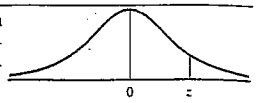
Areas of the Standard Normal Distribution

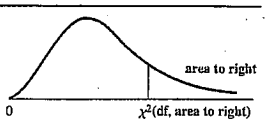
The entries in this table are the probabilities that a random variable, with a standard normal distribution, assumes a value between 0 and z; the probability is represented by the shaded area under the curve in the accompanying figure. Areas for negative values of z are obtained by symmetry.



	Second Decimal Place in z									
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
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999

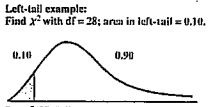
Critical Values of χ^2 ("Chi-Square") Distribution

The entries in this table, χ^2 (df, α), are the critical values for the χ^2 distribution for which the area under the curve to the right is α.



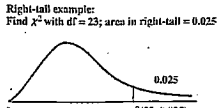
	Area to the Right												
	0.995	0.99	0.975	0.95	0.90	0.75	0.50	0.25	0.10	0.05	0.025	0.01	0.005
	Area in Left-hand Tail						Median			Area in Right-hand Tail			
	0.005	0.01	0.025	0.05	0.10	0.25	0.50	0.25	0.10	0.05	0.025	0.01	0.005
1	0.0000393	0.000157	0.000982	0.00393	0.0158	0.101	0.455	1.32	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	0.575	1.39	2.77	4.61	5.99	7.38	9.21	10.6
3	0.0717	0.115	0.216	0.352	0.584	1.21	2.37	4.11	6.25	7.82	9.35	11.3	12.8
4	0.207	0.297	0.484	0.711	1.06	1.92	3.36	5.39	7.78	9.49	11.1	13.3	14.9
5	0.412	0.554	0.831	1.15	1.61	2.67	4.35	6.63	9.24	11.1	12.8	15.1	16.8
6	0.676	0.872	1.24	1.64	2.20	3.45	5.35	7.84	10.6	12.6	14.5	16.8	18.6
7	0.990	1.24	1.69	2.17	2.83	4.25	6.35	9.04	12.0	14.1	16.0	18.5	20.3
8	1.34	1.65	2.18	2.73	3.49	5.07	7.34	10.2	13.4	15.5	17.5	20.1	22.0
9	1.73	2.09	2.70	3.33	4.17	5.90	8.34	11.4	14.7	16.9	19.0	21.7	23.6
10	2.16	2.56	3.25	3.94	4.87	6.74	9.34	12.5	16.0	18.3	20.5	23.2	25.2
11	2.60	3.05	3.82	4.57	5.58	7.58	10.34	13.7	17.3	19.7	21.9	24.7	26.8
12	3.07	3.57	4.40	5.23	6.30	8.44	11.34	14.8	18.5	21.0	23.3	26.2	28.3
13	3.57	4.11	5.01	5.89	7.04	9.30	12.34	16.0	19.8	22.4	24.7	27.7	29.8
14	4.07	4.66	5.63	6.57	7.79	10.2	13.34	17.1	21.1	23.7	26.1	29.1	31.3
15	4.60	5.23	6.26	7.26	8.55	11.0	14.34	18.2	22.3	25.0	27.5	30.6	32.8
16	5.14	5.81	6.91	7.96	9.31	11.9	15.34	19.4	23.5	26.3	28.8	32.0	34.3
17	5.70	6.41	7.56	8.67	10.1	12.8	16.34	20.5	24.8	27.6	30.2	33.4	35.7
18	6.26	7.01	8.23	9.39	10.9	13.7	17.34	21.6	26.0	28.9	31.5	34.8	37.2
19	6.84	7.63	8.91	10.1	11.7	14.6	18.34	22.7	27.2	30.1	32.9	36.2	38.6
20	7.43	8.26	9.59	10.9	12.4	15.5	19.34	23.8	28.4	31.4	34.2	37.6	40.0
21	8.03	8.90	10.3	11.6	13.2	16.3	20.34	24.9	29.6	32.7	35.5	38.9	41.4
22	8.64	9.54	11.0	12.3	14.0	17.2	21.34	26.0	30.8	33.9	36.8	40.3	42.8
23	9.26	10.2	11.7	13.1	14.8	18.1	22.34	27.1	32.0	35.2	38.1	41.6	44.2
24	9.89	10.9	12.4	13.8	15.7	19.0	23.34	28.2	33.2	36.4	39.4	43.0	45.6
25	10.5	11.5	13.1	14.6	16.5	19.9	24.34	29.3	34.4	37.7	40.6	44.3	46.9
26	11.2	12.2	13.8	15.4	17.3	20.8	25.34	30.4	35.6	38.9	41.9	45.6	48.3
27	11.8	12.9	14.6	16.2	18.1	21.7	26.34	31.5	36.7	40.1	43.2	47.0	49.6
28	12.5	13.6	15.3	16.9	18.9	22.7	27.34	32.6	37.9	41.3	44.5	48.3	51.0
29	13.1	14.3	16.0	17.7	19.8	23.6	28.34	33.7	39.1	42.6	45.7	49.6	52.3
30	13.8	15.0	16.8	18.5	20.6	24.5	29.34	34.8	40.3	43.8	47.0	50.9	53.7
40	20.7	22.2	24.4	26.5	29.1	33.7	39.34	45.6	51.8	55.8	59.3	63.7	66.8
50	28.0	29.7	32.4	34.8	37.7	42.9	49.33	56.3	63.2	67.5	71.4	76.2	79.5
60	35.5	37.5	40.5	43.2	46.5	52.3	59.33	67.0	74.4	79.1	83.3	88.4	92.0
70	43.3	45.4	48.8	51.7	55.3	61.7	69.33	77.6	85.5	90.5	95.0	100.0	104.0
80	51.2	53.5	57.2	60.4	64.3	71.1	79.33	88.1	96.6	102.0	107.0	112.0	116.0
90	59.2	61.8	65.6	69.1	73.3	80.6	89.33	98.6	108.0	113.0	118.0	124.0	128.0
100	67.3	70.1	74.2	77.9	82.4	90.1	99.33	109.0	118.0	124.0	130.0	136.0	140.0

Left-tail example:
Find χ^2 with df = 28; area in left-tail = 0.10.



