

## List of Equations

### For Variable data:

$$\begin{array}{ccccc} & & \bar{X}\text{-chart} & R\text{-chart} & \\ & & & & \\ \bar{\bar{X}} = \frac{\sum_{i=1}^k \bar{X}_i}{k} & UCL & \bar{\bar{X}} + A_2 \bar{R} & D_4 \bar{R} & C_{pk} = \begin{cases} \frac{USL - \bar{\bar{X}}}{3\hat{\sigma}} \\ \frac{\bar{\bar{X}} - LSL}{3\hat{\sigma}} \end{cases} \\ \bar{\bar{R}} = \frac{\sum_{i=1}^k R_i}{k} & LCL & \bar{\bar{X}} - A_2 \bar{R} & D_3 \bar{R} & C_p = \frac{Tolerance}{6\hat{\sigma}} \end{array}$$

Sample size	Control limit coefficients			Devisors for estimation of $\sigma$
	Average chart	Range chart		
$n$	$A_2$	$D_3$	$D_4$	$d_2$
2	1.880	0	3.267	1.128
3	1.023	0	2.574	1.693
4	0.729	0	2.282	2.059
5	0.577	0	2.114	2.326

### For Attribute data:

Type of Chart	Control Limits
p	$\bar{p} \pm 3 \sqrt{\frac{\bar{p}(1 - \bar{p})}{\bar{n}}}$
np	$\bar{n}\bar{p} \pm 3 \sqrt{\bar{n}\bar{p} \left(1 - \frac{\bar{n}\bar{p}}{n}\right)}$
u	$\bar{u} \pm 3 \sqrt{\frac{\bar{u}}{\bar{n}}}$
c	$\bar{c} \pm 3\sqrt{\bar{c}}$

### For Reliability data:

Non-Repairable Items		Repairable Items	
Mean Time to Failure	$\frac{1}{N} \sum_{i=1}^{i=N} T_i$	Mean Down Time	$\frac{1}{N_f} \sum_{j=1}^{j=N_f} T_{Dj}$
Mean Failure Rate	$\frac{N}{\sum_{i=1}^{i=N} T_i}$	Mean Failure Rate	$\frac{N_F}{NT - N_F \cdot MDT}$

$$R(t) = \exp \left[ -\lambda \int_0^t d\xi \right] = \exp(-\lambda t)$$

$$R(t) = \exp \left[ -\left( \frac{t - t_0}{\eta} \right)^\beta \right] = 1 - F(t)$$