1. (5 points) Consider an experiment where four different fuels {Discount, Regular, Premium, Ultra} are used in a test car. The response is number of miles driven before the tank is empty.

   (a) (1 point) Write down the model you will use for this analysis, using Reference group coding with Discount as the reference group. Your answer looks like ‘$Y = $’ and then a bunch of $\beta$’s and indicator variables.

   \[
   Y = \beta_0 + \beta_1 I_{\text{Regular}} + \beta_2 I_{\text{Premium}} + \beta_3 I_{\text{Ultra}} + \epsilon
   \]

   In terms of the betas, what null hypothesis would you test to assess whether, on average:

   (b) (1 point) The Discount and Premium fuels had the same mileage?

   \[
   H_0 : \beta_2 = 0
   \]

   (c) (1 point) The average mileage of Discount and Regular was the same as the average of Premium and Ultra?

   \[
   H_0 : \beta_1 = \beta_2 + \beta_3
   \]

   (d) (1 point) The Ultra fuel mileage was no different than the average mileage of the other three?

   \[
   H_0 : 3\beta_1 = \beta_1 + \beta_2
   \]

   (e) (1 point) The Ultra fuel mileage was 30 units lower than the average of Regular and Premium?

   \[
   H_0 : \beta_1 + \beta_2 - 2\beta_3 = 60 \text{ or } H_0 : \frac{\beta_1 + \beta_2}{2} - \beta_3 = 30
   \]

   or any other equivalent ...
2. (5 points) Locate your printouts from the assignment and answer the following. If you cannot locate the answer on your printout, do not answer the question. Correct answers to a question that are NOT accompanied by a supporting printout will cause your whole quiz grade to be zero. You may give answers to the nearest tenth, except for p-values which should be to 4 decimal places (unless otherwise stated).

(a) What is the standard deviation of weight for chicks fed Casein? Circle this number on your printout and write “2a” beside it.

Solution: 64.4 (0.5)

(b) What proportion of the variation in chick weights is explained by feed type? (Two decimals please) Circle this number on your printout and write “2b” beside it.

Solution: 0.54 (0.5)

(c) Give a 95% CI for the difference in weight for chicks fed Soybean vs. Casein, with Tukey’s HSD correction. Circle these numbers on your printout and write “2c” beside it.

Solution: (140.5, 13.8) OK if negative too.

(d) Give the 95% CI for the difference between the expected weight for chicks fed horsebean, versus the average of the other expected values. Your answer is a pair of numbers. Circle these numbers on your printout and write “2d” beside it.

Solution: (-156.1, -81.3) (-0.5 if not negative)

(e) According to the Kruskal-Wallis test, do you reject the null hypothesis that the speeds in each trial come from the same distribution? What is the p-value for this test? Circle this number on your printout and write “2e” beside it.

Solution: 0.0047

(f) What was the MC power for Bartlett’s test to detect a difference in variance when 3 of the groups had double the SD of the other two (4 decimals)? Circle this number on your printout and write “2f” beside it.

Solution: 0.9709