Multiple Testing
Homework week 19

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Exercise One

Let be

```
## 0.523 0.0011 0.0246 0.0073
```

the p-values resulting in the comparison of two groups in a clinical trial with four endpoints.
Perfom:

- a Bonferroni correction
- a Holm correction
- a Closed testing correction using Bonferroni combination for the combined tests
- at least for the Bonferroni and Holm, program a function to perform it for a general vector of p-values

Compare the results of Closed Testing with the ones of Bonferroni and Holm.

Exercise Two

Consider the `PlantGrowth` in `library(datasets)`:

###Description: Results from an experiment to compare yields (as measured by dried weight of plants) obtained under a control and two different treatment conditions.

```
data(PlantGrowth)
?PlantGrowth
```

```
## starting httpd help server ... done
```

```
str(PlantGrowth)
```

```
## 'data.frame':    30 obs. of  2 variables:
##  $ weight: num  4.17 5.58 5.18 6.11 4.5 4.61 5.17 4.53 5.33 5.14 ...
##  $ group : Factor w/ 3 levels "ctrl","trt1",..: 1 1 1 1 1 1 1 1 1 1 ...
```

We are interested in all possible pair-wise comparisons of the three groups. Perform a parametric analysis and correct for post-hoc (i.e. multiple testing) using

- Bonferroni
- Holm
- Shaffer

Do this without the help of `library(multcomp)` (or any other specialized libraries/softwares), also showing step-by-step the calculation performed.

Compare your results with the ones of `library(multcomp)` (or any other specialized libraries/softwares).

Exercise Three

Consider the `InsectSprays` in `library(datasets)`:

###Description: The counts of insects in agricultural experimental units treated with different insecticides.

```
data(InsectSprays)
?InsectSprays
str(InsectSprays)
```

```
## 'data.frame':    72 obs. of  2 variables:
##  $ count: num  10 7 20 14 14 12 10 23 17 20 ...
##  $ spray: Factor w/ 6 levels "A","B","C","D",..: 1 1 1 1 1 1 1 1 1 1 ...
```

Same task as Exercise Two.