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Exercises

Exercise 13. The students participating in a course were randomly divided into two groups that received math lessons using different teaching methods. In a final test, overall scores were determined for arithmetic problems (AP) and text problems (TP). The following scores were obtained for the two teaching methods:

Method I		Method II	
AP	TP	AP	TP
180	90	150	120
160	80	180	150
180	80	150	100
200	110	160	130

Perform a multivariate statistical test by hand and using R to decide whether the two teaching methods differ with respect to the results.

a) Which statistical hypotheses are tested?

b) Identify the statistical assumptions on which the test is based?

c) Run the test ($\alpha = 0.05$) and answer the question posed above.

d) Briefly discuss whether the assumptions of the test are met.

e) Do the teaching methods differ when performing multiple univariate tests in the single variables? Adjust the Type I error rate using the Bonferroni method.

Exercise 14. Before and after a group dynamic training, four subjects rated their social anxiety and their striving for dominance in group situations on a 7 categories Likert scale (see example from the lecture). The following results were obtained:

	Before training		After training	
Subject	Fear	Dominance	Fear	Dominance
1	5	3	3	3
2	4	3	4	4
3	6	2	2	3
4	6	3	4	3

a) Test by hand and using R whether the training has changed the attitude of the subjects. Assume multinormally distributed values and a Type I error rate of $\alpha = 0.05$.

b) If the multivariate test is not significant, does it then make sense to perform univariate tests on each of the two dependent variables? Provide reasons for your answer.