b06901048 電機五 陳昱行

Problem1

i.

```
col.name <- c('Party', 'Results 2019 (%)', 'Results 2014 (%)')
Party <- c('ANC', 'DA',
'EFF','IFP','FF Plus','Others')
Results_2019 <- c(57.50,20.77,10.80,3.38,2.38,5.17)
Results_2014 <- c(62.15,22.23,6.35,2.40,0.90,5.97)
dat <- data.frame(Party,Results_2019,Results_2014)
names(dat) <- col.name
library(knitr)
kable(dat[1:6,])
```

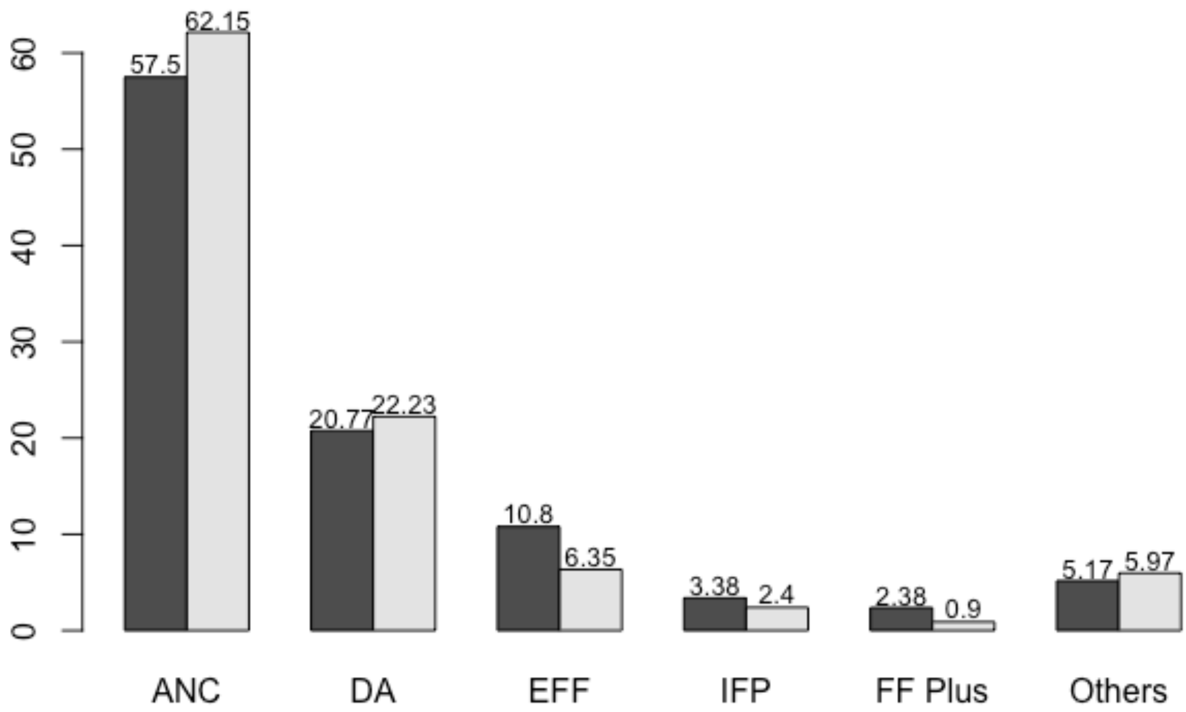
Party	Results 2019 (%)	Results 2014 (%)
ANC	57.50	62.15
DA	20.77	22.23
EFF	10.80	6.35
IFP	3.38	2.40
FF Plus	2.38	0.90
Others	5.17	5.97

```
summary(dat)
```

```
##     Party           Results 2019 (%) Results 2014 (%)
##  Length:6           Min.   : 2.380   Min.   : 0.900
##  Class :character   1st Qu.: 3.828   1st Qu.: 3.292
##  Mode  :character   Median : 7.985   Median : 6.160
##                     Mean   :16.667   Mean   :16.667
##                     3rd Qu.:18.277   3rd Qu.:18.260
##                     Max.   :57.500   Max.   :62.150
```

ii.

```
dat.plot <- matrix(c(Results_2019,Results_2014),nrow=2,ncol=6,byrow=T)
# quartz()
b <- barplot(dat.plot,names.arg=Party,beside=T,ylim=c(0,65))
text(x = b, y=dat.plot, label=dat.plot,pos = 3, cex = 0.8,offset=0.1)
```



