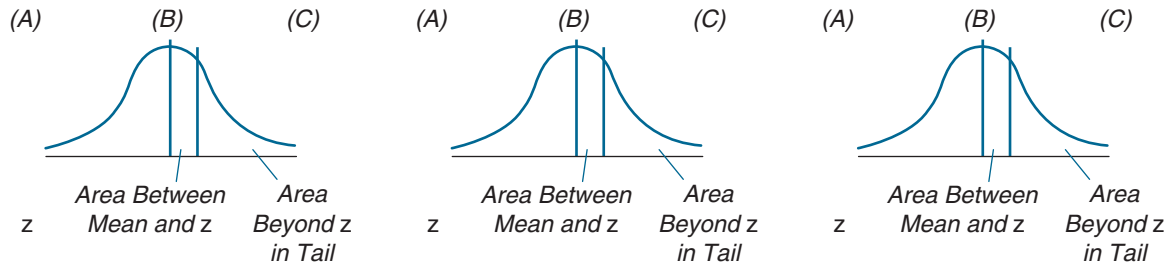


APPENDIX B

TABLE B.1 Proportions of Area under the Standard Normal Curve: The Unit Normal Table

Column (A) lists z-score values. Column (B) lists proportion of the area between the mean and the z-score value. Column (C) lists the proportion of the area beyond the z-score in the tail of the distribution. (Note: Because the normal distribution is symmetrical, areas for negative z-scores are the same as those for positive z-scores.)



(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail
0.00	.0000	.5000	0.15	.0596	.4404	0.30	.1179	.3821
0.01	.0040	.4960	0.16	.0636	.4364	0.31	.1217	.3783
0.02	.0080	.4920	0.17	.0675	.4325	0.32	.1255	.3745
0.03	.0120	.4880	0.18	.0714	.4286	0.33	.1293	.3707
0.04	.0160	.4840	0.19	.0753	.4247	0.34	.1331	.3669
0.05	.0199	.4801	0.20	.0793	.4207	0.35	.1368	.3632
0.06	.0239	.4761	0.21	.0832	.4168	0.36	.1406	.3594
0.07	.0279	.4721	0.22	.0871	.4129	0.37	.1443	.3557
0.08	.0319	.4681	0.23	.0910	.4090	0.38	.1480	.3520
0.09	.0359	.4641	0.24	.0948	.4052	0.39	.1517	.3483
0.10	.0398	.4602	0.25	.0987	.4013	0.40	.1554	.3446
0.11	.0438	.4562	0.26	.1026	.3974	0.41	.1591	.3409
0.12	.0478	.4522	0.27	.1064	.3936	0.42	.1628	.3372
0.13	.0517	.4483	0.28	.1103	.3897	0.43	.1664	.3336
0.14	.0557	.4443	0.29	.1141	.3859	0.44	.1700	.3300

(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail
0.45	.1736	.3264	0.78	.2823	.2177	1.11	.3665	.1335
0.46	.1772	.3228	0.79	.2852	.2148	1.12	.3686	.1314
0.47	.1808	.3192	0.80	.2881	.2119	1.13	.3708	.1292
0.48	.1844	.3156	0.81	.2910	.2090	1.14	.3729	.1271
0.49	.1879	.3121	0.82	.2939	.2061	1.15	.3749	.1251
0.50	.1915	.3085	0.83	.2967	.2033	1.16	.3770	.1230
0.51	.1950	.3050	0.84	.2995	.2005	1.17	.3790	.1210
0.52	.1985	.3015	0.85	.3023	.1977	1.18	.3810	.1190
0.53	.2019	.2981	0.86	.3051	.1949	1.19	.3830	.1170
0.54	.2054	.2946	0.87	.3078	.1922	1.20	.3849	.1151
0.55	.2088	.2912	0.88	.3106	.1894	1.21	.3869	.1131
0.56	.2123	.2877	0.89	.3133	.1867	1.22	.3888	.1112
0.57	.2157	.2843	0.90	.3159	.1841	1.23	.3907	.1093
0.58	.2190	.2810	0.91	.3186	.1814	1.24	.3925	.1075
0.59	.2224	.2776	0.92	.3212	.1788	1.25	.3944	.1056
0.60	.2257	.2743	0.93	.3238	.1762	1.26	.3962	.1038
0.61	.2391	.2709	0.94	.3264	.1736	1.27	.3980	.1020
0.62	.2324	.2676	0.95	.3289	.1711	1.28	.3997	.1003
0.63	.2357	.2643	0.96	.3315	.1685	1.29	.4015	.0985
0.64	.2389	.2611	0.97	.3340	.1660	1.30	.4032	.0968
0.65	.2422	.2578	0.98	.3365	.1635	1.31	.4049	.0951
0.66	.2454	.2546	0.99	.3389	.1611	1.32	.4066	.0934
0.67	.2486	.2514	1.00	.3413	.1587	1.33	.4082	.0918
0.68	.2517	.2483	1.01	.3438	.1562	1.34	.4099	.0901
0.69	.2549	.2451	1.02	.3461	.1539	1.35	.4115	.0885
0.70	.2580	.2420	1.03	.3485	.1515	1.36	.4131	.0869
0.71	.2611	.2389	1.04	.3508	.1492	1.37	.4147	.0853
0.72	.2642	.2358	1.05	.3531	.1469	1.38	.4162	.0838
0.73	.2673	.2327	1.06	.3554	.1446	1.39	.4177	.0823
0.74	.2704	.2296	1.07	.3577	.1423	1.40	.4192	.0808
0.75	.2734	.2266	1.08	.3599	.1401	1.41	.4207	.0793
0.76	.2764	.2236	1.09	.3621	.1379	1.42	.4222	.0778
0.77	.2794	.2206	1.10	.3643	.1357	1.43	.4236	.0764

