December 24, 1998, 1:19 p.m.

Appendices

STATISTICAL TABLES

Appendix A1 Random Numbers

This table contains blocks of random digits (see Section 1.5).

71578	81355	39007	60764	19852	87652	50354	22183	14935	09519	97820	86085
64215	70267	38804	00351	10065	27645	68107	21706	75781	04223	51761	05873
85586	70782	16377	09713	63471	93867	73473	22551	55024	09542	41617	83579
40922	52826	63529	38806	91458	67062	26370	30497	94358	69705	42120	88517
21169	11638	93363	00603	12371	39940	73570	56636	13663	47720	99518	97840
97248	78533	10849	86322	17818	95980	48813	92959	01602	62529	35575	24447
91623	07307	41478	61440	80083	73537	13436	99953	20202	99537	54308	78253
26508	84178	71632	65181	03772	61806	48375	16717	02711	56431	15463	48333
67108	16156	99133	67862	13572	23104	30784	06509	86187	41947	74514	85507
46400	89413	74507	49374	85117	99213	49557	98263	39623	38089	57890	71157
55333	97222	96104	65109	72010	50397	50996	63569	62204	40530	97192	73362
03521	10933	34889	13974	22627	89967	17772	37260	62576	01966	70333	12602
62387	33190	73580	15672	83265	94983	45401	59318	17077	13555	21212	89747
12965	44097	55481	22640	91748	57335	31097	24874	00267	84661	87853	61868
35560	83689	02626	32964	38791	02343	56275	25795	42090	54025	98377	70493
38905	93159	25252	29004	54972	73607	14151	57431	26736	88811	59533	33663
72329	44334	70842	93366	73428	80317	57771	45762	58234	73078	38946	36607
38868	89458	21217	89802	14210	84494	86517	25193	59752	42776	17976	02290
21633	28447	47136	39694	46548	54188	18153	02036	43884	84039	97730	17182
32215	44057	15706	55615	24632	77366	48561	17194	24541	32682	59173	17676
63669	73937	35964	17178	36804	50638	71972	73079	55746	69171	68684	59486
86383	50279	28234	09844	13578	28251	12708	24684	90170	80194	05569	32598
02687	70297	41900	36793	38314	03236	89243	88278	32991	39790	60135	93656
55269	99775	58393	41337	35439	57506	96195	34442	46408	26849	05553	25315
58841	72710	94082	43886	42436	28147	26488	86387	03710	24682	10587	01717
08382	43794	61510	16989	66863	09897	14697	00253	24678	41056	25886	13627
03316	27709	87263	60134	66341	43771	78054	60446	33196	17330	03423	11645
28247	07745	89325	69496	71694	88961	16079	17243	32843	98040	25866	50637
70111	40131	46657	39828	59286	72347	48453	02086	84718	69757	31580	37330
81281	10946	42393	09929	26565	41259	00055	75433	44947	97708	59872	63041
44647	09002	69021	93619	87392	86572	27661	00146	57180	93618	36382	05436
20837	85546	82953	14980	28104	25256	26545	98762	53874	52454	41547	84216
10973	04903	14270	93434	55394	46815	00642	92309	96336	99290	93273	13213
17508	59935	93902	02871	47830	91116	17804	57584	66385	88040	05182	43332
41921	48281	54456	48218	18232	03435	99630	18174	80514	00401	40216	67325
11362	35692	96337	90842	46843	62719	64049	17823	85899	11514	14557	48937
63394	27747	96239	22483	62553	45568	43041	96047	19285	73690	29780	88033
14168	49300	55727	25351	00206	07672	84073	01281	75177	92864	13769	41689
92814	04351	05957	09941	55423	03014	17425	36270	05099	03292	39526	01796
67234	45941	10747	25296	73782	34622	72824	06693	49142	97535	62240	54994

Table constructed by David Smith, University of Auckland.

Appendix A2 Binomial distribution (Individual terms)

The tabulated value is $\text{pr}(X = x)$, where $X \sim \text{Binomial}(n, p)$.

[e.g. For $n = 5$, $p = 0.2$, $\text{pr}(X = 2) = 0.205$
For $n = 7$, $p = 0.3$, $\text{pr}(X = 5) = 0.025$]

