Exercises for the course

"An introduction to R"

Exercise session 5: Tuesday, March 11 2013

Exercise to do in class on Wednesday 12.

Exercise 5.1: Write a function `se()` which calculates the standard error

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

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 `NA`s 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 5.2: 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). Recall the Chill Coma Recovery Time (CCRT) data set from. 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 for the two subvectors 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 5.3: In the rivers of Trinidad are the Guppys species *Poecilia reticulata* submitted to two different predators: the big and dangerous *Crenicichla alta* downstream and the smaller *Rivulus hartii* upstream. Evolutionary ecologists believe that the guppys offspring are smaller downstream. To test this hypothesis you will fly to Trinidad to weight new-born Guppies. How many Guppies should you weight in each part of the riverif the real difference is 0.4 mg and if you would like to show it with 5% significance? The flight costs are high so for it to be worth the power of the test should be 99%.
Hint: You know from previous studies that the standard deviation will be about 0.5 mg.
Imagine you had decided to measure 20 guppies per river part. What will be the power of your test?