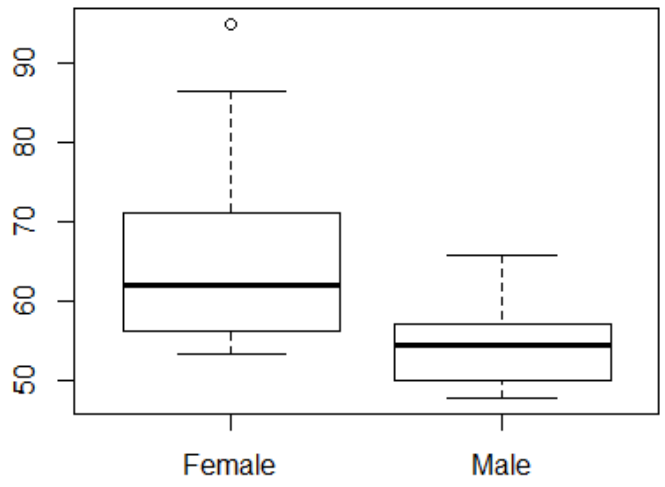
Name: _____ **School:** _____

University of Houston Mathematics Contest: Statistics Exam 2018

Directions: Select the best one answer. Tables are available at end of this test.

1. The following is a side by side box plot of swim times in seconds for the 100 meter race of male and female swimmers.



Which statement is true about the swim times of the male and female swimmers?

a. Males swim times have a higher variance.
b. The swim times for male swimmers and female swimmers on average is the same.
c. There are more female swimmers than male swimmers.
d. About 75% of the male swimmers swim faster than the average of the female swimmers.
e. The mean swim time for female swimmers is 62 seconds.

2. Suppose home sales prices have a mean of $300,000 and a standard deviation of $50,000. Determine the minimum percentage of the houses that should sell for prices between $170,000 and $430,000.

a. 99%
b. 85.2%
c. 97.7%
d. 86.7%
e. 80%

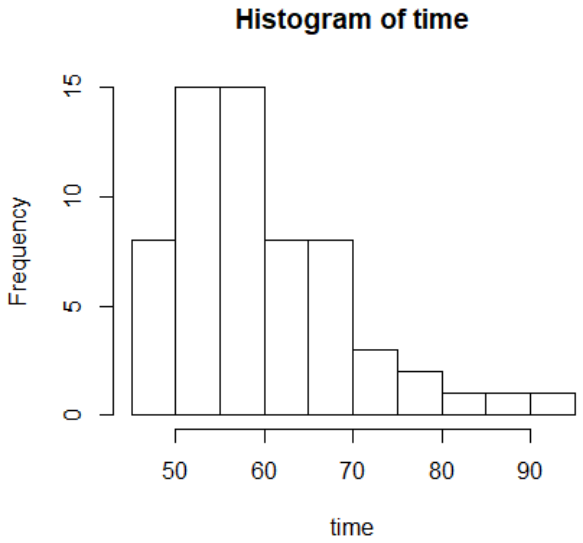
3. The following is the five number summary of 35 values.

   1.0 16.0 48.5 67.0 100.0

   How many numbers are strictly less than 16?

   a. 25
   b. 9
   c. 17
   d. 8
   e. 2

4. The following is a histogram for the waiting time for a dentist. The bin width for the bars are in increments of 5 minutes.



   Which of the following could be the mean for the waiting time?

   a. 55
   b. 60
   c. 70
   d. 50
   e. 75

5. For two events, E and F, P(E) = 0.7, P(F) = 0.4 and P(E ∩ F) = 0.1. Which statement is true?

   a. The events E and F are pairwise disjoint events.
   b. The events E and F are independent events.
   c. Either E occurs or F occurs all the time.
   d. The events E and F are both pairwise disjoint and independent events.
   e. None of these are true.

