1 Review problem set 4 solutions

Here are solutions to review problem set 4. See the computer programs on the website:

13.52 a) The plot looks fairly linear, so we will fit a simple linear model.
b) We get \( \hat{\gamma}_i = 38.1 - 5.425 \times SLEEP_i \)
c) Residual by predicted and normal plots look good. Hat value plots also look good.

13.67) Using backward selection, we obtain a final model of \( \hat{\gamma}_i = 1.15 + .266 \times STAY_i + .0542 \times INS_i \)

8.7 a) Yes, Low Tar appears to have lower average tar.
b) Yes, \( F = 1478.39 \) and \( P < .01 \)  c) \( P < .001 \).
d) A Type I error can result in people believing that Low Tar cigarettes are safer than they truly are.

8.29 a) From the plots, normality and HOV look ok.
b) With \( F = 55.67 \) and \( P < .001 \), we reject \( H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4 \) at \( \alpha = .05 \).
c) Each interval is of the form \( \bar{y}_i \pm t_{\alpha/2, df} \sqrt{\frac{MSE}{n_i}} \). Here \( t_{\alpha/2, df} \sqrt{\frac{MSE}{n_i}} = t_{.025, 28} \sqrt{\frac{953}{8}} = (2.048) \sqrt{\frac{953}{8}} = .707 \). Thus each interval is of the form \( \bar{y}_i \pm .707 \). For group I, it is \( 8.31 \pm .707 \), giving \( (7.603, 9.017) \).
d) These results agree with the computer output.

8.30 a) The Kruskal-Wallis test statistic = 26.62, yielding a \( P < .0001 \), so we would reject the null hypothesis that all distributions are equal.
b) These results are consistent with those of 8.29, where the null hypothesis of equality of means was rejected.

8.34 a) School-age children are the population of interest.
b) Strictly speaking, sixth graders who could have ended up in the sample. Further generalization is based on scientific grounds more than statistical grounds.
c) The effective sample size is one per group, since entire classes were randomly assigned.
d) With an effective sample size of one, statistical tests are not possible.
e) Randomize students to treatment groups instead of classes, perhaps block by class (randomize separately within each class).