



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

DEPARTMENT OF NATURAL RESOURCES SCIENCES

QUALIFICATION: BACHELOR OF NATURAL RESOURCES MANAGEMENT HONOURS	
QUALIFICATION CODE: 08BNRH	LEVEL: 8
COURSE CODE: RMC811S	COURSE NAME: RESEARCH METHODS FOR NATURAL SCIENCES
DATE: JULY 2025	
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
1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly.

PERMISSIBLE MATERIALS

1. Examination question paper
2. Answering book
3. Calculator

THIS QUESTION PAPER CONSISTS OF 8 PAGES (Excluding this front page)

SECTION A: SCIENTIFIC WRITING

[50]

QUESTION 1

(20)

- a) Define plagiarism and list three common types found in academic settings. (6)
- b) Describe how a student can avoid plagiarism when paraphrasing, summarising, and quoting. (6)
- c) Explain the importance of referencing and citation in scientific writing. Provide an example using APA style (in-text and reference list). (8)

QUESTION 2

(30)

- a) Identify and explain four key functions of the Discussion section. (8)
- b) Using the result: "Compost increased maize height by 15 cm ($p < 0.05$)", write a model paragraph for a Discussion section. (12)
- c) Discuss how speculative language should be used cautiously in the Discussion. Provide examples. (10)

SECTION B: STATISTICS

[100]

QUESTION 3

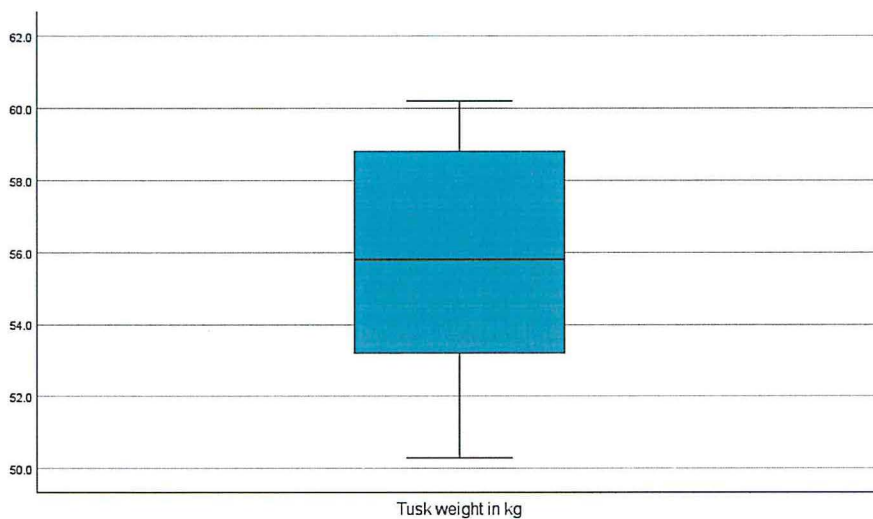
What statistical procedure would you use for the following research questions and/or scenarios? **(10)**

- a) A researcher determined the presence of a specific intestinal parasite in each animal from a random selection of mice of each of two species. You want to determine if there is a relationship between mice species and occurrence of the parasite. (2)
- b) You take a sample of the weights of 20 male elephant tusks from Etosha National Park (ENP) and a sample of 18 male elephant tusks from the Bwabwata National Park (BNP). You want to test if there is a difference in tusk weights between elephants from ENP and BNP. *Note: You find that the tusk weights for BNP were not normally distributed and that there were significant outliers in the data.* (2)
- c) A researcher wants to determine if there is a relationship between soil moisture content and nitrogen mineralization rates. They also want to predict mineralization rates at specific soil moisture content levels. (2)
- d) Trace metals in drinking water affect the flavour and an unusually high concentration can pose a health hazard. Ten pairs of data were taken measuring zinc concentration in bottom water and surface water (each pair of surface & bottom water samples are taken at the same location). You want to test whether the data suggest significant differences in average zinc concentration in bottom and surface water? (2)
- e) Habitat type and temperature are believed to affect insect diversity (using the Shannon Index). Habitat type is categorised into forest and grassland, while temperature has three levels: low, medium and high. You want to assess the impact of habitat type and temperature on insect diversity. (2)

QUESTION 4

A park warden claims that the average weight of elephant tusks in his park is 50kg. A sample of five (5) tusks is taken and their weights are recorded. Use the SPSS output provided to answer the questions that follow. (14)

- a) What statistical test would you use to investigate whether elephant tusk weight values from the sample are different from the population mean? (2)
- 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 elephant tusk weights. (3)
- f) Determine whether the tusk weight values from the sample are different from the population mean. (3)



