NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

SCHOOL OF AGRICULTURE AND NATURAL RESOURCE 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: JUNE 2023	
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	Dr Tendai Nzuma (Section A: Scientific Writing) Dr Meed Mbidzo (Section B: Statistics)
MODERATOR:	Dr 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 6 PAGES (Excluding this front page)

SECTION A: SCIENTIFIC WRITING

QUESTION 1

Explain the structure of a scientific research paper and the purpose of each section. **[15]**

QUESTION 2

Describe the characteristics of a good scientific abstract and provide an example of an abstract from a research article conducted in Namibia. **[5]**

QUESTION 3

Discuss the importance of citing sources in scientific writing, and provide an example of a correctly cited reference from a research article using a referencing style you have learnt. **[10]**

SECTION B: STATISTICS

QUESTION 4

Four varieties of house plants were planted in a greenhouse and their heights in cm were obtained. Answer the questions that follow using the SPSS outputs provided below. **[30]**

a) What test would be appropriate to test the hypothesis that all four plant varieties reach the same maximum height? (2)

b) Name three assumptions related to how your data fits the test mentioned in (a) (6)

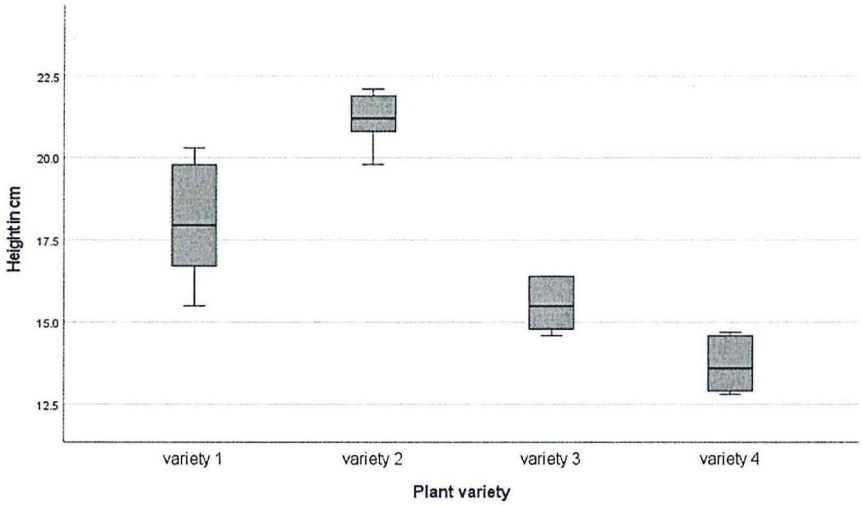
c) State whether the three assumptions mentioned in (b) are met or not (provide evidence for your answers). (9)

d) Report on the descriptive statistics of the plant heights for the different plant varieties. (4)

e) Determine whether the four plant varieties reach the same maximum height? (4)

f) If there is a statistically significant difference in plant heights of the four varieties, explain where the difference lies by providing evidence. (5)

	Plant variety	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Height in cm	variety 1	.167	6	.200*	.965	6	.854
	variety 2	.164	6	.200*	.951	6	.750
	variety 3	.204	6	.200*	.899	6	.370
	variety 4	.199	6	.200*	.893	6	.333



Height in cm								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
variety 1	6	18.033	1.8217	.7437	16.122	19.945	15.5	20.3
variety 2	6	21.167	.8359	.3412	20.289	22.044	19.8	22.1
variety 3	6	15.533	.7659	.3127	14.730	16.337	14.6	16.4
variety 4	6	13.700	.8124	.3317	12.847	14.553	12.8	14.7
Total	24	17.108	3.0564	.6239	15.818	18.399	12.8	22.1

		Levene Statistic	df1	df2	Sig.
Height in cm	Based on Mean	2.396	3	20	.098
	Based on Median	2.360	3	20	.102
	Based on Median and with adjusted df	2.360	3	11.201	.126
	Based on trimmed mean	2.394	3	20	.099

Height in cm					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	188.538	3	62.846	47.755	<.001
Within Groups	26.320	20	1.316		
Total	214.858	23			

Dependent Variable: Height in cm							
			Mean			95% Confidence Interval	
	(I) Plant variety	(J) Plant variety	Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Tukey HSD	variety 1	variety 2	-3.1333*	.6623	<.001	-4.987	-1.280
		variety 3	2.5000*	.6623	.006	.646	4.354
		variety 4	4.3333*	.6623	<.001	2.480	6.187
	variety 2	variety 1	3.1333*	.6623	<.001	1.280	4.987
		variety 3	5.6333*	.6623	<.001	3.780	7.487
		variety 4	7.4667*	.6623	<.001	5.613	9.320
	variety 3	variety 1	-2.5000*	.6623	.006	-4.354	-.646
		variety 2	-5.6333*	.6623	<.001	-7.487	-3.780
		variety 4	1.8333	.6623	.053	-.020	3.687
	variety 4	variety 1	-4.3333*	.6623	<.001	-6.187	-2.480
		variety 2	-7.4667*	.6623	<.001	-9.320	-5.613
		variety 3	-1.8333	.6623	.053	-3.687	.020

