QUEUING THEORY CHART

MODEL	(M/M/1) : (∞ / FIFO)	(M/M/1) : (N/ FIFO)
Steady State Probabilities	$P_0 = 1 - \frac{\lambda}{\mu}$	$P_0 = \begin{cases} \dfrac{1-\frac{\lambda}{\mu}}{1-\left(\frac{\lambda}{\mu}\right)^{N+1}} & if\ \lambda \neq \mu \\ \dfrac{1}{N+1} & if\ \lambda = \mu \end{cases}$
	$P_n = \left(\frac{\lambda}{\mu}\right)^n P_0$	$P_n = \begin{cases} \left(\frac{\lambda}{\mu}\right)^n \left[\dfrac{1-\frac{\lambda}{\mu}}{1-\left(\frac{\lambda}{\mu}\right)^{N+1}}\right] & if\ \lambda \neq \mu \\ \dfrac{1}{N+1} & if\ \lambda = \mu \end{cases}$
Average Number of Customers in the System (Ls)	$\frac{\lambda}{\mu - \lambda}$	$\begin{cases} \dfrac{\lambda}{\mu-\lambda} - \dfrac{(N+1)\left(\frac{\lambda}{\mu}\right)^{N+1}}{1-\left(\frac{\lambda}{\mu}\right)^{N+1}} & if\ \lambda \neq \mu \\ \dfrac{N}{2} & if\ \lambda = \mu \end{cases}$
Average Number of Customers in the Queue (Lq)	$\frac{\lambda^2}{\mu(\mu - \lambda)}$	$Lq = Ls - \frac{\lambda'}{\mu}$
Average Waiting time of Customers in the System (Ws)	$\frac{1}{\mu - \lambda}$	$\frac{Ls}{\lambda'}$
Average Waiting time of Customers in the Queue (Wq)	$\frac{\lambda}{\mu(\mu - \lambda)}$	$\frac{Lq}{\lambda'}$
Probability that the Server is idle	$1 - \frac{\lambda}{\mu}$	P_0
Probability that the Server is busy	$\frac{\lambda}{\mu}$	$1 - P_0$
Probability that number of customers in the system exceed k	$P(n>k) = \left(\frac{\lambda}{\mu}\right)^{k+1}$	-
Effective Arrival Rate	-	$\lambda' = \mu(1 - P_0)$