

◆ 注意：共兩大題組。請於答案卷按題號依序作答，並清楚標明題號。計算題請寫出計算過程，若要求進行假設檢定，請務必寫出虛無與對立假設。卷末附有三種統計分配表。

※ 注意：選擇題請於答案卷之「選擇題作答區」依序作答。

一、選擇題（每題3分，共75分）：請根據問題選擇一個最適當的答案

1. A two-factor research study is used to evaluate the effectiveness (效果) of a new blood-pressure medication (血壓藥). In this two-factor study, Factor A is medication (用藥) versus no medication (不用藥) and factor B is male versus female. The medicine is expected to reduce blood pressure for both males and females, but it is expected to have a much greater effect for males. What pattern of results should be obtained if the medication works as predicted?
 - A. A significant main effect for factor A.
 - B. A significant interaction.
 - C. A significant main effect for factor A and a significant interaction.
 - D. Answer cannot be determined from the information provided. 資訊不充足，無法回答。
2. A hypothesis test (假設檢定) involves a comparison of which two elements?
 - A. Research results from a sample and a hypothesis about a population
 - B. Research results from a population and a hypothesis about a sample
 - C. Research results from a population and a hypothesis about the population
 - D. Research results from a sample and a hypothesis about the sample
 - E. Answer cannot be determined from the information provided
3. If a treatment has a very small effect, what is a likely outcome for a hypothesis test evaluating the treatment?
 - A. A Type I error
 - B. A Type II error
 - C. Correctly reject the null hypothesis
 - D. Correctly fail to reject the null hypothesis
 - E. Answer cannot be determined from the information provided
4. Which of the following is an accurate description (正確的描述) regarding the *power* of a statistical test (統計檢定力)?
 - A. The power of a statistical test will increase if α changes from .05 to .01
 - B. The power of a statistical test is the probability of supporting true null hypothesis
 - C. The power of a statistical test will increase if the sample size changes from $n = 25$ to $n = 100$
 - D. The power of a statistical test is the probability of rejecting true null hypothesis
 - E. Answer cannot be determined from the information provided
5. Which of the following is the most accurate description of the sampling distribution (抽樣分配)?
 - A. The distribution of the values of a variable for all individuals in the sample
 - B. The distribution of the values of a variable for all individuals in the population
 - C. The distribution of the values of the statistic for *some* samples, with the same size, selected from the population
 - D. The distribution of the values of the statistic for all possible samples, with the same size, selected from the population
 - E. Answer cannot be determined from the information provided

6. A two sample z-test for the difference in population means is conducted. If the null hypothesis $H_0: \mu_1 = \mu_2$ is true, which of the following is the most accurate description?
- A. The mean of the sampling distribution is set to zero
 - B. The statistic for test is $\bar{x}_1 - \bar{x}_2$
 - C. The standard error of the sampling distribution is $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$
 - D. Both A and B are correct
 - E. Both B and C are correct

7-9. A survey of 134 cell phone users yielded the data found in the table below. The table compares gender and the type of phone. Using the table below and answer questions 7-9.

	iPhone	Non-iPhone
Male	57	23
Female	36	18

7. If 3 customers are independently selected based on this survey information what is the probability that none of the 3 have iPhone? (Round your answer to 3 decimal places)
- A. 0.029
 - B. 0.611
 - C. 0.918
 - D. 0.971
 - E. None of A-D is correct.
8. If a customer is selected based on this survey data, what is the probability that the customer is female *or* does not use an iPhone?
- A. 0.134
 - B. 0.709
 - C. 0.828
 - D. 0.575
 - E. Answer cannot be determined from the information provided
9. The event of having an iPhone (Event A) is independent of gender (ex. Event B=being male).
- A. True
 - B. False
 - C. Answer cannot be determined from the information provided
10. Consider a fair coin tossing experiment. If we toss a coin three times, how many times do we *expect* it to come up heads? What is the variance of this distribution?
- A. 1.5, 1.25
 - B. 1.5, 0.75
 - C. 2.5, 1.25
 - D. 2.5, 0.75
 - E. None of A-D is correct.
11. In the ANOVA test, if the null hypothesis is false, the means of the different samples should be _____ and the standard deviations of the different samples should be _____.
- A. similar in valuelarge in value
 - B. close to zeroequal to their respective variances
 - C. very different in valuelower in value than the means
 - D. very different in value.....relatively low in value
 - E. Answer cannot be determined from the information provided

