

# Systems of queues

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Gareth Tribello  
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For this project I would like you to consider the way patients are treated in a hospital.

1. Patients arrive into accident and emergency with a rate  $\lambda$  per minute.
2. Each patient waits to be seen by a triage nurse who then takes an average of  $\frac{1}{2\lambda}$  minutes to deal with each patient.
3. One third of the patients that the triage nurse sees are then sent to clinic A where they wait for an appointment with a doctor. On average a doctor in clinic A takes  $\frac{3}{2\lambda}$  minutes to deal with a patient.
4. The remaining two thirds of the customers, i.e. those that were not sent to clinic A, are sent to clinic B where doctors take an average of  $\frac{4}{3\lambda}$  minutes to deal with them.

Use the information in the description above to write a program that simulates the passage of patients through the hospital. Use your program to estimate the average amount of time a customer spends in hospital from their arrival in accident and emergency to their departure from clinic A/B after having been seen by a doctor. Calculate appropriate confidence limits on your estimate of this mean.