

PROJECT 2

An Optimal Diet

Due Friday, January 31, 2020
for teams of one to three

SYNOPSIS

Formulate and solve a linear programming problem to determine the best diet from a selection of foods.

PROJECT OUTLINE

1. Select at least 10 foods which you predict would collectively provide most of your nutritional needs.
2. Look up the nutritional information (the type that typically occurs on a food label will do) for each food. Be sure to keep track of the serving size to which this information applies.
3. Look up (or deduce from food labels) the USDA recommended amounts of at least 10 nutritional elements, including items such as grams of fat and carbohydrates, amounts of specific vitamins and minerals.
4. Devise a linear programming problem that will help select the "best" diet consisting of the foods you selected. Here, best could mean minimizing the number of calories while meeting the USDA recommendations or maximizing the amount of some particular vitamin (or the total amount of vitamins) while meeting the USDA recommendations and keeping the calories below some fixed amount. In other words, you can pick what quantity you are trying to optimize. Your independent variables should be the quantity of each food. If you dispute the USDA recommendations, you can substitute a different source. But don't just make up the numbers. Don't include the dependent variable as one of your independent variables.
5. Use technology to solve the linear programming problem.
6. If the output is unreasonable, first re-check for an error in your set-up. If the unreasonableness is not due to error, add in some additional foods and/or nutritional elements until you obtain reasonable results.
7. Prepare a report summarizing your work.

WHAT EACH TEAM SHOULD SUBMIT

Submit a typed report, prepared on Scientific Notebook or other software that does a good job of formatting mathematics. The report, which will be graded on completeness, correctness, clarity, and layout, should contain the following.

1. A cover sheet, including the course number, your name(s), "An Optimal Diet", and "Spring 2020".
2. A verbal summary of the linear programming problem you have devised. Include tables that provide the numerical data.
3. A mathematical formulation of the problem. Note that this does not need to be converted to the standard (matrix) form with all of the slack, surplus, and artificial variables but does need to clearly indicate the formulas for the objective function and constraints.
4. The optimal solution. Include not only the value of the objective function and the quantity of each food, but the amount of each nutritional element supplied by this optimal diet. I would recommend organizing this information in a table.
5. A list of references used.