6. A service organization in a large town organizes a raffle each month. One thousand raffle tickets are sold for $1 each. Each has an equal chance of winning. First prize is $300, second prize is $200, and third prize is $100. Let *X* denote the net gain for the town from the purchase of one ticket. What is the expected value of the net gain from the purchase of one ticket?

   a. $200
   b. $0.40
   c. $149.75
   d. -$100
   e. -$1

7. An exam score has a mean of 65 and a standard deviation of 7. Suppose the instructor wants to add 10 to everyone's score. What is the standard deviation of the curved scores?

   a. 17
   b. 75
   c. 4
   d. 0
   e. 7

8. The manager of a hotel wants to compare the effectiveness of two laundry detergents. Detergent A and Detergent B, in cleaning the sheets for the beds. The manager decides to clean 10 sheets in the same washing machine at a time. The manager flips a coin to determine whether Detergent A or Detergent B will be used for that load. The cleanliness of the load of sheets is rated on a scale of 1 to 10 by a person who does not know which detergent was used. The manager continues this experiment for many day. Which of the following best describes the manager's study?

   a. A completely randomized design.
   b. A randomized block design with Detergent A and Detergent B as blocks.
   c. A randomized block design with the washing machine as the block.
   d. A matched-pairs design with Detergent A and Detergent B as the pair.
   e. An observational study.

9. The following table has the number of cars of various types at a local dealership.

	Sedan	SUV
New	24	15
Used	9	12

   Calculate the probability that a randomly selected car is either used or an SUV.

   a. 0.6
   b. 0.8
   c. 0.33
   d. 0.12
   e. 0.75

10. A store has 20 laptop computers, 3 of which have a defect. A school orders 5 of these laptops. What is the probability that at least one computers in the school's order has a defect?

    a. 0.75
    b. 0.05
    c. 0.15
    d. 0.60
    e. 0.46

11. An FBI survey shows that about 80% of all property crimes go unsolved. Suppose that in your town 3 such crimes are committed and they are each deemed independent of each other. What is the probability that all three crimes will be solved?

    a. 0.512
    b. 0.008
    c. 0.488
    d. 0.992
    e. 0.24

12. A report claims that 15% of men are left-handed. Calculate the probability that 11% to 16% of a 75-man sample is left-handed.

    a. 0.57
    b. 0.18
    c. 0.27
    d. 0.43
    e. 0.3333

13. A study reports the mean change in HDL (high-density lipoprotein, or "good" cholesterol) of adults eating raw garlic six days a week for six months. The margin of error for a 95% confidence interval is given as plus or minus 5 milligrams per deciliter of blood (mg/dl). This means that

    a. We can be certain that the study results is within 5 mg/dl of the truth about the population.
    b. We could be certain that the study result is within 5 mg/dl of the truth about the population, if the conditions for inferences were satisfied.
    c. The study used a method that gives a results within 5 mg/dl of the truth about the population in 95% of all samples.
    d. There is a 95% probability that the true population mean is within 5 mg/dl.
    e. 95% percent of the population has changed their HDL after eating raw garlic six days a week for six months.

14. A pilot sample of 50 voters found that 30 of them voted in the last election. How many more voters must be sampled to construct a 98% confidence interval with a width of 0.08?

    a. 762
    b. 763
    c. 203
    d. 812
    e. 811

15. Suppose you wish to perform a hypothesis test for a population mean. Suppose that the population standard deviation is unknown, the population is skewed to the right, and the sample is large. Would you perform a z-test or t-test?

    a. The t-test is appropriate
    b. Either test is appropriate
    c. The z-test is appropriate
    d. Neither test is appropriate

16. In a random sample of 230 men (18 and older), 157 are married. Construct a 92% confidence interval to estimate the true proportion of married men (18 and older).

    a. (0.629, 0.726)
    b. (0.629, 0.736)
    c. (0.652, 0.713)
    d. (0.639, 0.726)
    e. None of the above.

17. A sample of 30 boxes of cereal has a standard deviation of 0.81 ounces. Construct a 95% confidence interval to estimate the true standard deviation of the filling process for the boxes of cereal.

    a. (0.52, 1.10)
    b. (0.416, 1.186)
    c. (0.645, 1.089)
    d. (0.717, 1.210)
    e. (0.514, 1.464)

18. A pizza delivery company claims that its average delivery time is at most 45 minutes, this is the null hypothesis. Any driver that has a mean delivery time of less than 45 minutes gets a bonus in their paycheck. One driver did get that bonus but really his mean delivery time was 55 minutes. This is an example of

    a. Type I error
    b. Type II error
    c. Type III error
    d. Correct decision

19. A certain exam grade was based on a "bell curve." An instructor decides to give A's to students who score in the top 15% on their exam, C's to those who scored in the bottom 25%, and B's to the rest. Suppose that the exam scores are Normally distributed. What would be the mean and standard deviation if any one who scored 95.5 or above is an A and anyone who scored less than 70 is a C.

    a. $\mu = 80; \sigma = 15$
    b. $\mu = 80; \sigma = 16$
    c. $\mu = 82.5; \sigma = 12.75$
    d. $\mu = 95.5; \sigma = 64.5$
    e. $\mu = 0; \sigma = 1$

20. A manufacturer claims its Brand A flashlight lasts longer than its competitor's Brand B flashlight. Nine flashlights of each brand are tested independently, and the hours of the flashlight life are shown in the table below.