		p																		
n	***x***	.01	.05	.10	.15	.20	.25	.30	.35	.40	.50	.60	.65	.70	.75	.80	.85	.90	.95	.99
2	0	.980	.902	.810	.723	.640	.563	.490	.422	.360	.250	.160	.122	.090	.063	.040	.023	.010	.003	
	1	.020	.095	.180	.255	.320	.375	.420	.455	.480	.500	.480	.455	.420	.375	.320	.255	.180	.095	.020
	2		.003	.010	.023	.040	.063	.090	.122	.160	.250	.360	.422	.490	.563	.640	.723	.810	.902	.980
3	0	.970	.857	.729	.614	.512	.422	.343	.275	.216	.125	.064	.043	.027	.016	.008	.003	.001		
	1	.029	.135	.243	.325	.384	.422	.441	.444	.432	.375	.288	.239	.189	.141	.096	.057	.027	.007	
	2		.007	.027	.057	.096	.141	.189	.239	.288	.375	.432	.444	.441	.422	.384	.325	.243	.135	.029
	3			.001	.003	.008	.016	.027	.043	.064	.125	.216	.275	.343	.422	.512	.614	.729	.857	.970
4	0	.961	.815	.656	.522	.410	.316	.240	.179	.130	.063	.026	.015	.008	.004	.002	.001			
	1	.039	.171	.292	.368	.410	.422	.412	.384	.346	.250	.154	.111	.076	.047	.026	.011	.004		
	2	.001	.014	.049	.098	.154	.211	.265	.311	.346	.375	.346	.311	.265	.211	.154	.098	.049	.014	.001
	3			.004	.011	.026	.047	.076	.111	.154	.250	.346	.384	.412	.422	.410	.368	.292	.171	.039
	4				.001	.002	.004	.008	.015	.026	.063	.130	.179	.240	.316	.410	.522	.656	.815	.961
5	0	.951	.774	.590	.444	.328	.237	.168	.116	.078	.031	.010	.005	.002	.001					
	1	.048	.204	.328	.392	.410	.396	.360	.312	.259	.156	.077	.049	.028	.015	.006	.002			
	2	.001	.021	.073	.138	.205	.264	.309	.336	.346	.313	.230	.181	.132	.088	.051	.024	.008	.001	
	3		.001	.008	.024	.051	.088	.132	.181	.230	.313	.346	.336	.309	.264	.205	.138	.073	.021	.001
	4				.002	.006	.015	.028	.049	.077	.156	.259	.312	.360	.396	.410	.392	.328	.204	.048
	5						.001	.002	.005	.010	.031	.078	.116	.168	.237	.328	.444	.590	.774	.951
6	0	.941	.735	.531	.377	.262	.178	.118	.075	.047	.016	.004	.002	.001						
	1	.057	.232	.354	.399	.393	.356	.303	.244	.187	.094	.037	.020	.010	.004	.002				
	2	.001	.031	.098	.176	.246	.297	.324	.328	.311	.234	.138	.095	.060	.033	.015	.005	.001		
	3		.002	.015	.041	.082	.132	.185	.235	.276	.313	.276	.235	.185	.132	.082	.041	.015	.002	
	4			.001	.005	.015	.033	.060	.095	.138	.234	.311	.328	.324	.297	.246	.176	.098	.031	.001
	5					.002	.004	.010	.020	.037	.094	.187	.244	.303	.356	.393	.399	.354	.232	.057
	6							.001	.002	.004	.016	.047	.075	.118	.178	.262	.377	.531	.735	.941
7	0	.932	.698	.478	.321	.210	.133	.082	.049	.028	.008	.002	.001							
	1	.066	.257	.372	.396	.367	.311	.247	.185	.131	.055	.017	.008	.004	.001					
	2	.002	.041	.124	.210	.275	.311	.318	.298	.261	.164	.077	.047	.025	.012	.004	.001			
	3		.004	.023	.062	.115	.173	.227	.268	.290	.273	.194	.144	.097	.058	.029	.011	.003		
	4			.003	.011	.029	.058	.097	.144	.194	.273	.290	.268	.227	.173	.115	.062	.023	.004	
	5				.001	.004	.012	.025	.047	.077	.164	.261	.298	.318	.311	.275	.210	.124	.041	.002
	6						.001	.004	.008	.017	.055	.131	.185	.247	.311	.367	.396	.372	.257	.066
	7								.001	.002	.008	.028	.049	.082	.133	.210	.321	.478	.698	.932

Table constructed by David Smith, University of Auckland.

Appendix A2 Binomial distribution (Individual terms) cont.

The tabulated value is $\text{pr}(X = x)$, where $X \sim \text{Binomial}(n, p)$.

