

Appendix B: Statistical Tables

B

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Table B1 Random Digits^a

Line										
1	17174	75908	43306	77061	97755	26780	07446	34836	47656	22475
2	26580	68460	18051	95528	78196	91824	10696	09283	06525	13596
3	24041	33800	09976	36785	11529	19948	21497	94665	54600	51793
4	74838	79323	43962	50531	30826	76623	04007	72395	03544	37575
5	72862	50965	29962	37114	73007	36615	83463	01021	56940	56615
6	82274	94537	52039	68725	06163	47388	62564	46097	71644	00108
7	77568	89168	04043	31926	83333	99957	22204	96361	79770	42561
8	17802	16697	96288	24603	36345	17063	05251	68206	71113	19390
9	10271	06180	39740	01903	01539	59476	83991	07954	83098	01486
10	07780	55451	05276	87719	42723	33685	66024	14236	96801	45797
11	05751	92219	44689	92084	10025	73998	12863	55026	09230	05881
12	14324	44563	13269	88172	47751	64408	86355	16960	72794	30842
13	12869	51161	96952	01895	35785	40807	88980	56656	88839	94521
14	36891	94679	18832	02471	98216	51769	57593	52247	65271	73641
15	22899	37988	68991	28990	87701	99578	06381	33877	45714	45227
16	58556	91925	66542	12852	57203	25725	19844	92696	56861	51882
17	08520	26078	78485	74072	60421	89379	55514	92898	17894	67682
18	31466	97330	39266	06800	32679	37443	53245	81738	73843	64176
19	43780	49375	20055	79095	79987	96005	44296	29004	25059	95752
20	15875	68956	37126	69074	68076	85098	23707	03965	52477	52517
21	22002	20395	72174	70897	00337	70238	19154	77878	33456	89624
22	28968	92168	79825	50945	99479	03121	43217	97297	47547	12201
23	19446	40211	48163	91237	78166	00421	09652	37508	75560	48279
24	98339	39146	76425	55658	60259	59368	49751	44492	99846	07142
25	42746	66199	44160	87627	31369	59756	91765	64760	46878	57467
26	25544	61063	35953	30319	61982	24629	78600	70075	64922	65913
27	22776	62299	05281	92046	98422	95316	20720	90877	01922	32294
28	22578	20732	18421	77419	75391	20665	60627	29382	37782	13163
29	51580	99897	58983	01745	37488	56543	99580	74823	80339	31931
30	63403	94610	23839	69171	52030	91661	18486	83805	62578	67212
31	77353	80198	26674	72839	09944	51278	99333	97341	87588	01655
32	68849	86194	61771	39583	40760	54492	14279	85621	67459	82681
33	50190	86021	96163	18245	58245	41974	05243	66966	07246	09569
34	91239	72671	10759	17927	38958	40672	06409	21979	87813	11939
35	23457	17487	93379	41738	87628	28721	07582	36969	09161	66801
36	60016	28539	40587	27737	50626	22101	74564	65628	11076	75953
37	37076	96887	07002	14535	70186	84065	57590	94324	14132	25879
38	66454	08589	05977	82951	77907	88931	44828	24952	68021	48766
39	14921	18264	69297	84783	83152	82360	46620	53243	56694	17183
40	79201	63127	02632	42083	23715	95916	66794	52598	84195	45420
41	73735	41872	55392	78688	46013	78470	12915	41744	27769	83002
42	67931	75825	80931	07475	06189	88500	36417	35724	65641	35527
43	40580	67626	06630	79770	08154	12159	11322	84871	53591	77690
44	44858	33801	13691	54744	55641	36758	96949	26400	00505	59016
45	84835	40044	86334	34812	35222	20327	71467	37874	51288	95802
46	88089	35765	87473	22457	56445	18890	60892	53132	87424	71714
47	64102	14894	13441	06584	23270	04518	94560	81582	69858	42800
48	62020	92065	06863	58852	84988	81613	53313	58765	27750	71533
49	36121	29901	65962	49271	09970	00719	72935	35598	53014	50036
50	73007	65445	42898	86105	55352	37128	56141	11222	16718	25885

Table B1 *Continued*

Line										
51	32220	61646	87732	07598	05465	68584	64790	56416	21824	61643
52	12782	34043	30801	64642	62329	85019	22481	70105	38254	57186
53	66400	03051	40583	75130	88348	50303	03657	47252	18090	35891
54	76763	78376	40249	52103	36769	53552	55846	61963	86763	67257
55	11767	46380	25290	59073	91662	89160	94869	71368	90732	33583
56	61292	87282	79921	20936	56304	81358	94966	54748	25865	48333
57	64169	56790	91323	29070	49567	86422	13878	42058	53470	22312
58	86741	20680	18422	64127	88381	27590	99659	47854	12163	41801
59	23215	07774	49216	77376	83893	37631	44332	54941	11038	09157
60	72324	05050	52212	82330	10707	92439	33220	11634	35942	09534
61	18209	60272	95944	64495	09247	61000	52564	99690	52055	70716
62	26568	12545	07291	30737	11449	36252	70323	80141	17833	48502
63	66895	34490	95682	44956	39491	54269	07867	84505	05578	91088
64	28908	21020	84646	17475	40539	62981	93042	38181	35279	21843
65	03091	10135	85594	86222	36342	07903	97933	53548	56768	77881
66	69948	54947	28724	33966	90529	16339	40152	06517	18221	53248
67	80774	71613	41590	18430	99863	70872	41549	89671	63628	82167
68	84702	95823	83712	55061	89773	63242	97952	24027	95176	95129
69	18067	54980	38542	86549	43966	92989	87768	16267	47616	63546
70	76825	11257	34842	26130	91870	37116	90770	42369	09614	16645
71	59759	28041	48498	94968	02759	29884	87231	17899	21157	91094
72	67377	59310	86243	30374	18340	58630	21092	62426	37022	40022
73	86655	18980	13739	12234	50705	68189	02212	64653	39716	29953
74	84073	53993	78016	77751	31457	18155	97944	27295	90526	57958
75	58999	77251	84274	15777	66045	84364	62165	24700	00055	06668
76	11308	03979	68271	51776	55915	67970	52691	19073	82178	66031
77	24585	78224	96506	77936	97772	65814	46162	58603	24666	49133
78	22369	34622	75780	67276	06726	07734	48849	60918	83256	17099
79	24914	45155	66234	00460	86700	72578	57617	82212	50104	34094
80	88320	48338	70689	05856	91247	29214	21807	77100	74896	24592
81	69848	33544	50065	69910	15783	76852	25025	37762	49049	21666
82	77987	45152	89425	81350	10697	90522	10496	86753	75366	83410
83	97709	78833	69516	05969	98796	60938	90201	99875	37430	87145
84	05209	88924	10458	20004	65788	91299	41139	76993	47040	15777
85	68616	23573	66693	83674	34890	57000	07586	39661	23774	50682
86	18260	40283	35008	94377	47286	93322	68092	92858	99829	59997
87	29121	89864	44444	03931	34222	49057	49713	50972	23191	29933
88	36834	59756	46105	01156	40367	50950	43614	70178	93359	77431
89	10757	21796	12219	39415	32020	04178	69733	83093	58039	74845
90	99465	88838	45530	96133	66529	57600	52060	98052	72613	32354
91	59157	66024	86610	70068	29879	30664	87190	98772	76243	62043
92	63489	17951	66279	69460	03659	53135	79535	05034	26052	75480
93	08723	61325	57652	18876	08976	51276	12793	60467	11655	04069
94	75883	23261	03050	36180	38486	47570	72493	92403	06412	10039
95	95560	45085	03464	79493	25121	04125	86957	16042	63551	40774
96	81329	74272	70097	05615	91212	73956	43022	64078	77377	14160
97	13536	31170	91648	67487	95149	17890	50223	82906	59466	01721
98	28778	55892	59449	53815	84565	62568	79771	00793	19324	10150
99	39757	44482	21115	01607	93177	26324	66403	91660	62073	34237
00	54595	87336	08030	30633	83752	04706	96494	71064	19061	84919

^aGenerated from MINITAB.

Table B2 Binomial Probabilities^a

<i>n</i>	<i>x</i>	<i>P</i>										
		.01	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
2	0	.9801	.9025	.8100	.7225	.6400	.5625	.4900	.4225	.3600	.3025	.2500
	1	.0198	.0950	.1800	.2550	.3200	.3750	.4200	.4550	.4800	.4950	.5000
	2	.0001	.0025	.0100	.0225	.0400	.0625	.0900	.1225	.1600	.2025	.2500
3	0	.9703	.8574	.7290	.6141	.5120	.4219	.3430	.2746	.2160	.1664	.1250
	1	.0294	.1354	.2430	.3251	.3840	.4219	.4410	.4436	.4320	.4084	.3750
	2	.0003	.0071	.0270	.0574	.0960	.1406	.1890	.2389	.2880	.3341	.3750
	3	.0001	.0001	.0010	.0034	.0080	.0156	.0270	.0429	.0640	.0911	.1250
4	0	.9606	.8145	.6561	.5220	.4096	.3164	.2401	.1785	.1296	.0915	.0625
	1	.0388	.1715	.2916	.3685	.4096	.4219	.4116	.3845	.3456	.2995	.2500
	2	.0006	.0135	.0486	.0975	.1536	.2109	.2646	.3105	.3456	.3675	.3750
	3		.0005	.0036	.0115	.0256	.0469	.0756	.1115	.1536	.2005	.2500
	4			.0001	.0005	.0016	.0039	.0018	.0150	.0256	.0410	.0625
5	0	.9510	.7738	.5905	.4437	.3277	.2373	.1681	.1160	.0778	.0503	.0313
	1	.0480	.2036	.3281	.3915	.4096	.3955	.3602	.3124	.2592	.2059	.1563
	2	.0010	.0214	.0729	.1382	.2048	.2637	.3087	.3364	.3456	.3369	.3125
	3		.0011	.0081	.0244	.0512	.0879	.1323	.1811	.2304	.2757	.3125
	4			.0005	.0022	.0064	.0146	.0284	.0488	.0768	.1128	.1563
	5				.0001	.0003	.0010	.0024	.0053	.0102	.0185	.0313
6	0	.9415	.7351	.5314	.3771	.2621	.1780	.1176	.0754	.0467	.0277	.0156
	1	.0571	.2321	.3543	.3993	.3932	.3560	.3025	.2437	.1866	.1359	.0938
	2	.0014	.0305	.0984	.1762	.2458	.2966	.3241	.3280	.3110	.2780	.2344
	3		.0021	.0146	.0415	.0819	.1318	.1852	.2355	.2765	.3032	.3125
	4			.0001	.0012	.0055	.0154	.0330	.0595	.0951	.1382	.1861
	5				.0001	.0004	.0015	.0044	.0102	.0205	.0369	.0609
	6					.0001	.0002	.0007	.0018	.0041	.0083	.0156
7	0	.9321	.6983	.4783	.3206	.2097	.1335	.0824	.0490	.0280	.0152	.0078
	1	.0659	.2573	.3720	.3960	.3670	.3115	.2471	.1848	.1306	.0872	.0547
	2	.0020	.0406	.1240	.2097	.2753	.3115	.3177	.2985	.2613	.2140	.1641
	3		.0036	.0230	.0617	.1147	.1730	.2269	.2679	.2903	.2918	.2734
	4			.0002	.0026	.0109	.0287	.0577	.0972	.1442	.1935	.2388
	5				.0002	.0012	.0043	.0115	.0250	.0466	.0774	.1172
	6					.0001	.0004	.0013	.0036	.0084	.0172	.0320
	7							.0002	.0006	.0016	.0037	.0078
8	0	.9227	.6634	.4305	.2725	.1678	.1001	.0576	.0319	.0168	.0084	.0039
	1	.0746	.2793	.3826	.3847	.3355	.2670	.1977	.1373	.0896	.0548	.0313
	2	.0026	.0515	.1488	.2376	.2936	.3115	.2965	.2587	.2090	.1569	.1094
	3	.0001	.0054	.0331	.0839	.1468	.2076	.2541	.2786	.2787	.2568	.2188
	4		.0004	.0046	.0185	.0459	.0865	.1361	.1875	.2322	.2627	.2734
	5			.0004	.0026	.0092	.0231	.0467	.0808	.1239	.1719	.2188
	6				.0002	.0011	.0038	.0100	.0217	.0413	.0703	.1094
	7					.0001	.0004	.0012	.0033	.0079	.0164	.0313
	8							.0001	.0002	.0007	.0017	.0039
9	0	.9135	.6302	.3874	.2316	.1342	.0751	.0404	.0207	.0101	.0046	.0020
	1	.0830	.2985	.3874	.3679	.3020	.2253	.1557	.1004	.0605	.0039	.0176
	2	.0034	.0629	.1722	.2597	.3020	.3003	.2668	.2162	.1612	.1110	.0703
	3	.0001	.0077	.0446	.1069	.1762	.2336	.2668	.2716	.2508	.2119	.1641
	4		.0006	.0074	.0283	.0661	.1168	.1715	.2194	.2508	.2600	.2461
	5			.0008	.0050	.0165	.0389	.0735	.1181	.1672	.2128	.2461
	6			.0001	.0006	.0028	.0087	.0210	.0424	.0743	.1160	.1641
	7					.0003	.0012	.0039	.0098	.0212	.0407	.0703
	8						.0001	.0004	.0013	.0035	.0083	.0176
	9								.0001	.0003	.0008	.0020
10	0	.9044	.5987	.3487	.1969	.1074	.0563	.0282	.0135	.0060	.0025	.0010
	1	.0914	.3151	.3874	.3474	.2684	.1877	.1211	.0725	.0403	.0207	.0098
	2	.0042	.0746	.1937	.2759	.3020	.2816	.2335	.1757	.1209	.0763	.0439
	3	.0001	.0105	.0574	.1298	.2013	.2503	.2668	.2522	.2150	.1665	.1172
	4		.0010	.0112	.0401	.0881	.1460	.2001	.2377	.2508	.2384	.2051
	5		.0001	.0015	.0085	.0264	.0584	.1029	.1536	.2007	.2340	.2461
	6			.0001	.0012	.0055	.0162	.0368	.0689	.1115	.1596	.2051
	7				.0001	.0008	.0031	.0090	.0212	.0425	.0746	.1172
	8					.0001	.0004	.0014	.0043	.0106	.0229	.0439
	9							.0001	.0005	.0016	.0042	.0098
	10									.0001	.0003	.0010

