RPS
Analiza podatkov

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Vprašanja

Nekaj vprašanj, na katere bi radi odgovorili je:

- Ali so fantje večji od deklet?
- Ali so fantje težji od deklet?
- Ali sta razpon rok in višina približno enaka?
- Ali drži Galtonovo opažanje glede višine otrok in staršev?
- ...

Zbrali smo nekaj podatkov o študentih, s katerimi si bomo lahko poskusili odgovoriti.

Podatki

Podaki so o študentih 3. letnika biologije v letu 2012/13 so v datoteki lfn in na http://bit.ly/16oBVpR

```
> fpath <- "http://bit.ly/16oBVpR"
> data <- read.table(fpath, header = TRUE, sep = "\t")
> names(data)
 [1] "starost" "mesec"   "spol"    "masa"    "visina"
 [6] "roke"    "cevelj"  "lasje"   "oci"     "mati"
[11] "oce"     "majica"
```

Opisna statistika

```
> summary(data[, 1:6])
```

```
    starost          mesec          spol         masa
 Min.   :20.00   Min.   : 0.000   F:33   Min.   :50.00
 1st Qu.:21.00   1st Qu.: 5.000   M:10   1st Qu.:55.50
 Median :21.00   Median : 7.000          Median :61.00
 Mean   :22.07   Mean   : 6.814          Mean   :63.42
 3rd Qu.:22.00   3rd Qu.: 9.500          3rd Qu.:70.00
 Max.   :59.00   Max.   :11.000          Max.   :91.00

     visina           roke
 Min.   :156.0   Min.   :154.0
 1st Qu.:164.0   1st Qu.:163.2
 Median :170.0   Median :167.8
 Mean   :169.9   Mean   :169.3
 3rd Qu.:173.5   3rd Qu.:172.5
 Max.   :189.0   Max.   :193.0
                 NA's   :5
```

Ali pri podatkih kaj opazite?

Nenavadni podatki

Kaj storiti s tistim, ki je napisal, da je rojen v mesecu 0?
Eden pa je star 59 let??

Nadaljevanje opisa

```
> summary(data[, 7:dim(data)[2]])
```

```
     cevelj        lasje   oci          mati      
 Min.   :36.00   S:19   S:24   Min.   :155.0  
 1st Qu.:38.00   T:24   T:19   1st Qu.:160.0  
 Median :39.00                 Median :165.0  
 Mean   :40.02                 Mean   :165.4  
 3rd Qu.:41.50                 3rd Qu.:168.0  
 Max.   :48.00                 Max.   :180.0  
                               NA's   :5      
      oce          majica 
 Min.   :170.0   L : 5  
 1st Qu.:174.2   M :19  
 Median :179.5   S :16  
 Mean   :179.1   XL: 1  
 3rd Qu.:182.0   XS: 2  
 Max.   :190.0          
 NA's   :5              
```

Višina po spolu

Povzetek višin glede na spol

```
> summary(data$mati)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
  155.0   160.0   165.0   165.4   168.0   180.0       5
> by(data$visina, data$spol, summary)
data$spol: F
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  156.0   163.0   168.0   166.8   170.0   178.0
------------------------------------------------
data$spol: M
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  171.0   178.5   180.0   180.0   182.5   189.0
> summary(data$oce)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.    NA's
  170.0   174.2   179.5   179.1   182.0   190.0       5
```

Doseg spremenljivk v objektu `data.frame`

Poglejte kakšne so vrednosti spremenljivke `visina`!
Ali je v delovnem prostoru (workspace)?
Do spremenljivk lahko pridem posredno na več načinov

