



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
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DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY: EXAMINATION QUESTION PAPER

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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 4 pages including this front page

QUESTION ONE [15]

The Ministry of Education summarized the mathematics grades of ten thousand Grade 12 learners. The result was to categorize into the following categories *A*, *B*, *C*, *D* and *E* respectively. The following table shows data on mathematics results for a sample of 50 Grade 12 learners.

<i>A</i>	<i>C</i>	<i>E</i>	<i>B</i>	<i>D</i>	<i>C</i>	<i>D</i>	<i>B</i>	<i>D</i>	<i>C</i>
<i>D</i>	<i>B</i>	<i>D</i>	<i>E</i>	<i>C</i>	<i>A</i>	<i>D</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>D</i>	<i>C</i>	<i>A</i>	<i>B</i>	<i>D</i>	<i>C</i>	<i>B</i>	<i>E</i>	<i>C</i>	<i>D</i>
<i>B</i>	<i>C</i>	<i>D</i>	<i>C</i>	<i>D</i>	<i>C</i>	<i>E</i>	<i>A</i>	<i>D</i>	<i>C</i>
<i>C</i>	<i>B</i>	<i>D</i>	<i>D</i>	<i>B</i>	<i>D</i>	<i>C</i>	<i>E</i>	<i>B</i>	<i>A</i>

- 1.1) Construct the frequency distribution for the set of qualitative data in the table. (8)
- 1.2) Construct the relative frequency distribution for the data set. (2)
- 1.3) Construct the bar chart for the absolute frequency distribution for the data set. (5)

QUESTION TWO [25]

The data below shows scores in BBS611C for a random sample of 7 students in a class test.

86, 72, 23, 56, 62, 94, 48

Use the data provided to find the following:

2.1 The average score

- a) 64 b) 62 c) 100 d) none of the provided (2)

2.2 The modal scores

- a) 86 b) no mode c) 23 d) none of the provided (2)

2.3 The median scores

- a) 72 b) 62 c) no median d) none of the provided (3)

2.4 The range of the scores

- a) 72 b) 73 c) 38 d) none of the provided (2)

- 2.5 The first quartile of the scores
 a) 62 b) 48 c) 71 d) none of the provided (3)
- 2.6 The third quartile of the scores
 a) 88 b) 94 c) 62 d) none of the provided (3)
- 2.7 The inter-quartile range for the scores
 a) 0 b)38 c)17 d) none of the provided (2)
- 2.8) The variance for the scores
 a) 23.9 b) 15.25 c) 574.3 d) none of the provided (3)
- 2.9) The Standard Deviation in scores
 a) 25.75 b) 22.25 c) 125.50 d) none of the provided (2)
- 2.10) The Coefficient of Variation
 a) 40.5 b) 38.0 c) 35.5 d) none of the provided (3)

QUESTION THREE [15]

A popular retail store receives, on average 6 calls per day.

What is the probability that on any given day:

- 3.1) No calls will be received (3)
- 3.2) At most two calls will be received (6)
- 3.3) At least four calls will be received (6)

QUESTION FOUR [20]

The travelling speed for cars within townland areas 'normally distributed with a mean speed of 70 km/h and a standard deviation of 8 km/h. What is the probability that a car travelling within townland areas will drive at a speed of:-

- 4.1) 74.9 km/h (inclusive) and faster. (5)
- 4.2) 64.1 km/h (inclusive) and slower (5)
- 4.3) Between 59.7 km/h and 82.3 km/h (both inclusive) (5)

- 4.4) What is the probability that nine cars travelling within townland areas will drive at an average of 66.4 km/h (inclusive) and slower (5)

QUESTION FIVE [15]

Consider a random variable with the following distribution and find the following probabilities.

x	2	4	6	8
P(x)	0.2	0.3	0.4	0.1

- 5.1) $P(x > 6)$ (1)
 5.2). $P(X = 8)$ (1)
 5.3) $P(2 \leq X \leq 6)$ (1)
 5.4) Find Mean or Mathematical Expectation (4)
 5.5) Variance, $\text{Var}(x)$ (6)
 5.6) and the standard deviation for the random variable. (2)

QUESTION SIX [10]

Given the following prices and quantities, use the data provided to compute and interpret:

	Price (per kg)			Quantities produced		
	2012	2017	2022	2012	2017	2022
Sugar	3.95	3.89	4.13	675	717	436
Coffee	61.50	62.20	59.70	117	115	115
Tee	34.80	35.40	38.90	77	74	82

- 6.1) Compute and interpret the Laspeyres price index number for the year 2022 with as 2012 base. [5]
 6.2) Compute and interpret the Paasche's price index number for the year 2022 with 2017 as base. [5]

XX

Statistical Formulae Sheet

$$\bar{x} = \frac{\sum x}{\sum f} \quad ; \quad \text{Median} = L + \frac{h(\text{MedVal} - F)}{f_m} \quad ; \quad \text{Mode} = L + \left(\frac{\Delta_1}{\Delta_1 + \Delta_2} \right) c$$

$$S^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}$$

$$P(X) = {}^n C_x p^x (1-p)^{n-x}, \text{ where } X = 0, 1, 2, \dots, n$$

$$P(x/u) = \frac{u^x}{x!} e^{-u}$$

$$Y' = bx + a$$

$$b = \frac{n \sum xy - \sum x \sum y}{n \sum x^2 - (\sum x)^2} \quad \& \quad a = \frac{\sum y - b \sum x}{n}$$

$$E(X) = \sum p(x_i) \cdot x_i \quad \& \quad \text{Var}(x) = \sum p(x) x^2 - u^2$$

$$I_p(L) = \frac{\sum P_i \times Q_b}{\sum P_b \times Q_b} \times 100 \quad \& \quad I_q(L) = \frac{\sum Q_i \times P_b}{\sum Q_b \times P_b} \times 100$$

$$I_p(P) = \frac{\sum P_i \times Q_i}{\sum P_b \times Q_i} \times 100 \quad \& \quad I_q(P) = \frac{\sum Q_i \times P_i}{\sum Q_b \times P_i} \times 100$$

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 2nd 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

