Formula Sheet

$$C_{pk} = Minimum\ of\ [\frac{\bar{\bar{x}} - Lower\ Specification}{3\sigma}, \frac{Upper\ Specification - \bar{\bar{x}}}{3\sigma}]$$

$$C_p = \frac{Upper\ Specification - Lower\ Specification}{6\sigma}$$

$$Utilization = \frac{Actual\ Output}{Design\ Capacity}$$

$$Efficiency = \frac{Actual\ Output}{Effective\ Capacity}$$

$$Break - even\ in\ units = \frac{F}{P - V}$$

$$Break - even\ in\ dollars = \frac{F}{1 - (\frac{V}{P})}$$

$$Multiproduct\ break - even\ in\ dollars = \frac{F}{\sum[\left(1 - \frac{V_i}{P_i}\right) * (W_i)]}$$

Labor cost per unit= $Labor\ cost\ per\ day \div production\ (units\ per\ day)$

$$x - coordinate\ of\ the\ center\ of\ gravity = \sum_i x_i Q_i / \sum_i Q_i$$

$$y - coordinate\ of\ the\ center\ of\ gravity = \sum_i y_i Q_i / \sum_i Q_i$$

$$Minimize\ Cost = \sum_{i=1}^{n}\sum_{j=1}^{n} X_{ij} C_{ij}$$

$$Takt\ time = \frac{total\ work\ time\ available}{units\ required\ to\ satisfy\ customer\ demand} \qquad Workers\ Required = \frac{total\ operation\ time\ required}{takt\ time}$$

$$cycle\ time = \frac{production\ time\ available\ per\ day}{units\ required\ per\ day} \qquad Minimum\ Number\ of\ Workstations = \frac{\sum_{i=1}^{n} time\ for\ task\ i}{cycle\ time}$$

$$efficiency = \frac{\sum task\ times}{actual\ number\ of\ workstations * largest\ assigned\ cycle\ time}$$

Idle Time = (actual number of workstations) X (Largest assigned cycle time) - $\sum task\ times$

$$P(n) = S + (1 - S)U^n \qquad Bullwhip = \frac{Variance\ in\ orders}{Variance\ of\ demand} = \frac{\sigma^2_{orders}}{\sigma^2_{demand}}$$