



ZIMBABWE EZEKIEL GUTI UNIVERSITY

FACULTY OF LAW, BUSINESS INTELLIGENCE AND ECONOMICS

DEPARTMENT OF ECONOMICS, MARKETING AND ENTREPRENEURSHIP

EXAMINATION PAPER

COURSE CODE : MSTM511
COURSE TITLE : QUANTITATIVE MANAGEMENT
DURATION : 3 Hours
DATE : 28 JUL 2025

INSTRUCTIONS TO CANDIDATES:

1. No cell phones are allowed in the examination venue.
2. **Section A** is compulsory
3. Answer any **FOUR (3)** questions from **Section B**
4. Begin each question on a new page.
5. The number of marks for each question or part question is shown in brackets []

SECTION A: Case Study

QUESTION 1

Using documentary secondary data

Sasha was interested in how her work placement organisation dealt with complaints by customers. Her mentor within the organisation arranged for her to have access to the paper-based files containing customers' letters of complaint and the replies sent by the organisation's customer relations team (written documentary secondary data). Reading through the customer's letters, Sasha soon realised that many of these customers wrote to complain because they had not received a satisfactory response when they had complained earlier by telephone. She therefore asked her mentor if records were kept of complaints made by customers by telephone.

Her mentor said that summary details of all telephone conversations by the customer relations team, including complaints, were kept in their database (written documentary secondary data) and offered to find out precisely what data were held. Her mentor was, however, doubtful as to whether these data would be as detailed as the customers' letters. On receiving details of the data held in the customer relations database, Sasha realised that the next stage would be to match the complaints data from the paper-based files with telephone complaints data. The latter, she hoped, would enable her to obtain a complete list of all complaints and set the written complaints in context of all complaints received by the organisation.

QUESTIONS

- a) Evaluate Sasha's attitude towards her work. (10 marks)
- b) Examine the significance of secondary data in solving the problems faced by Sasha's organization. (20 marks)
- c) Recommend the best procedures to be followed if Sasha is to achieve her goal/s. (10 marks)

(Total 40 marks)

SECTION B: Answer any (3) questions

Question 2

- a) The number of calls received by the head-office were summed daily for a month and tabulated as follows:

67	74	60	90	64	72	83	77	67	85
73	66	60	49	57	90	78	70	63	79
68	56	78	71	71	46	53	67	88	65

- i) Present the data above in a stem and leaf diagram. (5 marks)
ii) Compute the mean (3 marks)
iii) Compute the median (4 marks)
- b) Making use of examples distinguish between the following:
- i) Correlation and causation (2 marks)
ii) Parameter and statistic (2 marks)
iii) Discrete data and continuous data (2 marks)
iv) Dispersion measures and variability measures (2 marks)

Total marks [20]

Question 3

Secondary data pertaining the number of social media adverts posted on a given period (X) and the number of new customers received (Y) were extracted and tabulated as follows:

X	78	36	98	25	75	82	92	62	65	39
Y	84	51	91	69	68	62	86	58	35	49

- a) Compute the Pearson' product moment correlation coefficient and comment. (8 Marks)
b) Compute the Kendall's Tau Correlation coefficient and comment. (8 marks)
c) Compare the results of the two computations above and give an overall comment. (4 marks)

Total marks [20]

Question 4

- a) Making use of examples distinguish between qualitative data and quantitative data. (5 marks)
b) 'Sampling will eventually replace census practices.' Evaluate this [proposition in light of examples. (15 marks)

Total marks [20]

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STATISTICAL FORMULAE

Sample Variance: $s^2 = \frac{\sum(x-\bar{x})^2}{n-1}$

Sample Standard Deviation: $s = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}}$

Product moment correlation coefficient:

$$r_{xy} = \frac{n \sum xy - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

Spearman's rank order correlation coefficient: $r_{ho} = 1 - \frac{6 \sum d^2}{n(n^2-1)}$

Kendall Tau's correlation coefficient $r_k = \frac{C-D}{C+D}$ or $r_k = \frac{S}{\frac{n(n-1)}{2}}$

Chi-squared Test Statistic: $\chi^2 = \sum \frac{(O-E)^2}{E}$

Z-score: $Z = \frac{x-\bar{x}}{s}$

Standardisation: $Z = \frac{x-\mu}{\sigma}$ Where $Z \sim N(0,1)$

T-score: $T = 50 + 10\left(\frac{x-\bar{x}}{s}\right)$

Student t-test: $t = \frac{\sqrt{(n-1)} \cdot \sum d}{\sqrt{n \sum d^2 - (\sum d)^2}}$

Total Sum of Squares $TSS = \sum x_{ij}^2 - \frac{G^2}{N}$

Group Sum of Squares $GSS = \sum \frac{T^2}{n} - \frac{G^2}{N}$

Block Sum-of Squares $BSS = \sum \frac{B^2}{b} - \frac{G^2}{N}$

Residual Sum of Squares: One-way $RSS = TSS - GSS$

Residual Sum of Squares: Two-way $RSS = TSS - (GSS + BSS)$

Question 5

- a) The marketing department of a specific university argue arguing that the enrolment figures are not improving in the faculty of commerce. In order to expose the reality, the management team compiled and tabulated data for the four (4) preceding semesters as follows:

		<i>Semesters</i>			
		A	B	C	D
<i>Programmes</i>	Accounting	30	90	150	50
	HRM	20	100	200	40
	Marketing	22	90	180	30
	Procurement	40	70	190	20

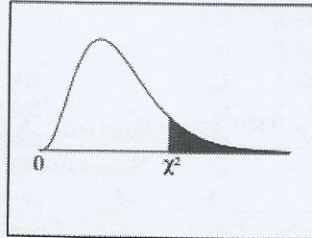
Basing on the data above, test at 5% level of significance if there is a significant difference in enrolment figures realised in the four preceding semesters. (15 marks)

- b) Making use of examples distinguish between probability sampling and non-probability sampling. (5 marks)

Total marks [20]

.....**END OF THE EXAMINATION**.....

Chi-Square Distribution Table



The shaded area is equal to α for $\chi^2 = \chi_{\alpha}^2$.

df	$\chi_{.995}^2$	$\chi_{.990}^2$	$\chi_{.975}^2$	$\chi_{.950}^2$	$\chi_{.900}^2$	$\chi_{.100}^2$	$\chi_{.050}^2$	$\chi_{.025}^2$	$\chi_{.010}^2$	$\chi_{.005}^2$
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

CRITICAL VALUES for the "F" Distribution, ALPHA = .05.

Denominator DF	Numerator DF									
	1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236

26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026