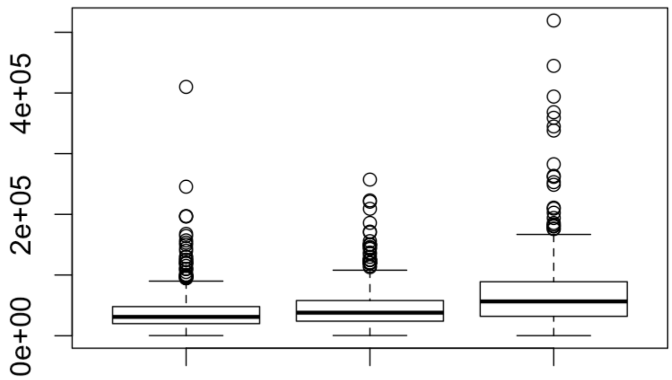
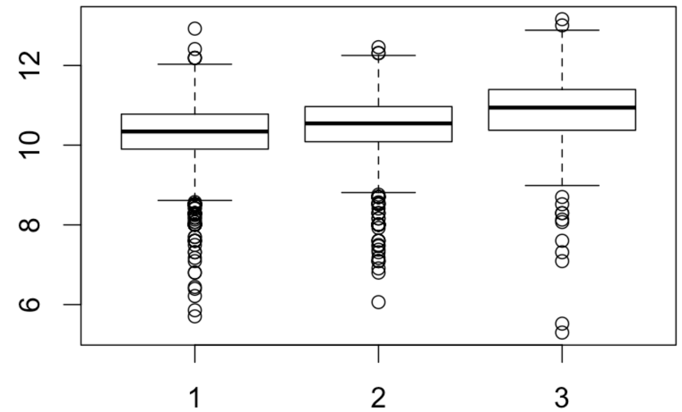
Name: Parth Pareek
UNI: PP2547
Date: 2/24/2016
Assignment: HW4

1. F test p-value < 0.001 → There is no evidence that means are different for different bones

2. Income2005 has a high range and log transformation would be ideal in such case





F-test p-value < 0.001 → Evidence that mean difference in some groups is different

Group	Mean Difference (Log trnfd.)	Median Ratio (back trnfd.)	Percentage higher
<12	0.33	1.388	38.8%
12	0.12	1.178	17.82%
13 – 15	0.41	1.500	50.06%
16	0.10	1.106	10.6%
>16	--	--	--

Group	CI Mean Diff. (Log trnfd.)		Median Ratio Interval (back trnfd.)		Percentage higher Interval	
<12	0.17	0.48	1.187	1.623	18.72%	62.27%
12	0.07	0.25	1.080	1.285	7.99%	28.54%
13 – 15	0.28	0.52	1.335	1.686	33.52%	68.64%
16	-0.04	0.24	0.959	1.275	-4.06%	27.52%
>16	--	--	--	--	--	--

3. Hearing ~ Amputee + Crutches + Wheelchair

   Coeff : Hearing = 1, Amputee = -1/3, Crutches = -1/3, Wheelchair = -1/3
   g = 1.1809
   SE = 0.5039
   t = g/SE = 2.3435
   p-value = 0.0221

4.

a. Pooled SD = 4.484

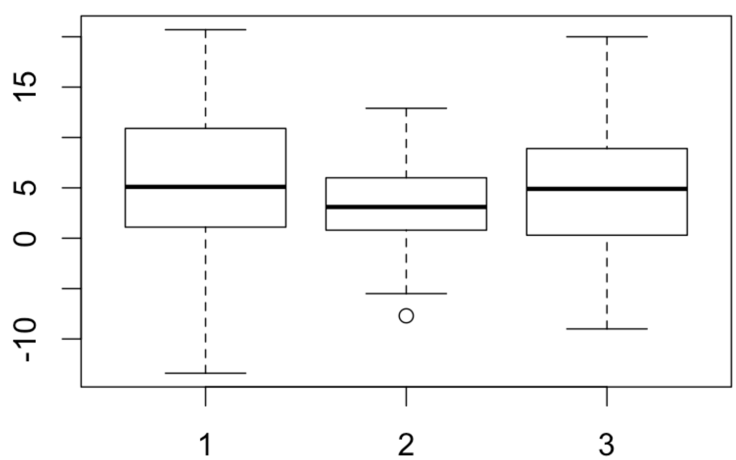
b. Coefficients

   L+D = 1/3
   R = -1/2
   R+L = -1/2
   C = 1/3
   C+L = 1/3

c. g = 3
   SE = 1.365
   t-stat = 2.021
   CI = 0.242 to 5.758
   HW = t-stat*SE = 2.758

