N(0,1) standardized normal distribution

u	0	1	2	3	4	5	6	7	8	9
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.1	0.53983	0.54380	0.54776	0.55172	0.55567	0.55962	0.56356	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.62930	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71226	0.71566	0.71904	0.72240
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.7	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214
1.1	0.86433	0.86650	0.86864	0.87076	0.87286	0.87493	0.87698	0.87900	0.88100	0.88298
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.3	0.90320	0.90490	0.90658	0.90824	0.90988	0.91149	0.91308	0.91466	0.91621	0.91774
1.4	0.91924	0.92073	0.92220	0.92364	0.92507	0.92647	0.92785	0.92922	0.93056	0.93189
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.6	0.94520	0.94630	0.94738	0.94845	0.94950	0.95053	0.95154	0.95254	0.95352	0.95449
1.7	0.95543	0.95637	0.95728	0.95818	0.95907	0.95994	0.96080	0.96164	0.96246	0.96327
1.8	0.96407	0.96485	0.96562	0.96638	0.96712	0.96784	0.96856	0.96926	0.96995	0.97062
1.9	0.97128	0.97193	0.97257	0.97320	0.97381	0.97441	0.97500	0.97558	0.97615	0.97670
2.0	0.97725	0.97778	0.97831	0.97882	0.97932	0.97982	0.98030	0.98077	0.98124	0.98169
2.1	0.98214	0.98257	0.98300	0.98341	0.98382	0.98422	0.98461	0.98500	0.98537	0.98574
2.2	0.98610	0.98645	0.98679	0.98713	0.98745	0.98778	0.98809	0.98840	0.98870	0.98899
2.3	0.98928	0.98956	0.98983	0.99010	0.99036	0.99061	0.99086	0.99111	0.99134	0.99158
2.4	0.99180	0.99202	0.99224	0.99245	0.99266	0.99286	0.99305	0.99324	0.99343	0.99361
2.5	0.99379	0.99396	0.99413	0.99430	0.99446	0.99461	0.99477	0.99492	0.99506	0.99520
2.6	0.99534	0.99547	0.99560	0.99573	0.99585	0.99598	0.99609	0.99621	0.99632	0.99643
2.7	0.99653	0.99664	0.99674	0.99683	0.99693	0.99702	0.99711	0.99720	0.99728	0.99736
2.8	0.99744	0.99752	0.99760	0.99767	0.99774	0.99781	0.99788	0.99795	0.99801	0.99807
2.9	0.99813	0.99819	0.99825	0.99831	0.99836	0.99841	0.99846	0.99851	0.99856	0.99861
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99896	0.99900

Summary table for the variables control charts

Type of chart			
$\bar{x} - R$	$\bar{x} - s$	$\bar{x} - s^2$	$x\text{–}MR$
$CL_{\bar{x}} = \bar{\bar{x}}$	$CL_{\bar{x}} = \bar{\bar{x}}$	$CL_{\bar{x}} = \bar{\bar{x}}$	$CL_x = \bar{x}$
$UCL_{\bar{x}} = \bar{\bar{x}} + \dfrac{3\bar{R}}{d_2\sqrt{n}} = \bar{\bar{x}} + A_2\bar{R}$	$UCL_{\bar{x}} = \bar{\bar{x}} + 3\dfrac{\bar{s}}{c_4\sqrt{n}} = \bar{\bar{x}} + A_3\bar{s}$	$UCL_{\bar{x}} = \bar{\bar{x}} + 3\dfrac{\sqrt{\overline{s^2}}}{\sqrt{n}}$	$UCL_x = \bar{x} + \dfrac{3\overline{MR}}{d_2}$
$LCL_{\bar{x}} = \bar{\bar{x}} - \dfrac{3\bar{R}}{d_2\sqrt{n}} = \bar{\bar{x}} - A_2\bar{R}$	$LCL_{\bar{x}} = \bar{\bar{x}} - 3\dfrac{\bar{s}}{c_4\sqrt{n}} = \bar{\bar{x}} - A_3\bar{s}$	$LCL_{\bar{x}} = \bar{\bar{x}} - 3\dfrac{\sqrt{\overline{s^2}}}{\sqrt{n}}$	$LCL_x = \bar{x} - \dfrac{3\overline{MR}}{d_2}$
$CL_R = \bar{R}$	$CL_s = \bar{s}$	$CL_{s^2} = \overline{s^2}$	$CL_{MR} = \overline{MR}$
$UCL_R = \bar{R} + 3\dfrac{d_3\bar{R}}{d_2} = D_4\bar{R}$	$UCL_s = \bar{s} + 3\dfrac{\bar{s}}{c_4}\sqrt{1-c_4^2} = B_4\bar{s}$	$UCL_{s^2} = \dfrac{\overline{s^2}\,\chi^2_{f\ddot{o}ls\hat{o}}}{v}$	$UCL_{MR} = D_4\,\overline{MR}$
$LCL_R = \bar{R} - 3\dfrac{d_3\bar{R}}{d_2} = D_3\bar{R}$	$LCL_s = \bar{s} - 3\dfrac{\bar{s}}{c_4}\sqrt{1-c_4^2} = B_3\bar{s}$	$LCL_{s^2} = \dfrac{\overline{s^2}\,\chi^2_{als\acute{o}}}{v}$	$LCL_{MR} = D_3\,\overline{MR}$

