Tables of the Normal Distribution

Probability Content from $-\infty$ to Z

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	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

Values of z for selected values of Pr(Z<z)

z	0.842	1.036	1.282	1.645	1.960	2.326	2.576
Pr(Z<z)	0.800	0.850	0.900	0.950	0.975	0.990	0.995

Tail areas (two-sided) for t-distributions

df	0.20	0.10	0.05	0.02	0.01
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
35	1.306	1.690	2.030	2.438	2.724
40	1.303	1.684	2.021	2.423	2.704
45	1.301	1.679	2.014	2.412	2.690
50	1.299	1.676	2.009	2.403	2.678
55	1.297	1.673	2.004	2.396	2.668
60	1.296	1.671	2.000	2.390	2.660
70	1.294	1.667	1.994	2.381	2.648
80	1.292	1.664	1.990	2.374	2.639
90	1.291	1.662	1.987	2.368	2.632
100	1.290	1.660	1.984	2.364	2.626
120	1.289	1.658	1.980	2.358	2.617
400	1.284	1.649	1.966	2.336	2.588
Inf	1.282	1.645	1.960	2.326	2.576

For use on the CAS exams

Selected Upper-tail areas for F-distributions

Denominator df	Upper-tail	Numerator df: 1	2	3	4	5	6	7	8	9	10	11	12	14	16	20	24	30	40	50	75	100	200	500	Inf		
1	0.20	9.472	12	13.064	13.644	14.008	14.258	14.439	14.577	14.685	14.772	14.844	14.904	14.998	15.07	15.171	15.238	15.306	15.374	15.415	15.47	15.497	15.539	15.563	15.58	0.20	1
1	0.10	39.86	49.5	53.59	55.83	57.24	58.2	58.91	59.44	59.86	60.19	60.47	60.71	61.07	61.35	61.74	62	62.26	62.53	62.69	62.9	63.01	63.17	63.26	63.33	0.10	1
1	0.05	161.4	199.5	215.7	224.6	230.2	234	236.8	238.9	240.5	241.9	243	243.9	245.4	246.5	248	249.1	250.1	251.1	251.8	252.6	253	253.7	254.1	254.3	0.05	1
1	0.02	1013	1249	1351	1406	1441	1464	1482	1495	1505	1514	1521	1526	1535	1542	1552	1558	1565	1571	1575	1581	1583	1587	1590	1591	0.02	1
1	0.01	4052	4999	5403	5625	5764	5859	5928	5981	6022	6056	6083	6106	6143	6170	6209	6235	6261	6287	6303	6324	6334	6350	6360	6366	0.01	1
2	0.20	3.556	4	4.156	4.236	4.284	4.317	4.34	4.358	4.371	4.382	4.391	4.399	4.41	4.419	4.432	4.44	4.448	4.456	4.461	4.468	4.471	4.476	4.479	4.481	0.20	2
2	0.10	8.526	9	9.162	9.243	9.293	9.326	9.349	9.367	9.381	9.392	9.401	9.408	9.42	9.429	9.441	9.45	9.458	9.466	9.471	9.478	9.481	9.486	9.489	9.491	0.10	2
2	0.05	18.51	19	19.16	19.25	19.3	19.33	19.35	19.37	19.38	19.4	19.4	19.41	19.42	19.43	19.45	19.45	19.46	19.47	19.48	19.48	19.49	19.49	19.49	19.5	0.05	2
2	0.02	48.51	49	49.17	49.25	49.3	49.33	49.36	49.37	49.39	49.4	49.41	49.42	49.43	49.44	49.45	49.46	49.46	49.47	49.48	49.48	49.49	49.49	49.5	49.5	0.02	2
2	0.01	98.5	99	99.17	99.25	99.3	99.33	99.36	99.37	99.39	99.4	99.41	99.42	99.43	99.44	99.45	99.46	99.47	99.47	99.48	99.49	99.49	99.49	99.5	99.5	0.01	2
3	0.20	2.682	2.886	2.936	2.956	2.965	2.971	2.974	2.976	2.978	2.979	2.98	2.981	2.982	2.982	2.983	2.983	2.984	2.984	2.984	2.984	2.984	2.985	2.985	2.985	0.20	3
3	0.10	5.538	5.462	5.391	5.343	5.309	5.285	5.266	5.252	5.24	5.23	5.222	5.216	5.205	5.196	5.184	5.176	5.168	5.16	5.155	5.148	5.144	5.139	5.136	5.134	0.10	3
3	0.05	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786	8.763	8.745	8.715	8.692	8.66	8.639	8.617	8.594	8.581	8.563	8.554	8.54	8.532	8.526	0.05	3
