

# Assignment 1

Group 69

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## Assignment 1

### Exercise 1

### Exercise 2. Cholesterol

*A study tested whether cholesterol was reduced after using a certain brand of margarine as part of a low fat low cholesterol diet. The data set cholesterol.txt contains information on 18 people using margarine to reduce cholesterol: columns Before and After8weeks contain the cholesterol level (mmol/L) respectively before the diet and after 8 weeks on the diet.*

*a) Make some relevant plots of this data set, comment on normality. Are there any inconsistencies in the data? Investigate whether the columns Before and After8weeks are correlated.*

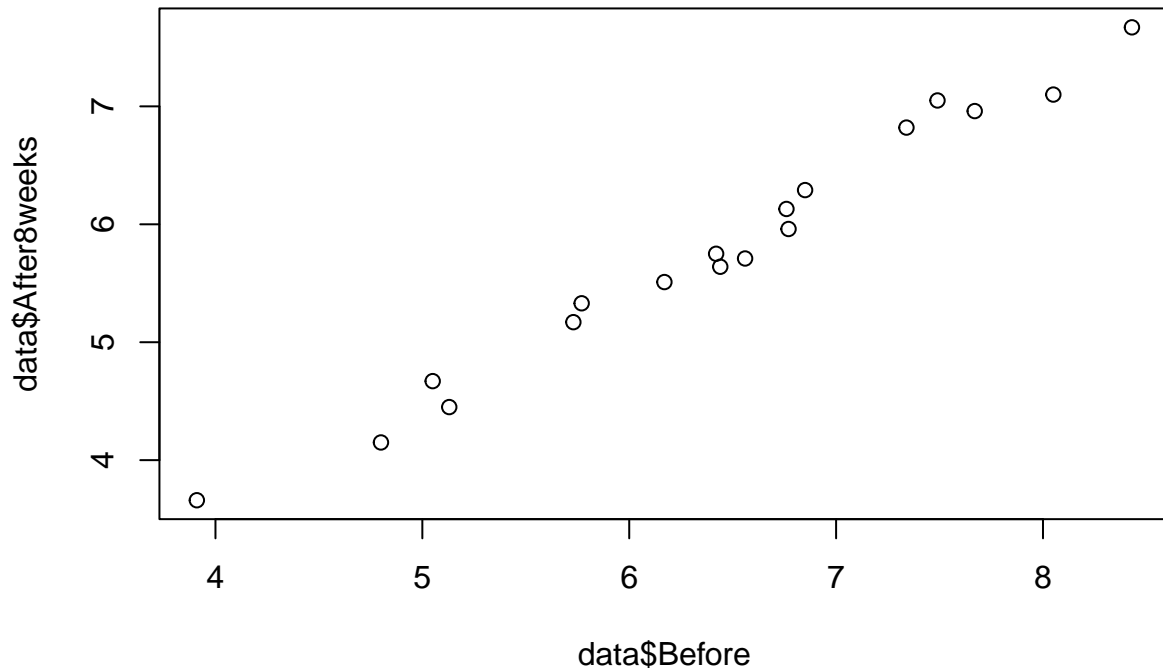
```
data = read.table("cholesterol.txt")
head(data)
```

```
##   Before After8weeks
## 1    6.42         5.75
## 2    6.76         6.13
## 3    6.56         5.71
## 4    4.80         4.15
## 5    8.43         7.67
## 6    7.49         7.05
```

```
cor(data$Before, data$After8weeks)
```

```
## [1] 0.9908885
```

```
plot(data$Before, data$After8weeks)
```



- b) Apply two relevant tests (cf. Lectures 2, 3) to verify whether the diet with low fat margarine has an effect (argue whether the data are paired or not). Is a permutation test applicable?
- c) Let  $X_1, \dots, X_{18}$  be the column After8weeks. Assume  $X_1, \dots, X_{18} \sim \text{Unif}[3, \theta]$ , then use the central limit theorem to find an estimate  $\hat{\theta}$  for  $\theta$  and construct a 95%-CI for  $\theta$ . Can you improve this CI?
- d) By using a bootstrap test with test statistic  $T = \max(X_1, \dots, X_{18})$ , determine those  $\theta \in [3, 12]$ , for which the hypothesis  $X_1, \dots, X_{18} \sim \text{Unif}[3, \theta]$  is not rejected. Can the Kolmogorov-Smirnov test be also applied for this situation?
- e) Using an appropriate test, verify whether the median cholesterol level after 8 weeks of low fat diet is less than 6. Next, design and perform a test to check whether the fraction of the cholesterol levels after 8 weeks of low fat diet less than 4.5 is at most 25%.

### Exercise 3

### Exercise 4