

PSYC 5086: Advanced Statistical Methods

Tarleton State University

Homework 5

1. A study investigated the effectiveness of small-group tutoring and the effectiveness of a classroom instruction technique known as *hot math* (Fuchs et al., 2008). The hot math program teaches students to recognize types or categories of problems so that they can generalize skills from one problem to another. The data below is a math test score for each student after 16 weeks in the study.

	No tutoring	With tutoring
Traditional instruction	3,6,2,2,4,7	10,4,5,8,4,6
Hot math instruction	7,7,2,6,8,6	8,12,9,13,9,9

- Sketch a plot of the condition means implied by this experimental design. Plot **instruction type** on the horizontal axis and separate lines for each level of **tutoring group**.
 - Perform a factorial analysis of variance on these data. Report p -values for the main effects of **instruction type** and **tutoring group** and the interaction.
 - Perform a Bayesian analysis of variance on these data. Compute and report inclusion Bayes factors for each main effect and the interaction, being sure to report the prior and posterior odds for each.
 - Interpret your results in the context of the problem.
2. A researcher conducted a two-factor study comparing users of a particular social media platform with non-users for three different grade levels: middle school, high school, and college. For consistency across groups, grades were converted into six categories, numbered 0 to 5 from low to high. The data are below:

	Middle school	High school	College
User	3,5,5,3	5,5,2,4	5,4,2,5
Non-user	5,3,2,2	1,2,3,2	1,0,0,3

- Sketch a plot of the condition means implied by this experimental design. Plot **grade level** on the horizontal axis and separate lines for each level of **user type**.
- Perform a factorial analysis of variance on these data. Report p -values for the main effects of **grade level** and **user type** and the interaction.
- Perform a Bayesian analysis of variance on these data. Compute and report inclusion Bayes factors for each main effect and the interaction, being sure to report the prior and posterior odds for each.
- Interpret your results in the context of the problem.

PSYC 5086: Advanced Statistical Methods

Tarleton State University

Homework 5

3. Consider the following data from an experiment designed to examine the effect of an audience on the performance of two different personality types. These data represent the number of errors made by each participant in a task:

	No audience	Audience
High self-esteem	3,6,2,2,4,7	9,4,5,8,4,6
Low self-esteem	6,7,2,6,8,6	8,14,11,15,11,11

- (a) Sketch a plot of the condition means implied by this experimental design. Plot **audience type** on the horizontal axis and separate lines for each level of **self-esteem**.
- (b) Perform a factorial analysis of variance on these data. Report p -values for the main effects of **audience type** and **self-esteem** and the interaction.
- (c) Perform a Bayesian analysis of variance on these data. Compute and report inclusion Bayes factors for each main effect and the interaction, being sure to report the prior and posterior odds for each.
- (d) Interpret your results in the context of the problem.