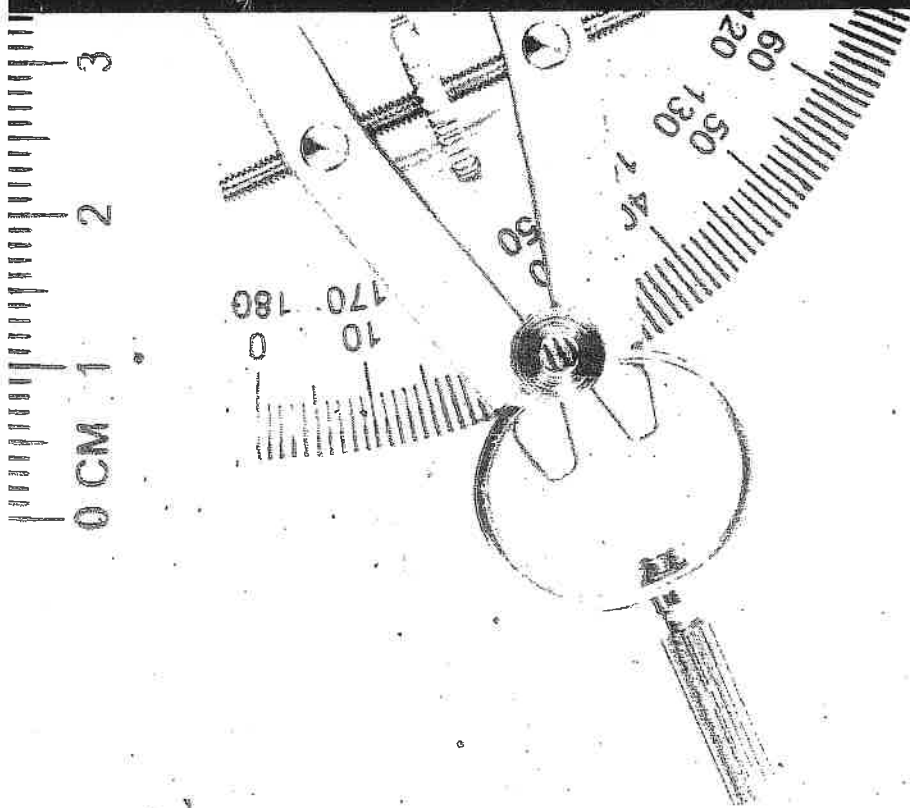


F D J Dunstan, A B J Nix,
J F Reynolds, R J Rowlands

MATHEMATICS ELEMENTARY STATISTICAL TABLES



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PREFACE

This set of tables has been designed by RND Publications in collaboration with the Associated Examining Board for use in Advanced level and university courses in statistics. Each table is preceded by a brief explanation of its contents and we hope that, in general, the lay-out is sufficiently familiar to enable the tables to be used satisfactorily without further explanation. We have resisted the temptation to include excessive material on the use of tables and we leave this to the textbooks. Furthermore, since the tables will be used in examinations, many of the formulae which are expected to be known by the candidates have also been omitted. We have tried to maintain a degree of consistency in presentation. To this end, we have tabulated the distribution function in Tables 1, 2 and 3. In Tables 4, 6, 7 and 8, the percentage points are tabulated since these distributions are used in many different ways. In Tables 9, 10, 13 and 14, the upper tail critical values are tabulated since the corresponding distributions are used almost exclusively in hypothesis testing. In Tables 1 and 2, for ease of presentation, as soon as the value of the distribution function reaches unity, all succeeding ones are omitted. Thus if, in using these tables, a blank is obtained as the required probability, this should be interpreted as unity. In Tables 10, 13 and 14 where non-parametric discrete statistics are tabulated, the values given should be included within the critical region. Furthermore, as explained in the headings, exact significance levels cannot in general be obtained using these statistics. The critical values given are those which ensure a significance level as close as possible to the stated levels. If, in using these tables, a blank is obtained as the required critical value, this means that the nearest achievable significance level to the stated level is 0%. The corresponding critical value is omitted on the grounds that such a test has no practical value.

*Mathematics
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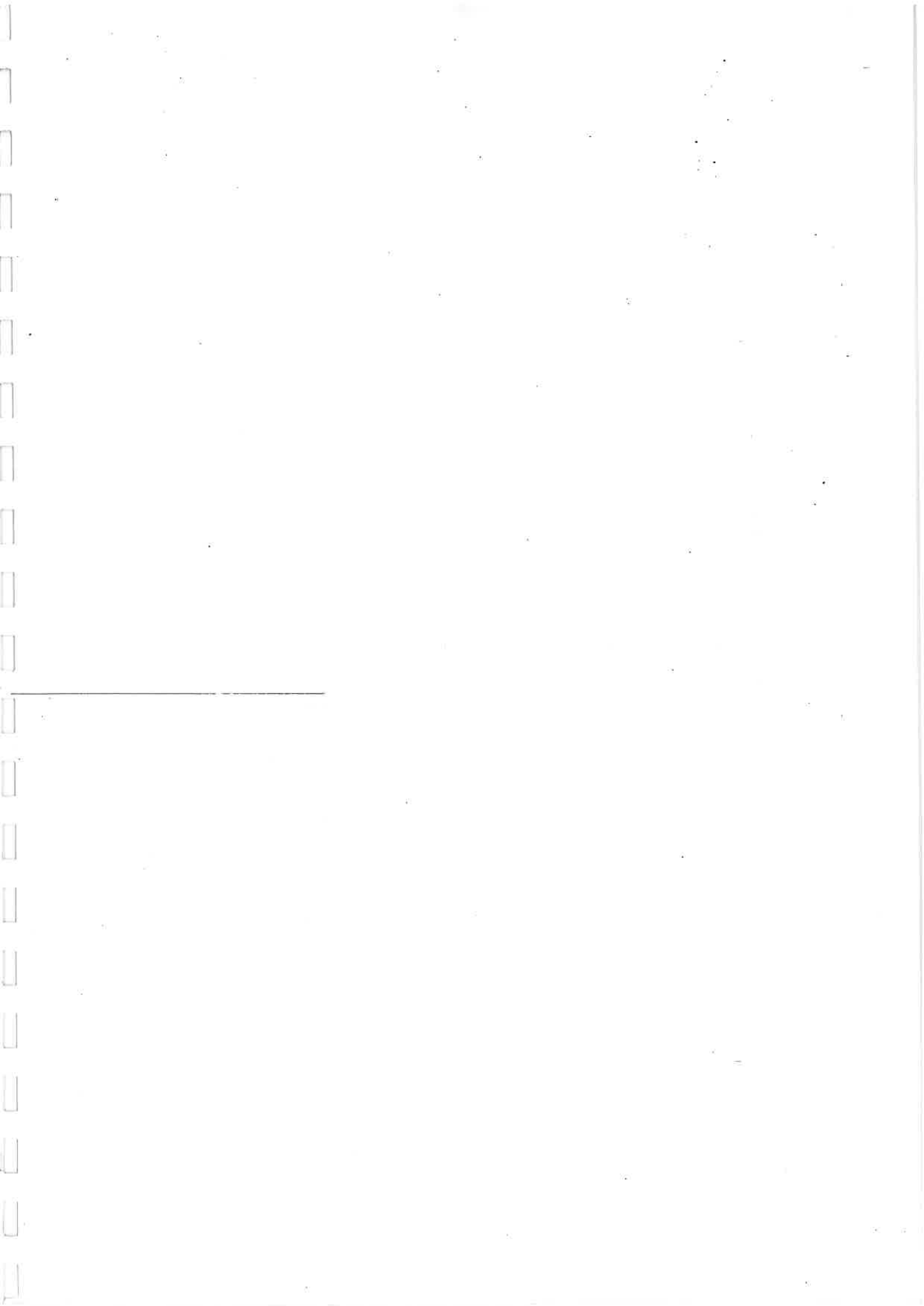
The table gives the probability of obtaining at most x successes in a sequence of n independent trials, each of which has a probability p of success, i.e.

independent trials, each of which has a probability p of success, i.e.

$$P(X \leq k) = \sum_{i=0}^k \binom{n}{i} p^i (1-p)^{n-i}$$

where X denotes the number of successes.

