7. A newsboy keeps careful records of the number of papers he sells each day and the various costs that are relevant to his decision regarding the optimal number of newspapers to purchase. For what reason might his results be inaccurate? What would he need to do in order to accurately measure the daily demand for newspapers?
8. Billy's Bakery bakes fresh bagels each morning. The daily demand for bagels is a random variable with a distribution estimated from prior experience given by

Number of Bagels Sold in One Day	*Probability*
0	.05
5	.10
10	.10
15	.20
20	.25
25	.15
30	.10
35	.05

The bagels cost Billy's 8 cents to make, and they are sold for 35 cents each. Bagels unsold at the end of the day are purchased by a nearby charity soup kitchen for 3 cents each.

a. Based on the discrete distribution above, how many bagels should Billy's bake at the start of each day? (Your answer should be a multiple of 5.)

b. If you were to approximate the discrete distribution with a normal distribution, would you expect the resulting solution to be close to the answer that you obtained in part (*a*)? Why or why not?

c. Determine the optimal number of bagels to bake each day using a normal approximation. (Hint: You must compute the mean μ and the variance σ^2 of the demand from the discrete distribution above.)

9. The Crestview Printing Company prints a particularly popular Christmas card once a year and distributes the cards to stationery and gift shops throughout

the United States. It costs Crestview 50 cents to print each card, and the company receives 65 cents for each card sold.

Because the cards have the current year printed on them, those cards that are not sold are generally discarded. Based on past experience and forecasts of current buying patterns, the probability distribution of the number of cards to be sold nationwide for the next Christmas season is estimated to be

Quantity Sold	*Probability*
100,000–150,000	.10
150,001–200,000	.15
200,001–250,000	.25
250,001–300,000	.20
300,001–350,000	.15
350,001–400,000	.10
400,001–450,000	.05

Determine the number of cards that Crestview should print this year.

10. Happy Henry's car dealer sells an imported car called the EX123. Once every three months, a shipment of the cars is made to Happy Henry's. Emergency shipments can be made between these three-month intervals to resupply the cars when inventory falls short of demand. The emergency shipments require two weeks and buyers are willing to wait this long for the cars, but will generally go elsewhere before the next three-month shipment is due.

From experience, it appears that the demand for the EX123 over a three-month interval is normally distributed with a mean of 60 and a variance of 36. The cost of holding an EX123 for one year is $500. Emergency shipments cost $250 per car over and above normal shipping costs.

a. How many cars should Happy Henry's be purchasing every three months?

b. Repeat the calculations, assuming that excess demands are back ordered from one three-month period to the next. Assume a loss-of-goodwill cost of $100 for customers having to wait until the next three-month period and a cost of $50 per customer for bookkeeping expenses.

c. Repeat the calculations, assuming that when Happy Henry's is out of stock of EX123s the customer will purchase the car elsewhere. In this case, assume that the cars cost Henry an average of $10,000 and sell for an average of $13,500. Ignore loss-of-goodwill costs for this calculation.

11. Irwin's sells a particular model of fan, with most of the sales being made in the summer months. Irwin's makes a one-time purchase of the fans prior to each summer season at a cost of $40 each and sells each fan for $60. Any fans unsold at the end of the summer season are marked down to $29 and sold in a special fall sale. Virtually all marked-down fans are sold. The following is the number of sales of fans during the past 10 summers: 30, 50, 30, 60, 10, 40, 30, 30, 20, 40.

a. Estimate the mean and variance of the demand for fans each summer.

b. Assume that the demand for fans each summer follows a normal distribution, with mean and variance given by what you obtained in part (*a*). Determine the optimal number of fans for Irwin's to buy prior to each summer season.

c. Based on the observed 10 values of the prior demand, construct an empirical probability distribution of summer demand and determine the optimal number of fans for Irwin's to buy based on the empirical distribution.

d. Based on your results for parts (*b*) and (*c*), would you say that the normal distribution provides an adequate approximation?

12. The buyer for Needless Markup, a famous "high end" department store, must decide on the quantity of a high-priced women's handbag to procure in Italy for the following Christmas season. The unit cost of the handbag to the store is $28.50 and the handbag will sell for $150.00. Any handbags not sold by the end of the season are purchased by a discount firm for $20.00. In addition, the store accountants estimate that there is a cost of $.40 for each dollar tied up in inventory, as this dollar invested elsewhere could have yielded a gross profit. Assume that this cost is attached to unsold bags only.

a. Suppose that the sales of the bags are equally likely to be anywhere from 50 to 250 handbags during the season. Based on this, how many bags should the buyer purchase? (Hint: This means that the correct distribution of demand is uniform. You may solve this problem assuming either a discrete or a continuous uniform distribution.)

b. A detailed analysis of past data shows that the number of bags sold is better described by a normal distribution, with mean 150 and standard deviation 20. Now what is the optimal number of bags to be purchased?

c. The expected demand was the same in parts (*a*) and (*b*), but the optimal order quantities should have been different. What accounted for this difference?