



The Open University of Sri Lanka

B.Sc/B.Ed. DEGREE, CONTINUING EDUCATION PROGRAMME

No Book Test (NBT) 2016/2017

Level 04 - Applied Mathematics

APU2141/APE4141 – Regression Analysis I

Date: - 11.11.2017

10.30 am - 11.30 am

Instructions

- This examination is of **one hour** duration.
- Answer **all** questions.
- Each of the two questions is allocated fifty marks.
- Non programmable calculators are permitted.

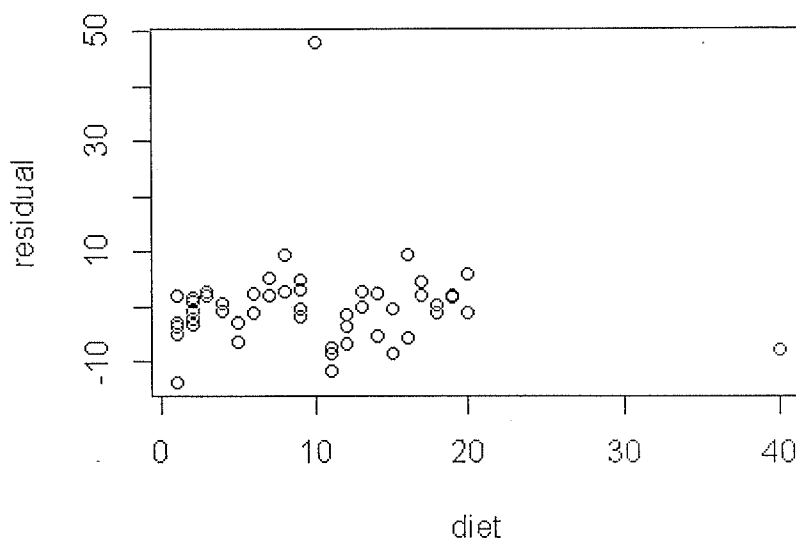
1. The following summary statistics were computed from the reaction times (minutes) measured on 60 chemical samples (y) after adding known amounts (x) of a catalyst. The amounts of catalyst used for data collection had varied from $0mg$ to $20mg$.

$$\sum x_i = 627.0, \sum y_i = 516.7193, \sum x_i y_i = 6953.26, \sum x_i^2 = 8607.0, \sum y_i^2 = 6501.985.$$

A simple linear regression model is to be fitted to the data using the method of least squares, with the amount of catalyst as the predictor variable.

- i) Obtain least squares estimates for the slope and intercept of the population regression line.
- ii) Write down the equation of the fitted line.
- iii) Estimate the expected reaction time of a sample that had received $5mg$ of the catalyst.
- iv) A sample that had received $5mg$ fertilizer had 6 minutes. Compute the residual corresponding to this observation.

2. A plot of residuals from fitting a simple linear regression model using the method of least squares to weight gains (mg), y , of 50 rats after giving known amounts of a protein rich diet (x) is illustrated in the figure. The x values used for the study had varied from $0mg$ to $40mg$ and had an average of $10mg$.



Based on the given plot, a student concluded the following. In each case, state whether you agree with the conclusion or not. If you do not agree, give reasons.

- i) The observations are uncorrelated.
- ii) The highest weight gain is observed for rats receiving $10mg$ of the diet.
- iii) The researcher has not used replicates.
- iv) There is only one extreme observation in the data set.
- v) If the model is now fitted without the observation corresponding to $10mg$ of compound, the resulting estimate for the slope parameter will be smaller.

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