(continued)

Table B2 *Continued*

<i>n</i>	<i>x</i>	<i>p</i>										
		.01	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
11	0	.8953	.5688	.3138	.1673	.0859	.0422	.0198	.0088	.0036	.0014	.0005
	1	.0995	.3293	.3835	.3248	.2362	.1549	.0932	.0518	.0266	.0125	.0054
	2	.0050	.0867	.2131	.2866	.2953	.2581	.1998	.1395	.0887	.0513	.0269
	3	.0002	.0137	.0710	.1517	.2215	.2581	.2568	.2254	.1774	.1259	.0806
	4		.0014	.0158	.0536	.1107	.1721	.2201	.2428	.2365	.2060	.1611
	5		.0001	.0025	.0132	.0388	.0803	.1321	.1830	.2207	.2360	.2256
	6			.0003	.0023	.0097	.0268	.0566	.0985	.1471	.1931	.2256
	7				.0003	.0017	.0064	.0173	.0379	.0701	.1128	.1611
	8					.0002	.0011	.0037	.0102	.0234	.0462	.0806
	9						.0001	.0005	.0018	.0052	.0126	.0269
	10								.0002	.0007	.0021	.0054
	11										.0002	.0005
12	0	.8864	.5404	.2824	.1422	.0687	.0317	.0138	.0057	.0022	.0008	.0002
	1	.1074	.3413	.3766	.3012	.2062	.1267	.0712	.0368	.0174	.0075	.0029
	2	.0060	.0988	.2301	.2924	.2835	.2323	.1678	.1088	.0639	.0339	.0161
	3	.0002	.0173	.0852	.1720	.2362	.2581	.2397	.1954	.1419	.0923	.0537
	4		.0021	.0213	.0683	.1329	.1936	.2311	.2367	.2128	.1700	.1209
	5		.0002	.0038	.0193	.0532	.1032	.1585	.2039	.2270	.2225	.1934
	6			.0005	.0040	.0155	.0401	.0792	.1281	.1766	.2124	.2256
	7				.0006	.0033	.0115	.0291	.0591	.1009	.1489	.1934
	8				.0001	.0005	.0024	.0078	.0199	.0420	.0762	.1209
	9					.0001	.0004	.0015	.0048	.0125	.0277	.0537
	10							.0002	.0008	.0025	.0068	.0161
	11								.0001	.0003	.0010	.0029
	12										.0001	.0002
13	0	.8775	.5133	.2542	.1209	.0550	.0238	.0097	.0037	.0013	.0004	.0001
	1	.1152	.3512	.3672	.2774	.1787	.1029	.0540	.0259	.0113	.0045	.0016
	2	.0070	.1109	.2448	.2937	.2680	.2059	.1388	.0836	.0453	.0220	.0095
	3	.0003	.0214	.0997	.1900	.2457	.2517	.2181	.1651	.1107	.0660	.0349
	4		.0028	.0277	.0838	.1535	.2097	.2337	.2222	.1845	.1350	.0873
	5		.0003	.0055	.0266	.0691	.1258	.1803	.2154	.2214	.1989	.1571
	6			.0008	.0063	.0230	.0559	.1030	.1546	.1968	.2169	.2095
	7			.0001	.0011	.0058	.0186	.0442	.0833	.1312	.1775	.2095
	8				.0001	.0011	.0047	.0142	.0336	.0656	.1089	.1571
	9					.0002	.0009	.0034	.0101	.0243	.0495	.0873
	10						.0001	.0006	.0022	.0065	.0162	.0349
	11							.0001	.0003	.0012	.0036	.0095
	12									.0001	.0005	.0016
	13											.0001
14	0	.8687	.4877	.2288	.1028	.0440	.0178	.0068	.0024	.0008	.0002	.0001
	1	.1229	.3593	.3559	.2539	.1539	.0832	.0407	.0181	.0073	.0027	.0009
	2	.0081	.1229	.2570	.2912	.2501	.1802	.1134	.0634	.0317	.0141	.0056
	3	.0003	.0259	.1142	.2056	.2501	.2402	.1943	.1366	.0845	.0462	.0222
	4		.0037	.0349	.0998	.1720	.2202	.2290	.2022	.1549	.1040	.0611
	5		.0004	.0078	.0352	.0860	.1468	.1963	.2178	.2066	.1701	.1222
	6			.0013	.0093	.0322	.0734	.1262	.1759	.2066	.2088	.1833
	7			.0002	.0019	.0092	.0280	.0618	.1082	.1574	.1952	.2095
	8				.0003	.0020	.0082	.0232	.0510	.0918	.1398	.1833
	9					.0003	.0018	.0066	.0183	.0408	.0762	.1222
	10						.0003	.0014	.0049	.0136	.0312	.0611
	11							.0002	.0010	.0033	.0093	.0222
	12								.0001	.0006	.0019	.0056
	13									.0001	.0002	.0009
	14											.0001

(continued)

Table B2 *Continued*

<i>n</i>	<i>x</i>	<i>p</i>													
		.01	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50			
15	0	.8601	.4633	.2059	.0874	.0352	.0134	.0047	.0016	.0005	.0001				
	1	.1303	.3658	.3432	.2312	.1319	.0668	.0305	.0126	.0047	.0016	.0005			
	2	.0092	.1348	.2669	.2856	.2309	.1559	.0916	.0476	.0219	.0090	.0032			
	3	.0004	.0308	.1285	.2184	.2501	.2252	.1700	.1110	.0634	.0318	.0139			
	4		.0049	.0428	.1156	.1876	.2252	.2186	.1792	.1268	.0780	.0417			
	5		.0006	.0105	.0449	.1032	.1651	.2061	.2123	.1859	.1404	.0916			
	6			.0019	.0132	.0430	.0917	.1472	.1906	.2066	.1914	.1527			
	7			.0003	.0030	.0138	.0393	.0811	.1319	.1771	.2013	.1964			
	8				.0005	.0035	.0131	.0348	.0710	.1181	.1647	.1964			
	9				.0001	.0007	.0034	.0116	.0298	.0612	.1048	.1527			
	10					.0001	.0007	.0030	.0096	.0245	.0515	.0916			
	11						.0001	.0006	.0024	.0074	.0191	.0417			
	12							.0001	.0004	.0016	.0052	.0139			
	13								.0001	.0003	.0010	.0032			
	14									.0001	.0003	.0010			
15										.0001	.0005				
16	0	.8515	.4401	.1853	.0743	.0281	.0100	.0033	.0010	.0003	.0001				
	1	.1376	.3706	.3294	.2097	.1126	.0535	.0228	.0087	.0030	.0009	.0002			
	2	.0104	.1463	.2745	.2775	.2111	.1336	.0732	.0353	.0150	.0056	.0018			
	3	.0005	.0359	.1423	.2285	.2463	.2079	.1465	.0888	.0468	.0215	.0085			
	4		.0061	.0514	.1311	.2001	.2252	.2040	.1553	.1014	.0572	.0278			
	5		.0008	.0137	.0555	.1201	.1802	.2099	.2008	.1623	.1123	.0667			
	6		.0001	.0028	.0180	.0550	.1101	.1649	.1982	.1983	.1684	.1222			
	7			.0004	.0045	.0197	.0524	.1010	.1524	.1889	.1969	.1746			
	8			.0001	.0009	.0055	.0197	.0487	.0923	.1417	.1812	.1964			
	9				.0001	.0012	.0058	.0185	.0442	.0840	.1318	.1746			
	10					.0002	.0014	.0056	.0167	.0392	.0755	.1222			
	11						.0002	.0013	.0049	.0142	.0337	.0667			
	12							.0002	.0011	.0040	.0115	.0278			
	13								.0002	.0008	.0029	.0085			
	14									.0001	.0005	.0018			
	15											.0002			
16															
17	0	.8429	.4181	.1668	.0631	.0225	.0075	.0023	.0007	.0002					
	1	.1447	.3741	.3150	.1893	.0957	.0426	.0169	.0060	.0019	.0005	.0001			
	2	.0117	.1575	.2800	.2673	.1914	.1136	.0581	.0260	.0102	.0035	.0010			
	3	.0006	.0415	.1556	.2359	.2393	.1893	.1245	.0701	.0341	.0144	.0052			
	4		.0076	.0605	.1457	.2093	.2209	.1868	.1320	.0796	.0411	.0182			
	5		.0010	.0175	.0668	.1361	.1914	.2081	.1849	.1379	.0875	.0472			
	6		.0001	.0039	.0236	.0680	.1276	.1784	.1991	.1839	.1432	.0944			
	7			.0007	.0065	.0267	.0668	.1201	.1685	.1927	.1841	.1484			
	8			.0001	.0014	.0084	.0279	.0644	.1134	.1606	.1883	.1855			
	9				.0003	.0021	.0093	.0276	.0611	.1070	.1540	.1855			
	10					.0004	.0025	.0095	.0263	.0571	.1008	.1484			
	11					.0001	.0005	.0026	.0090	.0242	.0525	.0944			
	12						.0001	.0006	.0024	.0081	.0215	.0472			
	13							.0001	.0005	.0021	.0068	.0182			
	14								.0001	.0004	.0016	.0052			
	15									.0001	.0003	.0010			
	16											.0001			
17															

(continued)

