Section 8

1. A store must decide how much of a certain commodity to order so as to meet next month’s demand, where that demand is assumed to have an exponential distribution with rate $\lambda$. If the commodity costs the store $c$ per pound, and can be sold at a price of $s > c$ per pound, how much should be ordered so as to maximize the store's expected profit? Assume that any inventory left over at the end of the month is worthless and that there is no penalty if the store cannot meet all the demand.

2. Suppose you arrive at a post office having two clerks at a moment when both are busy but there is no one else waiting in line. You will enter service when either clerk becomes free. If service times for clerk $i$ is exponential with rate $\lambda_i$, $i = 1, 2$, find the expected time that you spend in the post office.

3. The number of hours between successive train arrivals at the station is uniformly distribute on $(0,1)$. Passengers arrive according to a Poisson process with rate 7 per hour. Suppose a train has just left the station. Let $X$ denote the number of people who get on the next rain. Find $E[X]$.

4. Green men arrive at the launching pad according to a Poisson process with rate $\mu = 2$ while red men arrive according to a Poisson process with rate $\lambda = 3$. The space ship leaves when there are 3 men (of either color) at the pad.
   
   (a) What is the expected time required to fill the space ship?
   
   (b) What is the probability that the crew are all green?

5. Customers arrive at a store according to a Poisson process with rate $\lambda = 2$ per hour.
   
   (a) What is the probability that there are no arrivals in the first and last hour of a given 10 hour interval?
   
   (b) What is the probability that there is at most 1 arrival in the first hour and at least 2 arrivals in the first two hours?