國立臺灣大學106學年度轉學生招生考試試題

題號： 32
科目：社會統計

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12. There is no linear relationship between two interval-ratio variables when the regression line on a scatterplot _____.
- A. is parallel to the horizontal axis (與水平軸平行)
 - B. does not touch all of the scores
 - C. is not an equal distance from all of the scores
 - D. is bimodal (雙峰)
 - E. None of A-D is true
13. The partial correlation coefficient between X and Y after controlling for Z shows a much weaker relationship than the Pearson's r computed for X and Y. This would be taken as evidence of a(n) _____ relationship between X and Y.
- A. direct
 - B. Spurious (虛假) or intervening (中介)
 - C. Interactive (互動)
 - D. Positive
 - E. None of A-D is true
14. In order for a least squares regression line to provide the most accurate predictions of the average value of the dependent variable y for a given value of x, which of the following results is considered to be desirable based on the data?
- A. An unexpectedly large value for the standard deviation of the residuals
 - B. A value of r^2 no larger than 0.50
 - C. A scatterplot of x and y values that shows a high degree of correlation between the variables
 - D. A plot of the residuals versus the x-values that shows an unexpectedly large amount of variation in the residuals
 - E. None of A-D is true

15-17. The marketing department of a large chain of automobile tire retail stores (汽車輪胎零售商) would like to pursue consumers interested in all-terrain tires. They wish to investigate the extent to which the amount of money spent on TV advertising (ADV) on Sundays is related to the sales revenue (收益, REV) for the week from this type of tire. They begin by selecting a random sample of 41 stores in various cities, and then determine the sample linear regression model based on the collected data. The following is the output from regression analysis:

Regression Analysis: $R^2=0.862$ n=41
 $r=0.929$
 Standard deviation of the residual=915.247 Dep. Var.= REV

Regression Output:

Variables	Coefficients	Std. Error	t(df=39)	p-value
Intercept	15,531.3086	573.7946	27.068	.000
ADV	5.4728	0.3503	15.625	.000

With the information given above, please answer questions 15-17 based on testing the hypothesis $H_0: \beta_1=0$ at a level of significance of $\alpha=.05$.

15. Which of the following is NOT a condition needed in order to perform this test for slope?
- A. X and Y are associated linearly.
 - B. The errors are evidently independent.
 - C. The residuals are nearly normal.
 - D. The variances of the residuals are linear.
 - E. All of A-D are necessary conditions.

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16. Does the result suggest that the model explains statistically variation in revenue?
- The p-value is large and therefore reject H_0 – the model is statistically significant.
 - The p-value is large and therefore do not reject H_0 – the model is not statistically significant.
 - The p-value is small and therefore reject H_0 – the model is statistically significant.
 - The p-value is small and therefore do not reject H_0 – the model is not statistically significant.
 - Answer cannot be determined from the information provided
17. Determine a 95% confidence interval for the slope β_1
- $5.4728 \pm (2.02) \frac{0.3503}{\sqrt{41}}$
 - $5.4728 \pm (2.02)(0.3503)$
 - $5.4728 \pm (1.96) \frac{0.3503}{\sqrt{41}}$
 - $5.4728 \pm (1.96)0.3503$
 - None of A-D is true.
18. Under what circumstances can a very small treatment effect be statistically significant?
- If the sample size big and the sample variance is small.
 - If the sample size and the sample variance are both big.
 - If the sample size is small and the sample variance is big.
 - If the sample size and the sample variance are both small.
 - None of A-D is true.
19. Under what circumstances will the distribution of sample means be normal?
- It is always normal.
 - Only if the population distribution is normal.
 - Only if the sample size is large enough (i.e. n is greater than 30)
 - If the population is normal or if the sample size is large enough, say, greater than 30.
 - None of A-D is true.

