Quality Control Homework Problems

1. Processing new accounts at a bank is intended to average 10 minutes each. Five samples of four observations each have been taken. Use the sample data in conjunction with Table in 10.3 to construct the upper and lower control limits for both a mean chart and a range chart. Do the results suggest the process is in control?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample 1 | Sample 2 | Sample 3 | Sample 4 | Sample 5 |
| 12.11 | 12.15 | 12.09 | 12.12 | 12.09 |
| 12.10 | 12.12 | 12.09 | 12.10 | 12.14 |
| 12.11 | 12.10 | 12.11 | 12.08 | 12.13 |
| 12.08 | 12.11 | 12.15 | 12.10 | 12.12 |
|  |  |  |  |  |
|  |  |  |  |  |

1. Determine the mean and range of each sample.
2. Compute the average mean and average range.
3. Obtain factors A(2) for n=4
4. Compute the mean upper and lower control limits.
5. There were 20 samples of n=8. The average sample range for 20 samples was .016 minute and average mean was 3 minutes. Determine 3 sigma control limits for sample ranges. Use Table 10.3 for D values.
6. A medical facility does MRIs for sports injuries. Occasionally a test yields inconclusive results and must be repeated. Using the following sample data and n=200, determine the upper and lower control limits for the fraction of retests using two –sigma limits. Is the process in control? (z = 2)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| # | 1 | 2 | 2 | 0 | 2 | 1 | 2 | 0 | 2 | 7 | 3 | 2 | 1 |

# = Number of retests

1. Given the following data for the number of defects per spool of cable, using three-sigma limits, is the process in control? (z = 3)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| # | 2 | 3 | 1 | 0 | 1 | 3 | 2 | 0 | 2 | 1 | 3 | 1 | 2 | 0 |

# = Number of defects

Table 10.3

|  |  |  |  |
| --- | --- | --- | --- |
| Number of Observations per Group (n) | Factors for X chart  A(2) | Factors for R chart  Lower control limit D(3) | Factors for R chart  Upper control limit D(4) |
| 2 | 1.88 | 0 | 3.27 |
| 3 | 1.02 | 0 | 2.57 |
| 4 | .73 | 0 | 2.28 |
| 5 | .58 | 0 | 2.11 |
| 6 | .48 | 0 | 2.00 |
| 7 | .42 | .08 | 1.92 |
| 8 | .37 | .14 | 1.86 |
| 9 | .34 | .18 | 1.82 |
| 10 | .31 | .22 | 1.78 |
| 11 | .29 | .26 | 1.74 |
| 12 | .27 | .28 | 1.72 |
| 13 | .25 | .31 | 1.69 |
| 14 | .24 | .33 | 1.87 |
| 15 | .22 | .35 | 1.65 |
| 16 | .21 | .36 | 1.64 |
| 17 | .20 | .38 | 1.62 |
| 18 | .19 | .39 | 1.61 |
| 19 | .19 | .40 | 1.60 |
| 20 | .18 | .41 | 1.59 |
|  |  |  |  |