- `data$visina`
- `data[,v̈isina]̈`
- `data[,5]`

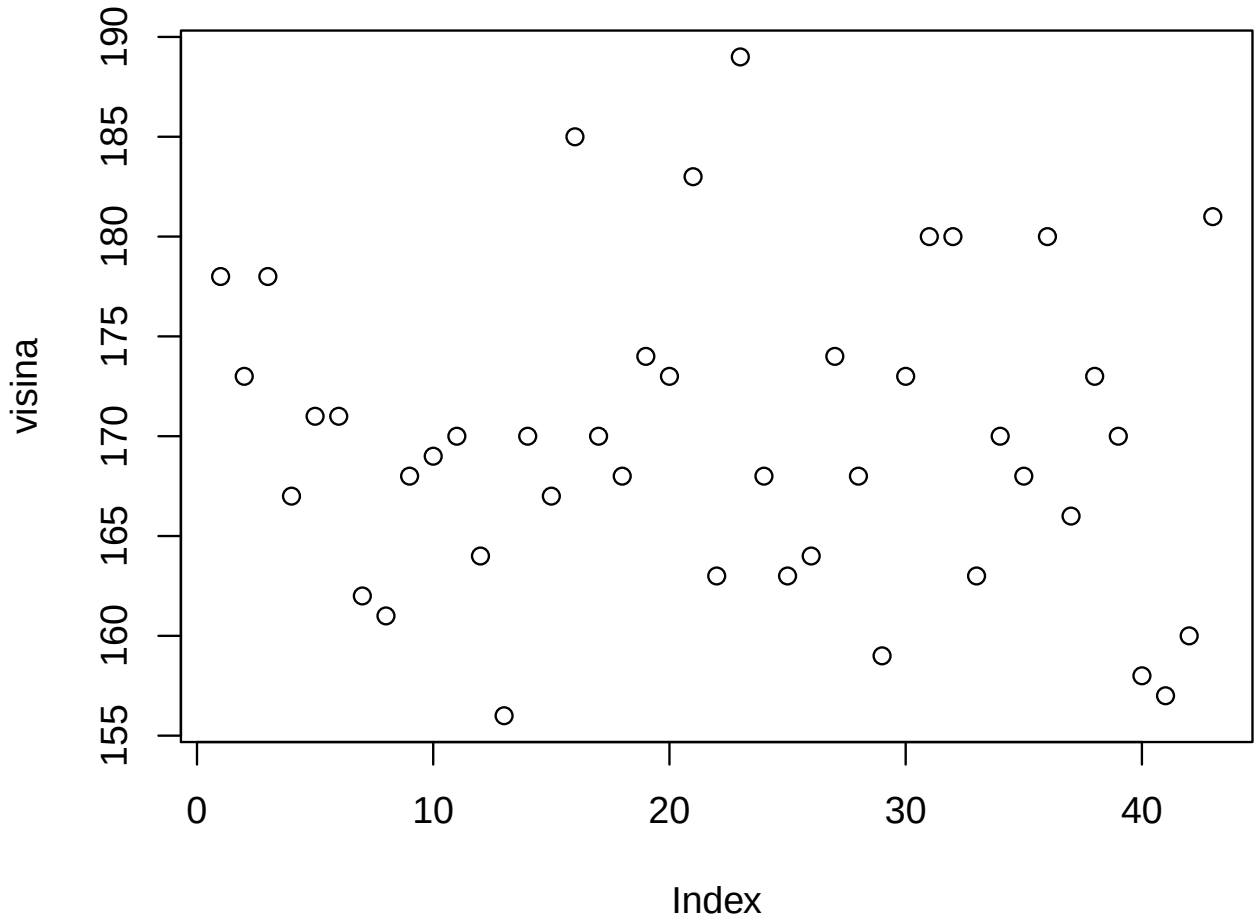
Neposreden dostop

Neposreden dostop do spremenljivk omogoči

```
> attach(data)
> length(visina)
[1] 43
> visina[1:5]
[1] 178 173 178 167 171
```

