FACULTY	**HEALTH SCIENCES & VETERINARY MEDICINE**		
DEPARTMENT	**VETERINARY PRECLINICAL STUDIES**		
SUBJECT	**BIOMETRY**		
SUBJECT CODE	**V3632EB**		
DATE	**OCTOBER/NOVEMBER 2024**		
DURATION	**3 HOURS**	**MARKS**	**100**

OCTOBER /NOVEMBER SECOND OPPORTUNITY EXAMINATION

QUESTION PAPER

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INSTRUCTIONS

1. While most of the marks will be awarded for a clear and correct and clear method, candidates are advised to ensure that their answers are accurate as well.
2. Number your questions correctly and clearly.
3. This paper consists of **7** pages excluding the cover page.
4. Answer **ALL** Questions in Section A and **ANY THREE** Questions in Section B
5. If the degree of accuracy is not specified, answers must be given to 3 decimal places and
6. Unless specified in a part question, all statistical tests must be performed at 5% significance level

ADDITIONAL MATERIALS

1. Non-programmable scientific calculators may be used during the examination.
2. List of formulas containing statistical tables to be provided to candidates.

SECTION A [40 marks]

ANSWER ALL QUESTIONS IN THIS SECTION

Question 1 **[10]**

A survey was conducted to assess the effects of job category (clerical, custodial, managerial), salary (N$), years in school, time on the job between (months) on on-the-job satisfaction (1. very dissatisfied, 2. dissatisfied, 3. neutral, 4. satisfied and 5. very satisfied) for male and female employees of a certain agricultural enterprise. The salary, job category and time within the organisation data was collected for all the employees in the organisation from the file records while years in school and job satisfaction were collected from a sample selected for the interviews.

(a) Identify the most appropriate sampling method to ensure a representative sample where all job categories are properly represented and justify your answer (2)

(b) Suppose an average employee salary is calculated for the data collected, is the resultant measure a parameter or sample statistic? Justify your answer (2)

(c) Which measure of central tendency will be most appropriate to summarise the respondents according to their on-the-job satisfaction? (1)

(d) Identify two graphs that are more appropriate to summarise the distribution of respondents according to their job categories (2)

(e) What type of data measurement scale is on-the-job satisfaction data? (1)

(f) Suppose the salary is positively skewed, identify the most appropriate measure of central tendency

(i) Measure of variability to summarise the data (2)

Question 2 **[10]**

Introduction to Statistics and Biometry students at the University of Namibia sat for the same examination. Table 1 shows the Biometry marks for 10 Veterinary Medicine students. The Biometry marks have a skewness and kurtosis of -2.9 and 8.9, respectively.

Table 1: Biometry marks for 10 Veterinary Medicine students

Student number	1	2	3	4	5	6	7	8	9	10
Marks	96	87	93	96	89	89	92	84	86	100

(a) List the recommended measure of central tendency for the data (1)

(b) List two measures of the spread of the marks. (2)

(c) Calculate the median for the Biometry marks (2)

(d) If the mean Introduction to Statistics is 92.2. What test would you use to compare marks for the Biometry and Introduction to Statistics results? (1)

(e) State the null hypothesis for the test in (e) (2)

(f) What are the underlying assumptions for the test in (e) above? (2)

Question 3 **[10]**

(a) The probability that a dam (female goat) with brucellosis aborts is 0.4. If 15 dams were diagnosed with brucellosis in the past lambing season, what is the probability that

(i) Exactly 5 aborted? (2)

(ii) More than 2 but less than 5 aborted? (3)

(b) The grapefruits in a large orchard have a mean weight of 547.2 g with a standard deviation of 62.40 g. Assuming that the distribution of weight of these grapefruits is normally distributed,

(i) Find the proportion of grapefruits that weigh less than 510.3 g. (2)

(ii) Find the percentage of grapefruits that weigh between 524.5 g and 581.2 g. (3)

Question 4 **[10]**

You are the chief investigator in a child health study in Namibia You want to investigate the influence of sex on weight in 2000 children in //Karas Region. Your sample size consists of 1100 boys and 900 girls aged between 2 and 4 years. Your study reveals that 300 boys and 260 girls are underweight.