3	0.02	20.62	18.86	18.11	17.69	17.43	17.25	17.11	17.01	16.93	16.86	16.81	16.76	16.69	16.63	16.55	16.5	16.45	16.39	16.36	16.32	16.3	16.26	16.24	16.23	0.02	3
3	0.01	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35	27.23	27.13	27.05	26.92	26.83	26.69	26.6	26.5	26.41	26.35	26.28	26.24	26.18	26.15	26.13	0.01	3
4	0.20	2.351	2.472	2.485	2.483	2.478	2.473	2.469	2.465	2.462	2.46	2.457	2.455	2.452	2.449	2.445	2.442	2.439	2.436	2.434	2.432	2.43	2.428	2.427	2.426	0.20	4
4	0.10	4.545	4.325	4.191	4.107	4.051	4.01	3.979	3.955	3.936	3.92	3.907	3.896	3.878	3.864	3.844	3.831	3.817	3.804	3.795	3.784	3.778	3.769	3.764	3.761	0.10	4
4	0.05	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964	5.936	5.912	5.873	5.844	5.803	5.774	5.746	5.717	5.699	5.676	5.664	5.646	5.635	5.628	0.05	4
4	0.02	14.04	12.142	11.344	10.899	10.616	10.419	10.274	10.162	10.074	10.003	9.944	9.894	9.815	9.755	9.67	9.612	9.554	9.495	9.46	9.412	9.388	9.352	9.33	9.315	0.02	4
4	0.01	21.2	18	16.69	15.98	15.52	15.21	14.98	14.8	14.66	14.55	14.45	14.37	14.25	14.15	14.02	13.93	13.84	13.75	13.69	13.61	13.58	13.52	13.49	13.46	0.01	4
5	0.20	2.178	2.259	2.253	2.24	2.228	2.217	2.209	2.202	2.196	2.191	2.187	2.184	2.178	2.173	2.166	2.161	2.156	2.151	2.148	2.144	2.141	2.138	2.136	2.134	0.20	5
5	0.10	4.06	3.78	3.619	3.52	3.453	3.405	3.368	3.339	3.316	3.297	3.282	3.268	3.247	3.23	3.207	3.191	3.174	3.157	3.147	3.133	3.126	3.116	3.109	3.105	0.10	5
5	0.05	6.608	5.786	5.409	5.192	5.05	4.95	4.876	4.818	4.772	4.735	4.704	4.678	4.636	4.604	4.558	4.527	4.496	4.464	4.444	4.418	4.405	4.385	4.373	4.365	0.05	5
5	0.02	11.323	9.454	8.67	8.233	7.953	7.758	7.614	7.503	7.415	7.344	7.285	7.235	7.156	7.095	7.009	6.951	6.893	6.833	6.797	6.749	6.724	6.687	6.665	6.65	0.02	5
5	0.01	16.258	13.274	12.06	11.392	10.967	10.672	10.456	10.289	10.158	10.051	9.963	9.888	9.77	9.68	9.553	9.466	9.379	9.291	9.238	9.166	9.13	9.075	9.042	9.02	0.01	5
6	0.20	2.073	2.13	2.113	2.092	2.076	2.062	2.051	2.042	2.034	2.028	2.022	2.018	2.01	2.004	1.995	1.989	1.982	1.976	1.972	1.966	1.963	1.959	1.956	1.954	0.20	6
6	0.10	3.776	3.463	3.289	3.181	3.108	3.055	3.014	2.983	2.958	2.937	2.92	2.905	2.881	2.863	2.836	2.818	2.8	2.781	2.77	2.754	2.746	2.734	2.727	2.722	0.10	6
6	0.05	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.06	4.027	4	3.956	3.922	3.874	3.841	3.808	3.774	3.754	3.726	3.712	3.69	3.678	3.669	0.05	6
6	0.02	9.876	8.052	7.287	6.859	6.585	6.393	6.251	6.141	6.055	5.984	5.925	5.876	5.797	5.737	5.651	5.593	5.534	5.474	5.438	5.389	5.364	5.327	5.304	5.289	0.02	6
6	0.01	13.745	10.925	9.78	9.148	8.746	8.466	8.26	8.102	7.976	7.874	7.79	7.718	7.605	7.519	7.396	7.313	7.229	7.143	7.091	7.022	6.987	6.934	6.902	6.88	0.01	6
7	0.20	2.002	2.043	2.019	1.994	1.974	1.957	1.945	1.934	1.925	1.918	1.911	1.906	1.897	1.89	1.879	1.872	1.865	1.857	1.852	1.845	1.842	1.837	1.833	1.831	0.20	7
7	0.10	3.589	3.257	3.074	2.961	2.883	2.827	2.785	2.752	2.725	2.703	2.684	2.668	2.643	2.623	2.595	2.575	2.555	2.535	2.523	2.506	2.497	2.484	2.476	2.471	0.10	7