Brand A	106	105	102	100	99	96	91	92	108
Brand B	103	99	103	85	102	105	81	110	89

    Provided that the assumptions for inference are met, which of the following tests should be conducted then determine if Brand A flashlights do, in fact, last longer than Brand B flashlights.

    a. A one-sided, pair t-test
    b. A one-sided, two-sample t-test
    c. A two-sided, two-sample t-test
    d. A one-sided, two-sample z-test
    e. A two-sided, pair t-test

21. Marie is getting married tomorrow at an outdoor ceremony in the desert. In recent years, it has rained only 5 days each year. Unfortunately, the weatherman has predicted rain for tomorrow. When it actually rains, the weatherman correctly forecasts rain 90% of the time. When it doesn't rain, he incorrectly forecasts rain 10% of the time. What is the probability that it will rain on the day of Marie's wedding, given the weatherman forecasts rain?

    a. 0.9
    b. 0.09
    c. 0.11
    d. 0.10
    e. 0.01

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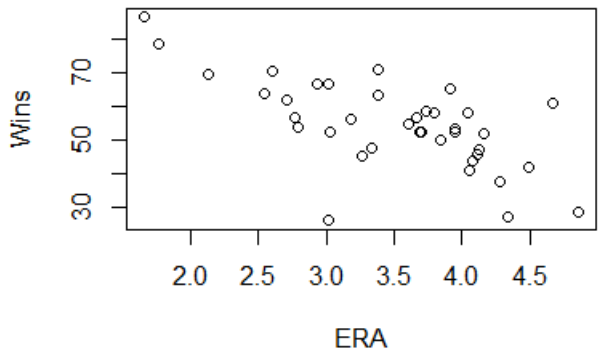
22. The following is a scatterplot of the number of Wins and ERA for Major League Baseball for 2015 season.



Which is the best value for correlation coefficient?

a. -0.97
b. -0.67
c. 0.67
d. 0.97
e. -0.01

23. A regression analysis of company profits and the amount of money the company spent on advertising found the coefficient of determination, $r^2 = 0.84$. Which of these is true?

I. This model can correctly predict the profit for 84% of companies.
II. On average, about 84% of a company's profit results from advertising.
III. On average, companies spend about 84% of their profits on advertising.

a. I only
b. II only
c. III only
d. I and III
e. None

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24. The cos t of a home depends on the number of bedrooms in the house. Suppose the following data is recorded for homes in a given town

price (in thousands)	300	250	400	550	317	389	425	289	389	559
No. bedrooms	3	3	4	5	4	3	6	3	4	5

