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0002

THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF MANAGEMENT STUDIES DEGREE PROGRAMME – LEVEL 05
FINAL EXAMINATION – 2016
QUANTITATIVE TECHNIQUES FOR MANAGEMENT II – MCU 3209
DURATION THREE (03) HOURS

DATE: 18th June, 2016	TIME: 1.30 pm – 4.30pm

Answer any 5 questions.
Use of a non-programmable calculator is allowed.
This paper contains 5 pages and has 7 questions.

Question 1

a. Home loan applications are normally distributed with Rs.1,000,000 and a standard deviation of Rs 250,000 at the ABC Bank. The Bank policy requires that applications involving loan amounts greater than Rs. 1,500,000 should be submitted to a vice president. What is the percentage of loans to be submitted to this vice president? (6 marks)

b. Briefly explain the relationship between Poisson distribution and Normal distribution. (5 marks)

c. At a suburban medical service, the probability of an emergency call for assistance is identical at every instant of time, with the calls averaging four per eight hour shift. Use the Poisson distribution to find the probability of receiving more than three calls during an eight hour shift. (9 marks)

(Total 20 Marks)

Question 2

a. Explain how to calculate the expected number and the standard deviation of the Binomial distribution. (4 marks)

b. A recent issue of *Bride Magazine* suggested that couples planning their wedding should expect 65% of those who are invited to respond that they will attend. Sirimal and Shriyani are planning to be married later this year. They plan to send 197 invitations.

i. What is the distribution applies in this situation of responding to wedding invitations? (1 mark)

ii. How many guests would you expect to accept the invitation? (2 marks)

iii. What is the standard deviation of accepting the invitation? (2 marks)

iv. Using Normal approximation, determine is the probability that 140 or more will accept invitation? (5 marks)

c. An examination consists of 5 multiple choice questions, in each of which a candidate has to deduce which one of the four suggested answers is correct. A completely unprepared student may be assumed to guess each answer completely randomly. What is the probability that this student gets 3 or more answers correct (6 marks)

(Total 20 Marks)

Question 3

a. Using suitable illustrations, describe the following terms:

i. Simple Random Sampling (2 marks)
ii. Stratified Sampling (2 marks)
iii. Multistage Sampling (2 marks)
iv. Quota Sampling (2 marks)
v. Systematic Sampling (2 marks)

b. An inventor has developed a new, energy-efficient lawn mower engine. He claims that the engine will run continuously for at least 5 hours (300 minutes) on a single gallon of regular gasoline. Suppose a simple random sample of 50 engines is tested and found the engines run for an average of 295 minutes, with a standard deviation of 20 minutes.

i. Test the manufacturer's claim. Use a 0.05 level of significance.
ii. Develop the 95% confidence interval estimate for the mean.

(10 marks)

(Total 20 marks)

Question 4

a. Using suitable illustrations, briefly describe one tail test and two tail test of hypothesis testing. (6 marks)

b. Are all employees equally likely to have accidents? Are certain employees groups –say, younger employees are more prone to particular types of accidents? The effective implementation of hiring policies, training programs, and safety programs requires such knowledge. A study conducted to address these questions for a particular manufacturing company was published in Professional Safety recently. A portion of the result is summarized in the accompanying contingency table.

Test the association between the age and the type of accident at 5% significance level.

(14 marks)

		Kind of Accident		
		Sprain	**Burn**	**Cut**
AGE (years)	**Under 25**	9	17	5
	Over 25	61	13	12

(Total 20 marks)

Question 5

Ten sales people were surveyed and the average number of client contacts per month, and the corresponding sales volumes (in thousands) were recorded for each:

Contacts	12	14	16	20	23	46	50	48	50	55
Sales	15	25	30	30	30	80	90	95	110	130

a. Plot the data on a scatter diagram and interpret the relationship you can observe. (5 marks)

b. Calculate the correlation between contacts and sales. Interpret the correlation between the two factors? (6 marks)

c. Calculate the regression equation to predict sales using number of contacts. (4 marks)

d. If you know that there are 46 contacts per month in a given month, what amount of sales would you expect? Compare the result with the similar number of actual contacts in table. Explain the reasons for difference between the predicted value and the actual value. (5 marks)

(Total: 20 marks)

Question 6

a. The marketing manager of a company wants to find whether annual sales made by each sales manager can be predicted based on the years of education and years of experience. The SPSS outputs related to the regression analysis are provided below.