7	0.05	5.591	4.737	4.347	4.12	3.972	3.866	3.787	3.726	3.677	3.637	3.603	3.575	3.529	3.494	3.445	3.41	3.376	3.34	3.319	3.29	3.275	3.252	3.239	3.23	0.05	7
7	0.02	8.988	7.203	6.454	6.035	5.765	5.576	5.435	5.327	5.241	5.171	5.113	5.064	4.985	4.925	4.839	4.781	4.722	4.662	4.625	4.576	4.551	4.513	4.49	4.475	0.02	7
7	0.01	12.246	9.547	8.451	7.847	7.46	7.191	6.993	6.84	6.719	6.62	6.538	6.469	6.359	6.275	6.155	6.074	5.992	5.908	5.858	5.789	5.755	5.702	5.671	5.65	0.01	7
8	0.20	1.951	1.981	1.951	1.923	1.9	1.883	1.868	1.856	1.847	1.838	1.831	1.825	1.815	1.807	1.796	1.787	1.779	1.77	1.765	1.757	1.753	1.748	1.744	1.742	0.20	8
8	0.10	3.458	3.113	2.924	2.806	2.726	2.668	2.624	2.589	2.561	2.538	2.519	2.502	2.475	2.455	2.425	2.404	2.383	2.361	2.348	2.33	2.321	2.307	2.298	2.293	0.10	8
8	0.05	5.318	4.459	4.066	3.838	3.687	3.581	3.5	3.438	3.388	3.347	3.313	3.284	3.237	3.202	3.15	3.115	3.079	3.043	3.02	2.99	2.975	2.951	2.937	2.928	0.05	8
8	0.02	8.389	6.637	5.901	5.489	5.223	5.036	4.897	4.79	4.705	4.635	4.577	4.528	4.449	4.389	4.304	4.245	4.186	4.125	4.088	4.038	4.013	3.975	3.952	3.936	0.02	8
8	0.01	11.259	8.649	7.591	7.006	6.632	6.371	6.178	6.029	5.911	5.814	5.734	5.667	5.559	5.477	5.359	5.279	5.198	5.116	5.065	4.998	4.963	4.911	4.88	4.859	0.01	8
9	0.20	1.913	1.935	1.901	1.87	1.846	1.826	1.811	1.798	1.787	1.778	1.771	1.764	1.753	1.745	1.732	1.723	1.714	1.704	1.698	1.69	1.686	1.68	1.676	1.673	0.20	9
9	0.10	3.36	3.006	2.813	2.693	2.611	2.551	2.505	2.469	2.44	2.416	2.396	2.379	2.351	2.329	2.298	2.277	2.255	2.232	2.218	2.199	2.189	2.174	2.165	2.159	0.10	9
9	0.05	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.23	3.179	3.137	3.102	3.073	3.025	2.989	2.936	2.9	2.864	2.826	2.803	2.771	2.756	2.731	2.717	2.707	0.05	9
9	0.02	7.961	6.234	5.51	5.103	4.84	4.654	4.517	4.41	4.325	4.256	4.198	4.149	4.071	4.011	3.925	3.866	3.806	3.745	3.708	3.658	3.632	3.593	3.57	3.554	0.02	9
9	0.01	10.561	8.022	6.992	6.422	6.057	5.802	5.613	5.467	5.351	5.257	5.178	5.111	5.005	4.924	4.808	4.729	4.649	4.567	4.517	4.449	4.415	4.363	4.332	4.311	0.01	9

Denominator df	Upper-tail	Numerator df 1	2	3	4	5	6	7	8	9	10	11	12	14	16	20	24	30	40	50	75	100	200	500	Inf		
10	0.20	1.883	1.899	1.861	1.829	1.803	1.782	1.766	1.752	1.741	1.732	1.723	1.716	1.705	1.696	1.682	1.673	1.663	1.653	1.646	1.637	1.633	1.626	1.621	1.618	0.20	10
10	0.10	3.285	2.924	2.728	2.605	2.522	2.461	2.414	2.377	2.347	2.323	2.302	2.284	2.255	2.233	2.201	2.178	2.155	2.132	2.117	2.097	2.087	2.071	2.062	2.055	0.10	10
10	0.05	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.02	2.978	2.943	2.913	2.865	2.828	2.774	2.737	2.7	2.661	2.637	2.605	2.588	2.563	2.548	2.538	0.05	10
10	0.02	7.638	5.934	5.218	4.816	4.555	4.371	4.235	4.129	4.044	3.975	3.917	3.868	3.79	3.73	3.644	3.585	3.525	3.463	3.425	3.374	3.348	3.309	3.285	3.269	0.02	10
10	0.01	10.044	7.559	6.552	5.994	5.636	5.386	5.2	5.057	4.942	4.849	4.772	4.706	4.601	4.52	4.405	4.327	4.247	4.165	4.115	4.048	4.014	3.962	3.93	3.909	0.01	10
11	0.20	1.859	1.87	1.83	1.796	1.768	1.747	1.73	1.716	1.704	1.694	1.685	1.678	1.666	1.656	1.642	1.632	1.622	1.611	1.604	1.594	1.589	1.582	1.577	1.574	0.20	11
