Peng Zeng @ Auburn University
09-01-2016

Suggested Format for Homework Problems Using SAS

If you use SAS to finish homework problems, you should copy and paste **related** SAS outputs (including plots, if any) to Microsoft Word (or other word processing software you use).

Include SAS codes in the end of your solution.

Homework only containing computer output will earn zero point. You should show that you understand the outputs and are able to locate answers in outputs.

For special symbols such as α, β, λ, μ, σ, you may simply write alpha, beta, lambda, mu, and sigma if you do not know how to type them in Microsoft Word. It will not affect grading.

For long formulas and equations, you can leave a blank in the document, and write the missing part by hand.

To copy a plot from SAS, right click on the plot, choose Edit from the pop-up menu, and then choose copy.

When copying text outputs from SAS, the copy function may not work sometimes in that you cannot paste the contents you just copied. If it happens, try to highlight the contents from the end of what you wanted to the beginning and then copy and paste. (Shared by Albert Van Hoogmoed)

Alternate way to create output: Add statements `ods rtf` before and after your SAS code

```
ods rtf file = 'E:\homework.rtf';
   /* your SAS codes */
ods rtf close;
```

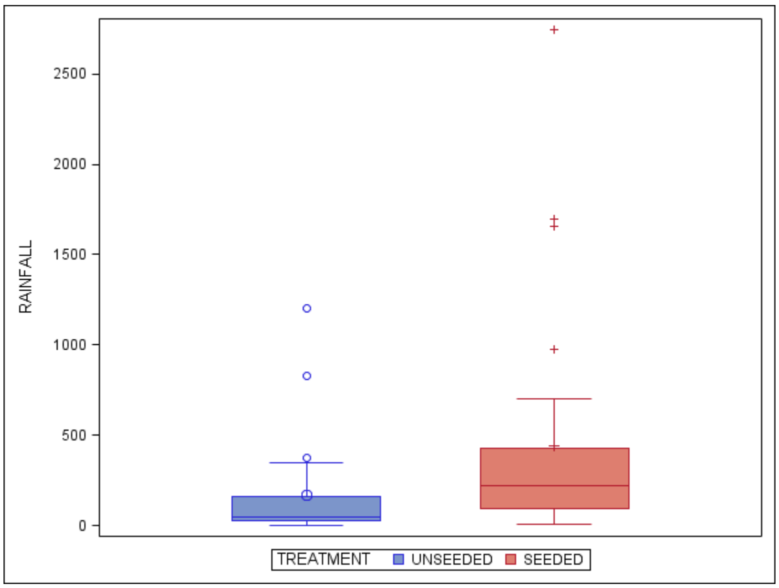
Then SAS will save all outputs including graphs in a RTF file. A RTF file can be edited by most common word processing software such as Microsoft Word. Delete the output that you do not need and add your answer and explanations to complete your homework.

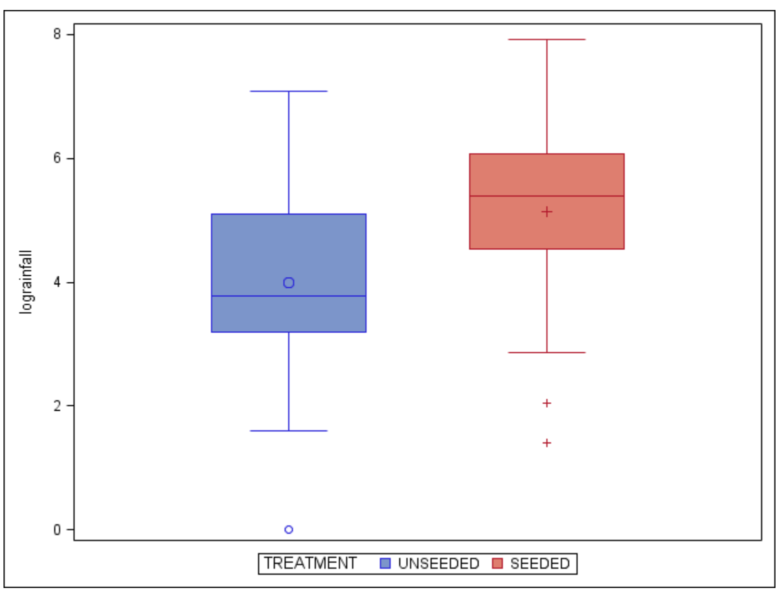
Problem: The data in Display 3.1 of the textbook were collected in south Florida between 1968 and 1972 to test a hypothesis that massive injection of silver iodide into cumulus clouds can lead to increased rainfall.

a) Draw side-by-side boxplots for the original data, and then draw side-by-side boxplots for the log transformed data.
b) Write out the null and alternative hypothesis.
c) Conduct a two-sample t-test. Report your results.

Solution.

(a) The side-by-side boxplots for the original data and for the log transformed data are as follows.





(b) The null and alternative hypothesis are H_0: $\mu_1 = \mu_2$ versus H_a: $\mu_1 > \mu_2$, where μ_1 and μ_2 are the means of rainfall with and without massive injection of silver iodide into cumulus clouds, respectively.

(c) We apply two-sample t-test to the log transformed data. Notice that the alternative hypothesis is one-sided. Because the test for equality of variance is not significance (p-value = 0.8971 is larger than 0.05), we should report the first row of t-test, which assumes equal standard deviations. The test statistic is 2.54 with p-value 0.007 (half of the p-value in the SAS output). We should reject the null hypothesis, which means massive injection of silver iodide into cumulus clouds can lead to increased rainfall.

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	50	**2.54**	**0.0141**
Satterthwaite	Unequal	49.966	2.54	0.0141

Equality of Variances				
Method	**Num DF**	**Den DF**	**F Value**	**Pr > F**
Folded F	25	25	1.05	**0.8971**

SAS code:

```
data cloud;
   input RAINFALL  TREATMENT $;
   lograinfall = log(rainfall);
datalines;
1202.60    UNSEEDED
830.10     UNSEEDED
…………
7.70       SEEDED
4.10       SEEDED
;

proc print data = cloud; run;

ods rtf file = 'I:\homework.rtf';

/***** draw side-by-side boxplots *****/

ods listing gpath = 'I:\';
proc sgplot data = cloud;
   vbox rainfall / group = treatment;
run;

proc sgplot data = cloud;
   vbox lograinfall / group = treatment;
run;

/***** two-sample t-test. values in the original scale *****/

proc ttest data = cloud;
   class treatment;
   var rainfall;
run;

/***** two-sample t-test for the transformed data *****/

proc ttest data = cloud;
   class treatment;
   var lograinfall;
run;

ods rtf close;
```