Model 1:

$(M/M/1):(\infty/FIFO)$

P_n - Probability of n customers in s/m

λ - mean arrival rate

μ - mean service rate

ρ - traffic intensity (or time for which server is busy).

$$\rho = \frac{\lambda}{\mu}$$

1. The idle time of the ~~customer~~ server $= P_0 = 1-\rho$
2. Avg no: of customers in the s/s, $L_s = \frac{\rho}{1-\rho} = \frac{\lambda}{\mu-\lambda}$
3. Avg no: of customers $L_q = \frac{\rho^2}{1-\rho} = \frac{\lambda^2}{\mu(\mu-\lambda)}$
4. Avg weighting time of customers in the s/s, $W_s = \frac{1}{\mu-\lambda} = \frac{1}{\lambda} L_s$

5. Avg waiting time of customers in queue, $W_q = \frac{\lambda}{\mu(\mu-\lambda)}$

$= \frac{1}{\lambda} L_q$ ✓

6. The prob: that the no: of customers in s/s exceeds N, $P(n>N) = \left(\frac{\lambda}{\mu}\right)^{N+1}$

7. the prob that no: of customers in queue exceeds N, $P(n>N) = \left(\frac{\lambda}{\mu}\right)^{N}$

Q. A barber shop with one man takes exactly 25 mins to complete haircut. If customers arrive in poisson fashion