UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Pertama
Sidang Akademik 1989/90

Oktober/November 1989

IUK 207/3 - Kaedah dan Amalan Teknologis

Masa: [3 jam]

Sila pastikan bahawa kertas peperiksaan ini mengandungai 12 (DUABELAS) mukasurat yang bercetak (termasuk Lampiran) sebelum anda memulakan peperiksaan ini.

Jawab 5 (LIMA) soalan daripada 8 soalan yang diberi. Semua soalan mesti dijawab di dalam Bahasa Malaysia.

Semua soalan mengandungi nilai yang sama.

1. Jawab sebarang empat bahagian soalan ini.

   (a) Kaedah saintifik

   (b) Data jenis "attribute"

   (c) "Outliers"

   (d) Kepersisan "repeatability" dan "reproducibility"

   (e) Propagasi ralat

2. (a) Apakah jeda keyakinan?

   <u>atau</u>

   apakah paras signifikans? [5 markah]

   (b) Jangka lasak pada lampu-lampu elektrik yang dihasilkan oleh sebuah kilang mengikut agihan normal dengan min 100 jam dengan varians 36. Apakah peratusan yang akan tahan lasak lebih dari 110 jam? Apakah peratusan yang akan tahan lasak selama antara 85 dan 95 jam? [15 markah]

3. Sebuah kilang mengwujudkan satu program latihan yang tujuannya untuk memperbaiki prestasi pekerja-pekerjanya. Prestasi seramai 12 orang pekerja dinilaikan menurut kriterion-kriterion tertentu sebelum dan setelah program itu. Skor-skor prestasi yang diperolehi seperti berikut:

Pekerja	Skor prestasi	
	Sebelum mengikut program	Setelah mengikut program
1	61	65
2	55	54
3	66	62
4	65	65
5	58	59
6	61	64
7	58	58
8	59	(Pekerja meninggalkan kilang sebelum tamat program)
9	60	62
10	59	58
11	63	67
12	67	66

Adakah data di atas menunjuk bahawa program latihan itu berkesan untuk memperbaiki prestasi pekerja? Beri ulasan mengenai ujian statistik yang anda lakukan serta data yang digunakan.

4. Sesuatu proses pengilangan menghasil piston motokar. Mula-mula 200 piston diperiksa dan 24 darinya adalah defektif. Oleh hal yang demikian satu kaedah pembaikan diwujudkan. Dengan adanya sistem baru itu, dari 200 piston yang diperiksa 9 adalah defektif. Adakah data ini menunjuk kaedah pembaikan itu berkesan pada paras signifikans $\alpha = 0.05$?

[15 markah]

Adakah keputusan sama sekiranya pembetulan Yates tidak dilakukan? [5 markah]

5. Prestasi pelajar dalam peperiksaan kursus IUK 207 dikaji. Sepuluh orang pelajar dipilih dari kelas tersebut secara rambang. Jangka pembelajaran mereka dan markah yang diperolehi seperti berikut:

Jangka pembelajaran (jam)	Markah yang diperolehi
8	56
5	57
11	79
13	72
10	70
5	54
18	82
15	85
2	33
8	65

Adakah ini menunjuk iaitu pelajar yang belajar lebih lama memperolehi markah lebih tinggi pada paras signifikans $\alpha = 0.01$? [Panduan: Kirakan dengan menggunakan koefisien korelasi beza peringkat Spearman (Spearman's rank difference correlation coefficient): $r_s = 1 - \frac{6\Sigma d^2}{n(n^2-1)}$].

6. Sebuah kilang melakukan proses baru untuk membuat satu hasilan celup lateks getah asli. Kilang itu ingin mengwujudkan program kawalan mutu untuk mengawal berat hasilan itu. Sehubungan dengan kehendak ini, sampel-sampel lima unit dikutip dan tiap-tiap unitnya ditimbang. Data beratnya yang diperolehi seperti berikut