20-21 Every week a grocery store orders 5 cases of fresh oranges. Sometimes the cases have been damaged during transport. The following table includes a count of the number of damaged cases out of 5 for the 52 weeks in the year. The manager of the store proposes that the number of cases that are damaged out of the 5 each week follows a Binomial distribution. Please answer questions 20 and 21.

# of damages	# of cases
0	31
1	12
2	5
3	1
4	1
5	2

20. Find the Binomial parameter p needed to compute the expected counts.
- 0.15
 - 0.60
 - 0.40
 - 0.17
 - None of A-D is true.

21. Find the estimated probability that 2 of the 5 cases are damaged

- A. 0.0089
- B. 0.9734
- C. 0.3110
- D. 0.1382
- E. None of A-D is true.

22-23 A manufacturer of fitness equipment (健身器材的製造商)inspects (檢驗)a random sample of the welds (焊縫/焊接處) that are performed on various pieces of equipment in an effort to monitor the quality and strength of the equipment (以監控器材的品質). During one week, a random sample of 200 welds showed that 15 of the welds were defective(有缺陷的). Please answer questions 22 to 23.

22. Which of the following represents a 98% confidence interval for the population proportion of defective welds?

- A. (.056, .094)
- B. (.032, .118)
- C. (.072, .078)
- D. (.037, .112)
- E. (.064, .086)

23. The production manager states that he has computed a 95% confidence interval for the population proportion of defective welds, and that "the margin of error (誤差範圍) is .035." Which of the following is an appropriate interpretation for the margin of error in this case?

- A. He is 95% confident that the population proportion is .035.
- B. The sample proportion he computed is within .035 of the population proportion
- C. He is 95% confident that the population proportion is between 0 and .07.
- D. He is 95% confident that the population proportion is within .035 of the sample proportion he computed.
- E. The population proportion cannot differ from the sample proportion by more than .035 in either direction.

24. Confidence intervals are preferred to significance tests because they

- A. do not require a random sample
- B. provide more information
- C. describe sample variability
- D. assess importance
- E. All of the above

25. Sampling error occurs because

- A. The investigator choose the wrong sample (選樣錯誤)
- B. Of the operation of chance (隨機來的)
- C. Of a calculation error in obtaining the sample mean(樣本平均數計算錯誤)
- D. The measuring devices is flawed (測量工具有瑕疵)
- E. All of the above (以上皆是)

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※本大題請於答案卷內之「非選擇題作答區」標明題號依序作答。

二、計算與簡答題 (共 25 分)

1. (共 15 分) 在社會學的文獻中發現種族偏見在不同宗教信仰的人之間存在差異。根據 2002 年美國社會變遷調查(GSS)的資料，研究者將隸屬於不同宗教團體者(FUND)對「你認為是否應該立法禁止黑人與白人通婚？」(RACEMAR)該項問題的回應(贊成或反對)編製成下表：

Religious preference	Laws against marriage		Total
	Favor (贊成)	Oppose (反對)	
Fundamentalist (原教旨主義派)	39	142	181
Moderate (溫和派)	21	248	269
Liberal (自由主義派)	17	236	253
None (無宗教)	16	74	90
Total	93	700	793

- 1) 請問 Fundamentalist 中贊成立法禁止黑白種族通婚的勝算(odds)為?(2 分)
 - 2) 請問 Fundamentalist 與 Liberal 贊成立法禁止黑白種族通婚的勝算比(odds ratio)為?(3 分)
 - 3) 請使用適當的統計檢定方法來了解宗教信仰是否與黑白通婚態度有相關?請寫出虛無與對立假設、計算過程，以及結論。(10 分)
2. (共 10 分) 以下為使用性別(female 1 為女性; 0 為男性)、平時測驗成績(QuizAvg)，以及期中考成績(Midterm)來預測大一學生統計期末考的成績所進行的 OLS 迴歸分析結果。請根據此迴歸分析的結果，回答問題。

