Homework 08 Answer Sheet

Psych 10C
Due: Sunday, November 6th (by 11:59pm PT)

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Submission Details

- Download *HW08AnswerSheet.Rmd* from the Canvas course space and open it RStudio.
- Enter your name in the *author* field at the top of the document.
- Complete the assignment by entering your answers in your *HW08AnswerSheet.Rmd* document.
- Once you have completed the assignment, click the *Knit* button to turn your completed answer document into a pdf file.
- Submit your HW08AnswerSheet.pdf file only (no other formats are acceptable) before the assignment's deadline.

Problems

For each problem, show/describe all of your work.

Problem #1 (10 points)

A research study was conducted to examine the impact of eating a high protein breakfast on adolescents' performance during a physical education physical fitness test. Half of the subjects received a high protein breakfast and half were given a low protein breakfast. All of the adolescents, both male and female, were given a fitness test with high scores representing better performance.

Load the data from our course website (HW08_FitnessData.csv) into a data frame named *FitnessData*. The fitness scores will be contained in the *Score* variable of the data frame (FitnessData$Score). The gender ("Male" or "Female") of each subject is contained in the *Gender* variable (FitnessData$Gender). The protein level ("High" or "Low") of each subject's breakfast is contained in the *Protein* variable (FitnessData$Protein).

```
FitnessData<- read.csv("/Users/zzze/Downloads/HW08_FitnessData.csv")
```

(a) (4 points) Use RStudio to compute and plot the difference in means. Fitness score means should be represented on the y-axis and the breakfast protein level should be represented on the x-axis.

ANSWER:

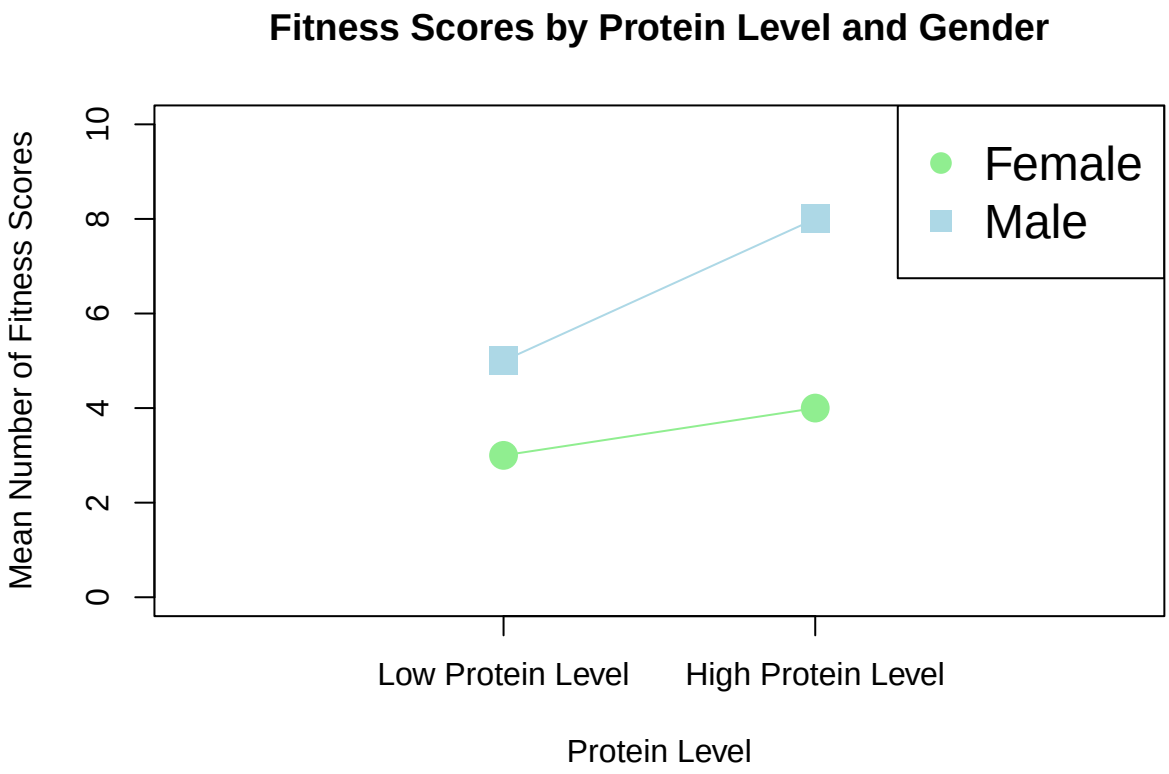
```
n<- sum(FitnessData$Protein == "High" & FitnessData$Gender == "Male")
n
```

```
## [1] 5
```

```
#Factor A: protein level (1:Low, 2:High), Factor B: gender (1:Male, 2:Female)
TotA1B1<- sum(FitnessData[FitnessData$Protein == "Low" & FitnessData$Gender == "Male", "Score"])
TotA1B2<- sum(FitnessData[FitnessData$Protein == "Low" & FitnessData$Gender == "Female", "Score"])
TotA2B1<- sum(FitnessData[FitnessData$Protein == "High" & FitnessData$Gender == "Male", "Score"])
TotA2B2<- sum(FitnessData[FitnessData$Protein == "High" & FitnessData$Gender == "Female", "Score"])
```

```
MaleMeans<- c(TotA1B1/n, TotA2B1/n)
FemaleMeans<- c(TotA1B2/n, TotA2B2/n)
```

```
plot(FemaleMeans, pch=16, cex=2, col= "Lightgreen", type = "o",
     xlab = "Protein Level", ylab = "Mean Number of Fitness Scores",
     main= "Fitness Scores by Protein Level and Gender", ylim = c(0,10),
     xlim = c(0,3), xaxt = "n")
axis(1, at= c(1,2), labels = c("Low Protein Level", "High Protein Level"))
points(MaleMeans, pch=15, cex=2, col="Lightblue", type = "o")
legend("topright", legend = c("Female", "Male"), col=c("Lightgreen", "Lightblue"),
       pch = c(16, 15), cex = 1.5)
```



