Exercises for the course

"An introduction to R"

Exercise session Statistics 1: Tuesday, March 10 2015

Exercise 1: One more exercise on functions Write a function **se()** which calculates the standard error

$$\frac{\operatorname{sd}(x)}{\sqrt{\operatorname{length}(x)}}$$

of its argument x. What happens if you apply this function to c(3,5,"a",7) or to c(3,NA,8,2)?

In a second step, improve the definition of se() as follows. Use is.numeric() to check whether the argument is numeric. If it is not numeric, then print the warning message "Argument is not numeric: returning NA" with the command warning() and return NA. Furthermore add an argument na.rm to the definition of your function and let its default value be FALSE. If that argument is TRUE, then remove all NAs from the argument vector and continue as before. Here is how it should work:

```
> se(c(3,5,"a",7))
[1] NA
Warning message:
In se(c(3, 5, "a", 7)) : Argmunt is not numeric: returning NA
> se(c(3,NA,8,2))
[1] NA
> se(c(3,NA,8,2),na.rm=TRUE)
[1] 1.855921
```

Exercise 2: Drosophila cold shock Download the data file ccrt.txt from the web page. This file contains the chill coma recovery times (ccrt) for two populations of Drosophila ananassae from Bangkok (BKK) and from Kathmandu (KATH). Read the data into the variable data.ccrt. Calculate the sample mean and the sample standard deviation of ccrt. Then caculate the sample mean and the sample standard deviation of ccrt corresponding to flies from Bangkok and Kathmandu, respectively. Is the difference of these two means significantly different from zero? Choose a suitable test and justify its usage. Furthermore check with a one sample test that both sample means are significantly different from mean(ccrt).

Exercise 3: Supporting a hypothesis Apply a suitable test:

- Recall heartbeats from yesterday. 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 (Bohnenspinnmilbe) 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!