Table B2 *Continued*

<i>n</i>	<i>x</i>	<i>p</i>										
		.01	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
18	0	.8345	.3972	.1501	.0536	.0180	.0056	.0016	.0004	.0001		
	1	.1517	.3763	.3002	.1704	.0811	.0338	.0126	.0042	.0012	.0003	.0001
	2	.0130	.1683	.2835	.2556	.1723	.0958	.0458	.0190	.0069	.0022	.0006
	3	.0007	.0473	.1680	.2406	.2297	.1704	.1046	.0547	.0246	.0095	.0031
	4		.0093	.0700	.1592	.2153	.2130	.1681	.1104	.0614	.0291	.0117
	5		.0014	.0218	.0787	.1507	.1988	.2017	.1664	.1146	.0666	.0327
	6		.0002	.0052	.0301	.0816	.1436	.1873	.1941	.1655	.1181	.0708
	7			.0010	.0091	.0350	.0820	.1376	.1792	.1892	.1657	.1214
	8			.0002	.0022	.0120	.0376	.0811	.1327	.1734	.1864	.1669
	9				.0004	.0033	.0139	.0386	.0794	.2844	.1694	.1855
	10				.0001	.0008	.0042	.0149	.0385	.0771	.1248	.1669
	11					.0001	.0010	.0046	.0151	.0374	.0742	.1214
	12						.0002	.0012	.0047	.0145	.0354	.0708
	13							.0002	.0012	.0045	.0134	.0327
	14								.0002	.0011	.0039	.0117
	15									.0002	.0009	.0031
	16										.0001	.0006
	17											.0001
	18											
19	0	.8262	.3774	.1351	.0456	.0144	.0042	.0011	.0003	.0001		
	1	.1586	.3774	.2852	.1259	.0685	.0268	.0093	.0029	.0008	.0002	
	2	.0144	.1787	.2852	.2428	.1540	.0803	.0358	.0138	.0046	.0013	.0003
	3	.0008	.0533	.1796	.2428	.2182	.1517	.0869	.0422	.0175	.0062	.0018
	4		.0112	.0798	.1714	.2182	.2023	.1491	.0909	.0467	.0203	.0074
	5		.0018	.0266	.0907	.1637	.2023	.1916	.1468	.0933	.0497	.0222
	6		.0002	.0069	.0374	.0955	.1574	.1916	.1844	.1451	.0949	.0518
	7			.0014	.0122	.0443	.0974	.1525	.1844	.1797	.1443	.0961
	8			.0002	.0032	.0166	.0487	.0981	.1489	.1797	.1771	.1442
	9				.0007	.0051	.0198	.0514	.0980	.1464	.1771	.1762
	10				.0001	.0013	.0066	.0220	.0528	.0976	.1449	.1762
	11					.0003	.0018	.0077	.0233	.0532	.0970	.1442
	12						.0004	.0022	.0083	.0237	.0529	.0961
	13						.0001	.0005	.0024	.0085	.0233	.0518
	14							.0001	.0006	.0024	.0082	.0222
	15								.0001	.0005	.0022	.0074
	16									.0001	.0005	.0018
	17										.0001	.0003
	18											
	19											
20	0	.8179	.3585	.1216	.0388	.0115	.0032	.0008	.0002			
	1	.1652	.3774	.2702	.1368	.0576	.0211	.0068	.0020	.0005	.0001	
	2	.0159	.1887	.2852	.2293	.1369	.0669	.0278	.0100	.0031	.0008	.0002
	3	.0010	.0596	.1901	.2428	.2054	.1339	.0716	.0323	.0124	.0040	.0011
	4		.0133	.0898	.1821	.2182	.1897	.1304	.0738	.0350	.0139	.0046
	5		.0022	.0319	.1028	.1746	.2023	.1789	.1272	.0746	.0365	.0148
	6		.0003	.0089	.0454	.1091	.1686	.1916	.1712	.1244	.0746	.0370
	7			.0020	.0160	.0546	.1124	.1643	.1844	.1659	.1221	.0739
	8			.0004	.0046	.0222	.0609	.1144	.1614	.1797	.1623	.1201
	9			.0001	.0011	.0074	.0271	.0654	.1158	.1597	.1771	.1602
	10				.0002	.0020	.0099	.0308	.0686	.1171	.1593	.1762
	11					.0005	.0030	.0120	.0336	.0710	.1185	.1602
	12					.0001	.0008	.0039	.0136	.0355	.0727	.1201
	13						.0002	.0010	.0045	.0146	.0366	.0739
	14							.0002	.0012	.0049	.0150	.0370
	15								.0003	.0013	.0049	.0148
	16									.0003	.0013	.0046
	17										.0002	.0011
	18											.0002
	19											

*Calculated by MINITAB.

Table B3 Poisson Probabilities^a

		μ								
x	.2	.4	.6	.8	1.0	1.2	1.4	1.6	x	
0	.818731	.670320	.548812	.449329	.367879	.301194	.246597	.201896	0	
1	.163746	.268128	.329287	.359463	.367879	.361433	.345236	.323034	1	
2	.016375	.053626	.098786	.143785	.183940	.216860	.241665	.258428	2	
3	.001092	.007150	.019757	.038343	.061313	.086744	.112777	.137828	3	
4	.000055	.000715	.002964	.007669	.015328	.026023	.039472	.055131	4	
5	.000002	.000057	.000356	.001227	.003066	.006246	.011052	.017642	5	
6		.000004	.000036	.000164	.000511	.001249	.002579	.004705	6	
7			.000003	.000019	.000073	.000214	.000516	.001075	7	
8				.000002	.000009	.000032	.000090	.000215	8	
9					.000001	.000004	.000014	.000038	9	
10						.000001	.000002	.000006	10	
11								.000001	11	
		μ								
x	1.8	2.0	2.5	3.0	3.5	4.0	4.5	5.0	x	
0	.165299	.135335	.082085	.049787	.030197	.018316	.011109	.006738	0	
1	.297538	.270671	.205213	.149361	.105691	.073263	.049990	.033690	1	
2	.267784	.270671	.256516	.224042	.184959	.146525	.112479	.084224	2	
3	.160671	.180447	.213763	.224042	.215785	.195367	.168718	.140374	3	
4	.072302	.090224	.133602	.168031	.188812	.195367	.189808	.175467	4	
5	.026029	.036089	.066801	.100819	.132169	.156293	.170827	.175467	5	
6	.007809	.012030	.027834	.050409	.077098	.104196	.128120	.146223	6	
7	.002008	.003437	.009941	.021604	.038549	.059540	.082363	.104445	7	
8	.000452	.000859	.003106	.008102	.016865	.029770	.046329	.065278	8	
9	.000090	.000191	.000863	.002701	.006559	.013231	.023165	.036266	9	
10	.000016	.000038	.000216	.000810	.002296	.005292	.010424	.018133	10	
11	.000003	.000007	.000049	.000221	.000730	.001925	.004264	.008242	11	
12		.000001	.000010	.000055	.000213	.000642	.001599	.003434	12	
13			.000002	.000013	.000057	.000197	.000554	.001321	13	
14				.000003	.000014	.000056	.000178	.000472	14	
15				.000001	.000003	.000015	.000053	.000157	15	
16					.000001	.000004	.000015	.000049	16	
17						.000001	.000004	.000014	17	
18							.000001	.000004	18	
19								.000001	19	

(continued)

Table B3 *Continued*

<i>x</i>	μ								<i>x</i>
	5.5	6.0	6.5	7.0	8.0	9.0	10.0	11.0	
0	.004087	.002479	.001503	.000912	.000335	.000123	.000045	.000017	0
1	.022477	.014873	.009772	.006383	.002684	.001111	.000454	.000184	1
2	.061812	.044618	.031760	.022341	.010735	.004998	.002270	.001010	2
3	.113323	.089235	.068814	.052129	.028626	.014994	.007567	.003705	3
4	.155819	.133853	.111822	.091226	.057252	.033737	.018917	.010189	4
5	.171401	.160623	.145369	.127717	.091604	.060727	.037833	.022415	5
6	.157117	.160623	.157483	.149003	.122138	.091090	.063055	.041095	6
7	.123449	.137677	.146234	.149003	.139587	.117116	.090079	.064577	7
8	.084871	.103258	.118815	.130377	.139587	.131756	.112599	.088794	8
9	.051866	.068838	.085811	.101405	.124077	.131756	.125110	.108526	9
10	.028526	.041303	.055777	.070983	.099262	.118580	.125110	.119378	10
11	.014263	.022529	.032959	.045171	.072190	.097020	.113736	.119378	11
12	.006537	.011264	.017853	.026350	.048127	.072765	.094780	.109430	12
13	.002766	.005199	.008926	.014188	.029616	.050376	.072908	.092595	13
14	.001087	.002228	.004144	.007094	.016924	.032384	.052077	.072753	14
15	.000398	.000891	.001796	.003311	.009026	.019431	.034718	.053352	15
16	.000137	.000334	.000730	.001448	.004513	.010930	.021699	.036680	16
17	.000044	.000118	.000279	.000596	.002124	.005786	.012764	.023734	17
18	.000014	.000039	.000101	.000232	.000944	.002893	.007091	.014504	18
19	.000004	.000012	.000034	.000085	.000397	.001370	.003732	.008397	19
20	.000001	.000004	.000011	.000030	.000159	.000617	.001866	.004618	20
21		.000001	.00003	.000010	.000061	.000264	.000889	.002419	21
22			.000001	.000003	.000022	.000108	.000404	.001210	22
23				.000001	.000008	.000042	.000176	.000578	23
24					.000003	.000016	.000073	.000265	24
25					.000001	.000006	.000029	.000117	25
26						.000002	.000011	.000049	26
27						.000001	.000004	.000020	27
28							.000001	.000008	28
29							.000001	.000003	29
30								.000001	30

(continued)

Table B3 *Continued*

x	μ						x
	12.0	13.0	14.0	15.0	16.0	17.0	
0	.000006	.000002	.000001				0
1	.000074	.000029	.000012	.000005	.000002	.000001	1
2	.000442	.000191	.000081	.000034	.000014	.000006	2
3	.001770	.000828	.000380	.000172	.000077	.000034	3
4	.005309	.002690	.001331	.000645	.000307	.000144	4
5	.012741	.006994	.003727	.001936	.000983	.000490	5
6	.025481	.015153	.008696	.004839	.002622	.001388	6
7	.043682	.028141	.017392	.010370	.005994	.003371	7
8	.065523	.045730	.030436	.019444	.011988	.007163	8
9	.087364	.066054	.047344	.032407	.021311	.013529	9
10	.104837	.085870	.066282	.048611	.034098	.023000	10
11	.114368	.101483	.084359	.066287	.049597	.035545	11
12	.114368	.109940	.098418	.082859	.066129	.050355	12
13	.105570	.109940	.105989	.095607	.081389	.065849	13
14	.090489	.102087	.105989	.102436	.093016	.079960	14
15	.072391	.088475	.098923	.102436	.099218	.090621	15
16	.054293	.071886	.086558	.096034	.099218	.096285	16
17	.038325	.054972	.071283	.084736	.093381	.096285	17
18	.025550	.039702	.055442	.070613	.083006	.090936	18
19	.016137	.027164	.040852	.055747	.069899	.081363	19
20	.009682	.017657	.028597	.041810	.055920	.069159	20
21	.005533	.010930	.019064	.029865	.042605	.055986	21
22	.003018	.006459	.012132	.020362	.030986	.043262	22
23	.001574	.003651	.007385	.013280	.021555	.031976	23
24	.000787	.001977	.004308	.008300	.014370	.022650	24
25	.000378	.001028	.002412	.004980	.009197	.015402	25
26	.000174	.000514	.001299	.002873	.005660	.010070	26
27	.000078	.000248	.000674	.001596	.003354	.006341	27
28	.000033	.000115	.000337	.000855	.001917	.003850	28
29	.000014	.000052	.000163	.000442	.001057	.002257	29
30	.000005	.000022	.000076	.000221	.000564	.001279	30
31	.000002	.000009	.000034	.000107	.000291	.000701	31
32	.000001	.000004	.000015	.000050	.000146	.000373	32
33		.000001	.000006	.000023	.000071	.000192	33
34		.000001	.000003	.000010	.000033	.000096	34
35			.000001	.000004	.000015	.000047	35
36				.000002	.000007	.000022	36
37				.000001	.000003	.000010	37
38					.000001	.000005	38
39					.000001	.000002	39
40						.000001	40

^aCalculated by MINITAB.

