

THE OPEN UNIVERSITY OF SRI LANKA
 FACULTY OF MANAGEMENT STUDIES
 COMMONWEALTH EXECUTIVE MASTER OF BUSINESS/PUBLIC
 ADMINISTRATION
 FINAL EXAMINATION – 2023/24
 OSPA9407 - QUANTITATIVE TECHNIQUES
 DURATION – THREE (03) HOURS



DATE: 31ST AUGUST 2024

TIME: 1.30 PM – 4.30 PM

INSTRUCTIONS:

- Answer FIVE questions ONLY.
- All questions carry equal marks.
- Use of a non-programmable calculator is allowed.
- All workings pertaining to answers should be properly submitted with the answer script.
- This question paper consists of 7 questions in 10 pages.

Question 1

- a. A website has an average click-through rate (CTR) of 10%. If the website is visited by 9 users per minute, what is the probability that less than 5 users click on an advertisement within a minute? (5 marks)
- b. A restaurant receives an average of 4 customer complaints per week. What is the probability that the restaurant receives less than 3 complaints next week? (5 marks)
- c. The scores of a term test follow a Normal distribution with a mean of 50 and a standard deviation of 10 marks. What is the probability that a randomly selected student scores above 60 marks at the test? (5 marks)
- d. A company conducts a customer satisfaction survey, and each customer has a 70% probability of being satisfied with the company's products and services. If the company surveys 200 customers, what is the probability that at least 140 of them are satisfied? (Use Normal approximation to Binomial distribution) (5 marks)

(Total 20 Marks)

Question 2

- a. Describe the four components of time series with practical examples. (6 marks)
- b. The quarterly sales data of a retail store are available for past 4 years. An analysis is required to predict the future sales.

Period	Year	Quarter	Sales (Rs. '000)	Quarterly Moving Averages	Centered Moving Averages (CMA)	Sales/ CMA
1	2020	1	82			
2		2	87			
3		3	93	96.75	104.625	0.889
4		4	125	112.5	115.125	1.086
5	2021	1	145	117.75	117.75	1.231
6		2	108	(1)	(6)	(11)
7		3	93	(2)	(7)	(12)
8		4	87	(3)	(8)	(13)
9	2022	1	72	(4)	(9)	(14)
10		2	88	(5)	(10)	(15)
11		3	112	102.75	104.5	1.072
12		4	139	106.25	106.375	1.307
13	2023	1	86	106.5	105.5	0.815
14		2	89	104.5	102.875	0.865
15		3	104	101.25		
16		4	126			

- Calculate the values for (1) – (15). (5 marks)
- Find the adjusted seasonal index values. (5 marks)
- If the trend line equation is, $\text{Sales} = 127.38 + 0.22 \times \text{Period}$, find the forecasted sales for the four quarters of year 2024. (4 marks)

(Total: 20 marks)

Question 3

- A principal of Rs. 250,000/- is deposited in a savings account at an interest of 8.5% per annum compounded annually. How much is available in the account after 6 years? (3 marks)
- A person deposits Rs. 500,000/- in a savings account for which an annual interest rate of 7% is paid. If the interest is calculated bi-annually, what is the total amount in his account after 6 years? (3 marks)
- Find the effective rate of interest which is equal to the nominal rate of interest of 12.5% on which the compound interest rate is calculated quarterly? (3 marks)
- A company is evaluating 2 loan schemes (A and B) offered by a bank. The loan installments of each loan for 5 years are given in the table below:

Loan Scheme	Loan amount (Rs.)	Loan installments (Rs.)				
		1 st year	2 nd year	3 rd year	4 th year	5 th year
A	750,000	200,000	150,000	250,000	250,000	Nil
B	400,000	Nil	120,000	100,000	110,000	100,000

Based on the net present values of each loan scheme, identify which loan scheme should be obtained by the company? Use the discount rate of 14%. (11 marks)

(Total 20 marks)

Question 4

a. A printer wishes to evaluate the printing quality of 150 books. The printer wishes to study a sample of 50 books. There are 4 categories of books and the number of books available in each category are as follows:

Book A.....39

Book B.....46

Book C.....30

Book D.....35

- Explain how you pick a stratified sample of 50 books. (3 marks)
- Explain how you pick a systematic sample of 50 books. (4 marks)

b. Daily tourist arrivals at a popular tourist destination for 20 days of this month are given below:

1428	1292	1411	1697	1692	1711	1569	1429	1675	1604
1633	1315	1389	1365	1295	1534	1697	1411	1468	1326

Estimate the following measures for the above data.