A regression analysis for the data produced the following output

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)    94.40      97.98   0.963   0.3635
bed            73.10      23.76   3.076   0.0152 *
```

To test the hypothesis that an extra bedroom costs $60,000 against the alternative that it costs more, what is the p-value?

a. 0.0152
b. 0.0076
c. 0.2982
d. 0.5964
e. 0.5513

25. Some believe that if a car is red it is more likely to be in an accident. Other say that if the car is yellow it is at a higher risk of being in an accident. The following is a two-way table to determine if there is an association between the color of car and if it is in the accident.

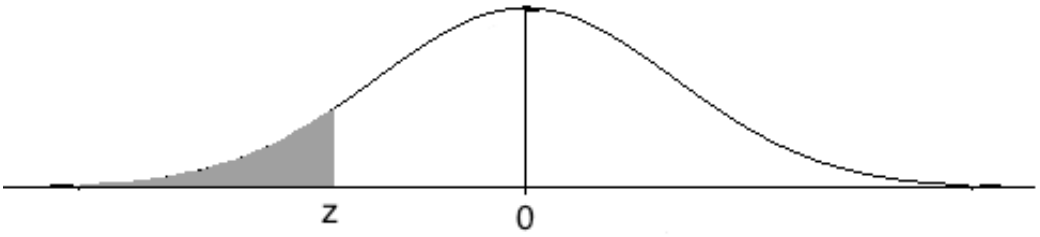
Accident By Color of Car

Count	Red	White	Yellow	
No	23	30	22	75
Yes	28	36	33	97
	51	66	55	172

Which is the best result for the test of association?

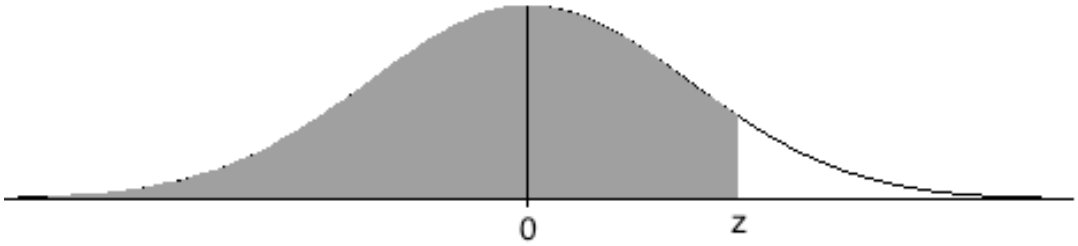
a. The data does not provide sufficient evidence to conclude that car color and being in an accident are dependent, p-value > 0.1
b. The data provide sufficient evidence to conclude that being in an accident is dependent on color of car, p-value < 0.1
c. More white cars are in an accident.
d. The data does not provide sufficient evidence to conclude that car color and being in an accident are dependent, p-value < 0.1
e. We do not have enough information.

Table of Standard Normal Probabilities for Negative Z-scores



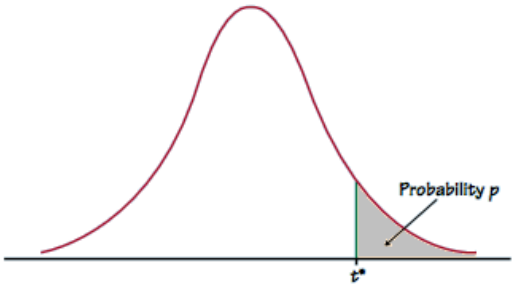
z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Table of Standard Normal Probabilities for Positive Z-scores



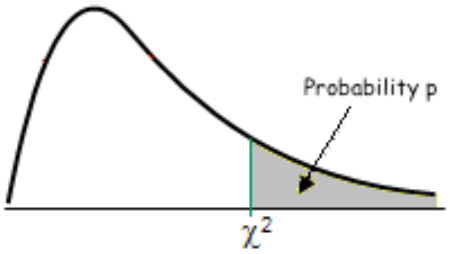
z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Table entry for p and C is the critical value t* with probability p lying to its right and probability C lying between –t* and t*



	Upper tail probability *p*											
df	**0.25**	**0.20**	**0.15**	**0.10**	**0.05**	**0.025**	**0.02**	**0.01**	**0.005**	**0.0025**	**0.001**	**0.0005**
1	1.000	1.376	1.963	3.078	6.314	12.706	15.895	31.821	63.657	127.321	318.309	636.619
2	0.8165	1.0607	1.3862	1.8856	2.9200	4.3027	4.8487	6.9646	9.9248	14.0890	22.3271	31.5991
3	0.7649	0.9785	1.2498	1.6377	2.3534	3.1824	3.4819	4.5407	5.8409	7.4533	10.2145	12.9240
4	0.7407	0.9410	1.1896	1.5332	2.1318	2.7764	2.9985	3.7469	4.6041	5.5976	7.1732	8.6103
5	0.7267	0.9195	1.1558	1.4759	2.0150	2.5706	2.7565	3.3649	4.0321	4.7733	5.8934	6.8688
6	0.7176	0.9057	1.1342	1.4398	1.9432	2.4469	2.6122	3.1427	3.7074	4.3168	5.2076	5.9588
7	0.7111	0.8960	1.1192	1.4149	1.8946	2.3646	2.5168	2.9980	3.4995	4.0293	4.7853	5.4079
8	0.7064	0.8889	1.1081	1.3968	1.8595	2.3060	2.4490	2.8965	3.3554	3.8325	4.5008	5.0413
9	0.7027	0.8834	1.0997	1.3830	1.8331	2.2622	2.3984	2.8214	3.2498	3.6897	4.2968	4.7809
10	0.6998	0.8791	1.0931	1.3722	1.8125	2.2281	2.3593	2.7638	3.1693	3.5814	4.1437	4.5869