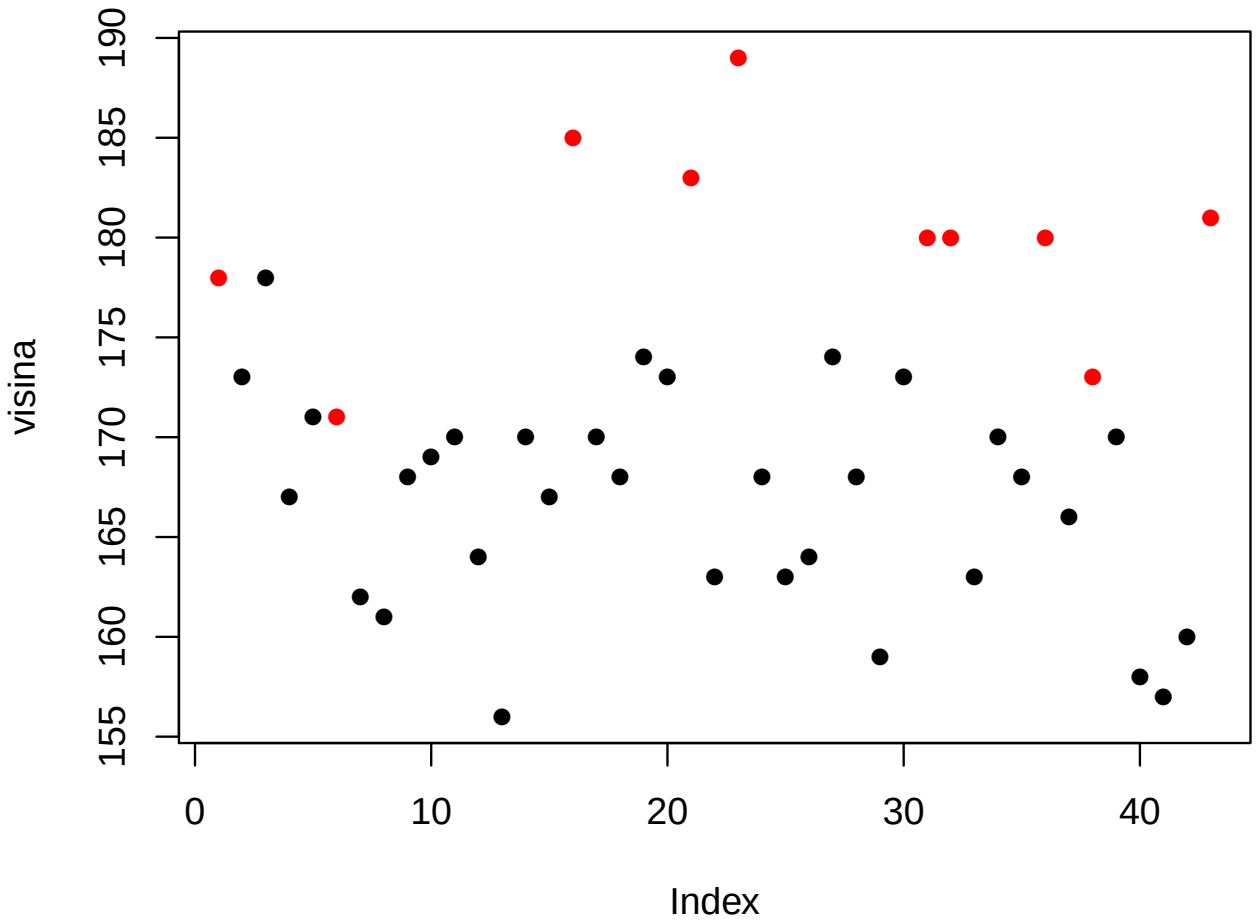
Grafični prikaz podatkov

```
> plot(visina)
```



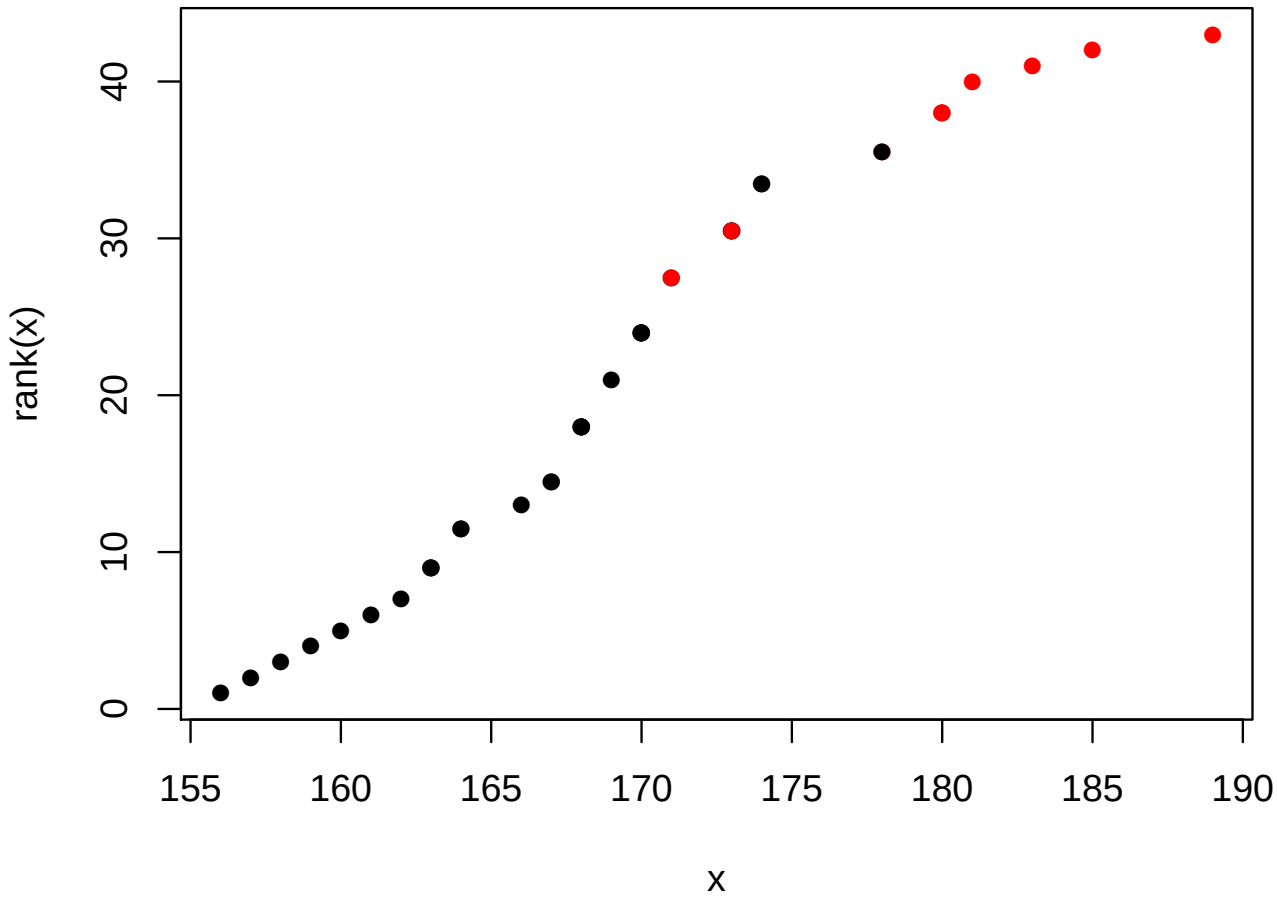
Grafični prikaz podatkov

```
> plot(visina, pch = 16, col = spol)
```



