Strathmore
UNIVERSITY

STRATHMORE BUSINESS SCHOOL

BACHELOR OF SUPPLY CHAIN MANAGEMENT

END OF SEMESTER EXAMINATION

MAT 2103: STATISTICS FOR MANAGEMENT

DATE: 1st August 2024 Time: 2 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.

Question One

a) The following table shows the levels of retirement benefits given to a group of workers in a given establishment:

Retirement benefits (Sh."million")	Number of retirees
20 - 29	50
30 - 39	69
40 - 49	70
50 - 59	90
60 - 69	52
70 - 79	40
80 - 89	11

Required

i) Determine the semi-interquartile range for the above data **(5 marks)**

ii) Determine the minimum value for the top 10% and interpret the result **(4 marks)**

iii) Determine the maximum value for the lower 40% of the retirees and interpret the result **(5 marks)**

b) In a class of 100 students, 36 are male and studying accounting, 9 are male but not studying accounting, 42 are female and studying accounting, 13 are female and are not studying accounting. Calculate the probability that a student selected at random will be:

i) Male **(2 marks)**

ii) Female **(2 marks)**

iii) Female and studying accounting **(2 marks)**

iv) Studying accounting **(2 marks)**

v) Not studying accounting **(2 marks)**

vi) Male and studying accounting **(2 marks)**

vii) Male and not studying accounting **(2 marks)**

viii) Not studying accounting given that the student is female **(2 marks)**

(TOTAL: 30 MARKS)

Question Two

a) An insurance company takes a keen interest in the age at which a person is insured. Consequently a survey conducted on prospective clients indicated that for clients having the same age the probability that they will be alive in 30 years' time is $\frac{2}{3}$. This probability was established using the actuarial tables and it follows a binomial probability distribution. If a sample of 5 people was insured now, find the probability of having the following possible outcomes in 30 years:

i) All are alive **(2marks)**
ii) At least 3 are alive **(2marks)**
iii) At most one is alive **(2marks)**
iv) None is alive **(2marks)**
v) At least 1 is alive **(2marks)**

b) A market research agency takes a sample of 1,000 people and finds that 200 of them know of Brand X. After an advertising campaign a further sample of 1091 people is taken and it's found that 240 know of Brand X.
It is required to know if there has been an increase in the number of people having an awareness of Brand X at the 5% level of significance. **(10 marks)**

(TOTAL: 20 MARKS)

Question Three

(a) A trader at Gikomba market sells tomatoes at different prices (x shillings per kilogram). He calculates the average number of kilograms (y) sold per day at each of the six different prices. From the data the following are calculated.

$$\sum x = 200;\ \sum y = 436;\ \sum xy = 12515$$
$$\sum x^2 = 7250;\ \sum y^2 = 39237;\ n = 6$$

Calculate the value of Karl Pearson correlation and interpret the results. **(5 marks)**

(b) Explain the term ***residual*** as used in regression analysis **(2 marks)**

(c) The owner of Maumee Ford-Volvo wants to study the relationship between the age of a car and its selling price. Listed below is a random sample of 12 used cars sold at the dealership during the last year.

Car	Age (years)	Selling Price ("000")
1	9	8.1
2	7	6
3	11	3.6
4	12	4
5	8	5
6	7	10
7	8	7.6
8	11	8
9	10	8
10	12	6
11	6	8.6
12	6	8

i) Using the above data plot a scatter plot and state two key observations from the scatter plot? **(3 marks)**

ii) Develop the estimated regression equation by computing the values of β_0 and β_1 and write the estimated regression equation. **(5 marks)**

iii) Provide an interpretation for the y intercept (β_0) and slope (β_1) and of the estimated regression equation. **(2 marks)**

iv) Estimate the expected selling price of a car whose number of age is 15 years. **(3 marks)**

(TOTAL: 20 MARKS)

Question Four

a) The following data was obtained during a social survey conducted in a given urban area regarding the annual income of given families and the corresponding expenditures.

