

**UNIVERSITY OF SWAZILAND
SUPPLEMENTARY EXAMINATION PAPER 2008/2009**

TITLE OF PAPER: BIostatistics

COURSE CODE: B305

TIME ALLOWED: THREE (3) HOURS

- INSTRUCTIONS:**
1. ANSWER ANY FOUR QUESTIONS.
 2. EACH QUESTION CARRIES TWENTY FIVE (25) MARKS.
 3. ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELED DIAGRAMS WHERE APPROPRIATE.
 4. CLEARLY STATE YOUR NULL AND ALTERNATIVE HYPOTHESES AND YOUR CONCLUSIONS WHERE APPROPRIATE.

SPECIAL REQUIREMENTS:

1. CALCULATORS (CANDIDATES MUST BRING THEIR OWN).
2. GRAPH PAPER.
3. STATISTICAL TABLES (TO BE SUPPLIED BY THE LECTURER).

**THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN
GRANTED BY THE INVIGILATORS**

ANSWER ANY FOUR (4) OUT OF THE SIX (6) QUESTIONS**QUESTION 1**

The following table shows the variability of bill length in 10 individuals of a species of bird occurring in three different populations in Swaziland. The data are normally distributed.

Bill length (mm)	Population
55	Malolotja
53	Malolotja
52	Malolotja
56	Mlilwane
55	Mlilwane
58	Mlilwane
57	Mlilwane
61	Hlane
59	Hlane
59	Hlane
57	Hlane

Using an appropriate statistical test, establish whether the three different populations have significantly different bill lengths.

[TOTAL = 25 marks]

QUESTION 2

- a) Define a normal distribution. [4 marks]
- b) A normally distributed population of beetles has a mean mass of 1.33 g and a standard deviation of 0.022 g.
- I. What proportion of this population is 1.31 g or heavier? [3 marks]
- II. What is the probability of selecting at random from this population a beetle lighter than 1.35 g? [3 marks]

QUESTION 2 (continued)

- III. What is the probability of choosing at random from this population a sample of 13 beetles that has a mean heavier than 1.39 g? [5 marks]
- c) Present the following data in a single appropriate graph that best represents the data. [10 marks]

Month	Rainfall (mm)	Mean mass (g)
January	110	21
February	98	22
March	56	20
April	40	19
May	37	17
June	7	18
July	9	16
August	15	17
September	38	19
October	78	20
November	105	22
December	118	21

[TOTAL = 25 marks]

QUESTION 3

- a) What are the assumptions of parametric tests? [6 marks]

b) Why are the data given in the table below are not parametric? [2 marks]

	Percent (%)	
	Pop. A	Pop. B
	89	66
	78	64
	63	71
	77	62
	69	69
Mean	75.2	66.4
Variance	97.2	13.3

- c) Using an appropriate transformation, transform the data in (b) above. [6 marks]
- d) Are the transformed data in (b) above now parametric? If so, why? [2 marks]
- e) Using an appropriate test, test whether the masses of the two populations are no different from each other. [9 marks]

[TOTAL = 25 marks]

QUESTION 4

- a) What is the difference between a histogram and an X-Y graph? [3 marks]
- b) Name and describe the different types of statistical data. [9 marks]
- c) A plant ecologist has measured the dispersal distance of 35 individual seeds from the parental tree as follows (in m): 12.5; 17.8; 15.6; 22.7; 11.9; 12.7; 18.8; 17.8; 23.4; 16.7; 16.1; 17.2; 19.0; 19.5; 18.4; 18.4; 13.3; 14.1; 15.8; 16.4; 18.2; 19.9; 21.5; 17.3; 17.9; 18.1; 16.9; 17.7; 17.1; 17.5; 18.5; 16.5; 18.0; 19.2; 19.1
Plot these data as a histogram. [13 marks]
[25 marks]

QUESTION 5

a) Assume that you are a wildlife biologist. You are approached by the chief ranger of a national park and asked to determine the population of a highly threatened butterfly in the park. The ranger asks you for a brief outline of how you propose to conduct the study. [You need to know the following: 1) the park supports 3 major habitats: wetlands, grasslands and forest. 2) The ranger tells you that the butterfly is most abundant in the forest, rare in the grassland and entirely absent from the wetland]. Present your survey procedure here explaining why you propose to conduct the study in this way. [5 marks]

b) Consider the following data collected from observing four nests in four years.

Year	Nest	Number of chicks fledged (1 st attempt)	Number of chicks fledged (2 st attempt)
2003	1	6	4
	2	6	3
	3	0	0
	4	5	0
2004	1	5	0
	2	4	3
	3	4	3
	4	0	0
2005	1	0	0
	2	0	0
	3	0	0
	4	4	3
2006	1	6	5
	2	6	4
	3	6	4
	4	7	4

QUESTION 5 (continued)

Present the data in (b) above in the form of an appropriate graph showing mean number of chicks raised (separately for 1st and 2nd attempts) in the four years. Also show the standard error (as a bar above the mean). Make sure that all this is presented in a single graph.

[20 marks]

[TOTAL = 25 marks]

QUESTION 6

a) What are the assumptions of a chi-square test?

[4 marks]

b) The data below were collected during an outbreak of some virulent disease which killed large numbers of people

Delay in getting treatment (days)	Number of people that died (n = total number of people who contracted the disease)
1	12 (n = 99)
2	15 (n = 88)
3	12 (n = 60)
4	10 (n = 40)
5	8 (n = 16)

Is survival dependent on the delay in getting treatment? Use an appropriate statistical procedure to test this hypothesis.

[21 marks]

[TOTAL = 25 marks]