DIRECTIONS: Choose Option One or Option Two. Save two electronic copies of your answer (one with just your ID number assigned to you, the other with your ID number and name). Email both copies to dv14@txstate.edu; print out a hard copy as well with both your id number and name written on it.

Option 1:
Background and Motivation
This exam focuses on the role that religiosity plays in explaining criminal offending. The hypothesis is that religiosity has a negative effect on offending. However, this negative effect increases (that is, gets farther from zero) as the age of the respondent increases.

Estimate an ordinary least squares multiple regression model to test the following hypothesis:

Religiosity has a negative effect on criminal offending, but this effect increases with the age of the respondent. Hold constant the potentially confounding effects of: (1) importance of career aspirations; (2) time the respondent spends with their family; (3) sex of respondent; and (4) whether the respondent’s race is white.

You may use a calculator.
You will be assessed based on your responses to the following items:

1. Using the data file described below, use SPSS to estimate a multivariate ordinary least squares regression equation with criminal offending as the dependent variable. The primary independent variables are religiosity, age, and the statistical interaction (i.e., the product term) of religiosity and age. The secondary variables (that is, the control variables) are: career importance, time spent with family, sex, and race.

2. Interpret the model-fit statistics associated with the model you estimated.

3. Based on the model you estimated, interpret (a) the y-intercept; (b) the slopes (i.e., the coefficients) for the primary independent variables; (c) the slope for the respondent race variable; and (d) their tests of statistical significance. Assume that all continuous variables have been mean centered.

4. Examine measures of collinearity and determine whether levels of multicollinearity seem problematic for the model you estimated. If problems exist, however, do not attempt to address problems with additional analysis.
5. Examine measures of outlying and non-outlying influence, and discuss whether levels of influence seem problematic for the model you estimated. If problems exist, do not attempt to address problems with additional analysis.

6. Assume the standard deviation of age is 1.9.

   A. What is the effect of religiosity on criminal offending when age is 1 standard deviation below the mean age?
      A. -0.017
      B. -0.014
      C. -0.011
      D. -0.003
      E. 0.020

   B. What is the effect of religiosity on criminal offending when age equals the mean age?
      A. -0.017
      B. -0.014
      C. -0.011
      D. -0.003
      E. 0.020

   C. What is the effect of religiosity on criminal offending when age is 1 standard deviation above the mean age?
      A. -0.017
      B. -0.014
      C. -0.011
      D. -0.003
      E. 0.020
The data file contains data from 500 individual respondents. The variables relevant to the exam are named and described below.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Variable Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>crime</td>
<td>A continuous measure for criminal offending. Higher values indicate more offending. Refer to units of this variable as points on the criminal offending scale.</td>
</tr>
<tr>
<td>relig</td>
<td>A mean-centered and continuous measure of religiosity. Higher values indicate more religiosity. Refer to units on this scale as points on the religiosity scale.</td>
</tr>
<tr>
<td>age</td>
<td>A mean-centered and continuous measure of the age of the respondent. Higher values indicate older respondents. Refer to units on this scale as years of age.</td>
</tr>
<tr>
<td>product</td>
<td>The product-term for the statistical interaction between religiosity and age (that is, product = relig × age).</td>
</tr>
<tr>
<td>career</td>
<td>A mean-centered and continuous measure for career importance. Higher values indicate more importance. Refer to units of this variable as points on the career importance scale.</td>
</tr>
<tr>
<td>family</td>
<td>A mean-centered and continuous measure for time spent with family. Higher values indicate more time spent with family. Refer to units of this variable as hours spent with family.</td>
</tr>
<tr>
<td>female</td>
<td>A dummy-coded variable for sex of respondent. 0 = not female 1 = female</td>
</tr>
<tr>
<td>white</td>
<td>A dummy-coded variable for respondent race. 0 = not white. 1 = white</td>
</tr>
</tbody>
</table>

End of Option 1
Option 2: 
Background and Motivation

Criminologists acknowledge the relationship between peer delinquency and delinquency. Criminologists also acknowledge that violent crime is overwhelmingly committed by males. This exam focuses on whether gender regulates the effect of peers. Research in this area has produced mixed results with regard to gender-conditioned variation in the effect of peers.