		p																			
n	***x***	.01	.05	.10	.15	.20	.25	.30	.35	.40	.50	.60	.65	.70	.75	.80	.85	.90	.95	.99
8	0	.923	.663	.430	.272	.168	.100	.058	.032	.017	.004	.001								
	1	.075	.279	.383	.385	.336	.267	.198	.137	.090	.031	.008	.003	.001						
	2	.003	.051	.149	.238	.294	.311	.296	.259	.209	.109	.041	.022	.010	.004	.001				
	3		.005	.033	.084	.147	.208	.254	.279	.279	.219	.124	.081	.047	.023	.009	.003			
	4			.005	.018	.046	.087	.136	.188	.232	.273	.232	.188	.136	.087	.046	.018	.005		
	5				.003	.009	.023	.047	.081	.124	.219	.279	.279	.254	.208	.147	.084	.033	.005	
	6					.001	.004	.010	.022	.041	.109	.209	.259	.296	.311	.294	.238	.149	.051	.003
	7							.001	.003	.008	.031	.090	.137	.198	.267	.336	.385	.383	.279	.075
	8									.001	.004	.017	.032	.058	.100	.168	.272	.430	.663	.923
9	0	.914	.630	.387	.232	.134	.075	.040	.021	.010	.002									
	1	.083	.299	.387	.368	.302	.225	.156	.100	.060	.018	.004	.001							
	2	.003	.063	.172	.260	.302	.300	.267	.216	.161	.070	.021	.010	.004	.001					
	3		.008	.045	.107	.176	.234	.267	.272	.251	.164	.074	.042	.021	.009	.003	.001			
	4		.001	.007	.028	.066	.117	.172	.219	.251	.246	.167	.118	.074	.039	.017	.005	.001		
	5			.001	.005	.017	.039	.074	.118	.167	.246	.251	.219	.172	.117	.066	.028	.007	.001	
	6				.001	.003	.009	.021	.042	.074	.164	.251	.272	.267	.234	.176	.107	.045	.008	
	7						.001	.004	.010	.021	.070	.161	.216	.267	.300	.302	.260	.172	.063	.003
	8								.001	.004	.018	.060	.100	.156	.225	.302	.368	.387	.299	.083
	9										.002	.010	.021	.040	.075	.134	.232	.387	.630	.914
10	0	.904	.599	.349	.197	.107	.056	.028	.013	.006	.001									
	1	.091	.315	.387	.347	.268	.188	.121	.072	.040	.010	.002	.001							
	2	.004	.075	.194	.276	.302	.282	.233	.176	.121	.044	.011	.004	.001						
	3		.010	.057	.130	.201	.250	.267	.252	.215	.117	.042	.021	.009	.003	.001				
	4		.001	.011	.040	.088	.146	.200	.238	.251	.205	.111	.069	.037	.016	.006	.001			
	5			.001	.008	.026	.058	.103	.154	.201	.246	.201	.154	.103	.058	.026	.008	.001		
	6				.001	.006	.016	.037	.069	.111	.205	.251	.238	.200	.146	.088	.040	.011	.001	
	7					.001	.003	.009	.021	.042	.117	.215	.252	.267	.250	.201	.130	.057	.010	
	8							.001	.004	.011	.044	.121	.176	.233	.282	.302	.276	.194	.075	.004
	9								.001	.002	.010	.040	.072	.121	.188	.268	.347	.387	.315	.091
	10										.001	.006	.013	.028	.056	.107	.197	.349	.599	.904
11	0	.895	.569	.314	.167	.086	.042	.020	.009	.004										
	1	.099	.329	.384	.325	.236	.155	.093	.052	.027	.005	.001								
	2	.005	.087	.213	.287	.295	.258	.200	.140	.089	.027	.005	.002	.001						
	3		.014	.071	.152	.221	.258	.257	.225	.177	.081	.023	.010	.004	.001					
	4		.001	.016	.054	.111	.172	.220	.243	.236	.161	.070	.038	.017	.006	.002				
	5			.002	.013	.039	.080	.132	.183	.221	.226	.147	.099	.057	.027	.010	.002			
	6				.002	.010	.027	.057	.099	.147	.226	.221	.183	.132	.080	.039	.013	.002		
	7					.002	.006	.017	.038	.070	.161	.236	.243	.220	.172	.111	.054	.016	.001	
	8						.001	.004	.010	.023	.081	.177	.225	.257	.258	.221	.152	.071	.014	
	9							.001	.002	.005	.027	.089	.140	.200	.258	.295	.287	.213	.087	.005
	10									.001	.005	.027	.052	.093	.155	.236	.325	.384	.329	.099
	11											.004	.009	.020	.042	.086	.167	.314	.569	.895

Table constructed by David Smith, University of Auckland.

Appendix A2 Binomial distribution (Individual terms) cont.

The tabulated value is $\text{pr}(X = x)$, where $X \sim \text{Binomial}(n, p)$.