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.106E9	2	2.053E9	2136.648	.000[a]
	Residual	1.028E8	107	960862.469		
	Total	4.209E9	109			

a. Predictors: (Constant), Years of education, Years of experience

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-8510.838	586.586		-14.509	.000
	Years of experience	1874.500	31.239	.919	60.005	.000
	Years of education	609.391	38.237	.244	15.937	.000

a. Dependent Variable: Last year sales

Based on the above, the regression equation is:

Last year sales = - 8510.838 + 1874.5x (Experience) + 609.391x (Education)

i. The management of the company claims that the weekly sales increase with the years of experience. Is this statement correct? Justify your answer. (3 marks)

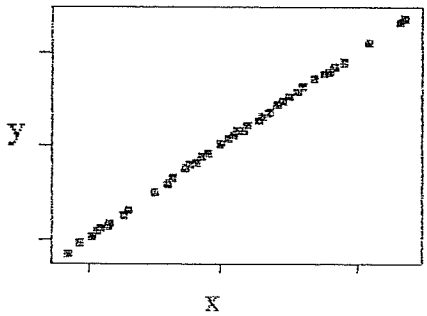
ii. Interpret the coefficient of the variable of 'years of education'. (Its strength and how it may affect the sales value) (3 marks)

iii. Estimate the weekly sales value if the years of education is 15 and years of experience is 3. (2 marks)

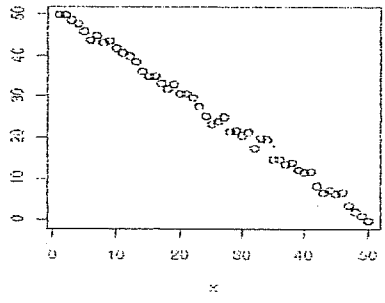
iv. Discuss the importance of correlation analysis and regression analysis. (4 marks)

b. Comment on the following scatter plots. (i.e. the relationship and its strength). (8 marks)

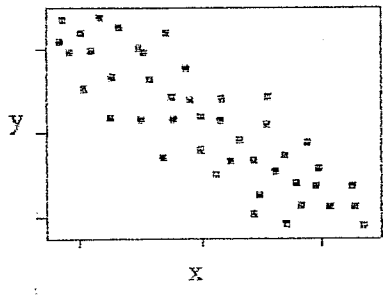
(i)



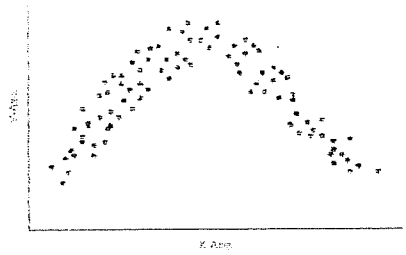
(ii)



(iii)



(iv)



(Total: 20 marks)

Question 7

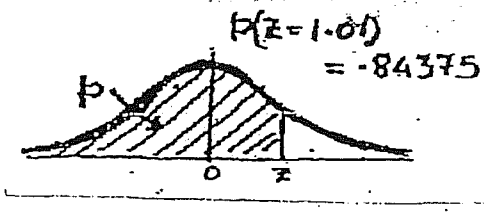
a. The quarterly earnings of a distribution company have been recorded for the period 2012 - 2015. These data (in millions of Rupees) are shown in the accompanying table.

Year	Quarter	Sales	Centered moving average (quarterly)
2012	1	102	
2012	2	100	
2012	3	104	103.38
2012	4	106	104.13
2013	1	105	104.88
2013	2	103	105.63
2013	3	107	106.50
2013	4	109	107.50
2014	1	109	108.38
2014	2	107	109.00
2014	3	110	109.63
2014	4	111	110.13
2015	1	112	110.25
2015	2	108	110.50
2015	3	110	
2015	4	113	

i. Find the seasonal index values using the moving averages. (5 marks)
ii. Calculate the trend line for the sales data. (6 marks)
iii. Find the forecasted sales for the four quarters of year 2016. (3 marks)

b. Using suitable illustrations, briefly explain the components of a time series data. (6 marks)

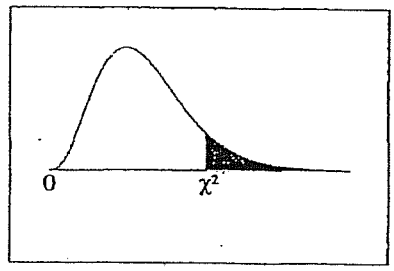
(Total: 20 marks)



STANDARD NORMAL DISTRIBUTION: Table Values Represent AREA to the LEFT of the Z score.

