

ตารางสถิติ  
 Statistical Tables  
 ตารางสถิติ

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Table II Binomial Probability Sums  $\sum_{x=0}^r \binom{n}{x} p^x (1-p)^{n-x}$

n	r	p										
		0.10	0.20	0.25	0.30	0.40	0.50	0.60	0.70	0.80	0.90	
5	0	0.5005	0.3277	0.2373	0.1681	0.0778	0.0312	0.0102	0.0024	0.0003	0.0000	
	1	0.9185	0.7373	0.6328	0.5282	0.3370	0.1875	0.0870	0.0308	0.0067	0.0005	
	2	0.9955	0.9421	0.8965	0.8369	0.6826	0.5000	0.3174	0.1631	0.0579	0.0086	
	3	1.0000	0.9997	0.9990	0.9976	0.9898	0.9688	0.9222	0.8319	0.6723	0.4815	
	4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	
	10	0	0.3487	0.1074	0.0563	0.0382	0.0260	0.0170	0.0091	0.0048	0.0024	0.0010
		1	0.7361	0.3758	0.2440	0.1491	0.0778	0.0312	0.0102	0.0024	0.0003	0.0000
		2	0.9298	0.6778	0.5282	0.3828	0.2440	0.1491	0.0778	0.0312	0.0102	0.0024
		3	0.9872	0.8791	0.7759	0.6496	0.4826	0.3174	0.1875	0.1038	0.0579	0.0282
		4	0.9984	0.9672	0.9219	0.8497	0.7361	0.5875	0.4500	0.3270	0.2167	0.1282
5		0.9999	0.9936	0.9803	0.9527	0.8338	0.6230	0.3669	0.1662	0.0474	0.0064	
6		1.0000	0.9991	0.9965	0.9894	0.9452	0.8281	0.6177	0.3504	0.1209	0.0128	
7		1.0000	0.9999	0.9996	0.9984	0.9877	0.9453	0.8327	0.6172	0.3222	0.0702	
8		1.0000	1.0000	1.0000	0.9999	0.9983	0.9893	0.9536	0.8507	0.6242	0.2639	
9		1.0000	1.0000	1.0000	1.0000	0.9999	0.9990	0.9940	0.9718	0.8926	0.6513	
15	0	0.2059	0.0352	0.0134	0.0047	0.0025	0.0005	0.0000	0.0000	0.0000	0.0000	
	1	0.5490	0.1671	0.0802	0.0353	0.0052	0.0003	0.0000	0.0000	0.0000	0.0000	
	2	0.8159	0.3980	0.2261	0.1268	0.0271	0.0037	0.0003	0.0000	0.0000	0.0000	
	3	0.9444	0.6482	0.4613	0.2969	0.0905	0.0176	0.0019	0.0001	0.0000	0.0000	
	4	0.9873	0.8338	0.6865	0.5155	0.2173	0.0592	0.0094	0.0007	0.0000	0.0000	
	5	0.9978	0.9389	0.8516	0.7216	0.4032	0.1509	0.0338	0.0037	0.0001	0.0000	
	6	0.9997	0.9812	0.9434	0.8689	0.6998	0.3036	0.0951	0.0152	0.0008	0.0000	
	7	1.0000	0.9992	0.9978	0.9858	0.9469	0.8281	0.6177	0.3504	0.1209	0.0128	
	8	1.0000	0.9999	0.9992	0.9981	0.9877	0.9453	0.8327	0.6172	0.3222	0.0702	
	9	1.0000	0.9999	0.9999	0.9991	0.9987	0.9965	0.9824	0.9403	0.8732	0.8020	
20	0	0.1216	0.0115	0.0037	0.0016	0.0008	0.0000	0.0000	0.0000	0.0000	0.0000	
	1	0.3517	0.0692	0.0243	0.0076	0.0025	0.0005	0.0000	0.0000	0.0000	0.0000	
	2	0.6769	0.2061	0.0913	0.0355	0.0102	0.0032	0.0003	0.0000	0.0000	0.0000	
	3	0.8670	0.4114	0.2252	0.1071	0.0160	0.0013	0.0000	0.0000	0.0000	0.0000	
	4	0.9568	0.6296	0.4148	0.2375	0.0510	0.0059	0.0003	0.0000	0.0000	0.0000	
	5	0.9887	0.8042	0.6172	0.4164	0.1256	0.0207	0.0016	0.0000	0.0000	0.0000	
	6	0.9976	0.9133	0.7858	0.6080	0.2500	0.0577	0.0065	0.0003	0.0000	0.0000	
	7	0.9996	0.9679	0.8982	0.7723	0.4159	0.1316	0.0210	0.0013	0.0000	0.0000	
	8	0.9999	0.9901	0.9591	0.8867	0.5956	0.2517	0.0565	0.0051	0.0001	0.0000	
	9	1.0000	0.9994	0.9981	0.9820	0.7553	0.4119	0.1275	0.0171	0.0006	0.0000	
30	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	4	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	6	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
	9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
10	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		

Table III Poisson Probability Sums  $\sum_{x=0}^r \frac{\mu^x}{x!} e^{-\mu}$

r	μ									
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0	0.9048	0.8187	0.7408	0.6730	0.6065	0.5488	0.4966	0.4493	0.4066	0.3679
1	0.9953	0.9825	0.9631	0.9384	0.9098	0.8781	0.8442	0.8088	0.7725	0.7358
2	0.9998	0.9989	0.9964	0.9921	0.9856	0.9769	0.9659	0.9526	0.9371	0.9197
3	1.0000	0.9999	0.9997	0.9992	0.9982	0.9966	0.9942	0.9909	0.9865	0.9810
4	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9992	0.9986	0.9977	0.9963
5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9997	0.9994
6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
7	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
10	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Poisson Probability Sums  $\sum_{x=0}^r p(x; \mu)$  (Continued)

	$\mu$									
	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0005	0.0002	0.0001	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0028	0.0012	0.0005	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0103	0.0049	0.0023	0.0010	0.0005	0.0002	0.0001	0.0000	0.0000	0.0000
4	0.0293	0.0151	0.0076	0.0037	0.0018	0.0009	0.0004	0.0002	0.0001	0.0000
5	0.0671	0.0375	0.0203	0.0107	0.0055	0.0028	0.0014	0.0007	0.0003	0.0001
6	0.1301	0.0786	0.0458	0.0259	0.0142	0.0076	0.0040	0.0021	0.0010	0.0003
7	0.2202	0.1432	0.0895	0.0540	0.0316	0.0180	0.0100	0.0054	0.0029	0.0015
8	0.3328	0.2320	0.1550	0.0998	0.0621	0.0374	0.0220	0.0126	0.0071	0.0040
9	0.4579	0.3405	0.2424	0.1658	0.1094	0.0699	0.0433	0.0261	0.0154	0.0090
10	0.5830	0.4599	0.3472	0.2517	0.1757	0.1185	0.0774	0.0491	0.0304	0.0190
11	0.6968	0.5793	0.4616	0.3532	0.2600	0.1848	0.1270	0.0847	0.0549	0.0350
12	0.7916	0.6887	0.5760	0.4631	0.3585	0.2676	0.1931	0.1350	0.0917	0.0600
13	0.8645	0.7813	0.6815	0.5730	0.4644	0.3632	0.2745	0.2009	0.1426	0.0950
14	0.9165	0.8540	0.7720	0.6751	0.5704	0.4657	0.3675	0.2808	0.2081	0.1480
15	0.9513	0.9074	0.8444	0.7636	0.6694	0.5681	0.4667	0.3715	0.2867	0.2000
16	0.9730	0.9441	0.8987	0.8355	0.7559	0.6641	0.5660	0.4677	0.3750	0.2860
17	0.9857	0.9678	0.9370	0.8905	0.8272	0.7489	0.6593	0.5640	0.4686	0.3750
18	0.9928	0.9823	0.9626	0.9302	0.8826	0.8195	0.7423	0.6550	0.5622	0.4686
19	0.9965	0.9907	0.9787	0.9573	0.9235	0.8752	0.8122	0.7363	0.6509	0.5622
20	0.9984	0.9953	0.9884	0.9750	0.9521	0.9170	0.8682	0.8055	0.7307	0.6509
21	0.9993	0.9977	0.9939	0.9859	0.9712	0.9469	0.9108	0.8615	0.7991	0.7307
22	0.9997	0.9990	0.9970	0.9924	0.9833	0.9673	0.9418	0.9047	0.8551	0.7991
23	0.9999	0.9995	0.9985	0.9960	0.9907	0.9805	0.9633	0.9367	0.8989	0.8551
24	1.0000	0.9998	0.9993	0.9980	0.9950	0.9888	0.9777	0.9594	0.9317	0.8989
25	1.0000	0.9999	0.9997	0.9990	0.9974	0.9938	0.9777	0.9594	0.9317	0.8989
26	1.0000	1.0000	0.9999	0.9997	0.9995	0.9987	0.9925	0.9848	0.9718	0.9554
27	1.0000	1.0000	1.0000	0.9999	0.9999	0.9994	0.9983	0.9912	0.9827	0.9718
28	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9996	0.9978	0.9941	0.9897
29	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9994	0.9986	0.9967
30	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9997	0.9992	0.9982
31	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9996	0.9990
32	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9995
33	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998
34	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999
35	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999
36	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999
37	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999

Poisson Probability Sums  $\sum_{x=0}^r p(x; \mu)$  (Continued)

