

Statistics 411/511

Homework 6

Due Tuesday, November 17 by midnight Pacific time

- **Instructions:** Upload homework to Gradescope via Canvas (access specific homework assignments from the [Assignments](#) link on the Canvas course page). Your file must be a pdf document. Please see the end of the syllabus for formatting guidelines.
- The problems are assigned from the **third edition** of the textbook. If you have another edition, consult the copy on reserve at the library website for the homework problems.
- **Academic Integrity** You are encouraged to *discuss* the homework with other students, but what you turn in must be your own work in your own words. **DO NOT** copy someone else's homework. You may share ideas and R code, but do not share R output or written language. The syllabus contains details and links to OSU's Student Conduct Code and procedure for reporting suspected academic misconduct.
- **Please assign pages when submitting to Gradescope.** See [Gradescope help](#) for instructions and a video. Papers without assigned pages will lose 0.5 points.

The purpose of this homework assignment is to give you the opportunity to become familiar with the structure of the ANOVA table for a one-way ANOVA.

1. Parts (a)–(e) of this question are to give the numbers that belong in the corresponding boxes of the incomplete ANOVA table below.

Source	df	Sum of Squares	Mean Squares	F-statistic	p-value
Treatment	(a)	(b)	(c)	(d)	0.004714
Residuals	64	4726.6	(e)		
Total	68	5953.5			

2. For this question, we will work with the data of Exercise 23 in Chapter 5.
 - (a) Read about the data in Exercise 23 in Chapter 5. Look at the `ex0523` data frame. State the name of the response variable.
 - (b) Use R to produce an ANOVA table using the data. Submit your R code and output.
 - (c) State the full and reduced models compared by the F-statistic in the ANOVA table in part (b). You can either use the notation introduced on page 16 of Outline 5 or nicknames designated by the textbook.
 - (d) State the following numbers from the ANOVA table in part (b):
 - i Extra sum of squares
 - ii Extra degrees of freedom
 - iii Residual sum of squares for the full model in part (c).
 - iv Residual degrees of freedom for the full model in part (c).
 - (e) Fit the equal means model and obtain an ANOVA table. The code is the same as in item (b), except use formula `Oxygen~1`. (That's a number "one" on the right-hand side.) Submit your R code and output.

(Problem 2 continued on next page)

- (f) From the ANOVA table in part (e), state the following numbers:
- i Residual sum of squares for the reduced model in part (c)
 - ii Residual degrees of freedom for the reduced model in part (c)
- (g) Confirm that the extra sum of squares in part (d) is equal to the difference between the residual sum of squares for the reduced model and the residual sum of squares for the full model. Just use R as a calculator here, and submit your command and result.
- (h) State how many mean parameters the full model in part (c) has, and how many mean parameters the reduced model in part (c) has. Confirm that the extra degrees of freedom in part (d) is equal to the difference in number of mean parameters between the full and reduced models. Also confirm that this difference is the same as the difference between the residual degrees of freedom for the reduced model and the residual degrees of freedom for the full model. Again, just use R as a calculator here, and submit your commands and results.