Unit Exercise 4

```
data(attitude)

# Part 1: Central Tendency

print("Mean")
```

```
## [1] "Mean"
```

```
apply(attitude, 2, mean)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##   64.63333   66.60000   53.13333   56.36667   64.63333   74.76667   42.93333
```

```
print("Median")
```

```
## [1] "Median"
```

```
apply(attitude, 2, median)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##       65.5       65.0       51.5       56.5       63.5       77.5       41.0
```

```
print("Mode")
```

```
## [1] "Mode"
```

```
apply(attitude, 2, mode)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##  "numeric"  "numeric"  "numeric"  "numeric"  "numeric"  "numeric"  "numeric"
```

```
getmode <- function(v) {
  uniqv <- unique(v)
  uniqv[which.max(tabulate(match(v, uniqv)))]
}
apply(attitude, 2, getmode)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##         43         70         42         39         66         80         41
```

```
print("Max")
```

```
## [1] "Max"
```

```
apply(attitude, 2, max)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##         85         90         83         75         88         92         72
```

```
print("Min")
```

```
## [1] "Min"
```

```r
apply(attitude, 2, min)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##         40         37         30         34         43         49         25
```

```r
print("Range")
```

```
## [1] "Range"
```

```r
apply(attitude, 2, range)
```

```
##      rating complaints privileges learning raises critical advance
## [1,]     40         37         30       34     43       49      25
## [2,]     85         90         83       75     88       92      72
```

```r
print("Quantile")
```

```
## [1] "Quantile"
```

```r
apply(attitude, 2, quantile)
```

```
##      rating complaints privileges learning raises critical advance
## 0%    40.00       37.0       30.0    34.00  43.00    49.00   25.00
## 25%   58.75       58.5       45.0    47.00  58.25    69.25   35.00
## 50%   65.50       65.0       51.5    56.50  63.50    77.50   41.00
## 75%   71.75       77.0       62.5    66.75  71.00    80.00   47.75
## 100%  85.00       90.0       83.0    75.00  88.00    92.00   72.00
```

```r
print("IQR")
```

```
## [1] "IQR"
```

```r
apply(attitude, 2, IQR)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##      13.00      18.50      17.50      19.75      12.75      10.75      12.75
```

```r
print("Variance")
```

```
## [1] "Variance"
```

```r
var(attitude)
```

```
##               rating complaints privileges  learning    raises critical
## rating     148.17126  133.77931   63.46437  89.10460  74.68851 18.84253
## complaints 133.77931  177.28276   90.95172  93.25517  92.64138 24.73103
## privileges  63.46437   90.95172  149.70575  70.84598  56.67126 17.82529
## learning    89.10460   93.25517   70.84598 137.75747  78.13908 13.46782
## raises      74.68851   92.64138   56.67126  78.13908 108.10230 38.77356
## critical    18.84253   24.73103   17.82529  13.46782  38.77356 97.90920
## advance     19.42299   30.76552   43.21609  64.19770  61.42299 28.84598
##               advance
## rating      19.42299
## complaints  30.76552
## privileges  43.21609
## learning    64.19770
## raises      61.42299
## critical    28.84598
## advance    105.85747
```

```r
print("Standard Deviation")
```

```
## [1] "Standard Deviation"
```

```r
apply(attitude, 2, sd)
```

```
##     rating complaints privileges   learning     raises   critical    advance
##  12.172562  13.314757  12.235430  11.737013  10.397226   9.894908  10.288706
```

```r
var(attitude)^0.5
```

```
##               rating complaints privileges  learning    raises critical
## rating     12.172562  11.566301   7.966453  9.439523  8.642251 4.340798
## complaints 11.566301  13.314757   9.536861  9.656872  9.625039 4.973031
## privileges  7.966453   9.536861  12.235430  8.417005  7.528032 4.222000
## learning    9.439523   9.656872   8.417005 11.737013  8.839631 3.669852
## raises      8.642251   9.625039   7.528032  8.839631 10.397226 6.226842
## critical    4.340798   4.973031   4.222000  3.669852  6.226842 9.894908
## advance     4.407152   5.546667   6.573895  8.012347  7.837282 5.370845
##               advance
## rating      4.407152
## complaints  5.546667
## privileges  6.573895
## learning    8.012347
## raises      7.837282
## critical    5.370845
## advance    10.288706
```

```r
print("Correlation")
```

```
## [1] "Correlation"
```

```r
cor(attitude)
```

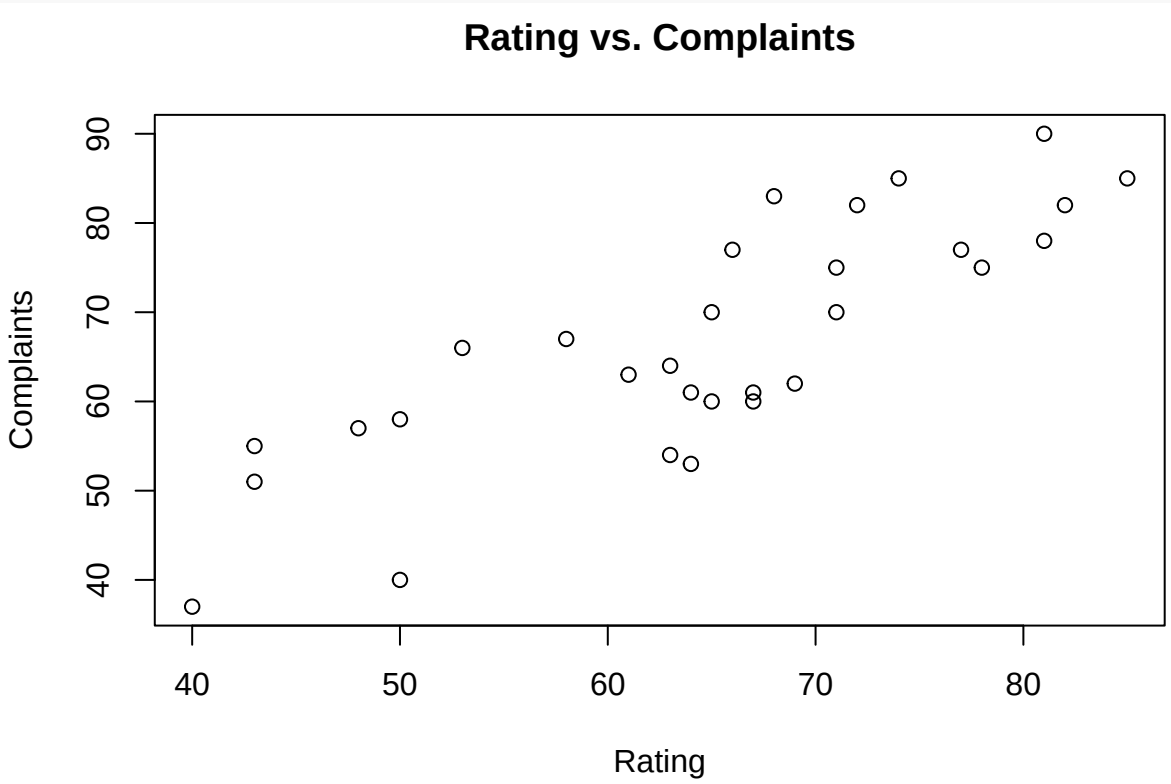
```
##               rating complaints privileges  learning    raises  critical
## rating     1.0000000  0.8254176  0.4261169 0.6236782 0.5901390 0.1564392
## complaints 0.8254176  1.0000000  0.5582882 0.5967358 0.6691975 0.1877143
## privileges 0.4261169  0.5582882  1.0000000 0.4933310 0.4454779 0.1472331
## learning   0.6236782  0.5967358  0.4933310 1.0000000 0.6403144 0.1159652
## raises     0.5901390  0.6691975  0.4454779 0.6403144 1.0000000 0.3768830
## critical   0.1564392  0.1877143  0.1472331 0.1159652 0.3768830 1.0000000
## advance    0.1550863  0.2245796  0.3432934 0.5316198 0.5741862 0.2833432
##               advance
## rating     0.1550863
## complaints 0.2245796
## privileges 0.3432934
## learning   0.5316198
## raises     0.5741862
## critical   0.2833432
## advance    1.0000000
```

```r
# Check
summary(attitude)
```

