Chapter 3: Art of Optimization

# LP Formulation: Blending Application

## Corresponding reading: Chapter 3, Page 2

### Purpose: Formulating an LP for the blending problem.

1. A coffee manufacturing company needs to blend three types of coffee to produce their new coffee brand. The cost of the three types and their characteristics along with the requires range for each characteristic are as follows. What do you think should be objective function in this problem?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Acidity (0-9) | Bitterness (0-9) | Aroma (0-9) | Cost ($/lb.) |
| Type 1 | 4 | 8 | 6 | 0.95 |
| Type 2 | 6.5 | 6 | 9 | 1.25 |
| Type 3 | 8 | 4 | 7 | 1.15 |
| Range |  |  |  |  |

1. What are the decision variables? Clearly define the decision variables (*remember to include the unit of the decision variables*)*.* Pick a notation for each decision variable.
2. What are the constraints? Remember to include the non-negativity constraints as well.

*Hint: You also need a constraint to make sure the sum of all types will be exactly equal to 1 lb.*

1. Write the whole formulation (i.e., the objective function and the constraints).
2. The supplier of the three coffee types imposes another restriction indicating that the amount of type 1 must be at least twice the amount of type 2. How can this constraint be written in terms of the decision variables?
3. The regulatory rules require that at most 30% of the blend be of type 3. How can this constraint be written in terms of the decision variables?
4. The environmental protection regulations require that type 1 in the blend be no more than types 2 and 3 combined. How can this constraint be written in terms of the decision variables?

***Note:*** *Understanding the case and what you need to do is PART OF THE CASE. If you do not understand a specific part, or are not sure what you should do, you need to review the corresponding reading section in the text before asking for help. You might also need to do some search on the internet. That is all part of the case and your learning process.*