Exam D

You can download the combined lecture notes for this module at: https://asta.math.aau.dk/course/asta/2018-1/std/lecture/4-2?file=D/module-D.pdf

In this exercise you will study a dataset concerning vital capacity, which is the maximal amount of air that can be exhaled after a maximal inhalation.

Read in the data:

```
vitcap <- read.delim("http://asta.math.aau.dk/dan/static/datasets?file=vitcap.txt")
head(vitcap)
```

```
##   exposure age vital.capacity z1 z2
## 1        C  39           4.62  0  1
## 2        C  40           5.29  0  1
## 3        C  41           5.52  0  1
## 4        C  41           3.71  0  1
## 5        C  45           4.02  0  1
## 6        C  49           5.09  0  1
```

In the dataset, the variable `vital.capacity` has been measured on 84 workers in the cadmium industry.

The next variable is the factor `exposure` with 3 levels, indicating the level of cadmium exposure:

- A: None
- B: Less than 10 years
- C: More than 10 years

The data set also contains dummy variables for the factor `exposure`:

- `z1=1` if `exposure=B` and 0 otherwise.
- `z2=1` if `exposure=C` and 0 otherwise.

You will use these two variables later on.

Make a model and carry out an analysis investigating the effect of the factor `exposure` on the response `vital.capacity`. In that connection you should calculate/interpret the F-test for no effect of `exposure`.

We expand the analysis to include the workers age - the variable `age` - as a predictor.

Make a model and carry out an analysis investigating the effect of the predictors `exposure` and `age` on the response `vital.capacity`. In that connection you should:

- investigate whether there is interaction between the effects of `exposure` and `age`
- give a graphical interpretation of such an interaction

Consider the following two models, where we introduce the dummy variables.

```
model1 <- lm(vital.capacity ~ age*z2, data = vitcap)
model2 <- lm(vital.capacity ~ age*z1 + age*z2, data = vitcap)
```

- Use an F-test to show that there is no significant difference between `model1` and `model2`.
- Give an interpretation of the difference between the two models.