Family	(x)Annual income Sh. "000"	(y)Annual expenditure Sh. "000"
A	420	360
B	380	390
C	520	510
D	610	500
E	400	360
F	320	290
G	280	250
H	410	380
J	380	240
K	300	270
Total	4020	3550

Required:

i) Determine the regression equation **(7 marks)**

ii) Calculate the product moment correlation coefficient and the coefficient of determination. Briefly comment on the values obtained. **(5 marks)**

b) Discuss any four applications of statistics **(8 marks)**

(TOTAL: 20 MARKS)

Question Five

(a) Deposits of customers in a certain financial institution are found to be normally distributed. A sample of 200 bank account holders gave an average deposit of $ 2200 and a standard deviation of $ 120.

i) Construct 99 % confidence interval for the mean deposits **(5 marks)**

ii) Suppose the Board of directors for this financial institution wish to roll out executive banking services for its clients. Which of these two intervals is best to be used in making such a decision? Why? **(3 marks)**

(b) An independent t test was conducted using excel to investigate whether there is a significance difference between the performance of JAVA restaurant and Strathmore University cafeteria. The excel output of the independent t test is as show below:

Independent t-Test: Two-Sample Assuming Unequal Variances		
	Java	***SU cafeteria***
Mean	5.9278	5.8056
Variance	1.3809	1.2770
Observations	18	18
Hypothesized Mean Difference	0	
df = degrees of freedom (n1+n2 - 2= 18+18-2)	34	
t Stat	0.3181	
P(T<=t) one-tail	0.3762	
t Critical one-tail	1.6909	
P(T<=t) two-tail	0.7524	
t Critical two-tail	2.0322	

i) State and explain the Descriptive statistics **(3 marks)**

ii) State the null hypothesis for this situation. Write the null hypothesis in words AND statistical notation **(2 marks)**

iii) State the alternative hypothesis for this situation. Write the alternative hypothesis in words AND statistical notation. **(2 marks)**

iv) Use this information to decide whether you should reject the null hypothesis in this case. Show all workings. (Use alpha=0.05). **(3 marks)**

v) Draw a conclusion with respect to the problem. **(2 marks)**

(TOTAL: 20 MARKS)

Formulae:

Karl Pearson correlation coefficient, r:

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

Z-score, Z_C:

$$Z_C = \frac{(p_1 - p_2) - (\Pi_1 - \Pi_2)}{\sigma_{p1-p2}}$$

Where $\sigma_{P1-P2} = \sqrt{\frac{p1q1}{n1} + \frac{p2q2}{n2}}$

Regression analysis:

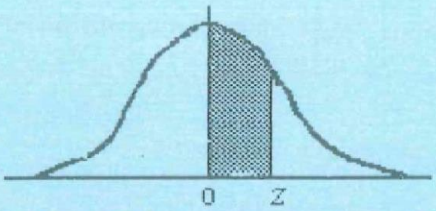
$$b = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2]}}$$

$$a = \frac{\sum y - b\sum x}{n}$$

Statistical Tables (Next Page)

NORMAL CURVE

AREAS
under the
STANDARD
NORMAL CURVE
from 0 to z



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.201	.2051	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

t Table

cum. prob	$t_{.50}$	$t_{.75}$	$t_{.80}$	$t_{.85}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$	$t_{.999}$	$t_{.9995}$
one-tail	0.50	0.25	0.20	0.15	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
two-tails	1.00	0.50	0.40	0.30	0.20	0.10	0.05	0.02	0.01	0.002	0.001
df											
1	0.000	1.000	1.376	1.963	3.078	6.314	12.71	31.82	63.66	318.31	636.62
2	0.000	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	0.000	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.000	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.000	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.000	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.000	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.000	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.000	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.000	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.000	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.000	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.000	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.000	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.000	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	0.000	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	0.000	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	0.000	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	0.000	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	0.000	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	0.000	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	0.000	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	0.000	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	0.000	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	0.000	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	0.000	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	0.000	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	0.000	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	0.000	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	0.000	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	0.000	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	0.000	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460
80	0.000	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416
100	0.000	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390
1000	0.000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581	3.098	3.300
z	0.000	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291
	0%	50%	60%	70%	80%	90%	95%	98%	99%	99.8%	99.9%
	Confidence Level										

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