Instruction:

(A) Questions in this paper should be answered by students whose **surnames** fall within the range **A-K**.

(B) Use Excel file '**Dataset1 part IIIB** to answer the questions asked.

(**C**) A heavy **penalty** will be applied if your answers are not based on dataset assigned to you.

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Instructions for Dataset1 part IIIB: Multiple Regression Analysis

A statistics lecturer took a random sample of 150 employees working in a small city and collected the following information: hourly wage, job tenure, age and level of education.

The variables in the dataset are:

- hwage (Y, hourly wage in dollar)
- tenure (X1, job tenure – length of time (in years) an employee has worked for their current employer)
- age (X2, age (in years) of an employee)
- col (X3, college completion: coded 1 if the employee has completed college and 0 if not)

The dependent variable for your analysis is **hwage**.

Answer the following questions using Dataset1 part IIIB

(a) Estimate a regression model using X1 and X2 to predict Y (state the multiple regression equation).

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(b) Interpret the meaning of the slopes.

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(c) Predict Y when X1 = 8 and X2 = 40.

(d) Compute a 95% confidence interval estimate of the mean Y for all employees working in the small city when X1 = 8 and X2 = 40 and interpret its meaning.

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(e) Compute a 95% prediction interval of Y for an employee working in the small city when X1 = 8 and X2 = 40 and interpret its meaning.

(f) Plot the residuals to test the assumptions of the regression model. Is there any evidence of violation of the regression assumptions? Explain.

(g) Determine the variance inflation factor (VIF) for each independent variable (X1 and X2) in the model. Is there reason to suspect the existence of collinearity? Why?

(h) At the 0.05 level of significance, determine whether each independent variable (X1 and X2) makes a significant contribution to the regression model (use t tests and follow all the necessary steps). On the basis of these results, indicate the independent variables to include in the model.

(i) Test for the significance of the overall multiple regression model (with two independent variables, X1 and X2) at 5% level of significance.

(j) Determine whether there is a significant relationship between Y and each independent variable (X1 and X2) at the 5% level of significance (hint: testing portions of the multiple regression model using the partial F test).

(k) Compute the coefficients of partial determination for a multiple regression model containing X1 and X2 and interpret their meaning.

(l) Estimate a regression model using X1, X2 and X3 to predict Y (state the multiple regression equation, the regression equation for employees who have completed college, the regression equation for employees who have not completed college) and interpret the coefficient for X3.

(m) Estimate a regression model using X1, X2, X3, an interaction between X1 and X2, an interaction between X1 and X3, and an interaction between X2 and X3 to predict Y.

(n) Test whether the three interactions significantly improve the regression model. Assume 5% level of significance (hint: test the **joint** significance of the three interaction terms using the partial F test. If you reject the null hypothesis, test the contribution of each interaction separately (using the partial F test) in order to determine which interaction terms to include in the model).

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