

QUALIFICATION: BACHELOR OF NATURAL RESOURCES MANAGEMENT HONOURS	
QUALIFICATION CODE: 08BNRH	LEVEL: 8
COURSE CODE: RMC811S	COURSE NAME: RESEARCH METHODS FOR NATURAL SCIENCES
DATE: JULY 2024	
DURATION: 3 HOURS	MARKS: 150

SECOND OPPORTUNITY/SUPPLEMENTARY EXAMINATION QUESTION PAPER	
EXAMINER(S)	Dr Tendai Nzuma (Section A: Scientific Writing) Dr Meed Mbidzo (Section B: Statistics)
MODERATOR:	Prof M. Mwale

INSTRUCTIONS
<ol style="list-style-type: none"> 1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly.

PERMISSIBLE MATERIALS

- D. Endnote
- E. Mendeley
- F. Direct Plagiarism
- G. Chicago
- H. APA
- I. MLA
- J. Accidental Plagiarism

Descriptions:

1. A citation style that uses author-date in-text citations.
2. Using text from another source without altering and not citing it.
3. A reference management tool designed for internet browser integration.
4. Mixing copied material from multiple sources without citing.
5. Reusing one's previous work without citation or acknowledgment.
6. A citation style primarily used in humanities.
7. A reference management tool that supports a wide range of citation styles.
8. A citation style used widely in history and arts.
9. Rephrasing another's ideas too closely to the original, with insufficient citation.
10. Unintentionally failing to cite sources correctly.

QUESTION 3

Discuss the implications of the research findings on "The Impact of Urbanization on Local Bird Populations" for urban planning and biodiversity conservation. Include an analysis of methodological strengths and potential biases in the research. [12]

QUESTION 4

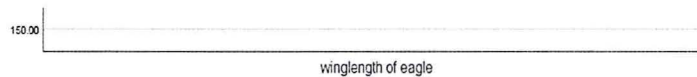
Discuss comprehensive strategies that could be employed by universities to minimize incidents of plagiarism among students. Include preventive, detective, and corrective [20]

- d) A biologist is comparing bird species diversity in urban and rural areas. The data collected are ordinal, ranking areas by the number of species observed from lowest to highest. What is the appropriate test for comparing bird species diversity between urban and rural areas; and why is this test appropriate? (3)

QUESTION 6

An ornithologist claims that the average wing length of an adult eagle is 200cm. Wing lengths of 20 adult eagles were measured and recorded. Use the dataset "eagle" to determine whether wing length values from the sample is different from the population mean. Use the SPSS output provided to answer the questions that follow. [13]

- a) What statistical test would you use to investigate whether wing length values from the sample is different from the population mean? (1)
- b) State the null and alternative hypotheses for this investigation. (2)
- c) Is the assumption of normality met or violated? Explain and provide evidence for your answer. (2)
- d) State whether the assumption of outliers is met or not (Explain and provide evidence for your answer. (2)
- e) Report on the descriptive statistics of the eagle wing lengths. (3)
- f) Determine whether wing length values from the sample are different from the population mean? (3)



	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Wing length of eagle	.116	20	.200*	.971	20	.781

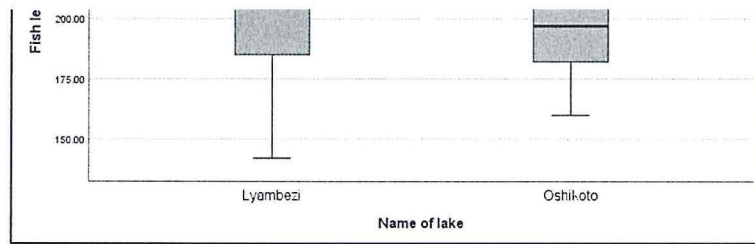
	N	Mean	Std. Deviation	Std. Error Mean
Wing length of eagle	20	184.2000	13.49698	3.01802

	Test Value = 200						
	t	df	Significance		Mean Difference	95% Confidence Interval of the Difference	
			One-Sided p	Two-Sided p		Lower	Upper
Wing length of eagle	-5.235	19	<.001	<.001	-15.80000	-22.1168	-9.4832

QUESTION 7

Samples of tilapia are collected from two lakes (Lyambezi and Oshikoto) and the length of each fish is measured in mm. Use the SPSS outputs provided to answer the questions that follow. [15]

- a) What statistical test would you use to determine whether the fish length differed between the two lakes? (2)



	Name of lake	Kolmogorov-Smirnova			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Fish length in mm	Lyambezi	0.189	8	.200	0.907	8	0.333
	Oshikoto	0.17	10	.200	0.949	10	0.662

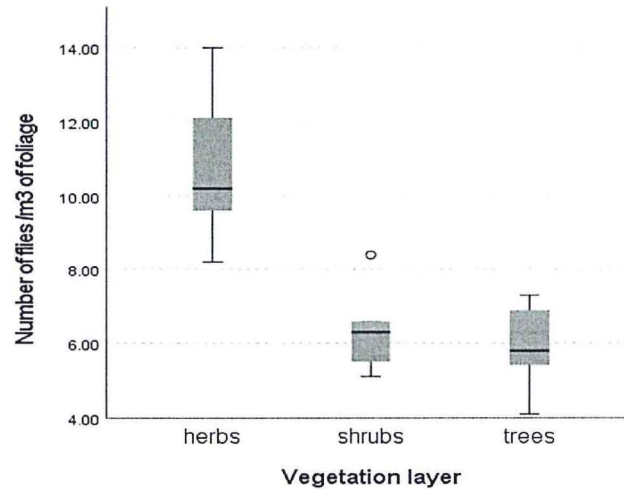
Group Statistics					
Name of lake		N	Mean	Std. Deviation	Std. Error Mean
Fish length in mm	Lyambezi	8	223.7500	51.72938	18.28910
	Oshikoto	10	197.8000	24.62970	7.78860

		Levene's Test for Equality of Variances		t-test for Equality of Means						
Fish	Equal	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Fish	Equal	4.840	0.043	1.407	16	0.179	25.95000	18.44417	-13.149	65.049

between groups. Fully explain your answer.

