EXAM #2 . . . . . 10 November 1992

1. Time to starvation in Bleak. d. $D50 = \beta_o + \beta_{BLsq}\, BLsq + \epsilon$

$H_A: \beta_{BLsq} > 0$ or $H_A: \beta_{BLsq} \neq 0$
$H_o: \beta_{BLsq} \leq 0$ $H_o: \beta_{BLsq} = 0$

e. Starvation time D50 increases with the square of length BLsq
$F_{1,4} = 936.6$ $p < 0.001 < 5\% = \alpha$

f. Repeat the experiment on fish in a wide range of sizes within several distinct age classes.
Use both age and size as explanatory variables (ANCOVA).
or Repeat the experiment on fish in a wide range of ages within several distinct size classes.
Use both age and size as explanatory variables (ANCOVA).
or Repeat experiment on fish in several distinct size classes within distinct age classes.
Use both age and size as explanatory variables (2-way ANOVA).
Note:
Using both age and size as ratio scale explanatory variables in multiple regression assumes that age and size have independent effects on time to starvation.

2. For ANALYSIS II.

a. block 3 282.464 94.15 28.32 0.011 <--BLANKS FILLED IN

b. Block effects were removed from one test ($p = 0.001$) but not from the other ($p = 0.026$).
Removal of block effect reduces the error mean square, resulting in a more sensitive test.

c. The test with the smaller error term is better because it has lower Type II error (ie less likely to fail to detect a true effect of treatment).

3. For ANALYSIS III. a. $Yield = \beta_o + \beta_{inf}*inf + \beta_{tr}*tr + \beta_{inf*tr}*inf*tr + \epsilon$

b.
inf	1	382.2	382.2	3.49	0.086
tr	1	364.8	364.8	3.33	0.093
inf*tr	1	101.0	101.0	0.92	0.356

c. No significant interaction effect on yield: effect of treatment (if any) on yield does not depend on whether oats are infected.
$F_{1,12} = 0.92$ $p = 0.356 > \alpha = 5\%$
Yield does not depend on treatment.
$F_{1,12} = 3.33$ $p = 0.093 > \alpha = 5\%$
Yield does not depend on presence of infection.
$F_{1,12} = 3.49$ $p = 0.086 > \alpha = 5\%$

3. For ANALYSIS III.

d. Compute p-value by randomization, thus avoiding assumptions made in computing p-values the easy way (using the F-distribution) in ANOVA.

e. Devise a more sensitive test by (1) including a new term, such as the block effects in ANALYSIS I; or by (2) increasing replication to reduce the error mean square.