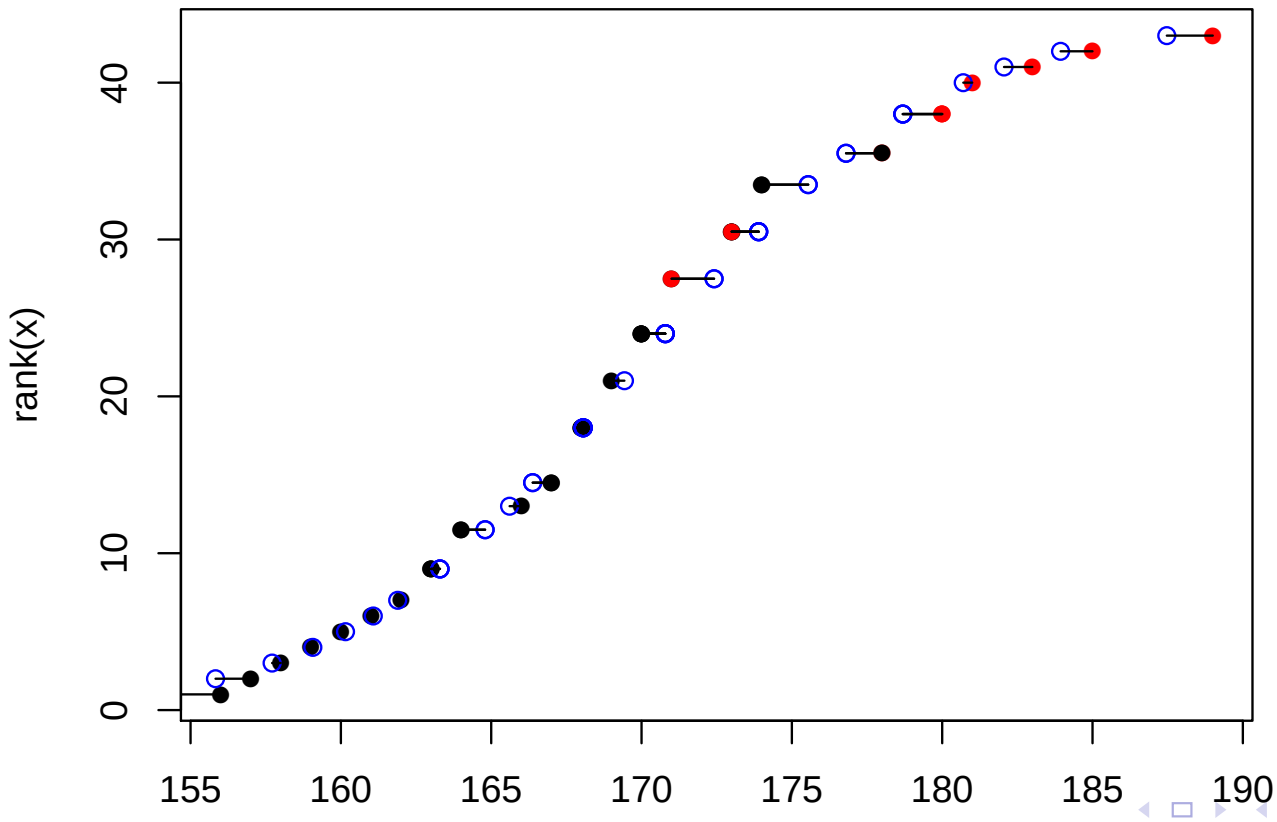
Kumulativa

```
> x <- visina
> plot(x, rank(x), pch = 16, col = spol)
```