Nombor sampel	Berat (gram)				
	1	2	3	4	5
1	4.849	4.890	4.862	4.857	4.842
2	4.896	4.875	4.882	4.856	4.861
3	4.871	4.857	4.868	4.856	4.863
4	4.847	4.850	4.869	4.839	4.851
5	4.858	4.873	4.862	4.847	4.848
6	4.865	4.844	4.836	4.853	4.856
7	4.858	4.841	4.883	4.877	4.850
8	4.871	4.837	4.862	4.855	4.845
9	4.833	4.859	4.863	4.848	4.859
10	4.878	4.852	4.849	4.861	4.867
11	4.860	4.866	4.858	4.870	4.857
12	4.841	4.859	4.863	4.848	4.859
13	4.844	4.836	4.855	4.872	4.865
14	4.828	4.860	4.860	4.852	4.874
15	4.863	4.887	4.885	4.851	4.868
16	4.882	4.872	4.864	4.870	4.854
17	4.840	4.863	4.864	4.851	4.867
18	4.856	4.860	4.859	4.876	4.869
19	4.849	4.863	4.862	4.868	4.855
20	4.856	4.850	4.869	4.863	4.864

Dirikan carta $\bar{x}$ dan R. Labelkan kedua dua carta itu dengan baik-baik. Buat ulasan mengenai carta-carta itu.

7. Data berikut menunjukkan bilangan kecacatan yang didapati dalam tiap-tiap motokar semasa penghasilannya dalam satu jangka tertentu.

Nombor motokar	Bilangan kecacatan	Nombor motorkar	Bilangan kecacatan
201	7	226	7
202	6	227	13
203	6	228	4
204	7	229	5
205	4	230	9
206	7	231	3
207	8	232	4
208	12	233	6
209	9	234	7
210	9	235	14
211	8	236	18
212	5	237	11
213	5	238	11
214	9	239	11
215	8	240	8
216	15	241	10
217	6	242	8
218	4	243	7
219	13	244	16
220	7	245	13
221	8	246	12
222	15	247	9
223	6	248	11
224	6	249	11
225	10	250	8

Dengan menggunakan data itu, dirikan carta kawalan yang sesuai. [16 markah]

Buat ulasan mengenai penemuan-penemuan ganjil dalam carta itu. [4 markah]

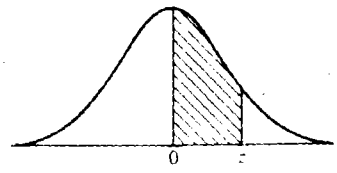
8. (a) Tulis nota-nota ringkas mengenai "variables" dan "attributes". [10 markah]

(b) Tulis nota-nota ringkas mengenai carta kawalan "variables" dan carta kawalan "attributes". [10 markah]

oooooooooo0000oooooooooo

LAMPIRAN A

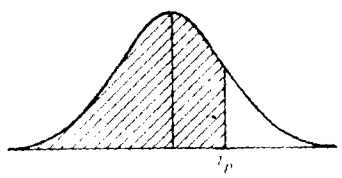
Standardized Normal Distribution—Areas Under the Standard Normal Curve from 0 to z



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2966	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4949	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

LAMPIRAN B

Student's t-Distribution—Percentile Values (t_p) with ν Degrees of Freedom (shaded area = p)



ν	$t_{.995}$	$t_{.99}$	$t_{.975}$	$t_{.95}$	$t_{.90}$	$t_{.80}$	$t_{.75}$	$t_{.70}$	$t_{.60}$	$t_{.55}$
1	63.66	31.82	12.71	6.31	3.08	1.376	1.000	.727	.325	.158
2	9.92	6.96	4.30	2.92	1.89	1.061	.816	.617	.289	.142
3	5.84	4.54	3.18	2.35	1.64	.978	.765	.584	.277	.137
4	4.60	3.75	2.78	2.13	1.53	.941	.741	.569	.271	.134
5	4.03	3.36	2.57	2.02	1.48	.920	.727	.559	.267	.132
6	3.71	3.14	2.45	1.94	1.44	.906	.718	.553	.265	.131
7	3.50	3.00	2.36	1.90	1.42	.896	.711	.549	.263	.130
8	3.36	2.90	2.31	1.86	1.40	.889	.706	.546	.262	.130
9	3.25	2.82	2.26	1.83	1.38	.883	.703	.543	.261	.129
10	3.17	2.76	2.23	1.81	1.37	.879	.700	.542	.260	.129
11	3.11	2.72	2.20	1.80	1.36	.876	.697	.540	.260	.129
12	3.06	2.68	2.18	1.78	1.36	.873	.695	.539	.259	.128
13	3.01	2.65	2.16	1.77	1.35	.870	.694	.538	.259	.128
14	2.98	2.62	2.14	1.76	1.34	.868	.692	.537	.258	.128
15	2.95	2.60	2.13	1.75	1.34	.866	.691	.536	.258	.128
16	2.92	2.58	2.12	1.75	1.34	.865	.690	.535	.258	.128
17	2.90	2.57	2.11	1.74	1.33	.863	.689	.534	.257	.128
18	2.88	2.55	2.10	1.73	1.33	.862	.688	.534	.257	.127
19	2.86	2.54	2.09	1.73	1.33	.861	.688	.533	.257	.127
20	2.84	2.53	2.09	1.72	1.32	.860	.687	.533	.257	.127
21	2.83	2.52	2.08	1.72	1.32	.859	.686	.532	.257	.127
22	2.82	2.51	2.07	1.72	1.32	.858	.686	.532	.256	.127
23	2.81	2.50	2.07	1.71	1.32	.858	.685	.532	.256	.127
24	2.80	2.49	2.06	1.71	1.32	.857	.685	.531	.256	.127
25	2.79	2.48	2.06	1.71	1.32	.856	.684	.531	.256	.127
26	2.78	2.48	2.06	1.71	1.32	.856	.684	.531	.256	.127
27	2.77	2.47	2.05	1.70	1.31	.855	.684	.531	.256	.127
28	2.76	2.47	2.05	1.70	1.31	.855	.683	.530	.256	.127
29	2.76	2.46	2.04	1.70	1.31	.854	.683	.530	.256	.127
30	2.75	2.46	2.04	1.70	1.31	.854	.683	.530	.256	.127
40	2.70	2.42	2.02	1.68	1.30	.851	.681	.529	.255	.126
60	2.66	2.39	2.00	1.67	1.30	.848	.679	.527	.254	.126
120	2.62	2.36	1.98	1.66	1.29	.845	.677	.526	.254	.126
∞	2.58	2.33	1.96	1.645	1.28	.842	.674	.524	.253	.126

