



**NAMIBIA UNIVERSITY**  
**OF SCIENCE AND TECHNOLOGY**

**Faculty of Health, Natural  
Resources and Applied  
Sciences**

**School of Natural and Applied  
Sciences**

**Department of Mathematics,  
Statistics and Actuarial Science**

13 Jackson Kaujeua Street  
Private Bag 13388  
Windhoek  
NAMIBIA

T: +264 61 207 2913  
E: msas@nust.na  
W: www.nust.na

**QUALIFICATION : BACHELOR of SCIENCE IN APPLIED MATHEMATICS AND STATISTICS &  
BACHELOR of SCIENCE**

**QUALIFICATION CODE: 07BSAM & 07BSOC**

**LEVEL: 5**

**COURSE: INTRODUCTION TO APPLIED STATISTICS**

**COURSE CODE: IAS501S**

**DATE: NOVEMBER 2024**

**SESSION: 1**

**DURATION: 3 HOURS**

**MARKS: 100**

### **FIRST OPPORTUNITY: EXAMINATION QUESTION PAPER**

**EXAMINER: MR. ANDREW ROUX**

**MODERATOR: DR. DISMAS NTIRAMPEBA**

### **INSTRUCTIONS**

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

### **PERMISSIBLE MATERIALS :**

1. Non-Programmable Calculator

### **ATTACHEMENTS**

1. Statistical Formulae Sheet
2. Standard Normal Probability Distribution Table
3. 1 x A4 Graph Sheet

**This paper consists of 7 pages including this front page**

**QUESTION 1 [10 x 2 = 20]**

**Write down the letter corresponding to your choice next to the question number**

- 1.1) Which of the following methods are used in analysing categorical (qualitative) data (2)
- A. Bar charts, pie charts and Histogram
  - B. Bar charts, pie charts and frequency tables
  - C. Mean, median and mode
  - D. Variance, standard deviation and coefficient of variation
  - E. None of the above
- 1.2) In a positively skewed distribution, the mean is (2)
- A. below the median
  - B. above the median
  - C. equal to the median
  - D. below the mode
  - E. none of the above
- 1.3) Which of the following are measures of dispersion (spread) (2)
- A. Range, Variance and Standard deviation
  - B. Range, mean, median and mode
  - C. Mean, median and mode
  - D. Quartile, Decile and percentile
  - E. Mean, median and percentile
- 1.4) Censuses are rarely done as compared to sample surveys because: (2)
- A. Sample surveys can be done in a short time as compared to censuses
  - B. Sample surveys are cheap to implement as compared to censuses
  - C. Sample surveys are easy to implement as compared to censuses
  - D. All of the above

- 1.5) Fill in the blank to make the following sentence true: "The -----of a particular outcome is the number of times it occurs within a specific sample of a population ." (2)
- A. Frequency                      B. Variance  
C. Mean deviation                D. Distribution  
E. Mean
- 1.6) A Sample of a population is: (2)
- A. A subset of the population  
B. An experiment in the population  
C. An outcome of the population  
D. A variable in the population  
E. All of the above
- 1.7) Height is a \_\_\_\_\_ measurement scale variable (2)
- A. Ordinal                              B. Interval                              C. Ratio  
D. Nominal                              E. None of the above
- 1.8) Consider the shoes size of 12 students at NUST: (2)
- 4, 6, 12, 7, 9, 7, 8, 11, 8, 8, 11, 5
- Which of the following answers is incorrect?
- A. This is a bimodal distribution  
B. The range of this data values is 8.  
C. The modal shoes size is 8.  
D. The lowest value of this data values is 4.  
E. The median of this data values is 8.
- 1.9) Which of the following statements is not true about the mean? (2)
- A. The value of the mean times the number of observations equals the sum of the of all observations  
B. It utilizes all values in its calculation  
C. It is not affected by extreme values (outliers)  
D. It is the best measure of central tendency when the data is not skewed  
E. In a symmetric distribution, the mean, the median and the mode are all equal

- 1.10) A list of 5 pulse rates is: 70, 64, 80, 74, 92. What is the median for this list? (2)
- A. 74              B. 76              C. 77              D. 80              E. None of the provided

