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Quiz #4, Quality control 2015 Fall

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- **Numerical answers up to 4 digits, 0.XXXX**

We obtained the following data

					Mean	Range
i=1	12	16	10	10	12	6
i=2	22	20	22	16	20	6
i=3	13	15	12	12	13	3
i=4	15	13	12	12	13	3
i=5	14	14	9	11	12	5

+1 1) [+1] Calculate the estimate of μ

$\hat{\mu} = \bar{\bar{X}} = \frac{1}{5}(12+20+13+13+12) = 14$ ✓

+1 2) [+1] Calculate the estimate of σ $n=4$.

$\bar{R} = \frac{1}{5}(6+6+3+3+5) = 4.6$ $d_2 = 2.059$, $\hat{\sigma} = \frac{\bar{R}}{d_2} = \frac{4.6}{2.059} = 2.2341$ ✓

+1 3) [+1] Calculate $SD(\bar{X}_{i\cdot})$

$SD(\bar{X}_{i\cdot}) = \frac{\sigma}{\sqrt{n}} \Longrightarrow \frac{\hat{\sigma}}{\sqrt{n}} = \frac{2.2341}{\sqrt{4}} = 1.1171$ ✓

+2 4) [+2] Draw $\bar{X}$-Chart (3-sigma quality performance), and state your conclusion

$\bar{\bar{X}} = 14$.

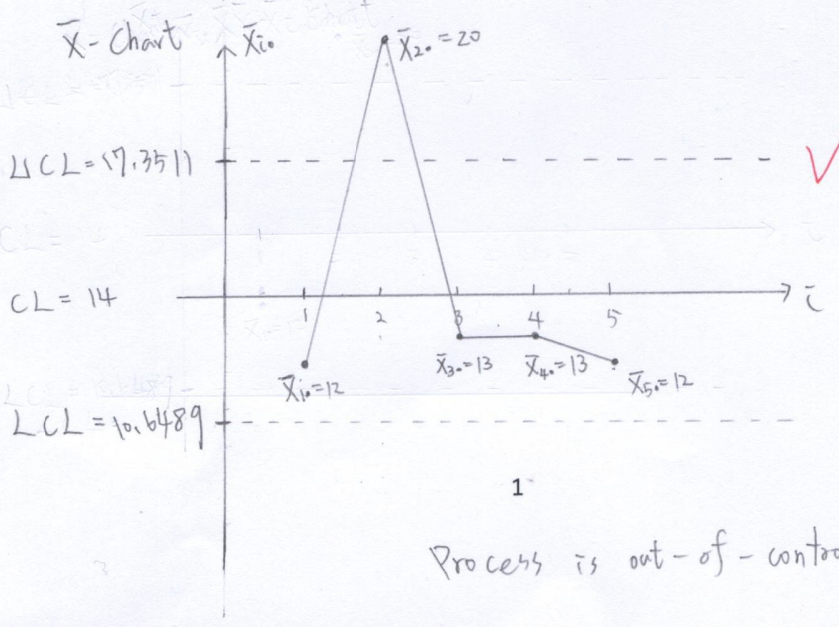
$\bar{R} = 4.6$

$A_2 = \frac{3}{\sqrt{n}\cdot d_2} = \frac{3}{\sqrt{4}\cdot 2.059} = 0.7285$

CL: $\bar{\bar{X}} = 14$ ✓

UCL: $\bar{\bar{X}} + A_2\bar{R} = 14 + 0.7285 \times 4.6 = 17.3511$ ✓

LCL: $\bar{\bar{X}} - A_2\bar{R} = 14 - 0.7285 \times 4.6 = 10.6489$ ✓



✓

Process is out-of-control ($\bar{X}_{2\cdot} > UCL$).

Tables

Table: the normal distribution $p = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{x^2}{2}\right) dx$

z	0	0.5	1	1.5	2	2.5	3	3.5	4
P	0.5	0.6915	0.8413	0.9332	0.9772	0.9938	0.99865	0.99977	0.99997

Table: Conversion of range to standard deviation

n	2	3	4	5	6
d_2	1.128	1.683	2.059	2.326	2.534