EXERCISE 1
Use the results from homework 6 exercise 8. You need to use the two Stata printouts from part (a) and part (e). You can also find them on the last page of the solutions distributed in class.

a. Report the $SSE$ and its degrees of freedom for the full model.

b. Report the $SSE$ and its degrees of freedom for the reduced model.

c. Use both regressions to test ($\alpha = 0.05$) the hypothesis:

\[ H_0: \beta_{\text{BH}} = \beta_{\text{GAR}} = \beta_{\text{LOT}} = 0 \]

\[ H_a: \text{At least one of } \beta_{\text{BH}}, \beta_{\text{GAR}}, \beta_{\text{LOT}} \neq 0 \]

EXERCISE 2
An experiment was conducted to determine the effect of alcohol on reaction time. Four students were given no alcohol, six were given two drinks, and eight were given four drinks. The students’ reaction times to a visual stimulus were then measured, yielding the following data:

<table>
<thead>
<tr>
<th>No drinks</th>
<th>4</th>
<th>5</th>
<th>3</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 drinks</td>
<td>6</td>
<td>4</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>4 drinks</td>
<td>8</td>
<td>12</td>
<td>6</td>
<td>11</td>
</tr>
</tbody>
</table>

Using these data with $\alpha = 0.05$, test that there is no significant difference in reaction time due to the number of drinks. You can do this with or without Stata.

EXERCISE 3
A consumer protection group compares three different types of front bumpers for a brand of automobile. A test is conducted by driving an automobile into a brick wall at 15 miles per hour. The response is the amount of damage to the car, as measured by the repair costs, in hundreds of dollars. Due to the potentially large costs, the study conducts only two tests with each bumper type. The table below shows the results:

<table>
<thead>
<tr>
<th>Bumper A</th>
<th>Bumper B</th>
<th>Bumper C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>15</td>
</tr>
</tbody>
</table>

a. Report the sample means for the three bumpers. Do not use Stata.

b. Find the within-groups sum of squares ($WSS$). Do not use Stata.

c. Find the between-groups sum of squares ($BSS$). Do not use Stata.

d. Complete the ANOVA table. Do not use Stata.

e. Now use Stata to verify your ANOVA table of part (d).

f. Test the hypothesis that the mean repair costs are the same for the three types of bumpers. Use $\alpha = 0.05$. Do not use Stata.

g. Set up the regression model with indicator variables using these data. Show the correspondence between the hypothesis for the means (using ANOVA) and the hypothesis for the regression parameters and test it at the significance level $\alpha = 0.05$. For this question use Stata.

EXERCISE 4
One-way ANOVA provides relatively more evidence that $H_0 : \mu_1 = \cdots = \mu_g$ is false:

a. The smaller the $BSS$ and the larger the $WSS$.

b. The smaller the $BSS$ and the smaller the $WSS$.

c. The larger the $BSS$ and the smaller the $WSS$.

d. The larger the $BSS$ and the larger the $WSS$.

Explain!

EXERCISE 5
In the one-way ANOVA problem let

\[ \bar{\mu} = \frac{\sum_{i=1}^{n} n_i \mu_i}{N} \]. Use it for part (a) below.

Show that:

a. $E(BSS) = (k - 1)\sigma^2 + \sum_{i=1}^{n} n_i(\mu_i - \bar{\mu})^2$.

b. $E(WSS) = (N - k)\sigma^2$.