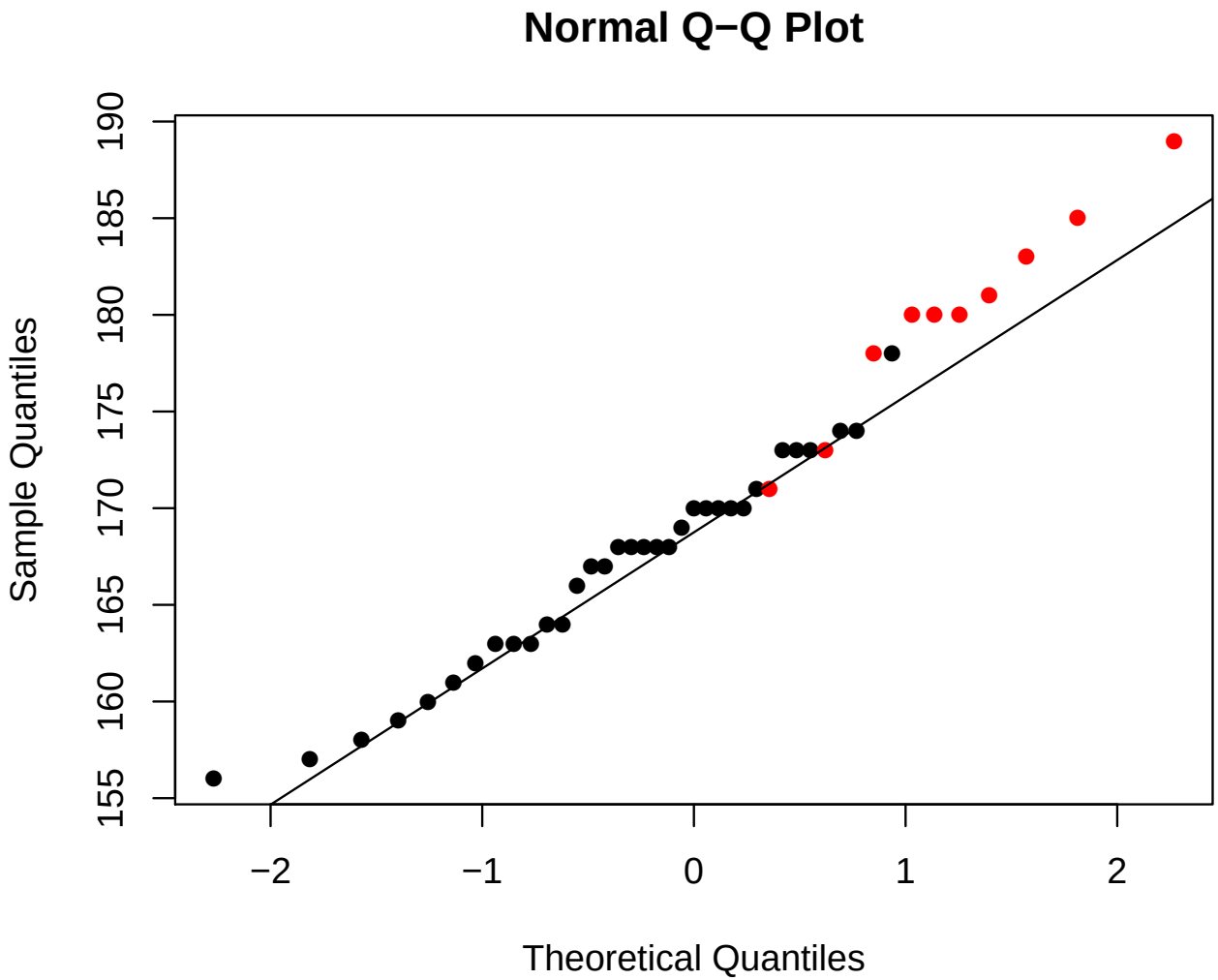
Kumulativa in normalna aproksimacija

```
> x <- visina
> plot(x, rank(x), pch = 16, col = spol)
> q <- qnorm((rank(x) - 0.5)/length(x), mean(x),
+     sd(x))
> points(q, rank(x), col = 4)
> segments(x, rank(x), q, rank(x))
```



