

Supplement for Lecture 22: One-Way ANOVA

Load Data

```
Exams = read.csv("Exams4.csv")
Exams
```

```
##      Student Exam Grade
## 1      Barb    1     62
## 2      Barb    2     87
## 3      Barb    3     74
## 4      Barb    4     77
## 5     Betsy    1     94
## 6     Betsy    2     95
## 7     Betsy    3     86
## 8     Betsy    4     89
## 9      Bill    1     68
## 10     Bill    2     93
## 11     Bill    3     82
## 12     Bill    4     73
## 13     Bob     1     86
## 14     Bob     2     97
## 15     Bob     3     70
## 16     Bob     4     79
## 17     Bud     1     50
## 18     Bud     2     63
## 19     Bud     3     28
## 20     Bud     4     47
```

Examine Average Grades of Different Exams

```
# Overall Statistics of Grade
COMPLETE

# Group Statistics of Grade
COMPLETE

# Create Table
rbind(cbind(length,average,st.dev),overall)

# Create Visual
boxplot(Grade~Exam,data=Exams)
points(average,col="red",pch=16,cex=2)
```

ANOVA For Testing Differences in Mean Grades for the Different Exams

```
# Visual
plot(Grade ~ Exam, data = Exams)
points(average, col="red", pch=16, cex=1.5)

# SST vs SSE vs SSGroups
COMPLETE

#ANOVA F-test
amodG = COMPLETE
summary(amodG)
```

Checking Assumptions

```
plot(amodG) #Check Plots of Residuals

tapply(Exams$Grade, Exams$Exam, sd) #Is Largest More than Double Smallest
COMPLETE
```