11	0.10	3.225	2.86	2.66	2.536	2.451	2.389	2.342	2.304	2.274	2.248	2.227	2.209	2.179	2.156	2.123	2.1	2.076	2.052	2.036	2.016	2.005	1.989	1.979	1.972	0.10	11
11	0.05	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854	2.818	2.788	2.739	2.701	2.646	2.609	2.57	2.531	2.507	2.473	2.457	2.431	2.415	2.404	0.05	11
11	0.02	7.388	5.701	4.993	4.594	4.336	4.153	4.017	3.912	3.828	3.758	3.701	3.652	3.573	3.513	3.427	3.367	3.307	3.245	3.207	3.155	3.129	3.089	3.065	3.048	0.02	11
11	0.01	9.646	7.206	6.217	5.668	5.316	5.069	4.886	4.744	4.632	4.539	4.462	4.397	4.293	4.213	4.099	4.021	3.941	3.86	3.81	3.742	3.708	3.656	3.624	3.602	0.01	11
12	0.20	1.839	1.846	1.804	1.768	1.74	1.718	1.7	1.686	1.673	1.663	1.654	1.646	1.634	1.624	1.609	1.598	1.587	1.576	1.568	1.558	1.553	1.545	1.54	1.537	0.20	12
12	0.10	3.177	2.807	2.606	2.48	2.394	2.331	2.283	2.245	2.214	2.188	2.166	2.147	2.117	2.094	2.06	2.036	2.011	1.986	1.97	1.949	1.938	1.921	1.911	1.904	0.10	12
12	0.05	4.747	3.885	3.49	3.259	3.106	2.996	2.913	2.849	2.796	2.753	2.717	2.687	2.637	2.599	2.544	2.505	2.466	2.426	2.401	2.367	2.35	2.323	2.307	2.296	0.05	12
12	0.02	7.188	5.516	4.814	4.419	4.162	3.98	3.845	3.74	3.656	3.587	3.529	3.48	3.402	3.341	3.254	3.195	3.134	3.071	3.033	2.981	2.954	2.913	2.889	2.872	0.02	12
12	0.01	9.33	6.927	5.953	5.412	5.064	4.821	4.64	4.499	4.388	4.296	4.22	4.155	4.052	3.972	3.858	3.78	3.701	3.619	3.569	3.501	3.467	3.414	3.382	3.361	0.01	12
13	0.20	1.823	1.826	1.783	1.746	1.717	1.694	1.676	1.661	1.648	1.637	1.628	1.62	1.607	1.596	1.581	1.57	1.558	1.546	1.539	1.528	1.523	1.514	1.509	1.506	0.20	13
13	0.10	3.136	2.763	2.56	2.434	2.347	2.283	2.234	2.195	2.164	2.138	2.116	2.097	2.066	2.042	2.007	1.983	1.958	1.931	1.915	1.893	1.882	1.864	1.853	1.846	0.10	13
13	0.05	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671	2.635	2.604	2.554	2.515	2.459	2.42	2.38	2.339	2.314	2.279	2.261	2.234	2.218	2.206	0.05	13
13	0.02	7.024	5.366	4.669	4.276	4.02	3.84	3.705	3.6	3.516	3.447	3.39	3.341	3.262	3.201	3.114	3.054	2.993	2.93	2.891	2.838	2.811	2.77	2.745	2.728	0.02	13
13	0.01	9.074	6.701	5.739	5.205	4.862	4.62	4.441	4.302	4.191	4.1	4.025	3.96	3.857	3.778	3.665	3.587	3.507	3.425	3.375	3.307	3.272	3.219	3.187	3.165	0.01	13
14	0.20	1.809	1.809	1.765	1.727	1.697	1.674	1.655	1.639	1.626	1.615	1.606	1.598	1.584	1.573	1.557	1.546	1.534	1.521	1.513	1.502	1.497	1.488	1.482	1.479	0.20	14
14	0.10	3.102	2.726	2.522	2.395	2.307	2.243	2.193	2.154	2.122	2.095	2.073	2.054	2.022	1.998	1.962	1.938	1.912	1.885	1.869	1.846	1.834	1.816	1.805	1.797	0.10	14
14	0.05	4.6	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602	2.565	2.534	2.484	2.445	2.388	2.349	2.308	2.266	2.241	2.205	2.187	2.159	2.142	2.131	0.05	14
14	0.02	6.888	5.241	4.549	4.158	3.904	3.724	3.589	3.485	3.401	3.332	3.274	3.225	3.146	3.086	2.998	2.938	2.876	2.812	2.773	2.72	2.692	2.651	2.625	2.608	0.02	14
14	0.01	8.862	6.515	5.564	5.035	4.695	4.456	4.278	4.14	4.03	3.939	3.864	3.8	3.698	3.619	3.505	3.427	3.348	3.266	3.215	3.147	3.112	3.059	3.026	3.004	0.01	14
