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First Efficiency Bar Examination for Grade II Statistical Officers in the Department of Census & Statistics - 2015 (2023)

(01) Basic Statistical Methods

Two hours

- A non-scientific calculator can be used for this paper.
- Answer **all** questions.
- Formula and statistical tables will be provided. Show the steps to reach the answer clearly.

1. (i) Why is it necessary to consider both characteristics central tendency and dispersion in describing a data distribution? *(04 marks)*

(ii) Describe the importance of descriptive statistics. *(05 marks)*

(iii) A survey is done for the purpose of improving the living standards of the paddy farmers, living in North Central province. In the survey 78% of the 800 registered paddy farmers interviewed say they need to have a good price for their yields.

(a) What is the population of interest?

(b) What is the sample?

(c) Is the value 78% a parameter or a statistic? Give reasons for your answer. *(06 marks)*

(iv) Information concerning the paddy farmers interviewed, following questions were asked. For each question, determine the scale of measurements of possible responses.

(a) Your idea about the price receivable for yield

(b) Types of the fertilizer used

(c) Time spent in paddy farming
(Hint: You have to select one of the four scales; nominals, ordinal, interval and ratio) *(03 marks)*

(v) Describe the shape of the frequency distribution about the number of defects (X) belonging to the each product obtained in the quality testing process, shown in the following table by using the appropriate measures of central tendency.

X	1	2	3	4	5
f	2	4	13	4	2

(07 marks)

2. (i) The following data give the sum of age (X) and the marks of the efficiency-bar examination (Y) of 100 statistical officers.

$\sum X = 4{,}000$ $\sum Y = 5{,}500$ $\sum X^2 = 170{,}000$ $\sum Y^2 = 334{,}900$

(a) Mention a suitable measure by giving reasons to compare the variability of age and the marks of statistical officers. *(03 marks)*

(b) Using the measure, mentioned in part 2 (i) (a), compare the variability of age and the marks of the statistical officers. *(12 marks)*

(ii) A soft-drink machine is regulated so that it discharges a mean of 210 millilitres per cup. If the amount of drink is normally distributed with a standard deviation equal to 7 millilitres,

(a) what fraction of cups will contain more than 225 millilitres? *(06 marks)*

(b) how many cups will probably overflow if 230 millilitre cups are used for next 1000 drinks? *(04 marks)*

(See page two.

3. (i) A manufacturer of ice cream uses machines to dispense ice cream into plastic boxes that move along a filling line. The machine that dispenses ice cream is working properly if 1000 ml is dispensed for one box. Suppose that the mean of the amount dispensed in a particular randomly selected sample of 25 boxes is 998 ml with a variance of 9. Manufacture wants to know whether there is any statistical evidence to stop the operating of the dispensing machine for repairs.

(a) Write null and alternative hypotheses. *(02 mark)*

(b) Is this a one-tail or two-tail test? *(01 mark)*

(c) Perform a suitable hypothesis test and write your conclusion. (Use 1% significance level.) *(08 marks)*

(d) Is this conclusion valid at 5% signification level? (Justify your answer without using any statistical table). *(01 mark)*

(e) State the assumption under the above test. *(01 mark)*

(ii) A social scientist sampled 150 people and classified them according to income level and whether they purchased household consumer goods from supermarkets last month. The sample information is reported below. Using the suitable statistical test decide whether is it reasonable to conclude that the purchasing household consumer goods from supermarkets is related to income level. Use the 0.05 significance level.

Purchasing from supermarkets	**Income Level**			
	Low	Middle	High	**Total**
Yes	45	30	25	100
No	15	15	20	50
Total	60	45	45	150

(12 marks)

4. (i) Distinguish between the following.

(a) Sample survey and census *(04 marks)*

(b) Simple random sampling and stratified random sampling *(04 marks)*

(ii) "Sri Lanka Travellers" company makes deliveries of good from Colombo to different ports around the world. The chairman of the company is studying the relationship between the distance (X) a shipment must be transported (km) and length of time (Y) in days, it takes shipment to arrive at its destination. To investigate this, the chairman selected random sample of 25 shipments made last month. Shipping distance is the independent variable and shipping time is the depend variable. In analysis of the sample data following summations were obtained.

$$\sum X = 14525, \quad \sum Y = 200, \quad \sum X^2 = 10682475, \quad \sum Y^2 = 1945, \quad \sum XY = 143400$$

(a) Calculate the correlation coefficient and comment on the result, assuming linear relationship between the two variables.