[illegible]



BINOMIAL DISTRIBUTION FUNCTION

x	$n=9$	$n=10$	$n=11$	$n=12$	$n=13$
0	0.135 .8337 .7602 .6925 .6302 .5730 .5204 .4722 .4279 .3874 .3516 .3184 .2874 .2584 .2316 .2071 .1840 .1622 .1414 .1214 .1020	0.9048 .8171 .7374 .6648 .5987 .5386 .4840 .4344 .3894 .3487 .3119 .2784 .2479 .2194 .1936 .1699 .1479 .1274 .1082 .0902 .0734	0.8953 .8007 .7153 .6382 .5688 .5063 .4501 .3996 .3544 .3138 .2773 .2442 .2138 .1859 .1603 .1367 .1147 .0941 .0748 .0567 .0397	0.8864 .7847 .6938 .6127 .5404 .4759 .4186 .3677 .3225 .2824 .2422 .2087 .1777 .1484 .1206 .0941 .0696 .0461 .0237 .0022 .0000	0.8775 .7690 .6730 .5882 .5133 .4474 .3893 .3383 .2935 .2542 .2209 .1909 .1642 .1398 .1164 .0941 .0729 .0527 .0336 .0154 .0000
1	0.9966 .9869 .9718 .9522 .9288 .9022 .8729 .8417 .8088 .7748 .7400 .7047 .6689 .6326 .5961 .5595 .5228 .4861 .4494 .4127 .3760	0.9957 .9838 .9653 .9418 .9139 .8824 .8483 .8121 .7746 .7361 .6974 .6574 .6174 .5774 .5374 .4974 .4574 .4174 .3774 .3374 .2974	0.9948 .9805 .9587 .9308 .8981 .8618 .8228 .7819 .7399 .6974 .6554 .6134 .5714 .5294 .4874 .4454 .4034 .3614 .3194 .2774 .2354	0.9938 .9785 .9552 .9257 .8904 .8504 .8064 .7597 .7114 .6624 .6114 .5594 .5064 .4534 .3994 .3454 .2914 .2374 .1834 .1294 .0754	0.9928 .9730 .9436 .9068 .8646 .8186 .7702 .7206 .6707 .6213 .5724 .5234 .4744 .4254 .3764 .3274 .2784 .2294 .1804 .1314 .0824
2	0.9999 .9994 .9980 .9955 .9916 .9862 .9791 .9702 .9595 .9470 .9322 .9174 .9022 .8869 .8717 .8564 .8412 .8259 .8107 .7954 .7802	0.9999 .9991 .9972 .9938 .9885 .9812 .9717 .9599 .9460 .9298 .9122 .8934 .8744 .8554 .8364 .8174 .7984 .7794 .7604 .7414 .7224	0.9998 .9988 .9963 .9917 .9848 .9752 .9630 .9481 .9305 .9104 .8891 .8661 .8424 .8184 .7944 .7704 .7464 .7224 .6984 .6744 .6504	0.9997 .9980 .9938 .9865 .9755 .9608 .9422 .9201 .8946 .8661 .8366 .8061 .7744 .7414 .7074 .6724 .6364 .6004 .5644 .5284 .4924	0.9997 .9975 .9922 .9797 .9679 .9539 .9379 .9202 .8999 .8764 .8524 .8279 .8024 .7764 .7494 .7214 .6924 .6624 .6314 .5994 .5674
3	0.9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999	0.9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999	0.9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999	0.9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999	0.9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999 .9999

BINOMIAL DISTRIBUTION FUNCTION

x	p	$n = 25$	$n = 30$
0	0.00	0.0000	0.0000
1	0.00	0.0000	0.0000
2	0.00	0.0000	0.0000
3	0.00	0.0000	0.0000
4	0.00	0.0000	0.0000
5	0.00	0.0000	0.0000
6	0.00	0.0000	0.0000
7	0.00	0.0000	0.0000
8	0.00	0.0000	0.0000
9	0.00	0.0000	0.0000
10	0.00	0.0000	0.0000
11	0.00	0.0000	0.0000
12	0.00	0.0000	0.0000
13	0.00	0.0000	0.0000
14	0.00	0.0000	0.0000
15	0.00	0.0000	0.0000
16	0.00	0.0000	0.0000
17	0.00	0.0000	0.0000
18	0.00	0.0000	0.0000
19	0.00	0.0000	0.0000
20	0.00	0.0000	0.0000
21	0.00	0.0000	0.0000
22	0.00	0.0000	0.0000
23	0.00	0.0000	0.0000
24	0.00	0.0000	0.0000
25	0.00	0.0000	0.0000

TABLE 2. POISSON DISTRIBUTION FUNCTION

The table gives the probability that a Poisson random variable X with mean m is less than or equal to x , i.e.

$$P(X \leq x) = \sum_{z=0}^x m^z e^{-m} \frac{m!}{z!}$$

[illegible]

The table gives the probability p that a normally distributed random variable Z with zero mean and unit variance is less than or equal to z .

TABLE 3 NORMAL DISTRIBUTION FUNCTION

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.50000	.50399	.50798	.51197	.51595	.51994	.52392	.52790	.53188	.53586
0.1	.53983	.54380	.54776	.55172	.55567	.55962	.56356	.56749	.57142	.57535
0.2	.57926	.58317	.58706	.59095	.59483	.59871	.60257	.60642	.61026	.61409
0.3	.61791	.62172	.62552	.62930	.63307	.63683	.64058	.64431	.64803	.65173
0.4	.65542	.65910	.66276	.66640	.67003	.67364	.67724	.68082	.68439	.68793
0.5	.69146	.69497	.69847	.70194	.70540	.70884	.71226	.71566	.71904	.72240
0.6	.72575	.72907	.73237	.73565	.73891	.74215	.74537	.74857	.75175	.75490
0.7	.75804	.76115	.76424	.76730	.77035	.77337	.77637	.77935	.78230	.78524
0.8	.78814	.79103	.79389	.79673	.79955	.80234	.80511	.80785	.81057	.81327
0.9	.81594	.81859	.82121	.82381	.82639	.82894	.83147	.83398	.83646	.83891
1.0	.84134	.84375	.84614	.84849	.85083	.85314	.85543	.85769	.85993	.86214
1.1	.86433	.86650	.86864	.87076	.87286	.87493	.87698	.87900	.88100	.88298
1.2	.88493	.88686	.88877	.89065	.89251	.89435	.89617	.89796	.89973	.90147
1.3	.90320	.90490	.90658	.90824	.90988	.91149	.91309	.91466	.91621	.91774
1.4	.91924	.92073	.92220	.92364	.92507	.92647	.92785	.92922	.93056	.93189
1.5	.93319	.93448	.93574	.93699	.93822	.93943	.94062	.94179	.94295	.94408
1.6	.94520	.94630	.94738	.94845	.94950	.95053	.95154	.95254	.95352	.95449
1.7	.95543	.95637	.95728	.95818	.95907	.95994	.96080	.96164	.96246	.96327
1.8	.96407	.96485	.96562	.96638	.96712	.96784	.96856	.96926	.96995	.97062
1.9	.97128	.97193	.97257	.97320	.97381	.97441	.97500	.97558	.97615	.97670
2.0	.97725	.97778	.97831	.97882	.97932	.97982	.98030	.98077	.98124	.98169
2.1	.98214	.98257	.98300	.98341	.98382	.98422	.98461	.98500	.98537	.98574
2.2	.98610	.98645	.98679	.98713	.98745	.98778	.98809	.98840	.98870	.98899
2.3	.98928	.98956	.98983	.99010	.99036	.99061	.99086	.99111	.99134	.99158
2.4	.99180	.99202	.99224	.99245	.99266	.99286	.99305	.99324	.99343	.99361
2.5	.99379	.99396	.99413	.99430	.99446	.99461	.99477	.99492	.99506	.99520
2.6	.99534	.99547	.99560	.99573	.99585	.99598	.99609	.99621	.99632	.99643
2.7	.99653	.99664	.99674	.99683	.99693	.99702	.99711	.99720	.99728	.99736
2.8	.99744	.99752	.99760	.99767	.99774	.99781	.99788	.99795	.99801	.99807
2.9	.99813	.99819	.99825	.99831	.99836	.99841	.99846	.99851	.99856	.99861
3.0	.99865	.99869	.99874	.99878	.99882	.99886	.99889	.99893	.99896	.99900
3.1	.99903	.99906	.99910	.99913	.99916	.99918	.99921	.99924	.99926	.99929
3.2	.99931	.99934	.99936	.99938	.99940	.99942	.99944	.99946	.99948	.99950
3.3	.99952	.99953	.99955	.99957	.99958	.99960	.99961	.99962	.99964	.99965
3.4	.99966	.99968	.99969	.99970	.99971	.99972	.99973	.99974	.99975	.99976
3.5	.99977	.99978	.99978	.99979	.99980	.99981	.99981	.99982	.99983	.99983
3.6	.99984	.99985	.99985	.99986	.99986	.99987	.99987	.99988	.99988	.99989
3.7	.99989	.99990	.99990	.99990	.99991	.99991	.99992	.99992	.99992	.99992
3.8	.99993	.99993	.99993	.99993	.99994	.99994	.99994	.99995	.99995	.99995
3.9	.99995	.99995	.99995	.99996	.99996	.99996	.99996	.99997	.99997	.99997