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99994	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99996	.99996	.99996	.99996	.99996	.99996	.99997	.99997

Chi-Square Distribution Table



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

df	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
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

Cumulative Binomial Probabilities

n	k	0.01	0.05	0.10	0.15	0.20	0.25	0.30	1/3	0.35	0.40	0.45	0.49	0.50
2	0	0.9801	0.9025	0.8100	0.7225	0.6400	0.5625	0.4900	0.4444	0.4225	0.3600	0.3025	0.2601	0.2500
	1	0.0198	0.0950	0.1800	0.2550	0.3200	0.3750	0.4200	0.4444	0.4550	0.4800	0.4950	0.4998	0.5000
	2	0.0001	0.0025	0.0100	0.0225	0.0400	0.0625	0.0900	0.1111	0.1225	0.1600	0.2025	0.2401	0.2500
3	0	0.9703	0.8574	0.7290	0.6141	0.5120	0.4219	0.3430	0.2963	0.2746	0.2160	0.1664	0.1326	0.1250
	1	0.0294	0.1354	0.2430	0.3251	0.3840	0.4219	0.4410	0.4444	0.4436	0.4320	0.4084	0.3823	0.3750
	2	0.0003	0.0071	0.0270	0.0574	0.0960	0.1406	0.1890	0.2222	0.2389	0.2880	0.3341	0.3674	0.3750
	3		0.0001	0.0010	0.0034	0.0080	0.0156	0.0270	0.0370	0.0429	0.0640	0.0911	0.1177	0.1250
4	0	0.9606	0.8145	0.6561	0.5220	0.4096	0.3164	0.2401	0.1975	0.1785	0.1296	0.0915	0.0677	0.0625
	1	0.0388	0.1715	0.2916	0.3685	0.4096	0.4219	0.4116	0.3951	0.3845	0.3456	0.2995	0.2600	0.2500
	2	0.0006	0.0135	0.0486	0.0975	0.1536	0.2109	0.2646	0.2963	0.3105	0.3456	0.3675	0.3747	0.3750
	3		0.0005	0.0036	0.0115	0.0256	0.0469	0.0756	0.0988	0.1115	0.1536	0.2005	0.2400	0.2500
	4			0.0001	0.0005	0.0016	0.0039	0.0081	0.0123	0.0150	0.0256	0.0410	0.0577	0.0625
5	0	0.9510	0.7738	0.5905	0.4437	0.3277	0.2373	0.1681	0.1317	0.1160	0.0778	0.0503	0.0345	0.0313
	1	0.0480	0.2036	0.3281	0.3915	0.4096	0.3955	0.3602	0.3292	0.3124	0.2592	0.2059	0.1657	0.1563
	2	0.0010	0.0214	0.0729	0.1382	0.2048	0.2637	0.3087	0.3292	0.3364	0.3456	0.3369	0.3185	0.3125
	3		0.0011	0.0081	0.0244	0.0512	0.0879	0.1323	0.1646	0.1812	0.2304	0.2757	0.3060	0.3125
	4			0.0004	0.0022	0.0064	0.0147	0.0284	0.0412	0.0488	0.0768	0.1128	0.1470	0.1563
	5				0.0001	0.0003	0.0010	0.0024	0.0041	0.0053	0.0102	0.0185	0.0282	0.0313
6	0	0.9415	0.7351	0.5315	0.3772	0.2622	0.1780	0.1177	0.0878	0.0754	0.0467	0.0277	0.0176	0.0156
	1	0.0571	0.2321	0.3543	0.3993	0.3932	0.3560	0.3025	0.2634	0.2437	0.1866	0.1359	0.1014	0.0938
	2	0.0014	0.0305	0.0984	0.1762	0.2458	0.2966	0.3241	0.3292	0.3280	0.3110	0.2780	0.2437	0.2344
	3		0.0021	0.0146	0.0415	0.0819	0.1318	0.1852	0.2195	0.2355	0.2765	0.3032	0.3121	0.3125