(a) Which figure would you use to summarise the data above (1)

(b) Which test would you use to compare the proportion of underweight boys and girls? (1)

(c) What are the requirements for using the test in (b) above? (2)

(d) What is your null hypothesis for the test in (b)? (1)

(e) Calculate the proportion of underweight children. (1)

(f) Calculate the proportion of underweight girls. (1)

(g) The 95% confidence interval of underweight boys is 0.25 to 0.30. Do you think the girls and boys come from a population with similar parameters (i.e similar proportion of underweight). Justify your answer. (2)

(h) Previous studies have shown that the proportion of underweight girls in the Hardap Region for the same age category is 0.32. What statistical test would you use to compare the proportion of underweight girls in //Karas and Hardap regions? (1)

SECTION B [60 marks]

ANSWER ANY THREE QUESTIONS IN THIS SECTION

Question 6 **[20]**

A researcher interested in the characterisation of indigenous goats in the northern regions of Namibia collected data on several body measurements (cm) using a measuring tape and body weight from a sample of goats in the Oshana Region. The goats' weights are summarised and presented in Table 2.

Table 2. Body weights of Indigenous goats in the Oshana Region

Weight of goats (kg)	Frequency (f)
36-40	30
40-44	40
44-48	50
48-52	45
52-56	35
56-60	30

(a) Using the data in Table 2, draw a histogram showing the distribution of weights of the sample of indigenous goats. (4)

(b) Completing Table 2, calculate:

(i) The mean weight of the sample of goats. (3)

(ii) The median weight of the sample of goats. (4)

(iii) The modal weight of the sample of goats. (3)

(c) Briefly explain three reasons for sampling. (3)

Question 7 **[20]**

(a) What is the meaning of the "statistical power" of test? (2)

(b) A herbal supplement is claimed to reduce weight in adult women in 90 days. To test this claim, the initial weights of 10 adult women were measured before they were given the supplement daily for 90 days. Their weights were recorded again at the end of the trial period. Table 3 gives their weight before and after the herbal supplement was administered.

Table 3: Initial and final body weight for women in the trial

Participant ID	**Weight Before Supplement (kg)**	**Weight After Supplement (kg)**
1	75	71.5
2	82.5	78
3	68	64
4	74	71
5	80	76.5
6	85	81
7	70.5	67
8	77	73
9	72	68.5
10	78	74

(i) Does supplementation reduce weight in adult women? (15)

(ii) What are the assumptions underlying the use of the statistical test you performed in (i) above? (3)

Question 8 **[20]**

A study was conducted to examine the relationship between the amount of fertilizer applied and the crop yield. 10 plots of the same size, in the same agro-ecological zone were planted with maize of the same variate. Different amounts of fertiliser were applied and the yield (ton/ha) was recorded at the end of the experiment. The results are shown in the table 4 below.

Table 4: The amount of fertiliser applied and crop yield for different fields

Field	Fertilizer Applied (kg/ha)	Crop Yield (tons/ha)
1	50	4.2
2	60	5.0
3	70	5.8
4	80	6.1
5	90	6.9
6	100	7.4
7	110	8.0
8	120	8.5
9	130	9.2
10	140	9.8

(a) State the response and the explanatory variable in the above experiment. (2)

(b) Calculate the correlation coefficient of the data and comment on the relationship between the amount of fertiliser applied and the crop yield. (5)

(c) Use the Least squares regression technique to find the regression equation Y against X (7)

(d) Interpret the regression coefficients estimated in (c). (2)

(e) Estimate the crop yield for fertiliser input of content of 105kg/ha (2)

(f) Calculate the coefficient of determination and interpret your findings (2)

Question 9 **[20]**

The 2023 national canine rabies vaccination coverage of Namibia is 75%. A veterinarian in Omusati Region sampled 550 (300 males and 250 females) dogs and found that 300 (125 males and 175 females) dogs were vaccinated against rabies.

(a) Construct the 95% confidence interval for the proportion of female dogs vaccinated in Omusati Region (5)

(b) Is there any significant difference between the proportion of male and female dogs vaccinated in Omusati Region? Test at 5% level of significance (13)

(c) The 95% confidence interval of rabies vaccination in Oshana Region is 50.4% to 58.7%. Do you think the sample comes from a population with a 75% vaccination coverage? Justify your answer. (2)

END OF EXAMINATION!!!!