		p																			
n	***x***	.01	.05	.10	.15	.20	.25	.30	.35	.40	.50	.60	.65	.70	.75	.80	.85	.90	.95	.99
12	0	.886	.540	.282	.142	.069	.032	.014	.006	.002										
	1	.107	.341	.377	.301	.206	.127	.071	.037	.017	.003									
	2	.006	.099	.230	.292	.283	.232	.168	.109	.064	.016	.002	.001							
	3		.017	.085	.172	.236	.258	.240	.195	.142	.054	.012	.005	.001						
	4		.002	.021	.068	.133	.194	.231	.237	.213	.121	.042	.020	.008	.002	.001				
	5			.004	.019	.053	.103	.158	.204	.227	.193	.101	.059	.029	.011	.003	.001			
	6				.004	.016	.040	.079	.128	.177	.226	.177	.128	.079	.040	.016	.004			
	7				.001	.003	.011	.029	.059	.101	.193	.227	.204	.158	.103	.053	.019	.004		
	8					.001	.002	.008	.020	.042	.121	.213	.237	.231	.194	.133	.068	.021	.002	
	9							.001	.005	.012	.054	.142	.195	.240	.258	.236	.172	.085	.017	
	10								.001	.002	.016	.064	.109	.168	.232	.283	.292	.230	.099	.006
	11										.003	.017	.037	.071	.127	.206	.301	.377	.341	.107
	12											.002	.006	.014	.032	.069	.142	.282	.540	.886
15	0	.860	.463	.206	.087	.035	.013	.005	.002											
	1	.130	.366	.343	.231	.132	.067	.031	.013	.005										
	2	.009	.135	.267	.286	.231	.156	.092	.048	.022	.003									
	3		.031	.129	.218	.250	.225	.170	.111	.063	.014	.002								
	4		.005	.043	.116	.188	.225	.219	.179	.127	.042	.007	.002	.001						
	5		.001	.010	.045	.103	.165	.206	.212	.186	.092	.024	.010	.003	.001					
	6			.002	.013	.043	.092	.147	.191	.207	.153	.061	.030	.012	.003	.001				
	7				.003	.014	.039	.081	.132	.177	.196	.118	.071	.035	.013	.003	.001			
	8				.001	.003	.013	.035	.071	.118	.196	.177	.132	.081	.039	.014	.003			
	9					.001	.003	.012	.030	.061	.153	.207	.191	.147	.092	.043	.013	.002		
	10						.001	.003	.010	.024	.092	.186	.212	.206	.165	.103	.045	.010	.001	
	11							.001	.002	.007	.042	.127	.179	.219	.225	.188	.116	.043	.005	
	12									.002	.014	.063	.111	.170	.225	.250	.218	.129	.031	
	13										.003	.022	.048	.092	.156	.231	.286	.267	.135	.009
	14											.005	.013	.031	.067	.132	.231	.343	.366	.130
	15												.002	.005	.013	.035	.087	.206	.463	.860
20	0	.818	.358	.122	.039	.012	.003	.001												
	1	.165	.377	.270	.137	.058	.021	.007	.002											
	2	.016	.189	.285	.229	.137	.067	.028	.010	.003										
	3	.001	.060	.190	.243	.205	.134	.072	.032	.012	.001									
	4		.013	.090	.182	.218	.190	.130	.074	.035	.005									
	5		.002	.032	.103	.175	.202	.179	.127	.075	.015	.001								
	6			.009	.045	.109	.169	.192	.171	.124	.037	.005	.001							
	7			.002	.016	.055	.112	.164	.184	.166	.074	.015	.004	.001						
	8				.005	.022	.061	.114	.161	.180	.120	.035	.014	.004	.001					
	9				.001	.007	.027	.065	.116	.160	.160	.071	.034	.012	.003					
	10					.002	.010	.031	.069	.117	.176	.117	.069	.031	.010	.002				
	11						.003	.012	.034	.071	.160	.160	.116	.065	.027	.007	.001			
	12						.001	.004	.014	.035	.120	.180	.161	.114	.061	.022	.005			
	13							.001	.004	.015	.074	.166	.184	.164	.112	.055	.016	.002		
	14								.001	.005	.037	.124	.171	.192	.169	.109	.045	.009		
	15									.001	.015	.075	.127	.179	.202	.175	.103	.032	.002	
	16										.005	.035	.074	.130	.190	.218	.182	.090	.013	
	17										.001	.012	.032	.072	.134	.205	.243	.190	.060	.001
	18											.003	.010	.028	.067	.137	.229	.285	.189	.016
	19												.002	.007	.021	.058	.137	.270	.377	.165
	20													.001	.003	.012	.039	.122	.358	.818

Table constructed by David Smith, University of Auckland.

Appendix A3 **Minimum sample sizes** for large sample confidence intervals for a proportion based upon the Normal approximation[a]

$\widehat{p}$[b]	***Minimum n***		
	15% rule	**10% rule**	5% rule
0.01	2400	5400	21400
0.02	1200	2650	10400
0.03	767	1700	6700
0.04	550	1225	4875
0.05	440	960	3760
0.06	350	767	3033
0.07	286	643	2514
0.08	238	538	2125
0.09	211	456	1811
0.1	180	400	1570
0.11	155	345	1373
0.12	142	308	1208
0.13	123	269	1069
0.14	107	243	957
0.15	100	220	853
0.16	88	194	763
0.17	82	176	688
0.18	72	156	617
0.19	63	142	553
0.20	60	125	500
0.21	52	114	452
0.22	50	105	409
0.23	43	96	370
0.24	38	83	333
0.25	36	76	296
0.26	31	69	269
0.27	30	63	241
0.28	25	57	218
0.29	24	52	193
0.30	20	47	170
0.31	19	39	152
0.32	19	38	138
0.33	18	33	121
0.34	15	29	103
0.35	14	23	91
0.36	14	22	78
0.37	14	19	68
0.38	13	16	58
0.39	13	13	49
0.40	13	13	40
0.41	12	12	37
0.42	12	12	31
0.43	12	12	30
0.44	11	11	30
0.45	11	11	29
0.46	11	11	28
0.47	11	11	28
0.48	10	10	27
0.49	10	10	27
0.50	10	10	26

