

FILENAME file1 URL "http://www.uvm.edu/~rsingle/stat231/data/kuehl/exp7_2.txt";

```
DATA a2;                                (ch7-1-exp7-2b_H0.out)
  INFILE file1 FIRSTOBS=2 EXPANDTABS;
  INPUT day method trigly;
  RUN;
PROC GLM DATA=a2;
  CLASS method day;
  MODEL trigly = method day method*day;
  *RANDOM day / TEST;                    *NB: day*method treated as a fixed effect;
  RANDOM day day*method / TEST;         * need to specify both as random effects;

  LSMEANS method day method*day / STDERR; *NB: DEFAULT error term used (MSE);
  LSMEANS method day method*day / STDERR E=method*day PDIFF CL;
  RUN; QUIT;
```

| Class | Levels | Values |
|--------|--------|---------|
| method | 2 | 1 2 |
| day | 4 | 1 2 3 4 |

Dependent Variable: trigly

| Source | DF | Sum of Squares | Mean Square | F Value | Pr > F |
|-----------------|----|----------------|-------------|---------|--------|
| Model | 7 | 945.697500 | 135.099643 | 9.37 | 0.0026 |
| Error | 8 | 115.340000 | 14.417500 | | |
| Corrected Total | 15 | 1061.037500 | | | |

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|------------|----|-------------|-------------|---------|--------|
| method | 1 | 329.4225000 | 329.4225000 | 22.85 | 0.0014 |
| day | 3 | 431.4425000 | 143.8141667 | 9.97 | 0.0044 |
| method*day | 3 | 184.8325000 | 61.6108333 | 4.27 | 0.0446 |

| Source | Type III Expected Mean Square |
|------------|---|
| method | Var(Error) + 2 Var(method*day) + Q(method) |
| day | Var(Error) + 2 Var(method*day) + 4 Var(day) |
| method*day | Var(Error) + 2 Var(method*day) |

Tests of Hypotheses for Mixed Model Analysis of Variance

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|--------|----|-------------|-------------|---------|--------|
| method | 1 | 329.422500 | 329.422500 | 5.35 | 0.1038 |
| day | 3 | 431.442500 | 143.814167 | 2.33 | 0.2522 |
| Error | 3 | 184.832500 | 61.610833 | | |

Error: MS(method*day)

| Source | DF | Type III SS | Mean Square | F Value | Pr > F |
|------------------|----|-------------|-------------|---------|--------|
| method*day | 3 | 184.832500 | 61.610833 | 4.27 | 0.0446 |
| Error: MS(Error) | 8 | 115.340000 | 14.417500 | | |

Least Squares Means [DEFAULT ERROR TERM (MSE)]

| method | trigly LSMEAN | Standard Error | Pr > t |
|--------|---------------|----------------|---------|
| 1 | 147.000000 | 1.342456 | <.0001 |
| 2 | 137.925000 | 1.342456 | <.0001 |

| day | trigly LSMEAN | Standard Error | Pr > t |
|-----|---------------|----------------|---------|
| 1 | 144.150000 | 1.898519 | <.0001 |
| 2 | 133.675000 | 1.898519 | <.0001 |
| 3 | 144.875000 | 1.898519 | <.0001 |
| 4 | 147.150000 | 1.898519 | <.0001 |

| method | day | trigly LSMEAN | Standard Error | Pr > t |
|--------|-----|---------------|----------------|---------|
| 1 | 1 | 143.150000 | 2.684912 | <.0001 |
| 1 | 2 | 140.600000 | 2.684912 | <.0001 |

Least Squares Means [E=method*day]

Standard Errors and Probabilities Calculated Using the Type III MS for method*day as an Error Term

| day | trigly LSMEAN | Standard Error | Pr > t |
|-----|---------------|----------------|---------|
| 1 | 144.150000 | 3.924628 | <.0001 |
| 2 | 133.675000 | 3.924628 | <.0001 |
| 3 | 144.875000 | 3.924628 | <.0001 |
| 4 | 147.150000 | 3.924628 | <.0001 |

| method | trigly LSMEAN | Standard Error | H0:LSMEAN=0 Pr > t | H0:LSMean1=LSMean2 Pr > t |
|--------|---------------|----------------|---------------------|----------------------------|
| 1 | 147.000000 | 2.775131 | <.0001 | |
| 2 | 137.925000 | 2.775131 | <.0001 | 0.1038 |

| method | trigly LSMEAN | 95% Confidence Limits |
|--------|---------------|-----------------------|
| 1 | 147.000000 | 138.168293 155.831707 |
| 2 | 137.925000 | 129.093293 146.756707 |

| i | j | Difference Between Means | 95% Confidence Limits for LSMean(i)-LSMean(j) |
|---|---|--------------------------|---|
| 1 | 2 | 9.075000 | -3.414919 21.564919 |

Least Squares Means for effect method*day

| method | day | trigly LSMEAN | Standard Error | Pr > t | 95% Confidence Limits | LSMEAN Number |
|--------|-----|---------------|----------------|---------|-----------------------|---------------|
| 1 | 1 | 143.150000 | 5.550263 | 0.0001 | 125.486587 160.813413 | 1 |
| 1 | 2 | 140.600000 | 5.550263 | 0.0001 | 122.936587 158.263413 | 2 |
| 1 | 3 | 152.550000 | 5.550263 | 0.0001 | 134.886587 170.213413 | 3 |
| 1 | 4 | 151.700000 | 5.550263 | 0.0001 | 134.036587 169.363413 | 4 |
| 2 | 1 | 145.150000 | 5.550263 | 0.0001 | 127.486587 162.813413 | 5 |
| 2 | 2 | 126.750000 | 5.550263 | 0.0002 | 109.086587 144.413413 | 6 |
| 2 | 3 | 137.200000 | 5.550263 | 0.0001 | 119.536587 154.863413 | 7 |
| 2 | 4 | 142.600000 | 5.550263 | 0.0001 | 124.936587 160.263413 | 8 |

| i/j | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|
| 1 | | 0.7666 | 0.3171 | 0.3557 | 0.8153 | 0.1279 | 0.5035 | 0.9485 |
| 2 | 0.7666 | | 0.2253 | 0.2522 | 0.6028 | 0.1758 | 0.6942 | 0.8153 |
| 3 | 0.3171 | 0.2253 | | 0.9206 | 0.4154 | 0.0462 | 0.1455 | 0.2944 |
| 4 | 0.3557 | 0.2522 | 0.9206 | | 0.4652 | 0.0501 | 0.1619 | 0.3302 |
| 5 | 0.8153 | 0.6028 | 0.4154 | 0.4652 | | 0.1008 | 0.3857 | 0.7666 |
| 6 | 0.1279 | 0.1758 | 0.0462 | 0.0501 | 0.1008 | | 0.2752 | 0.1367 |
| 7 | 0.5035 | 0.6942 | 0.1455 | 0.1619 | 0.3857 | 0.2752 | | 0.5409 |
| 8 | 0.9485 | 0.8153 | 0.2944 | 0.3302 | 0.7666 | 0.1367 | 0.5409 | |

| i | j | Difference Between Means | 95% Confidence Limits for LSMean(i)-LSMean(j) |
|-----|-----|--------------------------|---|
| 1 | 2 | 2.550000 | -22.429839 27.529839 |
| 1 | 3 | -9.400000 | -34.379839 15.579839 |
| ... | ... | ... | ... |
| 3 | 7 | 15.350000 | -9.629839 40.329839 |
| ... | ... | ... | ... |
| 7 | 8 | -5.400000 | -30.379839 19.579839 |

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.