QUESTION 5

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. **[25]**

a) Describe the general relationship that exists between exam marks and time spent studying. Provide evidence for your answer. (3)

b) Did the data meet the assumption of homoscedasticity? Explain your answer. (4)

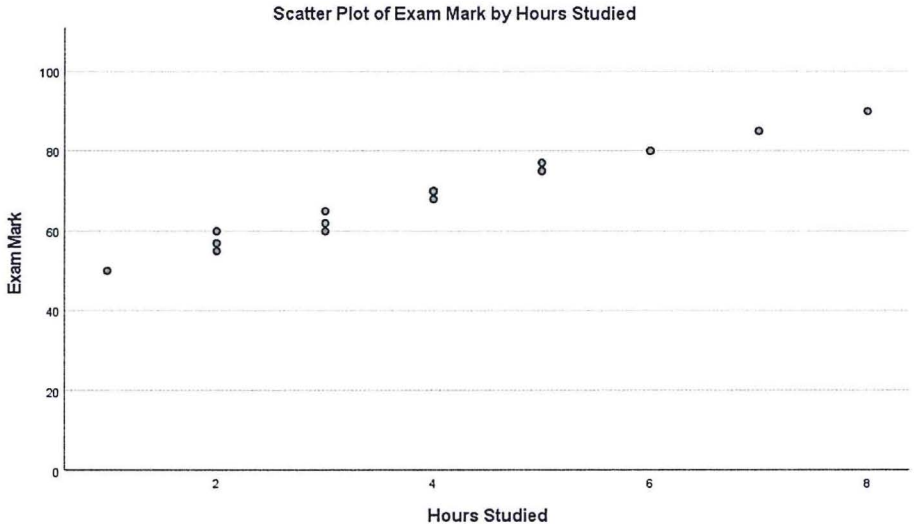
c) Did the data meet the assumption of normality? Explain your answer. (3)

d) Did the data meet the assumption of no significant outliers? Explain your answer. (2)

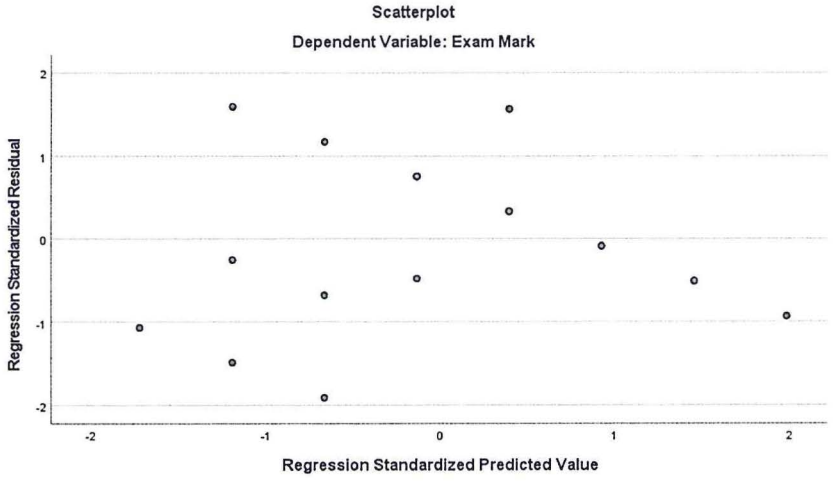
e) What proportion of the variance in the response variable is explained by the predictor variable? Explain fully. (4)

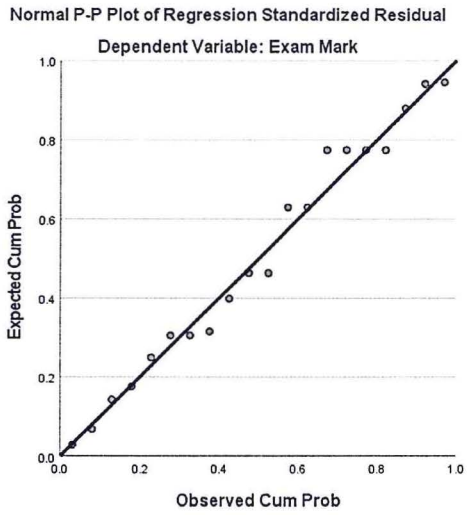
f) Determine whether the regression model results in a statistically significantly better prediction of the dependent variable than if we just used the mean of the dependent variable. Provide evidence for your explanation. (4)

g) 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]								
		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
Model		B	Std. Error	Beta	t	Sig.	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								

QUESTION 6 **[7]**

a) What does it mean to have data that are non-parametric? (3)

b) What are the two main drawbacks of non-parametric tests? (4)

QUESTION 7 **[8]**

a) In an experimental design, what is a control group and why is it important? (3)

b) What is the importance of controlling for confounding variables in an (3)

experimental design?

c) Define a simple random sample. (2)

PAPER TOTAL MARKS **[100]**