Due: Friday, February 28th (11:59 p.m. PT.)

References are to the course textbook, except as noted.

Reminders

The midterm exam will take place on **Monday, March 10th**.

The project proposals will take place on the weeks of **February 24th** and **March 3rd**. Please contact me if your group has not already arranged a time for the presentation.

Reading

For Monday, February 24th, Chapter 7.

For Wednesday, February 26th, Chapter 8.

For Wednesday, March 5th, Chapter 9.

Assignment exercises to hand in

All problems must be accompanied by well-written solutions. You should provide full details of how you solved the problems. The `.pdf` files for each question will be submitted in Crowdmark (1 file per question), and the spreadsheets to Canvas.

1. Take the digits of your student id, in order: a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8 and a_9.

Consider the linear program:

$$\begin{array}{ll} \max & x + y \\ \text{such that} & a_1 x + a_2 y \leq a_1 + a_2 + a_3 + 3 \\ & a_4 x + a_5 y \leq a_4 + a_5 + a_6 + 3 \\ & a_7 x + a_8 y \leq a_7 + a_8 + a_9 + 3 \\ & x, y \geq 0 \end{array}$$

a. Graph the feasible region of this problem.

b. Use `Excel` to solve the linear program. Mark the optimal solution on your graph.

c. Which constraints are binding? Describe the *pattern* of the solution by noting which variables are zero and non-zero, and which inequalities are binding and non-binding. Explain how this relates to the position on the optimal solution on your graph.

d. Perform an analysis describing what happens to the pattern of the solution and the optimal objective value as the objective co-efficient of x changes. Start with the co-efficient at 0, and increase it by steps of 0.1 to 2. Explain this with reference to the graph.

e. Is the optimal solution to the problem unique, or are there alternative optimal solutions?

f. What range of values of the right-hand side of the first equation retains the same pattern for the optimal solution? Within this range, describe the optimal solution and optimal value of the problem as a function of this right-hand side. Explain this with reference to the graph.

2. Exercise 6.16 (from the supplementary exercises). However, rather than Wyoming, let's try it for Eastern Washington, i.e. considering the counties Okanogan, Chelan, Kittias, Yakima and Klickitat and continuing eastwards to the border.

3. Case: Motel Location for Nature's Inn (end of Chapter 6). Your answer should be a one page report explaining your conclusions to a non-technical audience, followed by an appendix that contains the details of your integer programming model.

Some other exercises you should try

Additional exercises from Chapters 4, 6 and 7.