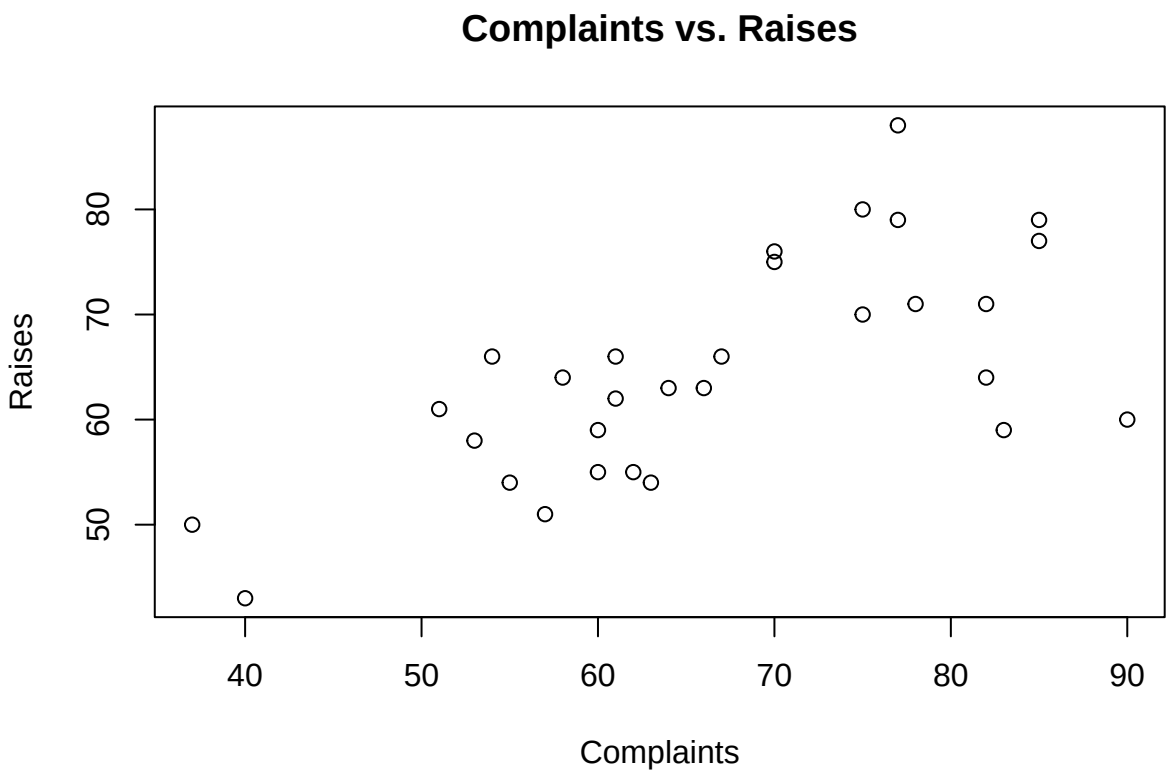
```
##      rating        complaints     privileges       learning         raises
##  Min.   :40.00   Min.   :37.0   Min.   :30.00   Min.   :34.00   Min.   :43.00
##  1st Qu.:58.75   1st Qu.:58.5   1st Qu.:45.00   1st Qu.:47.00   1st Qu.:58.25
##  Median :65.50   Median :65.0   Median :51.50   Median :56.50   Median :63.50
```

```
##  Mean   :64.63   Mean   :66.6   Mean   :53.13   Mean   :56.37   Mean   :64.63
##  3rd Qu.:71.75   3rd Qu.:77.0   3rd Qu.:62.50   3rd Qu.:66.75   3rd Qu.:71.00
##  Max.   :85.00   Max.   :90.0   Max.   :83.00   Max.   :75.00   Max.   :88.00
##     critical        advance
##  Min.   :49.00   Min.   :25.00
##  1st Qu.:69.25   1st Qu.:35.00
##  Median :77.50   Median :41.00
##  Mean   :74.77   Mean   :42.93
##  3rd Qu.:80.00   3rd Qu.:47.75
##  Max.   :92.00   Max.   :72.00
```

