All students should read §1.2 of the textbook in preparation for the next lecture.

The following numbered questions should be split across your group and the solutions discussed during the next lecture period. Students should review the learning goals for the day, determine which are applicable to their questions and provide answers or commentary to their group members. When using the Internet to formulate answers (some questions may require this), keep track of **where** you find your information on the web. You may be asked for, and are expected to have (in Email-able form), URLs supporting your investigations.

1. For all the **queuing disciplines** mentioned for SSQs, what type of data structure would be used for a time and memory efficient computational model?
2. Beginning with a diagram like that of the text's Figure 1.2.1, label it with the following important SSQ measures:
   - the **time intervals** specific to a job's travel through a SSQ;
   - the **job-averaged** and **time-averaged** statistics;
   - and finally with the Little's equestions that relate these quantities together.

   Make your diagram large so that the writing is not cluttered and cramped. Be sure to place all the labels and equations having to do with a particular component of a SSQ (namely the queue and the service node) within or spacially near that component.
3. Suppose you are given an ordered sequence of jobs along with their service times. You also have four SSQ simulations (A, B, C, D) written using different **queueing disciplines**: FIFO, LIFO, Shortest Job First (Priority), and Random — but you don't know which simulation uses a particular queuing discipline. **Your job** is to determine as accurately as you can which simulations use which queuing disciplines.

   The same sequence of jobs are fed into simulations A–D, and you observe these results:

   1. The first job (a) leaves each simulation's SSQ with the same sojourn time through each simulation.
   2. Job e enters an empty SSQ at time 123 with service time of 14, job g with a service time of 3 enters immediately after job f which has a service time of 9. Simulations A and B emit job g after e at time 140; sims C and D emit job f after e at time 146.

   Finally, you are permitted to construct your own sequence of 26 jobs (arrival and service times for each) and send them to **only one** of the simulations A–D. What are your 26 job definitions and which simulation do you send them through in order to draw your most accurate conclusion? **Warning, at the other end of the SSQ you will know only the *completion time* of the second job as it leaves the sim, you won't know its job index i.** (Otherwise this part of the question is a bit of a tautology.)

   What is the probability your final statement is wrong?
4. Consider the "machine shop" simulation we discussed in class (a shop with many identical machines, a collection of failure modes (each with a failure rate and service (repair) time), and we want to hire the right number of technicians to optimize profits). Name 2–3 "features" you add (or change) to the theoretical FIFO SSQ discussed in the book to simulate what you believe would be an efficient solution to the machine shop scenario.