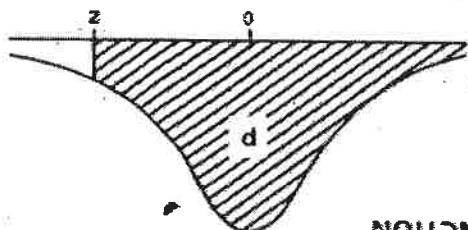
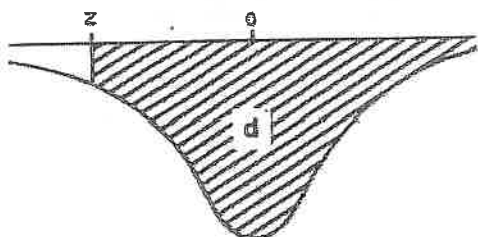


TABLE 4 PERCENTAGE POINTS OF THE NORMAL DISTRIBUTION

The table gives the values of z satisfying $P(Z \leq z) = p$ where Z is a normally distributed random variable with zero mean and unit variance.



p	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.50	0.000	0.025	0.050	0.075	0.100	0.126	0.151	0.176	0.202	0.228
0.60	0.253	0.279	0.305	0.332	0.358	0.385	0.412	0.440	0.468	0.496
0.70	0.524	0.553	0.583	0.613	0.643	0.674	0.706	0.739	0.772	0.806
0.80	0.842	0.878	0.915	0.954	0.994	1.036	1.080	1.126	1.175	1.227
0.90	1.282	1.341	1.405	1.476	1.555					

p	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
0.95	1.645	1.655	1.665	1.675	1.685	1.695	1.706	1.717	1.728	1.739
0.96	1.751	1.762	1.774	1.787	1.799	1.812	1.825	1.838	1.852	1.866
0.97	1.881	1.896	1.911	1.927	1.943	1.960	1.977	1.995	2.014	2.034
0.98	2.054	2.075	2.097	2.120	2.144	2.170	2.197	2.226	2.257	2.290
0.99	2.326	2.366	2.409	2.457	2.512	2.576	2.652	2.748	2.878	3.090

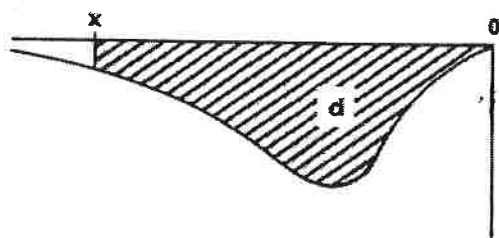
TABLE 5 CONTROL CHART LIMITS FOR SAMPLE RANGE

- The table gives:
- (i) values of k satisfying $\sigma = kE(W)$, where $E(W)$ may be estimated by $\bar{W}$,
 - (ii) values of $D_{1-\alpha}$ satisfying $P(W \leq D_{1-\alpha}) = 1 - \alpha$,
 - (iii) values of $D_{1-\alpha}$ satisfying $P(W \leq D_{1-\alpha} E(W)) = 1 - \alpha$
- where W is the range of a random sample of size n from a normal distribution with standard deviation σ .

n	k	$D_{.975}$	$D_{.999}$	$D_{.975}$	$D_{.999}$
2	0.886	3.170	4.654	2.809	4.124
3	0.591	3.682	5.064	2.176	2.992
4	0.486	3.984	5.309	1.935	2.579
5	0.430	4.197	5.484	1.804	2.358
6	0.395	4.361	5.619	1.721	2.217
7	0.370	4.493	5.729	1.662	2.119
8	0.351	4.605	5.823	1.617	2.045
9	0.337	4.700	5.903	1.583	1.988
10	0.325	4.785	5.974	1.555	1.941

TABLE 6 PERCENTAGE POINTS OF THE χ^2 -DISTRIBUTION

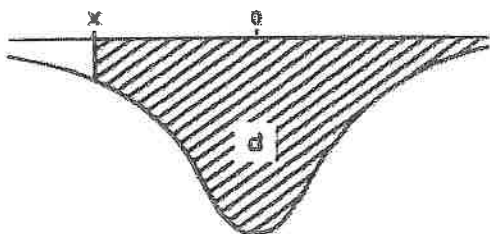
The table gives the values of x satisfying
 $P(X \leq x) = p$
 where X is a χ^2 random variable with v
 degrees of freedom.



v	0.995	0.99	0.975	0.95	0.9	0.1
1	0.00004	0.0002	0.001	0.004	0.016	2.706
2	0.010	0.020	0.051	0.103	0.211	4.605
3	0.072	0.115	0.216	0.352	0.584	6.251
4	0.207	0.297	0.484	0.711	1.064	7.779
5	0.412	0.554	0.831	1.145	1.610	9.236
6	0.676	0.872	1.237	1.635	2.204	10.645
7	0.989	1.239	1.690	2.167	2.833	12.017
8	1.344	1.646	2.180	2.733	3.490	13.362
9	1.735	2.088	2.700	3.325	4.168	14.684
10	2.156	2.558	3.247	3.940	4.865	15.987
11	2.603	3.053	3.816	4.575	5.578	17.275
12	3.074	3.571	4.404	5.226	6.304	18.549
13	3.565	4.107	5.009	5.892	7.042	19.812
14	4.075	4.660	5.629	6.571	7.790	21.064
15	4.601	5.229	6.262	7.261	8.547	22.307
16	5.142	5.812	6.908	7.962	9.312	23.542
17	5.697	6.408	7.564	8.672	10.085	24.769
18	6.265	7.015	8.231	9.390	10.865	25.989
19	6.844	7.633	8.907	10.117	11.651	27.204
20	7.434	8.260	9.591	10.851	12.443	28.412
21	8.034	8.897	10.283	11.591	13.240	29.615
22	8.643	9.542	10.982	12.338	14.041	30.813
23	9.260	10.196	11.689	13.091	14.848	32.007
24	9.886	10.856	12.401	13.848	15.659	33.196
25	10.520	11.524	13.120	14.611	16.479	34.382
26	11.160	12.198	13.844	15.379	17.292	35.563
27	11.808	12.879	14.573	16.151	18.114	36.741
28	12.461	13.565	15.308	16.928	18.939	37.916
29	13.121	14.256	16.047	17.708	19.768	39.087
30	13.787	14.953	16.791	18.493	20.599	40.256
31	14.458	15.655	17.539	19.281	21.434	41.422
32	15.135	16.362	18.291	20.072	22.271	42.585
33	15.815	17.074	19.047	20.867	23.110	43.745
34	16.501	17.789	19.806	21.664	23.952	44.903
35	17.192	18.509	20.569	22.465	24.797	46.059
36	17.887	19.233	21.336	23.269	25.643	47.212
37	18.586	19.960	22.106	24.075	26.492	48.363
38	19.289	20.691	22.878	24.884	27.343	49.513
39	19.996	21.426	23.654	25.695	28.196	50.660
40	20.707	22.164	24.433	26.509	29.051	51.805
45	24.311	25.901	28.366	30.612	33.350	57.505
50	27.991	29.707	32.357	34.764	37.689	63.167
55	31.735	33.570	36.398	38.958	42.060	68.796
60	35.534	37.485	40.482	43.188	46.459	74.397
65	39.383	41.444	44.603	47.450	50.883	79.973
70	43.275	45.442	48.758	51.739	55.329	85.527
75	47.206	49.475	52.942	56.054	59.795	91.061
80	51.172	53.540	57.153	60.391	64.278	96.578
85	55.170	57.634	61.389	64.749	68.777	102.079
90	59.196	61.754	65.647	69.126	73.291	107.565
95	63.250	65.898	69.925	73.520	77.818	113.038
100	67.328	70.065	74.222	77.929	82.358	118.498

TABLE 7 PERCENTAGE POINTS OF THE STUDENT'S t-DISTRIBUTION

The table gives the values of x satisfying
 $P(X \leq x) = p$
 where X is a random variable having the
 Student's t -distribution with v degrees of
 freedom.



