Homework 1

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STAT 451-001

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Problem 1

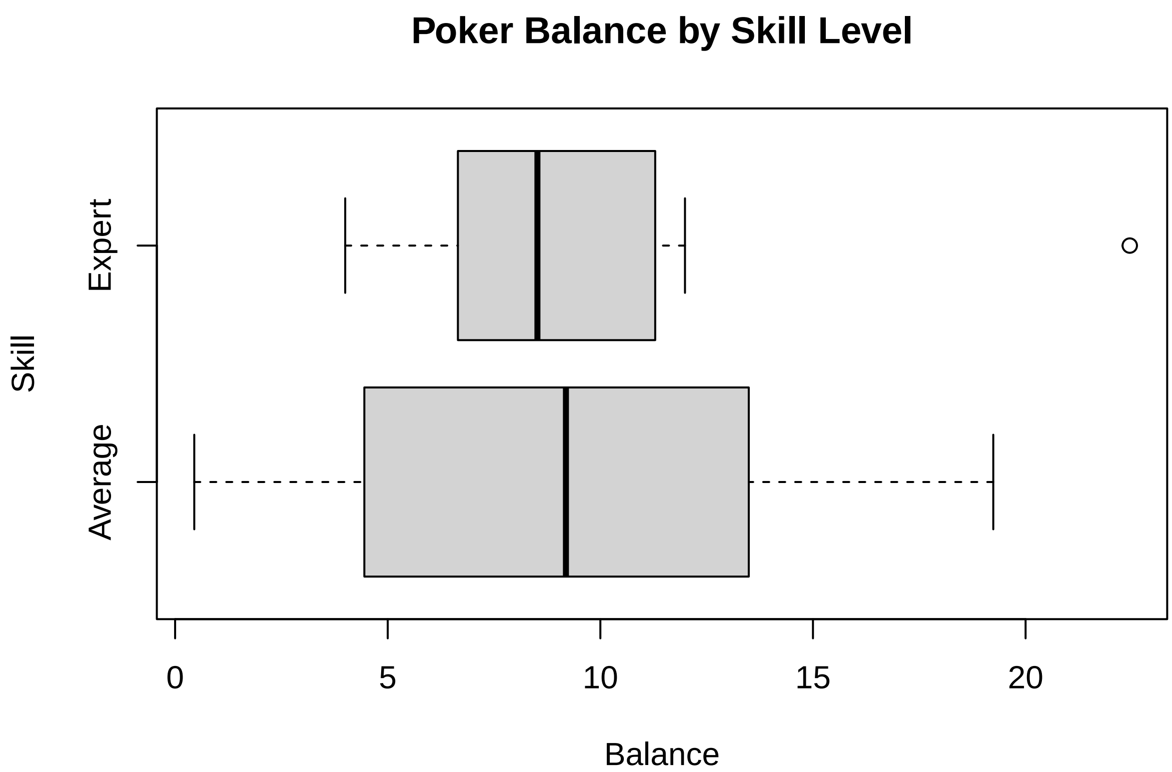
```
rm(list=ls())
update.packages(repos="https://cran.r-project.org")
```

Problem 2

```
Skill<-c(rep("Expert",9), rep("Average",9))                             # Problem 2(a)
Hand<-rep(c(rep("Bad",3),rep("Neutral",3),rep("Good",3)),2)
Balance<-c(4.00,8.52,6.55,11.99,6.65,7.64,11.29,9.12,22.45,3.58,4.45,8.74,11.86,9.19,13.49,16.33,0.45,19
df.poker<-data.frame(Skill,Hand,Balance)                                # Problem 2(b)
data.frame(mean(df.poker$Balance),sd(df.poker$Balance))                 # Problem 2(c)
```

```
##   mean.df.poker.Balance. sd.df.poker.Balance.
## 1               9.752222            5.603215
```

```
boxplot(Balance~Skill,main="Poker Balance by Skill Level",horizontal=T) # Problem 2(d)
```




```r
meanBalE<-mean(df.poker$Balance[df.poker$Skill=="Expert"])            # Problem 2(e)
meanBalA<-mean(df.poker$Balance[df.poker$Skill=="Average"])
sdBalE<-sd(df.poker$Balance[df.poker$Skill=="Expert"])
sdBalA<-sd(df.poker$Balance[df.poker$Skill=="Average"])
data.frame(meanBalE,sdBalE,meanBalA,sdBalA)
```

```
##   meanBalE   sdBalE meanBalA   sdBalA
## 1 9.801111 5.337721 9.703333 6.182225
```

```r
t.test(Balance~Skill)                                                  # Problem 2(f)
```

```
##
##  Welch Two Sample t-test
##
## data:  Balance by Skill
## t = -0.035914, df = 15.667, p-value = 0.9718
## alternative hypothesis: true difference in means between group Average and group Expert is not equal
## 95 percent confidence interval:
##  -5.879346  5.683791
## sample estimates:
## mean in group Average  mean in group Expert
##              9.703333              9.801111
```