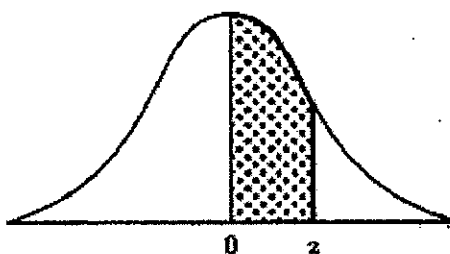
Source	SS	df	MS	Number of obs	=	50
Model	3111.52785	3	1037.17595	F(3, 46)	=	11.70
Residual	4079.19215	46	88.6780903	Prob > F	=	0.0000
Total	7190.72	49	146.749388	R-squared	=	0.4327
				Adj R-squared	=	0.3957
				Root MSE	=	9.4169

final	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
female	6.264099	2.790421	2.24	0.030	.6472737 11.88092
QuizAvg	.6764418	.1576337	4.29	0.000	.3591416 .993742
Midterm	-.0317909	.185193	-0.17	0.864	-.4045651 .3409832
_cons	17.86207	14.5137	1.23	0.225	-11.35249 47.07663

- 1) 請詮釋與期末考成績有顯著相關之預測變項的迴歸係數值及其 95%之信賴區間。(4 分)
- 2) 請依序詮釋 R-squared=0.4327 以及 Prob > F=0.0000 的意義(2 分)。
- 3) 請問預測變項迴歸係數的標準誤(Std. Err.)代表甚麼意思? 解釋時，請自行選擇一個自變項作為例子。(2 分)
- 4) MSE=88.678090，將其開根號後所得的數值為表中的 Root MSE。請問 Root MSE=9.4169 代表甚麼意思?(2 分)

Standard Normal Distribution (Z table)

Area Under the Normal Curve

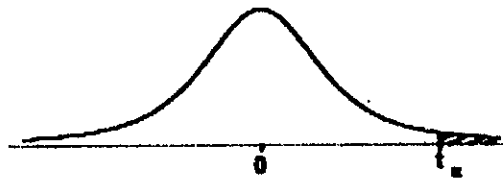


z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.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

Source: Abridged from Table I of *Statistical Tables and Formulas*, by A. Hoel (New York: John Wiley & Sons, Inc., 1952). Reproduced by permission of A. Hoel and the publishers, John Wiley & Sons, Inc.

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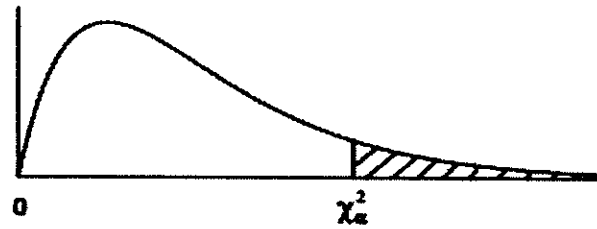
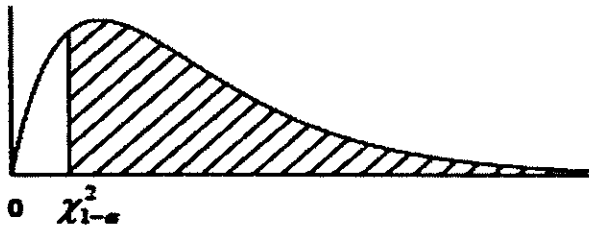
Upper critical values of Student's *T*-Distribution