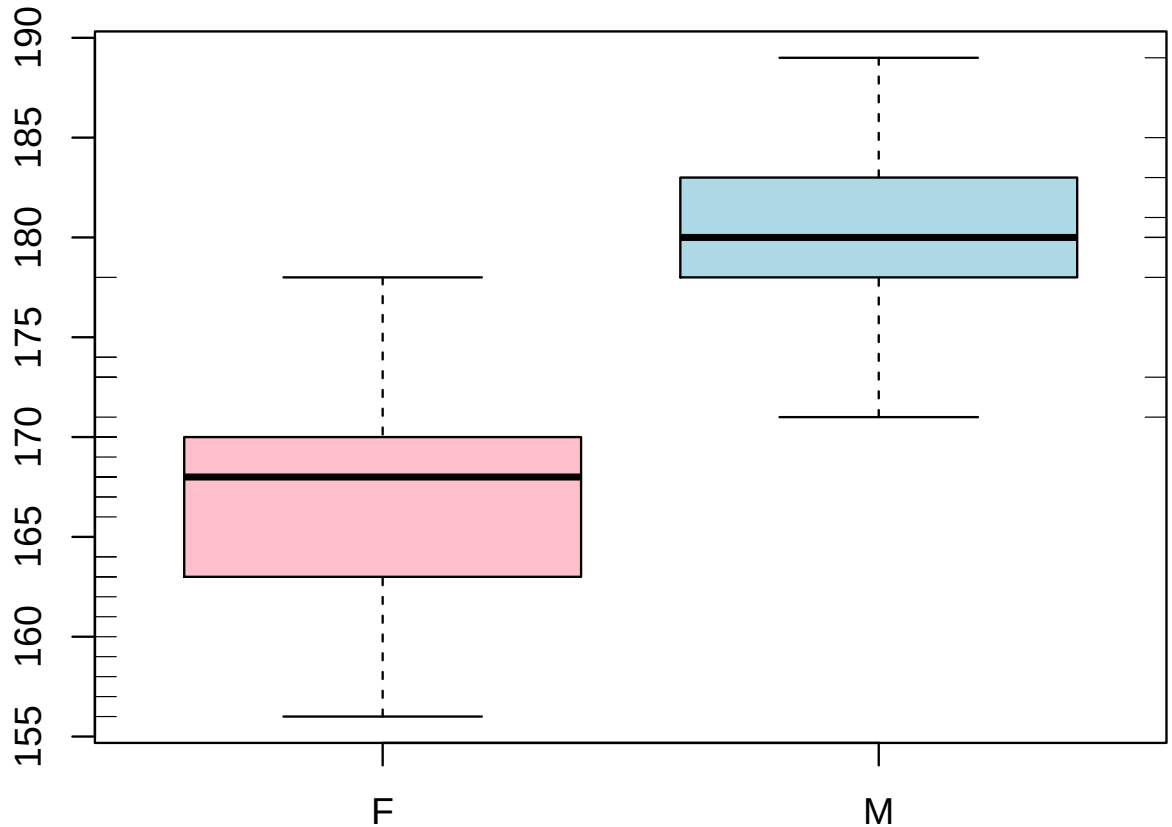
Slika kvantilov

```
> qqnorm(visina, col = spol, pch = 16)
> qqline(visina)
```



Boxplot

```
> boxplot(visina ~ spol, col = c("pink", "lightblue"))
> rug(visina[spol == "F"], side = 2)
> rug(visina[spol == "M"], side = 4)
```



Dorišite točke za mediane. Pomagajte si s `str()`, `locator()`.

Student t-test

```
> t.test(visina ~ spol)

Welch Two Sample t-test

data:  visina by spol
t = -6.8838, df = 15.244, p-value = 4.77e-06
alternative hypothesis: true difference in means is not
95 percent confidence interval:
 -17.257671  -9.105965
sample estimates:
mean in group F mean in group M
       166.8182        180.0000
```

Lahko tudi tako:

```
> t.test(visina[spol == "F"], visina[spol == "M"])
```

Oglejte si, kaj vrne funkcija `t.test()`. Dorišite točki povprečij.