Problem2

i.

```
time.until.score <-
c(53,49,42,26,6,39,60,10,47,2,38,74,18,52,29,11,24,21,57,42,37,17,12,18,
77,25,30,2,84,20,47,15,31,11,27,95,68,42,20,15,75,27,8,31,5,4,60,30,2)
table(time.until.score)
```

```
## time.until.score
##  2  4  5  6  8 10 11 12 15 17 18 20 21 24 25 26 27 29 30 31 37 38 39 42 47 49
##  3  1  1  1  1  1  2  1  2  1  2  2  1  1  1  1  2  1  2  2  1  1  1  3  2  1
## 52 53 57 60 68 74 75 77 84 95
##  1  1  1  2  1  1  1  1  1  1
```

```
F.head <- ecdf(time.until.score)
print(c(F.head(30),F.head(45),F.head(60)))
```

```
## [1] 0.5510204 0.7142857 0.8775510
```

ii.

```
f.head <- density(time.until.score, kernel="rectangular",bw = 10)
# n is default to 512
print(c(f.head$y[30],f.head$y[45],f.head$y[60]))
```

```
## [1] 0.000000000 0.001767399 0.003534798
```

iii.

```
mean(time.until.score)
```

```
## [1] 33.36735
```

```
median(time.until.score)
```

```
## [1] 29
```

```
quantile(time.until.score,c(0.75,0.25))
```

```
## 75% 25%
##  47  15
```

iv.

```
#interquantile range
quantiles <- quantile(time.until.score,c(0.75,0.25))
unname(quantiles[1] - quantiles[2])
```

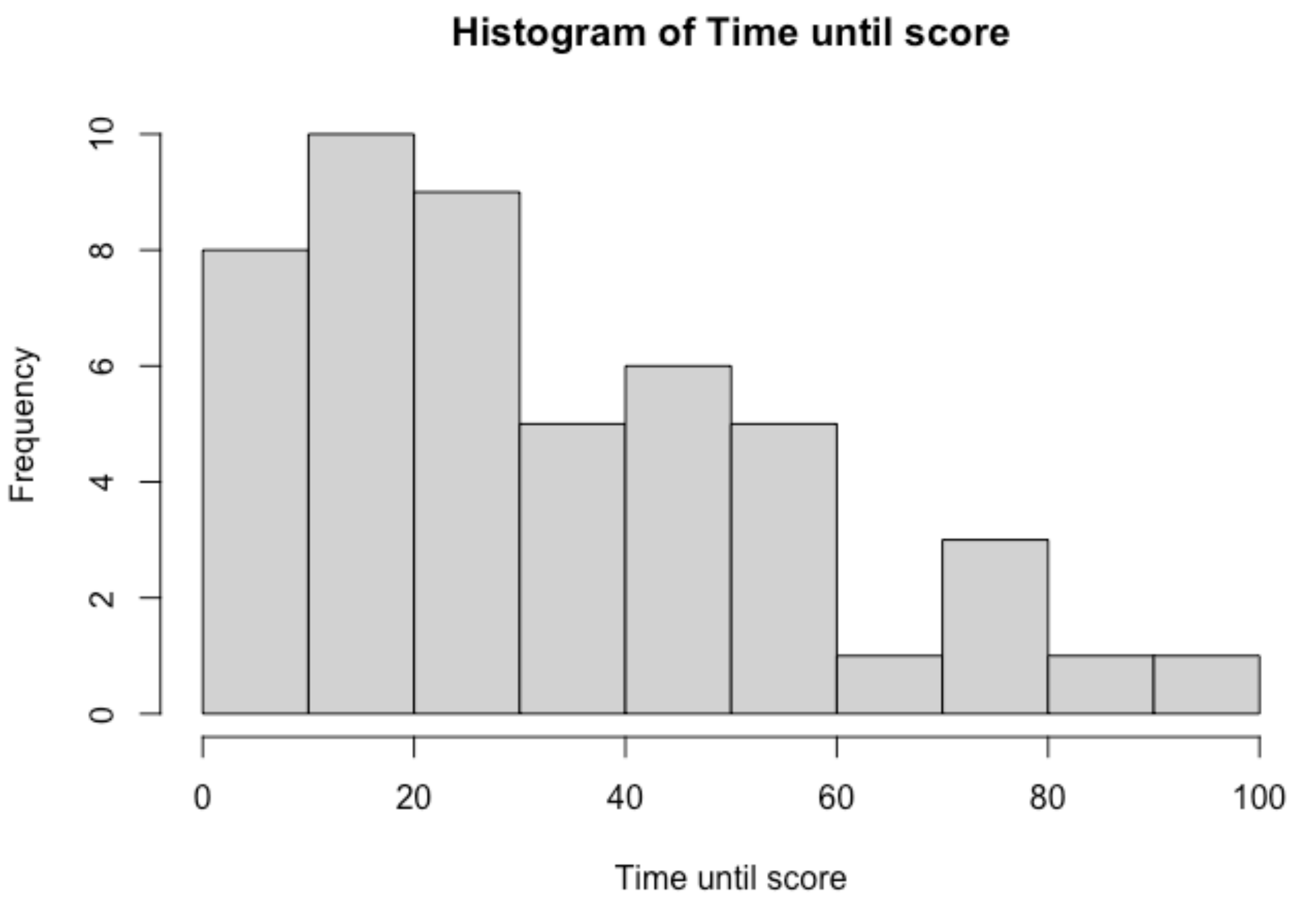
```
## [1] 32
```

```
#variance
var(time.until.score)
```