Tail Area α						Tail Area α					
df	.10	.05	.025	.01	.005	df	.10	.05	.025	.01	.005
1	3.0777	6.3138	12.706	31.821	63.657	51	1.2984	1.6753	2.0076	2.4017	2.6757
2	1.8856	2.9200	4.3027	6.9646	9.9248	52	1.2980	1.6747	2.0068	2.4002	2.6737
3	1.6377	2.3534	3.1824	4.5407	5.8409	53	1.2977	1.6741	2.0057	2.3988	2.6718
4	1.5332	2.1318	2.7764	3.7469	4.6041	54	1.2974	1.6736	2.0049	2.3974	2.6700
5	1.4759	2.0150	2.5706	3.3649	4.0321	55	1.2971	1.6730	2.0040	2.3961	2.6682
6	1.4398	1.9432	2.4469	3.1427	3.7074	56	1.2969	1.6725	2.0032	2.3948	2.6665
7	1.4149	1.8946	2.3646	2.9980	3.4995	57	1.2966	1.6720	2.0025	2.3936	2.6649
8	1.3968	1.8595	2.3060	2.8965	3.3554	58	1.2963	1.6716	2.0017	2.3924	2.6633
9	1.3830	1.8331	2.2622	2.8214	3.2498	59	1.2961	1.6711	2.0010	2.3912	2.6618
10	1.3722	1.8125	2.2281	2.7638	3.1693	60	1.2958	1.6706	2.0003	2.3901	2.6603
11	1.3634	1.7959	2.2010	2.7181	3.1058	61	1.2956	1.6702	1.9998	2.3890	2.6589
12	1.3562	1.7823	2.1788	2.6810	3.0545	62	1.2954	1.6698	1.9990	2.3880	2.6575
13	1.3502	1.7709	2.1604	2.6503	3.0123	63	1.2951	1.6694	1.9983	2.3870	2.6561
14	1.3450	1.7613	2.1448	2.6245	2.9768	64	1.2949	1.6690	1.9977	2.3860	2.6549
15	1.3406	1.7531	2.1314	2.6025	2.9467	65	1.2947	1.6686	1.9971	2.3851	2.6536
16	1.3368	1.7459	2.1199	2.5835	2.9208	66	1.2945	1.6683	1.9966	2.3842	2.6524
17	1.3334	1.7396	2.1098	2.5669	2.8982	67	1.2943	1.6679	1.9960	2.3833	2.6512
18	1.3304	1.7341	2.1009	2.5524	2.8784	68	1.2941	1.6676	1.9955	2.3824	2.6501
19	1.3277	1.7291	2.0930	2.5395	2.8609	69	1.2939	1.6672	1.9949	2.3816	2.6490
20	1.3253	1.7247	2.0860	2.5280	2.8453	70	1.2938	1.6669	1.9944	2.3808	2.6479
21	1.3232	1.7207	2.0796	2.5176	2.8314	71	1.2936	1.6666	1.9939	2.3800	2.6469
22	1.3212	1.7171	2.0739	2.5083	2.8188	72	1.2934	1.6663	1.9935	2.3793	2.6459
23	1.3195	1.7139	2.0687	2.4999	2.8073	73	1.2933	1.6660	1.9930	2.3785	2.6449
24	1.3178	1.7109	2.0639	2.4922	2.7969	74	1.2931	1.6657	1.9925	2.3778	2.6439
25	1.3163	1.7081	2.0595	2.4851	2.7874	75	1.2929	1.6654	1.9921	2.3771	2.6430
26	1.3150	1.7056	2.0555	2.4786	2.7787	76	1.2928	1.6652	1.9917	2.3764	2.6421
27	1.3137	1.7033	2.0518	2.4727	2.7707	77	1.2926	1.6649	1.9913	2.3758	2.6412
28	1.3125	1.7011	2.0484	2.4671	2.7633	78	1.2925	1.6646	1.9908	2.3751	2.6403
29	1.3114	1.6991	2.0452	2.4620	2.7564	79	1.2924	1.6644	1.9905	2.3745	2.6395
30	1.3104	1.6973	2.0423	2.4573	2.7500	80	1.2922	1.6641	1.9901	2.3739	2.6387
31	1.3095	1.6955	2.0395	2.4528	2.7440	81	1.2921	1.6639	1.9897	2.3733	2.6379
32	1.3086	1.6939	2.0369	2.4487	2.7385	82	1.2920	1.6636	1.9893	2.3727	2.6371
33	1.3077	1.6924	2.0345	2.4448	2.7333	83	1.2918	1.6634	1.9890	2.3721	2.6364
34	1.3070	1.6909	2.0322	2.4411	2.7284	84	1.2917	1.6632	1.9886	2.3716	2.6356
35	1.3062	1.6896	2.0301	2.4377	2.7238	85	1.2916	1.6630	1.9883	2.3710	2.6349
36	1.3055	1.6883	2.0281	2.4345	2.7195	86	1.2915	1.6628	1.9879	2.3705	2.6342
37	1.3049	1.6871	2.0262	2.4314	2.7154	87	1.2914	1.6626	1.9876	2.3700	2.6335
38	1.3042	1.6860	2.0244	2.4286	2.7116	88	1.2912	1.6624	1.9873	2.3695	2.6329
39	1.3036	1.6849	2.0227	2.4258	2.7079	89	1.2911	1.6622	1.9870	2.3690	2.6322
40	1.3031	1.6839	2.0211	2.4233	2.7045	90	1.2910	1.6620	1.9867	2.3685	2.6316
41	1.3025	1.6829	2.0195	2.4208	2.7012	91	1.2909	1.6618	1.9864	2.3680	2.6309
42	1.3020	1.6820	2.0181	2.4185	2.6981	92	1.2908	1.6616	1.9861	2.3676	2.6303
43	1.3016	1.6811	2.0167	2.4163	2.6951	93	1.2907	1.6614	1.9858	2.3671	2.6297
44	1.3011	1.6802	2.0154	2.4141	2.6923	94	1.2906	1.6612	1.9855	2.3667	2.6291
45	1.3006	1.6794	2.0141	2.4121	2.6896	95	1.2905	1.6611	1.9853	2.3662	2.6286
46	1.3002	1.6787	2.0129	2.4102	2.6870	96	1.2904	1.6609	1.9850	2.3658	2.6280
47	1.2998	1.6779	2.0117	2.4083	2.6846	97	1.2903	1.6607	1.9847	2.3654	2.6275
48	1.2994	1.6772	2.0106	2.4066	2.6822	98	1.2902	1.6606	1.9845	2.3650	2.6269
49	1.2991	1.6766	2.0096	2.4049	2.6800	99	1.2902	1.6604	1.9842	2.3646	2.6264
50	1.2987	1.6759	2.0086	2.4033	2.6778	100	1.2901	1.6602	1.9840	2.3642	2.6259
∞	1.2816	1.6449	1.9600	2.3263	2.5758						

