MATH 204 - MID-TERM

Please hand in scripts in the lecture on Wednesday 11th February.

*Note: In most scientific journals, the space allowed to report statistical results is limited, and the results must be reported in a concise fashion with no extraneous information. To reflect this, your script should consist of no more than **EIGHT** sides of paper (8.5in x 11in or 215.9mm x 279.4mm), including SPSS printout. Do not include any SPSS output not relevant to the answers you give.*

1. The data given below are the survival times (in 10 hour units) of laboratory animals in an experiment designed to investigate the toxicity of different toxins. A complete, balanced factorial experiment was carried out, with two factors **Toxin** (having three levels) and **Method** (describing the method of administration of toxin to the animal, having four levels). The allocation to animals to the treatments was completely randomized.

	Method			
Toxin	1	2	3	4
1	0.31,0.45,0.46,0.43	0.82,1.10,0.88,0.72	0.43,0.45,0.63,0.76	0.45,0.71,0.66,0.62
2	0.36,0.29,0.40,0.23	0.92,0.61,0.49,1.24	0.44,0.35,0.31,0.40	0.56,1.02,0.71,0.38
3	0.22,0.21,0.18,0.23	0.30,0.37,0.38,0.29	0.23,0.25,0.24,0.22	0.30,0.36,0.31,0.33

These data are contained in the SPSS data set **Toxin.sav**. Also included in the data set are the log transformed survival times.

In the following analyses, **Toxin** and **Method** are the "**main effects**".

(a) Using these data, and ANOVA tests for a factorial design **with interaction**, assess whether there is any evidence that the observed variation in survival time is due to the different toxins, the different methods of administration, and/or an interaction between toxin and method. In the notation of the lectures, the underlying model can be written

Toxin + Method + Toxin.Method

6 Marks

(b) Repeat the analysis in (a), but with the interaction between Toxin and Method removed, that is, using the model

Toxin + Method

How to remove the interaction term in SPSS is explained in a video on the website.

4 Marks

(c) Explain in words what the interaction term in the model in (a) represents. Explain the conclusion of your statistical test for interaction in the context of this data set.

4 Marks

(d) After assessing the validity of the assumptions behind ANOVA testing for these data, comment on the validity of the conclusions indicated by the the tests. Are the results and conclusions different if the log survival times are used ? Justify your answers.

6 Marks

2. The data set **Memory.sav** contains the results of a memory training experiment in **two** groups of patients. An experimenter randomly assigned 50 younger subjects, and 50 older subjects, to one of **five** learning technique groups. Subjects were asked to remember 27 words, and the response recorded was the number of words remembered. The experimenter was interested in discovering whether the different learning techniques yielded different results, and whether the learning techniques were equally effective in younger and older subjects.

   Write a report on an ANOVA analysis of these data, answering the research questions that the experimenter had. Include in your report an assessment of the validity of the ANOVA results.

   10 Marks