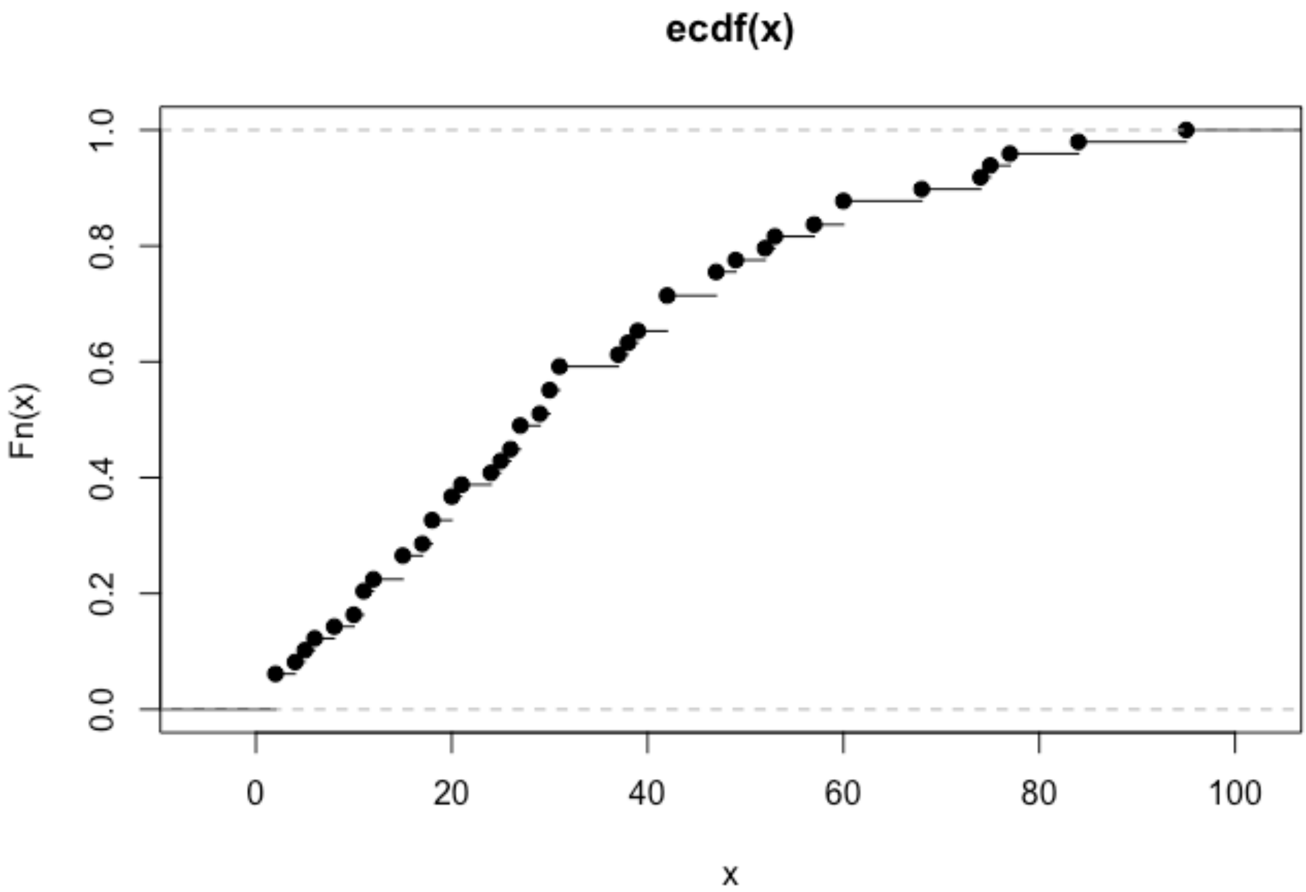
```
## [1] 557.3206
```

v.

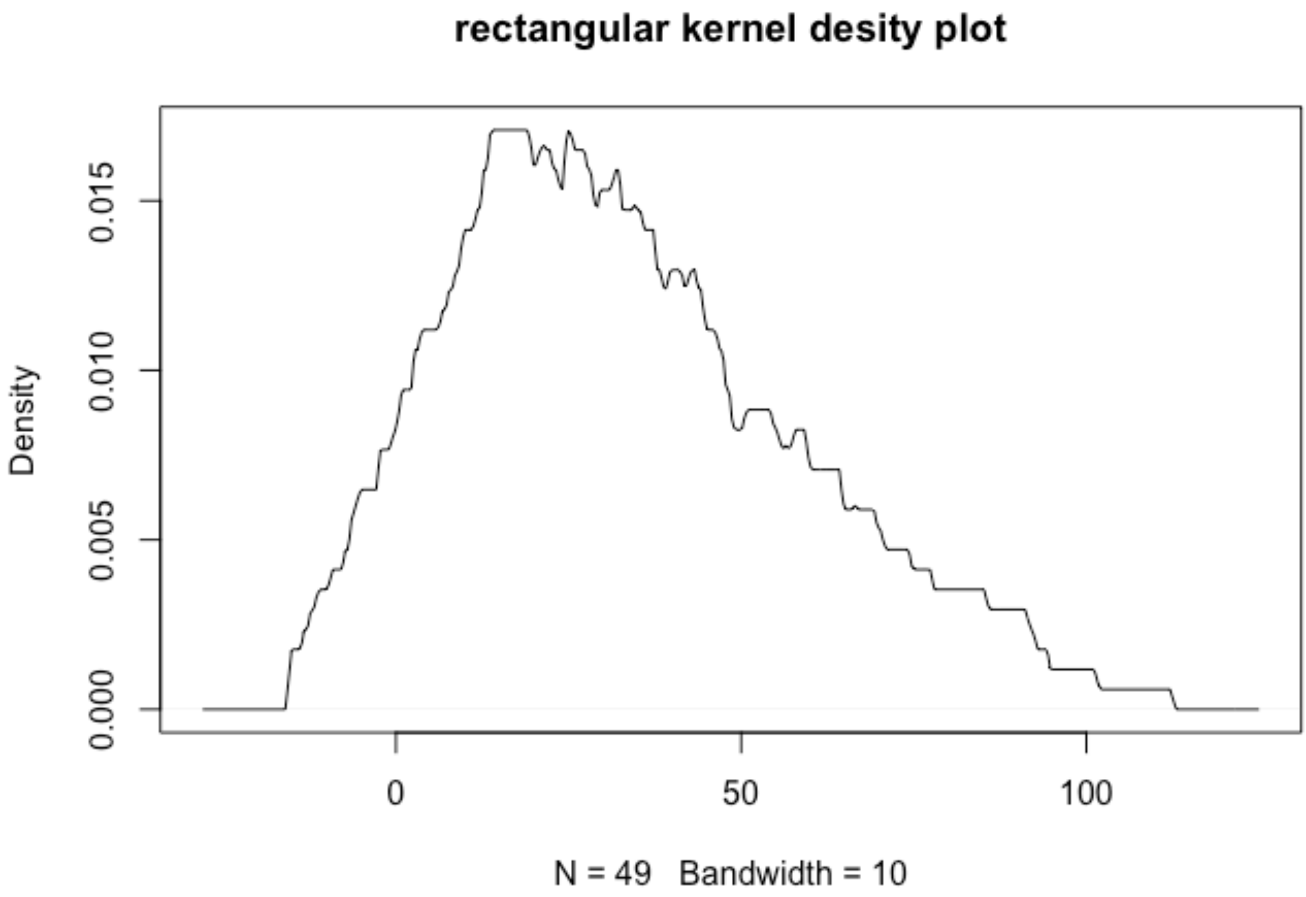
```
hist(time.until.score,xlab="Time until score",main = paste("Histogram of" , "Time until score"))
```