Table B4 Cumulative Distribution Function for Standard Normal Distribution^a

z	.09	.08	.07	.06	.05	.04	0.3	.02	.01	.00
-3.7	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001
-3.6	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0002	.0002
-3.5	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002	.0002
-3.4	.0002	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003
-3.3	.0003	.0004	.0004	.0004	.0004	.0004	.0004	.0005	.0005	.0005
-3.2	.0005	.0005	.0005	.0006	.0006	.0006	.0006	.0006	.0007	.0007
-3.1	.0007	.0007	.0008	.0008	.0008	.0008	.0009	.0009	.0009	.0010
-3.0	.0010	.0010	.0011	.0011	.0011	.0012	.0012	.0013	.0013	.0013
-2.9	.0014	.0014	.0015	.0015	.0016	.0016	.0017	.0018	.0018	.0019
-2.8	.0019	.0020	.0021	.0021	.0022	.0023	.0023	.0024	.0025	.0026
-2.7	.0026	.0027	.0028	.0029	.0030	.0031	.0032	.0033	.0034	.0035
-2.6	.0036	.0037	.0038	.0039	.0040	.0041	.0043	.0044	.0045	.0047
-2.5	.0048	.0049	.0051	.0052	.0054	.0055	.0057	.0059	.0060	.0062
-2.4	.0064	.0066	.0068	.0069	.0071	.0073	.0075	.0078	.0080	.0082
-2.3	.0084	.0087	.0089	.0091	.0094	.0096	.0099	.0102	.0104	.0107
-2.2	.0110	.0113	.0116	.0119	.0122	.0125	.0129	.0132	.0136	.0139
-2.1	.0143	.0146	.0150	.0154	.0158	.0162	.0166	.0170	.0174	.0179
-2.0	.0183	.0188	.0192	.0197	.0202	.0207	.0212	.0217	.0222	.0228
-1.9	.0233	.0239	.0244	.0250	.0256	.0262	.0268	.0274	.0281	.0287
-1.8	.0294	.0301	.0307	.0314	.0322	.0329	.0336	.0344	.0351	.0359
-1.7	.0367	.0375	.0384	.0392	.0401	.0409	.0418	.0427	.0436	.0446
-1.6	.0455	.0465	.0475	.0485	.0495	.0505	.0516	.0526	.0537	.0548
-1.5	.0559	.0571	.0582	.0594	.0606	.0618	.0630	.0643	.0655	.0668
-1.4	.0681	.0694	.0708	.0721	.0735	.0749	.0764	.0778	.0793	.0808
-1.3	.0823	.0838	.0853	.0869	.0885	.0901	.0918	.0934	.0951	.0968
-1.2	.0985	.1003	.1020	.1038	.1056	.1075	.1093	.1112	.1131	.1151
-1.1	.1170	.1190	.1210	.1230	.1251	.1271	.1292	.1314	.1335	.1357
-1.0	.1379	.1401	.1423	.1446	.1469	.1492	.1515	.1539	.1562	.1587
-0.9	.1611	.1635	.1660	.1685	.1711	.1736	.1762	.1788	.1814	.1841
-0.8	.1867	.1894	.1922	.1949	.1977	.2005	.2033	.2061	.2090	.2119
-0.7	.2148	.2177	.2206	.2236	.2266	.2296	.2327	.2358	.2389	.2420
-0.6	.2451	.2483	.2514	.2546	.2578	.2611	.2643	.2676	.2709	.2743
-0.5	.2776	.2810	.2843	.2877	.2912	.2946	.2981	.3015	.3050	.3085
-0.4	.3121	.3156	.3192	.3228	.3264	.3300	.3336	.3372	.3409	.3446
-0.3	.3483	.3520	.3557	.3594	.3632	.3669	.3707	.3745	.3783	.3821
-0.2	.3859	.3897	.3936	.3974	.4013	.4052	.4090	.4129	.4168	.4207
-0.1	.4247	.4286	.4325	.4364	.4404	.4443	.4483	.4522	.4562	.4602
-0.0	.4641	.4681	.4721	.4761	.4801	.4840	.4880	.4920	.4960	.5000

(continued)

Table B4 *Continued*

<i>z</i>	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998
3.5	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998	.9998
3.6	.9998	.9998	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999
3.7	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999	.9999

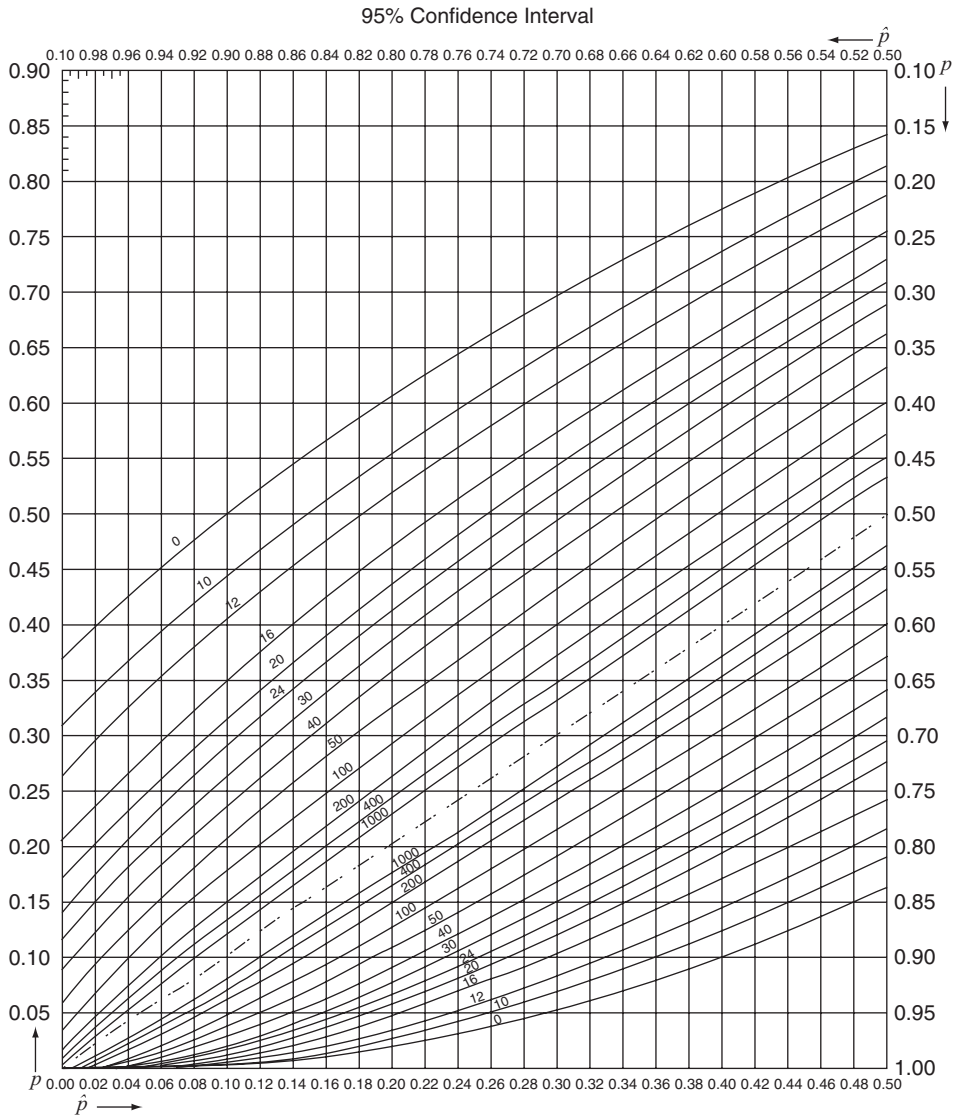
^aCalculated by MINITAB.

Table B5 Critical Values for the t Distribution^a

df	Probabilities between $\pm t$ values (two-sided)							
	.50	.60	.70	.80	.90	.95	.98	.99
1	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657
2	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169
11	0.697	0.876	1.088	1.363	1.796	2.201	2.718	3.106
12	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055
13	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012
14	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947
16	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921
17	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898
18	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878
19	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845
21	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831
22	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819
23	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807
24	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797
25	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787
26	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779
27	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771
28	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763
29	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756
30	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750
35	0.682	0.852	1.052	1.306	1.690	2.030	2.438	2.724
40	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704
45	0.680	0.850	1.049	1.301	1.679	2.014	2.412	2.690
50	0.679	0.849	1.047	1.299	1.676	2.009	2.403	2.678
55	0.679	0.848	1.046	1.297	1.673	2.004	2.396	2.668
60	0.679	0.848	1.045	1.296	1.671	2.000	2.390	2.660
65	0.678	0.847	1.045	1.295	1.669	1.997	2.385	2.654
70	0.678	0.847	1.044	1.294	1.667	1.994	2.381	2.648
75	0.678	0.846	1.044	1.293	1.665	1.992	2.377	2.643
80	0.678	0.846	1.043	1.292	1.664	1.990	2.374	2.639
90	0.677	0.846	1.042	1.291	1.662	1.987	2.369	2.632
100	0.677	0.845	1.042	1.290	1.660	1.984	2.364	2.626
150	0.676	0.844	1.040	1.287	1.655	1.976	2.351	2.609
200	0.676	0.843	1.039	1.286	1.653	1.972	2.345	2.601
500	0.675	0.842	1.038	1.283	1.648	1.965	2.334	2.586
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.330	2.581
∞	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576
	.75	.80	.85	.90	.95	.975	.99	.995
Probability below t value (one-sided)								

^aCalculated by MINITAB.

Table B6 Graphs for Binomial Confidence Interval



Source: Reprinted from "Biometrika Tables for Statisticians," 3rd ed., Vol. 1, Table 41, Bentley House, London; 1966, with the permission of the Biometrika Trustees. Use the bottom axis with the left axis and the top axis with the right axis.