$\frac{v}{p}$						$\frac{v}{p}$					
	0.995	0.99	0.975	0.95	0.9		0.995	0.99	0.975	0.95	0.9
1	3.078	6.314	12.706	31.821	63.657	29	1.311	1.699	2.045	2.462	2.756
2	1.886	2.920	4.303	6.965	9.925	30	1.310	1.697	2.042	2.457	2.750
3	1.638	2.353	3.182	4.541	5.841	31	1.309	1.696	2.040	2.453	2.744
4	1.533	2.132	2.776	3.747	4.604	32	1.309	1.694	2.037	2.449	2.738
5	1.476	2.015	2.571	3.365	4.032	33	1.308	1.692	2.035	2.445	2.733
6	1.440	1.943	2.447	3.143	3.707	34	1.307	1.691	2.032	2.441	2.728
7	1.415	1.895	2.365	2.998	3.499	35	1.306	1.690	2.030	2.438	2.724
8	1.397	1.860	2.306	2.896	3.355	36	1.306	1.688	2.028	2.434	2.719
9	1.383	1.833	2.262	2.821	3.250	37	1.305	1.687	2.026	2.431	2.715
10	1.372	1.812	2.228	2.764	3.169	38	1.304	1.686	2.024	2.429	2.712
11	1.363	1.796	2.201	2.718	3.106	39	1.304	1.685	2.023	2.426	2.708
12	1.356	1.782	2.179	2.681	3.055	40	1.303	1.684	2.021	2.423	2.704
13	1.350	1.771	2.160	2.650	3.012	45	1.301	1.679	2.014	2.412	2.690
14	1.345	1.761	2.145	2.624	2.977	50	1.299	1.676	2.009	2.403	2.678
15	1.341	1.753	2.131	2.602	2.947	55	1.297	1.673	2.004	2.396	2.668
16	1.337	1.746	2.120	2.583	2.921	60	1.296	1.671	2.000	2.390	2.660
17	1.333	1.740	2.110	2.567	2.898	65	1.295	1.669	1.997	2.385	2.654
18	1.330	1.734	2.101	2.552	2.878	70	1.294	1.667	1.994	2.381	2.648
19	1.328	1.729	2.093	2.539	2.861	75	1.293	1.665	1.992	2.377	2.643
20	1.325	1.725	2.086	2.528	2.845	80	1.292	1.664	1.990	2.374	2.639
21	1.323	1.721	2.080	2.518	2.831	85	1.292	1.663	1.988	2.371	2.635
22	1.321	1.717	2.074	2.508	2.819	90	1.291	1.662	1.987	2.368	2.632
23	1.319	1.714	2.069	2.500	2.807	95	1.291	1.661	1.985	2.366	2.629
24	1.318	1.711	2.064	2.492	2.797	100	1.290	1.660	1.984	2.364	2.626
25	1.316	1.708	2.060	2.485	2.787	125	1.288	1.657	1.979	2.357	2.616
26	1.315	1.706	2.056	2.479	2.779	150	1.287	1.655	1.976	2.351	2.609
27	1.314	1.703	2.052	2.473	2.771	200	1.286	1.653	1.972	2.345	2.601
28	1.313	1.701	2.048	2.467	2.763	∞	1.282	1.645	1.960	2.326	2.576

TABLE 8 PERCENTAGE POINTS OF THE F-DISTRIBUTION

The tables give the values of x satisfying

$$P(X \leq x) = p$$

where X is a random variable having the F -distribution with v_1 degrees of freedom in the numerator and v_2 degrees of freedom in the denominator.

The table below corresponds to $p=0.995$ and should be used for one-tail tests at significance level 0.5% or two-tail tests at significance level 1%.

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100	∞
1	162.1	200.0	216.1	225.0	230.6	234.7	237.5	239.2	240.9	242.4	243.4	244.2	245.6	246.9	248.3	249.6	250.4	251.4	253.7	254.6
2	19.0	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.5	19.5
3	16.7	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8	16.8
4	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2
5	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
6	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
7	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
8	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
9	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3
10	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1
11	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9
12	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
13	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6	11.6
14	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5
15	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4
16	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
17	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2	11.2
18	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
19	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
20	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
25	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
30	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6
40	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5
50	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4
100	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3

The table below corresponds to $p=0.99$ and should be used for one-tail tests at significance level 1% or two-tail tests at significance level 2%.

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100	∞
1	40.52	50.00	54.03	56.25	57.64	58.59	59.28	59.81	60.22	60.56	60.83	61.06	61.58	62.09	62.40	62.61	62.87	63.02	63.24	63.66
2	9.95	9.90	9.92	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93	9.93
3	9.00	8.98	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99	8.99
4	8.45	8.43	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44	8.44
5	8.00	7.98	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99	7.99
6	7.60	7.58	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59
7	7.25	7.23	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24	7.24
8	6.95	6.93	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94
9	6.65	6.63	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64	6.64
10	6.40	6.38	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39	6.39
11	6.15	6.13	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14	6.14
12	5.95	5.93	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94
13	5.75	5.73	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74	5.74
14	5.55	5.53	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54	5.54
15	5.35	5.33	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34	5.34
16	5.15	5.13	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14	5.14
17	4.95	4.93	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94	4.94
18	4.75	4.73	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74	4.74
19	4.55	4.53	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54	4.54
20	4.35	4.33	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34	4.34
25	4.15	4.13	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14	4.14
30	3.95	3.93	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94
40	3.75	3.73	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74	3.74
50	3.55	3.53	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54	3.54
100	3.35	3.33	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34

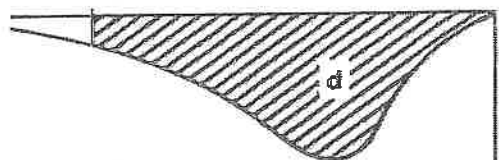
PERCENTAGE POINTS OF THE F-DISTRIBUTION

The relationship

$$F_p(v_1, v_2) = 1/F_{1-p}(v_2, v_1)$$

can be used to find the percentage points in

the lower tail.



$$x = F_p(v_1, v_2)$$

The table below corresponds to $p = 0.975$ and should be used for one-tail tests at significance level 5%.

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100	∞
1	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.7	963.3	968.6	973.0	976.7	984.9	993.1	998.1	1000	1008	1013	1018	1018

The table below corresponds to $p = 0.95$ and should be used for one-tail tests at significance level 5% or two-tail tests at significance level 10%.

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100	∞
1	161.4	199.5	215.7	226.6	230.2	234.0	236.8	239.0	240.5	241.9	243.0	243.9	246.0	248.0	249.3	250.1	251.1	251.8	253.0	245.3

$v_2 \backslash v_1$	1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100	∞
1	161.4	199.5	215.7	226.6	230.2	234.0	236.8	239.0	240.5	241.9	243.0	243.9	246.0	248.0	249.3	250.1	251.1	251.8	253.0	245.3
2	19.51	19.25	19.16	19.11	19.07	19.03	18.99	18.94	18.89	18.84	18.78	18.73	18.65	18.54	18.43	18.31	18.17	18.01	17.82	17.50
3	10.13	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786	8.763	8.745	8.703	8.640	8.564	8.475	8.371	8.251	8.113	7.750
4	7.709	6.946	6.591	6.286	6.163	6.094	6.041	5.999	5.964	5.936	5.912	5.888	5.833	5.750	5.654	5.545	5.421	5.281	5.131	4.750
5	6.608	5.786	5.409	5.192	5.050	4.956	4.876	4.810	4.754	4.704	4.659	4.614	4.545	4.454	4.341	4.213	4.068	3.913	3.750	3.375
6	5.987	5.133	4.757	4.534	4.387	4.284	4.207	4.147	4.090	4.040	3.993	3.947	3.874	3.778	3.661	3.529	3.370	3.203	3.037	2.661
7	5.591	4.737	4.361	4.138	3.990	3.887	3.810	3.750	3.700	3.652	3.605	3.559	3.483	3.384	3.264	3.129	2.960	2.791	2.625	2.249
8	5.318	4.464	4.088	3.865	3.717	3.614	3.537	3.477	3.427	3.379	3.332	3.285	3.207	3.106	2.984	2.847	2.676	2.506	2.340	1.964
9	5.117	4.263	3.887	3.664	3.516	3.413	3.336	3.276	3.226	3.178	3.131	3.084	2.995	2.893	2.770	2.632	2.460	2.290	2.124	1.748
10	4.965	4.111	3.735	3.512	3.364	3.261	3.184	3.124	3.074	3.026	2.979	2.932	2.842	2.739	2.615	2.476	2.304	2.134	1.968	1.592
11	4.844	3.989	3.613	3.390	3.242	3.139	3.062	2.992	2.932	2.874	2.826	2.779	2.688	2.585	2.460	2.320	2.148	1.978	1.812	1.436
12	4.747	3.892	3.516	3.293	3.145	3.042	2.965	2.895	2.835	2.777	2.729	2.682	2.591	2.487	2.361	2.220	2.048	1.878	1.712	1.336
13	4.687	3.832	3.456	3.233	3.085	2.982	2.905	2.835	2.775	2.717	2.669	2.622	2.531	2.427	2.300	2.159	1.987	1.817	1.651	1.275
14	4.600	3.745	3.369	3.146	2.998	2.895	2.818	2.748	2.688	2.630	2.582	2.535	2.444	2.340	2.212	2.071	1.899	1.729	1.563	1.187
15	4.543	3.688	3.312	3.089	2.941	2.838	2.761	2.691	2.631	2.573	2.525	2.478	2.387	2.283	2.155	2.014	1.842	1.672	1.506	1.130
16	4.494	3.639	3.263	3.040	2.892	2.789	2.712	2.642	2.582	2.524	2.476	2.429	2.338	2.234	2.106	1.965	1.793	1.623	1.457	1.081
17	4.451	3.592	3.216	2.993	2.845	2.742	2.665	2.595	2.535	2.477	2.429	2.382	2.291	2.187	2.059	1.918	1.746	1.576	1.410	1.034
18	4.414	3.555	3.179	2.956	2.808	2.705	2.628	2.558	2.498	2.440	2.392	2.345	2.254	2.150	2.022	1.881	1.709	1.539	1.373	1.007
19	4.381	3.522	3.146	2.923	2.775	2.672	2.595	2.525	2.465	2.407	2.359	2.312	2.221	2.117	1.989	1.848	1.676	1.506	1.340	1.000
20	4.351	3.493	3.117	2.894	2.746	2.643	2.566	2.496	2.436	2.378	2.330	2.283	2.192	2.088	1.960	1.819	1.647	1.477	1.311	1.000
25	4.242	3.385	2.999	2.776	2.628	2.525	2.448	2.378	2.318	2.260	2.212	2.165	2.074	1.970	1.842	1.701	1.529	1.359	1.193	1.000
30	4.171	3.316	2.929	2.706	2.558	2.455	2.378	2.308	2.248	2.190	2.142	2.095	2.004	1.900	1.772	1.631	1.459	1.289	1.123	1.000
40	4.034	3.183	2.796	2.573	2.425	2.322	2.245	2.175	2.115	2.057	2.009	1.962	1.871	1.767	1.639	1.498	1.326	1.156	1.000	1.000
50	3.936	3.087	2.699	2.476	2.328	2.225	2.148	2.078	2.018	1.960	1.912	1.865	1.774	1.670	1.542	1.401	1.229	1.059	1.000	1.000
100	3.841	2.992	2.604	2.381	2.233	2.130	2.053	1.983	1.923	1.865	1.817	1.770	1.679	1.575	1.447	1.306	1.134	1.000	1.000	1.000