$r$	$\mu$									
	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	
0	0.0041	0.0025	0.0015	0.0009	0.0006	0.0003	0.0002	0.0001	0.0001	
1	0.0266	0.0174	0.0113	0.0073	0.0047	0.0030	0.0019	0.0012	0.0008	
2	0.0884	0.0620	0.0430	0.0296	0.0203	0.0138	0.0093	0.0062	0.0042	
3	0.2017	0.1512	0.1118	0.0818	0.0591	0.0424	0.0301	0.0212	0.0149	
4	0.3575	0.2851	0.2237	0.1730	0.1321	0.0996	0.0744	0.0550	0.0403	
5	0.5289	0.4457	0.3690	0.3007	0.2414	0.1912	0.1496	0.1157	0.0885	
6	0.6860	0.6063	0.5265	0.4497	0.3782	0.3134	0.2562	0.2068	0.1649	
7	0.8095	0.7440	0.6728	0.5987	0.5246	0.4530	0.3856	0.3239	0.2687	
8	0.8944	0.8472	0.7916	0.7291	0.6620	0.5925	0.5231	0.4557	0.3918	
9	0.9462	0.9161	0.8774	0.8305	0.7754	0.7166	0.6530	0.5874	0.5218	
10	0.9747	0.9574	0.9332	0.9015	0.8622	0.8159	0.7634	0.7060	0.6453	
11	0.9890	0.9799	0.9661	0.9466	0.9208	0.8881	0.8487	0.8030	0.7530	
12	0.9955	0.9912	0.9840	0.9730	0.9573	0.9362	0.9091	0.8758	0.8364	
13	0.9983	0.9964	0.9929	0.9872	0.9784	0.9658	0.9486	0.9261	0.8981	
14	0.9994	0.9986	0.9970	0.9943	0.9897	0.9827	0.9726	0.9585	0.9400	
15	0.9998	0.9995	0.9988	0.9976	0.9954	0.9918	0.9862	0.9780	0.9665	
16	0.9999	0.9998	0.9996	0.9990	0.9980	0.9963	0.9934	0.9888	0.9823	
17	1.0000	0.9999	0.9998	0.9996	0.9992	0.9984	0.9970	0.9947	0.9911	
18	1.0000	1.0000	0.9999	0.9999	0.9997	0.9994	0.9987	0.9976	0.9957	
19	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	0.9995	0.9989	0.9980	
20	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	0.9991	
21	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9998	0.9996	
22	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	
23	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0.9999	
24	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	

Table V THE DISTRIBUTION OF  $F^*$  (TWO-TAILED TESTS)

Degrees of Freedom	Probability of a Larger Value, Sign Ignored									
	0.500	0.400	0.200	0.100	0.050	0.025	0.010	0.005	0.001	
1	1.000	1.376	3.078	6.314	12.706	25.452	63.657	14.069	31.598	
2	0.816	0.961	1.886	2.920	4.303	6.205	9.925	7.453	12.941	
3	0.765	0.978	1.638	2.353	3.182	4.176	5.841	5.598	3.610	
4	0.741	0.941	1.533	2.132	2.776	3.495	4.604	4.773	5.859	
5	0.727	0.920	1.476	2.015	2.571	3.163	4.032	4.317	5.959	
6	0.718	0.906	1.440	1.943	2.447	2.969	3.707	4.029	5.405	
7	0.711	0.896	1.415	1.895	2.365	2.841	3.499	3.832	5.041	
8	0.706	0.889	1.397	1.860	2.306	2.752	3.355	3.690	4.781	
9	0.703	0.883	1.383	1.833	2.262	2.685	3.250	3.581	4.587	
10	0.700	0.879	1.372	1.812	2.228	2.634	3.169	3.106	4.437	
11	0.697	0.876	1.363	1.796	2.201	2.593	3.106	3.055	4.318	
12	0.695	0.873	1.356	1.782	2.179	2.560	3.055	3.012	4.221	
13	0.694	0.870	1.350	1.771	2.160	2.533	3.012	2.977	4.140	
14	0.692	0.868	1.345	1.761	2.145	2.510	2.977	3.286	4.075	
15	0.691	0.866	1.341	1.753	2.131	2.490	2.947	3.252	4.015	
16	0.690	0.865	1.337	1.746	2.120	2.473	2.921	3.232	3.965	
17	0.689	0.863	1.333	1.740	2.110	2.458	2.898	3.222	3.922	
18	0.688	0.862	1.330	1.734	2.101	2.445	2.878	3.197	3.883	
19	0.688	0.861	1.328	1.729	2.093	2.433	2.861	3.174	3.850	
20	0.687	0.860	1.325	1.725	2.086	2.423	2.845	3.153	3.819	
21	0.686	0.859	1.323	1.721	2.080	2.414	2.831	3.135	3.792	
22	0.686	0.858	1.321	1.717	2.074	2.406	2.819	3.119	3.767	
23	0.685	0.858	1.319	1.714	2.069	2.398	2.807	3.104	3.745	
24	0.685	0.857	1.318	1.711	2.064	2.391	2.797	3.090	3.725	
25	0.684	0.856	1.316	1.708	2.060	2.385	2.787	3.078	3.707	
26	0.684	0.856	1.315	1.706	2.056	2.379	2.779	3.067	3.690	
27	0.684	0.855	1.314	1.703	2.052	2.373	2.771	3.056	3.674	
28	0.684	0.855	1.313	1.701	2.048	2.368	2.763	3.047	3.659	
29	0.683	0.854	1.311	1.699	2.045	2.364	2.756	3.038	3.646	
30	0.683	0.854	1.310	1.697	2.042	2.360	2.750	3.030	3.635	
35	0.682	0.852	1.306	1.690	2.030	2.342	2.724	2.996	3.591	
40	0.681	0.851	1.303	1.684	2.021	2.329	2.704	2.971	3.551	
45	0.680	0.850	1.301	1.680	2.014	2.319	2.690	2.952	3.520	
50	0.680	0.849	1.299	1.676	2.008	2.310	2.678	2.937	3.496	
55	0.679	0.849	1.297	1.673	2.004	2.304	2.669	2.925	3.476	
60	0.679	0.848	1.296	1.671	2.000	2.299	2.660	2.915	3.460	
70	0.678	0.847	1.294	1.667	1.994	2.290	2.648	2.899	3.435	
80	0.678	0.847	1.293	1.665	1.989	2.284	2.638	2.887	3.416	
90	0.678	0.846	1.291	1.662	1.986	2.279	2.631	2.878	3.402	
100	0.677	0.846	1.290	1.661	1.982	2.276	2.625	2.871	3.390	
120	0.677	0.845	1.289	1.658	1.980	2.270	2.617	2.860	3.373	
∞	0.6745	0.8416	1.2816	1.6448	1.9600	2.2414	2.5758	2.8070	3.2905	

\* Parts of this table are reprinted by permission from R. A. Fisher's *Statistical Methods for Research Workers*, published by Oliver and Boyd, Edinburgh (1925-1950); from Maxine Merrington's "Table of Percentage Points of the  $t$ -Distribution," *Biometrika*, 32: 3-30 (1942); and from Bernard Ostle's *Statistics in Research*, Iowa State University Press (1954).

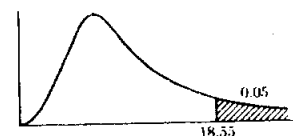
Table IV CUMULATIVE NORMAL FREQUENCY DISTRIBUTION (Area under the standard normal curve from 0 to Z)

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.398	0.438	0.478	0.517	0.557	0.596	0.636	0.675	0.714	0.753
0.2	0.793	0.832	0.871	0.910	0.948	0.987	1.026	1.064	1.103	1.141
0.3	1.179	1.217	1.255	1.293	1.331	1.368	1.406	1.443	1.480	1.517
0.4	1.554	1.591	1.628	1.664	1.700	1.736	1.772	1.808	1.844	1.879
0.5	1.915	1.950	1.985	2.019	2.054	2.088	2.123	2.157	2.190	2.224
0.6	2.257	2.291	2.324	2.357	2.389	2.422	2.454	2.486	2.517	2.549
0.7	2.580	2.611	2.642	2.673	2.704	2.734	2.764	2.794	2.823	2.852
0.8	2.881	2.910	2.939	2.967	2.995	3.023	3.051	3.078	3.106	3.133
0.9	3.159	3.186	3.212	3.238	3.264	3.289	3.315	3.340	3.365	3.389
1.0	3.413	3.438	3.461	3.485	3.508	3.531	3.554	3.577	3.599	3.621
1.1	3.643	3.665	3.686	3.708	3.729	3.749	3.770	3.790	3.810	3.830
1.2	3.849	3.869	3.888	3.907	3.925	3.944	3.962	3.980	3.997	4.015
1.3	4.032	4.049	4.066	4.082	4.099	4.115	4.131	4.147	4.162	4.177
1.4	4.192	4.207	4.222	4.236	4.251	4.265	4.279	4.292	4.306	4.319
1.5	4.332	4.345	4.357	4.370	4.382	4.394	4.406	4.418	4.429	4.441
1.6	4.452	4.463	4.474	4.484	4.495	4.505	4.515	4.525	4.535	4.545
1.7	4.554	4.564	4.573	4.582	4.591	4.599	4.608	4.616	4.625	4.633
1.8	4.641	4.649	4.656	4.664	4.671	4.678	4.686	4.693	4.699	4.706
1.9	4.713	4.719	4.726	4.732	4.738	4.744	4.750	4.756	4.761	4.767
2.0	4.772	4.778	4.783	4.788	4.793	4.798	4.803	4.808	4.812	4.817
2.1	4.821	4.826	4.830	4.834	4.838	4.842	4.846	4.850	4.854	4.857
2.2	4.861	4.864	4.868	4.871	4.875	4.878	4.881	4.884	4.887	4.890
2.3	4.893	4.896	4.898	4.901	4.904	4.906	4.909	4.911	4.913	4.916
2.4	4.918	4.920	4.922	4.925	4.927	4.929	4.931	4.932	4.934	4.936
2.5	4.938	4.940	4.941	4.943	4.945	4.946	4.948	4.949	4.951	4.952
2.6	4.953	4.955	4.956	4.957	4.959	4.960	4.961	4.962	4.963	4.964
2.7	4.965	4.966	4.967	4.968	4.969	4.970	4.971	4.972	4.973	4.974
2.8	4.974	4.975	4.976	4.977	4.978	4.979	4.979	4.980	4.981	4.981
2.9	4.981	4.982	4.982	4.983	4.984	4.984	4.985	4.985	4.986	4.986
3.0	4.987	4.987	4.987	4.988	4.988	4.989	4.989	4.989	4.990	4.990
3.1	4.990	4.991	4.991	4.991	4.992	4.992	4.992	4.992	4.993	4.993
3.2	4.993	4.993	4.994	4.994	4.994	4.994	4.994	4.995	4.995	4.995
3.3	4.995	4.995	4.996	4.996	4.996	4.996	4.996	4.996	4.997	4.997
3.4	4.997	4.997	4.997	4.997	4.997	4.997	4.997	4.997	4.997	4.998
3.6	4.998	4.998	4.999	4.999	4.999	4.999	4.999	4.999	4.999	4.999
3.9	5.000									

Percentage Points of the  $\chi^2$  Distribution

Table VI

Percentages represent areas in right-hand end of distribution. Example: For  $\nu = 12$ ,  $P(\chi^2 > 18.55) = 0.05$ .



