STATISTICAL METHODS II
ASSIGNMENT 04
DUE: 8 FEBRUARY 2011

This homework assignment deals with problems concerning comparing means of multiple groups. Please make sure you read the questions thoroughly and think about them *before* you begin your answer. The two questions use pseudo-data, data that I created from my computer. As always, you will need to use R to answer it. Download the two data sets from the web site (or link to them in your script). The filenames are given in the individual problems.

Your answers to the questions must be nicely typed. The answer should be at least paragraph in length and should follow the same pattern in what information is included:

- State the problem.
- State the null and alternative hypotheses in words.
- State the test you will use, its assumptions, and why you chose this test.
- In your answer, include the value of the test statistic, the degrees of freedom (if applicable), and the calculated p-value.
- Clearly draw the appropriate conclusion.

When you hand in this assignment, attach your R script to the back of the pages and include graphs immediately after (or with) the problem.

If you have any questions or issues, let me know as soon as possible.

Good luck!

PROBLEM 04.1   ⟦4⟧

My client wishes to test which of three types of fertilizer are most effective in growing
spelt wheat (*Triticum spelta*). To test this, he took a single plot of land and divided it
into nine (9) sub-plots, planting spelt in each of the sub-plots. He then applied the first
type of fertilizer to the three sub-plots nearest to the road; the second type to the next
three nearest; the third type to the three farthest from the road. He then measured the
height of 12 wheat plants in each plot prior to harvesting the wheat. A summary of the data
is provided in the table below (and the entire data is provided in the datafile `wheat2.csv`).

Plot	Fertilizer	Mean Height
A1	N18-P51-K20	35.08
A2	N18-P51-K20	35.00
A3	N18-P51-K20	33.75
B1	N13-P00-K44	30.00
B2	N13-P00-K44	30.50
B3	N13-P00-K44	30.67
C1	N18-P18-K18	20.00
C2	N18-P18-K18	19.25
C3	N18-P18-K18	21.58

Is there a statistically significant difference in the height of the wheat plants based on
the fertilizer used?

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In addition to answering the above research question appropriately, please write a para-
graph explaining why this experiment may be a bad experiment and that your results may
be incorrect.

PROBLEM 04.2   ⟦6⟧

Biomes are categories of similar climactic conditions on earth. Such conditions include plants types, soil types, and weather types. There are multiple biome classification schemes, each of which emphasizes certain aspects of the environment. The `biome2.csv` dataset uses the WWF system.

The dataset contains 30 sites around the United States. At each site, the biome type is determined, the distance to Stillwater is measured (in miles), the elevation of the site is measured (in feet above mean sea level), the mean fire return interval (mfri) is determined (in years) using tree ring data, and the standard deviation of the fire return interval (sfri) is calculated (in years).

Researchers hypothesize that the mean fire return interval is dependent upon the biome type. Does the sample data support this hypothesis?

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In addition to answering the above question appropriately, answer the following additional questions completely:

(1) What is the variance of the mean fire return interval without taking the biome into consideration?

(2) What is the variance of the mean fire return interval taking the biome into consideration (you will have to add the variances in each biome)?

(3) Does knowing the biome give us statistically significant information about the expected mean fire return interval?