	4		0.0001	0.0012	0.0055	0.0154	0.0330	0.0595	0.0823	0.0951	0.1382	0.1861	0.2249	0.2344
	5			0.0001	0.0004	0.0015	0.0044	0.0102	0.0165	0.0205	0.0369	0.0609	0.0864	0.0938
	6					0.0001	0.0002	0.0007	0.0014	0.0018	0.0041	0.0083	0.0138	0.0156
7	0	0.9321	0.6983	0.4783	0.3206	0.2097	0.1335	0.0824	0.0585	0.0490	0.0280	0.0152	0.0090	0.0078
	1	0.0659	0.2573	0.3720	0.3960	0.3670	0.3115	0.2471	0.2049	0.1848	0.1306	0.0872	0.0604	0.0547
	2	0.0020	0.0406	0.1240	0.2097	0.2753	0.3115	0.3177	0.3073	0.2985	0.2613	0.2140	0.1740	0.1641
	3		0.0036	0.0230	0.0617	0.1147	0.1730	0.2269	0.2561	0.2679	0.2903	0.2918	0.2786	0.2734
	4		0.0002	0.0026	0.0109	0.0287	0.0577	0.0972	0.1280	0.1442	0.1935	0.2388	0.2676	0.2734
	5			0.0002	0.0012	0.0043	0.0115	0.0250	0.0384	0.0466	0.0774	0.1172	0.1543	0.1641
	6				0.0001	0.0004	0.0013	0.0036	0.0064	0.0084	0.0172	0.0320	0.0494	0.0547
	7						0.0001	0.0002	0.0005	0.0006	0.0016	0.0037	0.0068	0.0078
8	0	0.9227	0.6634	0.4305	0.2725	0.1678	0.1001	0.0577	0.0390	0.0319	0.0168	0.0084	0.0046	0.0039
	1	0.0746	0.2793	0.3826	0.3847	0.3355	0.2670	0.1977	0.1561	0.1373	0.0896	0.0548	0.0352	0.0313
	2	0.0026	0.0515	0.1488	0.2376	0.2936	0.3115	0.2965	0.2731	0.2587	0.2090	0.1570	0.1183	0.1094
	3	0.0001	0.0054	0.0331	0.0839	0.1468	0.2076	0.2541	0.2731	0.2786	0.2787	0.2568	0.2273	0.2188
	4		0.0004	0.0046	0.0185	0.0459	0.0865	0.1361	0.1707	0.1875	0.2322	0.2627	0.2730	0.2734
	5			0.0004	0.0026	0.0092	0.0231	0.0467	0.0683	0.0808	0.1239	0.1719	0.2098	0.2188
	6				0.0002	0.0011	0.0039	0.0100	0.0171	0.0217	0.0413	0.0703	0.1008	0.1094
	7					0.0001	0.0004	0.0012	0.0024	0.0033	0.0079	0.0164	0.0277	0.0313
	8							0.0001	0.0002	0.0002	0.0007	0.0017	0.0033	0.0039
n	k	0.01	0.05	0.10	0.15	0.20	0.25	0.30	1/3	0.35	0.40	0.45	0.49	0.50

e. n = 9

k	0.01	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.99
0	0.914	0.630	0.387	0.134	0.040	0.010	0.002	0.000	0.000	0.000	0.000	0.000	0.000
1	0.997	0.929	0.775	0.436	0.196	0.071	0.020	0.004	0.000	0.000	0.000	0.000	0.000
2	1.000	0.992	0.947	0.738	0.463	0.232	0.090	0.025	0.004	0.000	0.000	0.000	0.000
3		0.999	0.992	0.914	0.730	0.483	0.254	0.099	0.025	0.003	0.000	0.000	0.000
4		1.000	0.999	0.980	0.901	0.733	0.500	0.267	0.099	0.020	0.001	0.000	0.000
5			1.000	0.997	0.975	0.901	0.746	0.517	0.270	0.086	0.008	0.001	0.000
6				1.000	0.996	0.975	0.910	0.768	0.537	0.262	0.053	0.008	0.000
7					1.000	0.996	0.980	0.929	0.804	0.564	0.225	0.071	0.003
8						1.000	0.998	0.990	0.960	0.866	0.613	0.370	0.086
9							1.000	1.000	1.000	1.000	1.000	1.000	1.000