(b) (2 points) Judging by the plot created in part (a), does there appear to be a significant main effect of diet? Of gender?

ANSWER:
There is a significant main effect of diet, since regardless of gender, adolescents who took High Protein Level got higher scores in Fitness test. And there is also a significant main effect of gender, since regardless of protein level, male got higher scores in Fitness test.

(c) (4 points) Use RStudio to compute and print SSA, SSB, and SSAxB.

ANSWER:

```
N<- nrow(FitnessData)
a<- length(table(FitnessData$Protein))
b<- length(table(FitnessData$Gender))
SumX<- sum(FitnessData$Score)
```

```
#SSA: Protein level
TotA1<-sum(FitnessData[FitnessData$Protein == "Low", "Score"])
TotA2<-sum(FitnessData[FitnessData$Protein == "High", "Score"])
SSA<- sum(TotA1^2 + TotA2^2)/ (b*n) - SumX^2/N
SSA
```

```
## [1] 20
```

```
#SSB: Gender
TotB1<- sum(FitnessData[FitnessData$Gender == "Male", "Score"])
TotB2<- sum(FitnessData[FitnessData$Gender == "Female", "Score"])
SSB<- sum(TotB1^2+ TotB2^2)/ (a*n) - SumX^2/N
SSB
```

```
## [1] 45
```

```
SSBetCond<- sum(TotA1B1^2+ TotA1B2^2+ TotA2B1^2+ TotA2B2^2)/n - SumX^2/N
SSBetCond
```

```
## [1] 70
```

```
SSAXB<- SSBetCond- SSA- SSB
SSAXB
```

```
## [1] 5
```

Problem #2 (10 points)

A study examining differences in life satisfaction between young adult and older adult males and females was conducted. Each individual who participated in the study completed a life satisfaction questionnaire. A high score on the test indicates a higher level of life satisfaction.

Load the data from our course website (HW08_SatisfactionData.csv) into a data frame named *Data*. The life satisfaction scores will be contained in the *LifeSat* variable of the data frame (Data$LifeSat). The gender ("Male" or "Female") of each subject is contained in the *Gender* variable (Data$Gender). The relative age ("Older" or "Younger") of each adult is contained in the *Age* variable (Data$Age).

```
Data<- read.csv("/Users/zzze/Downloads/HW08_SatisfactionData.csv")
```

(a) (4 points) Use RStudio to plot the difference in means. Life satisfaction score means should be represented on the y-axis and relative age (younger or older) should be represented on the x-axis.

