Question 15.2

Part 1:

**Constant data:**

CK= cost per unit of foodk

Aik= nutrient i per unit of foofk

Mi= Maximum amount of nutrient i as guided

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**Variables:**

Xk= amount of food k to intake

**Constraints:**∑AX > = m for each nutrient i

∑AX < = M for each nutrient i

X> = 0 for each food K

**Objective function:**

**Minimize** ∑ CX for each food k

After running in python, the suggested optimal solution: here as below:

|  |  |
| --- | --- |
| Food | Amount |
| Celery,\_Raw | 52.64 |
| Frozen Broccoli | 0.26 |
| Lettuce,Iceberg,Raw | 63.99 |
| Oranges | 2.29 |
| Poached Eggs | 0.14 |
| Popcorn,Air-Popped | 13.87 |
| Total | 4.34 |

*Part 2:*

2. Please add to your model the following constraints (which might require adding more variables) and solve the new model:

a. If a food is selected, then a minimum of 1/10 serving must be chosen. (Hint: now you will need two variables for each food i: whether it is chosen, and how much is part of the diet. You’ll also need to write a constraint to link them.)

**New variable:**

Yk= 1 If the food i is selected, 0 if not

**Constraints:**

Xk > = 1/10 Yk for each foof k, must 1/10 be selected.

b. Many people dislike celery and frozen broccoli. So at most one, but not both, can be selected.

**Constraints:**

YCelery+yfrozenbroccoli< = 1

c. To get day-to-day variety in protein, at least 3 kinds of meat/poultry/fish/eggs must be selected. [If something is ambiguous (e.g., should bean-and-bacon soup be considered meat?), just call it whatever you think is appropriate – I want you to learn how to write this type of constraint, but I don’t really care whether we agree on how to classify foods!]

Y['Roasted Chicken'] + Y ['Poached Eggs'] + Y ['Scrambled Eggs'] + Y ['Bologna,Turkey'] + Y ['Ham,Sliced,Extralean'] + Y ['Hamburger W/Toppings'] + Y ['Hotdog, Plain'] + Y ['Pork'] + Y ['Sardines in Oil'] + Y ['White Tuna in Water'] > = 3