Degrees of freedom	Probability that chi-square value will be exceeded									
	0.995	0.990	0.975	0.950	0.900	0.100	0.050	0.025	0.010	0.005
1	0.01393	0.0157	0.01982	0.02393	0.03158	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	4.61	5.99	7.38	9.21	10.60
3	0.072	0.115	0.216	0.352	0.564	5.25	7.81	9.35	11.34	12.84
4	0.207	0.297	0.484	0.711	1.064	7.78	9.49	11.14	13.28	14.86
5	0.412	0.554	0.831	1.145	1.61	9.24	11.07	12.83	15.09	16.75
6	0.676	0.872	1.24	1.64	2.20	10.64	12.50	14.45	16.81	18.55
7	0.989	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48	20.23
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.53	20.09	21.96
9	1.73	2.09	2.70	3.33	4.17	14.68	16.92	19.02	21.67	23.59
10	2.16	2.56	3.25	3.94	4.87	15.99	18.31	20.48	23.21	25.19
11	2.60	3.05	3.82	4.57	5.58	17.28	19.63	21.92	24.72	26.76
12	3.07	3.57	4.40	5.23	6.30	18.55	21.03	23.34	26.22	28.30
13	3.57	4.11	5.01	5.89	7.04	19.81	22.36	24.74	27.69	29.82
14	4.07	4.66	5.63	6.57	7.79	21.06	23.68	26.12	29.14	31.32
15	4.60	5.23	6.26	7.26	8.55	22.31	25.00	27.49	30.58	32.80
16	5.14	5.81	6.91	7.96	9.31	23.54	26.30	28.85	32.00	34.27
17	5.70	6.41	7.56	8.67	10.09	24.77	27.59	30.19	33.41	35.72
18	6.26	7.01	8.23	9.39	10.86	25.99	28.87	31.53	34.81	37.16
19	6.84	7.63	8.91	10.12	11.65	27.20	30.14	32.85	36.19	38.58
20	7.43	8.26	9.59	10.85	12.44	28.41	31.41	34.17	37.57	40.00
21	8.03	8.90	10.28	11.59	13.24	29.62	32.67	35.48	38.93	41.40
22	8.64	9.54	10.98	12.34	14.04	30.81	33.92	36.78	40.29	42.80
23	9.26	10.20	11.69	13.09	14.85	32.01	35.17	38.08	41.64	44.13
24	9.89	10.36	12.40	13.85	15.66	33.20	36.42	39.36	42.98	45.56
25	10.52	11.52	13.12	14.61	16.47	34.38	37.65	40.65	44.31	46.93
26	11.16	12.20	13.84	15.38	17.29	35.56	38.89	41.92	45.64	48.29
27	11.81	12.83	14.57	16.15	18.11	36.74	40.11	43.19	46.96	49.64
28	12.46	13.56	15.31	16.93	18.94	37.92	41.34	44.46	48.28	50.99
29	13.12	14.26	16.05	17.71	19.77	39.09	42.56	45.72	49.59	52.34
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89	53.67
40	20.71	22.16	24.43	26.51	29.05	51.80	55.76	59.34	63.69	66.77
50	27.99	29.71	32.36	34.76	37.69	63.17	67.50	71.42	76.15	79.49
60	35.53	37.43	40.48	43.19	46.46	74.40	79.08	83.30	83.38	91.95
70	43.28	45.44	48.76	51.74	55.33	85.53	90.53	95.02	100.4	104.22
80	51.17	53.54	57.15	60.39	64.28	98.58	101.9	106.6	112.3	116.32
90	59.20	61.75	65.65	69.13	73.29	107.6	113.1	118.1	124.1	123.3
100	67.33	70.06	74.22	77.93	82.36	113.5	124.3	129.6	135.3	140.2
$z_\alpha$	-2.58	-2.33	-1.96	-1.64	-1.28	+1.28	+1.64	+1.96	+2.33	+2.58

NOTE: For  $\nu > 100$  (i.e., for more than 100 degrees of freedom) take

$$\chi^2 = \nu \left[ 1 - \frac{2}{9\nu} + z_\alpha \sqrt{\frac{2}{9\nu}} \right]^2 \quad \text{or} \quad \chi^2 = \{ [z_\alpha + \sqrt{(2/\nu - 1)}] \}^2$$

according to the degree of accuracy required.  $z_\alpha$  is the standardized normal deviate corresponding to the  $\alpha$  level of significance, and is shown in the bottom line of the table.

F Distribution (Upper 5% points) (Upper 1% points) Table VII

m	n	Upper 5% points																		Upper 1% points																	
		1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞																	
1	1	161.4	199.5	216.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.0	243.9	244.6	245.0	245.1	245.1	245.1	245.1	245.1																	
2	1	18.81	19.00	19.18	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.41	19.43	19.45	19.46	19.47	19.48	19.48	19.49																	
3	1	10.13	9.65	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.78	8.77	8.76	8.75	8.74	8.73	8.73	8.72	8.72																	
4	1	7.71	6.94	6.39	6.20	6.06	6.00	5.96	5.92	5.89	5.87	5.86	5.85	5.84	5.83	5.82	5.81	5.81	5.80	5.80																	
5	1	6.61	5.78	5.41	5.19	5.05	4.95	4.88	4.83	4.77	4.74	4.73	4.72	4.71	4.70	4.69	4.68	4.68	4.67	4.67																	
6	1	5.99	5.14	4.78	4.52	4.39	4.28	4.21	4.15	4.10	4.06	4.05	4.04	4.03	4.02	4.01	4.00	4.00	3.99	3.99																	
7	1	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.63	3.62	3.61	3.60	3.59	3.58	3.58	3.57	3.57																	
8	1	5.32	4.46	4.07	3.84	3.68	3.58	3.50	3.44	3.39	3.35	3.34	3.33	3.32	3.31	3.30	3.29	3.29	3.28	3.28																	
9	1	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.13	3.12	3.11	3.10	3.09	3.08	3.08	3.07	3.07																	
10	1	4.98	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.97	2.96	2.95	2.94	2.93	2.92	2.92	2.91	2.91																	
11	1	4.84	3.96	3.57	3.34	3.20	3.09	3.01	2.95	2.90	2.85	2.84	2.83	2.82	2.81	2.80	2.79	2.79	2.78	2.78																	
12	1	4.75	3.87	3.48	3.25	3.11	3.00	2.91	2.85	2.80	2.75	2.74	2.73	2.72	2.71	2.70	2.69	2.69	2.68	2.68																	
13	1	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.66	2.65	2.64	2.63	2.62	2.61	2.61	2.60	2.60																	
14	1	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.59	2.58	2.57	2.56	2.55	2.54	2.54	2.53	2.53																	
15	1	4.54	3.68	3.28	3.05	2.90	2.79	2.71	2.64	2.59	2.54	2.53	2.52	2.51	2.50	2.49	2.48	2.48	2.47	2.47																	
16	1	4.49	3.63	3.23	3.00	2.85	2.74	2.66	2.59	2.54	2.49	2.48	2.47	2.46	2.45	2.44	2.43	2.43	2.42	2.42																	
17	1	4.45	3.59	3.19	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.44	2.43	2.42	2.41	2.40	2.39	2.39	2.38	2.38																	
18	1	4.41	3.55	3.15	2.92	2.77	2.66	2.58	2.51	2.46	2.41	2.40	2.39	2.38	2.37	2.36	2.35	2.35	2.34	2.34																	
19	1	4.38	3.52	3.12	2.89	2.74	2.63	2.54	2.48	2.42	2.38	2.37	2.36	2.35	2.34	2.33	2.32	2.32	2.31	2.31																	
20	1	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.34	2.33	2.32	2.31	2.30	2.29	2.29	2.28	2.28																	
21	1	4.32	3.47	3.07	2.84	2.68	2.57	2.48	2.42	2.37	2.32	2.31	2.30	2.29	2.28	2.27	2.26	2.26	2.25	2.25																	
22	1	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.29	2.28	2.27	2.26	2.25	2.24	2.24	2.23	2.23																	
23	1	4.28	3.43	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.26	2.25	2.24	2.23	2.22	2.21	2.21	2.20	2.20																	
24	1	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.24	2.23	2.22	2.21	2.20	2.19	2.19	2.18	2.18																	
25	1	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.23	2.22	2.21	2.20	2.19	2.18	2.18	2.17	2.17																	
26	1	4.23	3.37	2.98	2.74	2.58	2.47	2.38	2.32	2.27	2.22	2.21	2.20	2.19	2.18	2.17	2.16	2.16	2.15	2.15																	
27	1	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.19	2.18	2.17	2.16	2.15	2.14	2.14	2.13	2.13																	
28	1	4.20	3.34	2.95	2.71	2.55	2.44	2.35	2.29	2.24	2.19	2.18	2.17	2.16	2.15	2.14	2.13	2.13	2.12	2.12																	
29	1	4.18	3.33	2.93	2.70	2.54	2.43	2.34	2.28	2.23	2.18	2.17	2.16	2.15	2.14	2.13	2.12	2.12	2.11	2.11																	
30	1	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.15	2.14	2.13	2.12	2.11	2.10	2.10	2.09	2.09																	
40	1	4.06	3.23	2.84	2.61	2.45	2.34	2.25	2.19	2.12	2.06	2.05	2.04	2.03	2.02	2.01	1.99	1.99	1.98	1.98																	
60	1	4.00	3.15	2.78	2.53	2.37	2.26	2.17	2.10	2.04	1.99	1.97	1.96	1.95	1.94	1.93	1.92	1.91	1.91	1.91																	
120	1	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.89	1.88	1.87	1.86	1.85	1.84	1.83	1.83	1.83																	
∞	1	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.81	1.80	1.79	1.78	1.77	1.76	1.75	1.75	1.75																	

SOURCE: This table is abridged from Table 18 of the *Biometrika Tables for Statisticians*, Vol. 1 (1st ed.), edited by E. S. Pearson and H. O. Hartley. Reproduced with the kind permission of E. S. Pearson and the trustees of *Biometrika*.



