



**RAJARATA UNIVERSITY OF SRI LANKA**  
**FACULTY OF APPLIED SCIENCES**

**B.Sc. (General) Degree in Applied Sciences**  
**First Year - Semester II Examination – February/March 2019**

**BIO 1202 – STATISTICAL METHODS IN BIOLOGY I**

**Time: Two (02) hours**

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**Answer ALL questions**

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1) The following are quiz scores of two samples of students.

Sample 1- 4, 4, 0, 5, 7, 10

Sample 2- 1, 0, 0, 9, 10, 10

a) Calculate the median of the two samples. **(20 marks)**

b) Calculate the range, variance and standard deviation for the above samples and comment on your answers. **(40 marks)**

c) A survey of 30 adults found that the mean age of a person's primary vehicle is 5.6 years. Assuming the standard deviation of the population is 0.8 years, find the 95% and 99% confidence interval of the population mean. Comment on your answers. **(20 marks)**

d) Ten randomly selected people were asked how long they slept at night. The mean time was 7.1 hours, and the standard deviation was 0.78 hours. Find the 95% confidence interval of the mean time. Assume the variable is normally distributed. **(20 marks)**

- 2) a) A student took a biology exam and scored 550. Another student took a mathematics exam and scored 30. The biology exam has a  $\mu = 560$  and  $\sigma = 100$  while the mathematics exam has a  $\mu = 18$  and  $\sigma = 6$ . Assume that the scores of both exams are normally distributed. Which student did better? Comment on your answer.

(10 marks)

- b) The concentration of a series of sucrose solutions is approximately normally distributed with  $\mu = 65$  mg/ml and  $\sigma = 25$  mg/ml. What is the population greater than 85 mg/ml.

(05 marks)

- c) A population of one-year old dogs has a  $\mu = 47$  cm and  $\sigma = 25$  mg. What is the probability of drawing a sample of 9 dogs with a mean height greater than 50 cm?

(10 marks)

- d) The data below are blood clotting times of male adult rabbits given one of two different types of drugs.

Drug A	Drug B
8.8	9.9
8.4	9.0
7.9	11.1
8.7	9.6
9.1	8.7
9.6	10.4
	9.5

Carry out an appropriate statistical test to compare the mean blood clotting times of subjects receiving drugs A and B.

(75 marks)

- 3) A researcher wishes to determine whether there is a relationship between the gender of an individual and the amount of sugar consumed. A sample of 68 people were selected, and the following data were obtained.

Sugar consumption				
Gender	Low	Moderate	High	Total
Male	10	9	8	27
Female	13	16	12	41

Carry out an appropriate statistical test to determine if sugar consumption is associated with gender at  $\alpha = 0.10$ .

(100 marks)

- 4) The data below is on the number of hours a person exercises and the amount of milk a person consumes a week.

Subject	Number of hours of exercise	Milk consumption
A	3	48
B	0	8
C	2	32
D	5	64
E	8	10
F	5	32
G	10	56
H	2	72
I	1	48

- a) Construct a scatter plot for the data set given above. (10 marks)
- b) Compute the value of the correlation coefficient for the data and test the significance of the coefficient. (50 marks)
- c) Find the equation of the regression line for the data and graph the line on a scatter plot. (40 marks)

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## Equation sheet

$$s^2 = \frac{\sum (X - \bar{X})^2}{n - 1}$$

$$z = \frac{X - \mu}{\sigma}$$

$$z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$$

$$\bar{X} - z_{\alpha/2} \left( \frac{\sigma}{\sqrt{n}} \right) < \mu < \bar{X} + z_{\alpha/2} \left( \frac{\sigma}{\sqrt{n}} \right)$$

$$\bar{X} - t_{\alpha/2} \left( \frac{s}{\sqrt{n}} \right) < \mu < \bar{X} + t_{\alpha/2} \left( \frac{s}{\sqrt{n}} \right)$$

$$\hat{p} - z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}} < p < \hat{p} + z_{\alpha/2} \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$z = \frac{\hat{p} - p}{\sqrt{pq/n}}$$

$$z = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

$$(\bar{X}_1 - \bar{X}_2) - z_{\alpha/2} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} < \mu_1 - \mu_2 < (\bar{X}_1 - \bar{X}_2) + z_{\alpha/2} \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$$(\bar{X}_1 - \bar{X}_2) - t_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} < \mu_1 - \mu_2 < (\bar{X}_1 - \bar{X}_2) + t_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$$

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n(\Sigma x^2) - (\Sigma x)^2][n(\Sigma y^2) - (\Sigma y)^2]}}$$

$$t = r \sqrt{\frac{n-2}{1-r^2}}$$

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

$$a = \frac{(\Sigma y)(\Sigma x^2) - (\Sigma x)(\Sigma xy)}{n(\Sigma x^2) - (\Sigma x)^2}$$

$$b = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n(\Sigma x^2) - (\Sigma x)^2}$$