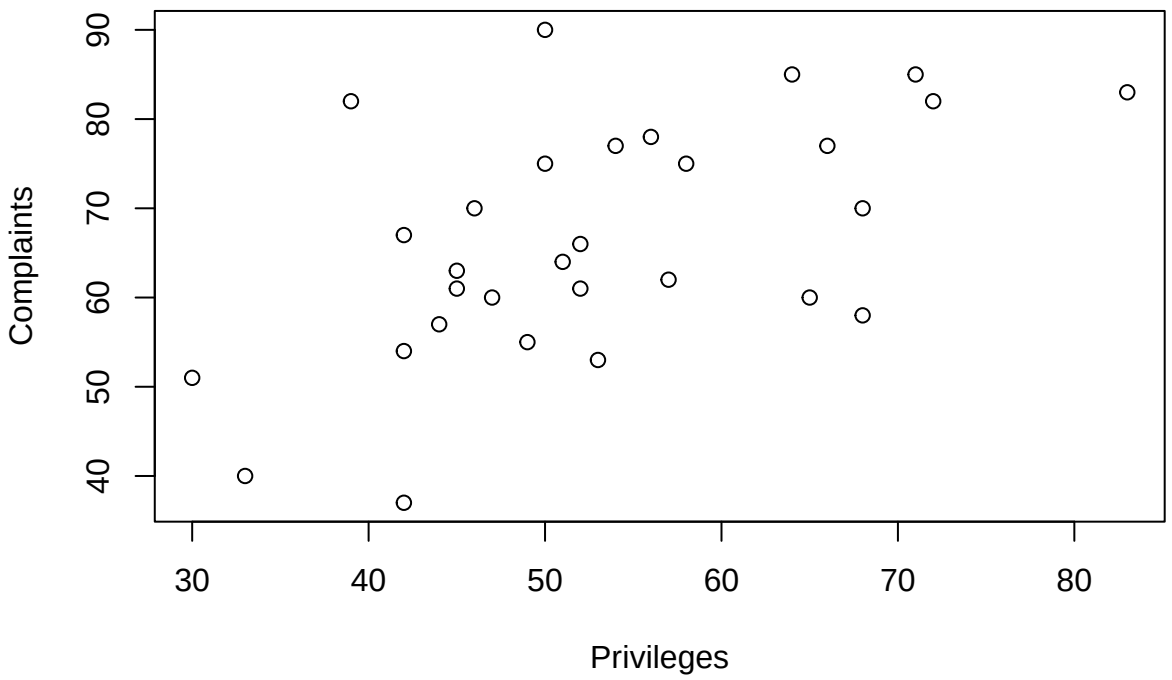
```r
# Part 2: Plotting

# make scatterplot for rating and complaints
plot(attitude$rating, attitude$complaints, xlab="Rating", ylab="Complaints", main="Rating vs. Complaints
```



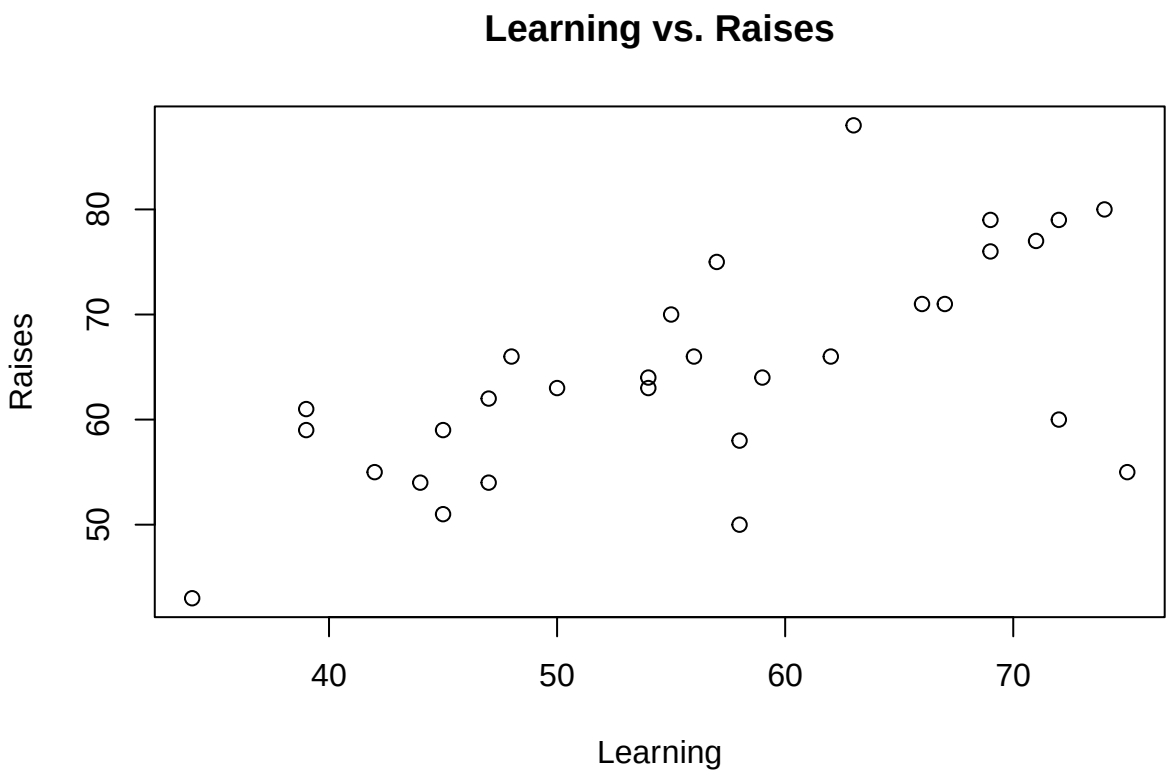

```r
# make scatterplot for complaints and raises
plot(attitude$complaints, attitude$raises, xlab="Complaints", ylab="Raises", main="Complaints vs. Raises
```