(b) Find the linear regression line using the least square method.

(c) Interpret the slope of the regression line.

(d) Calculate the coefficient of determination and interpret it.

(e) Predict the length of time using the regression line when the distance to transport is 2500 km. *(17 marks)*

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First Efficiency Bar Examination for Grade II Statistical Officers
in the Department of Census and Statistics - 2015 (2023)

(01) Basic Statistical Methods

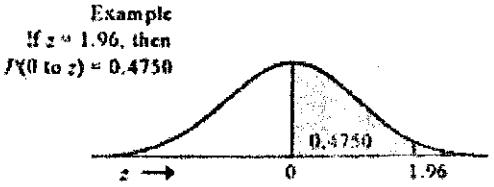
Formula sheet

$\mu = \frac{\sum x}{N}$	$\bar{X} = \frac{\sum x}{n}$	$\mu_x = \frac{N_1\mu_{x_1} + N_2\mu_{x_2} + \ldots + N_k\mu_{x_k}}{N_1 + N_2 + \ldots + N_k}$
$\mu = \frac{\sum WX}{\sum W}$	$\sigma_X^2 = \frac{\sum X^2}{N} - \mu_X^2$	$Median = Size\ of\ \left(\frac{N+1}{2}\right)^{th}\ item\ of\ ordered\ data\ set$
$S^2 = \frac{\sum(x_i - \bar{X})^2}{n-1}$	$S^2 = \frac{\sum X^2 - n\bar{X}^2}{n-1}$	$GM = \sqrt[n]{X_1 \times X_2 \times X_3 \times \ldots \times X_n}$
$C.V. = \frac{\sigma_X}{\mu} \times 100$	$C.V. = \frac{S_X}{\bar{X}} \times 100$	$P(A/B) = \frac{P(A \cap B)}{P(B)}$

$\sigma^2 = E[X^2] - (E[X])^2$	$Z = \frac{X - \mu}{\sigma}$	$E[X] = \sum_{i=1}^{n} x_i . P(x_i)$
$Test\ statistic(Z_{cal}) = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$	$Test\ statistic(t_{cal}) = \frac{\bar{X} - \mu}{s/\sqrt{n}}$	$Test\ statistic = \frac{p - p_0}{\sqrt{p_0(1-p_0)/n}}$
$E_{ij} = \frac{(R_i \times C_j)}{n}$	$\chi^2_{cal} = \sum \frac{(o_{ij} - E_{ij})^2}{E_{ij}}$	$r = \frac{S_{xy}}{\sqrt{(S_{xx})(S_{yy})}}$
$S_{xy} = \sum xy - n(\bar{X})(\bar{Y})$	$S_{xx} = \sum x_i^2 - n(\bar{X})^2$	$S_{yy} = \sum y_i^2 - n(\bar{Y})^2$
$\hat{\beta}_1 = \frac{S_{xy}}{S_{xx}}$	$\hat{\beta}_0 = \bar{Y} - \hat{\beta}_1\bar{X}$	$R^2 = \frac{\beta_1^2 S_{xx}}{S_{yy}}$

STATISTICAL TABLES

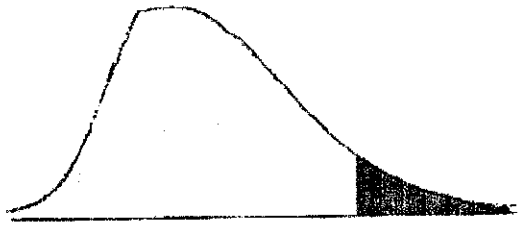
AREAS UNDER THE NORMAL CURVE



Z	*0.00*	*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

CRITICAL VALUES OF CHI-SQUARE

This table contains the values of χ^2 that correspond to a specific right-tail area and specific numbers of degrees of freedom df.