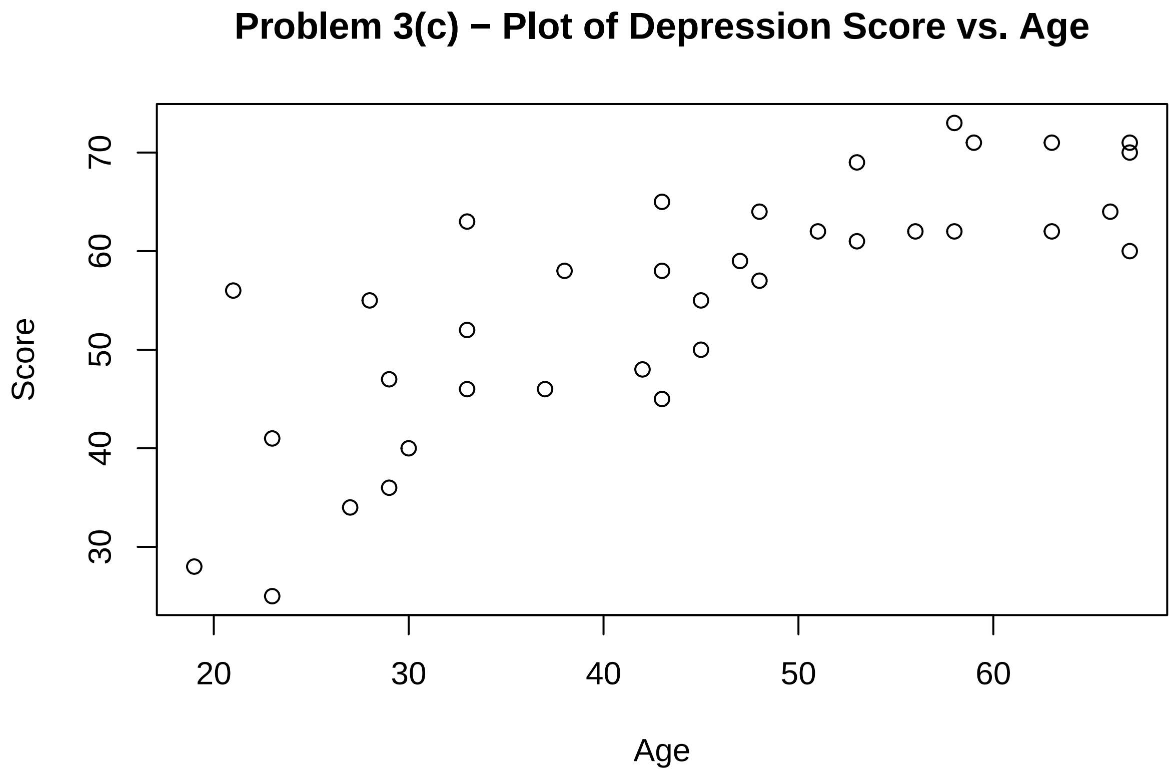
Problem 3

```r
depression<-read.table("/Users/newuser/Desktop/Notes/Graduate/STAT 451 - Nonparametric Statistical Meth
head(depression)                                          # Problem 3(b)
```