TABLE 9 CRITICAL VALUES OF THE PRODUCT MOMENT CORRELATION COEFFICIENT

The table gives the critical values, for different significance levels, of the sample product moment correlation coefficient r based on n independent pairs of observations from a bivariate normal distribution with correlation coefficient $\rho = 0$.

n	One tail		Two tail	
	10%	5%	2.5%	1%
4	0.8000	0.9000	0.9500	0.9800
5	0.6870	0.8054	0.8783	0.9343
6	0.6084	0.7293	0.8114	0.8822
7	0.5509	0.6694	0.7545	0.8329
8	0.5067	0.6215	0.7067	0.7887
9	0.4716	0.5822	0.6664	0.7498
10	0.4428	0.5494	0.6319	0.7155
11	0.4187	0.5214	0.6021	0.6851
12	0.3981	0.4973	0.5760	0.6581
13	0.3802	0.4762	0.5529	0.6339
14	0.3646	0.4575	0.5324	0.6120
15	0.3507	0.4409	0.5140	0.5923
16	0.3383	0.4259	0.4973	0.5742
17	0.3271	0.4124	0.4821	0.5577
18	0.3170	0.4000	0.4683	0.5425
19	0.3077	0.3887	0.4555	0.5285
20	0.2992	0.3783	0.4438	0.5155
21	0.2914	0.3687	0.4329	0.5034
22	0.2841	0.3598	0.4227	0.4921
23	0.2774	0.3515	0.4132	0.4815
24	0.2711	0.3438	0.4044	0.4716
25	0.2653	0.3365	0.3961	0.4622
26	0.2598	0.3297	0.3882	0.4534
27	0.2546	0.3233	0.3809	0.4451
28	0.2497	0.3172	0.3739	0.4372
29	0.2451	0.3115	0.3673	0.4297
30	0.2407	0.3061	0.3610	0.4226
31	0.2366	0.3009	0.3550	0.4158
32	0.2327	0.2960	0.3494	0.4093
33	0.2289	0.2913	0.3440	0.4032
34	0.2254	0.2869	0.3388	0.3972
35	0.2220	0.2826	0.3338	0.3916
36	0.2187	0.2785	0.3291	0.3862
37	0.2156	0.2746	0.3246	0.3810
38	0.2126	0.2709	0.3202	0.3760
39	0.2097	0.2673	0.3160	0.3712
40	0.2070	0.2638	0.3120	0.3665
41	0.2043	0.2605	0.3081	0.3621
42	0.2018	0.2573	0.3044	0.3578
43	0.1993	0.2542	0.3008	0.3536
44	0.1970	0.2512	0.2973	0.3496
45	0.1947	0.2483	0.2940	0.3457
46	0.1925	0.2455	0.2907	0.3420
47	0.1903	0.2429	0.2876	0.3384
48	0.1883	0.2403	0.2845	0.3348
49	0.1863	0.2377	0.2816	0.3314
50	0.1843	0.2353	0.2787	0.3281
60	0.1678	0.2144	0.2542	0.2997
70	0.1550	0.1982	0.2352	0.2776
80	0.1448	0.1852	0.2199	0.2597
90	0.1364	0.1745	0.2072	0.2449
100	0.1292	0.1654	0.1966	0.2324

TABLE 10 CRITICAL VALUES OF THE SPEARMAN RANK CORRELATION COEFFICIENT

The table gives the critical values, for different significance levels, of the Spearman rank correlation coefficient r_s for various sample sizes n . It should be noted that, since r_s is discrete, exact significance levels cannot in general be achieved. The critical values given are those whose significance levels are nearest to the stated values.