χ^2(df, area to right) = χ^2(28, 0.90) = 18.9

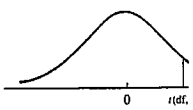
Right-tail example:
Find χ^2 with df = 23; area in right-tail = 0.025



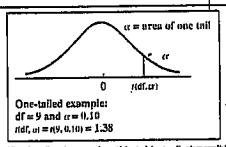
χ^2(df, area to right) = χ^2(23, 0.025) = 38.1

Critical Values of Student's t-Distribution

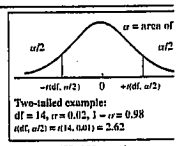
The entries in this table, t(df, α), are the critical values for Student's t-distribution for which the area under the curve in the right-hand tail is α. Critical values for the left-hand tail are found by symmetry.



	Amount of α in One Tail				
	0.25	0.10	0.05	0.025	0.01
	Amount of α in Two Tails				
df	0.50	0.20	0.10	0.05	0.02
3	0.765	1.64	2.35	3.18	4.54
4	0.741	1.53	2.13	2.78	3.75
5	0.729	1.48	2.02	2.57	3.37
6	0.718	1.44	1.94	2.45	3.14
7	0.711	1.42	1.89	2.36	3.00
8	0.706	1.40	1.86	2.31	2.90
9	0.703	1.38	1.83	2.26	2.82
10	0.700	1.37	1.81	2.23	2.76
11	0.697	1.36	1.80	2.20	2.72
12	0.696	1.36	1.78	2.18	2.68
13	0.694	1.35	1.77	2.16	2.65
14	0.692	1.35	1.76	2.14	2.62
15	0.691	1.34	1.75	2.13	2.60
16	0.690	1.34	1.75	2.12	2.58
17	0.689	1.33	1.74	2.11	2.57
18	0.688	1.33	1.73	2.10	2.55
19	0.688	1.33	1.73	2.09	2.54
20	0.687	1.33	1.72	2.09	2.53
21	0.686	1.32	1.72	2.08	2.52
22	0.686	1.32	1.72	2.07	2.51
23	0.685	1.32	1.71	2.07	2.50
24	0.685	1.32	1.71	2.06	2.49
25	0.684	1.32	1.71	2.06	2.49
26	0.684	1.32	1.71	2.06	2.48
27	0.684	1.31	1.70	2.05	2.47
28	0.683	1.31	1.70	2.05	2.47
29	0.683	1.31	1.70	2.05	2.46
30	0.683	1.31	1.70	2.04	2.46
35	0.682	1.31	1.69	2.03	2.44
40	0.681	1.30	1.68	2.02	2.42
50	0.679	1.30	1.68	2.01	2.40
70	0.678	1.29	1.67	1.99	2.38
100	0.677	1.29	1.66	1.98	2.36
df > 100	0.675	1.28	1.65	1.96	2.33



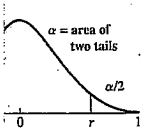
One-tailed example:
df = 9 and α = 0.10
t(df, α) = t(9, 0.10) = 1.38



Two-tailed example:
df = 14, α = 0.02, $1 - \alpha$ = 0.98
t(df, α/2) = t(14, 0.01) = 2.62

Critical Values of r When $\rho = 0$

The entries in this table are the critical values of r for a two-tailed test a simple correlation, df = $n - 2$, where n is the number of pairs of dat sample. For a one-tailed test, the value of α shown at the top of the double the value of α being used in the hypothesis test.



df \ α	0.10	0.05	0.02
1	0.988	0.997	1.000
2	0.900	0.950	0.980
3	0.805	0.878	0.934
4	0.729	0.811	0.882
5	0.669	0.754	0.833
6	0.621	0.707	0.789
7	0.582	0.666	0.750
8	0.549	0.632	0.716
9	0.521	0.602	0.685
10	0.497	0.576	0.658
11	0.476	0.553	0.634
12	0.458	0.532	0.612
13	0.441	0.514	0.592
14	0.426	0.497	0.574
15	0.412	0.482	0.558
16	0.400	0.468	0.542
17	0.389	0.456	0.528
18	0.378	0.444	0.516
19	0.369	0.433	0.503
20	0.360	0.423	0.492
25	0.323	0.381	0.445
30	0.296	0.349	0.409
35	0.275	0.325	0.381
40	0.257	0.304	0.358
45	0.243	0.288	0.338
50	0.231	0.273	0.322
60	0.211	0.250	0.295
70	0.195	0.232	0.274
80	0.183	0.217	0.256
90	0.173	0.205	0.242
100	0.164	0.195	0.230

TABLE B.10

Confidence Belts for the Correlation Coefficient $(1 - \alpha) = 0.95$

The numbers on the curves are sample sizes.