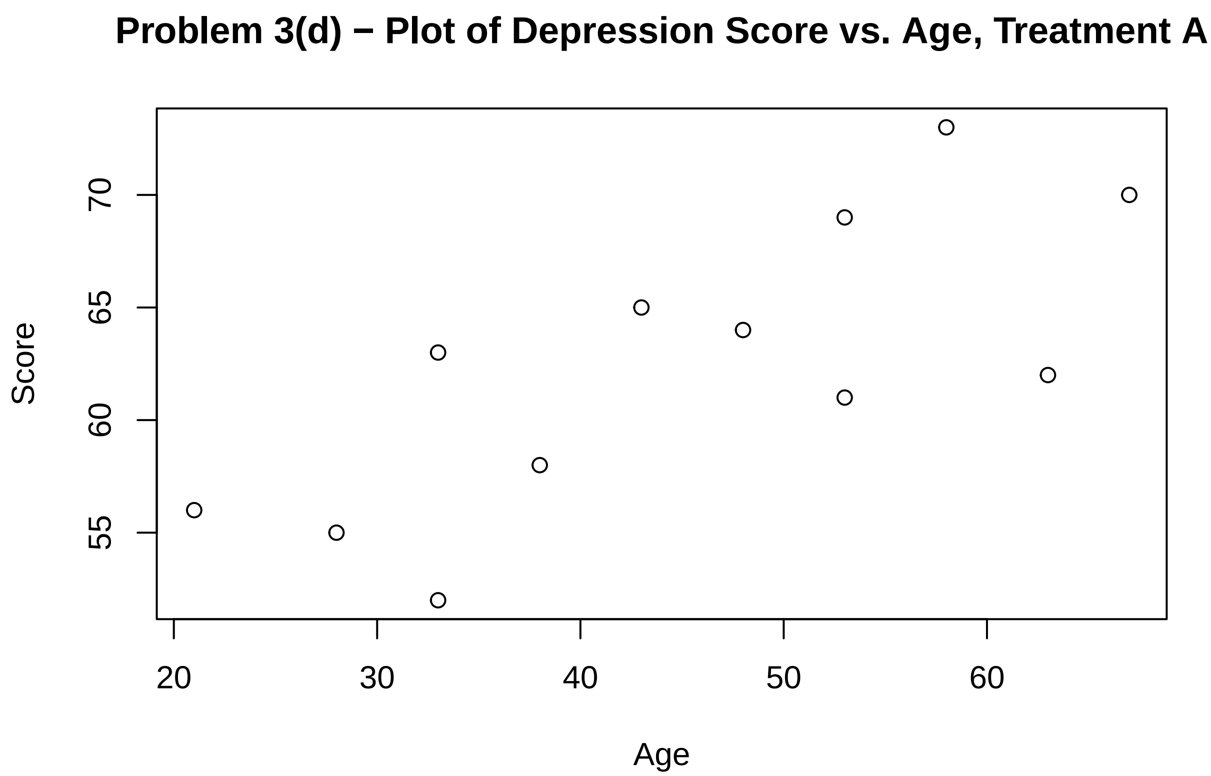
```
##    y age x2 x3 TRT
## 1 56  21  1  0   A
## 2 41  23  0  1   B
```

```
## 3 40   30  0  1   B
## 4 28   19  0  0   C
## 5 55   28  1  0   A
## 6 25   23  0  0   C
```