n	One tail					Two tail				
	10%	5%	2.5%	1%	0.5%	10%	5%	2.5%	1%	0.5%
4	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
5	0.7000	0.9000	0.9000	1.0000	1.0000	0.9429	0.8929	0.8571	0.8095	0.8571
6	0.6571	0.7714	0.8286	0.9429	0.9429	0.8167	0.7818	0.7545	0.7273	0.7273
7	0.5714	0.6786	0.7857	0.8571	0.8571	0.6747	0.6484	0.6220	0.6000	0.6536
8	0.5476	0.6429	0.7381	0.8095	0.8095	0.6324	0.6055	0.5897	0.5897	0.5897
9	0.4833	0.6000	0.6833	0.7667	0.7667	0.5614	0.5487	0.5368	0.5256	0.5151
10	0.4424	0.5636	0.6485	0.7333	0.7333	0.5155	0.5034	0.4921	0.4815	0.4716
11	0.4182	0.5273	0.6091	0.7000	0.7000	0.4785	0.4659	0.4558	0.4451	0.4372
12	0.3986	0.5035	0.5874	0.6713	0.6713	0.4487	0.4362	0.4266	0.4158	0.4093
13	0.3791	0.4780	0.5604	0.6484	0.6484	0.4296	0.4182	0.4076	0.4026	0.3978
14	0.3670	0.4593	0.5385	0.6220	0.6220	0.3932	0.3887	0.3843	0.3801	0.3761
15	0.3500	0.4429	0.5179	0.6000	0.6000	0.3610	0.3565	0.3521	0.3478	0.3420
16	0.3382	0.4265	0.5029	0.5824	0.5824	0.3384	0.3348	0.3314	0.3281	0.3249
17	0.3271	0.4124	0.4821	0.5577	0.5577	0.3120	0.3081	0.3044	0.3008	0.2973
18	0.3170	0.4000	0.4683	0.5425	0.5425	0.2876	0.2845	0.2816	0.2787	0.2752
19	0.3077	0.3887	0.4555	0.5285	0.5285	0.2605	0.2573	0.2542	0.2512	0.2483
20	0.2992	0.3783	0.4438	0.5155	0.5155	0.2377	0.2353	0.2329	0.2307	0.2281
21	0.2914	0.3687	0.4329	0.5034	0.5034	0.2126	0.2097	0.2070	0.2043	0.2018
22	0.2841	0.3598	0.4227	0.4921	0.4921	0.1925	0.1903	0.1883	0.1863	0.1843
23	0.2774	0.3515	0.4132	0.4815	0.4815	0.1745	0.1729	0.1703	0.1678	0.1654
24	0.2711	0.3438	0.4044	0.4716	0.4716	0.1550	0.1525	0.1500	0.1475	0.1450
25	0.2653	0.3365	0.3961	0.4622	0.4622	0.1364	0.1336	0.1308	0.1280	0.1252
26	0.2598	0.3297	0.3882	0.4534	0.4534	0.1179	0.1149	0.1119	0.1089	0.1059
27	0.2546	0.3233	0.3809	0.4451	0.4451	0.1000	0.0969	0.0938	0.0907	0.0876
28	0.2497	0.3172	0.3739	0.4372	0.4372	0.0829	0.0797	0.0765	0.0733	0.0701
29	0.2451	0.3115	0.3673	0.4297	0.4297	0.0657	0.0625	0.0593	0.0561	0.0529
30	0.2407	0.3061	0.3610	0.4226	0.4226	0.0486	0.0454	0.0422	0.0390	0.0358
31	0.2366	0.3009	0.3550	0.4158	0.4158	0.0315	0.0283	0.0251	0.0219	0.0187
32	0.2327	0.2960	0.3494	0.4093	0.4093	0.0144	0.0112	0.0080	0.0048	0.0016
33	0.2289	0.2913	0.3440	0.4032	0.4032					
34	0.2254	0.2869	0.3388	0.3972	0.3972					
35	0.2220	0.2826	0.3338	0.3916	0.3916					
36	0.2187	0.2785	0.3291	0.3862	0.3862					
37	0.2156	0.2746	0.3246	0.3810	0.3810					
38	0.2126	0.2709	0.3202	0.3760	0.3760					
39	0.2097	0.2673	0.3160	0.3712	0.3712					
40	0.2070	0.2638	0.3120	0.3665	0.3665					
41	0.2043	0.2605	0.3081	0.3621	0.3621					
42	0.2018	0.2573	0.3044	0.3578	0.3578					
43	0.1993	0.2542	0.3008	0.3536	0.3536					
44	0.1970	0.2512	0.2973	0.3496	0.3496					
45	0.1947	0.2483	0.2940	0.3457	0.3457					
46	0.1925	0.2455	0.2907	0.3420	0.3420					
47	0.1903	0.2429	0.2876	0.3384	0.3384					
48	0.1883	0.2403	0.2845	0.3348	0.3348					
49	0.1863	0.2377	0.2816	0.3314	0.3314					
50	0.1843	0.2353	0.2787	0.3281	0.3281					
60	0.1678	0.2144	0.2542	0.2997	0.2997					
70	0.1550	0.1982	0.2352	0.2776	0.2776					
80	0.1448	0.1852	0.2199	0.2597	0.2597					
90	0.1364	0.1745	0.2072	0.2449	0.2449					
100	0.1292	0.1654	0.1966	0.2324	0.2324					

The table gives the values of the function $z(r) = \tanh^{-1} r$.
For $r < 0$, the relationship $z(r) = -z(-r)$ may be used.

TABLE 11 THE FISHER z -TRANSFORMATION

r	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.00	0.0000	0.0100	0.0200	0.0300	0.0400	0.0500	0.0600	0.0700	0.0800	0.0900
0.10	0.1003	0.1104	0.1206	0.1307	0.1409	0.1511	0.1614	0.1717	0.1820	0.1923
0.20	0.2027	0.2132	0.2237	0.2342	0.2448	0.2554	0.2661	0.2769	0.2877	0.2986
0.30	0.3095	0.3205	0.3316	0.3428	0.3541	0.3654	0.3769	0.3884	0.4001	0.4118
0.40	0.4236	0.4356	0.4477	0.4599	0.4722	0.4847	0.4973	0.5101	0.5230	0.5361
0.50	0.5493	0.5627	0.5763	0.5901	0.6042	0.6184	0.6328	0.6475	0.6625	0.6777
0.60	0.6931	0.7089	0.7250	0.7414	0.7582	0.7753	0.7928	0.8107	0.8291	0.8480
0.70	0.8673	0.8872	0.9076	0.9287	0.9505	0.9730	0.9962	1.0203	1.0454	1.0714
0.80	1.0986	1.1270	1.1568	1.1881	1.2212	1.2562	1.2933	1.3331	1.3758	1.4219

r	.000	.001	.002	.003	.004	.005	.006	.007	.008	.009
0.900	1.4722	1.4775	1.4828	1.4882	1.4937	1.4992	1.5047	1.5103	1.5160	1.5217
0.910	1.5275	1.5334	1.5393	1.5453	1.5513	1.5574	1.5636	1.5698	1.5762	1.5826
0.920	1.5890	1.5956	1.6022	1.6089	1.6157	1.6226	1.6296	1.6366	1.6438	1.6510
0.930	1.6584	1.6658	1.6734	1.6811	1.6888	1.6967	1.7047	1.7129	1.7211	1.7295
0.940	1.7380	1.7467	1.7555	1.7645	1.7736	1.7828	1.7923	1.8019	1.8117	1.8216
0.950	1.8318	1.8421	1.8527	1.8635	1.8745	1.8857	1.8972	1.9090	1.9210	1.9333
0.960	1.9459	1.9586	1.9721	1.9857	1.9996	2.0139	2.0287	2.0439	2.0595	2.0756
0.970	2.0923	2.1095	2.1273	2.1457	2.1649	2.1847	2.2054	2.2269	2.2494	2.2729
0.980	2.2976	2.3235	2.3507	2.3796	2.4101	2.4427	2.4774	2.5147	2.5550	2.5987
0.990	2.6467	2.6996	2.7587	2.8257	2.9031	2.9945	3.1063	3.2504	3.4534	3.8002

The table gives the values of the function $r(z) = \tanh z$.
For $z < 0$, the relationship $r(z) = -r(-z)$ may be used.

TABLE 12 THE INVERSE FISHER z -TRANSFORMATION

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.00	0.0000	0.0100	0.0200	0.0300	0.0400	0.0500	0.0599	0.0699	0.0798	0.0898
0.10	0.0997	0.1096	0.1194	0.1293	0.1391	0.1489	0.1586	0.1684	0.1781	0.1877
0.20	0.1974	0.2070	0.2165	0.2260	0.2355	0.2449	0.2543	0.2636	0.2729	0.2821
0.30	0.2913	0.3004	0.3095	0.3185	0.3275	0.3364	0.3452	0.3540	0.3627	0.3714
0.40	0.3799	0.3885	0.3969	0.4053	0.4136	0.4219	0.4301	0.4382	0.4462	0.4542
0.50	0.4621	0.4699	0.4777	0.4854	0.4930	0.5005	0.5080	0.5154	0.5227	0.5299
0.60	0.5370	0.5441	0.5511	0.5581	0.5649	0.5717	0.5784	0.5850	0.5915	0.5980
0.70	0.6044	0.6107	0.6169	0.6231	0.6291	0.6351	0.6411	0.6469	0.6527	0.6584
0.80	0.6640	0.6696	0.6751	0.6805	0.6858	0.6911	0.6963	0.7014	0.7064	0.7114
0.90	0.7163	0.7211	0.7259	0.7306	0.7352	0.7398	0.7443	0.7487	0.7531	0.7574
1.00	0.7616	0.7658	0.7699	0.7739	0.7779	0.7818	0.7857	0.7895	0.7932	0.7969
1.10	0.8005	0.8041	0.8076	0.8110	0.8144	0.8178	0.8210	0.8243	0.8275	0.8306
1.20	0.8337	0.8367	0.8397	0.8426	0.8455	0.8483	0.8511	0.8538	0.8565	0.8591
1.30	0.8617	0.8643	0.8668	0.8692	0.8717	0.8741	0.8764	0.8787	0.8810	0.8832
1.40	0.8854	0.8875	0.8896	0.8917	0.8937	0.8957	0.8977	0.8996	0.9015	0.9033
1.50	0.9051	0.9069	0.9087	0.9104	0.9121	0.9138	0.9154	0.9170	0.9186	0.9201
1.60	0.9217	0.9232	0.9246	0.9261	0.9275	0.9289	0.9302	0.9316	0.9329	0.9341
1.70	0.9354	0.9366	0.9379	0.9391	0.9402	0.9414	0.9425	0.9436	0.9447	0.9458
1.80	0.9468	0.9478	0.9488	0.9498	0.9508	0.9517	0.9527	0.9536	0.9545	0.9554
1.90	0.9562	0.9571	0.9579	0.9587	0.9595	0.9603	0.9611	0.9618	0.9626	0.9633
2.00	0.9640	0.9647	0.9654	0.9661	0.9667	0.9674	0.9680	0.9687	0.9693	0.9699
2.10	0.9705	0.9710	0.9716	0.9721	0.9727	0.9732	0.9737	0.9743	0.9748	0.9753
2.20	0.9757	0.9762	0.9767	0.9771	0.9776	0.9780	0.9785	0.9789	0.9793	0.9797
2.30	0.9801	0.9805	0.9809	0.9812	0.9816	0.9820	0.9823	0.9827	0.9830	0.9833
2.40	0.9837	0.9840	0.9843	0.9846	0.9849	0.9852	0.9855	0.9858	0.9861	0.9863
2.50	0.9866	0.9869	0.9871	0.9874	0.9876	0.9879	0.9881	0.9884	0.9886	0.9888
2.60	0.9890	0.9892	0.9895	0.9897	0.9899	0.9901	0.9903	0.9905	0.9906	0.9908
2.70	0.9910	0.9912	0.9914	0.9915	0.9917	0.9919	0.9920	0.9922	0.9923	0.9925
2.80	0.9926	0.9928	0.9929	0.9931	0.9932	0.9933	0.9935	0.9936	0.9937	0.9938
2.90	0.9940	0.9941	0.9942	0.9943	0.9944	0.9945	0.9946	0.9947	0.9949	0.9950
3.00	0.9951	0.9952	0.9953	0.9954	0.9955	0.9956	0.9957	0.9958	0.9959	0.9959
3.10	0.9960	0.9961	0.9962	0.9963	0.9964	0.9965	0.9966	0.9967	0.9968	0.9968
3.20	0.9967	0.9967	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9972	0.9972
3.30	0.9973	0.9973	0.9974	0.9974	0.9975	0.9976	0.9977	0.9977	0.9977	0.9977
3.40	0.9978	0.9978	0.9979	0.9979	0.9980	0.9980	0.9981	0.9981	0.9981	0.9981
3.50	0.9982	0.9982	0.9983	0.9983	0.9984	0.9984	0.9984	0.9984	0.9984	0.9985
3.60	0.9985	0.9985	0.9986	0.9986	0.9986	0.9987	0.9987	0.9987	0.9987	0.9988
3.70	0.9988	0.9988	0.9988	0.9988	0.9989	0.9989	0.9989	0.9989	0.9989	0.9990
3.80	0.9990	0.9990	0.9990	0.9991	0.9991	0.9991	0.9991	0.9991	0.9991	0.9992
3.90	0.9992	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993	0.9993	0.9993	0.9993

