1. A, D

2. A, B

6. b) Ho: beta_1 = beta_2 = beta_3 = 0 (There is no linear association between fuel consumption, weight, transmission_typeM, and weight*transmission_typeM.)

Ha: There is a linear association between fuel consumption, weight, transmission typeM, and weight*transmission_typeM.

For an alpha = 0.05 significance level, we get a 1.669e-12 p-value which is less than 0.05. So, we can reject the null in favor of the alternative hypothesis. IN this case, that means there is some significant linear association between the predictors: weight, transmission_typeM, and interaction term weigh*transmission_typeM and response variable mpg.

7. a) Ho: beta_2 = beta_3 = 0

Ha: At least one of beta_2 and beta_3 is not equal to 0

b) The Anova F-Test in b is more reliable than the nested F-test in 7a. This is because more of the conditions for the Anova F-test have been met as compared to the nested F-test in 7a. For 6b, we only need to check the residual plot for model 3 (the full model), which raises no concerns about the linearity and constant variance condition. However, for the nested F-test, we need to look at the full model's residual plot as well as the reduced model (model 3 and model 1). In model 1's residual plot, we see a concave pattern, leading us to believe that the linearity assumption has been violated. Otherwise, the data collected for the two different models is the same, so all the other conditions should be met to the same level for those models. However, since the linearity condition is not met in the residual plot for model 1, the Anova F-test is more reliable than the nested F-test.

8. We can do this using an added variable plot. First, we will find the residuals of the model without displacement. Then, we will find the residuals for the model of displacement predicted by the other predictors in the original model. Then we will plot the residuals against each other and look at the correlation. Looking at these plotted residuals, we can tell that if the correlation is perfectly one, then there is no information to be gained from displacement. Otherwise, there is. We can also calculate the Mallow's Cp value for adding another predictor and see if it is a low value. If it is, we can add it to the model. Further, we can look at the adjusted r^2 values of the original model and the model with the displacement predictor added. If adjusted r^2 has increased from the original model, then that means that accounting for the fact that we added a predictor, we still see that the model with displacement explains more of the variability in the model than the original.