Possible values of χ^2

Degrees of Freedom	Righ-tail Area			
df	*0.10*	*0.05*	*0.02*	*0.01*
1	2.706	3.841	5.412	6.635
2	4.605	5.991	7.824	9.210
3	6.251	7.815	9.837	11.345
4	7.779	9.488	11.668	13.277
5	9.236	11.070	13.388	15.086
6	10.645	12.592	15.033	16.812
7	12.017	14.067	16.622	18.475
8	13.362	15.507	18.168	20.090
9	14.684	16.919	19.679	21.666
10	15.987	18.307	21.161	23.209
11	17.275	19.675	22.618	24.725
12	18.549	21.026	24.054	26.217
13	19.812	22.362	25.472	27.688
14	21.064	23.685	26.873	29.141
15	22.307	24.996	28.259	30.578
16	23.542	26.296	29.633	32.000
17	24.769	27.587	30.995	33.409
18	25.989	28.869	32.346	34.805
19	27.204	30.144	33.687	36.191
20	28.412	31.410	35.020	37.566
21	29.615	32.671	36.343	38.932
22	30.813	33.924	37.659	40.289
23	32.007	35.172	38.968	41.638
24	33.196	36.415	40.270	42.980
25	34.382	37.652	41.566	44.314
26	35.563	38.885	42.856	45.642
27	36.741	40.113	44.140	46.963
28	37.916	41.337	45.419	48.278
29	39.087	42.557	46.693	49.588
30	40.256	43.773	47.962	50.892

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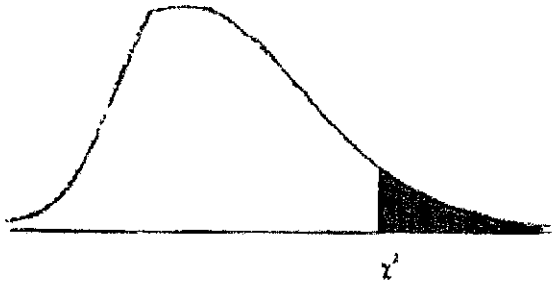

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First Efficiency Bar Examination for Grade II Statistical Officers
in the Department of Census and Statistics - 2015 (2023)

(02) Office Administration and Establishment Code *Two hours*

- Answer **all** questions.

1. (i) What are the conditions that should be fulfilled by an officer, who retired from government service on medical reasons, before appointed to the same post or grade by the appointing authority? *(10 marks)*

   (ii) State the provisions in the Establishment Code regarding the persons who are not eligible for recruiting to government service. *(10 marks)*

2. (i) Explain the provisions for obtaining casual leave by a government officer. *(10 marks)*

   (ii) Explain the provisions for approving vacation leave according to the Chapter XII of the Establishment Code. *(10 marks)*

3. (i) What are the conditions for the Commuted Allowance according to the provisions of the Establishment Code? *(10 marks)*

   (ii) What are the special matters that should be taken into consideration by the head of the department, when paying over-time according to the provisions of the Chapter VIII of the Establishment Code? *(10 marks)*

4. (i) State the provisions regarding 'vacation of post', according to Section 7 of Chapter V in the Establishment Code. *(10 marks)*

   (ii) What are the conditions should the appointing authority satisfy himself before an appointment or promotion of a government officer is made? *(10 marks)*

5. Write short-notes on the following :
   (i) Authority for approving leave
   (ii) Substitute officer
   (iii) Purposes for distress loan
   (iv) Compulsory leave

(05 × 4 = 20 marks)

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First Efficiency Bar Examination for Grade II Statistical Officers
in the Department of Census and Statistics - 2015 (2023)

(03) Financial Regulations *Two hours*

- Answer **all** questions.