f. n = 10

k	0.01	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.99
0	0.904	0.599	0.349	0.107	0.028	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000
1	0.996	0.914	0.736	0.376	0.149	0.046	0.011	0.002	0.000	0.000	0.000	0.000	0.000
2	1.000	0.988	0.930	0.678	0.383	0.167	0.055	0.012	0.002	0.000	0.000	0.000	0.000
3		0.999	0.987	0.879	0.650	0.382	0.172	0.055	0.011	0.001	0.000	0.000	0.000
4		1.000	0.998	0.967	0.850	0.633	0.377	0.166	0.047	0.006	0.000	0.000	0.000
5			1.000	0.994	0.953	0.834	0.623	0.367	0.150	0.033	0.002	0.000	0.000
6				0.999	0.989	0.945	0.828	0.618	0.350	0.121	0.013	0.001	0.000
7				1.000	0.998	0.988	0.945	0.833	0.617	0.322	0.070	0.012	0.000
8					1.000	0.998	0.989	0.954	0.851	0.624	0.264	0.086	0.004
9						1.000	0.999	0.994	0.972	0.893	0.651	0.401	0.096
10							1.000	1.000	1.000	1.000	1.000	1.000	1.000

g. n = 15

k	0.01	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	0.95	0.99
0	0.860	0.463	0.206	0.035	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1	0.990	0.829	0.549	0.167	0.035	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	1.000	0.964	0.816	0.398	0.127	0.027	0.004	0.000	0.000	0.000	0.000	0.000	0.000
3		0.995	0.944	0.648	0.297	0.091	0.018	0.002	0.000	0.000	0.000	0.000	0.000
4		0.999	0.987	0.836	0.515	0.217	0.059	0.009	0.001	0.000	0.000	0.000	0.000
5		1.000	0.998	0.939	0.722	0.403	0.151	0.034	0.004	0.000	0.000	0.000	0.000
6			1.000	0.982	0.869	0.610	0.304	0.095	0.015	0.001	0.000	0.000	0.000
7				0.996	0.950	0.787	0.500	0.213	0.050	0.004	0.000	0.000	0.000
8				0.999	0.985	0.905	0.696	0.390	0.131	0.018	0.000	0.000	0.000
9				1.000	0.996	0.966	0.849	0.597	0.278	0.061	0.002	0.000	0.000
10					0.999	0.991	0.941	0.783	0.485	0.164	0.013	0.001	0.000
11					1.000	0.998	0.982	0.909	0.703	0.352	0.056	0.005	0.000
12						1.000	0.996	0.973	0.873	0.602	0.184	0.036	0.000
13							1.000	0.995	0.965	0.833	0.451	0.171	0.010
14								1.000	0.995	0.965	0.794	0.537	0.140
15									1.000	1.000	1.000	1.000	1.000

$$P(r) = {}^{n}C_r p^r q^{(n-r)}$$

$$P(x) = \frac{e^{-\lambda}\lambda^x}{x!} \text{ where, } e = 2.718$$

$$x - E < \mu < x + E \quad \text{where, } E = Z_{\alpha/2}\ \frac{\sigma}{\sqrt{n}} \text{ or } E = t_{\alpha/2}\ \frac{s}{\sqrt{n}}$$

$$p - E < p < p + E \text{ where, } E = Z\sqrt{\frac{p(1-p)}{n}}$$

$$\chi^2_{STAT} = \sum_{\text{all cells}} \frac{(f_o - f_e)^2}{f_e}$$

$$r = \frac{\sum xy - \frac{\sum(x).\sum(y)}{n}}{\sqrt{\left(\sum x^2 - \frac{(\sum x)^2}{n}\right)\left(\sum y^2 - \frac{(\sum y)^2}{n}\right)}}$$

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

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