Week 6 in-class exercise/homework

(1) Break up into four groups of equal size.
(2) This week, we're upping the difficulty level and working with REAL DATA from the wild.
(3) Download the data and paper.
    a. The data are on Dryad at this location: http://datadryad.org/resource/doi:10.5061/dryad.qc537
    b. Download the PLANT DATA ("Lau and Lennon PNAS plant data.csv").
    c. The link to the paper is further down the page: http://dx.doi.org/10.1073/pnas.1202319109.
(4) We are going to reproduce the analyses and figures that make up Figure 1.
    a. Your group will be assigned panel A, B or C.
    b. The data file contains all the data you need for all three panels.
(5) Work together with your group to decide how to approach each problem using R.
    a. Determine what tests they did – we're not going to do those exactly.
    b. Instead, we'll do a two-factor analysis of variance.
        i. Use aov(response ~ factor1+factor2+factor1*factor2) instead of lm.
        ii. Posthoc_test <- TukeyHSD(aov).
        iii. We're using aov today because it does the same thing as lm, but it makes it easier to set up the post-hoc test for a two-factor ANOVA.
(6) Follow the necessary steps to analyze and graph the data:
    a. Check the data to make sure they satisfy the assumptions of the test you would like to do (analysis of variance).
    b. Perform any necessary transformations, if you think they will help. Check to see if they did help (HINT: look in the paper to see what they did).
    c. Make a table of means and standard errors.
    d. Graph the results (and try to put error bars on your graph).
    e. Perform your statistical test.
    f. Evaluate the null hypothesis on the basis of your results.
(7) After 10 minutes, I will ask the class what null hypothesis is being tested in Figure 1.
(8) As you work through the exercise, keep track of any pitfalls you encounter so you can describe them later. Ask for help if you get stuck!
(9) As you perform the steps of your analysis, evaluate whether or not the steps taken by the authors were justified.
(10) At the end of your analysis, were your results consistent with the results presented in the paper? Were there any noticeable differences? Were the authors' conclusions supported by your analysis?
(11) In the last 15 minutes, we will go around the room and discuss any pitfalls encountered by each group. We will also discuss the approaches used to overcome the pitfalls.
(12) At home, finish the analysis of all three panels of Figure 1. Answer questions (9) and (10) above. Turn this assignment in to me next Tuesday.