Two Factor Analysis of Variance Example

Y = GPA

Factor A: Seat location in classroom (Front, Middle, Back)

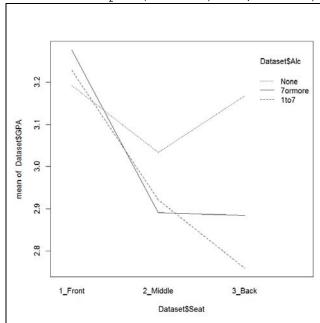
Factor B: Alcohol consumption, drinks/week, 0, 1 to 7, more than 7

Mean GPAs:

	0 drinks	1 to 7/week	More than 7/week
Front	3.2	3.23	3.27
Middle	3.03	2.92	2.89
Back	3.17	2.76	2.88

Cell means plot:

interaction.plot(Dataset\$Seat,Dataset\$Alc, response=Dataset\$GPA, fun=mean)



Sample sizes:

	0	1-7	>7
Front	53	24	6
Middle	93	66	37
Back	17	24	33

The plot shows the mean GPAs for the 9 groups. Clearly there is an interaction in the sample means, but from the results below it is not statistically significant. Nonetheless, the differences in means for the 3 seat locations could be examined separately for the 3 alcohol groups.

Using partial sums of squares (also known as Adjusted SS; Type III SS in SAS):

```
> AnovaModel.3 <- (lm(GPA ~ Seat*Alc, data=Dataset))</pre>
> Anova(AnovaModel.3, type = 3)
Anova Table (Type III tests)
Response: GPA
             Sum Sq Df
                          F value Pr(>F)
(Intercept) 1820.92
                     1 5916.5562 < 2e-16 ***
               2.81
                      2
                            4.5584 0.01112 *
Seat
                      2
Alc
               1.30
                            2.1163 0.12204
Seat:Alc
               1.40
                      4
                            1.1333 0.34059
Residuals
             105.87 344
```

Using sequential sums of squares (this is the default in R, Type I SS in SAS):

```
> Sequential <- lm(GPA ~ Seat*Alc, data=Dataset)</pre>
> anova(Sequential)
                                                 [NOTE: Must use lower case anova]
Analysis of Variance Table
Response: GPA
           Df Sum Sq Mean Sq F value
                                         Pr(>F)
Seat
            2
                4.359 2.17932 7.0811 0.000969 ***
                1.122 0.56091 1.8225 0.163175
Alc
            2
Seat:Alc
            4
                1.395 0.34878
                               1.1333 0.340593
Residuals 344 105.872 0.30777
```