15	0.20	1.797	1.795	1.749	1.71	1.68	1.656	1.637	1.621	1.608	1.596	1.587	1.578	1.564	1.553	1.537	1.525	1.513	1.5	1.491	1.48	1.474	1.465	1.459	1.455	0.20	15
15	0.10	3.073	2.695	2.49	2.361	2.273	2.208	2.158	2.119	2.086	2.059	2.037	2.017	1.985	1.961	1.924	1.899	1.873	1.845	1.828	1.805	1.793	1.774	1.763	1.755	0.10	15
15	0.05	4.543	3.682	3.287	3.056	2.901	2.79	2.707	2.641	2.588	2.544	2.507	2.475	2.424	2.385	2.328	2.288	2.247	2.204	2.178	2.142	2.123	2.095	2.078	2.066	0.05	15
15	0.02	6.773	5.135	4.447	4.058	3.805	3.626	3.492	3.387	3.303	3.235	3.177	3.128	3.049	2.988	2.9	2.84	2.777	2.713	2.674	2.62	2.592	2.55	2.524	2.506	0.02	15
15	0.01	8.683	6.359	5.417	4.893	4.556	4.318	4.142	4.004	3.895	3.805	3.73	3.666	3.564	3.485	3.372	3.294	3.214	3.132	3.081	3.012	2.977	2.923	2.891	2.868	0.01	15
16	0.20	1.787	1.783	1.736	1.696	1.665	1.641	1.621	1.605	1.591	1.58	1.57	1.561	1.547	1.536	1.519	1.507	1.494	1.481	1.472	1.46	1.454	1.445	1.439	1.435	0.20	16
16	0.10	3.048	2.668	2.462	2.333	2.244	2.178	2.128	2.088	2.055	2.028	2.005	1.985	1.953	1.928	1.891	1.866	1.839	1.811	1.793	1.769	1.757	1.738	1.726	1.718	0.10	16
16	0.05	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494	2.456	2.425	2.373	2.333	2.276	2.235	2.194	2.151	2.124	2.087	2.068	2.039	2.022	2.01	0.05	16
16	0.02	6.674	5.046	4.361	3.974	3.721	3.543	3.409	3.304	3.221	3.152	3.094	3.045	2.966	2.905	2.817	2.756	2.693	2.628	2.589	2.534	2.506	2.463	2.437	2.419	0.02	16
16	0.01	8.531	6.226	5.292	4.773	4.437	4.202	4.026	3.89	3.78	3.691	3.616	3.553	3.451	3.372	3.259	3.181	3.101	3.018	2.967	2.898	2.863	2.808	2.775	2.753	0.01	16
17	0.20	1.778	1.772	1.724	1.684	1.652	1.628	1.608	1.591	1.577	1.566	1.555	1.547	1.532	1.52	1.503	1.491	1.478	1.464	1.455	1.443	1.437	1.427	1.421	1.416	0.20	17
17	0.10	3.026	2.645	2.437	2.308	2.218	2.152	2.102	2.061	2.028	2.001	1.978	1.958	1.925	1.9	1.862	1.836	1.809	1.781	1.763	1.738	1.726	1.706	1.694	1.686	0.10	17
17	0.05	4.451	3.592	3.197	2.965	2.81	2.699	2.614	2.548	2.494	2.45	2.413	2.381	2.329	2.289	2.23	2.19	2.148	2.104	2.077	2.04	2.02	1.991	1.973	1.96	0.05	17
17	0.02	6.589	4.968	4.286	3.901	3.649	3.471	3.337	3.233	3.149	3.08	3.023	2.973	2.894	2.833	2.745	2.683	2.62	2.555	2.515	2.46	2.431	2.388	2.361	2.343	0.02	17
17	0.01	8.4	6.112	5.185	4.669	4.336	4.102	3.927	3.791	3.682	3.593	3.519	3.455	3.353	3.275	3.162	3.084	3.003	2.92	2.869	2.8	2.764	2.709	2.676	2.653	0.01	17
18	0.20	1.77	1.762	1.713	1.673	1.641	1.616	1.596	1.579	1.565	1.553	1.543	1.534	1.519	1.507	1.489	1.477	1.463	1.449	1.44	1.428	1.421	1.411	1.404	1.4	0.20	18
18	0.10	3.007	2.624	2.416	2.286	2.196	2.13	2.079	2.038	2.005	1.977	1.954	1.933	1.9	1.875	1.837	1.81	1.783	1.754	1.736	1.711	1.698	1.678	1.665	1.657	0.10	18
18	0.05	4.414	3.555	3.16	2.928	2.773	2.661	2.577	2.51	2.456	2.412	2.374	2.342	2.29	2.25	2.191	2.15	2.107	2.063	2.035	1.998	1.978	1.948	1.929	1.917	0.05	18
18	0.02	6.515	4.9	4.221	3.837	3.586	3.408	3.275	3.171	3.087	3.018	2.96	2.911	2.832	2.77	2.682	2.62	2.557	2.491	2.45	2.395	2.366	2.322	2.295	2.277	0.02	18