5. LSD = 2.042
   F Protected LSD (p-value of F-test > 0.05 → No change from LSD) = 2.042
   Tukey Kramer = 3.041
   Bonferroni = 3.189
   Scheffe = 3.559

6. Box plot of data shows little variation among the 3 diets and no transformation is required.

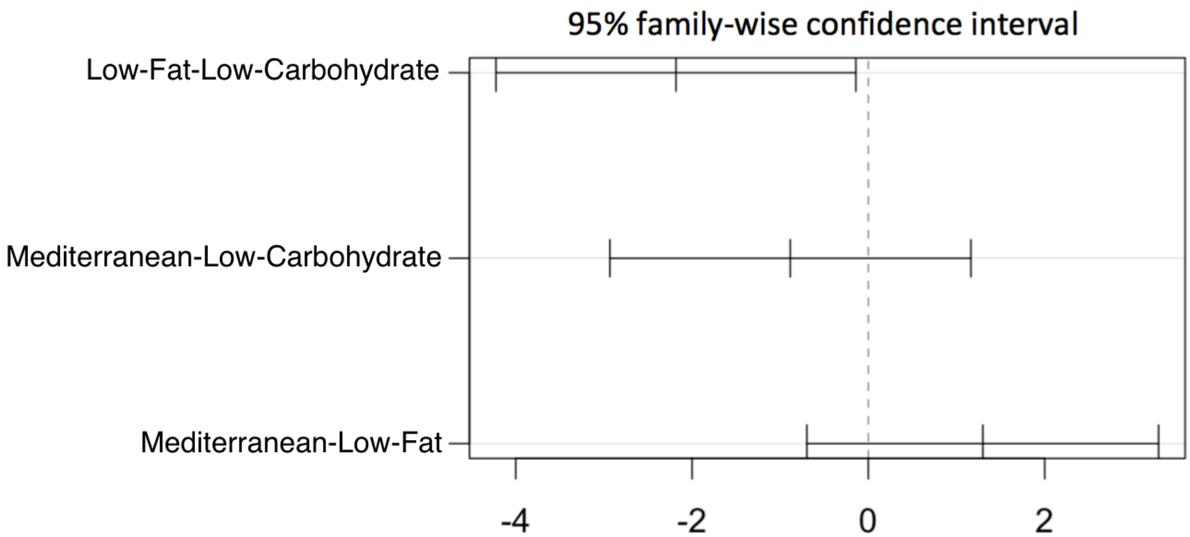



```
Analysis of Variance Table

Response: WtLoss24
           Df Sum Sq Mean Sq F value  Pr(>F)
Group       2  216.9 108.430  3.2358 0.04086 *
Residuals 269 9013.9  33.509
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

ANOVA analysis gives F-test p-values = 0.04 indicating there is some minor variation in means differences between groups

Groups	T-test p-value
Low-Carb ~ Low-Fat	0.011
Low-Carb ~ Mediterranean	0.366
Low-Fat ~ Mediterranean	0.086



The Tukey HSD test gives a difference of 2.183 kg between means levels of Low-Carb – Low-Fat diets.

CODES

```
#Question1
library(Sleuth3)
attach(ex0523)
dat <- ex0523
anova(lm(data = dat))