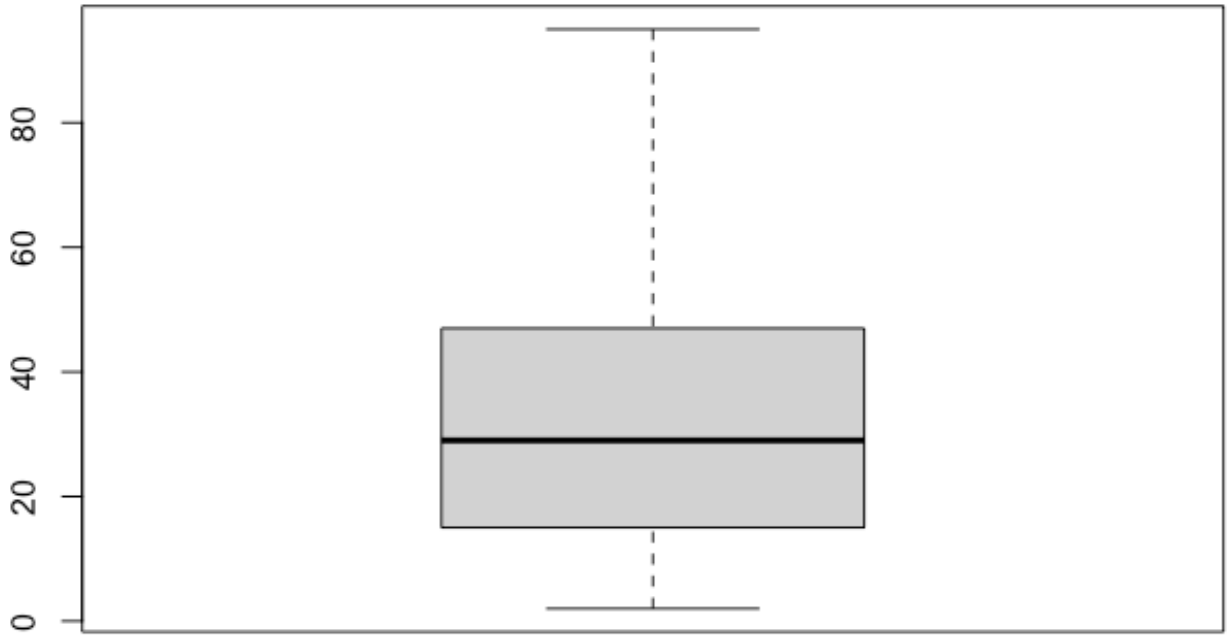

```
plot.ecdf(time.until.score)
```




```
plot(f.head,main=paste("rectangular kernel desity plot"))
```




```
boxplot(time.until.score)
```