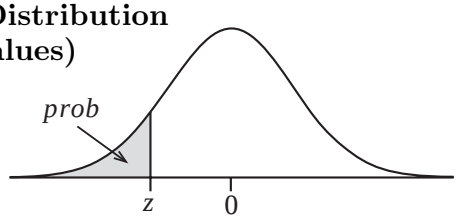
$\widehat{p}$[b]	***Minimum n***		
	15% rule	**10% rule**	5% rule
0.51	10	10	27
0.52	10	10	27
0.53	11	11	28
0.54	11	11	28
0.55	11	11	29
0.56	11	11	30
0.57	12	12	30
0.58	12	12	31
0.59	12	12	37
0.60	13	13	40
0.61	13	13	49
0.62	13	16	58
0.63	14	19	68
0.64	14	22	78
0.65	14	23	91
0.66	15	29	103
0.67	18	33	121
0.68	19	38	138
0.69	19	39	152
0.70	20	47	170
0.71	24	52	193
0.72	25	57	218
0.73	30	63	241
0.74	31	69	269
0.75	36	76	296
0.76	38	83	333
0.77	43	96	370
0.78	50	105	409
0.79	52	114	452
0.80	60	125	500
0.81	63	142	553
0.82	72	156	617
0.83	82	176	688
0.84	88	194	763
0.85	100	220	853
0.86	107	243	957
0.87	123	269	1069
0.88	142	308	1208
0.89	155	345	1373
0.90	180	400	1570
0.91	211	456	1811
0.92	238	538	2125
0.93	286	643	2514
0.94	350	767	3033
0.95	440	960	3760
0.96	550	1225	4875
0.97	767	1700	6700
0.98	1200	2650	10400
0.99	2400	5400	21400

[a] Source: Derived from Table 1 of Samuel and Lu [1992].

[b] For $\widehat{p} < 0.01$ the 10% rule gives a count of 56 ($= n\ \widehat{p}$).

Appendix A4 Standard Normal Distribution (negative *z*-values)

For given ***z***, the tabulated value is ***prob*** $= \text{pr}(Z \leq z)$ where $Z \sim \text{Normal}(0, 1)$.



Second decimal place of z

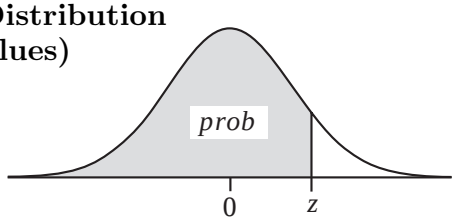
z	0	1	2	3	4	5	6	7	8	9
−3.4	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
−3.3	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
−3.2	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001
−3.1	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001
−3.0	.001	.001	.001	.001	.001	.001	.001	.001	.001	.001
−2.9	.002	.002	.002	.002	.002	.002	.002	.001	.001	.001
−2.8	.003	.002	.002	.002	.002	.002	.002	.002	.002	.002
−2.7	.003	.003	.003	.003	.003	.003	.003	.003	.003	.003
−2.6	.005	.005	.004	.004	.004	.004	.004	.004	.004	.004
−2.5	.006	.006	.006	.006	.006	.005	.005	.005	.005	.005
−2.4	.008	.008	.008	.008	.007	.007	.007	.007	.007	.006
−2.3	.011	.010	.010	.010	.010	.009	.009	.009	.009	.008
−2.2	.014	.014	.013	.013	.013	.012	.012	.012	.011	.011
−2.1	.018	.017	.017	.017	.016	.016	.015	.015	.015	.014
−2.0	.023	.022	.022	.021	.021	.020	.020	.019	.019	.018
−1.9	.029	.028	.027	.027	.026	.026	.025	.024	.024	.023
−1.8	.036	.035	.034	.034	.033	.032	.031	.031	.030	.029
−1.7	.045	.044	.043	.042	.041	.040	.039	.038	.038	.037
−1.6	.055	.054	.053	.052	.051	.049	.048	.047	.046	.046
−1.5	.067	.066	.064	.063	.062	.061	.059	.058	.057	.056
−1.4	.081	.079	.078	.076	.075	.074	.072	.071	.069	.068
−1.3	.097	.095	.093	.092	.090	.089	.087	.085	.084	.082
−1.2	.115	.113	.111	.109	.107	.106	.104	.102	.100	.099
−1.1	.136	.133	.131	.129	.127	.125	.123	.121	.119	.117
−1.0	.159	.156	.154	.152	.149	.147	.145	.142	.140	.138
−0.9	.184	.181	.179	.176	.174	.171	.169	.166	.164	.161
−0.8	.212	.209	.206	.203	.200	.198	.195	.192	.189	.187
−0.7	.242	.239	.236	.233	.230	.227	.224	.221	.218	.215
−0.6	.274	.271	.268	.264	.261	.258	.255	.251	.248	.245
−0.5	.309	.305	.302	.298	.295	.291	.288	.284	.281	.278
−0.4	.345	.341	.337	.334	.330	.326	.323	.319	.316	.312
−0.3	.382	.378	.374	.371	.367	.363	.359	.356	.352	.348
−0.2	.421	.417	.413	.409	.405	.401	.397	.394	.390	.386
−0.1	.460	.456	.452	.448	.444	.440	.436	.433	.429	.425
−0.0	.500	.496	.492	.488	.484	.480	.476	.472	.468	.464

Table constructed by David Smith, University of Auckland.