- Mean (2 marks)
- Mode (2 marks)
- Range (2 marks)
- Based on the above, comment on the tourist arrival during this period. (3 marks)

c. Classify the following variables as numerical/ categorical and identify their scales of measurements. (4 marks)

- Type of books
- Tourist arrivals

(Total 20 marks)

Question 5

Ten sales people were surveyed and the average number of client contacts per month, and the sales volume, (in Rs. '000), were recorded and those are as follows:

No. of contacts	12	14	16	20	23	46	50	48	50	55
Sales (Rs. '000s)	15	25	30	30	30	80	90	95	110	130

- Plot the data on a scatter diagram and interpret the relationship you can observe. (5 marks)
- Calculate the correlation between number of contacts and sales. Interpret the correlation between the two factors? (6 marks)
- Calculate the regression equation (use contacts to predict sales). (4 marks)
- If you know that there are 50 contacts per month in a given month, what amount of sales would you predict? Compare that result with 50 number of contacts in the above table. Describe why the regression equation does not predict the exact value. (5 marks)

(Total 20 Marks)

Question 6

- An online retailer wants to estimate the average delivery time for its products with 90% confidence level. A random sample of 50 recent orders is selected, and the delivery times (in days) are recorded. The sample mean delivery time is 3.5 days, and the sample standard deviation is 0.8 days. Calculate the 90% confidence interval for the population mean delivery time. (5 marks)
- A school has 1000 students. The principal of the school thinks that the average IQ of its students is at least 110. To prove her point, she administers an IQ test to 200 randomly selected students. Among the sampled students, the average IQ is 108 with a standard deviation of 10. Based on these results, should the principal accept or reject her original hypothesis? Assume a significance level of 1%. (8 marks)
- Explain the relationship between confidence intervals and hypothesis testing. How are these two concepts related in drawing conclusions from data? Provide examples of real-life business scenarios where both confidence intervals and hypothesis testing are used together to analyze and interpret data. (7 marks)

(Total: 20 marks)

Question 7

A book publisher wishes to test whether the preference pattern of consumers for its product types (A, B, and C) is dependent on their highest educational qualification (whether O/L, A/L, or a degree). A random sample of 500 individuals were considered to collect data.

Educational Qualification	Product types			Total
	A	B	C	
O/L	170	30	80	280
A/L	50	25	60	135
Degree	20	10	55	85
Total	240	65	195	500

- One of these 500 consumers was selected randomly. What is the probability that the selected consumer's highest educational qualification is A/Ls? (2 marks)
- A randomly selected consumer was found to be a degree holder. What is the probability that the consumer has preference to product type A? (2 marks)
- A randomly selected consumer was found to have preference to product B. What is the probability that the consumer's highest educational qualification is O/Ls? (2 marks)
- Find the probability of a consumer having O/L qualification prefers product C. (2 marks)
- What is the name of the procedure that can be used to check the association between the preference for product types and the highest educational qualification? (2 marks)
- What are the hypotheses to be checked in the said procedure? (4 marks)
- Briefly describe the procedure to test the above association at 1% significance level? Is there an association? (6 marks)

(Total: 20 marks)

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Appendix

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

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

$$\bar{x} \pm z^* \sigma / \sqrt{n}$$

$$\bar{x} \pm t^* s / \sqrt{n}$$

$$P \pm z \sqrt{\frac{p(1-p)}{n}}$$

$$\chi^2 = \sum_{i=1}^k \left[\frac{(O_i - E_i)^2}{E_i} \right]$$

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

$$Z = \frac{\bar{x}_1 - \bar{x}_2 - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

