

Assignment #11 contains problems about ANOVA. Problems which require the use of R have the symbol **(R)**.

Please include **your name** and **the discussion section (day/time) that you attend** on your homework. This assignment is worth 50 points in total. If you feel challenged by these problems, I encourage you to do additional problems on your own. Many problems have answers in the back of the textbook.

Your assignment must be turned in during lecture or to your TA's mailbox by 5pm on the due date. We will not grade late homework. If there are special circumstances, please speak to Professor Larget, preferably in advance, for consideration.

1. [5 points] Do Exercise 11.2 using your calculator.
2. **(R)** [5 points] Use R to create an ANOVA table for this data and to confirm your hand calculations.

There are several ways to enter the data into R. First, if your computer is connected to the internet, you can read in the data from the URL. (I split the command over two lines, but you would typically type it on a single line.)

```
> ex11.2 =  
read.table("http://www.stat.wisc.edu/courses/st371-larget/ex11-2.txt",header=T)
```

You can also download the file `ex11-2.txt` from the link on the course schedule. Make sure this file is in the R current working directory.

```
> ex11.2 = read.table("ex11-2.txt",header=T)
```

Finally, if you have downloaded the file, you can use the function `file.choose` to browse for the file.

```
> ex11.2 = read.table(file.choose(),header=T)
```

To check that one of the previous methods worked for you, use the `str` function to display the structure of the data frame `ex11.2`.

```
> str(ex11.2)
```

This should indicate that `ex11.2` is a data frame with 12 observations and two variables, `y` which takes on integer values and `sample` which is a factor with three levels.

You can use the `lm` function in R to fit an ANOVA and the `anova` function to display the ANOVA table.

```
> fit = lm(y ~ sample, data = ex11.2)  
> anova(fit)
```

3. [R](#) [5 points] Do Exercise 11.6. Use the `pf` function in R to find the p-value. The function `pf` takes three arguments, the test statistic, numerator df, and denominator df. It returns the area to the left, but the p-value is the area to the right. For the problem, replace `f`, `df1`, and `df2` with numbers.

```
> 1 - pf(f,df1,df2)
```

4. [5 points] Do Exercise 11.8.
5. [R](#) [5 points] Confirm the calculation of the ANOVA table for exercise 11.8 using R. The data is on the course web page, called `mao.txt`. Follow the example from the previous problem for the proper R commands.
6. [10 points] Do Exercise 11.35 using both Newman-Keuls and the Bonferroni methods to make the six different pairwise comparisons.
7. [R](#) [10 points] Do Exercise 11.50. Use the F tables in the back of the book to find a range for the p-value. Then use the `pf` function in R to compute the p-value more accurately.
8. [5 points] Do Exercise 11.52.