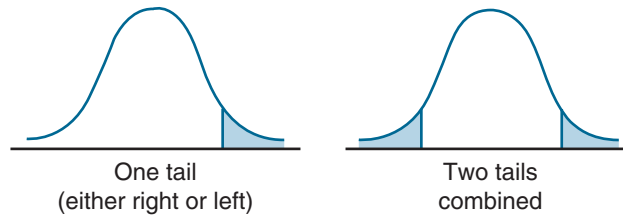
(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail
1.44	.4251	.0749	1.77	.4616	.0384	2.10	.4821	.0179
1.45	.4265	.0735	1.78	.4625	.0375	2.11	.4826	.0174
1.46	.4279	.0721	1.79	.4633	.0367	2.12	.4830	.0170
1.47	.4292	.0708	1.80	.4641	.0359	2.13	.4834	.0166
1.48	.4306	.0694	1.81	.4649	.0351	2.14	.4838	.0162
1.49	.4319	.0681	1.82	.4656	.0344	2.15	.4842	.0158
1.50	.4332	.0668	1.83	.4664	.0336	2.16	.4846	.0154
1.51	.4345	.0655	1.84	.4671	.0329	2.17	.4850	.0150
1.52	.4357	.0643	1.85	.4678	.0322	2.18	.4854	.0146
1.53	.4370	.0630	1.86	.4686	.0314	2.19	.4857	.0143
1.54	.4382	.0618	1.87	.4693	.0307	2.20	.4861	.0139
1.55	.4394	.0606	1.88	.4699	.0301	2.21	.4864	.0136
1.56	.4406	.0594	1.89	.4706	.0294	2.22	.4868	.0132
1.57	.4418	.0582	1.90	.4713	.0287	2.23	.4871	.0129
1.58	.4429	.0571	1.91	.4719	.0281	2.24	.4875	.0125
1.59	.4441	.0559	1.92	.4726	.0274	2.25	.4878	.0122
1.60	.4452	.0548	1.93	.4732	.0268	2.26	.4881	.0119
1.61	.4463	.0537	1.94	.4738	.0262	2.27	.4884	.0116
1.62	.4474	.0526	1.95	.4744	.0256	2.28	.4887	.0113
1.63	.4484	.0516	1.96	.4750	.0250	2.29	.4890	.0110
1.64	.4495	.0505	1.97	.4756	.0244	2.30	.4893	.0107
1.65	.4505	.0495	1.98	.4761	.0239	2.31	.4896	.0104
1.66	.4515	.0485	1.99	.4767	.0233	2.32	.4898	.0102
1.67	.4525	.0475	2.00	.4772	.0228	2.33	.4901	.0099
1.68	.4535	.0465	2.01	.4778	.0222	2.34	.4904	.0096
1.69	.4545	.0455	2.02	.4783	.0217	2.35	.4906	.0094
1.70	.4554	.0446	2.03	.4788	.0212	2.36	.4909	.0091
1.71	.4564	.0436	2.04	.4793	.0207	2.37	.4911	.0089
1.72	.4573	.0427	2.05	.4798	.0202	2.38	.4913	.0087
1.73	.4582	.0418	2.06	.4803	.0197	2.39	.4916	.0084
1.74	.4591	.0409	2.07	.4808	.0192	2.40	.4918	.0082
1.75	.4599	.0401	2.08	.4812	.0188	2.41	.4920	.0080
1.76	.4608	.0392	2.09	.4817	.0183	2.42	.4922	.0078

(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail	(A) z	(B) Area Between Mean and z	(C) Area Beyond z in Tail
2.43	.4925	.0075	2.74	.4969	.0031	3.05	.4989	.0011
2.44	.4927	.0073	2.75	.4970	.0030	3.06	.4989	.0011
2.45	.4929	.0071	2.76	.4971	.0029	3.07	.4989	.0011
2.46	.4931	.0069	2.77	.4972	.0028	3.08	.4990	.0010
2.47	.4932	.0068	2.78	.4973	.0027	3.09	.4990	.0010
2.48	.4934	.0066	2.79	.4974	.0026	3.10	.4990	.0010
2.49	.4936	.0064	2.80	.4974	.0026	3.11	.4991	.0009
2.50	.4938	.0062	2.81	.4975	.0025	3.12	.4991	.0009
2.51	.4940	.0060	2.82	.4976	.0024	3.13	.4991	.0009
2.52	.4941	.0059	2.83	.4977	.0023	3.14	.4992	.0008
2.53	.4943	.0057	2.84	.4977	.0023	3.15	.4992	.0008
2.54	.4945	.0055	2.85	.4978	.0022	3.16	.4992	.0008
2.55	.4946	.0054	2.86	.4979	.0021	3.17	.4992	.0008
2.56	.4948	.0052	2.87	.4979	.0021	3.18	.4993	.0007
2.57	.4949	.0051	2.88	.4980	.0020	3.19	.4993	.0007
2.58	.4951	.0049	2.89	.4981	.0019	3.20	.4993	.0007
2.59	.4952	.0048	2.90	.4981	.0019	3.21	.4993	.0007
2.60	.4953	.0047	2.91	.4982	.0018	3.22	.4994	.0006
2.61	.4955	.0045	2.92	.4982	.0018	3.23	.4994	.0006
2.62	.4956	.0044	2.93	.4983	.0017	3.24	.4994	.0006
2.63	.4957	.0043	2.94	.4984	.0016	3.25	.4994	.0006
2.64	.4959	.0041	2.95	.4984	.0016	3.30	.4995	.0005
2.65	.4960	.0040	2.96	.4985	.0015	3.35	.4996	.0004
2.66	.4961	.0039	2.97	.4985	.0015	3.40	.4997	.0003
2.67	.4962	.0038	2.98	.4986	.0014	3.45	.4997	.0003
2.68	.4963	.0037	2.99	.4986	.0014	3.50	.4998	.0002
2.69	.4964	.0036	3.00	.4987	.0013	3.60	.4998	.0002
2.70	.4965	.0035	3.01	.4987	.0013	3.70	.4999	.0001
2.71	.4966	.0034	3.02	.4987	.0013	3.80	.4999	.0001
2.72	.4967	.0033	3.03	.4988	.0012	3.90	.49995	.00005
2.73	.4968	.0032	3.04	.4988	.0012	4.00	.49997	.00003