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

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

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

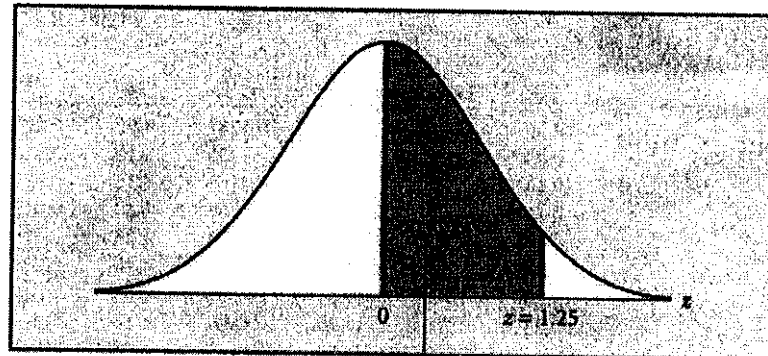
Binomial Probability Distribution Table

$n = 8$									
x	$p = 0.01$	$p = 0.02$	$p = 0.03$	$p = 0.04$	$p = 0.05$	$p = 0.06$	$p = 0.07$	$p = 0.08$	$p = 0.09$
0	0.9227	0.8508	0.7837	0.7214	0.6634	0.6096	0.5596	0.5132	0.4703
1	0.0746	0.1389	0.1939	0.2405	0.2793	0.3113	0.3370	0.3570	0.3721
2	0.0026	0.0099	0.0210	0.0351	0.0515	0.0695	0.0888	0.1087	0.1288
3	0.0001	0.0004	0.0013	0.0029	0.0054	0.0089	0.0134	0.0189	0.0255
4	0.0000	0.0000	0.0001	0.0002	0.0004	0.0007	0.0013	0.0021	0.0031
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	$p = 0.99$	$p = 0.98$	$p = 0.97$	$p = 0.96$	$p = 0.95$	$p = 0.94$	$p = 0.93$	$p = 0.92$	$p = 0.91$
x	$p = 0.10$	$p = 0.15$	$p = 0.20$	$p = 0.25$	$p = 0.30$	$p = 0.35$	$p = 0.40$	$p = 0.45$	$p = 0.50$
0	0.4305	0.2725	0.1678	0.1001	0.0576	0.0319	0.0168	0.0084	0.0039
1	0.3826	0.3847	0.3355	0.2670	0.1977	0.1373	0.0896	0.0548	0.0313
2	0.1488	0.2376	0.2936	0.3115	0.2965	0.2587	0.2090	0.1569	0.1094
3	0.0331	0.0839	0.1468	0.2076	0.2541	0.2786	0.2787	0.2568	0.2188
4	0.0046	0.0185	0.0459	0.0865	0.1361	0.1875	0.2322	0.2627	0.2734
5	0.0004	0.0026	0.0092	0.0231	0.0467	0.0808	0.1239	0.1719	0.2188
6	0.0000	0.0002	0.0011	0.0038	0.0100	0.0217	0.0413	0.0703	0.1094
7	0.0000	0.0000	0.0001	0.0004	0.0012	0.0033	0.0079	0.0164	0.0313
8	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0007	0.0017	0.0039
	$p = 0.90$	$p = 0.85$	$p = 0.80$	$p = 0.75$	$p = 0.70$	$p = 0.65$	$p = 0.60$	$p = 0.55$	$p = 0.50$

$n = 9$									
x	$p = 0.01$	$p = 0.02$	$p = 0.03$	$p = 0.04$	$p = 0.05$	$p = 0.06$	$p = 0.07$	$p = 0.08$	$p = 0.09$
0	0.9135	0.8337	0.7602	0.6925	0.6302	0.5730	0.5204	0.4722	0.4279
1	0.0830	0.1531	0.2116	0.2597	0.2985	0.3292	0.3525	0.3695	0.3809
2	0.0034	0.0125	0.0262	0.0433	0.0629	0.0840	0.1061	0.1285	0.1507
3	0.0001	0.0006	0.0019	0.0042	0.0077	0.0125	0.0186	0.0261	0.0348
4	0.0000	0.0000	0.0001	0.0003	0.0006	0.0012	0.0021	0.0034	0.0052
5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0002	0.0003	0.0005
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	$p = 0.99$	$p = 0.98$	$p = 0.97$	$p = 0.96$	$p = 0.95$	$p = 0.94$	$p = 0.93$	$p = 0.92$	$p = 0.91$
x	$p = 0.10$	$p = 0.15$	$p = 0.20$	$p = 0.25$	$p = 0.30$	$p = 0.35$	$p = 0.40$	$p = 0.45$	$p = 0.50$
0	0.3874	0.2316	0.1342	0.0751	0.0404	0.0207	0.0101	0.0046	0.0020
1	0.3874	0.3679	0.3020	0.2253	0.1556	0.1004	0.0605	0.0339	0.0176
2	0.1722	0.2597	0.3020	0.3003	0.2668	0.2162	0.1612	0.1110	0.0703
3	0.0446	0.1069	0.1762	0.2336	0.2668	0.2716	0.2508	0.2119	0.1641
4	0.0074	0.0283	0.0661	0.1168	0.1715	0.2194	0.2508	0.2600	0.2461
5	0.0008	0.0050	0.0165	0.0389	0.0735	0.1181	0.1672	0.2128	0.2461
6	0.0001	0.0006	0.0028	0.0087	0.0210	0.0424	0.0743	0.1160	0.1641
7	0.0000	0.0000	0.0003	0.0012	0.0039	0.0098	0.0212	0.0407	0.0703
8	0.0000	0.0000	0.0000	0.0001	0.0004	0.0013	0.0035	0.0083	0.0176
9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0003	0.0008	0.0020
	$p = 0.90$	$p = 0.85$	$p = 0.80$	$p = 0.75$	$p = 0.70$	$p = 0.65$	$p = 0.60$	$p = 0.55$	$p = 0.50$