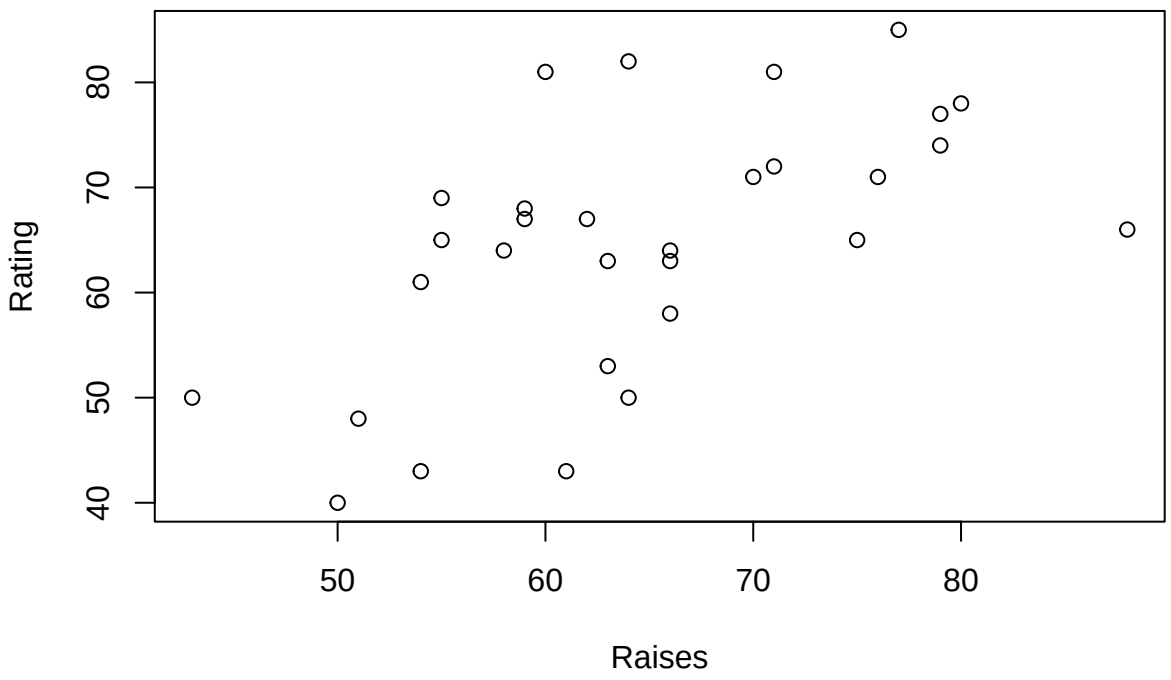

```
# make scatterplot for privileges and complaints
plot(attitude$privileges, attitude$complaints, xlab="Privileges", ylab="Complaints", main="Privileges vs
```



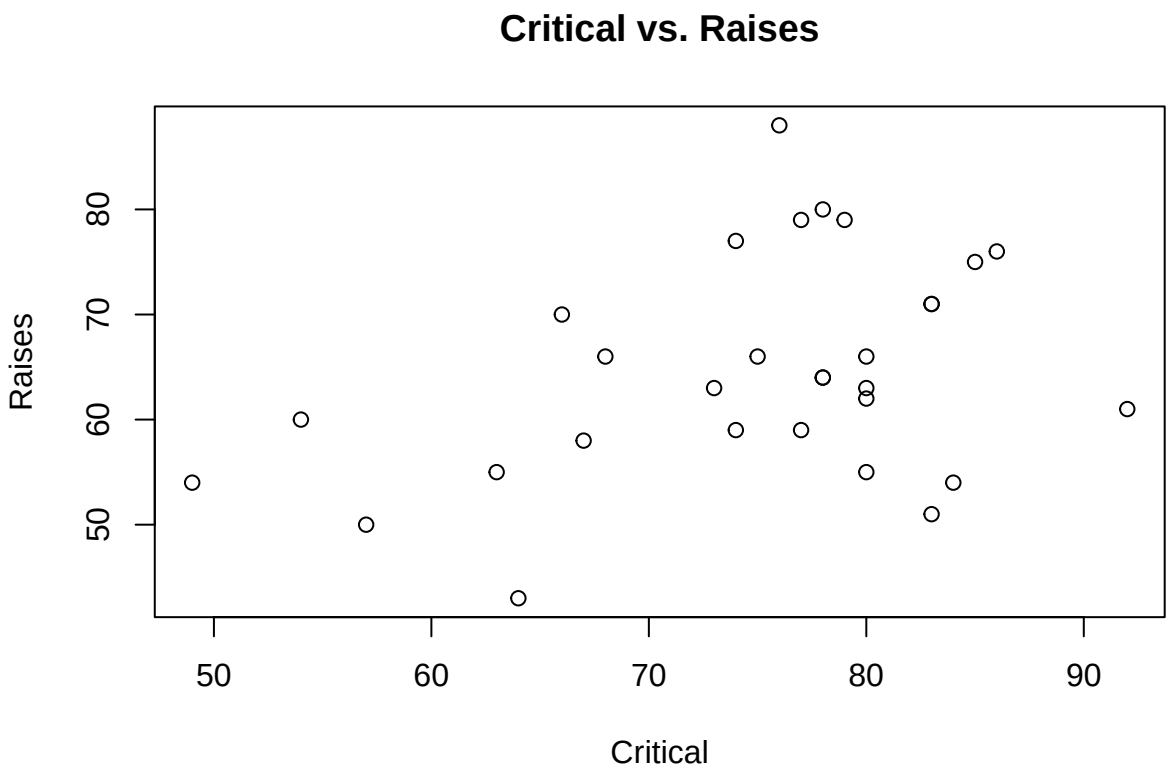

```
# make scatterplot for learning and raises
plot(attitude$learning, attitude$raises, xlab="Learning", ylab="Raises", main="Learning vs. Raises")
```



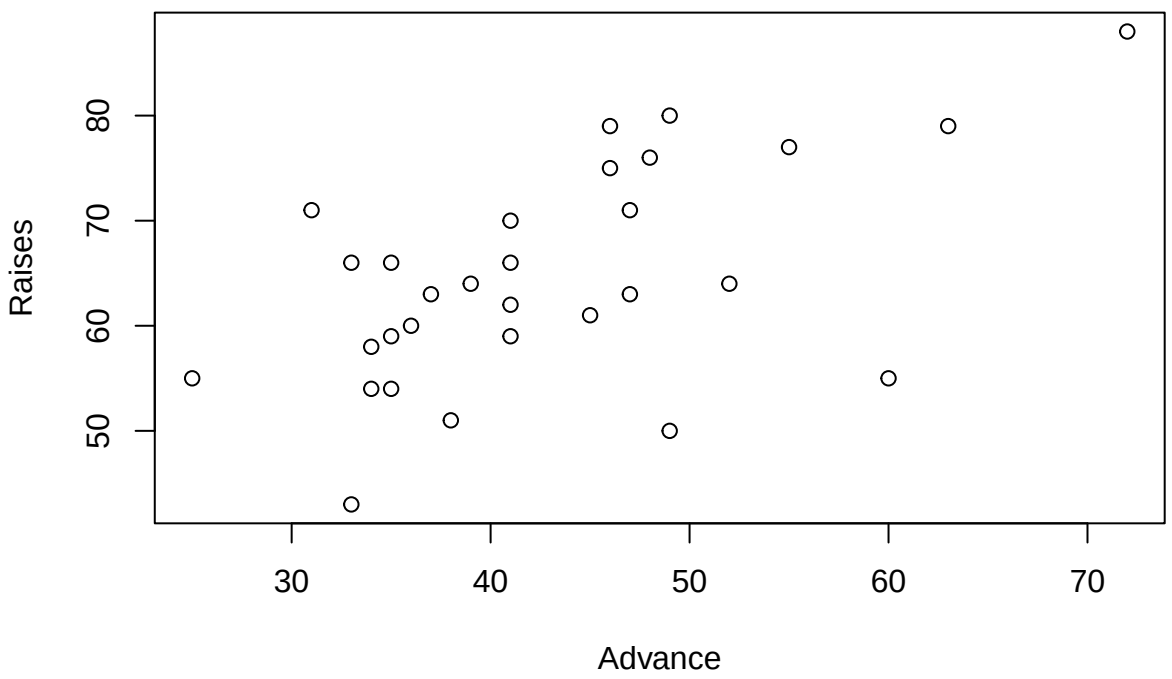

```
# make scatterplot for raises and rating
plot(attitude$raises, attitude$rating, xlab="Raises", ylab="Rating", main="Raises vs. Rating")
```




```
# make scatterplot for critical and raises
plot(attitude$critical, attitude$raises, xlab="Critical", ylab="Raises", main="Critical vs. Raises")
```

