**Chapter 13--Queuing Models**

**Exhibit 13-1**  
A grocery store manager would like to use an analytical queueing model to study the lines of customers that form in front of the checkout stations in the store. During a period of time when business is steady, several store employees have gathered data on customer interarrival times, which are shown below.  
  
  
  
 **[Part 1]** Refer to Exhibit 13-1. Is it reasonable to assume exponentially distributed interarrival times for the grocery store customers? If so, what is l?

22. **Exhibit 13-1**  
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 **[Part 2]** Refer to Exhibit 13-1. Assuming an exponential distribution with the parameter l you obtained in Part 1, what is the probability that a customer interarrival time will be less than 2 minutes?

23. **Exhibit 13-1**  
A grocery store manager would like to use an analytical queueing model to study the lines of customers that form in front of the checkout stations in the store. During a period of time when business is steady, several store employees have gathered data on customer interarrival times, which are shown below.  
  
  
  
 **[Part 3]** Refer to Exhibit 13-1. Again assuming an exponential distribution with the parameter l you obtained in Part 2, what is the probability that a customer interarrival time will be more than 2 minutes, but less than 5 minutes?

**ANSWERS BELOW**

**Exhibit 13-1 –ANSWER KEY**  
**[Part 1]** Answer; The histogram of the data (shown below) appears to be consistent with the exponential density. The mean of the data is ~5, so the parameter l = 0.2.  
  


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**[Part 2]** A grocery store manager would like to use an analytical queueing model to study the lines of customers that form in front of the checkout stations in the store. During a period of time when business is steady, several store employees have gathered data on customer interarrival times, *Refer to Exhibit 13-1*.

Assuming an exponential distribution with the parameter l you obtained in Part 1, what is the probability that a customer interarrival time will be less than 2 minutes?

ANSWER Refer to Exhibit 13-1. Assuming an exponential distribution with the parameter l you obtained in Part 1, what is the probability that a customer interarrival time will be less than 2 minutes?

=EXPONDIST(2,0.5,1) = 0.33

**[Part 3]** A grocery store manager would like to use an analytical queueing model to study the lines of customers that form in front of the checkout stations in the store. During a period of time when business is steady, several store employees have gathered data on customer interarrival times, Refer to Exhibit 13-1.

Again assuming an exponential distribution with the parameter l you obtained in Part 2, what is the probability that a customer interarrival time will be more than 2 minutes, but less than 5 minutes?

ANSWER *Refer to Exhibit 13-1*. Again assuming an exponential distribution with the parameter l you obtained in Part 2, what is the probability that a customer interarrival time will be more than 2 minutes, but less than 5 minutes?

=EXPONDIST(2,0.5,1) - EXPONDIST(2,0.5,1) = 0.63 - 0.33 = 0.30