

5. The reference desk of a university library receives requests for assistance. Assume that a Poisson probability distribution with an arrival rate of 10 requests per hour can be used to describe the arrival pattern and that service times follow an exponential probability distribution

with a service rate of 12 requests per hour.

- a. What is the probability that no requests for assistance are in the system?
- b. What is the average number of requests that will be waiting for service?
- c. What is the average waiting time in minutes before service begins?
- d. What is the average time at the reference desk in minutes (waiting time plus service time)?
- e. What is the probability that a new arrival has to wait for service?

18. All airplane passengers at the Lake City Regional Airport must pass through a security screening area before proceeding to the boarding area. The airport has three screening stations available, and the facility manager must decide how many to have open at any particular time. The service rate for processing passengers at each screening station is 3 passengers per minute. On Monday morning the arrival rate is 5.4 passengers per minute. Assume that processing times at each screening station follow an exponential distribution and that arrivals follow a Poisson distribution.

- a. Suppose two of the three screening stations are open on Monday morning. Compute the operating characteristics for the screening facility.
- b. Because of space considerations, the facility manager's goal is to limit the average number of passengers waiting in line to 10 or fewer. Will the two-screening-station system be able to meet the manager's goal?
- c. What is the average time required for a passenger to pass through security screening?

26. Manning Autos operates an automotive service. To complete their repair work, Manning mechanics often need to retrieve parts from the company's parts department counter. Mechanics arrive at the parts counter at a rate of four per hour. The parts coordinator spends an average of six minutes with each mechanic, discussing the parts the mechanic needs and retrieving the parts from inventory.

- a. Currently, Manning has one parts coordinator. On average, each mechanic waits four minutes before the parts coordinator is available to answer questions or retrieve parts from inventory. Find L_q , W , and L for this single-server parts operation.
- b. A trial period with a second parts coordinator showed that, on average, each mechanic waited only one minute before a parts coordinator was available. Find L_q , W , and L for this two-server parts operation.
- c. If the cost of each mechanic is \$20 per hour and the cost of each parts coordinator is \$12 per hour, is the one-server or the two-server system more economical?