

Homework 4

1. (Testing without replication) Otoliths (ear bones) can be used to age fish. The left and right otoliths are removed and two different sections are prepared. Each of two technicians measures each section along two transects and counts the number of layers deposited. The data appear below.

(Technician, Side, Transect, Section)	Estimated Age
(1,L,1,1)	228
(2,L,1,1)	231
(1,R,1,1)	231
(2,R,1,1)	235
(1,L,2,1)	245
(2,L,2,1)	241
(1,R,2,1)	244
(2,R,2,1)	251
(1,L,1,2)	235
(2,L,1,2)	239
(1,R,1,2)	237
(2,R,1,2)	234
(1,L,2,2)	243
(2,L,2,2)	253
(1,R,2,2)	246
(2,R,2,2)	245

- (a) Construct a probability plot. Which effects seem important?
- (b) Estimate σ by the method discussed in class. Use the square of this estimate as a replacement for MSPE in the t-test that follows.
- (c) Construct t-test statistics for the non-negligible effects (the degrees of freedom should be equal to the number of negligible effects). Compute p-values.
- (d) How many fish (replications) are needed to detect an effect of magnitude 1 day?
2. *Violin data.* You have already analyzed the full factorial experiment and one of the half-fractions as part of an in-class exercise. Analyze the remaining half-fraction and compare it to your earlier analyses. The easiest way to set up the design in Minitab is to select the default design for 4 factors in 8 runs. Under Options, unselect Principal Fraction, select Use Fraction and then enter 1 in the dialog box. This will select the fraction I=-ABCD. Are results the same?