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 (coded as 1), more than 7 (coded as 2)

Mean GPAs:

<table>
<thead>
<tr>
<th></th>
<th>0 drinks</th>
<th>1 to 7/week</th>
<th>More than 7/week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front</td>
<td>3.2</td>
<td>3.23</td>
<td>3.27</td>
</tr>
<tr>
<td>Middle</td>
<td>3.03</td>
<td>2.92</td>
<td>2.89</td>
</tr>
<tr>
<td>Back</td>
<td>3.17</td>
<td>2.76</td>
<td>2.88</td>
</tr>
</tbody>
</table>

See the cell means plot at end of handout on one-way analysis of variance

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

```
.anova gpa location drinks location*drinks, partial
```

```
Number of obs = 353  R-squared = 0.0610
Root MSE = 0.554767  Adj R-squared = 0.0391

Source | Partial SS  df       MS           F     Prob > F
-------+----------------------------------------------------
Model | 6.87559406  8    0.859449257       2.79     0.0052
       | location | 2.80583348  2    1.40291674       4.56     0.0111
       | drinks  | 1.30264797  2    0.651323985       2.12     0.1220
       | location*drinks | 1.39512588  4    0.34878147       1.13     0.3406
       | Residual | 105.871588  344  0.307766245       |
       | Total    | 112.747182  352  0.320304495       
```

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

```
.anova gpa location drinks location*drinks, sequential
```

```
Number of obs = 353  R-squared = 0.0610
Root MSE = 0.554767  Adj R-squared = 0.0391

Source | Seq. SS  df       MS           F     Prob > F
-------+----------------------------------------------------
Model | 6.87559406  8    0.859449257       2.79     0.0052
       | location | 4.35864669  2    2.17932334       7.08    0.0010
       | drinks  | 1.12182149  2    0.560910745       1.82   0.1632
       | location*drinks | 1.39512588  4    0.34878147       1.13     0.3406
       | Residual | 105.871588  344  0.307766245       |
       | Total    | 112.747182  352  0.320304495       
```