

Errata in Chapter 1

Solution to problem 1 (changes marked in RED).

Note that an order for 5 Plush sofa-sets is placed every time the inventory level reaches 2. So we pay attention to state 2 with corresponding steady-state probability $p_2 = 2/21$. In the long run, a fraction $2/21$ of time the system is in state 2 and on average state 2 lasts for half a week. Thus the average rate at which orders are placed is $2 \times 2/21$ per week (alternatively, in state 3 since sofas are demanded at rate 1, orders are placed at rate $1 \times p_3 = 4/21$). Hence the average input rate $\Lambda = 2 \times (2/21) \times 5 = 20/21$ Plush sofa-sets per week. Also, the time-averaged number of Plush sofa-sets in inventory (H) can be computed as

$$H = \sum_{i=0}^7 i p_i = 85/21.$$

Remark 1 (changes marked in RED).

It is fairly common that systems are sampled at regularly spaced intervals (such as every 15 minutes, say) and then the data are averaged. That is not good practice because it could lead to unintended errors. For example consider a traffic light that goes from red to green in 5-minute cycles. If this light is observed at 15-minute intervals and every time toward the end of a green period, then the observations would usually result in zero or a very small number of vehicles at the light. Although that is an extreme example, it is one where the averages based on discrete observations would not be equal to the time-averaged quantity. Now, instead, if observations are made according to a Poisson process with mean ~~a~~ inter-observation times 15 min, then the average would indeed be similar to when the system is observed continuously. In fact similar situations arise while monitoring computer networks. The probes sent to obtain statistics use what is called Poisson-ping instead of equally-spaced-ping, again to avoid any biases induced in the averages.

Exercises problem 1.8 (b) (changes marked in RED).

Given that an average of 4 customers per hour ~~arrive~~ enter according to a Poisson process to receive a haircut, determine W and W_q .