Table B6 Continued

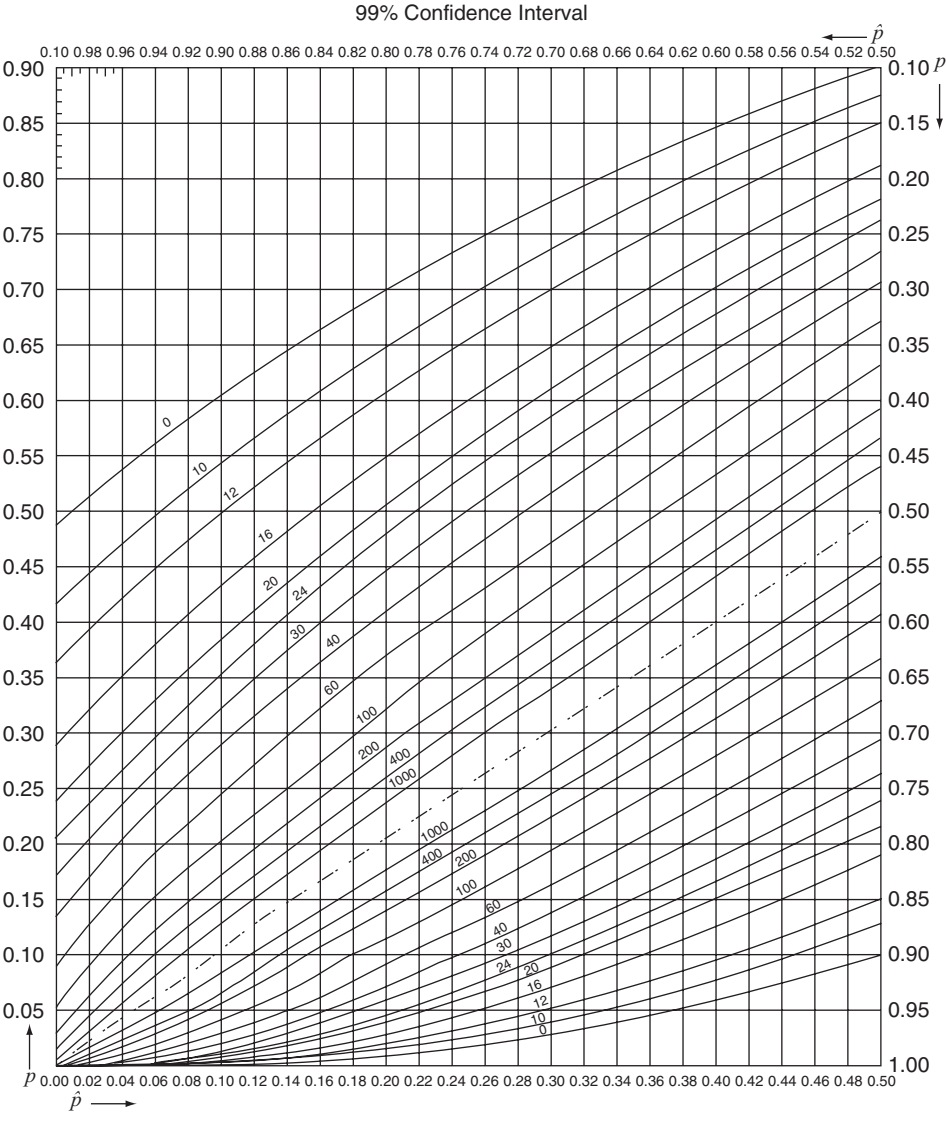


Table B7 Critical Values for the Chi-Square (χ^2) Distribution.^a

df	Probability below table value									
	.005	.01	.025	.05	.10	.90	.95	.975	.99	.995
1	0.00	0.00	0.00	0.00	0.02	2.71	3.84	5.02	6.64	7.88
2	0.01	0.02	0.05	0.10	0.21	4.61	5.99	7.38	9.21	10.60
3	0.07	0.12	0.22	0.35	0.58	6.25	7.82	9.35	11.35	12.84
4	0.21	0.30	0.48	0.71	1.06	7.78	9.49	11.14	13.28	14.86
5	0.41	0.55	0.83	1.15	1.61	9.24	11.07	12.83	15.09	16.75
6	0.68	0.87	1.24	1.64	2.20	10.65	12.59	14.45	16.81	18.55
7	0.99	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48	20.28
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.54	20.09	21.96
9	1.74	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	4.86	15.99	18.31	20.48	23.21	24.19
11	2.60	3.05	3.82	4.57	5.58	17.28	19.67	21.92	24.73	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	23.69	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	6.27	7.02	8.23	9.39	10.87	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	44.18
24	9.89	10.86	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	38.88	41.92	45.64	48.29
27	11.81	12.88	14.57	16.15	18.11	36.74	40.11	43.20	46.96	49.65
28	12.46	13.57	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
35	17.19	18.51	20.57	22.47	24.80	46.06	49.80	53.20	57.34	60.28
40	20.71	22.16	24.43	26.51	29.05	51.81	55.76	59.34	63.69	66.77
45	24.31	25.90	28.37	30.61	33.35	57.51	61.66	65.41	69.96	73.17
50	27.99	29.71	32.36	34.76	37.69	63.17	67.50	71.42	76.15	79.49
55	31.74	33.57	36.40	38.96	42.06	68.80	73.31	77.38	82.29	85.75
60	35.54	37.49	40.48	43.19	46.46	74.40	79.08	83.30	88.38	91.96
65	39.38	41.44	44.60	47.45	50.88	79.97	84.82	89.18	94.42	98.10
70	43.28	45.44	48.76	51.74	55.33	85.53	90.53	95.02	100.42	104.21
75	47.21	49.48	52.94	56.05	59.80	91.06	96.22	100.84	106.39	110.29
80	51.17	53.54	57.15	60.39	64.28	96.58	101.88	106.63	112.33	116.32
90	59.20	61.75	65.65	69.13	73.29	107.57	113.15	118.14	124.12	128.30
100	67.33	70.07	74.22	77.93	82.36	118.50	124.34	129.56	135.81	140.18
120	83.85	86.92	91.57	95.71	100.62	140.23	146.57	152.21	158.95	163.65
140	100.66	104.03	109.14	113.66	119.03	161.83	168.61	174.65	181.84	186.85
160	117.68	121.35	126.87	131.76	137.55	183.31	190.52	196.92	204.54	209.84
180	134.88	138.82	144.74	149.97	156.15	204.70	212.30	219.05	227.06	232.62
200	152.24	156.43	162.73	168.28	174.84	226.02	234.00	241.06	249.46	255.28

^aCalculated by MINITAB.

Table B8 Factors, k , for Two-Sided Tolerance Limits for Normal Distributions.

$n \Pi$:	$1 - \alpha = 0.75$					$1 - \alpha = 0.90$				
	0.75	0.90	0.95	0.99	0.999	0.75	0.90	0.95	0.99	0.999
2	4.498	6.301	7.414	9.531	11.920	11.407	15.978	18.800	24.167	30.227
3	2.501	3.538	4.187	5.431	6.844	4.132	5.847	6.919	8.974	11.309
4	2.035	2.892	3.431	4.471	5.657	2.932	4.166	4.943	6.440	8.149
5	1.825	2.599	3.088	4.033	5.117	2.454	3.494	4.152	5.423	6.879
6	1.704	2.429	2.889	3.779	4.802	2.196	3.131	3.723	4.870	6.188
7	1.624	2.318	2.757	3.611	4.593	2.034	2.902	3.452	4.521	5.750
8	1.568	2.238	2.663	3.491	4.444	1.921	2.743	3.264	4.278	5.446
9	1.525	2.178	2.593	3.400	4.330	1.839	2.626	3.125	4.098	5.220
10	1.492	2.131	2.537	3.328	4.241	1.775	2.535	3.018	3.959	5.046
11	1.465	2.093	2.493	3.271	4.169	1.724	2.463	2.933	3.849	4.906
12	1.443	2.062	2.456	3.223	4.110	1.683	2.404	2.863	3.758	4.792
13	1.425	2.036	2.424	3.183	4.059	1.648	2.355	2.805	3.682	4.697
14	1.409	2.013	2.398	3.148	4.016	1.619	2.314	2.756	3.618	4.615
15	1.395	1.994	2.375	3.118	3.979	1.594	2.278	2.713	3.562	4.545
16	1.383	1.977	2.355	3.092	3.946	1.572	2.246	2.676	3.514	4.484
17	1.372	1.962	2.337	3.069	3.917	1.552	2.219	2.643	3.471	4.430
18	1.363	1.948	2.321	3.048	3.891	1.535	2.194	2.614	3.433	4.382
19	1.355	1.936	2.307	3.030	3.867	1.520	2.172	2.588	3.399	4.339
20	1.347	1.925	2.294	3.013	3.846	1.506	2.152	2.564	3.368	4.300
21	1.340	1.915	2.282	2.998	3.827	1.493	2.135	2.543	3.340	4.264
22	1.334	1.906	2.271	2.984	3.809	1.482	2.118	2.524	3.315	4.232
23	1.328	1.898	2.261	2.971	3.793	1.471	2.103	2.506	3.292	4.203
24	1.322	1.891	2.252	2.959	3.778	1.462	2.089	2.489	3.270	4.176
25	1.317	1.883	2.244	2.948	3.764	1.453	2.077	2.474	3.251	4.151
26	1.313	1.877	2.236	2.938	3.751	1.444	2.065	2.460	3.232	4.127
27	1.309	1.871	2.229	2.929	3.740	1.437	2.054	2.447	3.215	4.106
30	1.297	1.855	2.210	2.904	3.708	1.417	2.025	2.413	3.170	4.049
35	1.283	1.834	2.185	2.871	3.667	1.390	1.988	2.368	3.112	3.974
40	1.271	1.818	2.166	2.846	3.635	1.370	1.959	2.334	3.066	3.917
45	1.262	1.805	2.150	2.826	3.609	1.354	1.935	2.306	3.030	3.871
50	1.255	1.794	2.138	2.809	3.588	1.340	1.916	2.284	3.001	3.833
55	1.249	1.785	2.127	2.795	3.571	1.329	1.901	2.265	2.976	3.801
60	1.243	1.778	2.118	2.784	3.556	1.320	1.887	2.248	2.955	3.774
65	1.239	1.771	2.110	2.773	3.543	1.312	1.875	2.235	2.937	3.751
70	1.235	1.765	2.104	2.764	3.531	1.304	1.865	2.222	2.920	3.730
75	1.231	1.760	2.098	2.757	3.521	1.298	1.856	2.211	2.906	3.712
80	1.228	1.756	2.092	2.749	3.512	1.292	1.848	2.202	2.894	3.696
85	1.225	1.752	2.087	2.743	3.504	1.287	1.841	2.193	2.882	3.682
90	1.223	1.748	2.083	2.737	3.497	1.283	1.834	2.185	2.872	3.669
95	1.220	1.745	2.079	2.732	3.490	1.278	1.828	2.178	2.863	3.657
100	1.218	1.742	2.075	2.727	3.484	1.275	1.822	2.172	2.854	3.646
110	1.214	1.736	2.069	2.719	3.473	1.268	1.813	2.160	2.839	3.626
120	1.211	1.732	2.063	2.712	3.464	1.262	1.804	2.150	2.826	3.610
130	1.208	1.728	2.059	2.705	3.456	1.257	1.797	2.141	2.814	3.595
140	1.206	1.724	2.054	2.700	3.449	1.252	1.791	2.134	2.804	3.582
150	1.204	1.721	2.051	2.695	3.443	1.248	1.785	2.127	2.795	3.571
160	1.202	1.718	2.047	2.691	3.437	1.245	1.780	2.121	2.787	3.561
170	1.200	1.716	2.044	2.687	3.432	1.242	1.775	2.116	2.780	3.552
180	1.198	1.713	2.042	2.683	3.427	1.239	1.771	2.111	2.774	3.543
190	1.197	1.711	2.039	2.680	3.423	1.236	1.767	2.106	2.768	3.536
200	1.195	1.709	2.037	2.677	3.419	1.234	1.764	2.102	2.762	3.529
250	1.190	1.702	2.028	2.665	3.404	1.224	1.750	2.085	2.740	3.501
300	1.186	1.696	2.021	2.656	3.393	1.217	1.740	2.073	2.725	3.481
400	1.181	1.688	2.012	2.644	3.378	1.207	1.726	2.057	2.703	3.453
500	1.177	1.683	2.006	2.636	3.368	1.201	1.717	2.046	2.689	3.434
600	1.175	1.680	2.002	2.631	3.360	1.196	1.710	2.038	2.678	3.421
700	1.173	1.677	1.998	2.626	3.355	1.192	1.705	2.032	2.670	3.411
800	1.171	1.675	1.996	2.623	3.350	1.189	1.701	2.027	2.663	3.402
900	1.170	1.673	1.993	2.620	3.347	1.187	1.697	2.023	2.658	3.396
1000	1.169	1.671	1.992	2.617	3.344	1.185	1.695	2.019	2.654	3.390
∞	1.150	1.645	1.960	2.576	3.291	1.150	1.645	1.960	2.576	3.291

(continued)

Table B8 *Continued*

<i>n</i> Π :	$1 - \alpha = 0.95$					$1 - \alpha = 0.99$				
	0.75	0.90	0.95	0.99	0.999	0.75	0.90	0.95	0.99	0.999
2	22.858	32.019	37.674	48.430	60.573	114.363	160.193	188.491	242.300	303.054
3	5.922	8.380	9.916	12.861	16.208	13.378	18.930	22.401	29.055	36.616
4	3.779	5.369	6.370	8.299	10.502	6.614	9.398	11.150	14.527	18.383
5	3.002	4.275	5.079	6.634	8.415	4.643	6.612	7.855	10.260	13.015
6	2.604	3.712	4.414	5.775	7.337	3.743	5.337	6.345	8.301	10.548
7	2.361	3.369	4.007	5.248	6.676	3.233	4.613	5.488	7.187	9.142
8	2.197	3.136	3.732	4.891	6.226	2.905	4.147	4.936	6.468	8.234
9	2.078	2.967	3.532	4.631	5.899	2.677	3.822	4.550	5.966	7.600
10	1.987	2.839	3.379	4.433	5.649	2.508	3.582	4.265	5.594	7.129
11	1.916	2.737	3.259	4.277	5.452	2.378	3.397	4.045	5.308	6.766
12	1.858	2.655	3.162	4.150	5.291	2.274	3.250	3.870	5.079	6.477
13	1.810	2.587	3.081	4.044	5.158	2.190	3.130	3.727	4.893	6.240
14	1.770	2.529	3.012	3.955	5.045	2.120	3.029	3.608	4.737	6.043
15	1.735	2.480	2.954	3.878	4.949	2.060	2.954	3.507	4.605	5.876
16	1.705	2.437	2.903	3.812	4.865	2.009	2.872	3.421	4.492	5.732
17	1.679	2.400	2.858	3.754	4.791	1.965	2.808	3.345	4.393	5.607
18	1.655	2.366	2.819	3.702	4.725	1.926	2.753	3.279	4.307	5.497
19	1.635	2.337	2.784	3.656	4.667	1.891	2.703	3.221	4.230	5.399
20	1.616	2.310	2.752	3.615	4.614	1.860	2.659	3.168	4.161	5.312
21	1.599	2.286	2.723	3.577	4.567	1.833	2.620	3.121	4.100	5.234
22	1.584	2.264	2.697	3.543	4.523	1.808	2.584	3.078	4.044	5.163
23	1.570	2.244	2.673	3.512	4.484	1.785	2.551	3.040	3.993	5.098
24	1.557	2.225	2.651	3.483	4.447	1.764	2.522	3.004	3.947	5.039
25	1.545	2.208	2.631	3.457	4.413	1.745	2.494	2.972	3.904	4.985
26	1.534	2.193	2.612	3.432	4.382	1.727	2.469	2.941	3.865	4.935
27	1.523	2.178	2.595	3.409	4.353	1.711	2.446	2.914	3.828	4.888
30	1.497	2.140	2.549	3.350	4.278	1.668	2.385	2.841	3.733	4.768
35	1.462	2.090	2.490	3.272	4.179	1.613	2.306	2.748	3.611	4.611
40	1.435	2.052	2.445	3.213	4.104	1.571	2.247	2.677	3.518	4.493
45	1.414	2.021	2.408	3.165	4.042	1.539	2.200	2.621	3.444	4.399
50	1.396	1.996	2.379	3.126	3.993	1.512	2.162	2.576	3.385	4.323
55	1.382	1.976	2.354	3.094	3.951	1.490	2.130	2.538	3.335	4.260
60	1.369	1.958	2.333	3.066	3.916	1.471	2.103	2.506	3.293	4.206
65	1.359	1.943	2.315	3.042	3.886	1.455	2.080	2.478	3.257	4.160
70	1.349	1.929	2.299	3.021	3.859	1.440	2.060	2.454	3.225	4.120
75	1.341	1.917	2.285	3.002	3.835	1.428	2.042	2.433	3.197	4.084
80	1.334	1.907	2.272	2.986	3.814	1.417	2.026	2.414	3.173	4.053
85	1.327	1.897	2.261	2.971	3.795	1.407	2.012	2.397	3.150	4.024
90	1.321	1.889	2.251	2.958	3.778	1.398	1.999	2.382	3.130	3.999
95	1.315	1.881	2.241	2.945	3.763	1.390	1.987	2.368	3.112	3.976
100	1.311	1.874	2.233	2.934	3.748	1.383	1.977	2.355	3.096	3.954
110	1.302	1.861	2.218	2.915	3.723	1.369	1.958	2.333	3.066	3.917
120	1.294	1.850	2.205	2.898	3.702	1.358	1.942	2.314	3.041	3.885
130	1.288	1.841	2.194	2.883	3.683	1.349	1.928	2.298	3.019	3.857
140	1.282	1.833	2.184	2.870	3.666	1.340	1.916	2.283	3.000	3.833
150	1.277	1.825	2.175	2.859	3.652	1.332	1.905	2.270	2.983	3.811
160	1.272	1.819	2.167	2.848	3.638	1.326	1.896	2.259	2.968	3.792
170	1.268	1.813	2.160	2.839	3.627	1.320	1.887	2.248	2.955	3.774
180	1.264	1.808	2.154	2.831	3.616	1.314	1.879	2.239	2.942	3.759
190	1.261	1.803	2.148	2.823	3.606	1.309	1.872	2.230	2.931	3.744
200	1.258	1.798	2.143	2.816	3.597	1.304	1.865	2.222	2.921	3.731
250	1.245	1.780	2.121	2.788	3.561	1.286	1.839	2.191	2.880	3.678
300	1.236	1.767	2.106	2.767	3.535	1.273	1.820	2.169	2.850	3.641
400	1.223	1.749	2.084	2.739	3.499	1.255	1.794	2.138	2.809	3.589
500	1.215	1.737	2.070	2.721	3.475	1.243	1.777	2.117	2.783	3.555
600	1.209	1.729	2.060	2.707	3.458	1.234	1.764	2.102	2.763	3.530
700	1.204	1.722	2.052	2.697	3.445	1.227	1.755	2.091	2.748	3.511
800	1.201	1.717	2.046	2.688	3.434	1.222	1.747	2.082	2.736	3.495
900	1.198	1.712	2.040	2.682	3.426	1.218	1.741	2.075	2.726	3.483
1000	1.195	1.709	2.036	2.676	3.418	1.214	1.736	2.068	2.718	3.472
∞	1.150	1.645	1.960	2.576	3.291	1.150	1.645	1.960	2.576	3.291

