

Long Problem Set 01

In this long problem set you will examine data made available by London Air, a website managed by Kings College in London that reports results from the continuous monitoring of air quality at hundreds of sites spread throughout the greater London area. If you wish, you can review the site here

<https://www.londonair.org.uk/LondonAir/Default.aspx>

The file `LPS01.RData` contains data reporting the daily average level of NOX (the combined concentrations of NO and of NO₂) in $\mu\text{g}/\text{m}^3$ and the daily average temperature in $^{\circ}\text{C}$ as recorded in 2017 at a roadside monitoring station located on Marylebone Road in Westminster, which is near Regents Park, Madame Tussaud's Wax Museum, and Baker Street, the "home" of Sherlock Holmes. The data file contains 15 objects, of which 12 are data frames, one for each month, that contain results for NOX and for temperature. Here, for example, are results for the first six days of January from the data frame `jan.data`; note that on some days the temperature was not reported and is listed as NA for not available.

Month	NOX	TEMP
January	180.3	7.3
January	133.2	3.3
January	423.1	3.0
January	175.4	NA
January	334.4	NA
January	628.7	NA

The remaining three objects are a data frame with the name `marlybone` that includes results for all 365 days, a vector with the name `days` whose values run from 1 to 365, and a vector with the name `months` that contains the names of the months.

You will share your answers to these problems in two ways: a text document that contains your written responses to the questions, and a `.R` script file that contains your code (use comments to separate your code by problem). Save your script file using `yourlastname_LPS01.R` as a file name and share it with by email. You may use any program you wish for your text document. See the document *Creating Plots Using R's Base Graphics* for information on how to copy a figure created using R into a text document.

Your answers to the following questions are due by 4:00 pm on Tuesday, September 4th.

1. For NOX as an analyte, report the mean, the median, the standard deviation, the IQR, and the MAD for the month of January and for the month of July. Comment briefly on your results.
2. For NOX as an analyte, construct a histogram and a stripchart for the month of January and for the month of July. Comment briefly on your results.
3. For NOX as an analyte, create a single panel that has separate boxplots for January and for July. Repeat using temperature in place of NOX. Comment briefly on your results.
4. Create a single scatterplot of temperature (on the x -axis) vs. NOX (on the y -axis) using the data for January and for July. Use different point symbols and different colors for the two months. Add a legend to your plot and a set of grid lines. Set the lower limit of each axis to zero and choose upper limits that will display all points. Give the axis labels appropriate names and add a suitable main title to your plot. See the document *Creating Plots Using R's Base Graphics* for hints on how to create and modify plots. *Note: The `plot()` command plots a point only when both variables for a day are numeric; if either variable's value is missing (NA), the function simply ignores that day when plotting your data.*