$n = 10$									
x	$p = 0.01$	$p = 0.02$	$p = 0.03$	$p = 0.04$	$p = 0.05$	$p = 0.06$	$p = 0.07$	$p = 0.08$	$p = 0.09$
0	0.9044	0.8171	0.7374	0.6648	0.5987	0.5386	0.4840	0.4344	0.3894
1	0.0914	0.1667	0.2281	0.2770	0.3151	0.3438	0.3643	0.3777	0.3851
2	0.0042	0.0153	0.0317	0.0519	0.0746	0.0988	0.1234	0.1478	0.1714
3	0.0001	0.0008	0.0026	0.0058	0.0105	0.0168	0.0248	0.0343	0.0452
4	0.0000	0.0000	0.0001	0.0004	0.0010	0.0019	0.0033	0.0052	0.0078
5	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0003	0.0005	0.0009
6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	$p = 0.99$	$p = 0.98$	$p = 0.97$	$p = 0.96$	$p = 0.95$	$p = 0.94$	$p = 0.93$	$p = 0.92$	$p = 0.91$

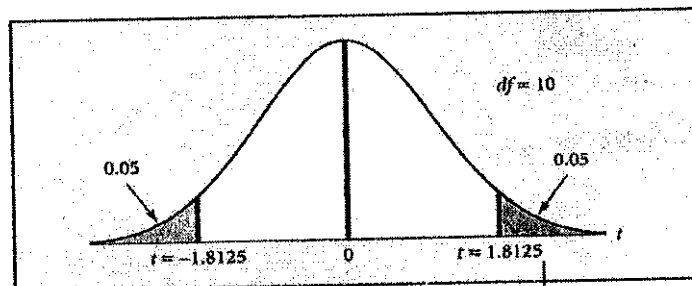
Standard Normal Distribution Table



z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990

The highlighted value is 0.3944

Critical values for t-distribution

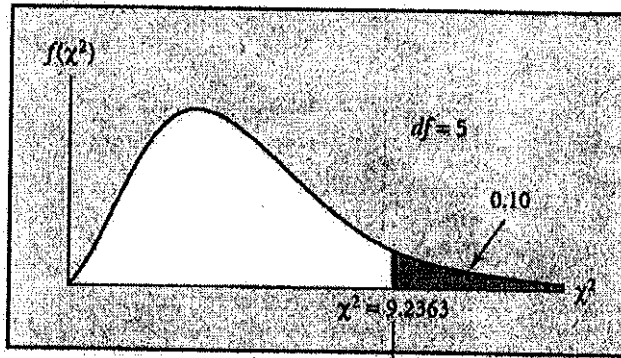


PROBABILITIES (OR AREAS UNDER t-DISTRIBUTION CURVE)									
Conf. Level	0.1	0.3	0.5	0.7	0.8	0.9	0.95	0.98	0.99
One Tail	0.45	0.35	0.25	0.15	0.1	0.05	0.025	0.01	0.005
Two Tails	0.9	0.7	0.5	0.3	0.2	0.1	0.05	0.02	0.01
df	Values of t								
1	0.1584	0.5095	1.0000	1.9626	3.0777	6.3137	12.7062	31.8210	63.6559
2	0.1421	0.4447	0.8165	1.3862	1.8856	2.9200	4.3027	6.9645	9.9250
3	0.1366	0.4242	0.7649	1.2498	1.6377	2.3534	3.1824	4.5407	5.8408
4	0.1338	0.4142	0.7407	1.1896	1.5332	2.1318	2.7765	3.7469	4.6041
5	0.1322	0.4082	0.7267	1.1558	1.4759	2.0150	2.5706	3.3649	4.0321
6	0.1311	0.4043	0.7176	1.1342	1.4398	1.9432	2.4469	3.1427	3.7074
7	0.1303	0.4015	0.7111	1.1192	1.4149	1.8946	2.3646	2.9979	3.4993
8	0.1297	0.3995	0.7064	1.1081	1.3968	1.8595	2.3060	2.8965	3.3554
9	0.1293	0.3979	0.7027	1.0997	1.3830	1.8331	2.2622	2.8214	3.2498
10	0.1289	0.3966	0.6998	1.0931	1.3722	1.8125	2.2281	2.7638	3.1693
11	0.1286	0.3956	0.6974	1.0877	1.3634	1.7959	2.2010	2.7181	3.1058