Source: Based on J. E. Freund, *Modern Elementary Statistics* (11th edition). Pearson Prentice Hall, 2004.

TABLE B.2 THE *t*-DISTRIBUTION

Table entries are values of *t*-corresponding to proportions in one tail or in two tails combined.



<i>df</i>	Proportion in One Tail					
	0.25	0.10	0.05	0.025	0.01	0.005
	Proportion in Two Tails Combined					
	0.50	0.20	0.10	0.05	0.02	0.01
1	1.000	3.078	6.314	12.706	31.821	63.657
2	0.816	1.886	2.920	4.303	6.965	9.925
3	0.765	1.638	2.353	3.182	4.541	5.841
4	0.741	1.533	2.132	2.776	3.747	4.604
5	0.727	1.476	2.015	2.571	3.365	4.032
6	0.718	1.440	1.943	2.447	3.143	3.707
7	0.711	1.415	1.895	2.365	2.998	3.499
8	0.706	1.397	1.860	2.306	2.896	3.355
9	0.703	1.383	1.833	2.282	2.821	3.250
10	0.700	1.372	1.812	2.228	2.764	3.169
11	0.697	1.363	1.796	2.201	2.718	3.106
12	0.695	1.356	1.782	2.179	2.681	3.055
13	0.694	1.350	1.771	2.160	2.650	3.012
14	0.692	1.345	1.761	2.145	2.624	2.977
15	0.691	1.341	1.753	2.131	2.602	2.947
16	0.690	1.337	1.746	2.120	2.583	2.921
17	0.689	1.333	1.740	2.110	2.567	2.898
18	0.688	1.330	1.734	2.101	2.552	2.878
19	0.688	1.328	1.729	2.093	2.539	2.861
20	0.687	1.325	1.725	2.086	2.528	2.845
21	0.686	1.323	1.721	2.080	2.518	2.831
22	0.686	1.321	1.717	2.074	2.508	2.819
23	0.685	1.319	1.714	2.069	2.500	2.807
24	0.685	1.318	1.711	2.064	2.492	2.797
25	0.684	1.316	1.708	2.060	2.485	2.787
26	0.684	1.315	1.706	2.056	2.479	2.779
27	0.684	1.314	1.703	2.052	2.473	2.771
28	0.683	1.313	1.701	2.048	2.467	2.763
29	0.683	1.311	1.699	2.045	2.462	2.756
30	0.683	1.310	1.697	2.042	2.457	2.750
40	0.681	1.303	1.684	2.021	2.423	2.704
60	0.679	1.296	1.671	2.000	2.390	2.660
120	0.677	1.289	1.658	1.980	2.358	2.617
∞	0.674	1.282	1.645	1.960	2.326	2.576

Source: Table III of R.A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, 6th ed. London: Longman Group Ltd., 1974 (previously published by Oliver and Boyd Ltd., Edinburgh). Adapted and reprinted with permission of the Addison Wesley Longman.

TABLE B.3 Table entries indicate critical values for the F -distribution.

Critical values at a .05 level of significance are given in lightface type.

Critical values at a .01 level of significance are given in boldface type.