Table 3 Percentage points of the χ^2 distribution

α	·995	·99	·975	·95	·50	·20	·10	·05	·025	·01	·005
ν											
1	0·000	0·0002	0·001	0·0039	0·45	1·64	2·71	3·84	5·02	6·63	7·88
2	0·010	0·020	0·051	0·103	1·39	3·22	4·61	5·99	7·38	9·21	10·60
3	0·072	0·115	0·216	0·352	2·37	4·64	6·25	7·81	9·35	11·34	12·84
4	0·207	0·30	0·484	0·71	3·36	5·99	7·78	9·49	11·14	13·28	14·86
5	0·412	0·55	0·831	1·15	4·35	7·29	9·24	11·07	12·83	15·09	16·75
6	0·676	0·87	1·24	1·64	5·35	8·56	10·64	12·59	14·45	16·81	18·55
7	0·989	1·24	1·69	2·17	6·35	9·80	12·02	14·07	16·01	18·48	20·28
8	1·34	1·65	2·18	2·73	7·34	11·03	13·36	15·51	17·53	20·09	21·95
9	1·73	2·09	2·70	3·33	8·34	12·24	14·68	16·92	19·02	21·67	23·59
10	2·16	2·56	3·25	3·94	9·34	13·44	15·99	18·31	20·48	23·21	25·19
11	2·60	3·05	3·82	4·57	10·34	14·63	17·28	19·68	21·92	24·72	26·76
12	3·07	3·57	4·40	5·23	11·34	15·81	18·55	21·03	23·34	26·22	28·30
13	3·57	4·11	5·01	5·89	12·34	16·98	19·81	22·36	24·74	27·69	29·82
14	4·07	4·66	5·63	6·57	13·34	18·15	21·06	23·68	26·12	29·14	31·32
15	4·60	5·23	6·26	7·26	14·34	19·31	22·31	25·00	27·49	30·58	32·80
16	5·14	5·81	6·91	7·96	15·34	20·47	23·54	26·30	28·85	32·00	34·27
17	5·70	6·41	7·56	8·67	16·34	21·61	24·77	27·59	30·19	33·41	35·72
18	6·26	7·02	8·23	9·39	17·34	22·76	25·99	28·87	31·53	34·81	37·16
19	6·84	7·63	8·91	10·12	18·34	23·90	27·20	30·14	32·85	36·19	38·58
20	7·43	8·26	9·59	10·85	19·34	25·04	28·41	31·41	34·17	37·57	40·00
21	8·03	8·90	10·28	11·59	20·34	26·17	29·62	32·67	35·48	38·93	41·40
22	8·64	9·54	10·98	12·34	21·34	27·30	30·81	33·92	36·78	40·29	42·80
23	9·26	10·20	11·69	13·09	23·34	28·43	32·01	35·17	38·08	41·64	44·18
24	9·89	10·86	12·40	13·85	23·34	29·55	33·20	36·42	39·36	42·98	45·56
25	10·52	11·52	13·12	14·61	24·34	30·68	34·38	37·65	40·65	44·31	46·93
26	11·16	12·20	13·84	15·38	25·34	31·79	35·56	38·89	41·92	45·64	48·29
27	11·81	12·88	14·57	16·15	26·34	32·91	36·74	40·11	43·19	46·96	49·64
28	12·46	13·57	15·31	16·93	27·34	34·03	37·92	41·34	44·46	48·26	50·99
29	13·12	14·26	16·05	17·71	28·34	35·14	39·09	42·56	45·72	49·58	52·34
30	13·79	14·95	16·79	18·49	29·34	36·25	40·26	43·77	46·98	50·89	53·67
40	20·71	22·16	24·43	26·51	39·34	47·27	51·81	55·76	59·34	63·69	66·77
50	27·99	29·71	32·36	34·76	49·33	58·16	63·17	67·50	71·41	76·15	79·49
60	35·53	37·48	40·48	43·19	59·33	68·97	74·40	79·08	83·30	88·38	91·95
70	43·28	45·44	48·76	51·74	69·33	79·71	85·53	90·53	95·02	100·43	104·2
80	51·17	53·54	57·15	60·39	79·33	90·41	96·58	101·88	106·63	112·33	116·3
90	59·20	61·75	65·65	69·13	89·33	101·05	107·57	113·15	118·14	124·12	128·3
100	67·33	70·06	74·22	77·93	99·33	111·67	118·50	124·34	129·56	135·81	140·2

