# Exam 2

You can download the combined lecture notes for this module at: <http://asta.math.aau.dk/dan/2017f/asta/?file=handouts/module-B.pdf>

It is highly recommended that you answer the exam using Rmarkdown (you can simply use the exam Rmarkdown file as a starting point).

Remember to load the mosaic package first:

library(mosaic)

## Warning: package 'mosaic' was built under R version 3.4.2

## Part I: Directed reading activities

An educator conducted an experiment to test whether new directed reading activities in the classroom will help elementary school pupils improve some aspects of their reading ability.

She arranged for a third grade class of 21 students to follow these activities for an 8-week period. A control classroom of 23 third graders followed the same curriculum without the activities. At the end of the 8 weeks, all students took a Degree of Reading Power (DRP) test, which measures the aspects of reading ability that the treatment is designed to improve.

Read in the data:

reading <- read.table("http://asta.math.aau.dk/dan/static/datasets?file=reading.dat", header=TRUE)  
head(reading)

## Treatment Response  
## 1 Treated 24  
## 2 Treated 43  
## 3 Treated 58  
## 4 Treated 71  
## 5 Treated 43  
## 6 Treated 49

Use a boxplot to compare the of measurements of DRP for Treated(direct reading activities) and Control visually.

## Delete this line and write a command using bwplot(...)

Use favstats to make a numerical summary of the measurements for Treated and Control.

## Delete this line and write a command using favstats(...)

* Write down a point estimate of the mean of DRP for students following the new *directed reading activities* and explain how this is calculated.
* Write down a point estimate of the standard deviation of DRP for this group and explain how this is calculated.
* Write down a 95% confidence interval for the mean of DRP for this group and explain how this is calculated.

Use the command t.test to compare the mean DRP of the two groups.

## Delete this line and write a command using t.test(...)

Go through the details of the output from t.test. Your analysis must include an account of

* What the relevant null hypothesis and the corresponding alternative hypothesis is.
* Choice and calculation of test statistic.
* Calculation of p-value and its interpretation in connection to a conclusion of the analysis.
* Calculation and interpretation of a relevant confidence interval.

## Part II: Determining sample size

*In this part there is no dataset to load into R and analyze. You should just use R as a calculator when you apply the relevant formulas (which are towards the end of the lecture notes for module 1).*

To estimate the proportion of danish companies with less than 10 employees determine the necessary sample size for the estimate to be accurate to within 0.06 with probability 0.90. Based on results from a previous study in 2013, we expect the proportion to be about 0.70.