Homework #3

You should work individually on this assignment, but you may discuss and debate your answers with your colleagues.

1. Lucy Lindner owns a small campus bookstore that sells UC sportswear. In February, she must place an order with Nike for a new UC football shirt for the coming season. The long lead time is required for the contract manufacturers in Asia to order the necessary materials and to begin production in April. The shirts will be delivered to Lucy in early August just in time for the new season. Nike will charge Lucy $50 for each shirt she orders, and she will sell each shirt for $75 during the football season. There will not be another opportunity for Lucy to order any more shirts if she runs out. At the end of the season, Lucy will sell all the shirts that are left at a price of $15. Obviously, Lucy doesn't know exactly what the demand for these shirts will be, but during the past few years she has sold an average of 500 shirts each season that are similar to this new shirt. Based on historical sales the demand for the shirts appears to be normally distributed with a standard deviation of 75, and Lucy is planning to order 550 shirts this year. Develop a simulation model for this problem using Python in a Jupyter Notebook. Generate a simulation sample of 10,000 trials and use it to answer the questions below.
    a. Describe the distribution of Lucy's total profit for this order?
    b. What is the mean total profit for this order?
    c. What is the probability that Lucy will incur a net loss on this order?
    d. What is the order quantity that maximizes Lucy's mean total profit?

2. A consumer electronics firm produces a line of battery rechargers for cell phones. The sales price per unit ranges from a minimum of $18.95 to a maximum of $26.95 with the most likely value being $24.95. The cost per unit ranges from $12.00 to $15.00 with all values equally likely. The quantity sold is equal to 10,000 – 250 x sales price + a random term that is normally distributed with a mean of 0 and a standard deviation of 10. Fixed costs are normally distributed with a mean of $30,000 and a standard deviation of $5,000. Develop a simulation model using Python in a Jupyter Notebook, and use it to generate a simulation sample of 10,000 trials to answer the questions below.
    a. Describe the distribution of total profit.
    b. What is the expected profit?
    c. What is the probability of incurring a loss?
    d. What is the maximum loss?