Homework Assignment 5

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November 28, 2016

Problem 5.2. Suppose that you arrive at a single-teller bank to find five other customers in the bank, one being served and the other four waiting in line. You join the end of the line. If the service times are exponential with rate μ, what is the expected amount of time you will spend in the bank?

Solution. Let T_i denote the time that the i-th person spends at the teller in order to complete his or her transaction. Then the total amount of time I will spend in the bank is the amount of time the other five customers spend at the teller plus the time that I, the sixth customer, will spend at the teller. If S denotes the total amount of time that I spend at the bank, then

$$S = \sum_{i=1}^{6} T_i.$$

Note that even though the first customer is currently being served, the service time is exponentially distributed with rate μ, i.e. the waiting time is memory-less so that the expected service time of the first customer is still $1/\mu$. Since the other T_i are exponential random variables with mean $1/\mu$, we have that

$$E[S] = \sum_{i=1}^{6} E[T_i] = \frac{6}{\mu}.$$

□

Problem 5.8.

Solution. □

Problem 5.15.

Solution. □

Problem 5.43.

Solution. □

Problem 5.44.

Solution. □

Problem 5.50.

Solution. □