#Question2
library(Sleuth3)
attach(ex0525)
dat <- ex0525
boxplot(split(dat,Educ)[[1]]$Income2005,
        split(dat,Educ)[[2]]$Income2005,
        split(dat,Educ)[[3]]$Income2005)
dat$Income_log <- log(dat$Income2005)
boxplot(split(dat,Educ)[[1]]$Income_log,
        split(dat,Educ)[[2]]$Income_log,
        split(dat,Educ)[[3]]$Income_log)
model <- lm(Income_log~Educ, data = dat)
anova(model)
prenewdat <- split(dat,Educ)
newdat <- list()
newdat[[1]] <- prenewdat$"<12"
newdat[[2]] <- prenewdat$"12"
newdat[[3]] <- prenewdat$"13-15"
newdat[[4]] <- prenewdat$"16"
newdat[[5]] <- prenewdat$">16"
meandiff <- data.frame()
CI <- data.frame()
for (i in 1:4){
  meandiff <- rbind(meandiff,
                t.test(newdat[[i]]$Income_log, newdat[[i+1]]$Income_log,
                       var.equal = TRUE)$estimate)
  CI <- rbind(CI,
                t.test(newdat[[i+1]]$Income_log, newdat[[i]]$Income_log,
                           var.equal = TRUE)$conf.int)
}
meandiff$difference <- meandiff[,2] - meandiff[,1]
meandiff$backtrans <- exp(meandiff$difference)
meandiff

CI$Lo <- exp(CI[,1])
CI$Hi <- exp(CI[,2])
CI

#Question3
library(Sleuth3)
attach(case0601)
dat <- split(case0601,Handicap)

#Planned Comparison
sampleMean <- c(mean(dat[[1]]$Score),mean(dat[[2]]$Score),
```

```
                 mean(dat[[3]]$Score),mean(dat[[4]]$Score),
                 mean(dat[[5]]$Score))
sampleSD <- c(sd(dat[[1]]$Score),sd(dat[[2]]$Score),
              sd(dat[[3]]$Score),sd(dat[[4]]$Score),
              sd(dat[[5]]$Score))
n <- c(nrow(dat[[1]]),nrow(dat[[2]]),nrow(dat[[3]]),
       nrow(dat[[4]]),nrow(dat[[5]]))
coeff <- c(1/3,1/3,-1,0,1/3)

pooledSD <- sqrt(sum((n-1)*sampleSD^2)/((sum(n) - length(n))))
g <- sum(coeff*sampleMean)
SE <- pooledSD*sqrt(sum((coeff^2)/n))
t <- g/SE
pval <- 2*(1-pt(t,65))

mobility <- rbind(dat[[1]],dat[[2]],dat[[5]])
comm <- dat[[3]]
t.test(mobility$Score,comm$Score,var.equal = TRUE)

#Tukey HSD
dat_test <- aov(case0601$Score~case0601$Handicap)
dat_anova <- anova(dat_test)
dat_tukey <- TukeyHSD(dat_test)


#Question4
sampleMean <- c(30.2,28.8,26.2,31.1,30.2)
sampleSD <- c(3.82,5.26,4.66,4.91,3.53)
n <- rep(9,5)

#Part A
pooledSD <- sqrt(sum((n-1)*sampleSD^2)/((sum(n) - length(n))))

#Part B
coeff <- c(1/3,-1/2,-1/2,1/3,1/3)

#Part C
g <- sum(coeff*sampleMean)
SE <- pooledSD*sqrt(sum((coeff^2)/n))
t <- qt(0.975,40)
CI <- c(g-(t*SE),g+(t*SE))
HW <- SE*t

#Question5
#ANOVA F-test with p-value = 0:0850
#n=36; I=6
#For 95% CI, alpha = 0.025

#LSD
qt(0.975,30)

#F Protected - no change, since p-value > 0.05
qt(0.975,30)
```

```
#Tukey Kramer
qtukey(0.95,6,30)/sqrt(2)

#Bonferroni
k <- 6*5/2
qt(1-(0.05/(k*2)),30)

#Scheffe
sqrt(5*qf(0.95,5,30))
```

#Question6

```
library(Sleuth3)
attach(ex0623)
anova(lm(WtLoss24~Group,data = ex0623))

dat <- split(ex0623,Group)
boxplot(dat[[1]]$WtLoss24,dat[[2]]$WtLoss24,dat[[3]]$WtLoss24) #data
fairly stable, no tranformation needed

dat_test <- aov(ex0623$WtLoss24~ex0623$Group)
dat_anova <- anova(dat_test)
dat_tukey <- TukeyHSD(dat_test)
plot(dat_tukey, las = 0)
```