12	0.1283	0.3947	0.6955	1.0832	1.3562	1.7823	2.1788	2.6810	3.0545
13	0.1281	0.3940	0.6938	1.0795	1.3502	1.7709	2.1604	2.6503	3.0123
14	0.1280	0.3933	0.6924	1.0763	1.3450	1.7613	2.1448	2.6245	2.9768
15	0.1278	0.3928	0.6912	1.0735	1.3406	1.7531	2.1315	2.6025	2.9467
16	0.1277	0.3923	0.6901	1.0711	1.3368	1.7459	2.1199	2.5835	2.9208
17	0.1276	0.3919	0.6892	1.0690	1.3334	1.7396	2.1098	2.5669	2.8982
18	0.1274	0.3915	0.6884	1.0672	1.3304	1.7341	2.1009	2.5524	2.8784
19	0.1274	0.3912	0.6876	1.0655	1.3277	1.7291	2.0930	2.5395	2.8609
20	0.1273	0.3909	0.6870	1.0640	1.3253	1.7247	2.0860	2.5280	2.8453
21	0.1272	0.3906	0.6864	1.0627	1.3232	1.7207	2.0796	2.5176	2.8314
22	0.1271	0.3904	0.6858	1.0614	1.3212	1.7171	2.0739	2.5083	2.8188
23	0.1271	0.3902	0.6853	1.0603	1.3195	1.7139	2.0687	2.4999	2.8073
24	0.1270	0.3900	0.6848	1.0593	1.3178	1.7109	2.0639	2.4922	2.7970
25	0.1269	0.3898	0.6844	1.0584	1.3163	1.7081	2.0595	2.4851	2.7874
26	0.1269	0.3896	0.6840	1.0575	1.3150	1.7056	2.0555	2.4786	2.7787
27	0.1268	0.3894	0.6837	1.0567	1.3137	1.7033	2.0518	2.4727	2.7707
28	0.1268	0.3893	0.6834	1.0560	1.3125	1.7011	2.0484	2.4671	2.7633
29	0.1268	0.3892	0.6830	1.0553	1.3114	1.6991	2.0452	2.4620	2.7564
30	0.1267	0.3890	0.6828	1.0547	1.3104	1.6973	2.0423	2.4573	2.7500
40	0.1265	0.3881	0.6807	1.0500	1.3031	1.6839	2.0211	2.4233	2.7045
50	0.1263	0.3875	0.6794	1.0473	1.2987	1.6759	2.0086	2.4033	2.6778
60	0.1262	0.3872	0.6786	1.0455	1.2958	1.6706	2.0003	2.3901	2.6603
70	0.1261	0.3869	0.6780	1.0442	1.2938	1.6669	1.9944	2.3808	2.6479
80	0.1261	0.3867	0.6776	1.0432	1.2922	1.6641	1.9901	2.3739	2.6387
90	0.1260	0.3866	0.6772	1.0424	1.2910	1.6620	1.9867	2.3685	2.6316
100	0.1260	0.3864	0.6770	1.0418	1.2901	1.6602	1.9840	2.3642	2.6259
250	0.1258	0.3858	0.6755	1.0386	1.2849	1.6510	1.9695	2.3414	2.5956
500	0.1257	0.3855	0.6750	1.0375	1.2832	1.6479	1.9647	2.3338	2.5857