TABLE 13 CRITICAL VALUES OF THE WILCOXON SIGNED RANK STATISTIC

The table gives the upper tail critical values w_c of the statistic

$$W = \sum_{i=1}^n U_i R_i$$

where R_i denotes the rank of the magnitude of the i th. observation in a sample of size n and $U_i = 1$ or 0 according as to whether this observation is positive or negative. The lower tail critical values are given by $\frac{1}{2}n(n+1) - w_c$. Since W is discrete, exact significance levels cannot in general be achieved. The critical values given are those whose significance levels are nearest to those stated.

n	One tail		Two tail	
	10%	5%	10%	5%
3	6	9	10	15
4	9	13	14	20
5	13	19	19	26
6	17	24	24	32
7	22	30	30	39
8	28	37	37	47
9	34	44	44	55
10	41	52	52	64
11	48	61	61	74
12	56	70	70	84
13	65	79	79	95
14	74	90	90	106
15	83	100	100	118
16	94	112	112	131
17	104	124	124	144
18	116	136	136	158
19	128	150	150	172
20	140	163	163	187
21	153	178	178	203
22	167	193	193	219
23	181	208	208	235
24	196	224	224	248
25	211	241	241	266
26	227	258	258	285
27	243	276	276	304
28	260	294	294	324
29	278	313	313	345
30	296	333	333	369
32	333	394	394	412
34	373	438	438	480
36	416	485	485	530
38	460	533	533	582
40	506	564	564	691
45	632	771	771	877
50				

TABLE 14 CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC

The table gives the upper tail critical values u_α of the statistic

$$U = \sum_{j=1}^m \sum_{i=1}^n Z_{ij}$$

where $Z_{ij} = 1$ if $X_i < Y_j$ and $Z_{ij} = 0$ if $X_i > Y_j$ given the independent samples $X_1, X_2, \dots, X_m$ and $Y_1, Y_2, \dots, Y_n$. The lower tail critical values are given by $mn - u_\alpha$.

$n \backslash m$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
2	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
3	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
4	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
5	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
6	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
7	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
8	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
9	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
10	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
11	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
12	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
13	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
14	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
15	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
16	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
17	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
18	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
19	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
20	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
21	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
22	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
23	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
25	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
26	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
27	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
28	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
29	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84
30	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84

$n \backslash m$	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	18	20	22	24	26	28	30	31	33	35	37	39	41	43	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
2	18	20	22	24	26	28	30	31	33	35	37	39	41	43	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
3	18	20	22	24	26	28	30	31	33	35	37	39	41	43	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74
4	16	20	22	26	30	34	36	38	40	43	46	48	50	52	54	56	58	60	63	65	67	69	71	73	75	77	79	81	83	85
5	15	20	24	28	32	36	40	44	48	51	55	59	63	67	71	75	79	83	87	91	95	99	103	107	111	115	119	123	127	131
6	18	23	28	33	37	42	47	51	56	61	65	70	75	79	84	89	93	98	102	107	111	116	120	125	129	134	138	143	147	152
7	18	26	33	40	47	53	60	67	73	80	87	93	100	106	113	119	127	134	141	148	155	162	169	176	183	190	197	204	211	218
8	18	27	36	45	54	62	71	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192	200	208	216	224	232	240	248	256
9	18	28	38	48	58	67	77	86	95	104	113	122	131	140	149	158	167	176	185	194	203	212	221	230	239	248	257	266	275	284
10	20	30	40	50	60	69	79	88	97	106	115	124	133	142	151	160	169	178	187	196	205	214	223	232	241	250	259	268	277	286
11	22	32	42	52	62	71	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234	243	252	261	270	279	288
12	24	34	44	54	64	73	83	92	101	110	119	128	137	146	155	164	173	182	191	200	209	218	227	236	245	254	263	272	281	290
13	26	36	46	56	66	75	84	93	102	111	120	129	138	147	156	165	174	183	192	201	210	219	228	237	246	255	264	273	282	291
14	28	38	48	58	68	77	86	95	104	113	122	131	140	149	158	167	176	185	194	203	212	221	230	239	248	257	266	275	284	293
15	30	40	50	60	70	79	88	97	106	115	124	133	142	151	160	169	178	187	196	205	214	223	232	241	250	259	268	277	286	295
16	32	42	52	62	72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234	243	252	261	270	279	288	297
17	34	44	54	64	74	83	92	101	110	119	128	137	146	155	164	173	182	191	200	209	218	227	236	245	254	263	272	281	290	299
18	36	46	56	66	76	85	94	103	112	121	130	139	148	157	166	175	184	193	202	211	220	229	238	247	256	265	274	283	292	301
19	38	48	58	68	78	87	96	105	114	123	132	141	150	159	168	177	186	195	204	213	222	231	240	249	258	267	276	285	294	303
20	40	50	60	70	80	89	98	107	116	125	134	143	152	161	170	179	188	197	206	215	224	233	242	251	260	269	278	287	296	305
21	42	52	62	72	82	91	100	109	118	127	136	145	154	163	172	181	190	199	208	217	226	235	244	253	262	271	280	289	298	307
22	44	54	64	74	84	93	102	111	120	129	138	147	156	165	174	183	192	201	210	219	228	237	246	255	264	273	282	291	300	309
23	46	56	66	76	86	95	104	113	122	131	140	149	158	167	176	185	194	203	212	221	230	239	248	257	266	275	284	293	302	311
24	48	58	68	78	88	97	106	115	124	133	142	151	160	169	178	187	196	205	214	223	232	241	250	259	268	277	286	295	304	313
25	50	60	70	80	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216	225	234	243	252	261	270	279	288	297	306	315
26	52	62	72	82	92	101	110	119	128	137	146	155	164	173	182	191	200	209	218	227	236	245	254	263	272	281	290	299	308	317
27	54	64	74	84	94	103	112	121	130	139	148	157	166	175	184	193	202	211	220	229	238	247	256	265	274	283	292	301	310	319
28	56	66	76	86	96	105	114	123	132	141	150	159	168	177	186	195	204	213	222	231	240	249	258	267	276	285	294	303	312	321
29	58	68	78	88	98	107	116	125	134	143	152	161	170	179	188	197	206	215	224	233	242	251	260	269	278	287	296	305	314	323
30	60	70	80	90	100	109	118	127	136	145	154	163	172	181	190	199	208	217	226	235	244	253	262	271	280	289	298	307	316	325

CRITICAL VALUES OF THE MANN-WHITNEY STATISTIC

Since U is discrete, exact significance levels cannot in general be achieved. The critical values given are those whose significance levels are nearest to those stated.

n	m	One tail 2.5% Two tail 5%																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
30	30	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68
29	29	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65	67
28	28	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66
27	27	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65
26	26	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64
25	25	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63
24	24	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62
23	23	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61
22	22	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
21	21	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59
20	20	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
19	19	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
18	18	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
17	17	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
16	16	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
15	15	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
14	14	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
13	13	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
12	12	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
11	11	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
10	10	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
9	9	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
8	8	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
7	7	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
6	6	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
5	5	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
4	4	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
3	3	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
2	2	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57
1	1	0	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57

n	One tail 5% Two tail 10%																													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0
28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0
27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0
26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0
25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0
24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0
23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0
22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0
21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0
20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0
19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0
18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 15 RANDOM DIGITS

The table gives 2500 random digits, from 0 to 9, arranged for convenience in blocks of 5.

