



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2011/2012
SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE (CONSERVATION BIOLOGY)

SCB 306: QUANTATIVE METHODS IN BIOLOGY

DATE: Wednesday 28th March 2012

TIME: 8.00a.m -10.00a.m

INSTRUCTIONS

Answer all questions in Section A and any one question in Section B

Section A. You should answer all questions in the spaces provided. (5 marks each)

1. Using specific examples, distinguish between ration scale and interval scale data.

2. Describe a situation where you can use each of the following types of charts to present biological data.
 - a) Pie chart

 - b) Scatter plot

3. Briefly describe a situation where you may use the following tests in drawing inferences about ecological data.

a) Paired sample t-test

b) Simple linear Correlation

4. A biologist intended to investigate whether male and female Beisa Oryx have equal home ranges. Using radio collars on 8 male 8 female individuals, he obtained the following results.

Home range size (KM squared)	Male	33	23	45	34	38	35	65	36
	Female	23	25	32	21	24	19	22	12

Using Data analysis tools of Microsoft Excel, the biologist performed a t-test and obtained the following results

t-Test: Two-Sample Assuming Equal Variances

	<i>Variable 1</i>	<i>Variable 2</i>
Mean	38.625	22.25
Variance	150.5536	31.92857
Observations	8	8
Pooled Variance	91.24107	
Hypothesized Mean Difference	0	
Df	14	
t Stat	3.428594	
P(T<=t) one-tail	0.002037	
t Critical one-tail	1.76131	
P(T<=t) two-tail	0.004074	
t Critical two-tail	2.144787	

a) Was there a significant difference in home range sizes of male and female Beisa Oryx?
Explain how you have arrived at your conclusion

b) State one assumption that the biologist must have made before using t-test.

5. Using specific biological or ecological examples, differentiate between correlation and regression.

6. Giving examples, differentiate between the following terms as used in statistics

a) Population and sample

b) Two-tailed and one tailed hypotheses

7. An ecologist wanted to find out if there is a difference in productivity in four conservation areas, namely A, B, C and D. He measured biomass in six plots in each of the habitats and obtained the following data.

Biomass (KG/M ²) for Conservation Areas				
	A	B	C	D
	50	55	50	70
	50	60	65	80
	55	65	75	65
	60	55	55	70
	45	70	60	75
	55	65	65	60

- a) Which statistical method is appropriate to test whether the mean biomass differed between the four conservation areas?

- b) State the assumptions of the method stated in (a).

8. Differentiate between

- a) Continuous and discrete data.

- b) Precision and accuracy

Section B: Answer any one question

1.
 - (a) What is simple random sampling? 3 marks
 - (b) A researcher intends to collect water samples from 20 out of 100 boreholes in Kajiando South using simple random sampling method. Discuss three methods that the researcher might use to select which wells to collect samples from. (9 marks)
 - (c) Discuss your understanding of
 - i. Stratified random sampling (6 marks)
 - ii. Cluster sampling (6 marks)
 - iii. Systematic sampling (6 marks)

2.
 - (a) Define the term “simple linear correlation” (2 marks)
 - (b) Using appropriate illustrations differentiate between positive and negative correlation (6 marks).
 - (c) The data below were collected from a study investigating the relationship between wing and tail lengths among birds of a particular species.

Tail length	11	9	8	7	6	3	2
Wing length	14	12	6	4	4	5	3

- i. Formulate the appropriate null and alternative hypotheses. (4 marks)
- ii. Using statistical software to analyse the data, the following correlation table (matrix) was obtained.

	Tail length	Wing length
Tail length	1	0.027319
Wing length	0.80967	1

Based on this table, describe the nature of the relationship between the two variables. Your description should declare (with reasons) whether the relationship is significant and whether it is zero, positive or negative. (12 marks).

- iii. When the data analysis tool of Microsoft Excel is used to perform such an analysis, P value is not one of the outputs. Describe how you would test whether the relationship is significant under such circumstances. (6 marks)
3.
 - (a) Discuss your understanding of the terms mean, mode and median and used in statistics. (6 marks)
 - (b) Use clear illustrations to differentiate between positively skewed, negatively skewed and symmetrical distribution. In your illustrations, indicate the relative positions of mean, median and mode. (9 marks)
 - (c) A researcher interested in describing the density of a plant species obtained the following data from 10 plots distributed in the habitat of interest.

Plot	1	2	3	4	5	6	7	8	9	10
Density (number/m squared)	45	32	45	31	54	34	23	12	13	18

Using the table compute the range, mean, variance, standard deviation, and coefficient of variation (10 marks).

(d) Compute 95 percent confidence interval for the mean. ($t_{0.05(2), 9} = 1.833$). (5 marks).