1. (i) Explain the "Virement Procedure" in terms of Government Financial Regulations. *(06 marks)*

   (ii) What are the occasions where Virement procedure **cannot** and **should not** be adopted? *(14 marks)*

2. (i) Explain what are the controlling and monitoring functions of the Treasury over the government finance. *(08 marks)*

   (ii) What are the common responsibilities of an Accounting Officer? *(12 marks)*

3. (i) What are the main objectives of Internal Audit units? *(06 marks)*

   (ii) Explain the functions of an Internal Audit Unit with regard to the financial activities of a government department. *(14 marks)*

4. (i) What are the responsibilities of an Assessing Officer in connection with government revenue. *(10 marks)*

   (ii) Explain the procedure regarding the collection of money due, to the Government. *(10 marks)*

5. (i) Explain the passing of vouchers for payment in terms of Government Financial Regulations. *(04 marks)*

   (ii) Explain the existing provisions with regard to payment of vouchers in terms of Government Financial Regulations. *(16 marks)*

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First Efficiency Bar Examination for Grade II Statistical Officers
in the Department of Census and Statistics - 2015 (2023)

(01) Basic Statistical Methods

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$\sigma^2 = E[X^2] - (E[X])^2$	$Z = \frac{X - \mu}{\sigma}$	$E[X] = \sum_{i=1}^{n} x_i . P(x_i)$
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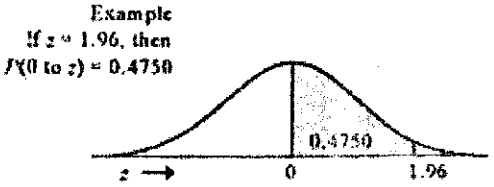
STATISTICAL TABLES

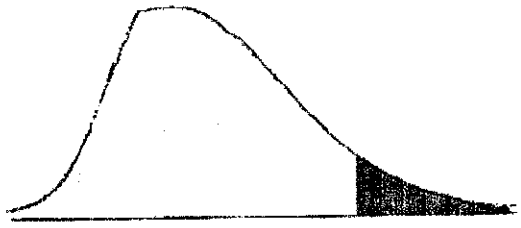
AREAS UNDER THE NORMAL CURVE



Z	*0.00*	*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

CRITICAL VALUES OF CHI-SQUARE

This table contains the values of χ^2 that correspond to a specific right-tail area and specific numbers of degrees of freedom df.

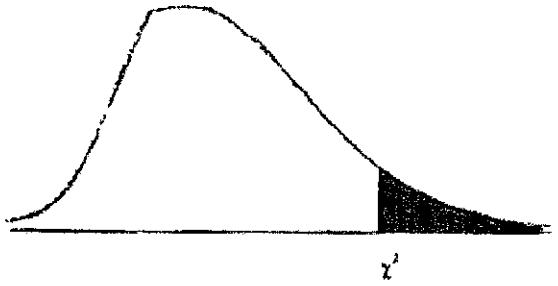


Possible values of χ^2

Degrees of Freedom	Righ-tail Area			
df	*0.10*	*0.05*	*0.02*	*0.01*
1	2.706	3.841	5.412	6.635
2	4.605	5.991	7.824	9.210
3	6.251	7.815	9.837	11.345
4	7.779	9.488	11.668	13.277
5	9.236	11.070	13.388	15.086
6	10.645	12.592	15.033	16.812
7	12.017	14.067	16.622	18.475
8	13.362	15.507	18.168	20.090
9	14.684	16.919	19.679	21.666
10	15.987	18.307	21.161	23.209
11	17.275	19.675	22.618	24.725
12	18.549	21.026	24.054	26.217
13	19.812	22.362	25.472	27.688
14	21.064	23.685	26.873	29.141
15	22.307	24.996	28.259	30.578
16	23.542	26.296	29.633	32.000
17	24.769	27.587	30.995	33.409
18	25.989	28.869	32.346	34.805
19	27.204	30.144	33.687	36.191
20	28.412	31.410	35.020	37.566
21	29.615	32.671	36.343	38.932
22	30.813	33.924	37.659	40.289
23	32.007	35.172	38.968	41.638
24	33.196	36.415	40.270	42.980
25	34.382	37.652	41.566	44.314
26	35.563	38.885	42.856	45.642
27	36.741	40.113	44.140	46.963
28	37.916	41.337	45.419	48.278
29	39.087	42.557	46.693	49.588
30	40.256	43.773	47.962	50.892

CRITICAL VALUES OF CHI-SQUARE

This table contains the values of χ^2 that correspond to a specific right-tail area and specific numbers of degrees of freedom df.



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