	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Tusk weight in kg	.182	5	.200*	.964	5	.834
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

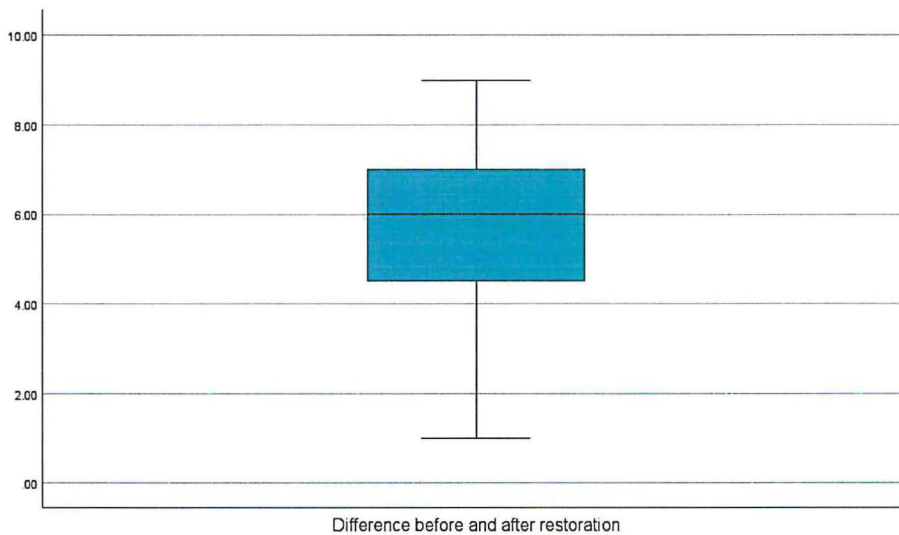
	N	Mean	Std. Deviation	Std. Error Mean
Tusk weight in kg	5	55.660	4.0396	1.8065

	Test Value = 50						
	t	df	Significance		Mean Difference	95% Confidence Interval of the Difference	
			One-Sided p	Two-Sided p		Lower	Upper
Tusk weight in kg	3.133	4	.018	.035	5.6600	.644	10.676

QUESTION 5

Ecologists count bird species in a degraded habitat before and after a restoration project. Use the SPSS outputs provided to answer the questions that follow. (15)

- a) What statistical procedure or test would you use to determine whether habitat restoration significantly increased bird species richness? (2)
- b) What are the two main data assumptions of the statistical procedure/test mentioned in (a)? (4)
- c) Have the two data assumptions in (b) been met or violated? Explain in detail. (4)
- d) Report on the descriptive statistics and fully explain whether habitat restoration significantly increased bird species richness. (5)



	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Difference before and after restoration	.164	15	.200*	.929	15	.267

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Number of bird species after restoration	19.5333	15	2.94877	.76137
	Number of bird species before restoration	13.9333	15	2.05171	.52975

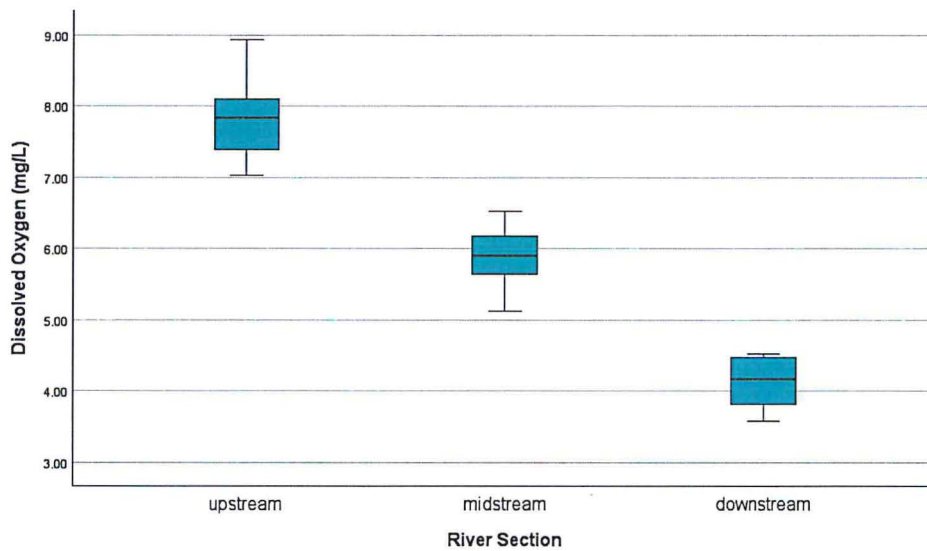
		Paired Differences					Significance			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	One-Sided p	Two-Sided p
					Lower	Upper				
Pair 1	Number of bird species after restoration - Number of bird species before restoration	5.60000	2.50143	.64587	4.21476	6.98524	8.671	14	<.001	<.001

