Exercise 1, Simulation

On the home page of the course there are simulation programs that can be used when you solve the problems in this exercise.

Task 1

Use the event scheduling program to solve this task. The program simulates a queuing system. The times between the arrivals are uniformly distributed between 0 and 2.5 and the service times are uniformly distributed between 0 and 2.

a) How many customers will arrive to this system per time unit?

b) Run the simulation program some times times. What is, approximately, the mean number of customers in the system?

c) Change the time between arrivals and complete the table below. Let the time between arrivals be a uniform distribution between 0 and 2*E(arrival time).

E(arrival time)	Mean number of customers
2	
1.5	
1.2	
1.1	
1.01	

d) Simulate the system ten times each for the two different times between arrivals seen in the table. What can you say about the accuracy of the results

Simulation no.	E(arrival time)=1.3	E(arrival time)=1.001
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

e) Simulate the system E(arrival time) = 0.8 for the three simulation times below. Explain the results.

Simulation time	Mean number of customers
5 000	
10 000	
20 000	

Task 2

On the home page of the course there is a simulation program that uses the process interaction method. Download the program and solve the following problems.

a) The class QS defines a process type that models a queuing system. How many servers does the queuing system have?

b) How many customers can a server serve per time unit?

c) How many customers will arrive to the queuing system per time unit?

d) Change the program so that the following system is simulated:

What is the mean number of customers in each one of the systems?

e) Change the simulation program so that the queuing systems have two servers. Now a server is slower and it takes in the mean twice as long time to serve a customer. What is now the mean number of customers in each queue if you simulate the systgem in d) above?