**QUESTION 2 [28]**

- 2.1) A variable is normally distributed with mean 6 and standard deviation 2. Find the probability that the variable will

2.1.1) lie between 1 and 7 (inclusive). (4)

2.1.2) at least 5. (4)

2.1.3) at most 4 (4)

- 2.2) The Namibia Cycling Federation has revealed that only 12 out of every 20 cyclist successfully finish the Desert Dash. Based upon this assumption, determine the probability that out of a random sample of 5 cyclists

2.2.1) None of them will successfully finish the Desert Dash (3)

2.2.2) All of them will successfully finish the Desert Dash (3)

2.2.3) At least one of them will successfully finish the Desert Dash (5)

2.2.4) At most one of them will successfully finish the Desert Dash (5)

**QUESTION 3 [15]**

Below are prices of toothpaste, shampoo, cough tablets, and antiperspirant for August 2020 and August 2023. Also included are quantities purchased.

Item	August 2020		August 2023	
	Price	Quantity	Price	Quantity
Toothpaste	2.49	6	2.69	6
Shampoo	3.29	4	3.59	5
Cough tablets	1.59	2	1.79	3
Antiperspirant	1.79	3	2.29	4

- 3.1) Use 2020 as the base period to compute and interpret the simple price index in 2023 for



- 3.1.1 toothpaste (2)
- 3.1.2 shampoo (2)
- 3.2) Construct a price index to reflect the overall change in prices of the items purchased for the period 2020 – 2023. Use the Laspeyres approach. Interpret your price index. (6)
- 3.3) Calculate and interpret the unweighted aggregate price index for 2023 on 2020 as base year. (5)

#### **QUESTION 4** [15]

The table below shows the annual rainfall (x 100 mm) recorded during the last decade at the Goabeb Research Station in the Namib Desert

Year	Rainfall
2014	3.0
2015	4.2
2016	4.8
2017	3.7
2018	3.4
2019	4.3
2020	5.6
2021	4.4
2022	3.8
2023	4.1

- 4.1 Construct a scatter plot (4)
- 4.2 Determine the least squares trend line equation, using the sequential coding method with 2014 = 1. (7)
- 4.3 Use the trend line equation obtained in 4.2 to find rainfall for 2012 and 2027 (4)

**QUESTION 5 [22]**

A small lab testing blood samples for multiple comorbidities has kept a record of samples tested for March and June 2022. The samples are summarized in the following frequency distribution:

Samples	Number of days
60-<70	5
70-<80	11
80-<90	22
90-<100	13
100-<110	7
110-<120	3

5.1) Calculate the mean, median and modal number of samples tested between March and June (5 + 5 + 5)

5.2) Calculate standard deviation in the number of samples tested between March and June (7)

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

END OF EXAMINATION

XXXXXXXXXXXXXXXXXXXX

# FORMULAE SHEET

$$\text{Mean } \bar{x} = \frac{\sum xf}{n} ; \text{ Mode} = L + \frac{c(f_m - f_{m-1})}{2 \times f_m - f_{m-1} - f_{m+1}} ; \text{ Median} = L + \frac{c(0.5n - CF)}{f_{me}}$$

$$\beta = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2} ; \quad \alpha = \frac{\sum y - \beta(\sum x)}{n}$$

$$Ip(L) = \frac{\sum P_i \times Q_b}{\sum P_b \times Q_b} \times 100 ; \quad Ip(P) = \frac{\sum P_i \times Q_i}{\sum P_b \times Q_i} \times 100 ;$$

$$Ip = \frac{\sum p_1}{\sum p_0} \times 100\%$$

$$Var(x) = \frac{\sum X^2 - n(\bar{x})^2}{n-1} ; \text{ Std Dev, } s = \sqrt{Var(x)} ;$$

$$CV = \frac{\text{Std Dev}}{\bar{x}} \times 100 ;$$



## Z - Table

The table shows cumulative probabilities for the standard normal curve.

**Cumulative probabilities for NEGATIVE z-values are shown first. SCROLL DOWN to the 2<sup>nd</sup> page for POSITIVE z**

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641



**Cumulative probabilities for POSITIVE z-values are shown below.**

[illegible]