[**Note:** For $z < -3.4$, $\text{pr}(Z \leq z) = 0.000$ (3 d.p.)]

Appendix A4 Standard Normal Distribution (positive *z*-values)

For given ***z***, the tabulated value is ***prob*** $= \text{pr}(Z \leq z)$ where $Z \sim \text{Normal}(0, 1)$.



Second decimal place of z

z	0	1	2	3	4	5	6	7	8	9
0.0	.500	.504	.508	.512	.516	.520	.524	.528	.532	.536
0.1	.540	.544	.548	.552	.556	.560	.564	.567	.571	.575
0.2	.579	.583	.587	.591	.595	.599	.603	.606	.610	.614
0.3	.618	.622	.626	.629	.633	.637	.641	.644	.648	.652
0.4	.655	.659	.663	.666	.670	.674	.677	.681	.684	.688
0.5	.691	.695	.698	.702	.705	.709	.712	.716	.719	.722
0.6	.726	.729	.732	.736	.739	.742	.745	.749	.752	.755
0.7	.758	.761	.764	.767	.770	.773	.776	.779	.782	.785
0.8	.788	.791	.794	.797	.800	.802	.805	.808	.811	.813
0.9	.816	.819	.821	.824	.826	.829	.831	.834	.836	.839
1.0	.841	.844	.846	.848	.851	.853	.855	.858	.860	.862
1.1	.864	.867	.869	.871	.873	.875	.877	.879	.881	.883
1.2	.885	.887	.889	.891	.893	.894	.896	.898	.900	.901
1.3	.903	.905	.907	.908	.910	.911	.913	.915	.916	.918
1.4	.919	.921	.922	.924	.925	.926	.928	.929	.931	.932
1.5	.933	.934	.936	.937	.938	.939	.941	.942	.943	.944
1.6	.945	.946	.947	.948	.949	.951	.952	.953	.954	.954
1.7	.955	.956	.957	.958	.959	.960	.961	.962	.962	.963
1.8	.964	.965	.966	.966	.967	.968	.969	.969	.970	.971
1.9	.971	.972	.973	.973	.974	.974	.975	.976	.976	.977
2.0	.977	.978	.978	.979	.979	.980	.980	.981	.981	.982
2.1	.982	.983	.983	.983	.984	.984	.985	.985	.985	.986
2.2	.986	.986	.987	.987	.987	.988	.988	.988	.989	.989
2.3	.989	.990	.990	.990	.990	.991	.991	.991	.991	.992
2.4	.992	.992	.992	.992	.993	.993	.993	.993	.993	.994
2.5	.994	.994	.994	.994	.994	.995	.995	.995	.995	.995
2.6	.995	.995	.996	.996	.996	.996	.996	.996	.996	.996
2.7	.997	.997	.997	.997	.997	.997	.997	.997	.997	.997
2.8	.997	.998	.998	.998	.998	.998	.998	.998	.998	.998
2.9	.998	.998	.998	.998	.998	.998	.998	.999	.999	.999
3.0	.999	.999	.999	.999	.999	.999	.999	.999	.999	.999
3.1	.999	.999	.999	.999	.999	.999	.999	.999	.999	.999
3.2	.999	.999	.999	.999	.999	.999	.999	.999	.999	.999
3.3	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3.4	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Table constructed by David Smith, University of Auckland.

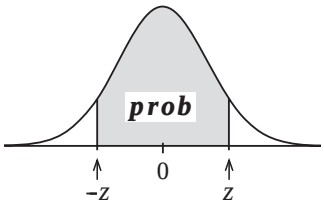
[**Note:** For $z > 3.4$, $\text{pr}(Z \leq z) = 1.000$ (3 d.p.)]

Appendix A5 Further Standard-Normal Tables

[Z is Normal($\mu = 0, \sigma = 1$)]

Appendix A5.1 : Central Probabilities

For given ***prob***, the tabulated value is ***z*** such that $\text{pr}(-z \le Z \le z) = prob$.

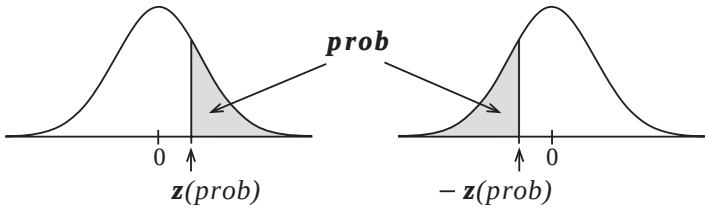


prob	0.50	0.70	0.75	0.80	0.85
z	0.6745	1.0364	1.1503	1.2816	1.4395
prob	0.90	0.95	0.98	0.99	0.999
z	1.6449	1.9600	2.3263	2.5758	3.2905

[e.g. for $prob = 0.9$, we read $z = 1.6449$, telling us that
$0.9 = \text{pr}(-1.6449 \le Z \le 1.6449)$.
Interpreted for arbitrary Normal distributions as "the prob. of of falling within 1.6449 sd's either side of the mean is 0.9."]