18	0.01	8.285	6.013	5.092	4.579	4.248	4.015	3.841	3.705	3.597	3.508	3.434	3.371	3.269	3.19	3.077	2.999	2.919	2.835	2.784	2.714	2.678	2.623	2.589	2.566	0.01	18
19	0.20	1.763	1.754	1.704	1.663	1.631	1.605	1.585	1.568	1.554	1.542	1.531	1.522	1.507	1.495	1.477	1.464	1.45	1.436	1.427	1.414	1.407	1.396	1.39	1.385	0.20	19
19	0.10	2.99	2.606	2.397	2.266	2.176	2.109	2.058	2.017	1.984	1.956	1.932	1.912	1.878	1.852	1.814	1.787	1.759	1.73	1.711	1.686	1.673	1.652	1.639	1.631	0.10	19
19	0.05	4.381	3.522	3.127	2.895	2.74	2.628	2.544	2.477	2.423	2.378	2.34	2.308	2.256	2.215	2.155	2.114	2.071	2.026	1.999	1.96	1.94	1.91	1.891	1.878	0.05	19
19	0.02	6.449	4.84	4.164	3.781	3.531	3.353	3.22	3.116	3.032	2.963	2.906	2.856	2.777	2.715	2.626	2.564	2.501	2.434	2.394	2.337	2.308	2.264	2.236	2.218	0.02	19
19	0.01	8.185	5.926	5.01	4.5	4.171	3.939	3.765	3.631	3.523	3.434	3.36	3.297	3.195	3.116	3.003	2.925	2.844	2.761	2.709	2.639	2.602	2.547	2.512	2.489	0.01	19

Denominator df	Upper-tail	Numerator df 1	2	3	4	5	6	7	8	9	10	11	12	14	16	20	24	30	40	50	75	100	200	500	Inf		
20	0.20	1.757	1.746	1.696	1.654	1.622	1.596	1.575	1.558	1.544	1.531	1.521	1.512	1.496	1.484	1.466	1.452	1.439	1.424	1.414	1.401	1.394	1.383	1.377	1.372	0.20	20
20	0.10	2.975	2.589	2.38	2.249	2.158	2.091	2.04	1.999	1.965	1.937	1.913	1.892	1.859	1.833	1.794	1.767	1.738	1.708	1.69	1.664	1.65	1.629	1.616	1.607	0.10	20
20	0.05	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348	2.31	2.278	2.225	2.184	2.124	2.082	2.039	1.994	1.966	1.927	1.907	1.875	1.856	1.843	0.05	20
20	0.02	6.391	4.788	4.113	3.731	3.482	3.304	3.171	3.067	2.984	2.915	2.857	2.808	2.728	2.666	2.577	2.515	2.451	2.384	2.343	2.286	2.257	2.212	2.184	2.165	0.02	20
20	0.01	8.096	5.849	4.938	4.431	4.103	3.871	3.699	3.564	3.457	3.368	3.294	3.231	3.13	3.051	2.938	2.859	2.778	2.695	2.643	2.572	2.535	2.479	2.445	2.421	0.01	20
21	0.20	1.751	1.739	1.688	1.646	1.614	1.588	1.567	1.549	1.535	1.522	1.511	1.502	1.487	1.474	1.455	1.442	1.428	1.413	1.403	1.39	1.383	1.371	1.364	1.36	0.20	21
21	0.10	2.961	2.575	2.365	2.233	2.142	2.075	2.023	1.982	1.948	1.92	1.896	1.875	1.841	1.815	1.776	1.748	1.719	1.689	1.67	1.644	1.63	1.608	1.595	1.586	0.10	21
21	0.05	4.325	3.467	3.072	2.84	2.685	2.573	2.488	2.42	2.366	2.321	2.283	2.25	2.197	2.156	2.096	2.054	2.01	1.965	1.936	1.897	1.876	1.845	1.825	1.812	0.05	21
21	0.02	6.339	4.74	4.068	3.687	3.438	3.261	3.128	3.024	2.94	2.872	2.814	2.764	2.685	2.623	2.533	2.471	2.406	2.339	2.298	2.24	2.211	2.165	2.137	2.118	0.02	21
21	0.01	8.017	5.78	4.874	4.369	4.042	3.812	3.64	3.506	3.398	3.31	3.236	3.173	3.072	2.993	2.88	2.801	2.72	2.636	2.584	2.512	2.475	2.419	2.384	2.36	0.01	21
22	0.20	1.746	1.733	1.682	1.639	1.606	1.58	1.559	1.541	1.526	1.514	1.503	1.494	1.478	1.465	1.446	1.433	1.418	1.403	1.393	1.379	1.372	1.361	1.353	1.349	0.20	22
22	0.10	2.949	2.561	2.351	2.219	2.128	2.06	2.008	1.967	1.933	1.904	1.88	1.859	1.825	1.798	1.759	1.731	1.702	1.671	1.652	1.625	1.611	1.59	1.576	1.567	0.10	22
22	0.05	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297	2.259	2.226	2.173	2.131	2.071	2.028	1.984	1.938	1.909	1.869	1.849	1.817	1.797	1.783	0.05	22