Problem 3

i.

```
pizza <- read.csv('http://chris.userweb.mwn.de/book/pizza_delivery.csv',
                  stringsAsFactors = T)
summary(pizza[c('time','temperature','bill','pizzas')])
```

```
##      time        temperature          bill           pizzas
##  Min.   :12.27   Min.   :41.76   Min.   : 9.10   Min.   : 1.000
##  1st Qu.:30.06   1st Qu.:58.24   1st Qu.:35.50   1st Qu.: 2.000
##  Median :34.38   Median :62.93   Median :42.90   Median : 3.000
##  Mean   :34.23   Mean   :62.86   Mean   :42.76   Mean   : 3.013
##  3rd Qu.:38.58   3rd Qu.:67.23   3rd Qu.:50.50   3rd Qu.: 4.000
##  Max.   :53.10   Max.   :87.58   Max.   :75.00   Max.   :11.000
```

ii.

```
quantile(pizza$time,0.99)
```

```
##      99%
## 48.61677
```

```
quantile(pizza$temperature,0.99)
```

```
##   99%
## 79.87
```

iii.

```
mean(abs(pizza$temperature - mean(pizza$temperature)))
```

```
## [1] 5.473862
```

```
mad(pizza$temperature,constant=1)
```

```
## [1] 4.494156
```

iv.

```
mean(scale(pizza$time))
```

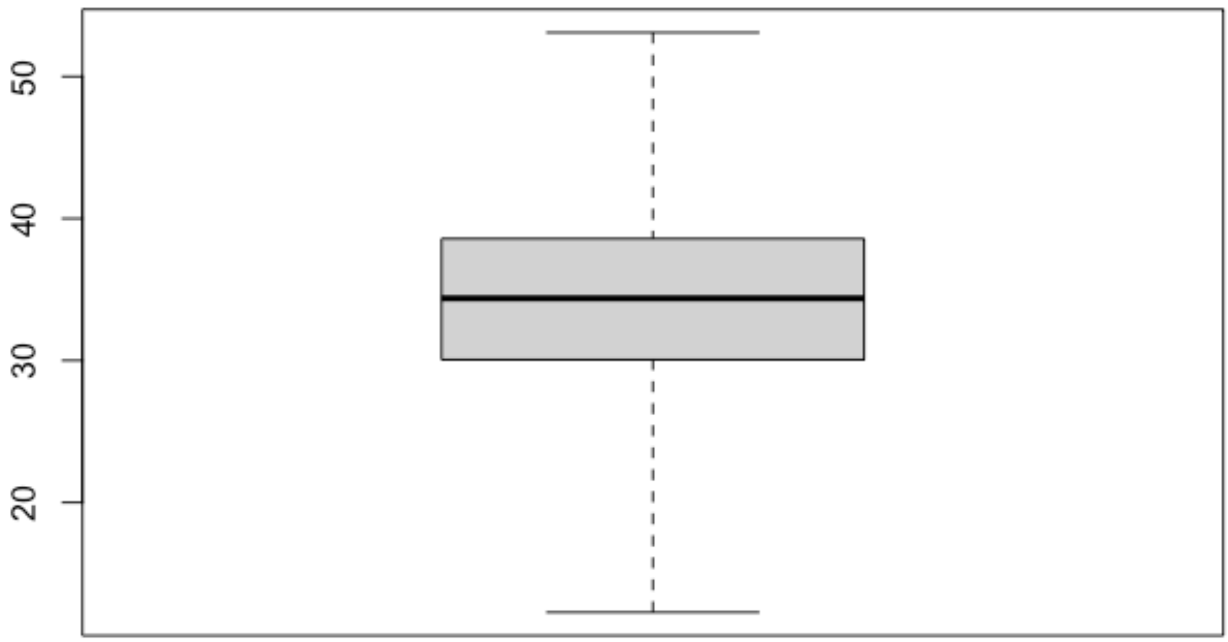
```
## [1] 5.222066e-16
```

```
# variance is a matrix
var(scale(pizza$time))[1]
```