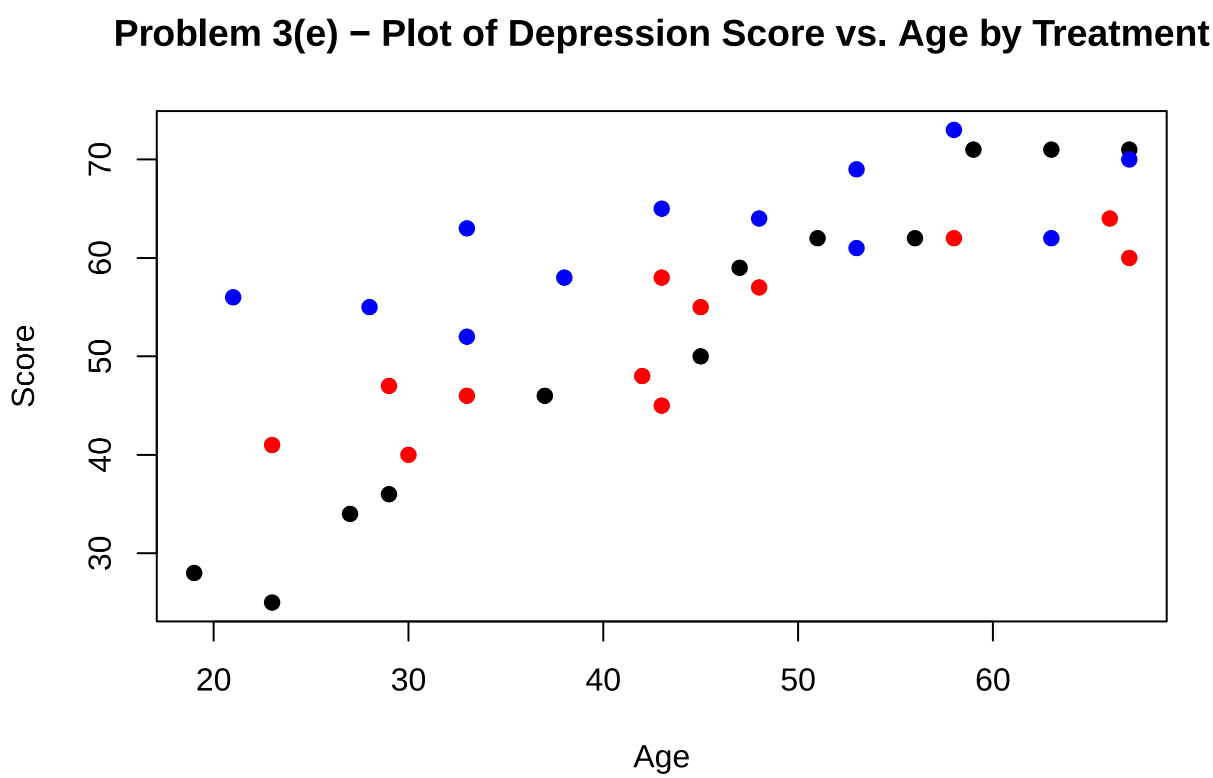
```
plot(depression$y~depression$age,main="Problem 3(c) - Plot of Depression Score vs. Age",xlab="Age",ylab=
```




```
plot(depression$y[depression$TRT=="A"]~depression$age[depression$TRT=="A"],main="Problem 3(d) - Plot of
```




```
plot(depression$y~depression$age,col=ifelse(depression$TRT=="A","blue",ifelse(depression$TRT=="B","red"
```




```
fit.depression<-aov(depression$y~depression$TRT) # Problem 3(f)
# H_0: The mean depression scores for each treatment type are the same
# H_A: At least one mean depression score is different
```

```r
summary(fit.depression)
```

```
##                 Df Sum Sq Mean Sq F value Pr(>F)
## depression$TRT  2    927   463.6   3.424 0.0445 *
## Residuals      33   4468   135.4
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```r
# We reject H_0 at the alpha = 0.05 level. There is sufficient evidence (p = 0.04453905)
# that at least one of the mean depression scores is different.
set.seed(1801)                                     # Problem 3(g)
ysamp<-sample(depression$y,8,replace=TRUE)
ysamp
```

```
## [1] 63 55 65 36 71 55 59 73
```

```r
ysampmat<-matrix(0,8,3)                            # Problem 3(h)
for (i in 1:3){ysampmat[,i]=sample(depression$y,8,replace=T)}
ysampmat
```

```
##      [,1] [,2] [,3]
## [1,]   28   62   71
## [2,]   58   58   62
## [3,]   61   62   45
## [4,]   62   36   71
## [5,]   34   55   55
## [6,]   62   56   25
## [7,]   64   58   69
## [8,]   46   61   69
```

Problem 4

```r
install.packages("binom",repos="https://cran.r-project.org") # Problem 4(a)
```

```
##
## The downloaded binary packages are in
##  /var/folders/1q/xhd093xd0r95jmd92b_kn26c0000gp/T//RtmpFJh9du/downloaded_packages
```

```r
library("binom")
binom.confint(x=7,n=20,conf.level=0.95,method="all")
```

```
##           method x  n      mean     lower     upper
## 1  agresti-coull 7 20 0.3500000 0.1799264 0.5684112
## 2     asymptotic 7 20 0.3500000 0.1409627 0.5590373
## 3          bayes 7 20 0.3571429 0.1639116 0.5576932
## 4        cloglog 7 20 0.3500000 0.1565570 0.5519204
## 5          exact 7 20 0.3500000 0.1539092 0.5921885
## 6          logit 7 20 0.3500000 0.1768430 0.5743951
## 7         probit 7 20 0.3500000 0.1711381 0.5710455
## 8        profile 7 20 0.3500000 0.1683639 0.5679308
## 9            lrt 7 20 0.3500000 0.1683028 0.5679401
## 10     prop.test 7 20 0.3500000 0.1630867 0.5905104
## 11        wilson 7 20 0.3500000 0.1811918 0.5671457
```

```r
# We are 95 percent confident that the binomial probability of having x = 7 successes in
# n = 20 attempts using the prop.test method is between 0.1630867 and 0.5905104.
```

```r
install.packages("pwr",repos="https://cran.r-project.org")   # Problem 4(b)
```

```
##
## The downloaded binary packages are in
##  /var/folders/1q/xhd093xd0r95jmd92b_kn26c0000gp/T//RtmpFJh9du/downloaded_packages
```

```r
library("pwr")
pwr.t.test(d=abs(45-48)/2.3,n=10,sig.level=0.05,type="one.sample",alternative="two.sided")
```

```
##
##      One-sample t test power calculation
##
##               n = 10
##               d = 1.304348
##       sig.level = 0.05
##           power = 0.9550261
##     alternative = two.sided
```

We can see the power for this test is 0.9550261.