph more comprehensible, add two features:

a. Plot the two series of points in a different colour.
b. Make them both be line graphs, not just disconnected points.

For Miami, the data set I have been using in these samples, you should get something like this:

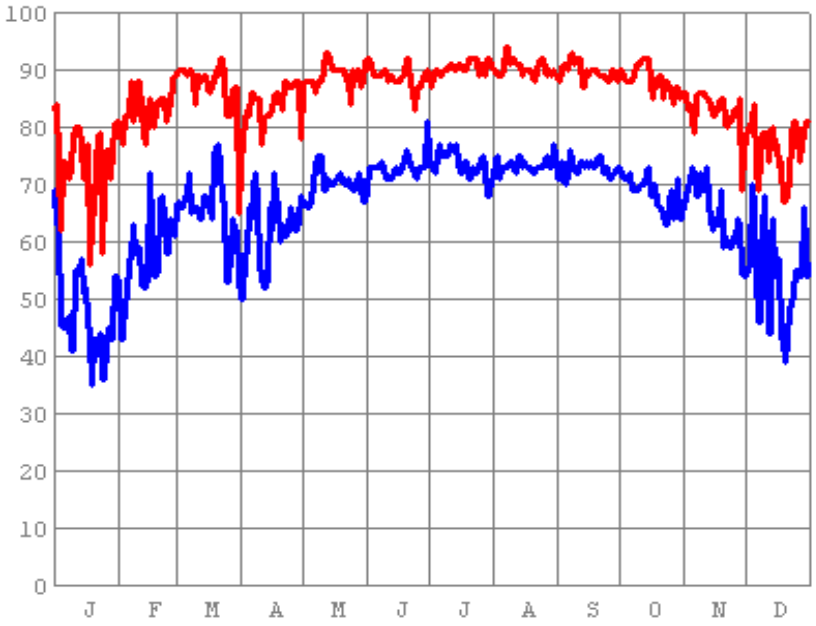


That's more like it, but there's still room for some improvement...

5. Make it Useful.

Put some visual aids in there. At the very least draw a grid (in grey, so that it isn't too intrusive) showing a vertical line on the first day of each month, and a horizontal line at each ten-degree interval. Draw the grid before drawing the graph, so that the graph is drawn on top.

It would be even better if you could add letters along the bottom indicating which month is which, and numbers up the side showing the actual temperatures each horizontal line represents. You may want to change the vertical scale so that the numbers aren't squeezed too closely together.



Before you go.....

Your program should work just as well for any of the data files. Download a different one and test it. This may help you to see errors that you didn't notice before. You don't know which data set will be used when your work is graded.

6. Extra Credit

There is more information in the data files than just minimum and maximum temperatures. Allow the user to choose which one or two of the six potentially interesting data items will be drawn.