

Chapter 9 Discussion Questions

1. Explain the principles of Shewhart control charts for sample mean and sample range, cumulative sum control charts for sample mean and sample range. Compare the performance of these charts.
2. A chocolate manufacturer takes a sample of six boxes at the end of each hour in order to verify the weight of the chocolates contained within each box. The individual chocolates are also examined visually during the check-weighing and the various types of major and minor faults are counted. The manufacturer equates 1 major fault to 4 minor faults and accepts a maximum equivalent to 2 minor physical faults/chocolate, in any box. Each box contains 24 chocolates. Discuss how the cusum chart techniques can be used to monitor the physical defects. Illustrate how the chart would be set up and used.
3. The following record shows the number of defective items found in a sample of 100 taken twice per day.

Sample number	Number of defectives	Sample number	Number of defectives
1	4	21	2
2	2	22	1
3	4	23	0
4	3	24	3
5	2	25	2
6	6	26	0
7	3	27	1
8	1	28	3
9	1	29	0
10	5	30	3
11	4	31	0
12	4	32	2
13	1	33	1
14	2	34	1
15	1	35	4
16	4	36	0
17	1	37	2
18	0	38	3
19	3	39	2
20	4	40	1

Set up and plot a cusum chart. Interpret your findings assuming a target value of 2 defectives.

4. The following data were obtained when measurements were made on the diameter of steel balls for use in bearings. The mean and range values of sixteen samples of size 5 are given in the table below.

Sample number	Mean dia. (0.001 mm)	Sample range (mm)	Sample number	Mean dia. (0.001 mm)	Sample range (mm)
1	250.2	0.0050	9	250.4	0.0040
2	251.3	0.0050	10	250.0	0.0040
3	250.4	0.0050	11	249.4	0.0045
4	250.2	0.0030	12	249.8	0.0035
5	250.7	0.0040	13	249.3	0.0045
6	248.9	0.0040	14	249.1	0.0035
7	250.2	0.0050	15	251.0	0.0040
8	249.1	0.0040	16	250.6	0.0045

Design a mean cusum chart for the process and plot the results on the chart. Interpret the cusum chart and explain briefly how it may be used to categorize production in pre-selection for an operation in assembly of the bearings.

- Small plastic bottles are made from preforms supplied by Britanic Polymers. It is possible that variability in the bottles is due in part to the variation in the preforms. Thirty preforms are sampled from the extruder at Britanic Polymers, one preform every 5 minutes for two and a half hours. The weights of the preforms, in grams, are given in the table below (the data should be read from left to right along the top row, then the middle row, etc.).

32.9	33.7	33.4	33.4	33.6	32.8	33.3	33.1	32.9	33.0
33.2	32.8	32.9	33.3	33.1	33.0	33.7	33.4	33.5	33.6
33.2	33.8	33.5	33.9	33.7	33.4	33.5	33.6	33.2	33.6

Carry out a cusum analysis of the preform weights and comment about on the stability of the process.