Applied Statistics - Exercise 11

1. Sugar Packaging (Theory)

A sugar packaging machine is filling the bags with sugar where the weight accurately follows normal distribution with the mean μ and variance σ^2, where $\sigma = 7$g. In the sample of 36 packages the sample mean for the weight is 507g. Compute the 97% confidence interval for μ.

2. Bags of potatoes (Theory)

You bought 10 very large bags of potatoes. Assume that the 10 weights can be viewed as a realization of a random sample from a normal distribution with unknwown parameters. Your measures give you the following data:

- Sample mean: 14.5 kg
- Sample standard deviation: 0.3 kg

Construct a 95% confidence interval for the expected weight of a bag.

3. How many samples do we need? (Theory)

Assume that we measure a person's height (in meters) and that the measurements are normal distributed with standard deviation $\sigma = 0.01$. How many measurements do we to make, if we want a 99% confidence interval no wider than 0.001 meters for the mean μ? Please explain how you find the number of required measurements.

4. Cats & confidence (R)

The `cats` data set (available in `UsingR`) contains the bodyweight and heart weight of adult cats, along with their sex.

(a) Compute the mean and the 90% confidence intervals for the body weight and heart weight assuming normality of the samples. Do the computation separately for the female and male cats. (So you have to compute 4 confidence intervals). Is there any difference between the results?

(b) Compute the one-sided 95% confidence intervals for the mean body weight of male cats and compare to the results you obtained at (a).

5. Bootstrapping confidence intervals (R)

Consider again the `cats` dataset of the previous exercise. Construct the 90% confidence intervals for the mean body weight of male cats by empirical bootstrap, using 500 bootstrap repetitions. Compare the result to those you got in Problem 1.
How do they compare with the intervals you found in the previous exercise?