MAS programmes - Statistical Analysis (Autumn Term)

Exercises 6

You are advised to keep the data frames (or script files) used in these Exercises for further analysis in Exercises 7.

1. An organization uses four methods for teaching word-processing keyboard skills. Method A is an established method, B is a new method that is similar to A; C and D are new methods but different in character. Forty people taking courses at the same time are allocated, randomly, ten to each method, and given an initial test. At the end of the course they are tested again and the difference in scores is used to assess the success of the method.

Differences in scores			
A	B	C	D
33	31	32	39
44	33	29	42
39	40	34	46
38	34	41	42
29	31	27	42
41	41	26	46
39	34	43	39
30	28	25	43
42	25	35	41
44	33	26	38

(a) Construct an R data frame that contains the data in an appropriate format.

(b) Calculate appropriate summary statistics and carry out a plot of the data in order to compare the effects of the four methods.

(c) Comment briefly on your initial impressions.

(d) Carry out an Analysis of Variance to test for differences among the methods. State your conclusions.

2. [c/f Krzanowski, pp 122-5]. A manufacturer of tyres wishes to investigate their rate of wear, and whether this rate differs substantially among the four positions on the car that the tyre can occupy (1 = front offside, 2 = front nearside, 3 = rear offside, 4 = rear nearside). The manufacturer sets up an experiment in which the tyres are fitted to a car, the car is driven at a fixed speed for a fixed distance, and the reduction in depth of tread caused by the test is measured (in hundredths of a mm) for each tyre. The process is then repeated nine times with a new set of tyres each time. The results are shown in the following table.

Wear of tyres
(hundredths of a mm)

Pos. 1	Pos. 2	Pos. 3	Pos. 4
20.935	18.279	28.535	20.182
17.123	14.815	37.227	34.340
29.590	19.973	30.529	29.023
19.013	21.200	27.998	18.792
15.919	11.280	38.853	34.707
28.092	20.096	29.177	28.176
20.332	19.389	30.073	19.203
15.285	12.153	40.017	36.307
28.304	20.477	30.795	28.701

(a) Construct an R data frame that contains the data in an appropriate format and carry out an initial exploration of the data.

(b) Carry out an analysis of variance.