22	0.02	6.292	4.698	4.028	3.647	3.399	3.222	3.089	2.985	2.902	2.833	2.775	2.725	2.646	2.584	2.494	2.431	2.366	2.299	2.257	2.199	2.169	2.123	2.095	2.075	0.02	22
22	0.01	7.945	5.719	4.817	4.313	3.988	3.758	3.587	3.453	3.346	3.258	3.184	3.121	3.019	2.941	2.827	2.749	2.667	2.583	2.531	2.459	2.422	2.365	2.329	2.305	0.01	22
23	0.20	1.741	1.728	1.676	1.633	1.599	1.573	1.552	1.534	1.519	1.506	1.495	1.486	1.47	1.457	1.438	1.424	1.41	1.394	1.384	1.37	1.362	1.351	1.343	1.338	0.20	23
23	0.10	2.937	2.549	2.339	2.207	2.115	2.047	1.995	1.953	1.919	1.89	1.866	1.845	1.811	1.784	1.744	1.716	1.686	1.655	1.636	1.609	1.594	1.572	1.558	1.549	0.10	23
23	0.05	4.279	3.422	3.028	2.796	2.64	2.528	2.442	2.375	2.32	2.275	2.236	2.204	2.15	2.109	2.048	2.005	1.961	1.914	1.885	1.844	1.823	1.791	1.771	1.757	0.05	23
23	0.02	6.249	4.66	3.991	3.611	3.363	3.187	3.054	2.95	2.867	2.798	2.74	2.69	2.61	2.548	2.458	2.395	2.33	2.262	2.22	2.162	2.132	2.085	2.056	2.037	0.02	23
23	0.01	7.881	5.664	4.765	4.264	3.939	3.71	3.539	3.406	3.299	3.211	3.137	3.074	2.973	2.894	2.781	2.702	2.62	2.535	2.483	2.411	2.373	2.316	2.28	2.256	0.01	23
24	0.20	1.737	1.722	1.67	1.627	1.593	1.567	1.545	1.527	1.512	1.499	1.488	1.479	1.463	1.45	1.43	1.416	1.401	1.385	1.375	1.361	1.353	1.341	1.334	1.329	0.20	24
24	0.10	2.927	2.538	2.327	2.195	2.103	2.035	1.983	1.941	1.906	1.877	1.853	1.832	1.797	1.77	1.73	1.702	1.672	1.641	1.621	1.593	1.579	1.556	1.542	1.533	0.10	24
24	0.05	4.26	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.3	2.255	2.216	2.183	2.13	2.088	2.027	1.984	1.939	1.892	1.863	1.822	1.8	1.768	1.747	1.733	0.05	24
24	0.02	6.211	4.625	3.958	3.579	3.331	3.155	3.022	2.919	2.835	2.766	2.708	2.658	2.578	2.516	2.426	2.363	2.297	2.229	2.187	2.128	2.097	2.05	2.021	2.001	0.02	24
24	0.01	7.823	5.614	4.718	4.218	3.895	3.667	3.496	3.363	3.256	3.168	3.094	3.032	2.93	2.852	2.738	2.659	2.577	2.492	2.44	2.367	2.329	2.271	2.235	2.211	0.01	24
25	0.20	1.733	1.718	1.665	1.622	1.588	1.561	1.539	1.521	1.506	1.493	1.482	1.472	1.456	1.443	1.423	1.409	1.394	1.378	1.367	1.353	1.345	1.333	1.325	1.32	0.20	25
25	0.10	2.918	2.528	2.317	2.184	2.092	2.024	1.971	1.929	1.895	1.866	1.841	1.82	1.785	1.758	1.718	1.689	1.659	1.627	1.607	1.579	1.565	1.542	1.527	1.518	0.10	25
25	0.05	4.242	3.385	2.991	2.759	2.603	2.49	2.405	2.337	2.282	2.236	2.198	2.165	2.111	2.069	2.007	1.964	1.919	1.872	1.842	1.801	1.779	1.746	1.725	1.711	0.05	25
25	0.02	6.176	4.593	3.928	3.549	3.302	3.126	2.993	2.89	2.806	2.737	2.679	2.629	2.549	2.487	2.396	2.333	2.267	2.199	2.156	2.097	2.066	2.018	1.989	1.969	0.02	25
25	0.01	7.77	5.568	4.675	4.177	3.855	3.627	3.457	3.324	3.217	3.129	3.056	2.993	2.892	2.813	2.699	2.62	2.538	2.453	2.4	2.327	2.289	2.23	2.194	2.169	0.01	25
26	0.20	1.729	1.713	1.66	1.617	1.583	1.556	1.534	1.516	1.5	1.487	1.476	1.466	1.45	1.437	1.417	1.402	1.387	1.371	1.36	1.345	1.337	1.325	1.317	1.312	0.20	26
26	0.10	2.909	2.519	2.307	2.174	2.082	2.014	1.961	1.919	1.884	1.855	1.83	1.809	1.774	1.747	1.706	1.677	1.647	1.615	1.594	1.566	1.551	1.528	1.514	1.504	0.10	26