**UPPER PERCENTAGE POINTS OF THE STUDENTIZED RANGE,  $q_{\alpha} = \frac{\bar{x}_{\max} - \bar{x}_{\min}}{s}$**   
**Table VIII**  
 UPPER PERCENTAGE POINTS OF THE STUDENTIZED RANGE,  $q_{\alpha} = \frac{\bar{x}_{\max} - \bar{x}_{\min}}{s}$

Error $d/f$	$\alpha$	$k$																		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5	.05	3.64	4.60	5.22	5.67	6.03	6.33	6.58	6.80	6.99	7.17	7.32	7.47	7.60	7.72	7.83	7.93	8.03	8.12	8.21
	.01	5.70	6.97	7.80	8.42	8.91	9.32	9.67	9.97	10.24	10.48	10.70	10.89	11.08	11.24	11.40	11.55	11.68	11.81	11.93
6	.05	3.46	4.34	4.90	5.31	5.63	5.89	6.12	6.32	6.49	6.65	6.79	6.92	7.03	7.14	7.24	7.34	7.43	7.51	7.59
	.01	5.24	6.33	7.03	7.56	7.97	8.32	8.61	8.87	9.10	9.30	9.49	9.65	9.81	9.95	10.08	10.21	10.32	10.43	10.54
7	.05	3.34	4.16	4.68	5.06	5.36	5.61	5.82	6.00	6.16	6.30	6.43	6.55	6.66	6.76	6.85	6.94	7.02	7.09	7.17
	.01	4.95	5.92	6.54	7.01	7.37	7.68	7.94	8.17	8.37	8.55	8.71	8.86	9.00	9.12	9.24	9.35	9.46	9.55	9.65
8	.05	3.26	4.04	4.53	4.89	5.17	5.40	5.60	5.77	5.92	6.05	6.18	6.29	6.39	6.49	6.57	6.65	6.73	6.80	6.87
	.01	4.74	5.63	6.20	6.63	6.96	7.24	7.47	7.68	7.87	8.03	8.18	8.31	8.44	8.53	8.66	8.76	8.85	8.94	9.03
9	.05	3.20	3.95	4.42	4.76	5.02	5.24	5.43	5.60	5.74	5.87	5.98	6.09	6.19	6.28	6.36	6.44	6.51	6.58	6.64
	.01	4.60	5.43	5.96	6.35	6.66	6.91	7.13	7.32	7.49	7.65	7.78	7.91	8.03	8.13	8.23	8.32	8.41	8.49	8.57
10	.05	3.15	3.88	4.33	4.65	4.91	5.12	5.30	5.46	5.60	5.72	5.83	5.93	6.03	6.11	6.20	6.27	6.34	6.40	6.47
	.01	4.48	5.27	5.77	6.14	6.43	6.67	6.87	7.05	7.21	7.36	7.48	7.60	7.71	7.81	7.91	7.99	8.07	8.15	8.22
11	.05	3.11	3.82	4.26	4.57	4.82	5.03	5.20	5.35	5.49	5.61	5.71	5.81	5.90	5.99	6.06	6.14	6.20	6.26	6.33
	.01	4.39	5.14	5.62	5.97	6.25	6.48	6.67	6.84	6.99	7.13	7.25	7.36	7.46	7.56	7.65	7.73	7.81	7.88	7.95
12	.05	3.08	3.77	4.20	4.51	4.75	4.95	5.12	5.27	5.40	5.51	5.62	5.71	5.80	5.88	5.95	6.03	6.09	6.15	6.21
	.01	4.32	5.04	5.50	5.84	6.10	6.32	6.51	6.67	6.81	6.94	7.06	7.17	7.26	7.36	7.44	7.52	7.59	7.66	7.73
13	.05	3.06	3.73	4.15	4.45	4.69	4.88	5.05	5.19	5.32	5.43	5.53	5.63	5.71	5.79	5.86	5.93	6.00	6.05	6.11
	.01	4.26	4.96	5.40	5.73	5.98	6.19	6.37	6.53	6.67	6.79	6.90	7.01	7.10	7.19	7.27	7.34	7.42	7.48	7.55
14	.05	3.03	3.70	4.11	4.41	4.64	4.83	4.99	5.13	5.25	5.36	5.46	5.55	5.64	5.72	5.79	5.85	5.92	5.97	6.03
	.01	4.21	4.89	5.32	5.63	5.88	6.08	6.26	6.41	6.54	6.66	6.77	6.87	6.96	7.05	7.12	7.20	7.27	7.33	7.39
15	.05	3.01	3.67	4.08	4.37	4.60	4.78	4.94	5.08	5.20	5.31	5.40	5.49	5.58	5.65	5.72	5.79	5.85	5.90	5.96
	.01	4.17	4.83	5.25	5.56	5.80	5.99	6.16	6.31	6.44	6.55	6.66	6.76	6.84	6.93	7.00	7.07	7.14	7.20	7.26
16	.05	3.00	3.65	4.05	4.33	4.56	4.74	4.90	5.03	5.15	5.26	5.35	5.44	5.52	5.59	5.66	5.72	5.79	5.84	5.90
	.01	4.13	4.78	5.19	5.49	5.72	5.92	6.08	6.22	6.35	6.46	6.56	6.66	6.74	6.82	6.90	6.97	7.03	7.09	7.15
17	.05	2.98	3.63	4.02	4.30	4.52	4.71	4.86	4.99	5.11	5.21	5.31	5.39	5.47	5.55	5.61	5.68	5.74	5.84	5.90
	.01	4.10	4.74	5.14	5.43	5.66	5.85	6.01	6.15	6.27	6.38	6.48	6.57	6.66	6.73	6.80	6.87	6.94	7.00	7.05
18	.05	2.97	3.61	4.00	4.28	4.49	4.67	4.82	4.96	5.07	5.17	5.27	5.35	5.43	5.50	5.57	5.63	5.69	5.74	5.79
	.01	4.07	4.70	5.09	5.38	5.60	5.79	5.94	6.08	6.20	6.31	6.41	6.50	6.58	6.65	6.72	6.79	6.85	6.91	6.96
19	.05	2.96	3.59	3.98	4.25	4.47	4.65	4.79	4.92	5.04	5.14	5.23	5.32	5.39	5.46	5.53	5.59	5.65	5.70	5.75
	.01	4.05	4.67	5.05	5.33	5.55	5.73	5.89	6.02	6.14	6.25	6.34	6.43	6.51	6.58	6.65	6.72	6.78	6.84	6.89
20	.05	2.95	3.58	3.96	4.23	4.45	4.62	4.77	4.90	5.01	5.11	5.20	5.28	5.36	5.43	5.49	5.55	5.61	5.66	5.71
	.01	4.02	4.64	5.02	5.29	5.51	5.69	5.84	5.97	6.09	6.19	6.29	6.37	6.45	6.52	6.59	6.65	6.71	6.76	6.82
24	.05	2.92	3.53	3.90	4.17	4.37	4.54	4.68	4.81	4.92	5.01	5.10	5.18	5.25	5.32	5.38	5.44	5.50	5.54	5.59
	.01	3.96	4.54	4.91	5.17	5.37	5.54	5.69	5.81	5.92	6.02	6.11	6.19	6.26	6.33	6.39	6.45	6.51	6.56	6.61
30	.05	2.89	3.49	3.84	4.10	4.30	4.46	4.60	4.72	4.83	4.92	5.00	5.08	5.15	5.21	5.27	5.33	5.38	5.43	5.48
	.01	3.89	4.45	4.80	5.05	5.24	5.40	5.54	5.65	5.76	5.85	5.93	6.01	6.08	6.14	6.20	6.26	6.31	6.36	6.41
40	.05	2.86	3.44	3.79	4.04	4.23	4.39	4.52	4.63	4.74	4.82	4.91	4.98	5.05	5.11	5.16	5.22	5.27	5.31	5.36
	.01	3.82	4.37	4.70	4.93	5.11	5.27	5.39	5.50	5.60	5.69	5.77	5.84	5.90	5.96	6.02	6.07	6.12	6.17	6.21
60	.05	2.83	3.40	3.74	3.98	4.16	4.31	4.44	4.55	4.65	4.73	4.81	4.88	4.94	5.00	5.06	5.11	5.16	5.20	5.24
	.01	3.76	4.28	4.60	4.82	4.99	5.13	5.23	5.36	5.45	5.53	5.60	5.67	5.73	5.79	5.84	5.89	5.93	5.98	6.02
120	.05	2.80	3.36	3.69	3.92	4.10	4.24	4.36	4.48	4.56	4.64	4.72	4.78	4.84	4.90	4.95	5.00	5.05	5.09	5.13
	.01	3.70	4.20	4.50	4.71	4.87	5.01	5.12	5.21	5.30	5.38	5.44	5.51	5.56	5.61	5.66	5.71	5.75	5.79	5.83
$\infty$	.05	2.77	3.31	3.63	3.86	4.03	4.17	4.29	4.39	4.47	4.55	4.62	4.68	4.74	4.80	4.85	4.89	4.93	4.97	5.01
	.01	3.64	4.12	4.40	4.60	4.76	4.88	4.99	5.08	5.16	5.23	5.29	5.35	5.40	5.45	5.49	5.54	5.57	5.61	5.65

SOURCE: This table is abridged from Table 29, *Biometrika Tables for Statisticians*, vol. 1, Cambridge University Press, 1954. It is reproduced with permission of the *Biometrika* trustees and the editors, F. S. Pearson and H. O. Hartley. The original work appeared in a paper by J. M. May, "Extended and corrected tables of the upper percentage points of the Studentized range," *Biometrika*, **39**: 192-193 (1952).