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

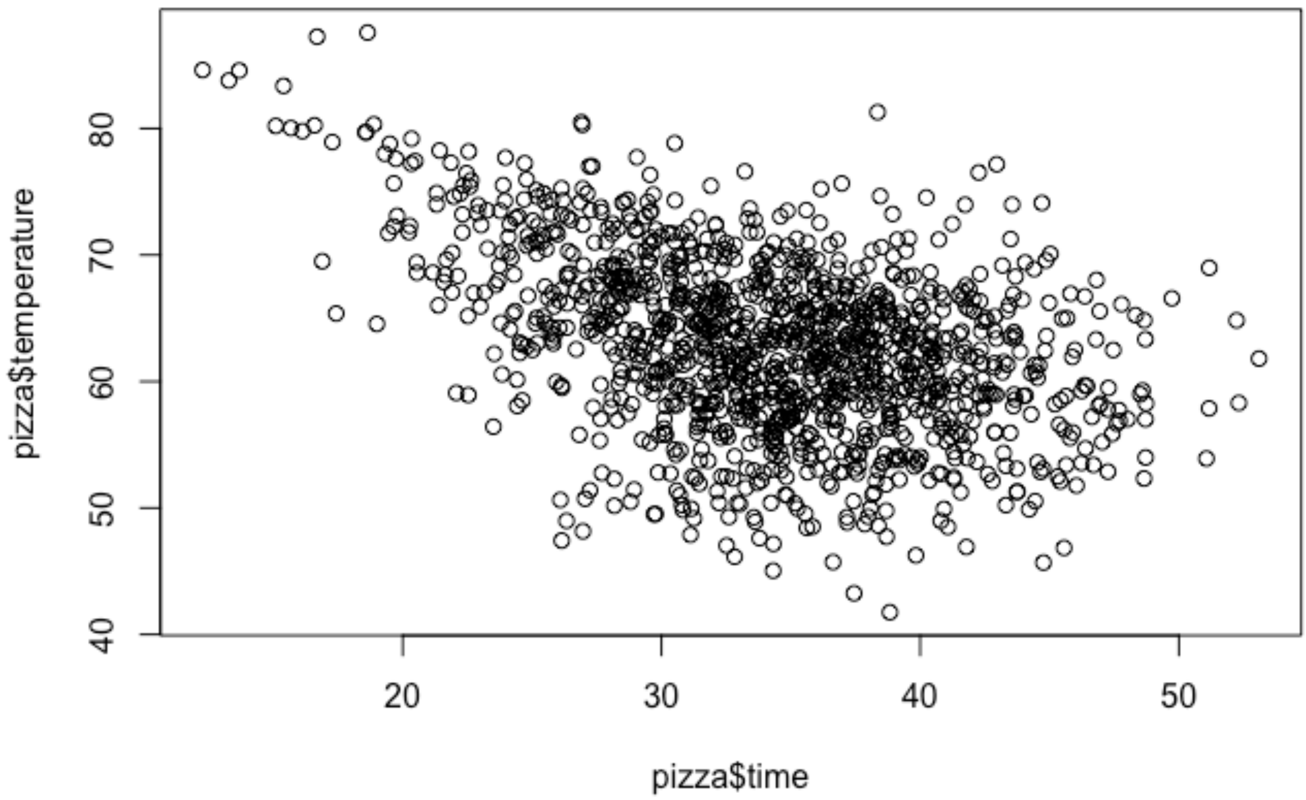
v.

```
boxplot(pizza$time,range=0)
```



vi.

```
plot(pizza$time,pizza$temperature)
```




```
cor(pizza$time,pizza$temperature, method = 'pearson')
```

```
## [1] -0.433935
```

```
cor(pizza$time,pizza$temperature, method = 'spearman')
```

```
## [1] -0.3912803
```