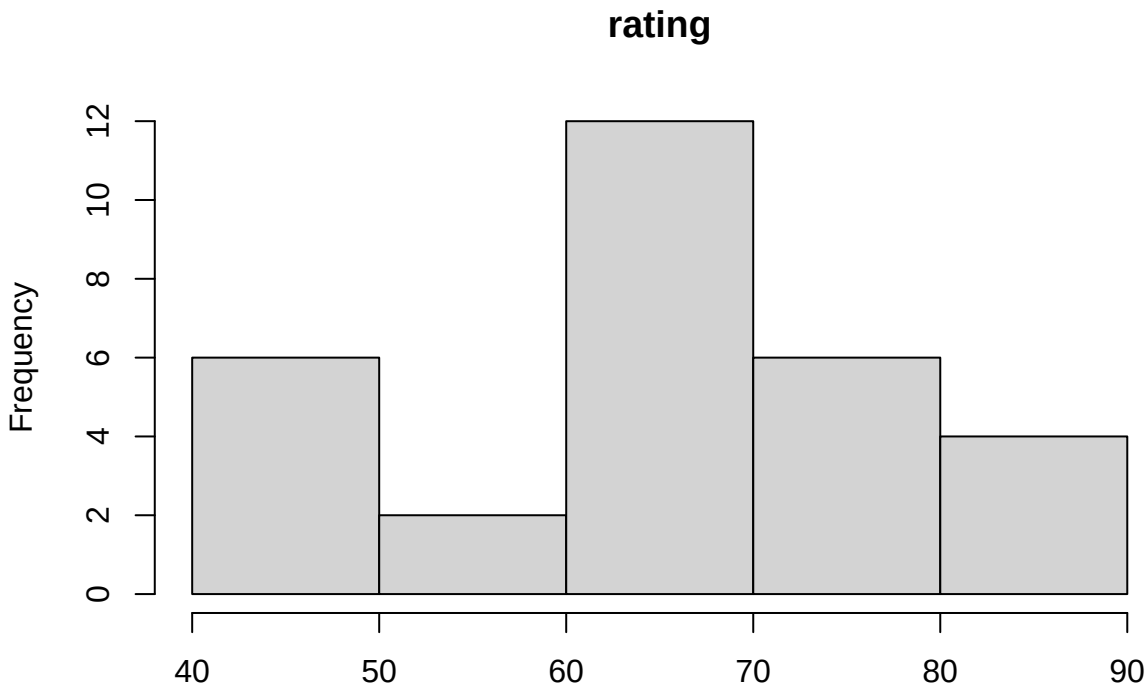


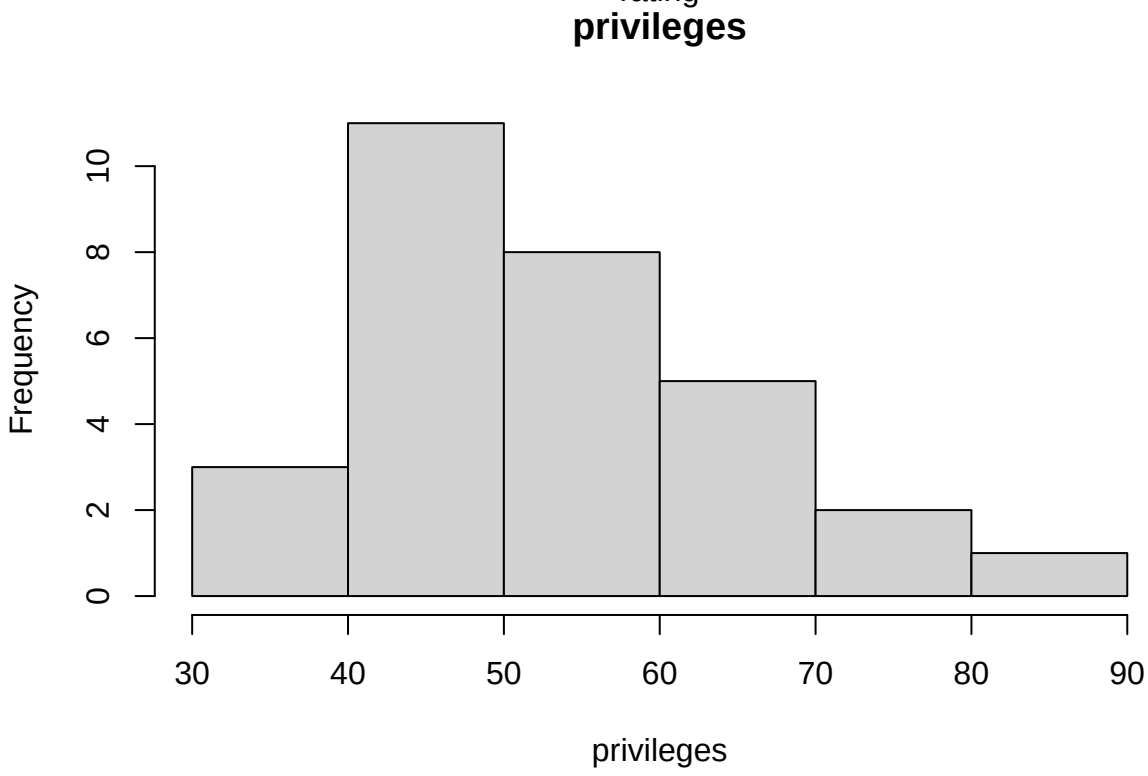

```r
# make scatterplot for advance and raises
plot(attitude$advance, attitude$raises, xlab="Advance", ylab="Raises", main="Advance vs. Raises")
```