Table IX Critical Values for the Maximum F-Ratio [46]  
 95% points (first line), 99% points (second line)

k	f							
	2	3	4	5	6	7	8	9
2	39.0	15.4	9.60	7.15	5.82	4.99	4.43	4.03
	199	47.5	23.2	14.9	11.1	8.89	7.50	6.54
3	87.5	27.8	15.5	10.8	8.38	6.94	6.00	5.34
	448	85	37	22	15.5	12.1	9.9	8.5
4	142	39.2	20.6	13.7	10.4	8.44	7.18	6.31
	729	120	49	28	19.1	14.5	11.7	9.9
5	202	50.7	25.2	16.3	12.1	9.70	8.12	7.11
	1036	151	59	33	22	16.5	13.2	11.1
6	266	62.0	29.5	18.7	13.7	10.8	9.03	7.80
	1362	184	69	38	25	18.4	14.5	12.1
7	333	72.9	33.6	20.8	15.0	11.8	9.78	8.41
	1705	216	79	42	27	20	15.8	13.1
8	403	83.5	37.5	22.9	16.3	12.7	10.5	8.95
	2063	249	89	46	30	22	16.9	13.9
9	475	93.9	41.1	24.7	17.5	13.5	11.1	9.45
	2432	281	97	50	32	23	17.9	14.7
10	550	104	44.6	26.5	18.6	14.3	11.7	9.91
	2813	310	106	54	34	24	18.9	15.3
11	626	114	48.0	28.2	19.7	15.1	12.2	10.3
	3204	337	113	57	36	26	19.8	16.0
12	704	124	51.4	29.9	20.7	15.8	12.7	10.7
	3605	361	120	60	37	27	21	16.6

k	f						
	10	12	15	20	30	60	∞
2	3.72	3.28	2.86	2.46	2.07	1.67	1.00
	5.85	4.91	4.07	3.32	2.63	1.96	1.00
3	4.85	4.16	3.54	2.95	2.40	1.85	1.00
	7.4	6.1	4.9	3.8	3.0	2.2	1.0
4	5.67	4.79	4.01	3.29	2.61	1.96	1.00
	8.6	6.9	5.5	4.3	3.3	2.3	1.0
5	6.34	5.30	4.37	3.54	2.78	2.04	1.00
	9.6	7.6	6.0	4.6	3.4	2.4	1.0
6	6.92	5.72	4.68	3.76	2.91	2.11	1.00
	10.4	8.2	6.4	4.9	3.6	2.4	1.0
7	7.42	6.09	4.95	3.94	3.02	2.17	1.00
	11.1	8.7	6.7	5.1	3.7	2.5	1.0
8	7.87	6.42	5.19	4.10	3.12	2.22	1.00
	11.8	9.1	7.1	5.3	3.8	2.5	1.0
9	8.28	6.72	5.40	4.24	3.21	2.26	1.00
	12.4	9.5	7.3	5.5	3.9	2.6	1.0
10	8.66	7.00	5.59	4.37	3.29	2.30	1.00
	12.9	9.9	7.5	5.6	4.0	2.6	1.0
11	9.01	7.25	5.77	4.49	3.36	2.33	1.00
	13.4	10.2	7.8	5.8	4.1	2.7	1.0
12	9.34	7.48	5.93	4.59	3.39	2.36	1.00
	13.9	10.6	8.0	5.9	4.2	2.7	1.0

Table X

Values given are for the statistic (largest  $s^2$ )/( $Z_{\alpha}$ ), where each of the  $k$  values of  $s^2$  has  $\nu$  degrees of freedom.

CRITICAL VALUES FOR COCHRAN'S TEST

PERCENTILE 95

$\nu \backslash k$	1	2	3	4	5	6	7	8	9	10	16	36	144	$\infty$
2	0.9985	0.9750	0.9302	0.9057	0.8772	0.8534	0.8332	0.8159	0.8010	0.7880	0.7341	0.6602	0.5813	0.5000
3	0.9609	0.8709	0.7977	0.7457	0.7071	0.6771	0.6539	0.6333	0.6167	0.6025	0.5466	0.4748	0.4031	0.3333
4	0.9065	0.7679	0.6841	0.6287	0.5895	0.5598	0.5365	0.5175	0.5017	0.4884	0.4366	0.3720	0.3093	0.2500
5	0.8412	0.6838	0.5981	0.5441	0.5065	0.4783	0.4564	0.4387	0.4241	0.4118	0.3645	0.3066	0.2513	0.2000
6	0.7808	0.6161	0.5321	0.4803	0.4447	0.4184	0.3980	0.3817	0.3682	0.3568	0.3135	0.2612	0.2119	0.1667
7	0.7271	0.5512	0.4800	0.4307	0.3974	0.3726	0.3535	0.3384	0.3259	0.3154	0.2758	0.2278	0.1833	0.1420
8	0.6798	0.5157	0.4377	0.3910	0.3595	0.3362	0.3185	0.3043	0.2926	0.2829	0.2462	0.2022	0.1616	0.1250
9	0.6385	0.4775	0.4027	0.3584	0.3266	0.3067	0.2931	0.2768	0.2659	0.2568	0.2228	0.1820	0.1446	0.1111
10	0.6020	0.4450	0.3733	0.3311	0.3029	0.2823	0.2666	0.2541	0.2439	0.2353	0.2032	0.1655	0.1308	0.1000
12	0.5410	0.3924	0.3264	0.2880	0.2624	0.2439	0.2299	0.2187	0.2098	0.2020	0.1737	0.1403	0.1100	0.0833
15	0.4709	0.3346	0.2758	0.2419	0.2195	0.2034	0.1911	0.1815	0.1736	0.1671	0.1429	0.1144	0.0889	0.0667
20	0.3894	0.2705	0.2205	0.1921	0.1735	0.1602	0.1501	0.1422	0.1357	0.1303	0.1108	0.0879	0.0675	0.0500
24	0.3434	0.2354	0.1907	0.1656	0.1493	0.1374	0.1286	0.1216	0.1160	0.1113	0.0942	0.0743	0.0567	0.0417
30	0.2929	0.1980	0.1593	0.1377	0.1237	0.1137	0.1061	0.1002	0.0958	0.0921	0.0771	0.0604	0.0457	0.0333
40	0.2370	0.1576	0.1259	0.1082	0.0968	0.0887	0.0827	0.0780	0.0745	0.0713	0.0595	0.0462	0.0347	0.0250
60	0.1737	0.1131	0.0895	0.0765	0.0682	0.0623	0.0583	0.0552	0.0520	0.0497	0.0411	0.0316	0.0234	0.0167
120	0.0998	0.0632	0.0495	0.0419	0.0371	0.0337	0.0312	0.0292	0.0279	0.0266	0.0218	0.0165	0.0120	0.0083
$\infty$	0	0	0	0	0	0	0	0	0	0	0	0	0	0

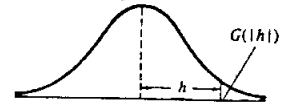
PERCENTILE 99

$\nu \backslash k$	1	2	3	4	5	6	7	8	9	10	16	36	144	$\infty$
2	0.9999	0.9950	0.9794	0.9588	0.9373	0.9172	0.8988	0.8823	0.8674	0.8539	0.7949	0.7067	0.6062	0.5000
3	0.9933	0.9423	0.8831	0.8335	0.7933	0.7606	0.7335	0.7107	0.6912	0.6743	0.6059	0.5153	0.4230	0.3333
4	0.9676	0.8643	0.7814	0.7212	0.6761	0.6410	0.6129	0.5897	0.5702	0.5536	0.4884	0.4057	0.3251	0.2500
5	0.9279	0.7885	0.6957	0.6329	0.5875	0.5531	0.5259	0.5037	0.4854	0.4697	0.4094	0.3351	0.2644	0.2000
6	0.8828	0.7218	0.6258	0.5635	0.5195	0.4866	0.4608	0.4401	0.4229	0.4084	0.3529	0.2858	0.2229	0.1667
7	0.8376	0.6644	0.5685	0.5080	0.4659	0.4347	0.4105	0.3911	0.3751	0.3616	0.3105	0.2494	0.1929	0.1420
8	0.7945	0.6152	0.5209	0.4627	0.4226	0.3932	0.3704	0.3522	0.3373	0.3248	0.2779	0.2214	0.1700	0.1250
9	0.7544	0.5727	0.4810	0.4251	0.3870	0.3592	0.3378	0.3207	0.3067	0.2950	0.2514	0.1992	0.1521	0.1111
10	0.7175	0.5358	0.4469	0.3934	0.3572	0.3308	0.3106	0.2945	0.2813	0.2704	0.2297	0.1811	0.1376	0.1000
12	0.6528	0.4751	0.3919	0.3428	0.3095	0.2861	0.2680	0.2535	0.2419	0.2320	0.1961	0.1535	0.1157	0.0833
15	0.5747	0.4069	0.3317	0.2882	0.2555	0.2386	0.2228	0.2104	0.2002	0.1918	0.1612	0.1251	0.0934	0.0667
20	0.4799	0.3297	0.2654	0.2288	0.2048	0.1877	0.1748	0.1646	0.1567	0.1501	0.1248	0.0960	0.0709	0.0500
24	0.4247	0.2871	0.2295	0.1970	0.1759	0.1608	0.1495	0.1406	0.1338	0.1283	0.1060	0.0810	0.0595	0.0417
30	0.3632	0.2412	0.1913	0.1635	0.1454	0.1327	0.1232	0.1157	0.1100	0.1054	0.0867	0.0658	0.0490	0.0333
40	0.2940	0.1915	0.1508	0.1281	0.1135	0.1033	0.0957	0.0898	0.0853	0.0816	0.0668	0.0508	0.0368	0.0250
60	0.2151	0.1371	0.1069	0.0902	0.0796	0.0722	0.0668	0.0625	0.0591	0.0567	0.0461	0.0344	0.0245	0.0167
120	0.1225	0.0759	0.0585	0.0489	0.0429	0.0387	0.0357	0.0334	0.0316	0.0302	0.0242	0.0178	0.0125	0.0083
$\infty$	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Unit Normal Loss Function  $G(|h|)$ 

