Example 17.3 Pages 1053-1056
2-way random effects …

```
options nodate nonumber ls=80 nocenter;
data calcium;
input assay lab content @@;
cards;
1 1 10.9 1 1 10.9 1 2 10.5 1 2 9.8 1 3 9.7 1 3 10.0
2 1 11.3 2 1 11.7 2 2 9.4 2 2 10.2 2 3 8.8 2 3 9.2
3 1 11.8 3 1 11.2 3 2 10.0 3 2 10.7 3 3 10.4 3 3 10.7
;

proc glm;
class assay lab;
model content = assay lab assay*lab;
random assay lab assay*lab;
run;
```

```
   Class Level Information

Class         Levels    Values

assay              3    1 2 3

lab                3    1 2 3


Number of Observations Read          18
Number of Observations Used          18

Dependent Variable: content

                                   Sum of
Source                     DF       Squares    Mean Square   F Value   Pr > F

Model                       8    10.76000000     1.34500000      9.76   0.0013
Error                       9     1.24000000     0.13777778
Corrected Total            17    12.00000000


R-Square     Coeff Var      Root MSE    content Mean
0.896667      3.569080      0.371184        10.40000

Source                     DF    Type III SS    Mean Square   F Value   Pr > F

assay                       2     1.56000000     0.78000000      5.66   0.0256
lab                         2     7.56000000     3.78000000     27.44   0.0001
assay*lab                   4     1.64000000     0.41000000      2.98   0.0803

Source                  Type III Expected Mean Square
assay                   Var(Error) + 2 Var(assay*lab) + 6 Var(assay)
lab                     Var(Error) + 2 Var(assay*lab) + 6 Var(lab)
assay*lab               Var(Error) + 2 Var(assay*lab)
```

```
proc mixed cl;
class assay lab;
model content = / solution cl DDFM = SATTERTHWAITE;
random assay lab assay*lab;
run;
```

Covariance Parameter Estimates

Cov Parm	Estimate	Alpha	Lower	Upper
assay	0.06167	0.05	0.008122	2373969
lab	0.5617	0.05	0.1374	51.6606
assay*lab	0.1361	0.05	0.03420	9.8652
Residual	0.1378	0.05	0.06519	0.4592

Solution for Fixed Effects

Effect	Estimate	Standard Error	DF	t Value	Pr > |t|	Alpha
Intercept	10.4000	0.4802	2.3	21.66	0.0010	0.05

Solution for Fixed Effects

Effect	Lower	Upper
Intercept	8.5715	12.2285