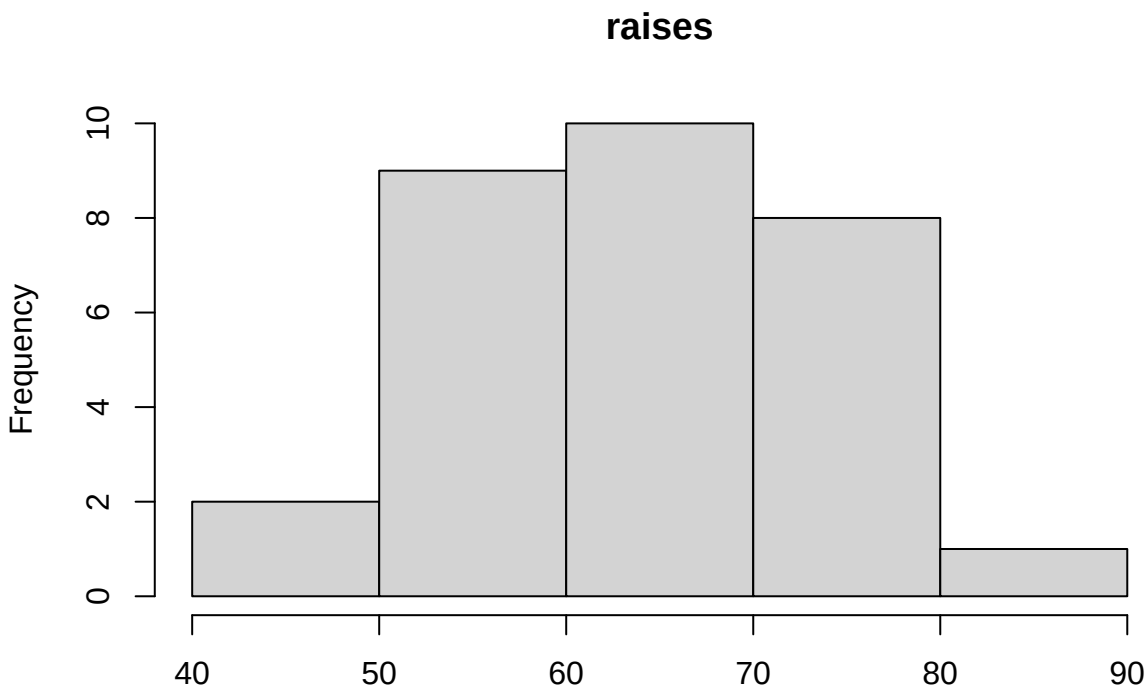


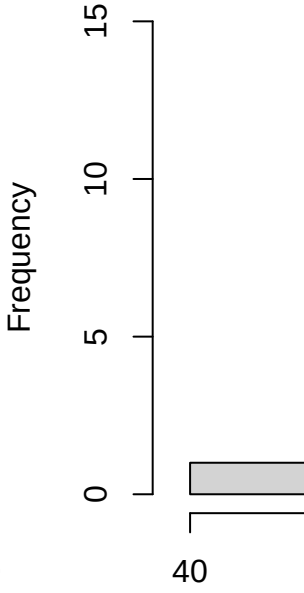

```r
# make a histogram for all variables
for (i in 1:ncol(attitude)) {
  hist(attitude[,i], main=names(attitude)[i], xlab=names(attitude)[i])
```

