

Assessment 5: Topics 7 & 8
Material from Chapters 11, 12 and additional reading on contrasts
Total marks: 100

Refer to the **Assessment Criteria and Guidelines** in the Assessment block of the Moodle site. **Five marks** will be awarded for the following:

- Clear expression including correct use of terminology and notation
- Presentation of figures and tables including relevant R output.
- Clearly and concisely annotated R code.

Question 1. **[40 marks]**

The file “folate.txt” contains data on red cell folate levels (folate) in patients receiving three different methods of ventilation (ventilation) during anesthesia. The three different methods are coded as follows:

1 = 35-50% oxygen given continuously for 24 hours

2 = 50% nitrous oxide and 50% oxygen given continuously for 24 hours.

3 = 50% nitrous oxide and 50% oxygen given only during the operation.

- a. Plot the data, and summarise the information available from the plot. *[5 marks]*
- b. Fit a model to compare the folate for different ventilation methods. Produce and interpret the summary table of coefficients. *[10 marks]*
- c. There is one pairwise comparison that cannot be tested explicitly by referring to the table of coefficients. Create a contrast that allows for that comparison. You should also create a second contrast to complete an *orthogonal* set.
 - (i) State the null hypothesis corresponding to each of these contrasts, in words and using statistical notation. *[5 marks]*
 - (ii) Verify that the two contrasts form an orthogonal set. *[5 marks]*
 - (iii) Rerun the model by partitioning the SS for ventilation using the two contrasts. Produce and interpret relevant output. *[15 marks]*

Question 2. **[55 marks]**

A factorial experiment was conducted to investigate the yield (BYIELD) of barley. Thirty-six plots were divided into four blocks (BBLOCK). Three varieties (BVARIETY) were compared at three different row spacings (BSPACE). The data are stored in **Data File: Barley.txt**

- (a) Produce two exploratory data plots. With reference to the plots, describe how the means may vary with variety and spacing. What statistical model is suggested? *[15 marks]*
- (b) Fit a model that includes all main effects and the interaction between variety and spacing. Produce relevant outputs and assess whether the interaction is significant. Write an *informative* summary that relates to the context of the question. *[40 marks]*