



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

Faculty of Health, Natural Resources and Applied Sciences

Department of Mathematics and Statistics

QUALIFICATIONS: B. Business Admin, B. Marketing, B. Human Resource Management, B. Public Management and B. Logistics and Supply Chain Management	
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COURSE: BASIC BUSINESS STATISTICS 1B	COURSE CODE: BBS112S
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DURATION: 3 HOURS	MARKS: 100

SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	MR E. MWAHI, MR S. KASHIHALWA, MR I. NDADI MS. Y NKALLE, MR A. ROUX, MS L. KHOA, MS A. SAKARIA
MODERATOR:	MR J. SWARTZ

THIS QUESTION PAPER CONSISTS OF 5 PAGES

(Including this front page)

INSTRUCTIONS

1. Answer all the questions and number your solutions correctly.
2. **Question 1** of this question paper entails multiple choice questions with options A to D. Write down the letter corresponding to the best option for each question.
3. For **Question 2, 3 & 4** you are required to show clearly all the steps used in the calculations.
4. All written work **MUST** be done in blue or black ink.
5. Untidy/ illegible work will attract no marks.

PERMISSIBLE MATERIALS

1. Non-Programmable Calculator without the cover

ATTACHMENTS

1. Standard normal Z-table and the Chi-square table.

QUESTION 1 [20 MARKS]

Write down the letter corresponding to the best answer for each question.

- 1.1 When the population is divided into mutually exclusive sets, and then a simple random sample is drawn from each set, this is called: [2]
- A. Simple random sampling.
 - B. Stratified random sampling.
 - C. Cluster random sampling.
 - D. Systematic random sampling.
- 1.2 A marketing research firm divides the population of a state into geographic areas, and randomly selects some of the areas and takes a simple random sample of each selected area. This is an example of a [2]
- A. Cluster random sample
 - B. Systematic random sample
 - C. Simple random sample
 - D. Stratified random sample.
- 1.3 Laspeyres index formula uses the weights of the..... [2]
- A. Base period.
 - B. Current year.
 - C. Average of the weights of a number of years.
 - D. None of the above.
- 1.4 A manufacturer of contact lenses is studying the curvature of the lenses it sells. In particular, the last 500 lenses sold had an average curvature of 0.5. The population is [2]
- A. The 500 lenses.
 - B. 0.5.
 - C. The lenses sold today.
 - D. All the lenses sold by the manufacturer.

- 1.5 A political scientist is studying voters in California. It is appropriate for him to use a mean to describe: [2]
 A. The age of a typical voter.
 B. The party affiliation of a typical voter.
 C. The sex of a typical voter.
 D. The county of residence of a typical voter.
- 1.6 A researcher is studying students in college in California. She takes a sample of 400 students from 10 colleges. The average age of all college students in California is? [2]
 A. A statistic. B. A parameter.
 C. The median. D. A population.
- 1.7 The standard deviation of a normal population is 10. You take a sample of 25 items from this population and compute a 95% confidence interval. In order to compute the confidence interval, you will use : [2]
 A. The t table because the degrees of freedom will be 24.
 B. The t table because the sample standard deviation is known.
 C. The z table because the population standard deviation is known.
 D. The z table because the sample size is small.
- 1.8 If in a random sample of 400 items, 88 are found to be defective. If the null hypothesis is that 20% of the items in the population are defective, what is the value of the test statistic? [2]
 A. 0.02 B. 1
 C. 0.9656 D. 1.03
- 1.9 A 92% confidence interval for population proportion is 32.4% to 47.6%, the value of sample proportion is: [2]
 A. 40% B. 32.4%
 C. 47.6% D. 80%
- 1.10 In a simple random survey of 89 teachers of high school AP Statistics, 73 said that it was the most satisfying, most enjoyable course they had ever taught. Establish a 98% confidence interval estimate of the proportion of all high school AP Statistics teachers who feel this way. [2]
 A. 0.820 ± 0.004 B. 0.820 ± 0.041
 C. 0.820 ± 0.084 D. 0.820 ± 0.095

QUESTION 2 [29 MARKS]