26	0.05	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.22	2.181	2.148	2.094	2.052	1.99	1.946	1.901	1.853	1.823	1.782	1.76	1.726	1.705	1.691	0.05	26
26	0.02	6.144	4.564	3.9	3.522	3.275	3.099	2.967	2.863	2.78	2.711	2.652	2.603	2.523	2.46	2.369	2.306	2.24	2.171	2.128	2.068	2.037	1.989	1.959	1.939	0.02	26
26	0.01	7.721	5.526	4.637	4.14	3.818	3.591	3.421	3.288	3.182	3.094	3.021	2.958	2.857	2.778	2.664	2.585	2.503	2.417	2.364	2.29	2.252	2.193	2.156	2.131	0.01	26

Lower-tail areas for Chi-square distributions

df	0.005	0.010	0.025	0.050	0.950	0.975	0.990	0.995
1	0.00	0.00	0.00	0.00	3.84	5.02	6.63	7.88
2	0.01	0.02	0.05	0.10	5.99	7.38	9.21	10.60
3	0.07	0.11	0.22	0.35	7.81	9.35	11.34	12.84
4	0.21	0.30	0.48	0.71	9.49	11.14	13.28	14.86
5	0.41	0.55	0.83	1.15	11.07	12.83	15.09	16.75
6	0.68	0.87	1.24	1.64	12.59	14.45	16.81	18.55
7	0.99	1.24	1.69	2.17	14.07	16.01	18.48	20.28
8	1.34	1.65	2.18	2.73	15.51	17.53	20.09	21.95
9	1.73	2.09	2.70	3.33	16.92	19.02	21.67	23.59
10	2.16	2.56	3.25	3.94	18.31	20.48	23.21	25.19
11	2.60	3.05	3.82	4.57	19.68	21.92	24.72	26.76
12	3.07	3.57	4.40	5.23	21.03	23.34	26.22	28.30
13	3.57	4.11	5.01	5.89	22.36	24.74	27.69	29.82
14	4.07	4.66	5.63	6.57	23.68	26.12	29.14	31.32
15	4.60	5.23	6.26	7.26	25.00	27.49	30.58	32.80
16	5.14	5.81	6.91	7.96	26.30	28.85	32.00	34.27
17	5.70	6.41	7.56	8.67	27.59	30.19	33.41	35.72
18	6.26	7.01	8.23	9.39	28.87	31.53	34.81	37.16
19	6.84	7.63	8.91	10.12	30.14	32.85	36.19	38.58
20	7.43	8.26	9.59	10.85	31.41	34.17	37.57	40.00
21	8.03	8.90	10.28	11.59	32.67	35.48	38.93	41.40
22	8.64	9.54	10.98	12.34	33.92	36.78	40.29	42.80
23	9.26	10.20	11.69	13.09	35.17	38.08	41.64	44.18
24	9.89	10.86	12.40	13.85	36.42	39.36	42.98	45.56
25	10.52	11.52	13.12	14.61	37.65	40.65	44.31	46.93
26	11.16	12.20	13.84	15.38	38.89	41.92	45.64	48.29
27	11.81	12.88	14.57	16.15	40.11	43.19	46.96	49.64
28	12.46	13.56	15.31	16.93	41.34	44.46	48.28	50.99
29	13.12	14.26	16.05	17.71	42.56	45.72	49.59	52.34
30	13.79	14.95	16.79	18.49	43.77	46.98	50.89	53.67
31	14.46	15.66	17.54	19.28	44.99	48.23	52.19	55.00
32	15.13	16.36	18.29	20.07	46.19	49.48	53.49	56.33
33	15.82	17.07	19.05	20.87	47.40	50.73	54.78	57.65
34	16.50	17.79	19.81	21.66	48.60	51.97	56.06	58.96
35	17.19	18.51	20.57	22.47	49.80	53.20	57.34	60.27
36	17.89	19.23	21.34	23.27	51.00	54.44	58.62	61.58
37	18.59	19.96	22.11	24.07	52.19	55.67	59.89	62.88
38	19.29	20.69	22.88	24.88	53.38	56.90	61.16	64.18
39	20.00	21.43	23.65	25.70	54.57	58.12	62.43	65.48
40	20.71	22.16	24.43	26.51	55.76	59.34	63.69	66.77
41	21.42	22.91	25.21	27.33	56.94	60.56	64.95	68.05
42	22.14	23.65	26.00	28.14	58.12	61.78	66.21	69.34
43	22.86	24.40	26.79	28.96	59.30	62.99	67.46	70.62
44	23.58	25.15	27.57	29.79	60.48	64.20	68.71	71.89
45	24.31	25.90	28.37	30.61	61.66	65.41	69.96	73.17
46	25.04	26.66	29.16	31.44	62.83	66.62	71.20	74.44
47	25.77	27.42	29.96	32.27	64.00	67.82	72.44	75.70
48	26.51	28.18	30.75	33.10	65.17	69.02	73.68	76.97
49	27.25	28.94	31.55	33.93	66.34	70.22	74.92	78.23
50	27.99	29.71	32.36	34.76	67.50	71.42	76.15	79.49

For use on the CAS exams