

MAT 118-01 Project #2

~~Due March 11, 2015~~

In preparing a recipe you must decide what ingredients and how much of each ingredient you will use. In these health-conscious days, you may also want to consider the amount of certain nutrients in your recipe. You may even be interested in minimizing some quantities (like calories or fat) or maximizing others (like carbohydrates or protein). Linear programming techniques can help you to do this.

For example, consider making a very simple trail mix from dry-roasted, unsalted peanuts and seedless raisins. The table below lists the amounts of various dietary quantities for these ingredients. The amounts are given per serving of the ingredient.

Nutrient	Peanuts Serving Size = 1 Cup	Raisins Serving Size = 1 Cup
Calories (Kcal)	850	440
Protein (g)	34.57	4.67
Fat (g)	72.50	0.67
Carbohydrates (g)	31.4	114.74

Suppose that you want to make at most 6 cups of trail mix for a day hike. You don't want either ingredient to dominate the mixture, so you want the amount of raisins to be at least $\frac{1}{2}$ of the amount of the peanuts and the amount of peanuts to be at least $\frac{1}{2}$ of the amount of the raisins. You want entire amount of trail mix you make to have fewer than 4000 calories, and you want to maximize the amount of carbohydrates in the mix.

1. Let x be the number of cups of peanuts you will use, let y be the number of cups of raisins you will use, and let c be the amount of carbohydrates in the mix. Find the object function.
2. What constraints must be placed on the object function?
3. Graph the feasible region for this problem.
4. Find the number of cups of peanuts and raisins that maximize the amount of the carbohydrates in the mix.
5. How many grams of carbohydrates are in a cup of the final mix? How many calories?
6. Under all the constraints given above, what recipe for trail mix will maximize the amount of protein in the mix? How many grams of proteins are in a cup of this mix? How many calories?
7. Suppose you decide to eat at least 3 cups of the trail mix. Keeping all constraints given before, what recipe for trail mix will minimize the amount of fat in the mix?
8. How many grams of carbohydrates are in this mix?
9. How many grams of proteins are in this mix?
10. Which of the three trail mixes would you use? Why?

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