1

a

```
  Posthoc multiple comparisons of means : Bonferroni
    95% family-wise confidence level

$Diet
             diff      lwr.ci    upr.ci   pval
2-1 -0.140714286 -0.43388882 0.1524602 1.0000
3-1 -0.147380952 -0.46253411 0.1677722 1.0000
4-1  0.176785714 -0.11638882 0.4699602 0.5784
3-2 -0.006666667 -0.31259382 0.2992605 1.0000
4-2  0.317500000  0.03426649 0.6007335 0.0217 *
4-3  0.324166667  0.01823951 0.6300938 0.0332 *
```

b

```
> ScheffeTest(D$Response,D$Diet)

  Posthoc multiple comparisons of means : Scheffe Test
    95% family-wise confidence level

$g
             diff       lwr.ci    upr.ci   pval
2-1 -0.140714286 -0.447266996 0.1658384 0.6023
3-1 -0.147380952 -0.476915214 0.1821533 0.6221
4-1  0.176785714 -0.129766996 0.4833384 0.4114
3-2 -0.006666667 -0.326553926 0.3132206 0.9999
4-2  0.317500000  0.021341945 0.6136581 0.0321 *
4-3  0.324166667  0.004279407 0.6440539 0.0461 *
```

At least we could conclude that 1,2,3 are in the same group, while evidences suggesting whether 4 is in the same group with the other three or not seem to be inconsistent.

```
> M2<-lm(Timelapse~Agent,data=soft)
> anova(M2)
Analysis of Variance Table

Response: Timelapse
          Df Sum Sq Mean Sq F value    Pr(>F)
Agent      4 4430.1 1107.53  147.23 < 2.2e-16 ***
Residuals 95  714.6    7.52
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

Since p-value is much smaller than 0.05, we reject H0.

```
> confint(M2)
                2.5 %      97.5 %
(Intercept)  23.33245  25.7675458
Agent2       -3.72187  -0.2781302
Agent3      -14.52187 -11.0781302
Agent4      -11.47187  -8.0281302
Agent5        3.82813   7.2718698
```

LSD should be one half of the length of the corresponding C.I., which is 1.72.

```
> pairwise.t.test(soft$Timelapse,soft$Agent,pool.sd=T,p.adjust.method="bonf")

        Pairwise comparisons using t tests with pooled SD

data:  soft$Timelapse and soft$Agent

  1       2       3       4
2 0.2329  -       -       -
3 < 2e-16 < 2e-16 -       -
4 < 2e-16 3.1e-13 0.0067  -
5 5.9e-08 9.7e-13 < 2e-16 < 2e-16

P value adjustment method: bonferroni
```

It is suggested that only 1 and 2 are in the same group.

```
> ScheffeTest(soft$Timelapse,soft$Agent)

  Posthoc multiple comparisons of means : Scheffe Test
    95% family-wise confidence level

$g
      diff     lwr.ci     upr.ci    pval
2-1  -2.00  -4.724852   0.724852  0.2647
3-1 -12.80 -15.524852 -10.075148 < 2e-16 ***
4-1  -9.75 -12.474852  -7.025148 < 2e-16 ***
5-1   5.55   2.825148   8.274852 6.2e-07 ***
3-2 -10.80 -13.524852  -8.075148 < 2e-16 ***
4-2  -7.75 -10.474852  -5.025148 5.9e-12 ***
5-2   7.55   4.825148  10.274852 1.8e-11 ***
4-3   3.05   0.325148   5.774852  0.0193 *
5-3  18.35  15.625148  21.074852 < 2e-16 ***
5-4  15.30  12.575148  18.024852 < 2e-16 ***
```

We still conclude that only 1 and 2 are in the same group.

```
[1] -14.67296 -10.92704
[1] 3.677044 7.422956
[1] 16.47704 20.22296
```

We conclude that the mean for these three agents are significantly different from each other.

```
> confint(glht(M2,linfct=mcp(Agent=c(1/2,1/2,-1/2,-1/2,0))))

         Simultaneous Confidence Intervals

Multiple Comparisons of Means: User-defined Contrasts


Fit: lm(formula = Timelapse ~ Agent, data = soft)

Quantile = 1.9853
95% family-wise confidence level


Linear Hypotheses:
       Estimate lwr     upr
1 == 0 10.2750   9.0575 11.4925
```

The level corresponding to merchandise is significantly greater than that corresponding to coupons.

```
[1] -0.1137815  4.1137815
[1] -8.380589 -4.719411
[1] -18.65559 -14.99441
```