Source: Abstracted from C. Eisenhart, M. W. Hastay, and W. A. Wallis, "Techniques of Statistical Analysis," Table 2.1, pp. 102–107. McGraw-Hill, New York, 1947

Table B9 Critical Values for Wilcoxon Signed Rank Test.^a

Two-sided Comparisons				
<i>n</i>	$\alpha \leq 0.10$	$\alpha \leq 0.05$	$\alpha \leq 0.02$	$\alpha \leq 0.01$
5	0, 15			
6	2, 19	0, 21		
7	3, 25	2, 26	0, 28	
8	5, 31	3, 33	1, 35	0, 36
9	8, 37	5, 40	3, 42	1, 44
10	10, 45	8, 47	5, 50	3, 52
11	13, 53	10, 56	7, 59	5, 61
12	17, 61	13, 65	9, 69	7, 71
13	21, 70	17, 74	12, 79	9, 82
14	25, 80	21, 84	15, 90	12, 93
15	30, 90	25, 95	19,101	15,105
16	35,101	29,107	23,113	19,117
17	41,112	34,119	28,125	23,130
18	47,124	40,131	32,139	27,144
19	53,137	46,144	37,153	33,158
20	60,150	52,158	43,167	37,173
21	67,164	58,173	49,182	42,189
22	75,178	66,187	55,198	48,205
23	83,193	73,203	62,214	54,222
24	91,209	81,210	69,231	61,239
25	100,225	89,236	76,249	68,257
26	110,241	98,253	84,267	75,276
27	119,259	107,271	93,285	83,295
28	130,276	114,278	101,305	91,315
29	140,295	126,309	122,313	100,335
30	151,314	137,328	132,333	109,356
One-sided Comparisons				
<i>n</i>	$\alpha \leq 0.05$	$\alpha \leq 0.025$	$\alpha \leq 0.01$	$\alpha \leq 0.005$

^aExtracted from "Critical Values and Probability Levels for the Wilcoxon Rank Sum Test and the Wilcoxon Signed Rank Test," by Frank Wilcoxon, S. K. Katti, and Roberta A. Wilcox, *Selected Tables in Mathematical Statistics*, Vol. 1, 1973, Table II, pp. 237–259, by permission of the American Mathematics Society.

Table B10 Critical Values for Wilcoxon Rank Sum Test.^a

$N_2 \setminus N_1$	Two-sided: $\alpha \leq 0.10$ One-sided: $\alpha \leq 0.05$														
	3	4	5	6	7	8	9	10	11	12	13	14	15		
3	—	10, 22	16, 29	23, 37	30, 47	39, 57	48, 69	59, 81	71, 94	83, 109	97, 124	112, 140	127, 158		
4	6, 18	11, 25	17, 33	24, 42	32, 52	41, 63	51, 75	62, 88	74, 102	87, 117	101, 133	116, 150	132, 168		
5	7, 20	12, 28	19, 36	26, 46	34, 57	44, 68	54, 81	66, 94	78, 109	91, 125	106, 141	121, 159	138, 177		
6	8, 22	13, 31	20, 40	28, 50	36, 62	46, 74	57, 87	69, 101	82, 116	95, 133	110, 150	126, 168	143, 187		
7	8, 25	14, 34	21, 44	29, 55	39, 66	49, 79	60, 93	72, 108	85, 124	99, 141	115, 158	131, 177	148, 197		
8	9, 27	15, 37	23, 47	31, 59	41, 71	51, 85	63, 99	75, 115	89, 131	104, 148	119, 167	136, 186	153, 207		
9	9, 30	16, 40	24, 51	33, 63	43, 76	54, 90	66, 105	79, 121	93, 138	108, 156	124, 178	141, 195	159, 216		
10	10, 32	17, 43	26, 54	35, 67	45, 81	56, 96	69, 111	82, 128	97, 145	112, 164	128, 184	146, 204	164, 226		
11	11, 34	18, 46	27, 58	37, 71	47, 86	59, 101	72, 117	86, 134	100, 153	116, 172	133, 192	151, 231	170, 235		
12	11, 37	19, 49	28, 62	38, 76	49, 91	62, 106	75, 123	89, 141	104, 160	120, 180	138, 200	156, 222	175, 245		
13	12, 39	20, 52	30, 65	40, 80	52, 95	64, 112	78, 129	92, 148	108, 167	125, 187	142, 209	161, 231	181, 254		
14	13, 41	21, 55	31, 69	42, 84	54, 100	67, 117	81, 135	96, 154	112, 174	129, 195	147, 217	166, 240	186, 264		
15	13, 44	22, 58	33, 72	44, 88	56, 105	69, 123	84, 141	99, 161	116, 181	133, 203	152, 225	171, 249	192, 273		
16	14, 46	24, 60	34, 76	46, 92	58, 110	72, 128	87, 147	103, 167	120, 188	138, 210	156, 234	176, 258	197, 283		
17	15, 48	25, 63	35, 80	47, 97	61, 114	75, 133	90, 153	106, 174	123, 196	142, 218	161, 242	182, 266	203, 292		
18	15, 51	26, 66	37, 83	49, 101	63, 119	77, 139	93, 159	110, 180	127, 203	146, 226	166, 250	187, 275	208, 302		
19	16, 53	27, 69	38, 87	51, 105	65, 124	80, 144	96, 165	113, 187	131, 210	150, 234	171, 258	192, 284	214, 311		
20	17, 55	28, 72	40, 90	53, 109	67, 129	83, 149	99, 171	117, 193	135, 217	155, 241	175, 267	197, 293	220, 320		
21	17, 58	29, 75	41, 94	55, 113	69, 134	85, 155	102, 177	120, 200	139, 224	159, 249	180, 275	202, 302	225, 330		
22	18, 60	30, 78	43, 97	57, 117	72, 138	88, 160	105, 183	123, 207	143, 231	163, 257	185, 283	207, 311	231, 339		
23	19, 62	31, 81	44, 101	58, 122	74, 143	90, 166	108, 189	127, 213	147, 238	168, 264	189, 292	212, 320	236, 349		
24	20, 65	32, 84	45, 105	60, 126	76, 148	93, 171	111, 195	130, 220	151, 245	172, 272	194, 300	218, 328	242, 358		
25	20, 67	33, 87	47, 108	62, 130	78, 153	96, 176	114, 201	134, 226	155, 252	176, 280	199, 308	223, 337	248, 367		
26	21, 69	34, 90	48, 112	64, 134	81, 157	98, 182	117, 207	137, 233	158, 260	181, 287	204, 316	228, 346	253, 377		
27	21, 72	35, 93	50, 115	66, 138	83, 162	101, 187	120, 213	141, 239	162, 267	185, 295	208, 325	233, 355	259, 386		
28	22, 74	36, 96	51, 119	67, 143	85, 167	104, 192	123, 219	144, 246	166, 274	189, 303	213, 333	238, 364	264, 396		
29	23, 76	37, 99	53, 122	69, 147	87, 172	106, 198	127, 224	148, 252	170, 281	194, 310	218, 341	243, 373	270, 405		
30	23, 79	38, 102	54, 126	71, 151	89, 177	109, 203	130, 230	151, 259	174, 288	198, 318	223, 349	249, 381	276, 414		

(continued)

Table B10 Continued

$N_2 \setminus N_1$	Two-sided: $\alpha \leq 0.02$ One-sided: $\alpha \leq 0.01$														
	3	4	5	6	7	8	9	10	11	12	13	14	15		
3	—	—	—	—	28, 49	36, 60	46, 71	56, 84	67, 98	80, 112	93, 128	107, 145	123, 162		
4	—	—	15, 35	22, 44	29, 55	38, 66	48, 78	58, 92	70, 106	83, 121	96, 138	111, 155	127, 173		
5	—	10, 30	16, 39	23, 49	31, 60	40, 72	50, 85	61, 99	73, 114	86, 130	100, 147	115, 165	131, 184		
6	—	11, 33	17, 43	24, 54	32, 66	42, 78	52, 92	63, 107	75, 123	89, 139	103, 157	118, 176	135, 195		
7	6, 27	11, 37	18, 47	25, 59	34, 71	43, 85	54, 99	66, 114	78, 131	92, 148	107, 166	122, 186	139, 206		
8	6, 30	12, 40	19, 51	27, 63	35, 77	45, 91	56, 106	68, 122	81, 139	95, 157	111, 175	127, 195	144, 216		
9	7, 32	13, 43	20, 55	28, 68	37, 82	47, 97	59, 112	71, 129	84, 147	99, 165	114, 185	131, 205	148, 227		
10	7, 35	13, 47	21, 59	29, 73	39, 87	49, 103	61, 119	74, 136	88, 154	102, 174	118, 194	135, 215	153, 237		
11	7, 38	14, 50	22, 63	30, 78	40, 93	51, 109	63, 126	77, 143	91, 162	106, 182	122, 203	139, 225	157, 248		
12	8, 40	15, 53	23, 67	32, 82	42, 98	53, 115	66, 132	79, 151	94, 170	109, 191	126, 212	143, 235	162, 258		
13	8, 43	15, 57	24, 71	33, 87	44, 103	56, 120	68, 139	82, 158	97, 178	113, 199	130, 221	148, 244	167, 268		
14	8, 46	16, 60	25, 75	34, 92	45, 109	58, 126	71, 145	85, 165	100, 186	116, 208	134, 230	152, 254	171, 279		
15	9, 48	17, 63	26, 79	36, 96	47, 114	60, 132	73, 152	88, 172	103, 194	120, 216	138, 239	156, 264	176, 289		
16	9, 51	17, 67	27, 83	37, 101	49, 119	62, 138	76, 158	91, 179	107, 201	124, 224	142, 248	161, 273	181, 299		
17	10, 53	18, 70	28, 87	39, 105	51, 124	64, 144	78, 165	93, 187	110, 209	127, 233	146, 257	165, 283	186, 309		
18	10, 56	19, 73	29, 91	40, 110	52, 130	66, 150	81, 171	96, 194	113, 217	131, 241	150, 266	170, 292	190, 320		
19	10, 59	19, 77	30, 95	41, 115	54, 135	68, 156	83, 178	99, 201	116, 225	134, 250	154, 275	174, 302	195, 330		
20	11, 61	20, 80	31, 99	43, 119	56, 140	70, 162	85, 185	102, 208	119, 233	138, 258	158, 284	178, 312	200, 340		
21	11, 64	21, 83	32, 103	44, 124	58, 145	72, 168	88, 191	105, 215	123, 240	142, 266	162, 293	183, 321	205, 350		
22	11, 67	21, 87	33, 107	45, 129	59, 151	74, 174	90, 198	108, 222	126, 248	145, 275	166, 302	187, 331	210, 360		
23	12, 69	22, 90	34, 111	47, 133	61, 156	76, 180	93, 204	110, 230	129, 256	149, 283	170, 311	192, 340	219, 381		
24	12, 72	23, 93	35, 115	48, 138	63, 161	78, 186	95, 211	113, 237	132, 264	153, 291	174, 320	196, 350	224, 391		
25	13, 74	23, 97	36, 119	50, 142	64, 167	81, 191	98, 217	116, 244	136, 271	156, 300	178, 329	200, 360	229, 401		
26	13, 77	24, 100	37, 123	51, 147	66, 172	83, 197	100, 224	119, 251	139, 279	160, 308	182, 338	205, 369	234, 411		
27	13, 80	25, 103	38, 127	52, 152	68, 177	85, 203	103, 230	122, 258	142, 287	163, 317	186, 347	209, 379	239, 421		
28	14, 82	26, 106	39, 131	54, 156	70, 182	87, 209	105, 237	125, 265	145, 295	167, 325	190, 356	214, 388	243, 432		
29	14, 85	26, 110	40, 135	55, 161	71, 188	89, 215	108, 243	128, 272	149, 302	171, 333	194, 365	218, 398	248, 442		
30	15, 87	27, 113	41, 139	56, 166	73, 193	91, 221	110, 250	131, 279	152, 310	174, 342	198, 374	223, 407			