- d) Determine which vegetation layers are statistically different from each other in terms of fly abundance. (5)

Hypothesis Test Summary				
	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Number of flies /m3 of foliage is the same across categories of Vegetation layer.	Independent-Samples Kruskal-Wallis Test	.013	Reject the null hypothesis.



Test Statistics	
	Number of flies /m3 of foliage

trees-herbs	7.600	2.828	2.687	.007	.022
shrubs-herbs	6.800	2.828	2.404	.016	.049

QUESTION 9

A total of forty seedlings were planted, twelve on each of a building’s four sides. The heights of each seedling after a few weeks of growth were taken in cm. Use the SPSS outputs provided to answer the questions that follow. [16]

- a) What procedure or statistical test would you perform to test the research hypothesis stated above? (2)
- b) explain whether the two main data assumption of the statistical test mentioned in (a) have been met. (6)
- c) Interpret the descriptive statistics table provided in the table below: (4)
- d) Explain whether seedling heights statistically differ with the side of building where the seedlings are grown. (4)

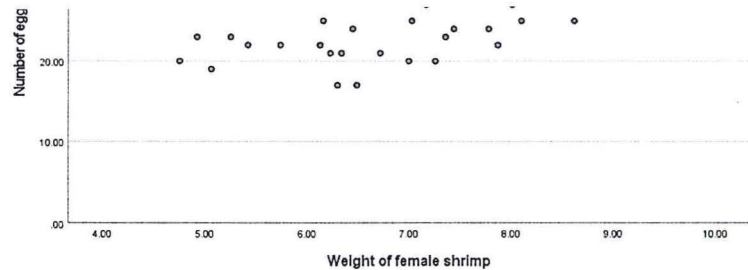
	Side of building	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
		Height of seedling in cm	north	.183	12	.200*	.954
	east	.190	12	.200*	.919	12	.281
	south	.228	12	.085	.934	12	.420
	west	.161	12	.200*	.899	12	.153

Descriptives								
Height of seedling in cm								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
north	12	7.8333	.52628	.15192	7.4990	8.1677	7.10	8.80
east	12	7.5417	.52477	.15149	7.2082	7.8751	6.90	8.50
south	12	8.4750	.48453	.13987	8.1671	8.7829	7.80	9.40
west	12	7.8167	.51231	.14367	7.2319	8.4014	6.40	8.90
Total	48	7.9167	.70871	.10229	7.7109	8.1225	6.40	9.40

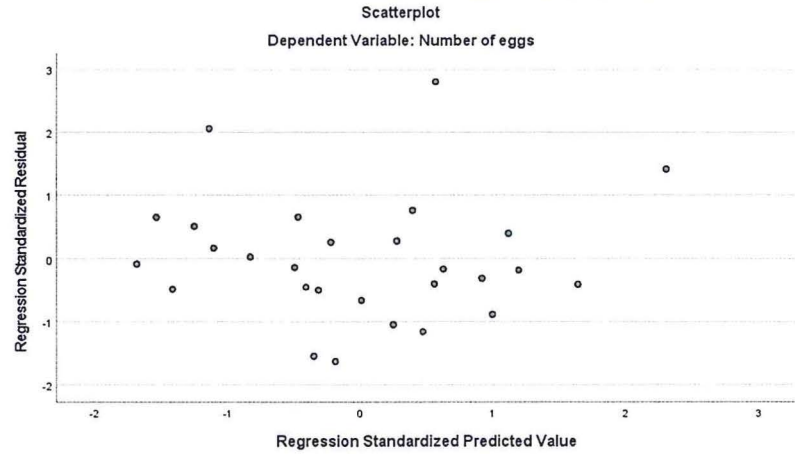
QUESTION 10

A marine biologist collected shrimp and counted the number of eggs each female was carrying; then freeze-dried and weighed the mothers. Use the SPSS outputs provided to answer the questions that follow. [30]

- a) What procedure or statistical test would you perform to test the research hypothesis stated above? (2)
- b) Describe the general relationship that exists between number of eggs produced and female shrimp weight. Provide evidence for your answer. (3)
- c) Did the data meet the assumption of homoscedasticity? Explain your answer. (3)
- d) Did the data meet the assumption of normality? Explain your answer. (3)
- e) Did the data meet the assumption of no significant outliers? Explain your answer. (2)



Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.453 ^a	.206	.175	3.73633	1.882
a. Predictors: (Constant), Weight of female shrimp					
b. Dependent Variable: Number of eggs					



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ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	93.893	1	93.893	6.726	.015 ^b
	Residual	362.964	26	13.960		
	Total	456.857	27			

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12.689	4.201		3.021	.006
	Weight of female shrimp	1.602	.618	.453	2.593	.015
a. Dependent Variable: Number of eggs						