QUESTION 6

A researcher examines pollution levels in three different sections of a river (upstream, midstream, and downstream) by measuring dissolved oxygen levels. Use the SPSS outputs provided to answer the questions that follow. (18)

- a) What procedure or test would you perform to assess whether pollution levels differ among river sections? (2)
- b) Explain whether the two main data assumptions (normality and homogeneity of variances) of the statistical test mentioned in (a) have been met. (5)
- c) How would you deal with violations of normality of data? (3)
- d) Interpret the descriptive statistics. (4)
- e) Fully explain whether pollution levels differ significantly among river sections. (4)

	River Section	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Dissolved Oxygen (mg/L)	upstream	.144	10	.200*	.966	10	.855
	midstream	.114	10	.200*	.969	10	.884
	downstream	.165	10	.200*	.905	10	.249



Descriptives								
Dissolved Oxygen (mg/L)								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
upstream	10	7.8450	.57270	.18110	7.4353	8.2547	7.02	8.93
midstream	10	5.8740	.45051	.14246	5.5517	6.1963	5.12	6.53
downstream	10	4.1020	.35411	.11198	3.8487	4.3553	3.58	4.52
Total	30	5.9403	1.61910	.29561	5.3358	6.5449	3.58	8.93

		Levene Statistic	df1	df2	Sig.
Dissolved Oxygen (mg/L)	Based on Mean	1.091	2	27	.350
	Based on Median	1.148	2	27	.332
	Based on Median and with adjusted df	1.148	2	24.127	.334
	Based on trimmed mean	1.097	2	27	.348

ANOVA					
Dissolved Oxygen (mg/L)					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	70.116	2	35.058	160.244	<.001
Within Groups	5.907	27	.219		
Total	76.023	29			

Multiple Comparisons							
Dependent Variable: Dissolved Oxygen (mg/L)							
	(I) River Section	(J) River Section	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	upstream	midstream	1.97100*	.20918	<.001	1.4524	2.4896
		downstream	3.74300*	.20918	<.001	3.2244	4.2616
	midstream	upstream	-1.97100*	.20918	<.001	-2.4896	-1.4524
		downstream	1.77200*	.20918	<.001	1.2534	2.2906

	downstream	upstream	-3.74300*	.20918	<.001	-4.2616	-3.2244
		midstream	-1.77200*	.20918	<.001	-2.2906	-1.2534
Games-Howell	upstream	midstream	1.97100*	.23042	<.001	1.3801	2.5619
		downstream	3.74300*	.21293	<.001	3.1899	4.2961
	midstream	upstream	-1.97100*	.23042	<.001	-2.5619	-1.3801
		downstream	1.77200*	.18121	<.001	1.3073	2.2367
	downstream	upstream	-3.74300*	.21293	<.001	-4.2961	-3.1899
		midstream	-1.77200*	.18121	<.001	-2.2367	-1.3073
*. The mean difference is significant at the 0.05 level.							

QUESTION 7

(15)

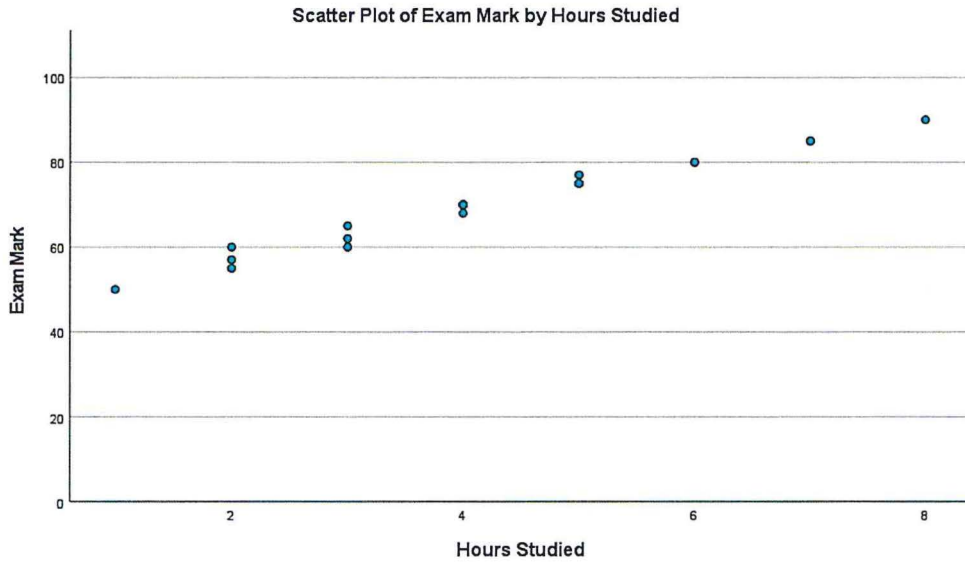
- What does it mean to have data that are non-parametric? (3)
- What are the two main drawbacks of non-parametric tests? (4)
- In an experimental design, what is a control group and why is it important? (3)
- What is the importance of controlling for confounding variables in an experimental design? (3)
- Define a simple random sample. (2)