Problem4

```
passenger.classes <- c('first','second','third','staff')
passenger <- c(337,285,721,885)
passenger.rescued <- c(135,160,541,674)
passenger.unrescued <- passenger - passenger.rescued
```

i.

```
table.contigency <-
matrix(c(passenger.rescued,passenger.unrescued),nrow=2,ncol=4,byrow=T)
dimnames(table.contigency) <- list(c('rescued','unrescued'),passenger.classes)
table.contigency.addmargin <- addmargins(table.contigency)
print(table.contigency.addmargin)
```

```
##           first second third staff  Sum
## rescued     135    160   541   674 1510
## unrescued   202    125   180   211  718
## Sum         337    285   721   885 2228
```

ii.

```
expected.absolute.frequency <- NULL
n <- table.contigency.addmargin['Sum','Sum']
for(i in table.contigency.addmargin['Sum',]){
    expected.absolute.frequency <-
c(expected.absolute.frequency,i*table.contigency.addmargin['rescued','Sum']/n)
}
print(expected.absolute.frequency)
```

```
## [1]  228.3977  193.1553  488.6490  599.7980 1510.0000
```

iii.

```
min.k.l <- min(dim(table.contigency))
chi <- chisq.test(table.contigency)$statistic
Cramers.V <-sqrt(chi/(table.contigency.addmargin['Sum','Sum']*(min.k.l-1)))
print(paste("χ2 = ",chi,"Cramer's V = ",Cramers.V))
```

```
## [1] "χ2 =  182.063173691428 Cramer's V =  0.28586004730962"
```

iv.

```
concordant.K <- 0
decordant.D <- 0
rev.table.contigency <- matrix(rev(table.contigency),nrow=2,ncol=4)
print(rev.table.contigency)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]  211  180  125  202
## [2,]  674  541  160  135
```

```
#calculate concordant
for( i in seq(1,dim(rev.table.contigency)[2]-1)){
    for(j in seq(i+1,dim(rev.table.contigency)[2])){
        concordant.K <- concordant.K + rev.table.contigency[1,i] *
rev.table.contigency[2,j]
    }
}
#calculate decordant
for( i in seq(dim(rev.table.contigency)[2],2)){
    for(j in seq(i-1,1)){
        decordant.D <- decordant.D + rev.table.contigency[1,i] *
rev.table.contigency[2,j]
    }
}
n <- table.contigency.addmargin['Sum','Sum']
print(paste("γ = ",(concordant.K-decordant.D)/(concordant.K+decordant.D),"τc =
",2*min(dim(rev.table.contigency))*(concordant.K-decordant.D)/(n^2*min.k.l-1)))
```

```
## [1] "γ =  -0.381999107003998 τc =  -0.122713542460405"
```

v.

```
new.class <- c('Class A','Class B')
new.rescued <- c(135+160,541+674)
new.total <- c(337+285,721+885)
new.unrescued <- new.total - new.rescued
new.contingency.table <- matrix(c(new.rescued,new.unrescued),nrow=2,ncol=2)
dimnames(new.contingency.table) <- list(c('rescued','unrecued'),new.class)
new.contingency.table.addmargin <- addmargins(new.contingency.table)
print(new.contingency.table.addmargin)
```

```
##          Class A Class B  Sum
## rescued      295     327  622
## unrecued    1215     391 1606
## Sum         1510     718 2228
```

```
new.chi <- chisq.test(new.contingency.table)$statistic
new.min.k.l <- min(dim(new.contingency.table))
new.Cramers.V <- sqrt(new.chi/(new.contingency.table.addmargin['Sum','Sum']*
(new.min.k.l-1)))
print(paste("χ2 = ",new.chi,"Cramer's V = ",new.Cramers.V))
```

```
## [1] "χ2 =  162.261077205382 Cramer's V =  0.269866877553103"
```

```
risk.new.unrescued.classB <-
new.contingency.table.addmargin[2,2]/new.contingency.table.addmargin[2,3]
risk.new.unrescued.classA <-
new.contingency.table.addmargin[1,2]/new.contingency.table.addmargin[1,3]
relative.risk <- risk.new.unrescued.classB/risk.new.unrescued.classA
relative.not.risk <- (1-risk.new.unrescued.classB)/(1-risk.new.unrescued.classA)
print(paste("relative risks = ",relative.risk, "odds ratio =
",relative.risk/relative.not.risk))
```

```
## [1] "relative risks =  0.463099005640164 odds ratio =  0.290318521035477"
```