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Upper Critical Values of the Chi-Square Distribution



Tail Area 1 - α					
df	.995	.99	.975	.95	.90
1	0.000	0.000	0.001	0.004	0.016
2	0.010	0.020	0.051	0.103	0.211
3	0.072	0.115	0.216	0.352	0.584
4	0.207	0.297	0.484	0.711	1.064
5	0.412	0.554	0.831	1.145	1.610
6	0.676	0.872	1.237	1.635	2.204
7	0.989	1.239	1.690	2.167	2.833
8	1.344	1.646	2.180	2.733	3.490
9	1.735	2.088	2.700	3.325	4.168
10	2.156	2.558	3.247	3.940	4.865
11	2.603	3.053	3.816	4.575	5.578
12	3.074	3.571	4.404	5.226	6.304
13	3.565	4.107	5.009	5.892	7.042
14	4.075	4.660	5.629	6.571	7.790
15	4.601	5.229	6.262	7.261	8.547
16	5.142	5.812	6.908	7.962	9.312
17	5.697	6.406	7.564	8.672	10.085
18	6.265	7.015	8.231	9.390	10.865
19	6.844	7.633	8.907	10.117	11.651
20	7.434	8.260	9.591	10.851	12.443
21	8.034	8.897	10.283	11.591	13.240
22	8.643	9.542	10.982	12.338	14.041
23	9.260	10.196	11.689	13.091	14.848
24	9.886	10.856	12.401	13.848	15.659
25	10.520	11.524	13.120	14.611	16.473
26	11.160	12.198	13.844	15.379	17.292
27	11.808	12.879	14.573	16.151	18.114
28	12.461	13.565	15.308	16.928	18.939
29	13.121	14.256	16.047	17.708	19.768
30	13.787	14.953	16.791	18.493	20.599
31	14.458	15.655	17.539	19.281	21.434
32	15.134	16.362	18.291	20.072	22.271
33	15.815	17.073	19.047	20.867	23.110
34	16.501	17.789	19.806	21.664	23.952
35	17.192	18.509	20.569	22.465	24.797
36	17.887	19.233	21.336	23.269	25.643
37	18.586	19.960	22.106	24.075	26.492
38	19.289	20.691	22.878	24.884	27.343
39	19.996	21.426	23.654	25.695	28.196
40	20.707	22.164	24.433	26.509	29.051
41	21.421	22.906	25.215	27.326	29.907
42	22.138	23.650	25.999	28.144	30.765
43	22.859	24.398	26.785	28.965	31.625
44	23.584	25.148	27.575	29.787	32.487
45	24.311	25.901	28.366	30.612	33.350
46	25.041	26.657	29.160	31.439	34.215
47	25.775	27.416	29.956	32.268	35.081
48	26.511	28.177	30.755	33.098	35.949
49	27.249	28.941	31.555	33.930	36.818
50	27.991	29.707	32.357	34.764	37.689

