DESAUTELS Faculty of Management
Faculté de gestion

MGSC 660
Math&Stat Foundations For Analytics

ASSIGNMENT # 1

Due on August 24, 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 a single 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

1. Answer problems 1-5 of Merton Truck Company case (course pack).

2. Capital budgeting at the McGill Corporation

Division A of the McGill Corporation has been allocated $160 million for capital projects this year. Managers in Division A have examined various possibilities and have proposed five projects for McGill's capital budgeting committee to consider. The projects cover a variety of activities, as listed below.

P1 Implement a new information system.
P2 License a new technology from another firm.
P3 Build a state-of-the-art recycling facility.
P4 Move the receiving department to new facilities on site.
P5 Install an automated machining center in production.

There is just one project of each type. Each project has an estimated NPV (Net Present Value), and each requires a capital expenditure, which must come out of the budget for capital projects. The following table summarized the possibilities, with all figures in millions of dollars.

	Projects				
	P1	**P2**	**P3**	**P4**	**P5**
NPV	10	17	16	8	14
Expenditure	48	96	80	32	64

a. The committee would like to maximize total NPV from projects selected, subject to budget limit of $160 million. Formulate the problem and find the optimal solution.
b. Suppose that in addition to the budget constraint, the following constraints should be also satisfied:
   i. At least *2* projects must be selected from P1, P3, and P4
   ii. At most *1* project must be selected from P2 and P5
   iii. If P5 is selected, then either P1 or P3 (but not both) must be as well.
   iv. P4 is selected if and only if both P1 and P2 are selected.

   Formulate the problem and find the optimal solution.