(continued)

Table B11 Critical Values for the F Distribution^a

df in the denominator	$F_{.90}$										
	df in the numerator										
	1	2	3	4	5	6	8	10	20	50	100
1	39.86	49.50	53.59	55.83	57.24	58.20	59.44	60.19	61.74	62.69	63.01
2	8.53	9.00	9.16	9.24	9.29	9.33	9.37	9.39	9.44	9.47	9.48
3	5.54	5.46	5.39	5.34	5.31	5.28	5.25	5.23	5.18	5.15	5.14
4	4.54	4.32	4.19	4.11	4.05	4.01	3.95	3.92	3.84	3.80	3.78
5	4.06	3.78	3.62	3.52	3.45	3.40	3.34	3.30	3.21	3.15	3.13
6	3.78	3.46	3.29	3.18	3.11	3.05	2.98	2.94	2.84	2.77	2.75
7	3.59	3.26	3.07	2.96	2.88	2.83	2.75	2.70	2.59	2.52	2.50
8	3.46	3.11	2.92	2.81	2.73	2.67	2.59	2.54	2.42	2.35	2.32
9	3.36	3.01	2.81	2.69	2.61	2.55	2.47	2.42	2.30	2.22	2.19
10	3.29	2.92	2.73	2.61	2.52	2.46	2.38	2.32	2.20	2.12	2.09
11	3.23	2.86	2.66	2.54	2.45	2.39	2.30	2.25	2.12	2.04	2.01
12	3.18	2.81	2.61	2.48	2.39	2.33	2.24	2.19	2.06	1.97	1.94
13	3.14	2.76	2.56	2.43	2.35	2.28	2.20	2.14	2.01	1.92	1.88
14	3.10	2.73	2.52	2.39	2.31	2.24	2.15	2.10	1.96	1.87	1.83
15	3.07	2.70	2.49	2.36	2.27	2.21	2.12	2.06	1.92	1.83	1.79
16	3.05	2.67	2.46	2.33	2.24	2.18	2.09	2.03	1.89	1.79	1.76
17	3.03	2.64	2.44	2.31	2.22	2.15	2.06	2.00	1.86	1.76	1.73
18	3.01	2.62	2.42	2.29	2.20	2.13	2.04	1.98	1.84	1.74	1.70
19	2.99	2.61	2.40	2.27	2.18	2.11	2.02	1.96	1.81	1.71	1.67
20	2.97	2.59	2.38	2.25	2.16	2.09	2.00	1.94	1.79	1.69	1.65
21	2.96	2.57	2.36	2.23	2.14	2.08	1.98	1.92	1.78	1.67	1.63
22	2.95	2.56	2.35	2.22	2.13	2.06	1.97	1.90	1.76	1.65	1.61
23	2.94	2.55	2.34	2.21	2.11	2.05	1.95	1.89	1.74	1.64	1.59
24	2.93	2.54	2.33	2.19	2.10	2.04	1.94	1.88	1.73	1.62	1.58
25	2.92	2.53	2.32	2.18	2.09	2.02	1.93	1.87	1.72	1.61	1.56
26	2.91	2.52	2.31	2.17	2.08	2.01	1.92	1.86	1.71	1.59	1.55
27	2.90	2.51	2.30	2.17	2.07	2.00	1.91	1.85	1.70	1.58	1.54
28	2.89	2.50	2.29	2.16	2.06	2.00	1.90	1.84	1.69	1.57	1.53
29	2.89	2.50	2.28	2.15	2.06	1.99	1.89	1.83	1.68	1.56	1.52
30	2.88	2.49	2.28	2.14	2.05	1.98	1.88	1.82	1.67	1.55	1.51
40	2.84	2.44	2.23	2.09	2.00	1.93	1.83	1.76	1.61	1.48	1.43
50	2.81	2.41	2.20	2.06	1.97	1.90	1.80	1.73	1.57	1.44	1.39
60	2.79	2.39	2.18	2.04	1.95	1.87	1.77	1.71	1.54	1.41	1.36
100	2.76	2.36	2.14	2.00	1.91	1.83	1.73	1.66	1.49	1.35	1.29
200	2.73	2.33	2.11	1.97	1.88	1.80	1.70	1.63	1.46	1.31	1.24
1000	2.71	2.31	2.09	1.95	1.85	1.78	1.68	1.61	1.43	1.27	1.20

(continued)

Table B11 *Continued*

df in the denominator	$F_{.95}$										
	df in the numerator										
	1	2	3	4	5	6	8	10	20	50	100
1	161.5	199.5	215.7	224.6	230.2	234.0	238.9	241.9	248.0	251.8	253.0
2	18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.40	19.45	19.48	19.49
3	10.13	9.55	9.28	9.12	9.01	8.94	8.85	8.79	8.66	8.58	8.55
4	7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.96	5.80	5.70	5.66
5	6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.74	4.56	4.44	4.41
6	5.99	5.14	4.76	4.53	4.39	4.28	4.15	4.06	3.87	3.75	3.71
7	5.59	4.74	4.35	4.12	3.97	3.87	3.73	3.64	3.44	3.32	3.27
8	5.32	4.46	4.07	3.84	3.69	3.58	3.44	3.35	3.15	3.02	2.97
9	5.12	4.26	3.86	3.63	3.48	3.37	3.23	3.14	2.94	2.80	2.76
10	4.96	4.10	3.71	3.48	3.33	3.22	3.07	2.98	2.77	2.64	2.59
11	4.84	3.98	3.59	3.36	3.20	3.09	2.95	2.85	2.65	2.51	2.46
12	4.75	3.89	3.49	3.26	3.11	3.00	2.85	2.75	2.54	2.40	2.35
13	4.67	3.81	3.41	3.18	3.03	2.92	2.77	2.67	2.46	2.31	2.26
14	4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.60	2.39	2.24	2.19
15	4.54	3.68	3.29	3.06	2.90	2.79	2.64	2.54	2.33	2.18	2.12
16	4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.49	2.28	2.12	2.07
17	4.45	3.59	3.20	2.96	2.81	2.70	2.55	2.45	2.23	2.08	2.02
18	4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.41	2.19	2.04	1.98
19	4.38	3.52	3.13	2.90	2.74	2.63	2.48	2.38	2.16	2.00	1.94
20	4.35	3.49	3.10	2.87	2.71	2.60	2.45	2.35	2.12	1.97	1.91
21	4.32	3.47	3.07	2.84	2.68	2.57	2.42	2.32	2.10	1.94	1.88
22	4.30	3.44	3.05	2.82	2.66	2.55	2.40	2.30	2.07	1.91	1.85
23	4.28	3.42	3.03	2.80	2.64	2.53	2.37	2.27	2.05	1.88	1.82
24	4.26	3.40	3.01	2.78	2.62	2.51	2.36	2.25	2.03	1.86	1.80
25	4.24	3.39	2.99	2.76	2.60	2.49	2.34	2.24	2.01	1.84	1.78
26	4.23	3.37	2.98	2.74	2.59	2.47	2.32	2.22	1.99	1.82	1.76
27	4.21	3.35	2.96	2.73	2.57	2.46	2.31	2.20	1.97	1.81	1.74
28	4.20	3.34	2.95	2.71	2.56	2.45	2.29	2.19	1.96	1.79	1.73
29	4.18	3.33	2.93	2.70	2.55	2.43	2.28	2.18	1.94	1.77	1.71
30	4.17	3.32	2.92	2.69	2.53	2.42	2.27	2.16	1.93	1.76	1.70
40	4.08	3.23	2.84	2.61	2.45	2.34	2.18	2.08	1.84	1.66	1.59
50	4.03	3.18	2.79	2.56	2.40	2.29	2.13	2.03	1.78	1.60	1.52
60	4.00	3.15	2.76	2.53	2.37	2.25	2.10	1.99	1.75	1.56	1.48
100	3.94	3.09	2.70	2.46	2.31	2.19	2.03	1.93	1.68	1.48	1.39
200	3.89	3.04	2.65	2.42	2.26	2.14	1.98	1.88	1.62	1.41	1.32
1000	3.85	3.00	2.61	2.38	2.22	2.11	1.95	1.84	1.58	1.36	1.26

(continued)

Table B11 *Continued*

df in the denominator	$F_{.99}$										
	df in the numerator										
	1	2	3	4	5	6	8	10	20	50	100
1	4052	4500	5403	5625	5764	5859	5981	6056	6209	6302	6334
2	98.50	99.00	99.17	99.25	99.30	99.33	99.37	99.40	99.45	99.48	99.49
3	34.12	30.82	29.46	28.71	28.24	27.91	27.49	27.23	26.69	26.35	26.24
4	21.20	18.00	16.69	15.98	15.52	15.21	14.80	14.55	14.02	13.69	13.58
5	16.26	13.27	12.06	11.39	10.97	10.67	10.29	10.05	9.55	9.24	9.13
6	13.75	10.92	9.78	9.15	8.75	8.47	8.10	7.87	7.40	7.09	6.99
7	12.25	9.55	8.45	7.85	7.46	7.19	6.84	6.62	6.16	5.86	5.75
8	11.26	8.65	7.59	7.01	6.63	6.37	6.03	5.81	5.36	5.07	4.96
9	10.56	8.02	6.99	6.42	6.06	5.80	5.47	5.26	4.81	4.52	4.41
10	10.04	7.56	6.55	5.99	5.64	5.39	5.06	4.85	4.41	4.12	4.01
11	9.65	7.21	6.22	5.67	5.32	5.07	4.74	4.54	4.10	3.81	3.71
12	9.33	6.93	5.95	5.41	5.06	4.82	4.50	4.30	3.86	3.57	3.47
13	9.07	6.70	5.74	5.21	4.86	4.62	4.30	4.10	3.66	3.38	3.27
14	8.86	6.51	5.56	5.04	4.69	4.46	4.14	3.94	3.51	3.22	3.11
15	8.68	6.36	5.42	4.89	4.56	4.32	4.00	3.80	3.37	3.08	2.98
16	8.53	6.23	5.29	4.77	4.44	4.20	3.89	3.69	3.26	2.97	2.86
17	8.40	6.11	5.19	4.67	4.34	4.10	3.79	3.59	3.16	2.87	2.76
18	8.29	6.01	5.09	4.58	4.25	4.01	3.71	3.51	3.08	2.78	2.68
19	8.19	5.93	5.01	4.50	4.17	3.94	3.63	3.43	3.00	2.71	2.60
20	8.10	5.85	4.94	4.43	4.10	3.87	3.56	3.37	2.94	2.64	2.54
21	8.02	5.78	4.87	4.37	4.04	3.81	3.51	3.31	2.88	2.58	2.48
22	7.95	5.72	4.82	4.31	3.99	3.76	3.45	3.26	2.83	2.53	2.42
23	7.88	5.66	4.76	4.26	3.94	3.71	3.41	3.21	2.78	2.48	2.37
24	7.82	5.61	4.72	4.22	3.90	3.67	3.36	3.17	2.74	2.44	2.33
25	7.77	5.57	4.68	4.18	3.85	3.63	3.32	3.13	2.70	2.40	2.29
26	7.72	5.53	4.64	4.14	3.82	3.59	3.29	3.09	2.66	2.36	2.25
27	7.68	5.49	4.60	4.11	3.78	3.56	3.26	3.06	2.63	2.33	2.22
28	7.64	5.45	4.57	4.07	3.75	3.53	3.23	3.03	2.60	2.30	2.19
29	7.60	5.42	4.54	4.04	3.73	3.50	3.20	3.00	2.57	2.27	2.16
30	7.56	5.39	4.51	4.02	3.70	3.47	3.17	2.98	2.55	2.25	2.13
40	7.31	5.18	4.31	3.83	3.51	3.29	2.99	2.80	2.37	2.06	1.94
50	7.17	5.06	4.20	3.72	3.41	3.19	2.89	2.70	2.27	1.95	1.82
60	7.08	4.98	4.13	3.65	3.34	3.12	2.82	2.63	2.20	1.88	1.75
100	6.90	4.82	3.98	3.51	3.21	2.99	2.69	2.50	2.07	1.74	1.60
200	6.76	4.71	3.88	3.41	3.11	2.89	2.60	2.41	1.97	1.63	1.48
1000	6.66	4.63	3.80	3.34	3.04	2.82	2.53	2.34	1.90	1.54	1.38

^aCalculated by MINITAB.

