

MATH 204 - ASSIGNMENT 1

Deadline: 11.59pm, Sunday 15th February 2026
Please submit your solutions via myCourses in pdf format.

Note: You may include code and output to explain and justify your answers. If you do not include code, you must explain in detail how the numerical results and conclusions were derived.

1. In study of the recall of the content of television commercials. In a designed experiment, 324 adults were randomly assigned to one of three viewer groups: (i) Watch a TV program with a violent content code (V), (ii) watch a show with an explicit content code (E), and, (iii) watch a neutral TV program (N). After viewing the program, each participant was scored on the number of brand names they could recall from the commercials shown during the program.

The results of the data collection are contained in the file

www.math.mcgill.ca/dstephens/204/Assignments/A1/A1Q1.csv

For this data set:

- (a) Identify the experimental units, the factor, the factor levels, the response and the name of the design used in this experiment. 5 Marks
 - (b) Construct the ANOVA table for the data, and hence carry out a suitable hypothesis test to assess whether there is a significant difference in the means of the groups defined by the factor levels. Justify your conclusions. 5 Marks
 - (c) Compute the sample means for data in each of the treatment groups, and also report the pooled estimate of the population variance. 5 Marks
 - (d) Comment on whether three assumptions needed for the ANOVA F-test appear to hold for these data. 5 Marks
2. The absentee rates at a jeans production factory were measured (as the percentage of employees absent) over a nine week period, with rates recorded on the five working days Monday to Friday. Factory managers were interested to find out whether there was any significant difference between absentee rates across the days of the week.

The resulting data are contained in the file

www.math.mcgill.ca/dstephens/204/Assignments/A1/A1Q2.csv

using a randomized block design, with week of study being the blocking factor. In the data, AbsRate represents absentee rate, Week denotes the week of the study, and Day denotes day of the week (M, T, W, R, F for days Monday through to Friday).

- (a) Construct the ANOVA table for the data. 10 Marks
- (b) Report precisely the conclusion of the analysis implied by the ANOVA table. 5 Marks
- (c) Using the data, construct a 95% confidence interval for the difference in absentee rates between Mondays and Fridays. Explain your calculation. 5 Marks

3. The following ANOVA tables were constructed from analyses of a two factor randomized complete balanced factorial design with factors A and B:

SOURCE	DF	SS	MS	F	p
A	5	36.860	7.372	8.793	0.0000
B	4	148.473	37.118	44.273	0.0000
INTERACTION	20	12.224	0.611	0.729	0.7672
ERROR	30	25.152	0.838		
TOTAL	59	222.710			

Table 1: First Analysis

SOURCE	DF	SS	MS	F	p
A	5	36.860	7.372	9.862	0.0000
B	4	148.473	37.118	49.655	0.0000
ERROR	50	37.376	0.748		
TOTAL	59	222.710			

Table 2: Second Analysis

The sums of squares quantities are reported to 3 decimal places, and the p-values are reported to 4 decimal places.

- Identify the number of levels of Factor A, of Factor B, and the number of replicates used in the design. Explain how you obtained your answers. 3 Marks
- What is the difference in the model used to compute values for the first table compared with the model used to compute values for the second table ? 2 Marks
- Explain why the values in the F column for the rows labelled A and B are different in the two tables, even though the values in the SS column are identical. 4 Marks
- Based on these two ANOVA tables, explain what the correct conclusion from the analysis should be. Refer to specific entries in the tables. 5 Marks
- Based on your previous answers, report your best estimate of the population variance within the groups, σ^2 . Explain your answer. 3 Marks
- Identify one further analysis that should be carried out to further verify the validity of the conclusions. Explain why this additional analysis should be done. 3 Marks