

IEOR 169: Problem Set #1

Spring 2022

Due Feb 10 2022 at 2 PM PST

You are encouraged to collaborate with fellow students as you work through the problem set. However, your final submission must be your own work.

If you used any technology to solve a problem (Pyomo, Gurobipy, Excel, AMPL, etc..) make sure to include the relevant details (ipython notebook, pdf of excel set up and solution, pdf of AMPL code and output, etc..). I may request a copy of the original files that you used.

Optional problems will not push your grade beyond 100% but it may compensate for your mistakes in the main problem set. In addition, this will be good practice for doing similar problems on the exams.

Your solutions must be uploaded on bCourses by Feb 10 2022 at 2 PM PST. Late submissions without prior approval will not be accepted.

Problem 1 *LP vs MIP vs IP*

Solve graphically:

$$\begin{aligned} \min_{x,y} \quad & x + 2y \\ \text{s.t.} \quad & x + y \leq \frac{11}{2} \\ & x - y \geq -2 \\ & x \leq 4 \\ & x, y \geq 0 \end{aligned}$$

1. Solve the problem where x, y are real numbers, i.e. an LP
2. Solve the problem where x is integer and y is real, i.e. an MIP
3. Solve the problem where x, y are integers, i.e. an IP

4. Compare the optimal values for the previous three parts. Give an explanation for the ordering of these values. A simple intuitive or mathematical explanation is adequate.

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Problem 2 investments

Exercise 1.9.1 from the textbook

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Problem 3 jobs scheduling

Exercise 1.9.5 from the textbook

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Problem 4 queens placement

Exercise 1.9.15 from the textbook (you don't have to solve the problem, just explain your formulation)

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Problem 5 create and solve a problem (optional)

Directions: choose a real life example of a process/phenomenon that interests you (think of a hobby or a favorite computer game), design an MIP or IP problem related to this example, and then solve it.

The question and solution must be written by you and be uniquely yours. However, you may use the textbook, the reference material, the internet, or any other resource you want for inspiration. Make sure you cite your inspirational sources or declare that there are none.

Required components:

- Inspiration statement
- Question
- Solution

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