11	0.6974	0.8755	1.0877	1.3634	1.7959	2.2010	2.3281	2.7181	3.1058	3.4966	4.0247	4.4370
12	0.6955	0.8726	1.0832	1.3562	1.7823	2.1788	2.3027	2.6810	3.0545	3.4284	3.9296	4.3178
13	0.6938	0.8702	1.0795	1.3502	1.7709	2.1604	2.2816	2.6503	3.0123	3.3725	3.8520	4.2208
14	0.6924	0.8681	1.0763	1.3450	1.7613	2.1448	2.2638	2.6245	2.9768	3.3257	3.7874	4.1405
15	0.6912	0.8662	1.0735	1.3406	1.7531	2.1314	2.2485	2.6025	2.9467	3.2860	3.7328	4.0728
16	0.6901	0.8647	1.0711	1.3368	1.7459	2.1199	2.2354	2.5835	2.9208	3.2520	3.6862	4.0150
17	0.6892	0.8633	1.0690	1.3334	1.7396	2.1098	2.2238	2.5669	2.8982	3.2224	3.6458	3.9651
18	0.6884	0.8620	1.0672	1.3304	1.7341	2.1009	2.2137	2.5524	2.8784	3.1966	3.6105	3.9216
19	0.6876	0.8610	1.0655	1.3277	1.7291	2.0930	2.2047	2.5395	2.8609	3.1737	3.5794	3.8834
20	0.6870	0.8600	1.0640	1.3253	1.7247	2.0860	2.1967	2.5280	2.8453	3.1534	3.5518	3.8495
21	0.6864	0.8591	1.0627	1.3232	1.7207	2.0796	2.1894	2.5176	2.8314	3.1352	3.5272	3.8193
22	0.6858	0.8583	1.0614	1.3212	1.7171	2.0739	2.1829	2.5083	2.8188	3.1188	3.5050	3.7921
23	0.6853	0.8575	1.0603	1.3195	1.7139	2.0687	2.1770	2.4999	2.8073	3.1040	3.4850	3.7676
24	0.6848	0.8569	1.0593	1.3178	1.7109	2.0639	2.1715	2.4922	2.7969	3.0905	3.4668	3.7454
25	0.6844	0.8562	1.0584	1.3163	1.7081	2.0595	2.1666	2.4851	2.7874	3.0782	3.4502	3.7251
26	0.6840	0.8557	1.0575	1.3150	1.7056	2.0555	2.1620	2.4786	2.7787	3.0669	3.4350	3.7066
27	0.6837	0.8551	1.0567	1.3137	1.7033	2.0518	2.1578	2.4727	2.7707	3.0565	3.4210	3.6896
28	0.6834	0.8546	1.0560	1.3125	1.7011	2.0484	2.1539	2.4671	2.7633	3.0469	3.4082	3.6739
29	0.6830	0.8542	1.0553	1.3114	1.6991	2.0452	2.1503	2.4620	2.7564	3.0380	3.3962	3.6594
30	0.6828	0.8538	1.0547	1.3104	1.6973	2.0423	2.1470	2.4573	2.7500	3.0298	3.3852	3.6460
40	0.6807	0.8507	1.0500	1.3031	1.6839	2.0211	2.1229	2.4233	2.7045	2.9712	3.3069	3.5510
50	0.6794	0.8489	1.0473	1.2987	1.6759	2.0086	2.1087	2.4033	2.6778	2.9370	3.2614	3.4960
60	0.6786	0.8477	1.0455	1.2958	1.6706	2.0003	2.0994	2.3901	2.6603	2.9146	3.2317	3.4602
80	0.6776	0.8461	1.0432	1.2922	1.6641	1.9901	2.0878	2.3739	2.6387	2.8870	3.1953	3.4163
100	0.6770	0.8452	1.0418	1.2901	1.6602	1.9840	2.0809	2.3642	2.6259	2.8707	3.1737	3.3905
1000	0.6747	0.8420	1.0370	1.2824	1.6464	1.9623	2.0564	2.3301	2.5808	2.8133	3.0984	3.3003
z*	0.6745	0.8416	1.0364	1.2816	1.6449	1.9600	2.0537	2.3263	2.5758	2.8070	3.0902	3.2905
	50%	60%	70%	80%	90%	95%	96%	98%	99%	99.5%	99.8%	99.9%
	Confidence Level *C*											

Table entry for p is the critical value χ^2 with probability p lying to its right.



	Upper tail probability *p*											
df	**0.25**	**0.20**	**0.15**	**0.10**	**0.05**	**0.025**	**0.02**	**0.01**	**0.005**	**0.0025**	**0.001**	**0.0005**
1	1.323	1.642	2.072	2.706	3.841	5.024	5.412	6.635	7.879	9.141	10.828	12.116
2	2.773	3.219	3.794	4.605	5.991	7.378	7.824	9.210	10.597	11.983	13.816	15.202