Appendix A5.2 : Inverse Tail-Probabilities

For given ***prob***, the tabulated value is ***z*** such that $\text{pr}(Z \ge z) = prob$ and $\text{pr}(Z \le -z) = prob$.

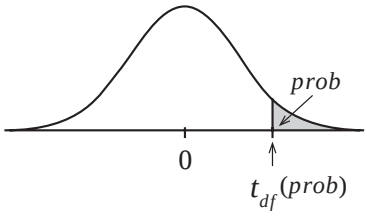


(fraction)	(1/4)	(1/5)	(3/20)	(1/10)	(1/20)	(1/40)
prob	0.25	0.20	0.15	0.10	0.05	0.025
z$(prob)$	0.6745	0.8416	1.0364	1.2816	1.6449	1.9600
(fraction)	(1/100)	(1/200)	(1/400)	(1/1,000)	(1/2,000)	(1/10,000)
prob	0.01	0.005	0.0025	0.001	0.0005	0.0001
z$(prob)$	2.3263	2.5758	2.8071	3.0902	3.2905	3.7195

[e.g. for $prob = 0.05$, we read $z(prob) = 1.6449$, telling us that $0.05 = \text{pr}(Z \ge 1.6449)$
and $0.05 = \text{pr}(Z \le -1.6449)$]
"$0.05 = \text{pr}(Z \ge 1.6449)$" is interpreted for arbitrary Normal distributions as,
"The probability of obtaining a value greater than 1.6449 sd's above the mean is 0.05."

Appendix A6 Student's *t*–distribution

For fixed *prob* and *df*, the tabulated value is the number $\big(t = t_{df}(prob)\big)$ such that for $T \sim \text{Student}(df)$, $\quad \text{pr}(T \geq t) = prob$.



[e.g. For $prob = 0.025$ and $df = 23$, $t_{23}(0.025) = 2.069$]

prob

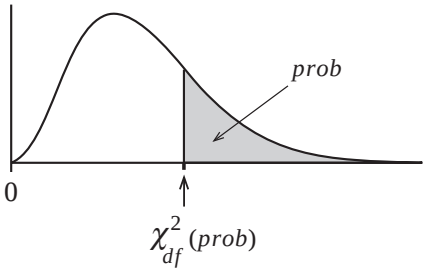
df	.20	.15	.10	.05	.025	.01	.005	.001	.0005	.0001
3	0.978	1.250	1.638	2.353	3.182	4.541	5.841	10.21	12.92	22.20
4	0.941	1.190	1.533	2.132	2.776	3.747	4.604	7.173	8.610	13.03
5	0.920	1.156	1.476	2.015	2.571	3.365	4.032	5.893	6.869	9.678
6	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.208	5.959	8.025
7	0.896	1.119	1.415	1.895	2.365	2.998	3.499	4.785	5.408	7.063
8	0.889	1.108	1.397	1.860	2.306	2.896	3.355	4.501	5.041	6.442
9	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.297	4.781	6.010
10	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.144	4.587	5.694
11	0.876	1.088	1.363	1.796	2.201	2.718	3.106	4.025	4.437	5.453
12	0.873	1.083	1.356	1.782	2.179	2.681	3.055	3.930	4.318	5.263
13	0.870	1.079	1.350	1.771	2.160	2.650	3.012	3.852	4.221	5.111
14	0.868	1.076	1.345	1.761	2.145	2.624	2.977	3.787	4.140	4.985
15	0.866	1.074	1.341	1.753	2.131	2.602	2.947	3.733	4.073	4.880
16	0.865	1.071	1.337	1.746	2.120	2.583	2.921	3.686	4.015	4.791
17	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.646	3.965	4.714
18	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.610	3.922	4.648
19	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.579	3.883	4.590
20	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.552	3.849	4.539
21	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.527	3.819	4.493
22	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.505	3.792	4.452
23	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.485	3.768	4.415
24	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.467	3.745	4.382
25	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.450	3.725	4.352
26	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.435	3.707	4.324
27	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.421	3.690	4.299
28	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.408	3.674	4.275
29	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.396	3.659	4.254
30	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.385	3.646	4.234
31	0.853	1.054	1.309	1.696	2.040	2.453	2.744	3.375	3.633	4.215
32	0.853	1.054	1.309	1.694	2.037	2.449	2.738	3.365	3.622	4.198
33	0.853	1.053	1.308	1.692	2.035	2.445	2.733	3.356	3.611	4.182
34	0.852	1.052	1.307	1.691	2.032	2.441	2.728	3.348	3.601	4.167
35	0.852	1.052	1.306	1.690	2.030	2.438	2.724	3.340	3.591	4.153
36	0.852	1.052	1.306	1.688	2.028	2.434	2.719	3.333	3.582	4.140
37	0.851	1.051	1.305	1.687	2.026	2.431	2.715	3.326	3.574	4.127
38	0.851	1.051	1.304	1.686	2.024	2.429	2.712	3.319	3.566	4.116
39	0.851	1.050	1.304	1.685	2.023	2.426	2.708	3.313	3.558	4.105
40	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.307	3.551	4.094
45	0.850	1.049	1.301	1.679	2.014	2.412	2.690	3.281	3.520	4.049
50	0.849	1.047	1.299	1.676	2.009	2.403	2.678	3.261	3.496	4.014
60	0.848	1.045	1.296	1.671	2.000	2.390	2.660	3.232	3.460	3.962
80	0.846	1.043	1.292	1.664	1.990	2.374	2.639	3.195	3.416	3.899
100	0.845	1.042	1.290	1.660	1.984	2.364	2.626	3.174	3.390	3.861
∞	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.090	3.291	3.719

Table constructed by David Smith, University of Auckland.