		Degrees of Freedom Numerator											
		1	2	3	4	5	6	7	8	9	10	20	∞
Degrees of Freedom Denominator	1	161 4052	200 5000	216 5403	225 5625	230 5764	234 5859	237 5928	239 5928	241 6023	242 6056	248 6209	254 6366
	2	18.51 98.49	19.00 99.00	19.16 99.17	19.25 99.25	19.30 99.30	19.33 99.33	19.36 99.34	19.37 99.36	19.38 99.38	19.39 99.40	19.44 99.45	19.5 99.5
	3	10.13 34.12	9.55 30.92	9.28 29.46	9.12 28.71	9.01 28.24	8.94 27.91	8.88 27.67	8.84 27.49	8.81 27.34	8.78 27.23	8.66 26.69	8.5 26.1
	4	7.71 21.20	6.94 18.00	6.59 16.69	6.39 15.98	6.26 15.52	6.16 15.21	6.09 14.98	6.04 14.80	6.00 14.66	5.96 14.54	5.80 14.02	5.6 13.5
	5	6.61 16.26	5.79 13.27	5.41 12.06	5.19 11.39	5.05 10.97	4.95 10.67	4.88 10.45	4.82 10.27	4.78 10.15	4.74 10.05	4.56 9.55	4.37 9.02
	6	5.99 13.74	5.14 10.92	4.76 9.78	4.53 9.15	4.39 8.75	4.28 8.47	4.21 8.26	4.15 8.10	4.10 7.98	4.06 7.87	3.87 7.39	3.67 6.88
	7	5.59 13.74	4.74 9.55	4.35 8.45	4.12 7.85	3.97 7.46	3.87 7.19	3.79 7.00	3.73 6.84	3.68 6.71	3.63 6.62	3.44 6.15	3.23 5.65
	8	5.32 11.26	4.46 8.65	4.07 7.59	3.84 7.01	3.69 6.63	3.58 6.37	3.50 6.19	3.44 6.03	3.39 5.91	3.34 5.82	3.15 5.36	2.93 4.86
	9	5.12 10.56	4.26 8.02	3.86 6.99	3.63 6.42	3.48 6.06	3.37 5.80	3.29 5.62	3.23 5.47	3.18 5.35	3.13 5.26	2.93 4.80	2.71 4.31
	10	4.96 10.04	4.10 7.56	3.71 6.55	3.48 5.99	3.33 5.64	3.22 5.39	3.14 5.21	3.07 5.06	3.02 4.95	2.97 4.85	2.77 4.41	2.54 3.91
	11	4.84 9.65	3.98 7.20	3.59 6.22	3.36 5.67	3.20 5.32	3.09 5.07	3.01 4.88	2.95 4.74	2.90 4.63	2.86 4.54	2.65 4.10	2.40 3.60
	12	4.75 9.33	3.89 6.93	3.49 5.95	3.26 5.41	3.11 5.06	3.00 4.82	2.92 4.65	2.85 4.50	2.80 4.39	2.76 4.30	2.54 3.86	2.30 3.36
	13	4.67 9.07	3.80 6.70	3.41 5.74	3.18 5.20	3.02 4.86	2.92 4.62	2.84 4.44	2.77 4.30	2.72 4.19	2.67 4.10	2.46 3.67	2.21 3.17
	14	4.60 8.86	3.74 6.51	3.34 5.56	3.11 5.03	2.96 4.69	2.85 4.46	2.77 4.28	2.70 4.14	2.65 4.03	2.60 3.94	2.39 3.51	2.13 3.00
	15	4.54 8.68	3.68 6.36	3.29 5.42	3.06 4.89	2.90 4.56	2.79 4.32	2.70 4.14	2.64 4.00	2.59 3.89	2.55 3.80	2.33 3.36	2.07 2.87

		Degrees of Freedom Numerator											
		1	2	3	4	5	6	7	8	9	10	20	∞
Degrees of Freedom Denominator	16	4.49 8.53	3.63 6.23	3.24 5.29	3.01 4.77	2.85 4.44	2.74 4.20	2.66 4.03	2.59 3.89	2.54 3.78	2.49 3.69	2.28 3.25	2.01 2.75
	17	4.45 8.40	3.59 6.11	3.20 5.18	2.96 4.67	2.81 4.34	2.70 4.10	2.62 3.93	2.55 3.79	2.50 3.68	2.45 3.59	2.23 3.16	1.96 2.65
	18	4.41 8.28	3.55 6.01	3.16 5.09	2.93 4.58	2.77 4.25	2.66 4.01	2.58 3.85	2.51 3.71	2.46 3.60	2.41 3.51	2.19 3.07	1.92 2.57
	19	4.38 8.18	3.52 5.93	3.13 5.01	2.90 4.50	2.74 4.17	2.63 3.94	2.55 3.77	2.48 3.63	2.43 3.52	2.38 3.43	2.15 3.00	1.88 2.49
	20	4.35 8.10	3.49 5.85	3.10 4.94	2.87 4.43	2.71 4.10	2.60 3.87	2.52 3.71	2.45 3.56	2.40 3.45	2.35 3.37	2.12 2.94	1.84 2.42
	21	4.32 8.02	3.47 5.78	3.07 4.87	2.84 4.37	2.68 4.04	2.57 3.81	2.49 3.65	2.42 3.51	2.37 3.40	2.32 3.31	2.09 2.88	1.81 2.36
	22	4.30 7.94	3.44 5.72	3.05 4.82	2.82 4.31	2.66 3.99	2.55 3.76	2.47 3.59	2.40 3.45	2.35 3.35	2.30 3.26	2.07 2.83	1.78 2.31
	23	4.28 7.88	3.42 5.66	3.03 4.76	2.80 4.26	2.64 3.94	2.53 3.71	2.45 3.54	2.38 3.41	2.32 3.30	2.28 3.21	2.04 2.78	1.76 2.26
	24	4.26 7.82	3.40 5.61	3.01 4.72	2.78 4.22	2.62 3.90	2.51 3.67	2.43 3.50	2.36 3.36	2.30 3.25	2.26 3.17	2.02 2.74	1.73 2.21
	25	4.24 7.77	3.38 5.57	2.99 4.68	2.76 4.18	2.60 3.86	2.49 3.63	2.41 3.46	2.34 3.32	2.28 3.21	2.24 3.13	2.00 2.70	1.71 2.17
	26	4.22 7.72	3.37 5.53	2.98 4.64	2.74 4.14	2.59 3.82	2.47 3.59	2.39 3.42	2.32 3.29	2.27 3.17	2.22 3.09	1.99 2.66	1.69 2.13
	27	4.21 7.68	3.35 5.49	2.96 4.60	2.73 4.11	2.57 3.79	2.46 3.56	2.37 3.39	2.30 3.26	2.25 3.14	2.20 3.06	1.97 2.63	1.67 2.10
	28	4.20 7.64	3.34 5.45	2.95 4.57	2.71 4.07	2.56 3.76	2.44 3.53	2.36 3.36	2.29 3.23	2.24 3.11	2.19 3.03	1.96 2.60	1.65 2.07
	29	4.18 7.60	3.33 5.42	2.93 4.54	2.70 4.04	2.54 3.73	2.43 3.50	2.35 3.33	2.28 3.20	2.22 3.08	2.18 3.00	1.94 2.57	1.63 2.04
	30	4.17 7.56	3.32 5.39	2.92 4.51	2.69 4.02	2.53 3.70	2.42 3.47	2.34 3.30	2.27 3.17	2.21 3.06	2.16 2.98	1.93 2.55	1.61 2.01
	31	4.16 7.53	3.30 5.36	2.91 4.48	2.68 3.99	2.52 3.67	2.41 3.45	2.32 3.28	2.25 3.15	2.20 3.04	2.15 2.96	1.92 2.53	1.60 1.89
32	4.15 7.50	3.29 5.34	2.90 4.46	2.67 3.97	2.51 3.65	2.40 3.43	2.31 3.26	2.24 3.13	2.19 3.02	2.14 2.93	1.91 2.51	1.59 1.88	

