

Exercises for the course
“An introduction to R”

Exercise session 7: Thursday, March 13 2013

Exercise 7.1: *Supporting a hypothesis*

Apply a suitable test:

- The built-in data set `sleep` shows the effect of two soporific drugs (increase in hours of sleep compared to the control group) on 10 patients. Are the increases in sleeping hours of the two groups significantly different?
- Recall `heartbeats` from Sheet 4. Is the increase in weight of the heartbeat group compared to the control group significant? Then answer this question for every weight class separately.
- The common red spider (Bohnenspinmilbe) is a vermin of agricultural plants to which plants react with the production of toxic substances. Do plants “remember” a former attack? Two groups of each 20 cotton plants are being infected with the mite. One group has never encountered this mite before. The second group has already survived a former attack. After a certain time, the mites on the plants are counted. You find the result in the file `mite.txt` on the web page. Is there a significant difference between the two groups? Compare the two groups visually (produce an appropriate plot) and apply a suitable test. Formulate an answer!

Exercise 7.2: Set the seed to 1234 to get the same picture. Define two vectors `x <- seq(from=0,to=5,by=0.1)` and `noisyline <- 4*x + rnorm(length(x))`. Explain the variable `noisyline` with a linear model of the independent variable `x`. Use the command `lm()` for this. Denote the returned object as `regr`. What is the Anova table of this regression? Read off the intercept and the slope of the fitted line with `coef()`. Extract the p-values of the intercept and of the slope from `summary(regr)`. What is the fraction of the total variation in `noisyline` that is explained by the regression? This fraction is called ‘r squared’ and is printed by `summary(regr)` under ‘Multiple R-squared’. Check that this value is equal to $(\text{cor}(x, \text{noisyline}))^2$. In order to visualize the linear model, plot `noisyline` against `x`. Add the regression line with `abline(regr)`. Next calculate confidence intervals of the fitted parameters with `confint()` applied to `regr`. Denote the object returned by this command as `cf`. Enter `cf` to view it. The two columns of `cf` define two lines. Add these two lines to the plot with line type “dashed”. Your result should resemble the following figure.