- 2.1 Suppose you would like to estimate the mean teacher's salary in Khomas region , with 99% confidence, to an accuracy within N\$2000. You are told that the population standard deviation of teachers' salaries in Khomas is known to be N\$6000. Find the necessary sample size you will need for this study. [3]
- 2.2 Suppose scores on exams in statistics are normally distributed with an unknown population mean and a population standard deviation of 3 points. A random sample of 36 scores is taken and gives a sample mean score of 68 points. Find a 90% confidence interval estimate for the population mean exam score. [5]
- 2.3 Suppose a baker claims that his bread height is more than 15 cm, on the average. Several of his customers do not believe him. To persuade his customers that he is right, the baker decides to do a hypothesis test. He baked 10 loaves of bread. The mean height of the sample loaves is 17 cm. The baker knows from baking hundreds of loaves of bread that the standard deviation for the height is 0.5 cm and the distribution of heights is normal. Help the baker do his hypothesis at 1% level of significance. [8]
- 2.4 With individual lines at its various windows, a post-office is interested in the standard deviation for normally distributed waiting times for customers on Friday. The post-office experiments with a single main waiting line and find that for a random sample of 25 customers, the waiting times for customers have a variance of 12.25 minutes.
- 2.4.1 With a significance level of 5%, construct a confidence interval estimate for the variance waiting times of all customers at this post-office on a Friday. [6]
- 2.4.2 Assuming that the estimated population variance at this post-office is 51.84 minutes, is there evidence at 1% level of significance to conclude that a single main waiting line causes lower variation among waiting times for customers? [7]

QUESTION 3 [32 MARKS]

3.1 A sample of 870 NUST students was asked for their preferences of one of the three ice-cream flavours (chocolate, vanilla and strawberry). The results are summarised in the contingency table below:

Gender	Flavour		
	Chocolate	Vanilla	Strawberry
Men	100	120	60
Women	300	200	90

At 5% level of significance, is there evidence to conclude that gender influences ice-cream flavour preference? [12]

3.2 The data on the table below shows the yield of maize per hectare in 100kg bags at Etunda irrigation project in Omusati region over the period 2003-2013.

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Yield (100 kg)	24	19	36	32	26	34	26	26	29	38	30

3.2.1 Compute a 4-period centred moving average trend for the time series. [7]

3.2.2 Compute the straight line trend equation ($Y = a + bX$) by the method of least squares using the sequential coding method, start the coding from 1 ($x=1$ for 2003). [10]

3.2.3 Estimate the yield of maize per hectare in 100kg bags for the year 2017. [3]

QUESTIONSTION 4 [19 MARKS]

In Oshakati town the monthly food expenses of a typical family between the year 2000 and the year 2004 were as following:

Product	Measurement	2000		2004	
		Quantity	Price (N\$)	Quantity	Price (N\$)
Bread	kg	18	94	25	110
Milk	litre	32	86	44	130
Salami	dkg	300	74	380	81

Using the year 2000 as the base period, answer the following questions:

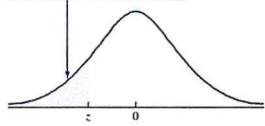
(a) Find the simple aggregate quantity index and interpret your results. [5]

(b) Calculate the Laspeyres price index and interpret your results. [7]

(c) Calculate the Paasche quantity index and interpret your results. [7]

=====END OF EXAMINATION=====

e.g., for $z = 1.34$, refer to the 1.3 row and the 0.04 column to find the cumulative area, 0.9091.

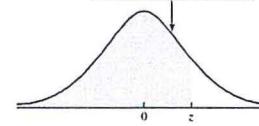


The Standard Normal Distribution

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Source: Cumulative standard normal probabilities generated by Minitab, then rounded to four decimal places.

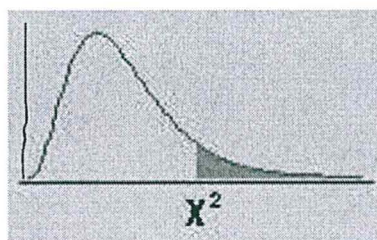
e.g., for $z = 1.34$, refer to the 1.3 row and the 0.04 column to find the cumulative area, 0.9099.