See Normal Distribution

The highlighted value is 1.8125

Critical Values for Chi-Squared Distribution



PROBABILITIES (OR AREAS UNDER CHI-SQUARE DISTRIBUTION CURVE
ABOVE GIVEN CHI-SQUARE VALUES)

	0.995	0.99	0.975	0.95	0.90	0.80	0.70	0.60	0.50	0.40	0.30	0.20	0.10	0.05	0.025	0.01	0.005
df	Values of Chi-Squared																
1	0.0000	0.0002	0.0010	0.0039	0.0158	2.7055	3.8415	5.0239	6.6349	7.8794							
2	0.0100	0.0201	0.0506	0.1026	0.2107	4.6052	5.9915	7.3778	9.2104	10.5965							
3	0.0717	0.1148	0.2158	0.3518	0.5844	6.2514	7.8147	9.3484	11.3449	12.8381							
4	0.2070	0.2971	0.4844	0.7107	1.0636	7.7794	9.4877	11.1433	13.2767	14.8602							
5	0.4118	0.5543	0.8312	1.1455	1.6103	9.2363	11.0705	12.8325	15.0863	16.7496							
6	0.6757	0.8721	1.2373	1.6354	2.2041	10.6446	12.5916	14.4494	16.8119	18.5475							
7	0.9893	1.2390	1.6899	2.1673	2.8331	12.0170	14.0671	16.0128	18.4753	20.2777							
8	1.3444	1.6465	2.1797	2.7326	3.4895	13.3616	15.5073	17.5345	20.0902	21.9549							
9	1.7349	2.0879	2.7004	3.3251	4.1682	14.6837	16.9190	19.0228	21.6660	23.5893							
10	2.1558	2.5582	3.2470	3.9403	4.8652	15.9872	18.3070	20.4832	23.2093	25.1881							
11	2.6032	3.0535	3.8157	4.5748	5.5778	17.2750	19.6752	21.9200	24.7250	26.7569							
12	3.0738	3.5706	4.4038	5.2260	6.3038	18.5493	21.0261	23.3367	26.2170	28.2997							
13	3.5650	4.1069	5.0087	5.8919	7.0415	19.8119	22.3620	24.7356	27.6882	29.8193							
14	4.0747	4.6604	5.6287	6.5706	7.7895	21.0641	23.6848	26.1189	29.1412	31.3194							
15	4.6009	5.2294	6.2621	7.2609	8.5468	22.3071	24.9958	27.4884	30.5780	32.8015							
16	5.1422	5.8122	6.9077	7.9616	9.3122	23.5418	26.2962	28.8453	31.9999	34.2671							
17	5.6973	6.4077	7.5642	8.6718	10.0852	24.7690	27.5871	30.1910	33.4087	35.7184							
18	6.2648	7.0149	8.2307	9.3904	10.8649	25.9894	28.8693	31.5264	34.8052	37.1564							
19	6.8439	7.6327	8.9065	10.1170	11.6509	27.2036	30.1435	32.8523	36.1908	38.5821							
20	7.4338	8.2604	9.5908	10.8508	12.4426	28.4120	31.4104	34.1696	37.5663	39.9969							
21	8.0336	8.8972	10.2829	11.5913	13.2396	29.6151	32.6706	35.4789	38.9322	41.4009							
22	8.6427	9.5425	10.9823	12.3380	14.0415	30.8133	33.9245	36.7807	40.2894	42.7957							
23	9.2604	10.1957	11.6885	13.0905	14.8480	32.0069	35.1725	38.0756	41.6383	44.1814							
24	9.8862	10.8563	12.4011	13.8484	15.6587	33.1962	36.4150	39.3641	42.9798	45.5584							
25	10.5196	11.5240	13.1197	14.6114	16.4734	34.3816	37.6525	40.6465	44.3140	46.9280							
26	11.1602	12.1982	13.8439	15.3792	17.2919	35.5632	38.8851	41.9231	45.6416	48.2898							
27	11.8077	12.8785	14.5734	16.1514	18.1139	36.7412	40.1133	43.1945	46.9628	49.6450							
28	12.4613	13.5647	15.3079	16.9279	18.9392	37.9159	41.3372	44.4608	48.2782	50.9936							
29	13.1211	14.2564	16.0471	17.7084	19.7677	39.0875	42.5569	45.7223	49.5878	52.3355							
30	13.7867	14.9535	16.7908	18.4927	20.5992	40.2560	43.7730	46.9792	50.8922	53.6719							

The highlighted value is 9.2363