Teža in spol

Izberite si nekaj prejšnjih prikazov in

- Raziščite kako je s težo pri dekletih in fantih.
- Kaj pa velja za BMI ($BMI = masa/visina^2$)

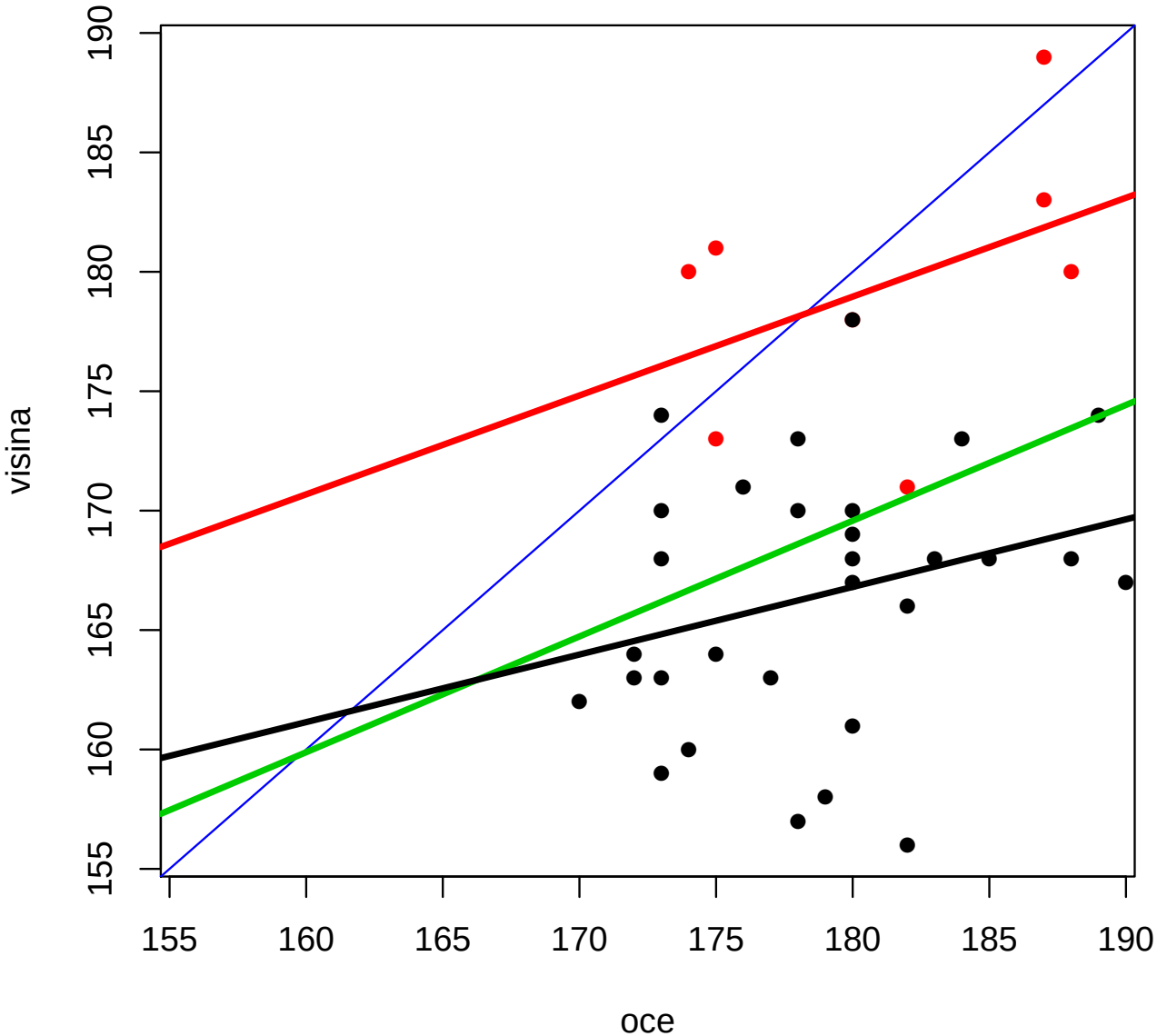
Velikost staršev in potomcev

Galton je ugotavljal korelacijo med velikostjo staršev in potomcev. Uvedel je pojem regresija, ki izvira iz ugotovitve, da so velikost staršev in potomcev v posebnem razmerju, ki zagotavlja 'regesijo' k povprečju.

