A simple system has a single server with an exponential service distribution with a mean of 6 minutes.

a. If the arrival rate is 10 customers per hour (Poisson), what is the average number of customers (served+waiting) in the system? Assume an infinite system capacity.

b. What is the average number of customers in the system if the customer arrival rate is 6 per hour? What is the server utilisation?

c. What customer arrival rate would give an average number of customers in the system to be equal to 9?

Consider the following 20 numbers:

2	6	9	10	14	14	18
24	25	27	40	48	54	58
60	65	75	80	125	320	

The sample mean ("central tendency") equals 53.

a. Compute the sample variance ("dispersion").

b. Is it reasonable to suspect that these numbers are geometrically distributed? (Maximum of 15 words).

c. What additional information would you need to have to conduct a χ^2 test checking the hypothesis that the numbers come from a binomial distribution?

A network has a gateway to the Internet which forwards packets at a rate of 10/second (exponential). Packets are submitted at a rate of 9.9/second (exponential). The gateway sends one packet at a time and has a buffer to store packets that were submitted while it was busy.

a. How large should this buffer be to guarantee that no packets are lost due to buffer overflow?

b. Suppose that the buffer is of size 2. How would you calculate the probability that a given packet will not be lost?

A computer repair shop is open from 9am to 5pm. All work not finished at 5pm is thrown into the dump so that every day starts with a empty set of work orders.

New repair orders arrive with an exponential interarrival time of 20 minutes. The sever operates in an odd fashion:

1. He takes an order and works on it for exactly 10 minutes.
2. (Exactly 10 minutes later). With probability p the repair is done. If so, the fixed computer is returned to the customer.
3. Otherwise, the (still broken) computer is returned to the customer who immediately resubmits the work order (at the end of the queue!).
4. When there is no work to do, the server solves sudoku puzzles.

a. Suppose that only one computer is broken today (no other orders will arrive today). If the computer was brought to the repair shop at 10am, what is the expected time when it will be fixed?

b. What is the probability that this computer will land in the dump?

c. Write a simulator of the repair shop with the objective of finding the expected time devoted to sudoku.