The Standard Normal Distribution

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990

APPENDIX E: The Chi-Square Distribution



df\p	.995	.990	.975	.950	.900	.750	.500	.250	.100	.050	.025	.010	.005
1	0.00004	0.00016	0.00098	0.00393	0.01579	0.10153	0.45494	1.32330	2.70554	3.84146	5.02389	6.63490	7.87944
2	0.01003	0.02010	0.05064	0.10259	0.21072	0.57536	1.38629	2.77259	4.60517	5.99146	7.37776	9.21034	10.59663
3	0.07172	0.11483	0.21580	0.35185	0.58437	1.21253	2.36597	4.10834	6.25139	7.81473	9.34840	11.34487	12.83816
4	0.20699	0.29711	0.48442	0.71072	1.06362	1.92256	3.35669	5.38527	7.77944	9.48773	11.14329	13.27670	14.86026
5	0.41174	0.55430	0.83121	1.14548	1.61031	2.67460	4.35146	6.62568	9.23636	11.07050	12.83250	15.08627	16.74960
6	0.67573	0.87209	1.23734	1.63538	2.20413	3.45460	5.34812	7.84080	10.64464	12.59159	14.44938	16.81189	18.54758
7	0.98926	1.23904	1.68987	2.16735	2.83311	4.25485	6.34581	9.03715	12.01704	14.06714	16.01276	18.47531	20.27774
8	1.34441	1.64650	2.17973	2.73264	3.48954	5.07064	7.34412	10.21885	13.36157	15.50731	17.53455	20.09024	21.95495
9	1.73493	2.08790	2.70039	3.32511	4.16816	5.89883	8.34283	11.38875	14.68366	16.91898	19.02277	21.66599	23.58935
10	2.15586	2.55821	3.24697	3.94030	4.86518	6.73720	9.34182	12.54886	15.98718	18.30704	20.48318	23.20925	25.18818
11	2.60322	3.05348	3.81575	4.57481	5.57778	7.58414	10.34100	13.70069	17.27501	19.67514	21.92005	24.72497	26.75685
12	3.07382	3.57057	4.40379	5.22603	6.30380	8.43842	11.34032	14.84540	18.54935	21.02607	23.33666	26.21697	28.29952
13	3.56503	4.10692	5.00875	5.89186	7.04150	9.29907	12.33976	15.98391	19.81193	22.36203	24.73560	27.68825	29.81947
14	4.07467	4.66043	5.62873	6.57063	7.78953	10.16531	13.33927	17.11693	21.06414	23.68479	26.11895	29.14124	31.31935
15	4.60092	5.22935	6.26214	7.26094	8.54676	11.03654	14.33886	18.24509	22.30713	24.99579	27.48839	30.57791	32.80132
16	5.14221	5.81221	6.90766	7.96165	9.31224	11.91222	15.33850	19.36886	23.54183	26.29623	28.84535	31.99993	34.26719
17	5.69722	6.40776	7.56419	8.67176	10.08519	12.79193	16.33818	20.48868	24.76904	27.58711	30.19101	33.40866	35.71847
18	6.26480	7.01491	8.23075	9.39046	10.86494	13.67529	17.33790	21.60489	25.98942	28.86930	31.52638	34.80531	37.15645
19	6.84397	7.63273	8.90652	10.11701	11.65091	14.56200	18.33765	22.71781	27.20357	30.14353	32.85233	36.19087	38.58226
20	7.43384	8.26040	9.59078	10.85081	12.44261	15.45177	19.33743	23.82769	28.41198	31.41043	34.16961	37.56623	39.99685
21	8.03365	8.89720	10.28290	11.59131	13.23960	16.34438	20.33723	24.93478	29.61509	32.67057	35.47888	38.93217	41.40106
22	8.64272	9.54249	10.98232	12.33801	14.04149	17.23962	21.33704	26.03927	30.81328	33.92444	36.78071	40.28936	42.79565
23	9.26042	10.19572	11.68855	13.09051	14.84796	18.13730	22.33688	27.14134	32.00690	35.17246	38.07563	41.63840	44.18128
24	9.88623	10.85636	12.40115	13.84843	15.65868	19.03725	23.33673	28.24115	33.19624	36.41503	39.36408	42.97982	45.55851
25	10.51965	11.52398	13.11972	14.61141	16.47341	19.93934	24.33659	29.33885	34.38159	37.65248	40.64647	44.31410	46.92789
26	11.16024	12.19815	13.84390	15.37916	17.29188	20.84343	25.33646	30.43457	35.56317	38.88514	41.92317	45.64168	48.28988
27	11.80759	12.87850	14.57338	16.15140	18.11390	21.74940	26.33634	31.52841	36.74122	40.11327	43.19451	46.96294	49.64492
28	12.46134	13.56471	15.30786	16.92788	18.93924	22.65716	27.33623	32.62049	37.91592	41.33714	44.46079	48.27824	50.99338
29	13.12115	14.25645	16.04707	17.70837	19.76774	23.56659	28.33613	33.71091	39.08747	42.55697	45.72229	49.58788	52.33562
30	13.78672	14.95346	16.79077	18.49266	20.59923	24.47761	29.33603	34.79974	40.25602	43.77297	46.97924	50.89218	53.67196