ANSWER

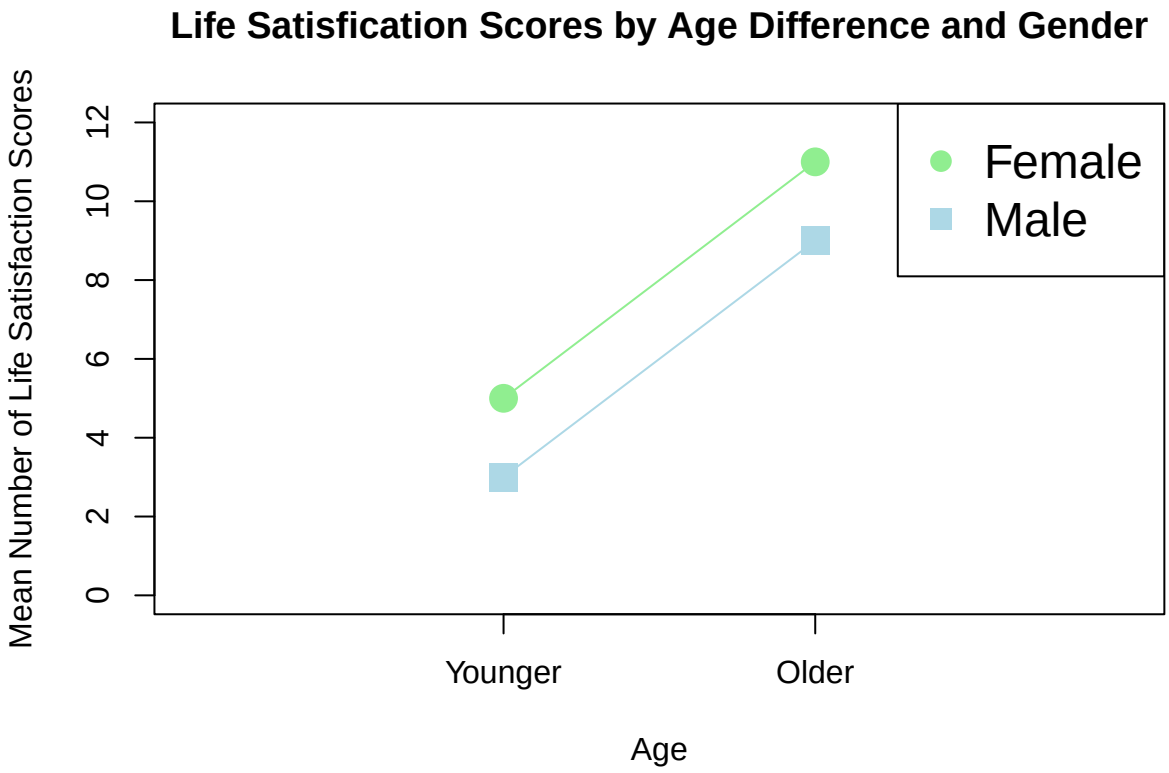
```
n2<- sum(Data$Age == "Younger" & Data$Gender == "Male")
n2
```

```
## [1] 5
```

```r
#Factor A: Age (1:Younger, 2:Older), Factor B: gender (1:Male, 2:Female)
Tot2A1B1<- sum(Data[Data$Age == "Younger" & Data$Gender == "Male", "LifeSat"])
Tot2A1B2<- sum(Data[Data$Age == "Younger" & Data$Gender == "Female", "LifeSat"])
Tot2A2B1<- sum(Data[Data$Age == "Older" & Data$Gender == "Male", "LifeSat"])
Tot2A2B2<- sum(Data[Data$Age == "Older" & Data$Gender == "Female", "LifeSat"])
```

```r
MaleMeans2<- c(Tot2A1B1/n, Tot2A2B1/n)
FemaleMeans2<- c(Tot2A1B2/n, Tot2A2B2/n)
```

```r
plot(FemaleMeans2, pch=16, cex=2, col= "Lightgreen", type = "o",
     xlab = "Age", ylab = "Mean Number of Life Satisfaction Scores",
     main= "Life Satisfication Scores by Age Difference and Gender", ylim = c(0,12),
     xlim = c(0,3), xaxt = "n")
axis(1, at= c(1,2), labels = c("Younger", "Older"))
points(MaleMeans2, pch=15, cex=2, col="Lightblue", type = "o")
legend("topright", legend = c("Female", "Male"), col=c("Lightgreen", "Lightblue"),
       pch = c(16, 15), cex = 1.5)
```



(b) (2 points) Judging by the plot created in part (a), does there appear to be a significant main effect of age? Of gender? Would you guess that there is or is not a significant interaction between age and gender?

ANSWER:

- There is a significant main effect of age, since regardless the gender difference, the younger adults had lower life satisfaction scores than older adults. Moreover, there is a significant main effect of gender, since regardless of age, female had higher scores than male. However, since the lines on the graph are parallel, indicating that there is no interaction among age and gender.

(c) (4 points) Use RStudio to compute and print SSA, SSB, and SSAxB.

ANSWER:

```
N2<- nrow(Data)
a2<- length(table(Data$Age))
b2<- length(table(Data$Gender))
SumX2<- sum(Data$LifeSat)
```

```
#SSA: Age
Tot2A1<-sum(Data[Data$Age == "Younger", "LifeSat"])
Tot2A2<-sum(Data[Data$Age == "Older", "LifeSat"])
SSA2<- sum(Tot2A1^2 + Tot2A2^2)/ (b2*n2) - SumX2^2/N2
SSA2
```

```
## [1] 180
```

```
#SSB: Gender
Tot2B1<- sum(Data[Data$Gender == "Male", "LifeSat"])
Tot2B2<- sum(Data[Data$Gender == "Female", "LifeSat"])
SSB2<- sum(Tot2B1^2+ Tot2B2^2)/ (a2*n2) - SumX2^2/N2
SSB2
```

```
## [1] 20
```

```
SSBetCond2<- sum(Tot2A1B1^2+ Tot2A1B2^2+ Tot2A2B1^2+ Tot2A2B2^2)/n2 - SumX2^2/N2
SSBetCond2
```

```
## [1] 200
```

```
SSAXB2<- SSBetCond2- SSA2- SSB2
SSAXB2
```

```
## [1] 0
```