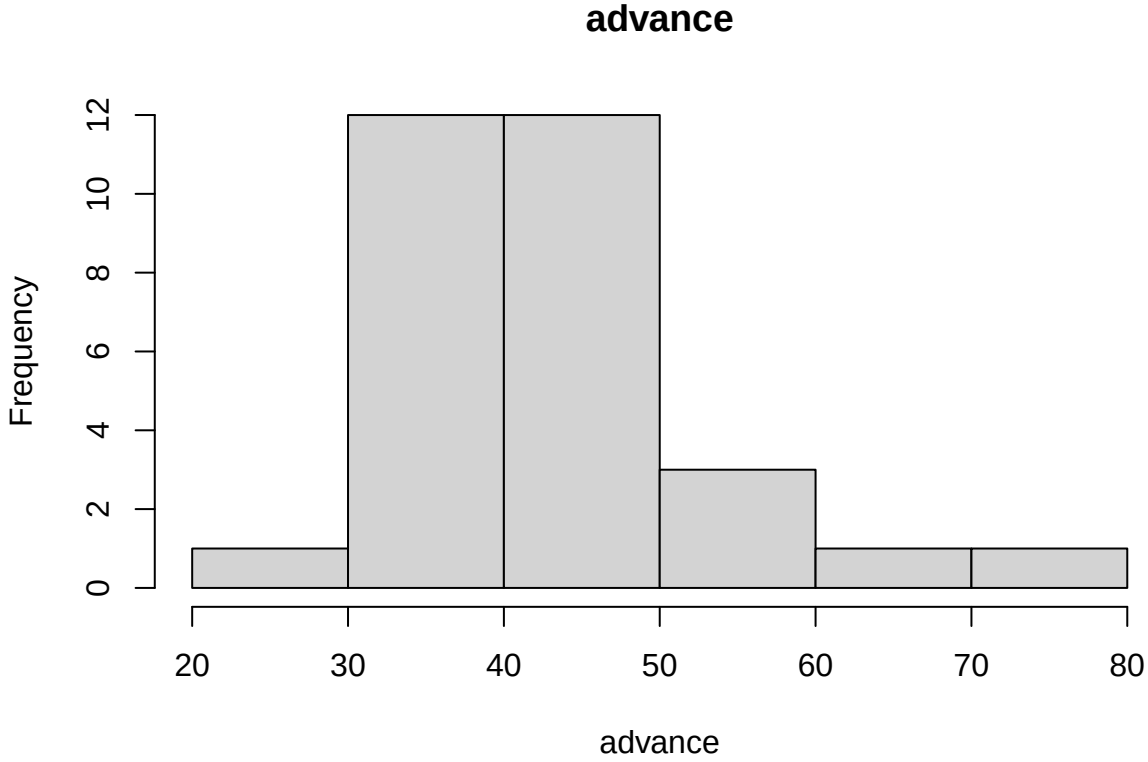
```
}
```


rating
Frequency
0
2
4
6
8
10
12
40
50
60
70
80
90
rating

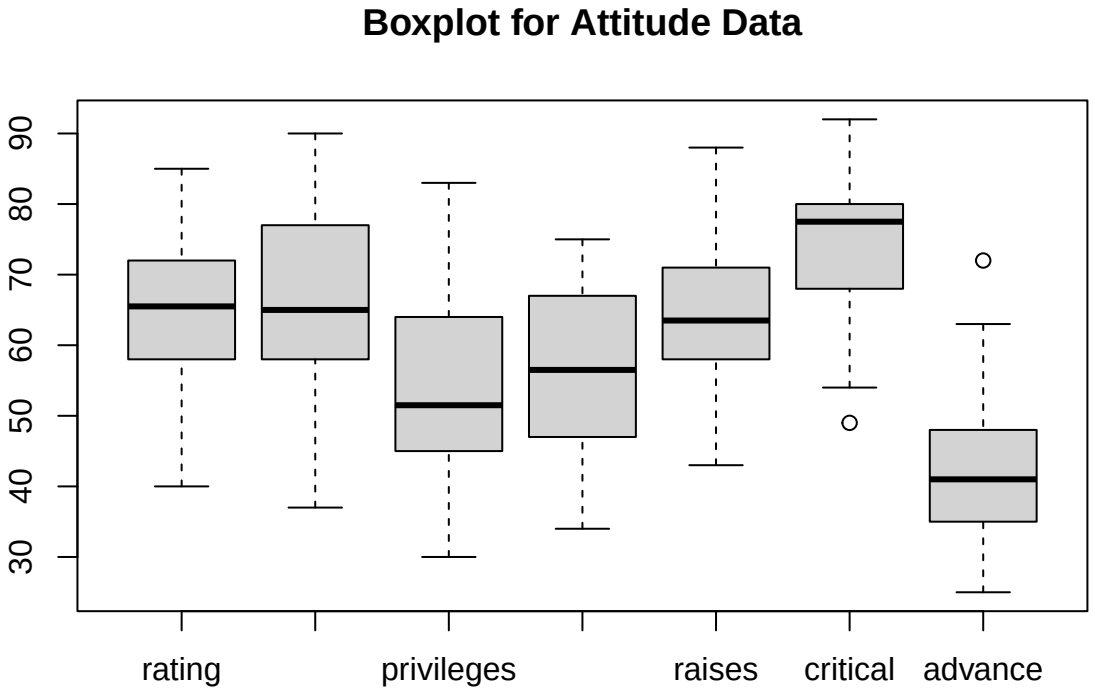

privileges
Frequency
0
2
4
6
8
10
30
40
50
60
70
80
90
privileges



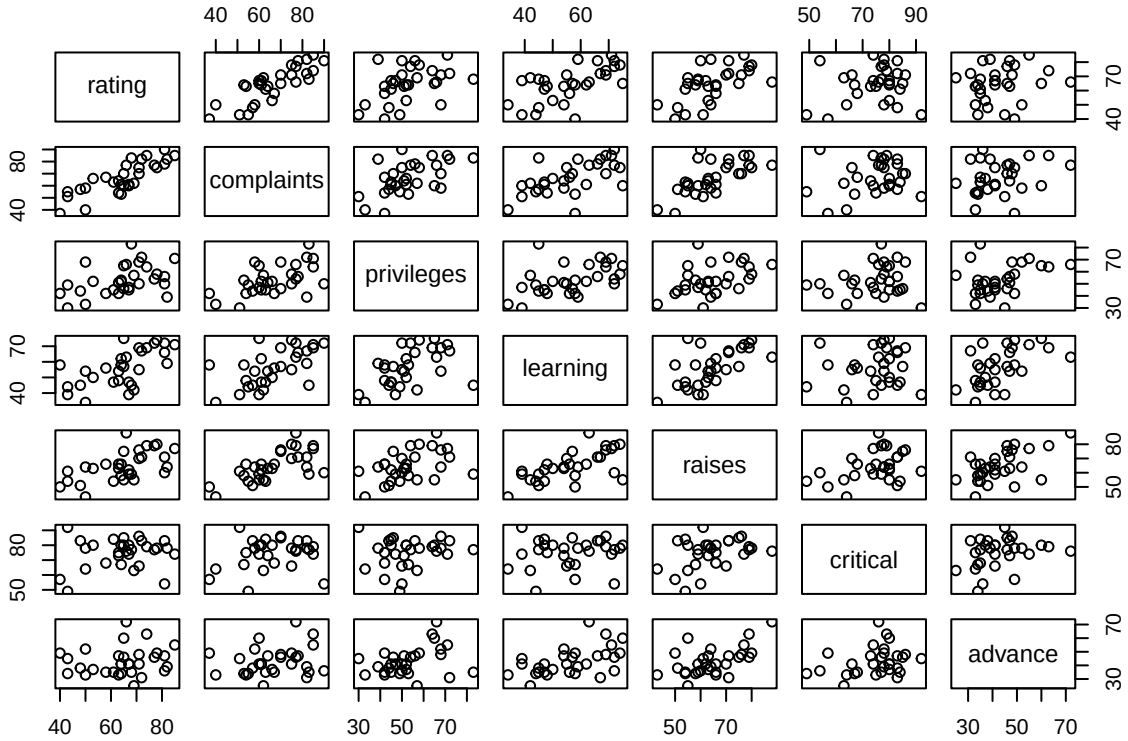





```
# make boxplot
par(mfrow=c(1,1))
boxplot(attitude, main="Boxplot for Attitude Data", xlab="Variables")
```