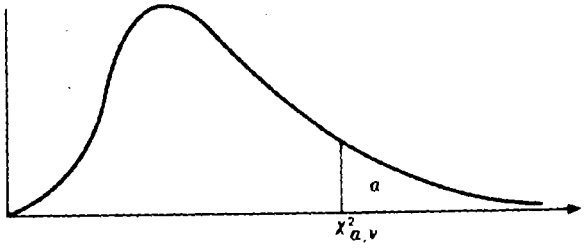


Table I. Critical Values for the Spearman Rank-Order Correlation Coefficient

	Significance level for a directional test at			
	.05	.025	.005	.001
	Significance level for a non-directional test at			
N	.10	.05	.01	.002
5	.900	1.000		
6	.829	.886	1.000	
7	.715	.786	.929	1.000
8	.620	.715	.881	.953
9	.600	.700	.834	.917
10	.564	.649	.794	.879
11	.537	.619	.764	.855
12	.504	.588	.735	.826
13	.484	.561	.704	.797
14	.464	.539	.680	.772
15	.447	.522	.658	.750
16	.430	.503	.636	.730
17	.415	.488	.618	.711
18	.402	.474	.600	.693
19	.392	.460	.585	.676
20	.381	.447	.570	.661
21	.371	.437	.556	.647
22	.361	.426	.544	.633
23	.353	.417	.532	.620
24	.345	.407	.521	.608
25	.337	.399	.511	.597
26	.331	.391	.501	.587
27	.325	.383	.493	.577
28	.319	.376	.484	.567
29	.312	.369	.475	.558
30	.307	.363	.467	.549

Source: Glasser, G. J., and R. F. Winter, "Critical Values of the Coefficient of Rank Correlation for Testing the Hypothesis of Independence," *Biometrika*, 48, 444 (1961).

If the observed value of r_s is *greater than or equal to* the tabled value for the appropriate level of significance, reject H_0. Note that the left-hand column is the number of pairs of scores, not the number of degrees of freedom. The critical values listed are both + and − for non-directional tests.