The hypothesis for this exam is that females, compared to males, are less influenced by delinquent peer associations. In other words, the size of the effect of peer delinquency depends on gender, and is smaller among females.

The table below presents results for a multivariate regression model using data from 1,484 respondents.

Violent offending, the dependent variable, is a continuous measure where higher values indicate more offending.

The measure for peer delinquency is a continuous variable ranging from 0 to 18. The measure is not mean centered. Higher values indicate more associations with delinquent peers.

Gender is measured as a dummy-coded variable where a value of 1 indicates that the respondent is female. The measure for gender for this exam simplifies the complexity surrounding the disagreement between sex and gender.

The product-term statistical interaction is based on these measures of peer delinquency and gender.

You may use a calculator.
You will be assessed based on your responses to the following items:

1. Interpret the estimates and the tests of statistical significance for the effects of (a) peer delinquency; (b) female; and (c) the product of these two variables. Do the results in the table support the hypothesis?

2. The hypothesis assumes that associating with delinquent peers is a criminogenic. However, the hypothesis also asserts that females, compared to males, are less susceptible to delinquent peer associations. In other words, peers have gender-specific effects. Based on the results:

   (a) What is the effect of delinquent peer associations among females? Report the actual numeric value.

   (b) What is the effect of delinquent peer associations among males? Report the actual numeric value.
3. What is the t statistic for the time with peers coefficient? Report the actual numeric value.

4. Based on the results and while being mindful of the table’s footnotes regarding variable coding, interpret the constant (that is, the y-intercept).

5. The authors reported a variance inflation factor (VIF) for each variable. Explain and discuss (a) collinearity; (b) strengths and weaknesses of using the VIF as a measure of collinearity; and (c) whether collinearity levels are problematically high.

6. Based on your discussion for question 5 and the results presented below, what is the $R^2$ value (that is, the squared multiple correlation coefficient) when peer delinquency is regressed on the remaining independent variables in the model? Report the actual numeric value.

7. The total sum of squares, notated with $\sum(Y_i - \bar{Y})^2$, is 331.84. What is the model sum of squares? The model sum of squares is sometimes called the sum of squared explained variation and is notated as $\sum(\hat{Y}_i - \bar{Y})^2$. Report the actual numeric value.
Table for statistics exam, option 2

Ordinary least squares model explaining violent criminal offending

N = 1,484

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>SE</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer Delinquency</td>
<td>0.204*</td>
<td>0.010</td>
<td>2.000</td>
</tr>
<tr>
<td>Female^a</td>
<td>-0.055*</td>
<td>0.020</td>
<td>1.020</td>
</tr>
<tr>
<td>Peer Delinquency × Female^a</td>
<td>-0.040*</td>
<td>0.014</td>
<td>1.880</td>
</tr>
<tr>
<td>Religiosity^b</td>
<td>-0.004</td>
<td>0.003</td>
<td>1.060</td>
</tr>
<tr>
<td>Attachment to Family^b</td>
<td>0.001</td>
<td>0.001</td>
<td>1.110</td>
</tr>
<tr>
<td>Importance of Career^b</td>
<td>0.011</td>
<td>0.015</td>
<td>1.100</td>
</tr>
<tr>
<td>Importance of College Education^b</td>
<td>-0.029*</td>
<td>0.007</td>
<td>1.120</td>
</tr>
<tr>
<td>Age^b</td>
<td>0.002</td>
<td>0.005</td>
<td>1.090</td>
</tr>
<tr>
<td>White^a</td>
<td>0.035</td>
<td>0.025</td>
<td>1.050</td>
</tr>
<tr>
<td>Time Spent With Peers^b</td>
<td>0.003*</td>
<td>0.001</td>
<td>1.140</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.104</td>
<td>0.116</td>
<td>--</td>
</tr>
</tbody>
</table>

R² = 0.3681  Root MSE = 0.3773

Model Statistics

\[ F_{df_1=10,df_2=1473} = 85.81, p < .05 \]

\(^* p < .05\)

^a A dummy-coded variable where zero indicates absence of characteristic.

^b A continuous variable that is mean centered.

End of Option 2