Table XI



$h$	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.3989	0.3940	0.3890	0.3841	0.3793	0.3744	0.3697	0.3649	0.3602	0.3556
0.1	0.3509	0.3464	0.3418	0.3373	0.3328	0.3284	0.3240	0.3197	0.3154	0.3111
0.2	0.3069	0.3027	0.2986	0.2944	0.2904	0.2863	0.2824	0.2784	0.2745	0.2706
0.3	0.2668	0.2630	0.2592	0.2555	0.2518	0.2481	0.2445	0.2409	0.2374	0.2339
0.4	0.2304	0.2270	0.2236	0.2203	0.2169	0.2137	0.2104	0.2072	0.2040	0.2009
0.5	0.1978	0.1947	0.1917	0.1887	0.1857	0.1828	0.1799	0.1771	0.1742	0.1714
0.6	0.1687	0.1659	0.1633	0.1606	0.1580	0.1554	0.1528	0.1503	0.1478	0.1453
0.7	0.1429	0.1405	0.1381	0.1358	0.1334	0.1312	0.1289	0.1267	0.1245	0.1223
0.8	0.1202	0.1181	0.1160	0.1140	0.1120	0.1100	0.1080	0.1061	0.1042	0.1023
0.9	0.1004	0.09860	0.09680	0.09503	0.09328	0.09156	0.08986	0.08819	0.08654	0.08491
1.0	0.08332	0.08174	0.08019	0.07866	0.07716	0.07568	0.07422	0.07279	0.07138	0.06999
1.1	0.06862	0.06727	0.06595	0.06465	0.06336	0.06210	0.06086	0.05964	0.05844	0.05726
1.2	0.05610	0.05496	0.05384	0.05274	0.05165	0.05059	0.04954	0.04851	0.04750	0.04650
1.3	0.04553	0.04457	0.04363	0.04270	0.04179	0.04090	0.04002	0.03916	0.03831	0.03748
1.4	0.03667	0.03587	0.03508	0.03431	0.03356	0.03281	0.03208	0.03137	0.03067	0.02998
1.5	0.02931	0.02865	0.02800	0.02736	0.02674	0.02612	0.02552	0.02494	0.02436	0.02380
1.6	0.02324	0.02270	0.02217	0.02165	0.02114	0.02064	0.02015	0.01967	0.01920	0.01874
1.7	0.01829	0.01785	0.01742	0.01699	0.01658	0.01617	0.01578	0.01539	0.01501	0.01464
1.8	0.01428	0.01392	0.01357	0.01323	0.01290	0.01257	0.01226	0.01195	0.01164	0.01134
1.9	0.01105	0.01077	0.01049	0.01022	0.009957	0.009698	0.009445	0.009198	0.008957	0.008721
2.0	0.008491	0.008266	0.008046	0.007832	0.007623	0.007418	0.007219	0.007024	0.006835	0.006649
2.1	0.006468	0.006292	0.006120	0.005952	0.005788	0.005628	0.005472	0.005320	0.005172	0.005028
2.2	0.004887	0.004750	0.004616	0.004486	0.004358	0.004235	0.004114	0.003996	0.003882	0.003770
2.3	0.003662	0.003556	0.003453	0.003352	0.003255	0.003159	0.003067	0.002977	0.002889	0.002804
2.4	0.002720	0.002640	0.002561	0.002484	0.002410	0.002337	0.002267	0.002199	0.002132	0.002067
2.5	0.002004	0.001943	0.001883	0.001826	0.001769	0.001715	0.001662	0.001610	0.001560	0.001511
2.6	0.001464	0.001418	0.001373	0.001330	0.001288	0.001247	0.001207	0.001169	0.001132	0.001095
2.7	0.001060	0.001026	0.009928	0.009607	0.009295	0.008992	0.008699	0.008414	0.008138	0.007870
2.8	0.007611	0.007359	0.007115	0.006879	0.006650	0.006428	0.006213	0.006004	0.005802	0.005606
2.9	0.005417	0.005233	0.005055	0.004883	0.004716	0.004555	0.004398	0.004247	0.004101	0.003959
3.0	0.003822	0.003689	0.003560	0.003436	0.003316	0.003199	0.003087	0.002978	0.002873	0.002771
3.1	0.002673	0.002577	0.002485	0.002396	0.002311	0.002227	0.002147	0.002070	0.001995	0.001922
3.2	0.001852	0.001785	0.001720	0.001657	0.001596	0.001537	0.001480	0.001426	0.001373	0.001322
3.3	0.001273	0.001225	0.001179	0.001135	0.001093	0.001051	0.001012	0.009734	0.009365	0.009009
3.4	0.008666	0.008335	0.008016	0.007709	0.007413	0.007127	0.006852	0.006587	0.006331	0.006085
3.5	0.005848	0.005620	0.005400	0.005188	0.004984	0.004788	0.004599	0.004417	0.004242	0.004073
3.6	0.003911	0.003755	0.003605	0.003460	0.003321	0.003188	0.003059	0.002935	0.002816	0.002702
3.7	0.002592	0.002486	0.002385	0.002287	0.002193	0.002103	0.002016	0.001933	0.001853	0.001776
3.8	0.001702	0.001632	0.001563	0.001498	0.001435	0.001375	0.001317	0.001262	0.001208	0.001157
3.9	0.001108	0.001061	0.001016	0.009723	0.009307	0.008908	0.008525	0.008158	0.007806	0.007469
4.0	0.007145	0.006835	0.006538	0.006253	0.005980	0.005718	0.005468	0.005227	0.004997	0.004777
4.1	0.004566	0.004364	0.004170	0.003985	0.003807	0.003637	0.003475	0.003319	0.003170	0.003027
4.2	0.002891	0.002760	0.002635	0.002516	0.002402	0.002292	0.002188	0.002088	0.001992	0.001901
4.3	0.001814	0.001730	0.001650	0.001574	0.001501	0.001431	0.001365	0.001301	0.001241	0.001183
4.4	0.001127	0.001074	0.001024	0.009756	0.009296	0.008857	0.008437	0.008037	0.007655	0.007290
4.5	0.006942	0.006610	0.006294	0.005992	0.005704	0.005429	0.005167	0.004917	0.004679	0.004452
4.6	0.004236	0.004029	0.003833	0.003645	0.003467	0.003297	0.003135	0.002981	0.002834	0.002694
4.7	0.002560	0.002433	0.002313	0.002197	0.002088	0.001984	0.001884	0.001790	0.001700	0.001615
4.8	0.001533	0.001456	0.001382	0.001312	0.001246	0.001182	0.001122	0.001065	0.001011	0.009588
4.9	0.009096	0.008629	0.008185	0.007763	0.007362	0.006982	0.006620	0.006276	0.005950	0.005640

$$G(-h) = h + G(h)$$

$$\text{Examples: } G(3.57) = 0.004417 = 0.00004417$$

$$G(-3.57) = 3.57004417$$

**Table XII**  
**Critical Values of  $r$  for the Sign Test**

(Two-tail percentage points are given for the binomial for  $p = 0.5$ )

N	1%	5%	10%	25%	N	1%	5%	10%	25%
1					51	15	18	19	20
2					52	16	18	19	21
3				0	53	16	18	20	21
4				0	54	17	19	20	22
5			0	0	55	17	19	20	22
6		0	0	1	56	17	20	21	23
7		0	0	1	57	18	20	21	23
8	0	0	1	1	58	18	21	22	24
9	0	1	1	2	59	19	21	22	24
10	0	1	1	2	60	19	21	23	25
11	0	1	2	3	61	20	22	23	25
12	1	2	2	3	62	20	22	24	25
13	1	2	3	3	63	20	23	24	26
14	1	2	3	4	64	21	23	24	26
15	2	3	3	4	65	21	24	25	27
16	2	3	4	5	66	22	24	25	27
17	2	4	4	5	67	22	25	26	28
18	3	4	5	6	68	22	25	26	28
19	3	4	5	6	69	23	25	27	29
20	3	5	5	6	70	23	26	27	29
21	4	5	6	7	71	24	26	28	30
22	4	5	6	7	72	24	27	28	30
23	4	6	7	8	73	25	27	28	31
24	5	6	7	8	74	25	28	29	31
25	5	7	7	9	75	25	28	29	32
26	6	7	8	9	76	26	28	30	32
27	6	7	8	10	77	26	29	30	32
28	6	8	9	10	78	27	29	31	33
29	7	8	9	10	79	27	30	31	33
30	7	9	10	11	80	28	30	32	34
31	7	9	10	11	81	28	31	32	34
32	8	9	10	12	82	28	31	33	35
33	8	10	11	12	83	29	32	33	35
34	9	10	11	13	84	29	32	33	36
35	9	11	12	13	85	30	32	34	36
36	9	11	12	14	86	30	33	34	37
37	10	12	13	14	87	31	33	35	37
38	10	12	13	14	88	31	34	35	38
39	11	12	13	15	89	31	34	36	38
40	11	13	14	15	90	32	35	36	39
41	11	13	14	16	91	32	35	37	39
42	12	14	15	16	92	33	36	37	39
43	12	14	15	17	93	33	36	38	40
44	13	15	16	17	94	34	37	38	40
45	13	15	16	18	95	34	37	38	41
46	13	15	16	18	96	34	37	39	41
47	14	16	17	19	97	35	38	39	42
48	14	16	17	19	98	35	38	40	42
49	15	17	18	19	99	36	39	40	43
50	15	17	18	20	100	36	39	41	43

**Table XIII** Critical Values of *T* in the Wilcoxon Matched-Pairs Signed-Ranks Test  
Critical Values of *T* at Various Levels of Probability

The symbol *T* denotes the smaller sum of ranks associated with differences that are all of the same sign. For any given *N* (number of ranked differences), the obtained *T* is significant at a given level if it is equal to or less than the value shown in the table.