		Degrees of Freedom Numerator											
		1	2	3	4	5	6	7	8	9	10	20	∞
Degrees of Freedom Denominator	33	4.14 7.47	3.28 5.31	2.89 4.44	2.66 3.95	2.50 3.63	2.39 3.41	2.30 3.24	2.23 3.11	2.18 3.00	2.13 2.91	1.90 2.49	1.58 1.87
	34	4.13 7.44	3.28 5.29	2.88 4.42	2.65 3.93	2.49 3.61	2.38 3.39	2.29 3.22	2.23 3.09	2.17 2.98	2.12 2.89	1.89 2.47	1.57 1.86
	35	4.12 7.42	3.27 5.27	2.87 4.40	2.64 3.91	2.49 3.59	2.37 3.37	2.29 3.20	2.22 3.07	2.16 2.96	2.11 2.88	1.88 2.45	1.56 1.85
	36	4.11 7.40	3.26 5.25	2.87 4.38	2.63 3.89	2.48 3.57	2.36 3.35	2.28 3.18	2.21 3.05	2.15 2.95	2.11 2.86	1.87 2.43	1.55 1.84
	37	4.11 7.37	3.25 5.23	2.86 4.36	2.63 3.87	2.47 3.56	2.36 3.33	2.27 3.17	2.20 3.04	2.14 2.93	2.10 2.84	1.86 2.42	1.54 1.83
	38	4.10 7.35	3.24 5.21	2.85 4.34	2.62 3.86	2.46 3.54	2.35 3.32	2.26 3.15	2.19 3.02	2.14 2.92	2.09 2.83	1.85 2.40	1.53 1.82
	39	4.09 7.33	3.24 5.19	2.85 4.33	2.61 3.84	2.46 3.53	2.34 3.30	2.26 3.14	2.19 3.01	2.13 2.90	2.08 2.81	1.84 2.39	1.52 1.81
	40	4.08 7.31	3.23 5.18	2.84 4.31	2.61 3.83	2.45 3.51	2.34 3.29	2.25 3.12	2.18 2.99	2.12 2.88	2.07 2.80	1.84 2.37	1.51 1.80
	42	4.07 7.27	3.22 5.15	2.83 4.29	2.59 3.80	2.44 3.49	2.32 3.26	2.24 3.10	2.17 2.96	2.11 2.86	2.06 2.77	1.82 2.35	1.50 1.78
	44	4.06 7.24	3.21 5.12	2.82 4.26	2.58 3.78	2.43 3.46	2.31 3.24	2.23 3.07	2.16 2.94	2.10 2.84	2.05 2.75	1.81 2.32	1.49 1.76
	60	4.00 7.08	3.15 4.98	2.76 4.13	2.53 3.65	2.37 3.34	2.25 3.12	2.17 2.95	2.10 2.82	2.04 2.72	1.99 2.63	1.75 2.20	1.39 1.60
	120	3.92 6.85	3.07 4.79	2.68 3.95	2.45 3.48	2.29 3.17	2.18 2.96	2.09 2.79	2.02 2.66	1.96 2.56	1.91 2.47	1.66 2.03	1.25 1.38
	∞	3.84 6.63	3.00 4.61	2.60 3.78	2.37 3.32	2.21 3.02	2.10 2.80	2.01 2.64	1.94 2.51	1.88 2.41	1.83 2.32	1.57 1.88	1.00 1.00

Source: The entries in this table were computed by the author.

TABLE B.4 The Studentized Range Statistic (q)

The critical values for q correspond to $\alpha = .05$ (lightface type) and $\alpha = .01$ (boldface type)

