DESAUTELS Faculty of Management
Faculté de gestion

MGSC 660
Math & Stat Foundations For Analytics

GROUP ASSIGNMENT # 2

Due on September 16, 2021 by 11:30 pm

INSTRUCTIONS:

1. **Make sure to write down the name, and student # for each student in the group on the cover page of the assignment.**

2. This assignment counts for **10%** of your final grade.

3. Late submissions will not be accepted.

4. You have to work in this assignment in groups. **The maximum number of students that can be in a group is 4.** Each group should submit only one assignment.

5. Assignment submissions consist of two components:

   - **Write-Up**: A single Word or PDF document. This must contain the answers to all your questions. You must submit this document via MyCourse submission system.
   - **Appendices**: Along with the main document, you can submit your computations in an Excel file. This excel file must contain a separate worksheet for each question and must also be submitted on MyCourses as well.

6. Good luck**!**

McGill

Question 1: Freemark Abbey Winery case

Work on the **Freemark Abbey Winery case** (included in the course-pack) and answer the following questions:

a. Assuming Mr. Jaeger chooses to harvest the Riesling grapes before the storm arrives, how much money will he make?
b. Assuming Mr. Jaeger chooses to leave the grapes on the vine, what is the probability that the grapes will end up with botrytis, and how much money will he make if that occurs?
c. Taking account of all the various possibilities, what should Mr. Jaeger do?
d. How much should Mr. Jaeger be willing to pay to learn whether the storm really will hit the Napa Valley?
e. How much should Mr. Jaeger be willing to pay to learn whether botrytis would form if the storm were to hit the Napa Valley?

Question 2: Revenue management on Air Canada Flight 660

Air China flight 660 travels from Montreal to Toronto. The airplane assigned to the flight is an Airbus A220 (formerly known as Bombardier CS300) having 125 seats. All of the seats are coach class. There is no first-class section. On the other hand, the airline sells two types of tickets discount, and full-fare. Discount tickets cost $400 each and must be purchased at least twenty-one days ahead of time. Full-fare tickets cost $1000 each, are refundable, and are available up to the time of departure on a space-available basis. Virtually all full-fare tickets are sold within twenty-one days before departure.

The airline is trying to decide how many seats to set aside for full-fare passengers on its busy Monday morning flight. The seat inventory control policy follows a nested structure. That is, when discount tickets are offered, full-fare tickets must also be offered. A protection level can be established to "protect" seats for full-fare customers. The protected seats for full-fare customers are only available to full-fare customers. If too many seats are set aside for the full-fare customers, the airplane may depart with many empty seats should the demand be low. If too few seats are set aside, revenues again may be low due to the number of high-paying passengers being turned away because too many discount tickets were sold.

The airline has estimated the demand for all two types of tickets. The demand distributions are all normal. The means and standard deviations are reported in the following table. In addition, the demands for the two types of tickets are assumed to be independent.

Type	Mean	Standard deviation
Discount	120	20
Full	30	10

To simplify the problem, assume the demand for the two types arrive sequentially with discount first and full-fare last. Air China wishes to determine how many seats to set aside for full-fare in order to maximize the expected revenue from flight 660.

(a) Construct a simulation model in Excel (or in Python) to simulate the following policy: protect 30 seats exclusively for full-fare customers. Simulate for 1000 times. What are the mean and standard deviation of the revenue? Calculate the 95% confidence interval for the mean. What do you think about the policy?

(b) Use Data Table function in Excel (or create a function in Python) to optimize the mean of the revenue by varying the protection level for full-fare customers between 20 and 40. Report the mean and standard deviation of the revenue corresponding to the optimal policy. Calculate the 95% confidence interval for the mean of the revenue corresponding the optimal policy.

(c) Find the 95% confidence interval for the probability of optimal revenue greater than or equal to the mean revenue that corresponds to protection level of 30 seats (i.e., the mean revenue that you found in part a).