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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: **JANUARY 2024**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

SECOND OPPORTUNITY / SUPPLEMENTARY: 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 4 pages including this front page

QUESTION 1 [20]

1.1 Which of the following measures of central tendency can reliably be used when dataset has outliers?

a) Mean b) Median c) Mode d) All the above [2]

1.2 A sample is

a) An experiment in the population b) A subset of the population

c) A variable in the population d) An outcome of the population [2]

1.3 A parameter refers to

a) Calculation made from the population b) A measurement that is made from the population

c) A value observed in the experiment d) All of the above [2]

1.4 Weight is a _________ variable

a) Continuous b) Discrete c) Ordinal d) Interval [2]

1.5 Researchers do sampling because of all of the following reasons except

a) Reduce cost b) Can be done in a shorter time frame

c) Sampling is interesting d) Easy to manage due to logistics requirements [2]

1.6 Rating the quality of our magazine (excellent, good, fair or poor) is a _________ variable

a) Qualitative b) Quantitative c) Ordinal d) Interval [2]

1.7 Which of the following is NOT a possible probability

a) $\frac{65}{100}$ b) 1.16 c) 0 d) All of the provided [2]

1.8 A student is chosen at random from a class of 28 girls and 12 boys. What is the probability that the student is **NOT** a boy?

a) $\frac{3}{10}$ b) $\frac{28}{12}$ c) 0 d) $\frac{7}{10}$ [2]

1.9 On a multiple choice test, each question has 4 possible answers. If you make a random guess on the first question, what is the probability that you are correct?

a) 4 b) 0 c) 0.25 d) 1 [2]

1.10 A 6-sided die is rolled. What is the probability of rolling a 3 or a 6 ?

a) ½ b) 1/6 c) 1/3 d) 0.25 [2]

QUESTION 2 [20]

A sample of 10 time periods (in days) that elapsed between the taking and delivery of an order at a company:

75	97	71	65	84	65	84	27	43	50

For the distribution above, calculate the:

2.1) Range (2)
2.2) Mode (2)
2.3) Median (3)
2.4) Arithmetic mean (3)
2.5) Variance (5)
2.6) Standard deviation (2)
2.7) Coefficient of variation (3)

QUESTION 3 [30]

3.1) A recent survey indicates that 90% of university lecturers run a private business in their spare time. Thus, in a random sample of 25 university lecturers, what is the probability that:

3.1.1) Exactly 20 of them run a private business in their spare time (5)
3.1.2) At least twenty of them run a private business in their spare time. (5)
3.1.3) At most twenty four of them run a private business in their spare time (5)

3.2 Shoprite / Checkers estimates that its maximum daily demand for electricity during the coming few weeks can be approximated by a normal distribution with a mean of 100kW and a standard deviation of 10 kW.

3.2.1) Determine the probability that the maximum daily demand will be between 100 kW and 125 kW (inclusive) (5)

3.2.2) Determine the probability that the maximum daily demand will be between 94 kW and 108 kW (inclusive) (5)

3.2.3) Determine the probability that a given day's maximum demand will be exceed 87 kW (inclusive) (5)

QUESTION 4 [9]

A shop owner has compiled the following information on the prices and quantities of fruit sales from December 2012 to December 2022

ITEM	PRICE 2012	PRICE 2022		QUANTITY 2012	QUANTITY 2022
Apple	1.85	3.75		75	110
Orange	1.50	2.25		140	260
Avocado	3.40	5.40		250	335

Using December 2012 as the base period, determine and interpret the simple price indexes for these three items in December 2022. [3 X 3 = 9]

QUESTION 5 [21]

The asset turnovers, excluding cash and short-term investments, for the Konkiep Cash Loans from 2012 to 2022 are listed below (in $mil):

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
3.33	3.84	3.51	3.30	3.18	3.42	3.37	3.99	4.14	4.50	4.95

5.1 Plot the time series data. (6)

5.2 Determine the least squares trend line equation, using the sequential coding method with x = 1 in 2012. (9)

5.3 Use the trend line equation to estimate turnovers for 2010 and 2026 (6)

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Statistical Formulae Sheet

$\bar{x} = \frac{\sum x}{\sum f}$. ; Median = L + $\frac{h(MedVal - F)}{f_m}$; Mode= L+ ($\frac{\blacktriangle_1}{\blacktriangle_1 + \blacktriangle_2}$)c

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

$P(X) = {}^nC_x p^x (1-p)^{n-x}, where\ X = 0,1,2,......,n$

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

$Y' = bx + a$

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

E(X) = $\sum p(x_i) \bullet x_i$ & Var(x) = $\sum p(x)\, x^2 - u^2$

$Ip(L) = \frac{\sum P_i \times Q_b}{\sum P_b \times Q_b} \times 100$ & $Iq(L) = \frac{\sum Q_i \times P_b}{\sum Q_b \times P_b} \times 100$

$Ip(P) = \frac{\sum P_i \times Q_i}{\sum P_b \times Q_i} \times 100$ & $Iq(P) = \frac{\sum Q_i \times P_i}{\sum Q_b \times P_i} \times 100$

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

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

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998