N	Level of significance for one-tailed test				N	Level of significance for one-tailed test			
	.05	.025	.01	.005		.05	.025	.01	.005
	Level of significance for two-tailed test					Level of significance for two-tailed test			
	.10	.05	.02	.01		.10	.05	.02	.01
5	0	--	--	--	28	130	116	101	91
6	2	0	--	--	29	140	126	110	100
7	3	2	0	--	30	151	137	120	109
8	5	3	1	0	31	163	147	130	118
9	8	5	3	1	32	175	159	140	128
10	10	8	5	3	33	187	170	151	138
11	13	10	7	5	34	200	182	162	148
12	17	13	9	7	35	213	195	173	159
13	21	17	12	9	36	227	208	185	171
14	25	21	15	12	37	241	221	198	182
15	30	25	19	15	38	256	235	211	194
16	35	29	23	19	39	271	249	224	207
17	41	34	27	23	40	286	264	238	220
18	47	40	32	27	41	302	279	252	233
19	53	46	37	32	42	319	294	266	247
20	60	52	43	37	43	336	310	281	261
21	67	58	49	42	44	353	327	296	276
22	75	65	55	48	45	371	343	312	291
23	83	73	62	54	46	389	361	328	307
24	91	81	69	61	47	407	378	345	322
25	100	89	76	68	48	426	396	362	339
26	110	98	84	75	49	446	415	379	355
27	119	107	92	83	50	466	434	397	373

(Slight discrepancies will be found between the critical values appearing in the table above and in Table 2 of the 1964 revision of F. Wilcoxon, and R. A. Wilcox, *Some Rapid Approximate Statistical Procedures*, New York, Lederle Laboratories, 1964. The disparity reflects the latter's policy of selecting the critical value nearest a given significance level, occasionally overstepping that level. For example, for *N* = 8,

the probability of a *T* of 3 = 0.0390 (two-tail)

and

the probability of a *T* of 4 = 0.0546 (two-tail).

Wilcoxon and Wilcox select a *T* of 4 as the critical value at the 0.05 level of significance (two-tail), whereas Table J reflects a more conservative policy by setting a *T* of 3 as the critical value at this level.)

Table XIV

Critical values and probability levels for the Wilcoxon rank-sum test

n	$\alpha_0 = P = .05$ one-sided			$\alpha_0 = P = .01$ two-sided		
	m=6	m=7	m=8	m=6	m=7	m=8
6	28, 50 .0465			24, 54 .0076		
7	29, 49 .0560	39, 66 .0487		25, 53 .0130	24, 71 .0037	
8	29, 55 .0367	40, 65 .0641		25, 59 .0070	35, 70 .0131	
9	30, 54 .0307	41, 71 .0469	51, 85 .0415	26, 58 .0111	35, 77 .0070	45, 91 .0074
10	31, 59 .0406	42, 70 .0603	52, 84 .0524	27, 63 .0100	36, 76 .0103	45, 90 .0103
11	32, 58 .0539	43, 76 .0454	54, 90 .0454	28, 62 .0147		
12	33, 63 .0440	44, 75 .0571	55, 89 .0570	28, 69 .0038	37, 82 .0032	47, 97 .0076
13	34, 62 .0567	45, 81 .0459	56, 96 .0416	29, 67 .0128	38, 91 .0115	49, 96 .0103
14	35, 67 .0457	46, 80 .0344	57, 95 .0506	29, 73 .0080	39, 87 .0093	49, 103 .0078
15	36, 66 .0539	47, 86 .0427	59, 101 .0454	30, 72 .0112	39, 95 .0125	50, 102 .0103
16	37, 71 .0491	48, 85 .0521	60, 100 .0543	30, 78 .0073	40, 91 .0077	51, 109 .0079
17	38, 70 .0603	49, 91 .0416	62, 106 .0489	31, 77 .0101	41, 91 .0102	52, 108 .0102
18	38, 76 .0415	50, 90 .0501	63, 105 .0576	32, 82 .0051	42, 98 .0035	53, 115 .0079
19	39, 75 .0512	51, 94 .0573	65, 111 .0521	33, 81 .0122	43, 97 .0111	54, 114 .0101
20	40, 80 .0437	52, 95 .0434	64, 112 .0445	33, 87 .0084	44, 103 .0093	55, 120 .0099
21	41, 79 .0520	53, 94 .0513	66, 118 .0505	34, 96 .0110	45, 102 .0113	57, 119 .0123
22	42, 84 .0457	54, 100 .0459	67, 122 .0477	34, 92 .0077	45, 109 .0079	58, 125 .0120
23	43, 83 .0547	55, 99 .0520	69, 128 .0551	35, 91 .0100	46, 108 .0100	59, 125 .0115
24	44, 88 .0474	56, 105 .0455	70, 133 .0513	35, 96 .0092	47, 114 .0086	60, 132 .0097
25	45, 87 .0561	57, 104 .0531	72, 139 .0547	37, 95 .0117	48, 113 .0106	61, 131 .0117
26	46, 92 .0490	58, 110 .0443	73, 144 .0478	38, 100 .0107	49, 119 .0092	62, 138 .0096
27	47, 91 .0574	59, 109 .0513	75, 150 .0528	39, 105 .0099	50, 118 .0112	63, 137 .0115
28	47, 97 .0433	61, 114 .0497	77, 156 .0517	40, 104 .0122	51, 124 .0097	64, 144 .0095
29	48, 96 .0505	62, 113 .0569	79, 162 .0552	40, 104 .0122	52, 123 .0118	65, 143 .0113
30	49, 101 .0448	63, 119 .0434	81, 168 .0493	40, 110 .0091	52, 130 .0085	66, 150 .0094
31	50, 100 .0518	64, 118 .0550	83, 174 .0531	41, 109 .0112	53, 129 .0103	67, 149 .0110
32	51, 105 .0462	65, 124 .0471	85, 180 .0475	41, 115 .0085	54, 135 .0090	68, 156 .0093
33	52, 104 .0530	66, 123 .0533	87, 186 .0527	42, 114 .0104	55, 134 .0108	69, 155 .0108
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Extracted with permission from "Selected Tables in Mathematical Statistics," vol. I (sponsored by the Institute of Mathematical Statistics and edited by H. L. Harter and D. B. Owen), Markham Publishing Company, Chicago, 1970.

**Table XV** Critical values of the R in the Runs Test

Given in the bodies of Table XV<sub>1</sub> and Table XV<sub>2</sub> are various critical values of R for various values of n<sub>1</sub> and n<sub>2</sub>. For the one-sample run test, any value of R which is equal to or smaller than that shown in Table XV<sub>1</sub> or equal to or larger than that shown in Table XV<sub>2</sub> is significant at the .05 level. For the Wald-Wolfowitz two-sample runs test, any value of R which is equal to or smaller than that shown in Table XV<sub>1</sub> is significant at the .05 level.

**Table XV<sub>1</sub>**

n <sub>1</sub> \ n <sub>2</sub>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
8	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
9	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
10	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
11	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
12	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
13	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
15	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
16	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
17	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
18	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
19	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
20	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

\* Adapted from Swed, Frieda S., and Eisenhart, C. 1943. Tables for testing randomness of grouping in a sequence of alternatives. *Ann. Math. Statist.*, 14, 83-86, with the kind permission of the authors and publisher.

**Table XV<sub>2</sub>**

n <sub>1</sub> \ n <sub>2</sub>	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2																			
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\* Adapted from Swed, Frieda S., and Eisenhart, C. 1943. Tables for testing randomness of grouping in a sequence of alternatives. *Ann. Math. Statist.*, 14, 83-86, with the kind permission of the authors and publisher.



Table XV. Durbin-Watson Test Statistic, Lower and Upper Bounds of  $d_L$  and  $d_U$ : 1%

n	Significance Points of $d_L$ and $d_U$ : 5%				Significance Points of $d_L$ and $d_U$ : 1%					
	$k' = 1$	$k' = 2$	$k' = 3$	$k' = 4$	$k' = 5$	$k' = 1$	$k' = 2$	$k' = 3$	$k' = 4$	$k' = 5$
15	1.08	1.36	0.82	1.75	0.56	1.97	0.56	2.21	0.81	1.07
16	1.10	1.37	0.86	1.73	0.62	1.93	0.62	2.15	0.84	1.09
17	1.13	1.38	0.90	1.71	0.67	1.90	0.67	2.10	0.87	1.10
18	1.16	1.39	0.93	1.69	0.71	1.87	0.71	2.06	0.90	1.12
19	1.18	1.40	0.97	1.68	0.75	1.85	0.75	2.02	0.93	1.13
20	1.20	1.41	1.00	1.68	0.79	1.83	0.79	1.99	0.95	1.15
21	1.22	1.42	1.03	1.67	0.83	1.81	0.83	1.96	0.97	1.16
22	1.24	1.43	1.05	1.66	0.86	1.80	0.86	1.94	1.00	1.17
23	1.26	1.44	1.08	1.66	0.99	1.79	0.90	1.92	1.02	1.19
24	1.27	1.45	1.10	1.66	1.01	1.78	0.93	1.90	1.04	1.20
25	1.29	1.45	1.12	1.66	1.04	1.77	0.95	1.89	1.05	1.21
26	1.30	1.46	1.14	1.65	1.06	1.76	0.98	1.88	1.07	1.22
27	1.32	1.47	1.16	1.65	1.08	1.76	1.01	1.86	1.10	1.23
28	1.33	1.48	1.18	1.65	1.10	1.75	1.03	1.85	1.12	1.24
29	1.34	1.48	1.20	1.65	1.12	1.74	1.05	1.84	1.15	1.25
30	1.35	1.49	1.21	1.65	1.14	1.74	1.07	1.83	1.13	1.26
31	1.36	1.50	1.23	1.65	1.16	1.74	1.09	1.83	1.15	1.27
32	1.37	1.50	1.31	1.65	1.18	1.73	1.11	1.82	1.16	1.28
33	1.38	1.51	1.32	1.65	1.19	1.73	1.13	1.81	1.17	1.29
34	1.39	1.51	1.33	1.65	1.21	1.73	1.15	1.81	1.18	1.30
35	1.40	1.52	1.34	1.65	1.22	1.73	1.16	1.80	1.19	1.31
36	1.41	1.52	1.35	1.65	1.24	1.73	1.18	1.80	1.21	1.32
37	1.42	1.53	1.36	1.66	1.25	1.72	1.19	1.80	1.22	1.32
38	1.43	1.54	1.37	1.66	1.26	1.72	1.21	1.79	1.23	1.33
39	1.44	1.54	1.38	1.66	1.27	1.72	1.22	1.79	1.24	1.34
40	1.44	1.54	1.39	1.66	1.29	1.72	1.23	1.79	1.25	1.34
45	1.48	1.57	1.43	1.62	1.34	1.72	1.29	1.78	1.29	1.38
50	1.50	1.59	1.46	1.63	1.42	1.67	1.34	1.77	1.32	1.40
55	1.53	1.60	1.49	1.64	1.45	1.68	1.41	1.77	1.36	1.43
60	1.55	1.62	1.51	1.65	1.48	1.69	1.44	1.77	1.38	1.45
65	1.57	1.63	1.54	1.66	1.50	1.70	1.47	1.77	1.41	1.47
70	1.58	1.64	1.55	1.67	1.52	1.70	1.49	1.77	1.43	1.49
75	1.60	1.65	1.57	1.68	1.54	1.71	1.51	1.77	1.45	1.50
80	1.61	1.66	1.59	1.69	1.56	1.72	1.53	1.77	1.47	1.52
85	1.62	1.67	1.60	1.70	1.57	1.72	1.55	1.77	1.48	1.53
90	1.63	1.68	1.61	1.70	1.59	1.73	1.57	1.78	1.50	1.54
95	1.64	1.69	1.62	1.71	1.60	1.73	1.58	1.78	1.51	1.55
100	1.65	1.69	1.63	1.72	1.61	1.74	1.59	1.78	1.52	1.56

