ASSIGNMENT 2 PART II

Remember to submit as a single PDF document and to include your statement of academic integrity. Note that you are required to show your work for full credit --- correct numeric answers may earn you little credit unless you show your work. [DUE DATE Feb 24nd]. Total out of 30 marks.

Question 1

Suppose you are a travel agent. A broker approaches you and offers to pay you a certain amount of money for organizing events for bus trips the broker advertises.

The broker guarantees that you can book 10 buses every month. There are two types of bus trips: Economy and Premium. The broker cannot predict with certainty how many of each bus types there will be, but tells you to expect that on average 1 in 5 buses will be premium buses.

Please answer the following questions:

1) Show the probability model for this distribution. 2P
2) What is the expected value for the number of premium buses per month? 1P
3) What is the variance of the number of premium buses per month? 1P
4) What is the probability of the broker sending you 6 or more premium buses per month? 1P

The agreement with the broker also stipulates that you will receive a certain amount of revenue for organizing the events. This amount varies by bus type: you receive $1000 per bus for economy buses and $1500 per bus for premium buses.

5) What are the minimum and maximum amounts you can earn per month? 1P
6) What is the expected value for your monthly revenues from this broker? 1P
7) What is the standard deviation of your monthly revenues from this broker? 1P

You decide that you are interested and arrange for a trial period with the broker. The trial period is a great success, and the broker tells you that they would be interested in increasing the number of buses per month. You calculate two scenarios: 20 buses per month and 30 buses per month; with revenues per bus and the ratio of economy to premium buses remaining the same as before.

8) What are the expected value of the number of premium buses for the scenario of 20 buses and the scenario of 30 buses? 2P
9) What are the variances of the number of premium buses for the scenario of 20 buses and the scenario of 30 buses? 2P
10) What are the expected values for your revenues from the two scenarios? 2P
11) What are the standard deviations for your revenues from the two scenarios? 2P
12) What are the coefficients of variation for the two scenarios? 2P

Question 2

Suppose you are the manager of a coffee shop with three servers, who each take an average of 1.7 minutes to serve a customer. You are concerned about your service during peak hours, and are considering making an investment to improve service. During peak hours, you have 1.3 customers per minute arriving on average.

You have two options to ensure faster service: (a) hire a fourth server at an annual cost of $38,000, or (b) rent faster dispensing machines at an annual cost of $25,000, which would reduce service time to 1.25 minutes, on average.

You decide to base your decision on the number of customers who arrive during the time you can serve them. You don't want to have a more than 10% chance of more customers arriving than you can serve. For instance, with your current operation, you can serve three customers in 1.7 minutes, so you don't want the chance of more than three customers within 1.7 minutes to be greater than 10%.

What should you do – continue the current operation, hire a fourth server, or rent faster dispensing machines?

Please use the Plan, Do Report format and make sure to show all key steps in your calculations. 12P