

You should hand in answers to **Question 2 only** by **Thursday, 24 January, 3.00 pm**.
*Please put your course-work into the **yellow box** on the **Basement** level of Maths Building.*
The work should be stapled if necessary.

Question 1. A part of an experiment in Ecological and Agronomic systems.

Energy maintenance requirements play an important role in predicting meat production in grazing sheep. We have data on 64 grazing Merino sheep in Australia (Energy requirements [Mcal/sheep/day], Weight [kg]), in file MerinoSheep.txt on the course web-page. We would like to obtain a good parsimonious model of energy requirements based on the weight of sheep.

- (a) Draw the scatter plot and comment briefly on the data.
- (b) Write down the simple linear model and its assumptions.
- (c) Fit the simple linear regression model and draw the fitted line plot.
- (d) Produce residual plots and comment on the model assumptions of normality and of constant variance.
- (e) The residual of one of the observations is large when compared to others. Which observation is it?
- (f) Delete the unusual observation and re-fit the model, that is follow items (a) to (d). What has changed?
- (f) Did the residuals improve? Is there evidence against the model assumptions?
- (g) Comment on the value of the variance ratio and the p-value given in the ANOVA table. Is the slope statistically significant?

Question 2

In the example of Question 1 we would expect that for zero weight there should be zero energy requirements. Hence, it makes sense to fit a model without intercept.

- 2.1 Follow items (a) - (g) from Question 1, but for a model without intercept.
- 2.2 Which model, out of all four you have fitted, is the best one? Explain briefly.
- 2.3 Interpret the estimate of β_1 of the last fitted model in practical language.