QUESTION 8

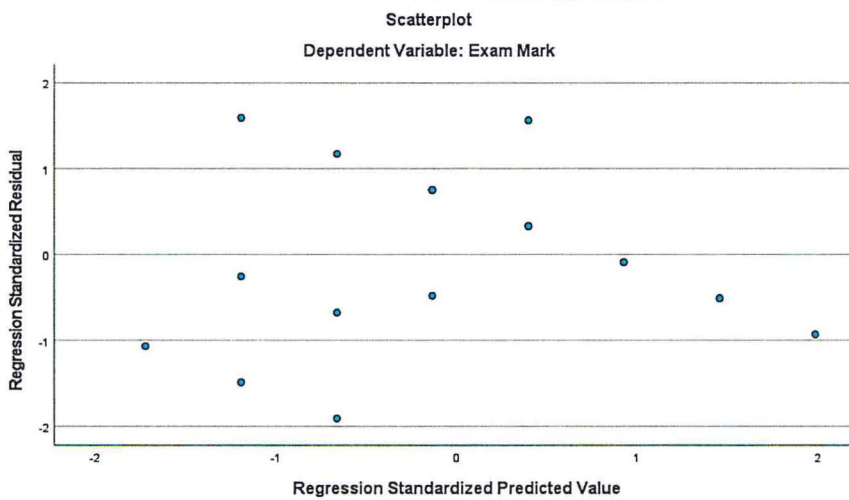
(28)

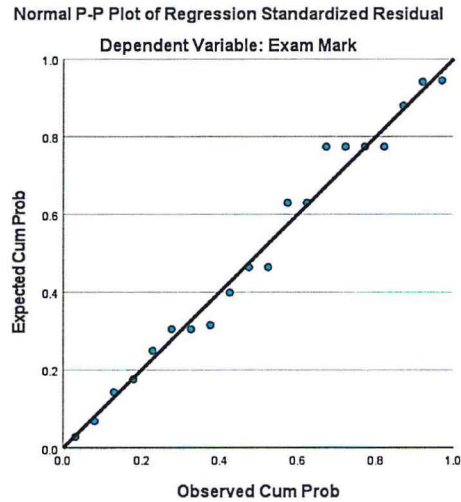
Suppose we want to investigate the relationship between the number of hours studied and the marks obtained on an exam. A sample of 20 Research Methods students were randomly selected, and the number of hours they studied, and their exam mark were recorded. Use the SPSS outputs provided to answer the questions that follow.

- What procedure or statistical test would you perform to test the research hypothesis stated above? (2)
- Describe the general relationship that exists between exam marks and time spent studying. Provide evidence for your answer. (4)
- Did the data meet the assumption of homoscedasticity? Explain your answer. (4)
- Did the data meet the assumption of normality? Explain your answer. (3)
- Did the data meet the assumption of no significant outliers? Explain your answer. (2)
- What proportion of the variance in the response variable is explained by the predictor variable? Explain fully. (4)
- Determine whether the regression model results in a statistically significantly better prediction of the dependent variable than if we just used the mean of the dependent variable. Provide evidence for your explanation. (4)
- Compute a regression equation using the SPSS output provided to predict the exam mark a student would obtain if they studied for 5 hours. (5)



Model Summary ^b					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.989 ^a	.979	.978	1.622	1.353
a. Predictors: (Constant), Hours Studied					
b. Dependent Variable: Exam Mark					





ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2187.823	1	2187.823	831.220	<.001 ^b
	Residual	47.377	18	2.632		
	Total	2235.200	19			
a. Dependent Variable: Exam Mark						
b. Predictors: (Constant), Hours Studied						

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	46.049	.913		50.444	<.001	44.131	47.967
	Hours Studied	5.683	.197	.989	28.831	<.001	5.269	6.097
a. Dependent Variable: Exam Mark								