

Series 6

1. a) An experimenter wishes to compare four treatments in blocks of two runs. Find a BIBD with six blocks.
 b) An experimenter wishes to compare seven treatments in blocks of three runs. Find a BIBD with seven blocks.

2. In a prospective randomized surgical trial cirrhotic patients were allocated to one of two treatments: to a nonselective shunt (standard operation) or to a selective shunt (new operation). The response variable is the maximal rate of urea synthesis, where low values are associated with poor liver function. The response was measured before and after surgery. The data are given in dataset `Shunt.txt`, and look like

Subject	Treatment	Pre	Post
1	Selective	51	48
⋮	⋮	⋮	⋮
8	Selective	42	54
9	Nonselective	34	16
⋮	⋮	⋮	⋮
21	Nonselective	43	32

Analyze these data in a split plot anova. First, draw the corresponding ANOVA skeleton by hand. Then, fit the data using R and interpret your results. Finally, Plot the data and answer: Is the new treatment significantly worse or better than the old one?

3. A market investigation explores the potential of three new types of pizzas in six different packings. 90 consumers assess the products on a 0–10 scale. What type of design is used and how does the skeleton anova look like if
 - a) each person rates the six packings of just one type of pizza,
 - b) each person rates exactly one pizza in one packing,
 - c) each person rates every pizza in every packing?

4. A chemical plant produces oxygen by liquifying air and separating it into its component gases. The purity of the oxygen is a function of the main condenser temperature and pressure ratio between the upper and lower columns. Current operating conditions are temperature $(\xi_1) = -220^\circ C$ and pressure ratio $(\xi_2) = 1.2$. Using the following data, find the direction corresponding to the maximum increase in the response variable.

Temperature (ξ_1)	Pressure ratio (ξ_2)	Purity
-225	1.1	82.8
-225	1.3	83.5
-215	1.1	84.7
-215	1.3	85.0
-220	1.2	84.1
-220	1.2	84.5
-220	1.2	83.9
-220	1.2	84.3

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Question hour:

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Exam consultation:

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