ΤΥΠΟΛΟΓΙΟ

Κατανομή	Συνάρτηση μάζας πιθανότητας p_X (ΣΜΠ) Συνάρ.πυκνότητας πιθανότητας f_X (ΣΜΠ)	Παράμετροι	Μέση τιμή & διασπορά
Poisson	$p_X(x) = \frac{(lt)^x}{x!} e^{-lt}$	λ	E(X)=λx Var(X)=λx
Εκθετική	$f_X(x) = me^{-mx}$	μ	E(X)=μ Var(X)=μ^2
Γάμμα	$f_X(x) = e^{-lx} \frac{l^n x^{n-1}}{(n-1)!}$	λ, n	E(X)=n/λ Var(X)=n/λ^2

$$E\left[E(X \mid Y)\right] = E\left[X\right]$$

$$X(t) = \sum_{i=1}^{N(t)} Y_i \Rightarrow E\left[X(t)\right] = E\left[N(t)\right] \cdot E(Y_i), \quad \text{Var}\left[X(t)\right] = E\left[N(t)\right] \cdot E(Y_i^2)$$

M/M/1

$$r = \frac{l}{m} \qquad p_0 = 1 - r \qquad p_n = r^n (1-r)$$

$$L = \frac{l}{m-l} \qquad L_q = \frac{l^2}{m(m-l)} \qquad L_{q'} = \frac{m}{m-l} \qquad P\{Q \geq n\} = r^n$$

$$W_q(t) = \begin{cases} 1-r, & t=0 \\ 1 - re^{-m(1-r)t}, & t>0 \end{cases} \qquad W_q = \frac{l}{m(m-l)}$$

$$w(t) = (m-l)e^{-(m-l)t} \qquad W = \frac{1}{m-l}$$

$$L_q = lW_q \qquad L = lW \qquad L = L_q + \frac{l}{m} \qquad W_q = \frac{L}{m}$$

M/M/1/K

$$p_0 = \begin{cases} \frac{1-r}{1-r^{K+1}}, & r \neq 1 \\ \frac{1}{K+1}, & r = 1 \end{cases} \qquad p_n = \begin{cases} \frac{(1-r)\, r^n}{1-r^{K+1}}, & r \neq 1 \\ \frac{1}{K+1}, & r = 1 \end{cases}$$

$$p_0 = \frac{1}{1 + \sum_{n=1}^{\infty} \prod_{i=1}^{n} \frac{l_{i-1}}{m_i}} \qquad p_n = p_0 \prod_{i=1}^{n} \frac{l_{i-1}}{m_i}$$

M/M/S

$$r=\frac{r}{S}=\frac{l}{Sm}\qquad p_0=\left[\sum_{n=0}^{S-1}\frac{r^n}{n!}+\frac{Sr^S}{S!(S-r)}\right]^{-1}\qquad p_n=\begin{cases}\dfrac{l^n}{n!m^n}p_0, & 1\le n\le S\\[2mm] \dfrac{l^n}{S^{n-S}S!m^n}p_0, & n\ge S\end{cases}$$

$$L_q=\frac{\left(l/m\right)^S\ lm}{(S-1)!(Sm-l)^2}\,p_0\qquad W_q=\frac{\left(l/m\right)^S\ m}{(S-1)!(Sm-l)^2}\,p_0$$

$$L=\frac{\left(l/m\right)^S\ lm}{(S-1)!(Sm-l)^2}\,p_0+\frac{l}{m}\qquad W=\frac{\left(l/m\right)^S\ m}{(S-1)!(Sm-l)^2}\,p_0+\frac{1}{m}$$

$$W_q(0)=1-\frac{S\left(\dfrac{l}{m}\right)^S}{S!\left(S-\dfrac{l}{m}\right)}\,p_0\qquad W_q(t)=\frac{\left(\dfrac{l}{m}\right)^S\left(1-e^{-(mS-l)t}\right)}{(S-1)!\left(S-\dfrac{l}{m}\right)}\,p_0+W_q(0)$$

M/M/S/K

$$p_0=\begin{cases}\left[\displaystyle\sum_{n=0}^{S-1}\frac{1}{n!}\left(\frac{l}{m}\right)^n+\frac{\left(\dfrac{l}{m}\right)^S}{S!}\cdot\frac{1-\left(\dfrac{l}{Sm}\right)^{K-S+1}}{1-\dfrac{l}{Sm}}\right]^{-1}, & \dfrac{l}{Sm}\neq 1\\[4mm] \left[\displaystyle\sum_{n=0}^{S-1}\frac{1}{n!}\left(\frac{l}{m}\right)^n+\frac{\left(\dfrac{l}{m}\right)^S}{S!}\cdot(K-S+1)\right]^{-1}, & \dfrac{l}{Sm}=1\end{cases}$$

$$r=\frac{r}{S}=\frac{l}{Sm}\qquad p_n=\begin{cases}\dfrac{1}{n!}\left(\dfrac{l}{m}\right)^n p_0, & 1\le n\le S\\[2mm] \dfrac{1}{S^{n-S}S!}\left(\dfrac{l}{m}\right)^n p_0, & S\le n\le K\end{cases}$$

$$L_q=\frac{p_0(Sr)^S}{S!(1-r)^2}\,r\left[1-r^{K-S+1}-(1-r)(K-S+1)r^{K-S}\right]\qquad W_q=\frac{L_q}{l'}\text{ ,όπου } l'=l(1-p_k)$$

$$W=W_q+\frac{1}{m}\qquad L=W\,l'\qquad L=L_q+S-p_0\sum_{n=0}^{S-1}\frac{(S-n)(rS)^n}{n!}$$

M/M/S/S

$$p_n=\frac{\dfrac{1}{n!}\left(\dfrac{l}{m}\right)^n}{\displaystyle\sum_{r=0}^{S}\frac{1}{r!}\left(\frac{l}{m}\right)^r}$$