Homework 6

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R Markdown

```
library(Sleuth3)
library(ggplot2)
```

Question 1:

a) df for Treatment= 4

```
68-64
```

```
## [1] 4
```

b) Sum of Squares for Treatment = 1226.9

```
5953.5 - 4726.6
```

```
## [1] 1226.9
```

c) Mean Squares of Treatment = 306.725

```
1226.9/4
```

```
## [1] 306.725
```

d) F-Stat = 4.153183

```
306.725/73.853
```

```
## [1] 4.153183
```

e) Residual Mean Square: = 73.853

```
4726.6/64
```

```
## [1] 73.85313
```

Question 2a: Response variable is Oxygen.

```
head(ex0523)
```

```
##    Oxygen  Bone
## 1  11.10 Bone1
## 2  11.22 Bone1
## 3  11.29 Bone1
## 4  11.49 Bone1
## 5  11.32 Bone2
## 6  11.40 Bone2
```

Question 2b:

```
ex0523_aov <- aov(Oxygen~Bone, data = ex0523)
anova(ex0523_aov)
```

```
## Analysis of Variance Table
##
## Response: Oxygen
##           Df Sum Sq Mean Sq F value   Pr(>F)
## Bone      11 6.0675 0.55159  7.4268 9.73e-07 ***
## Residuals 40 2.9708 0.07427
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Question 2c:

Let $\mu\{Yij\}$ be the population mean of population where we got Yij.

Full model: Full model is also known as Separate means model. $\mu\{Yij\} = \mu i$ Where μi is the ith population mean and there are 'I' mean parameters.That is each group has its own mean :$\mu1$, $\mu2$......μi.In the Full model, Yij is normally distributed with standard deviation sigma.

Reduced model: Reduced model is also known as Equal means model $\mu\{Yij\} = \mu$ where μ is the only mean parameter.The population here is normally distributed with standard deviation sigma.This is a special case of Separate means model.

Question 2d: Extra sum of squares = 6.0675 Extra degrees of freedom = 11 Residual sum of squares for the full model = 2.9708 Residual degrees of freedom for the full model = 40

Question 2e:

```
fitex0523_aov <- aov(Oxygen~1, data=ex0523)
anova(fitex0523_aov)
```

```
## Analysis of Variance Table
##
## Response: Oxygen
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals 51 9.0383 0.17722
```

Question 2f: Residual sum of squares for the reduced model in part (c) = 9.0383 Residual degrees of freedom for the reduced model in part (c) = 51

Question 2g: Residual sum of squares for the reduced model = 9.0383 Residual sum of squares for the Full model = 2.9708

```
9.0383-2.9708
```

[1] 6.0675

Therefore, the answer is equal to the extra sum of squares in part(d).

Question 2h: Number of mean parameters in full model = 12 Number of mean parameters in reduced model = 1

Confirming that the extra degrees of freedom in part (d) is equal to the difference in number of mean parameters between the full and reduced models :

```
12-1
```

[1] 11

Confirming that this difference is same as the difference between the residual degrees of freedom for the reduced model(51) and the residual degrees of freedom for the full model(40).

```
51-40
```

[1] 11