

Bachelor of Medical Laboratory Sciences (B.MLS)
MLU3141 – Application to Medical Statistics
Semester 02- Academic year 2015/2016
Final Examination

Return your question papers with the answer sheets.

Date: 27. 07. 2016	Duration – 2 hours
Time: 1.30 p.m. –3.30 p.m.	Index No.....

Please read the following instructions carefully before you answer the paper.

- Paper consists of four (04) Essay type questions.
- Answer **all** the questions.
- All the questions will be given equal marks.

1. In a study comprising 30 persons, blood serum cholesterol-level was measured before and after a 4-weeks intervention-period consisting of organized training with moderate to high intensity. The main aim of the study was to examine whether the intervention (physical exercise) influenced on cholesterol level.

Sample Statistics

Variable	Mean	Std. Deviation	Std. Error of the Mean
Cholesterol concentration (before)	5.57 mmol/L	0.4937	0.0637
Cholesterol concentration (after)	5.39 mmol/L	0.6581	0.0850

- i) Define the null and the alternative hypothesis you would examine, to meet the researcher's objective. (06 marks)
- ii) Suggest a statistical test that can be applied to test the validity of the null hypothesis stated in part (i)? (03 marks)
- iii) Clearly explain what is meant by the statement that the p-value obtained using the suggested test is 0.05. (04 marks)
- iv) The calculated t value for above condition is 3.426. Interpret the results using the decision rule at 0.05 significance level. (12 marks)

2. A researcher wishes to determine whether there is an association between the history of Sexually Transmitted Diseases (STDs) and the status of HIV (Positive/ Negative) of sexually active individuals ($n = 286$). The total count of individuals who did not have a history of STDs was 116 and 32 of them had HIV. Among individuals who had history of STDs, 48 were HIV negative.

- i) State the null hypothesis you would examine to determine whether there is a significant association between the history of STD and status of HIV. (03 marks)
- ii) Suggest a suitable statistical test that can be used to examine the validity of the null hypothesis. (03 marks)
- iii) Construct a contingency table for the above data. (08 marks)
- iv) Calculate the degree of freedom for the test stated in part (ii). (03 marks)
- v) The particular **calculated** value of the statistic for above data is 54.29. (08 marks)
Interpret this result at the 0.05 level of significance, using a suitable statistical table.

3.

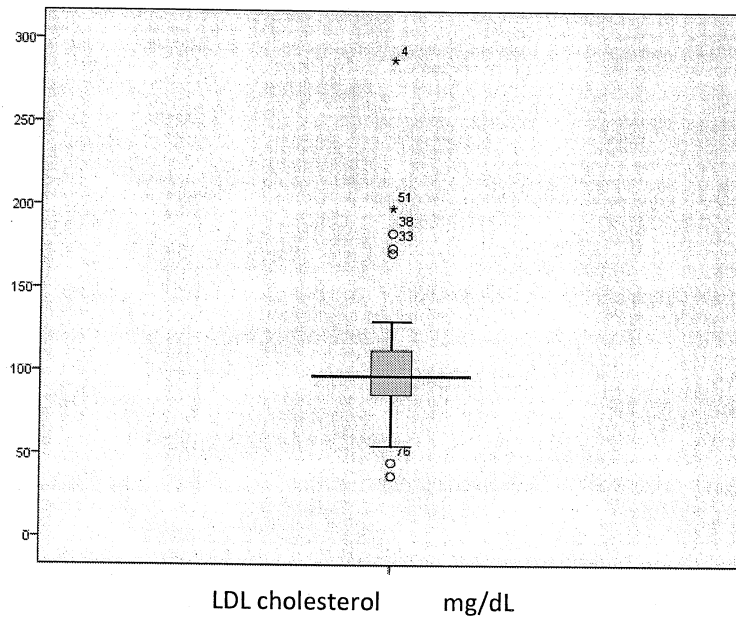
3.1 The probabilities of a non-infectious disease occurring in an adult and in a child are 0.2 and 0.1 respectively. Assume that the members of the family get the disease **independently** of each other.
A family with one child and one adult is randomly selected.

- i) Find the probability that both the adult and the child in the family get the disease? (05 marks)
- ii) Calculate the probability that **at least one of the family members** get the disease. (05 marks)

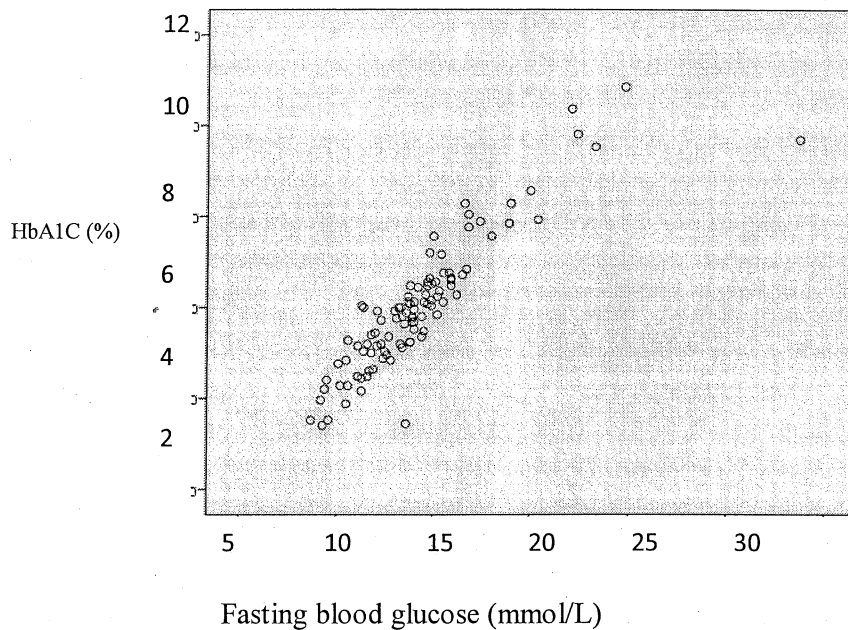
3.2 Mean value and standard deviation are common measures of central location that represent a typical value and the spread for a continuous, normally distributed variable respectively.

- i) Define the median. (03 marks)
- ii) When is the median value a better measure of central location (typical value) than the mean in an experimental data set? (04 marks)

- 3.3 In a clinical study, the aim was to examine the effect of a low carbohydrate diet on the level of LDL (low density lipoprotein) cholesterol in blood (mg/dL). The following is a box plot constructed from the data collected on LDL of a group of persons.



- i) Find roughly the highest value, lowest value, Q1, Q2, Q3, outliers, skewness and Interquartile Range (IQR). (04 marks)
 - ii) Clearly describe the findings from this box plot about the distribution of LDL cholesterol level. (04 marks)
4. A researcher wanted to predict the laboratory Glycated Hemoglobin (HbA_{1c}) result from the fasting blood glucose of diabetic patients. The scatter plot of two variables was as in the graph below.



- 4.1 The correlation coefficient, r , computed from the data is 0.8, Interpret the result. (06 marks)
- 4.2 Identify the dependent variable and independent variable. (04 marks)
- 4.3 The researcher calculated the equation of the line that gave “the best fit” through the scatter of plot.
The regression equation was $Y = 3.2 + 0.45X$.
- Briefly mention the use of the regression equation. (04 marks)
 - What is the value of the intercept in the above mentioned regression equation? (02 marks)
 - Briefly explain the meaning of the intercept related to this study. (04 marks)
 - Predict the HbA_{1c} level of a patient with a fasting blood glucose concentration of 9mmol/L. (05 marks)

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