D2: Graded Exercises Set 1

Upload and submit your solutions as a commented `R` script
until Sunday 10.05.2020 at 10 pm on the Moodle site

General rules for the exercises:

- There are two exercises sets with 5 problems each. One problem is worth one point. Points are generously awarded for any serious attempt to solve the problems.
- The total amount of points achieved in the graded exercises represent 20% of the points for your final grade.
- Respect the deadline. Late submission do not award any points.
- Structure your solutions in one `R` script and provide answers and explanations (exclusively in English) in form of comments. Do not forget to indicate your name at the beginning of the document.
- Be honest with yourself and do the exercises without consulting solutions even if you should have access to them. The aim of the exercises is to learn something, not to hand in perfect solutions.
- We encourage working in groups, but each group member has to hand in their own solutions.

The following problems refer to the famous `morley` data set, which lives in `R`'s `datasets` package and should be loaded by default. It contains *"measurements done in 1879 on the speed of light. The data consists of five experiments, each consisting of 20 consecutive 'runs'. The response is the speed of light measurement, suitably coded (km/sec, with '299000' subtracted)."*

1. Perform a one-way ANOVA to find out whether the five experiments give different average results for the measured speed of light. Give a p value to test the null hypothesis that the five experiments give the same mean speed of light measurement. What is the decision? What would be a good plot to visualize results?

2. Which of the five experiments differ from which other ones with respect to the average speed of light?

3. Test the normality assumption. Describe the QQ plot in a few words and give the p value of a formal test for normality. What are your conclusions regarding normality?

4. Test for homogeneity of variances. Give p values for the tests and interpret.

5. Perform a non-parametric test to answer the question whether the five experiments tend to give different results for the distribution of the speed of light.