Note:  $k'$  = number of explanatory variables excluding the constant term.  
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Table XVII  
The Theil-Nager Test for the Independence of Regression Disturbances

Significance points of  $d_L$  and  $d_U$ : 2.5%

n	k=1		k=2		k=3		k=4		k=5		t (Number of observations)	A (Number of coefficients adjusted)									
	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$	$d_L$	$d_U$		2		3		4		5		6	
												1%	5%	1%	5%	1%	5%	1%	5%	1%	5%
15	0.95	1.23	0.83	1.40	0.71	1.61	0.59	1.84	0.48	2.09	1.07	1.36	1.24	1.53	1.43	1.73	1.65	1.94	1.88	2.16	
16	0.98	1.24	0.86	1.40	0.75	1.59	0.64	1.80	0.53	2.03	1.08	1.37	1.24	1.53	1.42	1.71	1.62	1.90	1.83	2.11	
17	1.01	1.25	0.90	1.40	0.79	1.58	0.68	1.77	0.57	1.98	1.10	1.38	1.25	1.53	1.41	1.69	1.59	1.87	1.79	2.06	
18	1.03	1.26	0.93	1.40	0.82	1.56	0.72	1.74	0.62	1.93	1.12	1.39	1.25	1.53	1.40	1.68	1.57	1.85	1.75	2.02	
19	1.06	1.28	0.96	1.41	0.86	1.55	0.76	1.72	0.66	1.90	1.13	1.40	1.26	1.53	1.40	1.67	1.56	1.83	1.72	1.99	
20	1.08	1.28	0.99	1.41	0.89	1.55	0.79	1.70	0.70	1.87	1.15	1.41	1.26	1.53	1.40	1.67	1.54	1.81	1.70	1.96	
21	1.10	1.30	1.01	1.41	0.92	1.54	0.83	1.69	0.73	1.84	1.16	1.42	1.27	1.53	1.40	1.66	1.53	1.80	1.68	1.94	
22	1.12	1.31	1.04	1.42	0.95	1.54	0.86	1.68	0.77	1.82	1.17	1.43	1.28	1.54	1.40	1.66	1.53	1.78	1.66	1.92	
23	1.14	1.32	1.06	1.42	0.97	1.54	0.89	1.67	0.80	1.80	1.19	1.44	1.29	1.54	1.40	1.65	1.52	1.77	1.65	1.90	
24	1.16	1.33	1.08	1.43	1.00	1.54	0.91	1.66	0.83	1.79	1.20	1.45	1.29	1.54	1.40	1.65	1.51	1.77	1.64	1.89	
25	1.18	1.34	1.10	1.43	1.02	1.54	0.94	1.65	0.86	1.77	1.21	1.45	1.30	1.55	1.40	1.65	1.51	1.76	1.63	1.87	
26	1.19	1.35	1.12	1.44	1.04	1.54	0.96	1.65	0.88	1.76	1.22	1.46	1.31	1.55	1.40	1.65	1.51	1.75	1.62	1.86	
27	1.21	1.36	1.13	1.44	1.06	1.54	0.99	1.64	0.91	1.75	1.23	1.47	1.32	1.55	1.41	1.65	1.51	1.75	1.61	1.85	
28	1.22	1.37	1.15	1.45	1.08	1.54	1.01	1.64	0.93	1.74	1.24	1.48	1.32	1.56	1.41	1.65	1.51	1.74	1.60	1.84	
29	1.24	1.38	1.17	1.45	1.10	1.54	1.03	1.63	0.96	1.73	1.25	1.48	1.32	1.56	1.41	1.65	1.51	1.74	1.60	1.84	
30	1.25	1.38	1.18	1.46	1.12	1.54	1.05	1.63	0.98	1.73	1.25	1.48	1.33	1.56	1.41	1.65	1.51	1.74	1.60	1.83	
31	1.26	1.39	1.20	1.47	1.13	1.55	1.07	1.63	1.00	1.72	1.26	1.49	1.34	1.57	1.42	1.65	1.50	1.73	1.60	1.82	
32	1.27	1.40	1.21	1.47	1.15	1.55	1.08	1.63	1.02	1.71	1.27	1.50	1.34	1.57	1.42	1.65	1.50	1.73	1.59	1.82	
33	1.28	1.41	1.22	1.48	1.16	1.55	1.10	1.63	1.04	1.71	1.28	1.50	1.35	1.57	1.43	1.65	1.50	1.73	1.59	1.81	
34	1.29	1.41	1.24	1.48	1.17	1.55	1.12	1.63	1.06	1.70	1.29	1.51	1.36	1.58	1.43	1.65	1.51	1.73	1.59	1.81	
35	1.30	1.42	1.25	1.48	1.19	1.55	1.13	1.63	1.07	1.70	1.30	1.51	1.36	1.58	1.43	1.65	1.51	1.72	1.58	1.80	
36	1.31	1.43	1.26	1.49	1.20	1.56	1.15	1.63	1.09	1.70	1.31	1.52	1.37	1.58	1.44	1.65	1.51	1.72	1.58	1.80	
37	1.32	1.43	1.27	1.49	1.21	1.56	1.16	1.62	1.10	1.70	1.31	1.52	1.38	1.59	1.44	1.65	1.51	1.72	1.58	1.79	
38	1.33	1.44	1.28	1.50	1.23	1.56	1.17	1.62	1.12	1.70	1.32	1.53	1.38	1.59	1.44	1.65	1.51	1.72	1.58	1.79	
39	1.34	1.44	1.29	1.50	1.24	1.56	1.19	1.63	1.13	1.69	1.33	1.53	1.39	1.59	1.45	1.65	1.51	1.72	1.58	1.79	
40	1.35	1.45	1.30	1.51	1.25	1.57	1.20	1.63	1.15	1.69	1.34	1.54	1.39	1.60	1.45	1.66	1.51	1.72	1.58	1.79	
45	1.39	1.48	1.34	1.53	1.30	1.58	1.25	1.63	1.21	1.69	1.34	1.54	1.41	1.61	1.46	1.66	1.52	1.72	1.58	1.78	
50	1.42	1.50	1.38	1.54	1.34	1.59	1.30	1.64	1.26	1.69	1.37	1.56	1.42	1.61	1.47	1.67	1.53	1.72	1.58	1.78	
55	1.45	1.52	1.41	1.56	1.37	1.60	1.33	1.64	1.30	1.69	1.40	1.58	1.44	1.63	1.49	1.67	1.54	1.72	1.59	1.77	
60	1.47	1.54	1.44	1.57	1.40	1.61	1.37	1.65	1.33	1.69	1.43	1.60	1.47	1.64	1.51	1.68	1.55	1.72	1.57	1.77	
65	1.49	1.55	1.46	1.59	1.43	1.62	1.40	1.66	1.36	1.69	1.45	1.62	1.48	1.65	1.52	1.69	1.56	1.73	1.60	1.77	
70	1.51	1.57	1.48	1.60	1.45	1.63	1.42	1.66	1.39	1.70	1.47	1.63	1.50	1.66	1.53	1.70	1.57	1.73	1.60	1.77	
75	1.53	1.58	1.50	1.61	1.47	1.64	1.45	1.67	1.42	1.70	1.49	1.64	1.51	1.67	1.55	1.70	1.58	1.73	1.61	1.77	
80	1.54	1.59	1.52	1.62	1.49	1.65	1.47	1.67	1.44	1.70	1.50	1.65	1.53	1.68	1.56	1.71	1.59	1.74	1.62	1.77	
85	1.56	1.60	1.53	1.63	1.51	1.65	1.49	1.68	1.46	1.71	1.52	1.66	1.54	1.69	1.57	1.72	1.60	1.74	1.62	1.77	
90	1.57	1.61	1.55	1.64	1.53	1.66	1.50	1.69	1.48	1.71	1.53	1.67	1.55	1.70	1.58	1.72	1.60	1.75	1.63	1.77	
95	1.58	1.62	1.56	1.65	1.54	1.67	1.52	1.69	1.48	1.71	1.55	1.69	1.57	1.71	1.60	1.73	1.62	1.75	1.64	1.78	
100	1.59	1.63	1.57	1.65	1.55	1.67	1.53	1.70	1.51	1.72	1.56	1.69	1.58	1.72	1.60	1.74	1.63	1.76	1.65	1.78	

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