Lesson 6. An Example

Problem 1.2 from Sanders.   A baker is trying to determine how many dozens of doughnuts to bake each day. The probability distribution of the number of doughnut customers is as follows:

Number of customers per day	5	10	15	20
Probability	0.15	0.40	0.35	0.10

Customers order 1, 2, 3, or 4 dozen doughnuts according to the following probability distribution:

Number of dozen ordered per customer	1	2	3	4
Probability	0.3	0.4	0.2	0.1

Doughnuts sell for $3.50 per dozen. They cost $2.00 per dozen to make. All doughnuts not sold at the end of the day are sold at half price to a local stale baked goods distributor. Mixing size constraints require doughnuts to be made in batches of 10 dozen.

  a. Create an Excel spreadsheet that will simulate the number of customers in a day and the number of dozens of donuts ordered for 20 possible customers. Use an IF function in Excel to determine how many of the 20 customer orders actually occur during the day. For each of the possible batches that could be made, calculate the net profit that the baker would make that day for that many batches.

  b. Based on a 1-day simulation, how many batches (of 10 dozen doughnuts) should the baker make each day? Be sure to clearly identify the performance measure you used and how its values were obtained.

  c. Based on 50 days simulation, how many batches (of 10 dozen doughnuts) should the baker make each day? Be sure to clearly identify the performance measure you used and how its values were obtained.

  d. Instead of simulation, use expected values of the distributions to solve part b. That is, find the expected number of customers in a day and the expected number of donuts a customer orders. The product should be the expected number of donuts that are ordered in a day. Use this to determine the optimal number of batches for the baker.

  e. Discuss the relative merits of the solution techniques used in parts b, c and d.