Homework 1
Statistics 411: Fall 2017
Due: In class September 8

1. Read the article Your Brain on Meth: Forest Fire of Carnage available at http://discovermagazine.com/2005/jan/brain-on-meth or via links on the STAT411 website. Type your solutions and include them at the beginning of the report that you submit.

(a) Give the five steps of the scientific method. For each of the five steps of the scientific method, indicate how that step was carried out by the scientists described in the article.

(b) Who or what is the population of interest?

(c) Guess what the sampling plan was (the article does not say, but we can make a good guess how the researcher found subjects).

(d) Does the article report on the results of an observational study or an experiment? Explain.

(e) Give the two main statistics that the article reports.

(f) Give the Scope of Inference for this problem.

2. The following questions relate to Exercise 25 on page 25 of your text. Do not make a stem and leaf plot as suggested by your book. You must report your answers to this problem in the format according to the Syllabus and Writing a Statistical Report available on the course website. The report, not including the Appendix that contains your R-code and R-output and figures and any tables, should not exceed two pages. Your grade will be determined by how well you answer the questions and by the organization and clarity of your write-up.

(a) Load in the data for this problem. In R:

```r
library(Sleuth3) # You must have already installed the Sleuth3 package for this to work
rats = ex0125
rats
```

(b) Be sure to indicate the sampling plan and the experimental design.

(c) Plot side-by-side boxplots of the two groups in R and include in your report (see Lab 1 for R code).

(d) Apply a randomization test of the hypotheses that the mean zinc level in rats is affected by a calcium dietary supplement (see Chapter 1 notes for R code). Be sure to check the assumption that the randomization test is appropriate. Be sure to report the p-value and a CI for the difference in means. Put the R-code and R-output in the Appendix.

(e) Apply a Welch two-sample t-test of the hypotheses that the mean zinc level in rats is affected by a calcium dietary supplement (see Chapter 2 notes for R code). Be sure to check the assumption that the t-test is appropriate. Be sure to report the p-value and a CI for the difference in means. Put the R-code and R-output in the Appendix.

(f) Compare the results from the randomization test to the t-test. Are they similar? Did you expect the results to be similar? Why or why not? It is common to analyze data using different statistical methods. If you get similar results, great! If not, then you need to figure out why the results are different and whether one, or all, of the methods are inappropriate for the data.