

Assignment 4—Introduction to Statistics Using R

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* Due Friday March 3

1 ANCOVA

You are Dean of Science at UWO. You have just met with one of the new assistant professors in the Department of Math, for his annual performance evaluation. Professor X claims that his salary is much too low and he wants you to give him a raise. He claims he is particularly good at teaching and thus he deserves a raise. As evidence of this, he says that among the three sections of calculus taught in first year, his students (Section I) get the highest grades on the Calculus final exam, which is common to all three sections (see Table 1 below). You ask the Chair of Math to collect some data for you. She gives you final exam scores for a random sample of 50 students chosen from each of the three sections of Calculus 101 ¹.

Question 1.1: Conduct a standard one-way ANOVA to assess whether the three sections differ in terms of final exam scores. What would you conclude based on the ANOVA?

The Chair of the Math Department calls you the next day and tells you that she also has available high-school mathematics grades for each of the students in the three sections of Calculus 101. She advises that you might want to “take this information into consideration” when comparing final grades in the three sections. She advises you that Section I (Professor X’s section) appears to contain a disproportionate number of students from the same private school in Toronto, compared to sections II and III which contain a broader representation of students overall.

Question 1.2: Conduct an ANCOVA in which you take into account the high-school grades of students. Based on the ANCOVA results, what can you conclude about the final exam scores from Sections I, II and III of Calculus 101? What can you conclude about Professor X’s claim? Will you give him a raise?

Include in your (brief) report and discuss: raw means; adjusted means; ANOVA tables; helpful graphical displays.

¹<http://www.gribblelab.org/stats/data/calculus2.csv>

Calculus Section	I	II	III
Mean Calculus Grade	81.9	75.3	75.7
Mean High School Math Grade	76.1	67.5	68.6

Table 1: Final Calculus Grades