87024	74221	69721	44518	58804	04860	18127	16855	61558	15430
04852	03436	72753	99836	37513	91341	53517	92094	54386	44563
33592	45845	52015	72030	23071	92933	84219	39455	57792	14216
68121	53688	56812	34869	28573	51079	94677	23993	88241	97735
25062	10428	43930	56812	34869	28573	51079	94677	23993	88241
78183	44396	11064	32828	00927	61841	64754	91125	01206	06691
94342	91040	94035	02650	36284	91162	07950	36178	42536	49869
92503	29854	24116	61149	49266	82303	54924	58251	23928	20703
71646	57503	82416	22657	72359	30085	13037	39608	77439	49318
51809	70780	41544	27828	84321	07714	25865	97896	01924	62028
88504	21620	07292	71021	80929	45042	08703	45894	24521	49942
33186	49273	87542	41086	29615	81101	43707	87031	36101	15137
40068	35043	05280	62921	30122	65119	40512	26855	40842	83244
76401	68461	20711	12007	19209	28259	49820	76415	51534	63574
47014	93729	74235	47808	52473	03145	92563	05837	70023	33169
67147	90741	53647	55007	36607	29360	83163	79024	26155	99885
86987	62924	93157	70947	07336	49541	81386	26968	38311	99885
58973	47026	78574	08804	22960	32850	67944	92303	61216	72948
71635	86749	40369	94639	40731	54012	03972	98581	45604	34885
60971	54212	32596	03052	84150	36798	62635	26210	95685	87089
06599	60910	66315	96690	19039	39878	44688	65146	02482	73130
89960	27162	66264	71024	18708	77974	40473	87155	35834	03114
03930	56898	61900	44036	90012	17673	54167	82396	39468	49566
31338	28729	02095	07429	35718	86882	37513	51560	08872	33717
29782	33287	27400	42915	49914	68221	56088	06112	95481	30094
68493	88796	94771	89418	62045	40681	15941	05962	44378	64349
42534	31925	94158	90197	62874	53659	33433	48610	14698	54761
76126	41049	43363	52461	00552	93352	58497	16347	87145	73668
80434	73037	69008	36801	25520	14161	32300	04187	80668	07499
81301	39731	53857	19690	39998	49829	12399	70867	44498	17385
54521	42350	82908	51212	70208	39891	64871	67448	42988	32600
82530	22869	87276	06678	36873	61198	87748	07531	29592	39612
81338	64309	45798	42954	95565	02789	83017	82936	67117	17709
58264	60374	32610	17879	96900	68029	06993	84288	35401	56317
77023	46829	21332	77383	15547	29332	77698	89878	20489	71800
29750	59902	78110	59018	87548	10225	15774	70778	56086	08117
08288	38411	69886	64918	29055	87607	37452	38174	31431	46173
93908	94810	22057	94240	89918	16561	92716	66461	22337	64718
06341	25883	42574	80202	57287	95120	69332	19036	43326	98697
23240	94741	55622	79479	34606	51079	09476	10695	49618	63037
96370	19171	40441	05002	33165	28693	45027	73791	23047	32976
97050	16194	61095	26533	81738	77032	60551	31605	95212	81078
40833	12169	10712	78345	48236	45086	61654	94929	69169	70561
95676	13582	25664	60838	88071	50052	63188	50346	65618	17517
28030	14185	13226	99566	45483	10079	22945	23903	11695	10694
60202	32586	87466	83357	95516	31258	66309	40615	30572	60842
46530	48755	02308	79508	53422	50805	08896	06963	93922	99423
53151	95839	01745	46462	81463	28669	60179	17880	75875	34562
80272	64398	88249	06792	98424	66842	49129	98939	34173	49883

TABLE 16 NEGATIVE EXPONENTIAL FUNCTION

The table gives the values of the function $f(x) = e^{-x}$.

SUBTRACT

x	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	1.0000	.99005	.98020	.97045	.96079	.95123	.94176	.93239	.92312	.91393
0.1	.90484	.89583	.88692	.87810	.86936	.86071	.85214	.84366	.83527	.82696
0.2	.81873	.81058	.80252	.79453	.78663	.77880	.77105	.76338	.75578	.74826
0.3	.74082	.73345	.72615	.71892	.71177	.70469	.69766	.69073	.68386	.67706
0.4	.67032	.66365	.65705	.65051	.64404	.63763	.63128	.62500	.61878	.61263
0.5	.60653	.60050	.59452	.58860	.58275	.57695	.57121	.56553	.55990	.55433
0.6	.54881	.54335	.53794	.53259	.52729	.52205	.51685	.51171	.50662	.50158
0.7	.49659	.49164	.48675	.48191	.47711	.47237	.46767	.46301	.45841	.45384
0.8	.44933	.44486	.44043	.43605	.43171	.42741	.42316	.41895	.41478	.41066
0.9	.40657	.40252	.39852	.39455	.39063	.38674	.38289	.37908	.37531	.37158
1.0	.36788	.36422	.36059	.35701	.35345	.34994	.34646	.34301	.33960	.33622
1.1	.33287	.32956	.32628	.32303	.31982	.31664	.31349	.31037	.30728	.30422
1.2	.30119	.29820	.29523	.29229	.28938	.28650	.28365	.28083	.27804	.27527
1.3	.27253	.26982	.26714	.26448	.26185	.25924	.25666	.25411	.25158	.24908
1.4	.24660	.24414	.24171	.23931	.23693	.23457	.23224	.22993	.22764	.22537
1.5	.22313	.22091	.21871	.21654	.21438	.21225	.21014	.20805	.20598	.20393
1.6	.20190	.19988	.19790	.19593	.19398	.19205	.19014	.18825	.18637	.18452
1.7	.18266	.18087	.17907	.17728	.17552	.17377	.17204	.17033	.16864	.16696
1.8	.16530	.16365	.16203	.16041	.15882	.15724	.15567	.15412	.15259	.15107
1.9	.14957	.14808	.14661	.14515	.14370	.14227	.14086	.13946	.13807	.13670
2.0	.13534	.13395	.13256	.13119	.12983	.12848	.12715	.12583	.12451	.12319
2.1	.12184	.12053	.11924	.11795	.11668	.11543	.11418	.11294	.11171	.11048
2.2	.10920	.10797	.10676	.10553	.10432	.10313	.10194	.10077	.99601	.98427
2.3	.10306	.10187	.10069	.99512	.98357	.97204	.96052	.94901	.93751	.92602
2.4	.91454	.90309	.89165	.88022	.86880	.85739	.84599	.83460	.82322	.81185
2.5	.80049	.78915	.77782	.76650	.75519	.74389	.73260	.72132	.71005	.69879
2.6	.68754	.67629	.66505	.65382	.64260	.63139	.62019	.60899	.59780	.58662
2.7	.57544	.56425	.55307	.54190	.53074	.51959	.50844	.49730	.48616	.47503
2.8	.46390	.45276	.44163	.43051	.41940	.40830	.39721	.38612	.37504	.36396
2.9	.35289	.34188	.33088	.31989	.30891	.29794	.28698	.27603	.26508	.25414
3.0	.24320	.23226	.22133	.21041	.20000	.19000	.18000	.17000	.16000	.15000
3.1	.14000	.13000	.12000	.11000	.10000	.09000	.08000	.07000	.06000	.05000
3.2	.04000	.03000	.02000	.01000	.00000	.00000	.00000	.00000	.00000	.00000
3.3	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
3.4	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
3.5	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
3.6	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
3.7	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
3.8	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
3.9	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.0	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.1	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.2	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.3	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.4	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.5	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.6	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.7	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.8	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000
4.9	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00000