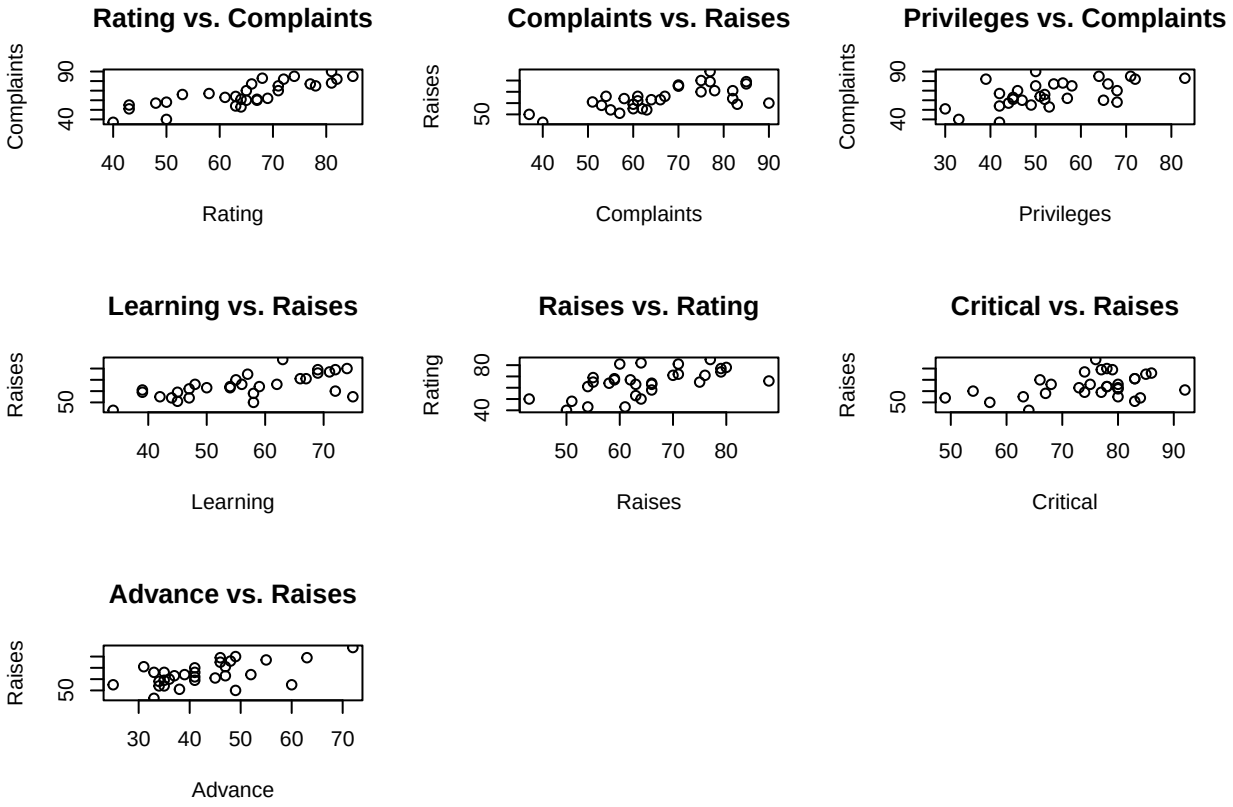



```
# Part 3: Matrix of Scatterplot, Histogram, and Boxplot
# make a matrix of scatterplots
pairs(attitude)
```

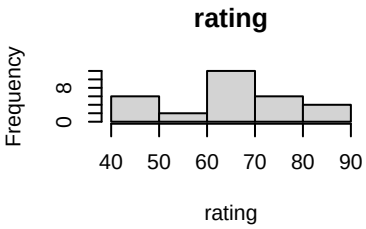


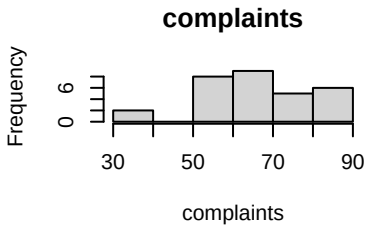

```
par(mfrow=c(3,3))
plot(attitude$rating, attitude$complaints, xlab="Rating", ylab="Complaints", main="Rating vs. Complaints
```

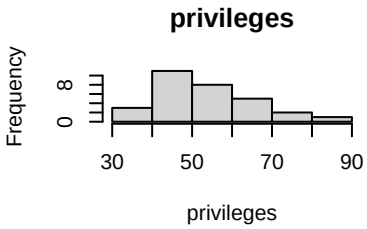
```
plot(attitude$complaints, attitude$raises, xlab="Complaints", ylab="Raises", main="Complaints vs. Raises")
plot(attitude$privileges, attitude$complaints, xlab="Privileges", ylab="Complaints", main="Privileges vs")
plot(attitude$learning, attitude$raises, xlab="Learning", ylab="Raises", main="Learning vs. Raises")
plot(attitude$raises, attitude$rating, xlab="Raises", ylab="Rating", main="Raises vs. Rating")
plot(attitude$critical, attitude$raises, xlab="Critical", ylab="Raises", main="Critical vs. Raises")
plot(attitude$advance, attitude$raises, xlab="Advance", ylab="Raises", main="Advance vs. Raises")

# make a matrix of histograms
par(mfrow=c(3,3))
```

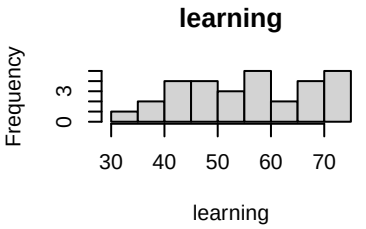


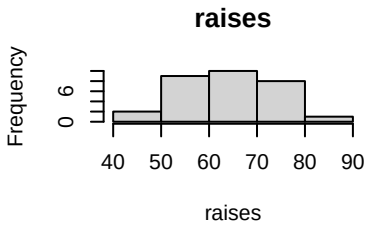

```
for (i in 1:ncol(attitude)) {
  hist(attitude[,i], main=names(attitude)[i], xlab=names(attitude)[i])
}

# make a matrix of boxplots
par(mfrow=c(3,3))
```

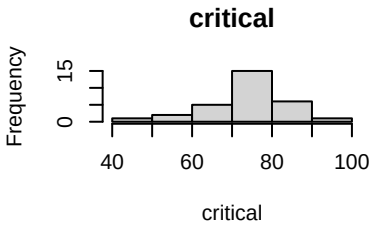


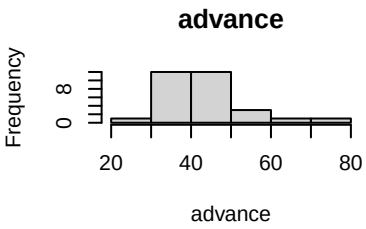













```
for (i in 1:ncol(attitude)) {
  boxplot(attitude[,i], main=names(attitude)[i], xlab=names(attitude)[i])
}
```