Fantje

```
> with(data, plot(oce, visina, col = spol, pch = 16,
+     xlim = range(visina)))
> abline(c(0, 1), col = "blue")
> abline(lm(visina ~ oce, data = data), col = 3,
+     lwd = 3)
> abline(lm(visina ~ oce, data = data[data$spol ==
+     "M", ]), col = "red", lwd = 3)
> abline(lm(visina ~ oce, data = data[data$spol ==
+     "F", ]), lwd = 3)
```

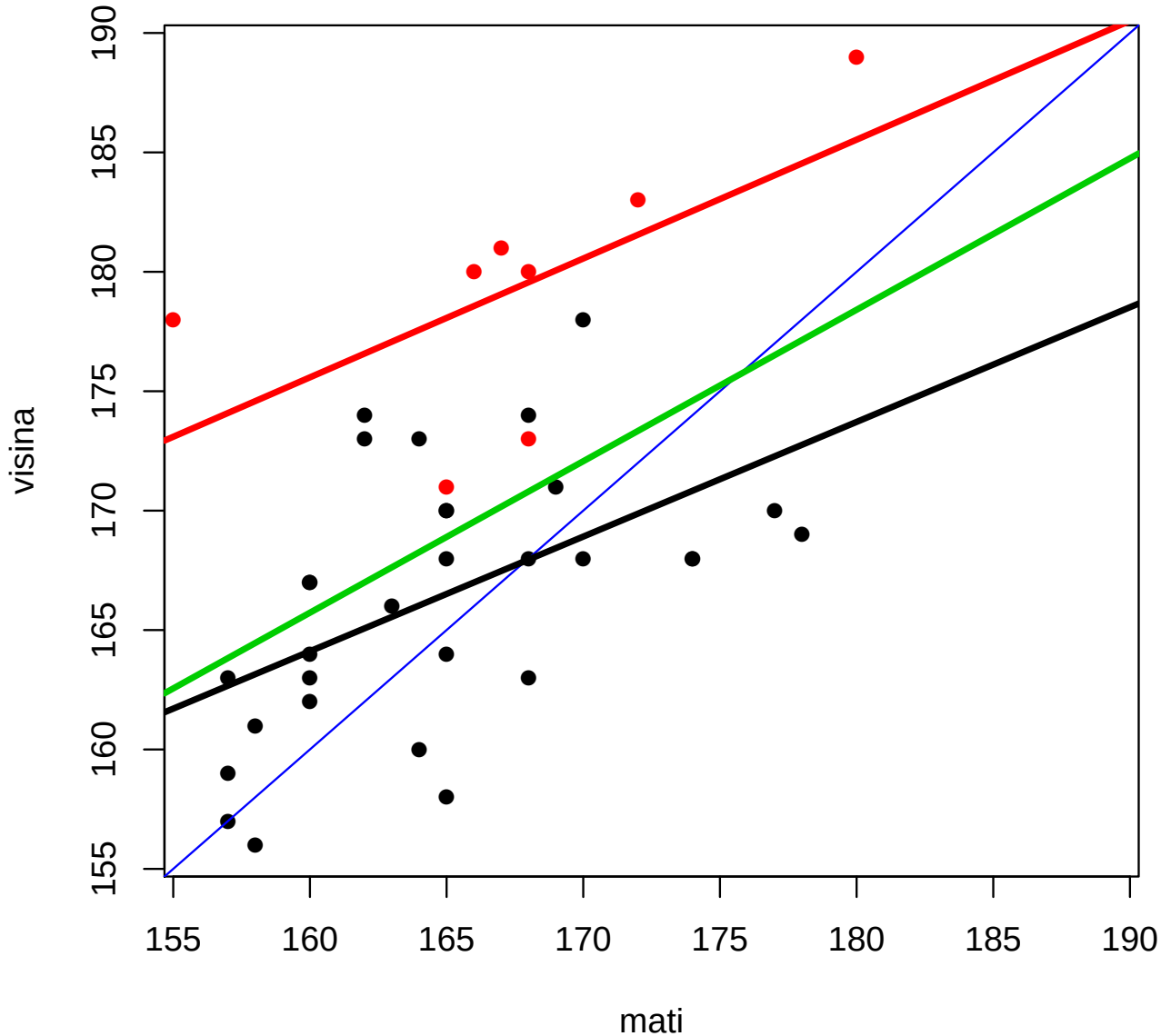
Fantje



Dekleta

```
> with(data, plot(mati, visina, col = spol, pch = 16,
+     xlim = range(visina)))
> abline(c(0, 1), col = "blue")
> abline(lm(visina ~ mati, data = data), col = 3,
+     lwd = 3)
> abline(lm(visina ~ mati, data = data[data$spol ==
+     "M", ]), col = "red", lwd = 3)
> abline(lm(visina ~ mati, data = data[data$spol ==
+     "F", ]), lwd = 3)
```

Dekleta



Fantje in dekleta