Table B12 Upper Percentage Points of the Studentized Range. $q_p = \frac{\bar{X}_{\max} - \bar{X}_{\min}}{S_x}$

Error df	$p = \text{number of treatment means}$															Error df						
	α	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16	17	18	19	20	α
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	.05	5
	.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	.01	
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	.05	6
	.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	.01	
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	.05	7
	.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	.01	
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	6.48	6.57	6.65	6.73	6.80	6.87	.05	8
	.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	8.55	8.66	8.76	8.85	8.94	9.03	.01	
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	.05	9
	.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	.01	
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	.05	10
	.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	.01	
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	.05	11
	.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	.01	
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	.05	12
	.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	.01	
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	.05	13
	.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	.01	
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	5.83	5.92	5.97	6.03	.05	14
	.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	.01	
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	.05	15
	.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	.01	

(continued)

Table B12 Continued

Error df	α	$p = \text{number of treatment means}$																		Error df		
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19		20	α
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	.05	16
	.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	.01	
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	5.79	5.84	.05	17
	.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	.01	
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	.05	18
	.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	.01	
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	.05	19
	.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	.01	
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	.05	20
	.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	.01	
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	.05	24
	.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	.01	
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	.05	30
	.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	.01	
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	.05	40
	.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	.01	
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	.05	60
	.01	3.76	4.28	4.60	4.82	4.99	5.13	5.25	5.36	5.45	5.53	5.60	5.67	5.73	5.79	5.84	5.89	5.93	5.98	6.02	.01	
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	.05	120
	.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	5.58	5.61	5.66	5.71	5.75	5.79	5.83	.01	
∞	.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	.05	∞
	.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	.01	

Source: This table is extracted from Table 29, "Biometrika Tables for Statisticians," 3rd Ed. Vol. I, London, Bentley House, 1966, with the permission of the Biometrika Trustees. 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 B13 t for Comparisons Between p Treatment Means and a Control for a Joint Confidence Coefficient of $p = 0.95$ and $p = 0.99$

Error df	P	One-Sided Comparisons										Two-Sided Comparisons									
		$p = \text{number of treatment means, excluding control}$										$p = \text{number of treatment means, excluding control}$									
		1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
5	.95	2.02	2.44	2.68	2.85	2.98	3.08	3.16	3.24	3.30	.95	2.57	3.03	3.39	3.66	3.88	4.06	4.22	4.36	4.49	
	.99	3.37	3.90	4.21	4.43	4.60	4.73	4.85	4.94	5.03	.99	4.03	4.63	5.09	5.44	5.73	5.97	6.18	6.36	6.53	
6	.95	1.94	2.34	2.56	2.71	2.83	2.92	3.00	3.07	3.12	.95	2.45	2.86	3.18	3.41	3.60	3.75	3.88	4.00	4.11	
	.99	3.14	3.61	3.88	4.07	4.21	4.33	4.43	4.51	4.59	.99	3.71	4.22	4.60	4.88	5.11	5.30	5.47	5.61	5.74	
7	.95	1.89	2.27	2.48	2.62	2.73	2.82	2.89	2.95	3.01	.95	2.36	2.75	3.04	3.24	3.41	3.54	3.66	3.76	3.86	
	.99	3.00	3.42	3.66	3.83	3.96	4.07	4.15	4.23	4.30	.99	3.50	3.95	4.28	4.52	4.71	4.87	5.01	5.13	5.24	
8	.95	1.86	2.22	2.42	2.55	2.66	2.74	2.81	2.87	2.92	.95	2.31	2.67	2.94	3.13	3.28	3.40	3.51	3.60	3.68	
	.99	2.90	3.29	3.51	3.67	3.79	3.88	3.96	4.03	4.09	.99	3.36	3.77	4.06	4.27	4.44	4.58	4.70	4.81	4.90	
9	.95	1.83	2.18	2.37	2.50	2.60	2.68	2.75	2.81	2.86	.95	2.26	2.61	2.86	3.04	3.18	3.29	3.39	3.48	3.55	
	.99	2.82	3.19	3.40	3.55	3.66	3.75	3.82	3.89	3.94	.99	3.25	3.63	3.90	4.09	4.24	4.37	4.48	4.57	4.65	
10	.95	1.81	2.15	2.34	2.47	2.56	2.64	2.70	2.76	2.81	.95	2.23	2.57	2.81	2.97	3.11	3.21	3.31	3.39	3.46	
	.99	2.76	3.11	3.31	3.45	3.56	3.64	3.71	3.78	3.83	.99	3.17	3.53	3.78	3.95	4.10	4.21	4.31	4.40	4.47	
11	.95	1.80	2.13	2.31	2.44	2.53	2.60	2.67	2.72	2.77	.95	2.20	2.53	2.76	2.92	3.05	3.15	3.24	3.31	3.38	
	.99	2.72	3.06	3.25	3.38	3.48	3.56	3.63	3.69	3.74	.99	3.11	3.45	3.68	3.85	3.98	4.09	4.18	4.26	4.33	
12	.95	1.78	2.11	2.29	2.41	2.50	2.58	2.64	2.69	2.74	.95	2.18	2.50	2.72	2.88	3.00	3.10	3.18	3.25	3.32	
	.99	2.68	3.01	3.19	3.32	3.42	3.50	3.56	3.62	3.67	.99	3.05	3.39	3.61	3.76	3.89	3.99	4.08	4.15	4.22	
13	.95	1.77	2.09	2.27	2.39	2.48	2.55	2.61	2.66	2.71	.95	2.16	2.48	2.69	2.84	2.96	3.06	3.14	3.21	3.27	
	.99	2.65	2.97	3.15	3.27	3.37	3.44	3.51	3.56	3.61	.99	3.01	3.33	3.54	3.69	3.81	3.91	3.99	4.06	4.13	
14	.95	1.76	2.08	2.25	2.37	2.46	2.53	2.59	2.64	2.69	.95	2.14	2.46	2.67	2.81	2.93	3.02	3.10	3.17	3.23	
	.99	2.62	2.94	3.11	3.23	3.32	3.40	3.46	3.51	3.56	.99	2.98	3.29	3.49	3.64	3.75	3.84	3.92	3.99	4.05	

(continued)

Table B13 Continued

Error df	One-Sided Comparisons										Two-Sided Comparisons									
	$p = \text{number of treatment means, excluding control}$										$p = \text{number of treatment means, excluding control}$									
	1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9	
15	.95	1.75	2.07	2.24	2.44	2.51	2.57	2.62	2.67	.95	2.13	2.44	2.64	2.79	2.90	2.99	3.07	3.13	3.19	
	.99	2.60	2.91	3.08	3.29	3.36	3.42	3.47	3.52	.99	2.95	3.25	3.45	3.59	3.70	3.79	3.86	3.93	3.99	
16	.95	1.75	2.06	2.23	2.34	2.50	2.56	2.61	2.65	.95	2.12	2.42	2.63	2.77	2.88	2.96	3.04	3.10	3.16	
	.99	2.58	2.88	3.05	3.17	3.26	3.33	3.39	3.44	.99	2.92	3.22	3.41	3.55	3.65	3.74	3.82	3.88	3.93	
17	.95	1.74	2.05	2.22	2.33	2.42	2.49	2.54	2.59	.95	2.11	2.41	2.61	2.75	2.85	2.94	3.01	3.08	3.13	
	.99	2.57	2.86	3.03	3.14	3.23	3.30	3.36	3.41	.99	2.90	3.19	3.38	3.51	3.62	3.70	3.77	3.83	3.89	
18	.95	1.73	2.04	2.21	2.32	2.41	2.48	2.53	2.58	.95	2.10	2.40	2.59	2.73	2.84	2.92	2.99	3.05	3.11	
	.99	2.55	2.84	3.01	3.12	3.21	3.27	3.33	3.38	.99	2.88	3.17	3.35	3.48	3.58	3.67	3.74	3.80	3.85	
19	.95	1.73	2.03	2.20	2.31	2.40	2.47	2.52	2.57	.95	2.09	2.39	2.58	2.72	2.82	2.90	2.97	3.04	3.09	
	.99	2.54	2.83	2.99	3.10	3.18	3.25	3.31	3.36	.99	2.86	3.15	3.33	3.46	3.55	3.64	3.70	3.76	3.81	
20	.95	1.72	2.03	2.19	2.30	2.39	2.46	2.51	2.56	.95	2.09	2.38	2.57	2.70	2.81	2.89	2.96	3.02	3.07	
	.99	2.53	2.81	2.97	3.08	3.17	3.23	3.29	3.34	.99	2.85	3.13	3.31	3.43	3.53	3.61	3.67	3.73	3.78	
24	.95	1.71	2.01	2.17	2.28	2.36	2.43	2.48	2.53	.95	2.06	2.35	2.53	2.66	2.76	2.84	2.91	2.96	3.01	
	.99	2.49	2.77	2.92	3.03	3.11	3.17	3.22	3.27	.99	2.80	3.07	3.24	3.36	3.45	3.52	3.58	3.64	3.69	
30	.95	1.70	1.99	2.15	2.25	2.33	2.40	2.45	2.50	.95	2.04	2.32	2.50	2.62	2.72	2.79	2.86	2.91	2.96	
	.99	2.46	2.72	2.87	2.97	3.05	3.11	3.16	3.21	.99	2.75	3.01	3.17	3.28	3.37	3.44	3.50	3.55	3.59	
40	.95	1.68	1.97	2.13	2.23	2.31	2.37	2.42	2.47	.95	2.02	2.29	2.47	2.58	2.67	2.75	2.81	2.86	2.90	
	.99	2.42	2.68	2.82	2.92	2.99	3.05	3.10	3.14	.99	2.70	2.95	3.10	3.21	3.29	3.36	3.41	3.46	3.50	
60	.95	1.67	1.95	2.10	2.21	2.28	2.35	2.39	2.44	.95	2.00	2.27	2.43	2.55	2.63	2.70	2.76	2.81	2.85	
	.99	2.39	2.64	2.78	2.87	2.94	3.00	3.04	3.08	.99	2.66	2.90	3.04	3.14	3.22	3.28	3.33	3.38	3.42	
120	.95	1.66	1.93	2.08	2.18	2.26	2.32	2.37	2.41	.95	1.98	2.24	2.40	2.51	2.59	2.66	2.71	2.76	2.80	
	.99	2.36	2.60	2.73	2.82	2.89	2.94	2.99	3.03	.99	2.62	2.84	2.98	3.08	3.15	3.21	3.25	3.30	3.33	
∞	.95	1.64	1.92	2.06	2.16	2.23	2.29	2.34	2.38	.95	1.96	2.21	2.37	2.47	2.55	2.62	2.67	2.71	2.75	
	.99	2.33	2.56	2.68	2.77	2.84	2.89	2.93	2.97	.99	2.58	2.79	2.92	3.01	3.08	3.14	3.18	3.22	3.25	

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