df_E	Range								
	2	3	4	5	6	7	8	9	10
6	3.46 5.24	4.34 6.32	4.90 7.02	5.30 7.55	5.63 7.98	5.91 8.33	6.13 8.62	6.32 8.87	6.50 9.10
7	3.34 4.95	4.17 5.91	4.68 6.54	5.06 7.00	5.36 7.38	5.60 7.69	5.82 7.94	5.99 8.17	6.15 8.38
8	3.26 4.75	4.05 5.64	4.53 6.21	4.89 6.63	5.17 6.97	5.41 7.26	5.60 7.47	5.78 7.70	5.93 7.89
9	3.20 4.60	3.95 5.43	4.42 5.95	4.76 6.34	5.03 6.67	5.24 6.91	5.43 7.13	5.60 7.33	5.74 7.50
10	3.15 4.48	3.88 5.27	4.33 5.77	4.66 6.14	4.92 6.43	5.12 6.67	5.30 6.89	5.46 7.06	5.60 7.22
11	3.11 4.38	3.82 5.16	4.27 5.63	4.59 5.98	4.83 6.25	5.03 6.48	5.21 6.69	5.36 6.85	5.49 7.01
12	3.08 4.32	3.78 5.05	4.20 5.50	4.51 5.84	4.75 6.10	4.96 6.32	5.12 6.52	5.26 6.67	5.39 6.82
13	3.05 4.26	3.73 4.97	4.15 5.41	4.47 5.74	4.69 5.98	4.88 6.19	5.06 6.39	5.21 6.53	5.33 6.68
14	3.03 4.21	3.70 4.90	4.11 5.33	4.41 5.64	4.64 5.88	4.83 6.10	4.99 6.28	5.13 6.41	5.25 6.56
15	3.01 4.17	3.68 4.84	4.09 5.26	4.38 5.56	4.59 5.80	4.79 6.01	4.95 6.18	5.09 6.31	5.21 6.46
16	2.99 4.13	3.65 4.79	4.05 5.19	4.33 5.50	4.56 5.72	4.74 5.94	4.89 6.10	5.03 6.23	5.15 6.37
17	2.98 4.10	3.63 4.75	4.02 5.15	4.30 5.44	4.52 5.66	4.70 5.86	4.85 6.02	4.99 6.14	5.11 6.28
18	2.97 4.07	3.62 4.71	4.01 5.10	4.29 5.39	4.49 5.60	4.68 5.80	4.84 5.95	4.97 6.08	5.08 6.21
19	2.96 4.05	3.59 4.68	3.98 5.05	4.26 5.35	4.47 5.56	4.65 5.75	4.80 5.91	4.93 6.03	5.04 6.15

df_E	Range								
	2	3	4	5	6	7	8	9	10
20	2.95 4.02	3.58 4.64	3.96 5.02	4.24 5.31	4.45 5.51	4.63 5.71	4.78 5.86	4.91 5.98	5.01 6.09
22	2.94 3.99	3.55 4.59	3.93 4.96	4.20 5.27	4.41 5.44	4.58 5.62	4.72 5.76	4.85 5.87	4.96 6.00
24	2.92 3.96	3.53 4.55	3.91 4.92	4.17 5.17	4.37 5.37	4.54 5.55	4.69 5.70	4.81 5.81	4.92 5.93
26	2.91 3.94	3.52 4.51	3.89 4.87	4.15 5.13	4.36 5.33	4.53 5.49	4.67 5.63	4.79 5.74	4.90 5.86
28	2.90 3.91	3.50 4.48	3.87 4.83	4.12 5.09	4.33 5.28	4.49 5.45	4.63 5.58	4.75 5.69	4.86 5.81
30	2.89 3.89	3.49 4.45	3.85 4.80	4.10 5.05	4.30 5.24	4.47 5.40	0.60 5.54	4.73 5.64	4.84 5.76
40	2.86 3.82	3.45 4.37	3.79 4.70	4.05 4.93	4.23 5.11	4.39 5.26	4.52 5.39	4.65 5.49	4.73 5.60
60	2.83 3.76	3.41 4.28	3.75 4.60	3.98 4.82	4.16 4.99	4.31 5.13	4.44 5.25	4.56 5.36	4.65 5.45
100	2.81 3.72	3.36 4.22	3.70 4.52	3.93 4.74	4.11 4.90	4.26 5.04	4.39 5.15	4.50 5.23	4.59 5.34
∞	2.77 3.64	3.31 4.12	3.63 4.40	3.86 4.60	4.03 4.76	4.17 4.88	4.28 4.99	4.39 5.08	4.47 5.16

Source: The entries in this table were computed by the author.

TABLE B.5 Critical Values for the Pearson Correlation*

*To be significant, the sample correlation, r , must be greater than or equal to the critical value in the table.

$df = n - 2$	Level of Significance for One-Tailed Test			
	.05	.025	.01	.005
	Level of Significance for Two-Tailed Test			
	.10	.05	.02	.01
1	.988	.997	.9995	.99999
2	.900	.950	.980	.990
3	.805	.878	.934	.959
4	.729	.811	.882	.917
5	.669	.754	.833	.874
6	.622	.707	.789	.834
7	.582	.666	.750	.798
8	.549	.632	.716	.765
9	.521	.602	.685	.735
10	.497	.576	.658	.708
11	.476	.553	.634	.684
12	.458	.532	.612	.661
13	.441	.514	.592	.641
14	.426	.497	.574	.623
15	.412	.482	.558	.606
16	.400	.468	.542	.590
17	.389	.456	.528	.575
18	.378	.444	.516	.561
19	.369	.433	.503	.549

$df = n - 2$	Level of Significance for One-Tailed Test			
	.05	.025	.01	.005
	Level of Significance for Two-Tailed Test			
	.10	.05	.02	.01
20	.360	.423	.492	.537
21	.352	.413	.482	.526
22	.344	.404	.472	.515
23	.337	.396	.462	.505
24	.330	.388	.453	.496
25	.323	.381	.445	.487
26	.317	.374	.437	.479
27	.311	.367	.430	.471
28	.306	.361	.423	.463
29	.301	.355	.416	.456
30	.296	.349	.409	.449
35	.275	.325	.381	.418
40	.257	.304	.358	.393
45	.243	.288	.338	.372
50	.231	.273	.322	.354
60	.211	.250	.295	.325
70	.195	.232	.274	.302
80	.183	.217	.256	.283
90	.173	.205	.242	.267
100	.164	.195	.230	.254

Source: Table VI of R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, 6th ed. London: Longman Group Ltd., 1974 (previously published by Oliver and Boyd Ltd., Edinburgh). Adapted and reprinted with permission of the Addison Wesley Longman.