TABLE B. Factors for computing control chart lines

No. of Observations in Sample	Chart for Averages				Chart for Standard Deviations								Chart for Ranges				
	Factors for control limits				Factors for central line		Factors for control limits						Factors for central line	Factors for control limits			
n	A	A_1	A_2	A_3	c_2	c_4	B_1	B_2	B_3	B_4	B_5	B_6	d_2	D_1	D_2	D_3	D_4
2	2.121	3.760	1.880	2.659	0.5642	0.7979	0	1.843	0	3.267	0	2.606	1.128	0	3.686	0	3.267
3	1.732	2.394	1.023	1.954	0.7236	0.8862	0	1.858	0	2.568	0	2.276	1.693	0	4.358	0	2.575
4	1.500	1.880	0.729	1.628	0.7979	0.9213	0	1.808	0	2.266	0	2.088	2.059	0	4.698	0	2.282
5	1.342	1.596	0.577	1.427	0.8407	0.9400	0	1.756	0	2.089	0	1.964	2.326	0	4.918	0	2.115
6	1.225	1.410	0.483	1.287	0.8686	0.9515	0.026	1.711	0.030	1.970	0.029	1.874	2.534	0	5.078	0	2.004
7	1.134	1.277	0.419	1.182	0.8882	0.9594	0.105	1.672	0.118	1.882	0.113	1.806	2.704	0.205	5.203	0.076	1.924
8	1.061	1.175	0.373	1.099	0.9027	0.9650	0.167	1.638	0.185	1.815	0.179	1.751	2.847	0.387	5.307	0.136	1.864
9	1.000	1.094	0.337	1.032	0.9139	0.9693	0.219	1.609	0.239	1.761	0.232	1.707	2.970	0.546	5.394	0.184	1.816
10	0.949	1.028	0.308	0.975	0.9227	0.9727	0.262	1.584	0.284	1.716	0.276	1.669	3.078	0.687	5.469	0.223	1.777
11	0.905	0.973	0.285	0.927	0.9300	0.9754	0.299	1.561	0.321	1.679	0.313	1.637	3.173	0.812	5.534	0.256	1.744
12	0.866	0.925	0.266	0.886	0.9359	0.9776	0.331	1.541	0.354	1.646	0.346	1.610	3.258	0.924	5.592	0.284	1.716
13	0.832	0.884	0.249	0.850	0.9410	0.9794	0.359	1.523	0.382	1.618	0.374	1.585	3.336	1.026	5.646	0.308	1.692
14	0.802	0.848	0.235	0.817	0.9453	0.9810	0.384	1.507	0.406	1.594	0.399	1.563	3.407	1.121	5.693	0.329	1.671
15	0.775	0.816	0.223	0.789	0.9490	0.9823	0.406	1.492	0.428	1.572	0.421	1.544	3.472	1.207	5.737	0.348	1.652
16	0.750	0.788	0.212	0.763	0.9523	0.9835	0.427	1.478	0.448	1.552	0.440	1.526	3.532	1.285	5.779	0.364	1.636
17	0.728	0.762	0.203	0.739	0.9551	0.9845	0.445	1.465	0.466	1.534	0.458	1.511	3.588	1.359	5.817	0.379	1.621
18	0.707	0.738	0.194	0.718	0.9576	0.9854	0.461	1.454	0.482	1.518	0.475	1.496	3.640	1.426	5.854	0.392	1.608
19	0.688	0.717	0.187	0.698	0.9599	0.9862	0.477	1.443	0.497	1.503	0.490	1.483	3.689	1.490	5.888	0.404	1.596
20	0.671	0.697	0.180	0.680	0.9619	0.9869	0.491	1.433	0.510	1.490	0.504	1.470	3.375	1.548	5.922	0.414	1.586
21	0.655	0.679	0.173	0.663	0.9638	0.9876	0.504	1.424	0.523	1.477	0.516	1.459	3.778	1.606	5.950	0.425	1.575
22	0.640	0.662	0.167	0.647	0.9655	0.9882	0.516	1.415	0.534	1.466	0.528	1.448	3.819	1.659	5.979	0.434	1.566
23	0.626	0.647	0.162	0.633	0.9670	0.9887	0.527	1.407	0.545	1.455	0.539	1.438	3.858	1.710	6.006	0.443	1.557
24	0.612	0.632	0.157	0.619	0.9684	0.9892	0.538	1.399	0.555	1.445	0.549	1.429	3.895	1.759	6.031	0.452	1.548
25	0.600	0.619	0.153	0.606	0.9696	0.9896	0.548	1.392	0.565	1.435	0.559	1.420	3.931	1.804	6.058	0.459	1.541
Over 25	$\frac{3}{\sqrt{n}}$	$\frac{3}{\sqrt{n}}$	...	...	...	...	*	**	*	**	*	**	...	...	...	...	...

Source: ASTM Manual on Quality Control of Materials, American Society for Testing and Materials, Philadelphia, Table B2, p. 115. The values for A_3, c_4, B_5, and B_6 are reprinted with permission of the American Society for Quality Control.

* $1 - \frac{3}{\sqrt{2n}}$ ** $1 + \frac{3}{\sqrt{2n}}$