Chap11

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```
library(xtable)
library(gmodels)
```

First, set working directory. 'data' is a table with two columns and same number of rows, and should be numeric. Columns have headers indicating the names of the variables. **User will also input desired variable names in double quotes**

```
data <- read.csv("chap11.csv", header = FALSE, skip = 1)
colnames(data) <- c("sub_1", "sub_2", "sub_3", "sub_4", "sub_5")
```

We now combine the observations into one long column (score)

```
colnames(data) <- c("V1", "V2", "V3", "V4", "V5")
score=c(data$V1,data$V2,data$V3,data$V4,data$V5)
```

We now prepare the labels for the 4x5 scores according to the factor levels: a1 a2 a3 a4, a1 a2 a3 a4.....etc for Factor A

```
Fact_A=gl(4,1,4*5*1, labels=c("a1","a2","a3","a4"))
```

sub_1 sub_1....., sub_2 sub_2.....,sub_3 sub_3 ....,sub_4 sub_4 ....., sub_5 sub_5....etc for Subjects

```
Subject=gl(5,4*1,5*4*1, labels=c("sub_1", "sub_2", "sub_3","sub_4", "sub_5"))
```

We now form a data frame with the dependent variable and the factors, then we print the results

```
data=data.frame(score = score,Factor_A = factor(Fact_A),
                Subject = factor(Subject))
knitr::kable(xtable(data))
```

score	Factor_A	Subject
5	a1	sub_1
4	a2	sub_1
1	a3	sub_1
8	a4	sub_1
7	a1	sub_2
4	a2	sub_2
1	a3	sub_2
10	a4	sub_2
12	a1	sub_3
9	a2	sub_3
8	a3	sub_3
16	a4	sub_3
4	a1	sub_4
9	a2	sub_4
6	a3	sub_4

score	Factor_A	Subject
9	a4	sub_4
8	a1	sub_5
9	a2	sub_5
5	a3	sub_5
13	a4	sub_5

Anova when "Subject" is considered as a random factor, then we print the results

```
aov1=aov(score~Fact_A+Error(Subject),data=data)
summary(aov1)
```

```
##
## Error: Subject
##           Df Sum Sq Mean Sq F value Pr(>F)
## Residuals  4  115.3   28.82
##
## Error: Within
##           Df Sum Sq Mean Sq F value Pr(>F)
## Fact_A     3  124.4   41.47   14.18  3e-04 ***
## Residuals 12   35.1    2.93
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
print(model.tables(aov(score~Fact_A+Subject),"means"))
```

```
## Tables of means
## Grand mean
##
## 7.4
##
##  Fact_A
## Fact_A
##   a1   a2   a3   a4
##  7.2  7.0  4.2 11.2
##
##  Subject
## Subject
## sub_1 sub_2 sub_3 sub_4 sub_5
##  4.50  5.50 11.25  7.00  8.75
```