TABLE B.6 Critical Values for the Spearman Correlation*

*To be significant, the sample correlation, r , must be greater than or equal to the critical value in the table.

<i>n</i>	Level of Significance for One-Tailed Test			
	.05	.025	.01	.005
	Level of Significance for Two-Tailed Test			
	.10	.05	.02	.01
4	1.000			
5	0.900	1.000	1.000	
6	0.829	0.886	0.943	1.000
7	0.714	0.786	0.893	0.929
8	0.643	0.738	0.833	0.881
9	0.600	0.700	0.783	0.833
10	0.564	0.648	0.745	0.794
11	0.536	0.618	0.709	0.755
12	0.503	0.587	0.671	0.727
13	0.484	0.560	0.648	0.703
14	0.464	0.538	0.622	0.675
15	0.443	0.521	0.604	0.654
16	0.429	0.503	0.582	0.635
17	0.414	0.485	0.566	0.615
18	0.401	0.472	0.550	0.600
19	0.391	0.460	0.535	0.584
20	0.380	0.447	0.520	0.570
21	0.370	0.435	0.508	0.556
22	0.361	0.425	0.496	0.544
23	0.353	0.415	0.486	0.532
24	0.344	0.406	0.476	0.521
25	0.337	0.398	0.466	0.511
26	0.331	0.390	0.457	0.501
27	0.324	0.382	0.448	0.491
28	0.317	0.375	0.440	0.483
29	0.312	0.368	0.433	0.475
30	0.306	0.362	0.425	0.467
35	0.283	0.335	0.394	0.433
40	0.264	0.313	0.368	0.405
45	0.248	0.294	0.347	0.382
50	0.235	0.279	0.329	0.363
60	0.214	0.255	0.300	0.331
70	0.190	0.235	0.278	0.307
80	0.185	0.220	0.260	0.287
90	0.174	0.207	0.245	0.271
100	0.165	0.197	0.233	0.257

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TABLE B.7 Critical Values of Chi-Square (χ^2)

<i>df</i>	Level of Significance	
	$\alpha = .05$	$\alpha = .01$
1	3.84	6.64
2	5.99	9.21
3	7.81	11.34
4	9.49	13.28
5	11.07	15.09
6	12.59	16.81
7	14.07	18.48
8	15.51	20.09
9	16.92	21.67
10	18.31	23.21
11	19.68	24.72
12	21.03	26.22
13	22.36	27.69
14	23.68	29.14
15	25.00	30.58
16	26.30	32.00
17	27.59	33.41
18	28.87	34.80
19	30.14	36.19
20	31.41	37.47
21	32.67	38.93
22	33.92	40.29
23	35.17	41.64
24	36.42	42.98
25	37.65	44.31
26	38.88	45.64
27	40.11	46.96
28	41.34	48.28
29	42.56	49.59
30	43.77	50.89
40	55.76	63.69
50	67.50	76.15
60	79.08	88.38
70	90.53	100.42

Source: From Table IV of R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, 6th ed. London: Longman Group Ltd., 1974 Reprinted with permission of the Addison Wesley Longman Ltd.

TABLE B.8 Distribution of Binomial Probabilities When $p = 0.50$

x	Sample Size (n)																			
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
0	0.250	0.125	0.062	0.032	0.016	0.008	0.004	0.002	0.001	...	...	...	...	...	...	...	...	...	...	...
1	0.500	0.375	0.250	0.156	0.094	0.055	0.031	0.018	0.010	0.005	0.003	0.002	0.001	...	...	...	...	...	...	...
2	0.250	0.375	0.376	0.312	0.234	0.164	0.109	0.070	0.044	0.027	0.016	0.010	0.006	0.003	0.002	0.001	0.001	...	...	...
3		0.125	0.250	0.312	0.312	0.273	0.219	0.164	0.117	0.081	0.054	0.035	0.022	0.014	0.008	0.006	0.003	0.002	0.001	0.001
4			0.062	0.156	0.234	0.273	0.274	0.246	0.205	0.161	0.121	0.087	0.061	0.042	0.028	0.019	0.012	0.007	0.005	0.005
5				0.032	0.094	0.164	0.219	0.246	0.246	0.226	0.193	0.157	0.122	0.092	0.067	0.047	0.033	0.022	0.015	0.015
6					0.016	0.055	0.109	0.164	0.205	0.226	0.226	0.209	0.183	0.153	0.122	0.094	0.071	0.053	0.037	0.037
7						0.008	0.031	0.070	0.117	0.161	0.193	0.209	0.210	0.196	0.175	0.148	0.121	0.096	0.074	0.074
8							0.004	0.018	0.044	0.081	0.121	0.157	0.183	0.196	0.196	0.185	0.167	0.144	0.120	0.120
9								0.002	0.010	0.027	0.054	0.087	0.122	0.152	0.175	0.185	0.184	0.176	0.160	0.160
10									0.001	0.005	0.016	0.035	0.061	0.092	0.122	0.148	0.167	0.176	0.176	0.176
11										...	0.003	0.010	0.022	0.042	0.067	0.094	0.121	0.144	0.160	0.160
12											...	0.002	0.006	0.014	0.028	0.047	0.071	0.096	0.120	0.120
13												...	0.001	0.003	0.008	0.019	0.033	0.053	0.074	0.074
14													...	...	0.002	0.006	0.012	0.022	0.037	0.037
15														...	...	0.001	0.003	0.007	0.015	0.015
16															...	...	0.001	0.002	0.005	0.005
17																...	...	...	0.001	0.001
18																	...	...	...	...
19																		...	...	...
20																			...	...

"..." reflects omitted values for probabilities of 0.0005 or less.

Source: The entries in this table were computed by the author.