Summary table for the attributes control charts

Type of chart			
np	p	c	u
$CL_{np} = n\bar{p}$	$CL_p = \bar{p}$	$CL_c = \bar{c}$	$CL_u = \bar{u}$
$UCL_{np} = n\bar{p} + 3\sqrt{n\bar{p}(1-\bar{p})}$	$UCL_p = \bar{p} + 3\sqrt{\dfrac{\bar{p}(1-\bar{p})}{n}}$	$UCL_c = \bar{c} + 3\sqrt{\bar{c}}$	$UCL_u = \bar{u} + 3\sqrt{\dfrac{\bar{u}}{n_i}}$
$LCL_{np} = n\bar{p} - 3\sqrt{n\bar{p}(1-\bar{p})}$	$LCL_p = \bar{p} - 3\sqrt{\dfrac{\bar{p}(1-\bar{p})}{n}}$	$LCL_c = \bar{c} - 3\sqrt{\bar{c}}$,	$LCL_u = \bar{u} - 3\sqrt{\dfrac{\bar{u}}{n_i}}$
$\bar{p} = \dfrac{\sum\limits_i^m \hat{p}_i}{m} = \dfrac{\sum\limits_i^m D_i}{mn}$	$\bar{p} = \dfrac{\sum\limits_i^m \hat{p}_i}{m} = \dfrac{\sum\limits_i^m D_i}{mn}$	$\bar{c} = \dfrac{\sum\limits_i^m c_i}{m}$	$u_i = \dfrac{c_i}{n_i}$ $\bar{u} = \dfrac{\sum\limits_i c_i}{\sum\limits_i n_i}$
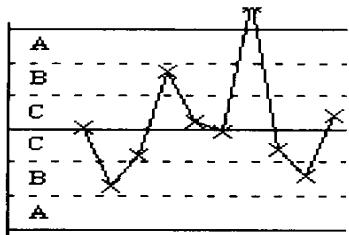
n	d_2	d_3	c_4	A_2	A_3	B_3	B_4	D_3	D_4
2	1.128	0.853	0.7979	1.880	2.659	0	3.267	0	3.267
3	1.693	0.886	0.8862	1.023	1.954	0	2.568	0	2.574
4	2.059	0.880	0.9213	0.729	1.628	0	2.266	0	2.282
5	2.326	0.864	0.9400	0.577	1.427	0	2.089	0	2.114