3	4.108	4.642	5.317	6.251	7.815	9.348	9.837	11.345	12.838	14.320	16.266	17.730
4	5.385	5.989	6.745	7.779	9.488	11.143	11.668	13.277	14.860	16.424	18.467	19.997
5	6.626	7.289	8.115	9.236	11.070	12.833	13.388	15.086	16.750	18.386	20.515	22.105
6	7.841	8.558	9.446	10.645	12.592	14.449	15.033	16.812	18.548	20.249	22.458	24.103
7	9.037	9.803	10.748	12.017	14.067	16.013	16.622	18.475	20.278	22.040	24.322	26.018
8	10.219	11.030	12.027	13.362	15.507	17.535	18.168	20.090	21.955	23.774	26.124	27.868
9	11.389	12.242	13.288	14.684	16.919	19.023	19.679	21.666	23.589	25.462	27.877	29.666
10	12.549	13.442	14.534	15.987	18.307	20.483	21.161	23.209	25.188	27.112	29.588	31.420
11	13.701	14.631	15.767	17.275	19.675	21.920	22.618	24.725	26.757	28.729	31.264	33.137
12	14.845	15.812	16.989	18.549	21.026	23.337	24.054	26.217	28.300	30.318	32.909	34.821
13	15.984	16.985	18.202	19.812	22.362	24.736	25.472	27.688	29.819	31.883	34.528	36.478
14	17.117	18.151	19.406	21.064	23.685	26.119	26.873	29.141	31.319	33.426	36.123	38.109
15	18.245	19.311	20.603	22.307	24.996	27.488	28.259	30.578	32.801	34.950	37.697	39.719
16	19.369	20.465	21.793	23.542	26.296	28.845	29.633	32.000	34.267	36.456	39.252	41.308
17	20.489	21.615	22.977	24.769	27.587	30.191	30.995	33.409	35.718	37.946	40.790	42.879
18	21.605	22.760	24.155	25.989	28.869	31.526	32.346	34.805	37.156	39.422	42.312	44.434
19	22.718	23.900	25.329	27.204	30.144	32.852	33.687	36.191	38.582	40.885	43.820	45.973
20	23.828	25.038	26.498	28.412	31.410	34.170	35.020	37.566	39.997	42.336	45.315	47.498
21	24.935	26.171	27.662	29.615	32.671	35.479	36.343	38.932	41.401	43.775	46.797	49.011
22	26.039	27.301	28.822	30.813	33.924	36.781	37.659	40.289	42.796	45.204	48.268	50.511
23	27.141	28.429	29.979	32.007	35.172	38.076	38.968	41.638	44.181	46.623	49.728	52.000
24	28.241	29.553	31.132	33.196	36.415	39.364	40.270	42.980	45.559	48.034	51.179	53.479
25	29.339	30.675	32.282	34.382	37.652	40.646	41.566	44.314	46.928	49.435	52.620	54.947
26	30.435	31.795	33.429	35.563	38.885	41.923	42.856	45.642	48.290	50.829	54.052	56.407
27	31.528	32.912	34.574	36.741	40.113	43.195	44.140	46.963	49.645	52.215	55.476	57.858
28	32.620	34.027	35.715	37.916	41.337	44.461	45.419	48.278	50.993	53.594	56.892	59.300
29	33.711	35.139	36.854	39.087	42.557	45.722	46.693	49.588	52.336	54.967	58.301	60.735
30	34.800	36.250	37.990	40.256	43.773	46.979	47.962	50.892	53.672	56.332	59.703	62.162
40	45.616	47.269	49.244	51.805	55.758	59.342	60.436	63.691	66.766	69.699	73.402	76.095
50	56.334	58.164	60.346	63.167	67.505	71.420	72.613	76.154	79.490	82.664	86.661	89.561
60	66.981	68.972	71.341	74.397	79.082	83.298	84.580	88.379	91.952	95.344	99.607	102.695
80	88.130	90.405	93.106	96.578	101.879	106.629	108.069	112.329	116.321	120.102	124.839	128.261
100	109.141	111.667	114.659	118.498	124.342	129.561	131.142	135.807	140.169	144.293	149.449	153.167