TABLE B.9 Wilcoxon Signed-Ranks T Critical Values

*For values of T to be significant, T must be equal to or less than the critical value listed in the table for a given level of significance and sample size n . Dashes (--) indicate that a decision is not possible.

n	Level of Significance (Two-Tailed test)		Level of Significance (One-Tailed test)	
	0.05	0.01	0.05	0.01
5	--	--	0	--
6	0	--	2	--
7	2	--	3	0
8	3	0	5	1
9	5	1	8	3
10	8	3	10	5
11	10	5	13	7
12	13	7	17	9
13	17	9	21	12
14	21	12	25	15
15	25	15	30	19
16	29	19	35	23
17	34	23	41	27
18	40	27	47	32
19	46	32	53	37
20	52	37	60	43
21	58	42	67	49
22	65	48	75	55
23	73	54	83	62
24	81	61	91	69
25	89	68	100	76
26	98	75	110	84
27	107	83	119	92
28	116	91	130	101
29	126	100	140	110
30	137	109	151	120

Source: The entries in this table were computed by the author.

TABLE B.10A Critical Values of the Mann-Whitney U for $\alpha = .05^*$

*Critical values are provided for a one-tailed test at $\alpha = .05$ (lightface type) and for a two-tailed test at $\alpha = .05$ (bold-face type). To be significant for any given n_A and n_B , the obtained U must be equal to or less than the critical value in the table. Dashes (-) in the body of the table indicate that no decision is possible at the stated level of significance and values off n_A and n_B .

$n_B \backslash n_A$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0
2	-	-	-	-	0	0	0	1	1	1	1	2	2	2	3	3	3	4	4	4
3	-	-	0	0	1	2	2	3	3	4	5	5	6	7	7	8	9	9	10	11
4	-	-	0	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	18
5	-	0	1	2	4	5	6	8	9	11	12	13	15	16	18	19	20	22	23	25
6	-	0	2	3	5	7	8	10	12	14	16	17	19	21	23	25	26	28	30	32
7	-	0	2	4	6	8	11	13	15	17	19	21	24	26	28	30	33	35	37	39
8	-	1	3	5	8	10	13	15	18	20	23	26	28	31	33	36	39	41	44	47
9	-	1	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54
10	-	1	4	7	11	14	17	20	24	27	31	34	37	41	44	48	51	55	58	62
11	-	1	5	8	12	16	19	23	27	31	34	38	42	46	50	54	57	61	65	69
12	-	2	5	9	13	17	21	26	30	34	38	42	47	51	55	60	64	68	72	77
13	-	2	6	10	15	19	24	28	33	37	42	47	51	56	61	65	70	75	80	84
14	-	2	7	11	16	21	26	31	36	41	46	51	56	61	66	71	77	82	87	92
15	-	3	7	12	18	23	28	33	39	44	50	55	61	66	72	77	83	88	94	100
16	-	3	8	14	19	25	30	36	42	48	54	60	65	71	77	83	89	95	101	107
17	-	3	9	15	20	26	33	39	45	51	57	64	70	77	83	89	96	102	109	115
18	-	4	9	16	22	28	35	41	48	55	61	68	75	82	88	95	102	109	116	123
19	0	4	11	18	25	32	39	47	54	62	69	77	84	92	100	107	115	123	130	138
20	0	4	11	18	25	32	39	47	54	62	69	77	84	92	100	107	115	123	130	138

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TABLE B.10B Critical Values of the Mann-Whitney U For $\alpha = .01^*$

*Critical values are provided for a one-tailed test at $\alpha = .01$ (lightface type) and for a two-tailed test at $\alpha = .01$ (bold-face type). To be significant for any given n_A and n_B , the obtained U must be equal to or less than the critical value in the table. Dashes (-) in the body of the table indicate that no decision is possible at the stated level of significance and values off n_A and n_B .

$n_B \backslash n_A$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	1	1
3	-	-	-	-	-	-	0	0	1	1	1	2	2	2	3	3	4	4	4	5
4	-	-	-	-	0	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10
5	-	-	-	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
6	-	-	-	1	2	3	4	6	7	8	9	11	12	13	15	16	18	19	20	22
7	-	-	0	1	3	4	6	7	9	11	12	14	16	17	19	21	23	24	26	28
8	-	-	0	2	4	6	7	9	11	13	15	17	20	22	24	26	28	30	32	34
9	-	-	1	3	5	7	9	11	14	16	18	21	23	26	28	31	33	36	38	40
10	-	-	1	3	6	8	11	13	16	19	22	24	27	30	33	36	38	41	44	47
11	-	-	1	4	7	9	12	15	18	22	25	28	31	34	37	41	44	47	50	53
12	-	-	2	5	8	11	14	17	21	24	28	31	35	38	42	46	49	53	56	60
13	-	0	2	5	9	12	16	20	23	27	31	35	39	43	47	51	55	59	63	67
14	-	0	2	6	10	13	17	21	24	28	31	35	38	43	47	51	55	59	63	67
15	-	0	3	7	11	15	19	24	28	33	37	42	47	51	56	61	66	70	75	80
16	-	0	3	7	12	16	21	26	31	36	41	46	51	56	61	66	71	76	82	87
17	-	0	4	8	13	18	23	28	33	38	44	49	55	60	66	71	77	82	88	93
18	-	0	4	9	14	19	24	30	36	41	47	53	59	65	70	76	82	88	94	100
19	-	1	4	9	15	20	26	32	38	44	50	56	63	69	75	82	88	94	101	107
20	-	1	5	10	16	22	28	34	40	47	53	60	67	73	80	87	93	100	107	114

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