	x_i	$MR_i = \left| x_i - x_{i-1} \right|$
1	248.49	-
2	249.84	1.35
3	250.39	
4	249.96	
5	250.08	
6	250.04	
7	250.50	0.46
8	249.95	0.55
9	249.57	0.38
10	250.09	0.52
11	251.86	1.77
12	251.32	0.54
13	250.94	0.38
14	250.63	0.31
15	252.21	1.58
16	250.83	1.38
17	250.61	0.22
18	250.64	0.03
19	250.64	0.00
20	249.88	0.76
average	250.4235	0.5984
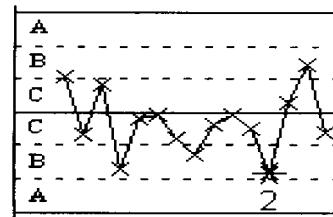
i	measured sample elements					mean	median	R
1	251.25	249.67	250.15	250.22	249.30	250.118	250.150	1.950
2	247.56	249.84	251.04	249.47	250.25			
3	251.47	250.23	250.07	250.12	250.37			
4	249.35	249.77	249.29	250.92	250.44	249.954	249.770	1.630
5	249.09	251.09	248.14	248.51	250.90	249.546	249.090	2.950
6	251.59	248.13	250.06	248.92	252.09	250.158	250.060	3.960
7	250.61	249.55	249.23	249.61	251.39	250.078	249.610	2.160
8	249.95	247.74	249.40	248.88	249.16	249.026	249.160	2.210
9	247.74	249.42	249.59	251.59	250.36	249.740	249.590	3.850
10	247.89	250.65	249.61	249.08	248.72	249.190	249.080	2.760
11	249.26	250.08	251.22	250.08	250.26	250.180	250.080	1.960
12	249.83	249.46	248.83	251.56	249.16	249.768	249.460	2.730
13	250.36	250.10	251.68	250.36	248.78	250.256	250.360	2.900
14	250.71	250.26	250.18	249.47	250.72	250.268	250.260	1.250
15	250.50	252.36	251.52	249.91	250.75	251.008	250.750	2.450
16	250.11	250.87	249.31	249.93	249.63	249.970	249.930	1.560
17	248.81	249.65	248.08	250.57	251.48	249.718	249.650	3.400
18	249.90	249.81	250.59	250.38	250.74	250.284	250.380	0.930
19	250.88	249.79	249.85	250.11	250.61	250.248	250.110	1.090
20	249.27	248.61	250.64	249.43	249.60	249.510	249.430	2.030
mean						249.955	249.850	2.333

Western Electric rules (runs test)
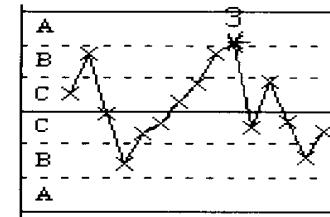
1. One point beyond Zone A
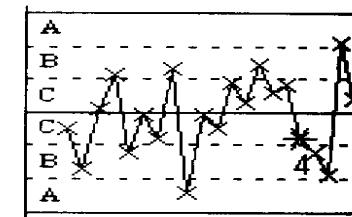
**2**. 9 points in Zone C or beyond (on one side of central line)
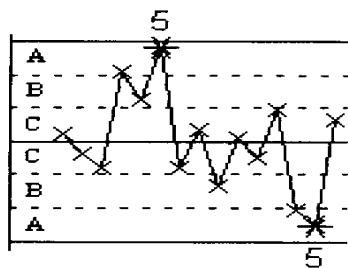
**3**. 6 points in a row steadily increasing or decreasing
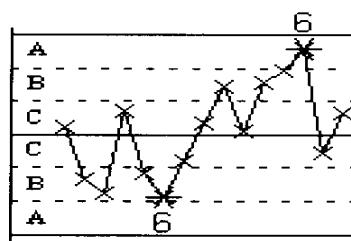
**4**. 14 points in a row alternating up and down
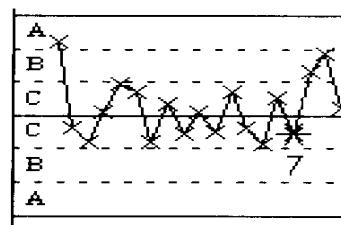
5. 2 out of 3 points in a row in Zone A or beyond

6. 4 out of 5 points in a row in Zone B or beyond

7. 15 points in a row in Zone C (above and below the center line)

8. 8 points in a row in Zone B, A, or beyond, on either side of the center line (without points in Zone C)