Tail Area α					
df	.10	.05	.025	.01	.005
1	2.706	3.841	5.024	6.635	7.879
2	4.605	5.991	7.378	9.210	10.597
3	6.251	7.815	9.348	11.345	12.838
4	7.779	9.488	11.143	13.277	14.860
5	9.236	11.070	12.833	15.086	16.750
6	10.645	12.592	14.449	16.812	18.548
7	12.017	14.067	16.013	18.475	20.278
8	13.362	15.507	17.535	20.090	21.955
9	14.684	16.919	19.023	21.666	23.589
10	15.987	18.307	20.483	23.209	25.188
11	17.275	19.675	21.920	24.725	26.757
12	18.549	21.026	23.337	26.217	28.300
13	19.812	22.362	24.736	27.688	29.819
14	21.064	23.685	26.119	29.141	31.319
15	22.307	24.996	27.488	30.578	32.801
16	23.542	26.296	28.845	32.000	34.267
17	24.769	27.587	30.191	33.409	35.718
18	25.989	28.869	31.526	34.805	37.156
19	27.204	30.144	32.852	36.191	38.582
20	28.412	31.410	34.170	37.566	39.997
21	29.615	32.671	35.479	38.932	41.401
22	30.813	33.924	36.781	40.289	42.796
23	32.007	35.172	38.076	41.638	44.181
24	33.198	36.415	39.364	42.980	45.559
25	34.382	37.652	40.646	44.314	46.928
26	35.563	38.885	41.923	45.642	48.290
27	36.741	40.113	43.195	46.963	49.645
28	37.916	41.337	44.461	48.278	50.993
29	39.087	42.557	45.722	49.588	52.336
30	40.256	43.773	46.979	50.892	53.672
31	41.422	44.985	48.232	52.191	55.003
32	42.585	46.194	49.480	53.486	56.328
33	43.745	47.400	50.725	54.776	57.648
34	44.903	48.602	51.966	56.061	58.964
35	46.059	49.802	53.203	57.342	60.275
36	47.212	50.998	54.437	58.619	61.581
37	48.363	52.192	55.668	59.892	62.883
38	49.513	53.384	56.895	61.162	64.181
39	50.660	54.572	58.120	62.428	65.476
40	51.805	55.758	59.342	63.691	66.766
41	52.949	56.942	60.561	64.950	68.053
42	54.090	58.124	61.777	66.206	69.336
43	55.230	59.304	62.990	67.459	70.616
44	56.369	60.481	64.201	68.709	71.893
45	57.505	61.656	65.410	69.957	73.166
46	58.641	62.830	66.617	71.201	74.437
47	59.774	64.001	67.821	72.443	75.704
48	60.907	65.171	69.023	73.683	76.969
49	62.038	66.339	70.222	74.919	78.231
50	63.167	67.505	71.420	76.154	79.490