

Exercise 1

1. Remember one of the examples presented in class: *The first row is chest circumference (in inches) of five subjects. Let us call this X. The second row is the respective total volumes of air that can be breathed in and out in one minute (in liters) for the same five subjects. Let us call this Y.*

X: 39, 29, 60, 40, 32

Y: 11, 5, 20, 8, 6

Download the package **combinat** in order to use the function **permn()**. Perform an exact test for $H_0 : \rho = 0$ against $H_1 : \rho > 0$. Use Pearson and Spearman correlation coefficient as well.

2. These are the increments of weight recorded in an experiment where a new additive has been added to a standard compound feed:

Standard: 2.5, 3.4, 2.9, 4.1, 5.3, 3.4, 1.9, 3.3, 1.8

+ Additive: 3.5, 6.3, 4.2, 4.3, 3.8, 5.7, 4.4

- (a) Is the additive efficient? Perform a classical T-test and use the corresponding T-statistic to perform a permutation test.
 - (b) Explore several statistics in order to perform the permutation test. What is the final conclusion?
3. Assume that during a three-hour period spent outside, a person recorded the temperature, the amount of time they mowed the grass, and their water consumption. The experiment was conducted on 7 randomly selected days during the summer. The data is shown in the table below with the temperature placed in increasing order.

Temperature (F)	Water Consumption (ounces)	Time mowing the grass (h)
75	16	1.85
83	20	1.25

85	25	1.5
85	27	1.75
92	32	1.15
97	48	1.75
99	48	1.6

- (a) Fit the Water Consumption as a linear function of the Temperature (T) and the Time mowing the grass (TMG) by means of a multiple regression model. Hint: Use function `lm` in R.
- (b) Test the significance of the variables T and TMG using an exact permutation test. Compare the results with those obtained with the multiple regression model.

You have to work in couples (groups of two persons). Send the solutions of the exercise in a pdf file to ppuig@mat.uab.cat. Deadline: December 30 at 23:59h