[A simple guideline, when *df* is not in the table, is to use the tabulated value immediately smaller than that required. When $df \geq 120$, use $df = \infty$.]

Appendix A7 Chi-square distribution

For fixed *prob* and *df*, the tabulated value is the number $\chi^2 = \chi^2_{df}(prob)$ such that for $X^2 \sim$ Chi-square (df), $\text{pr}(X^2 \geq \chi^2) = prob$.



[e.g. For $prob = 0.10$ and $df = 13$, $\chi^2_{13}(0.10) = 19.81$]

prob

df	.975	.95	.20	.15	.10	.05	.025	.01	.005	.001
1	0.001	0.004	1.642	2.072	2.706	3.841	5.024	6.635	7.879	10.83
2	0.051	0.103	3.219	3.794	4.605	5.991	7.378	9.210	10.60	13.82
3	0.216	0.352	4.642	5.317	6.251	7.815	9.348	11.34	12.84	16.27
4	0.484	0.711	5.989	6.745	7.779	9.488	11.14	13.28	14.86	18.47
5	0.831	1.145	7.289	8.115	9.236	11.07	12.83	15.09	16.75	20.52
6	1.237	1.635	8.558	9.446	10.64	12.59	14.45	16.81	18.55	22.46
7	1.690	2.167	9.803	10.75	12.02	14.07	16.01	18.48	20.28	24.32
8	2.180	2.733	11.03	12.03	13.36	15.51	17.53	20.09	21.95	26.12
9	2.700	3.325	12.24	13.29	14.68	16.92	19.02	21.67	23.59	27.88
10	3.247	3.940	13.44	14.53	15.99	18.31	20.48	23.21	25.19	29.59
11	3.816	4.575	14.63	15.77	17.28	19.68	21.92	24.72	26.76	31.26
12	4.404	5.226	15.81	16.99	18.55	21.03	23.34	26.22	28.30	32.91
13	5.009	5.892	16.98	18.20	19.81	22.36	24.74	27.69	29.82	34.53
14	5.629	6.571	18.15	19.41	21.06	23.68	26.12	29.14	31.32	36.12
15	6.262	7.261	19.31	20.60	22.31	25.00	27.49	30.58	32.80	37.70
16	6.908	7.962	20.47	21.79	23.54	26.30	28.85	32.00	34.27	39.25
17	7.564	8.672	21.61	22.98	24.77	27.59	30.19	33.41	35.72	40.79
18	8.231	9.390	22.76	24.16	25.99	28.87	31.53	34.81	37.16	42.31
19	8.907	10.12	23.90	25.33	27.20	30.14	32.85	36.19	38.58	43.82
20	9.591	10.85	25.04	26.50	28.41	31.41	34.17	37.57	40.00	45.31
21	10.28	11.59	26.17	27.66	29.62	32.67	35.48	38.93	41.40	46.80
22	10.98	12.34	27.30	28.82	30.81	33.92	36.78	40.29	42.80	48.27
23	11.69	13.09	28.43	29.98	32.01	35.17	38.08	41.64	44.18	49.73
24	12.40	13.85	29.55	31.13	33.20	36.42	39.36	42.98	45.56	51.18
25	13.12	14.61	30.68	32.28	34.38	37.65	40.65	44.31	46.93	52.62
26	13.84	15.38	31.79	33.43	35.56	38.89	41.92	45.64	48.29	54.05
27	14.57	16.15	32.91	34.57	36.74	40.11	43.19	46.96	49.64	55.48
28	15.31	16.93	34.03	35.71	37.92	41.34	44.46	48.28	50.99	56.89
29	16.05	17.71	35.14	36.85	39.09	42.56	45.72	49.59	52.34	58.30
30	16.79	18.49	36.25	37.99	40.26	43.77	46.98	50.89	53.67	59.70
40	24.43	26.51	47.27	49.24	51.81	55.76	59.34	63.69	66.77	73.40
50	32.36	34.76	58.16	60.35	63.17	67.50	71.42	76.15	79.49	86.66
60	40.48	43.19	68.97	71.34	74.40	79.08	83.30	88.38	91.95	99.61
70	48.76	51.74	79.71	82.26	85.53	90.53	95.02	100.4	104.2	112.3
80	57.15	60.39	90.41	93.11	96.58	101.9	106.6	112.3	116.3	124.8
90	65.65	69.13	101.1	103.9	107.6	113.1	118.1	124.1	128.3	137.2
100	74.22	77.93	111.7	114.7	118.5	124.3	129.6	135.8	140.2	149.4

Table constructed by David Smith, University of Auckland.