

## 15.2

### 1) Small dataset:

As given in the problem set, I created the objective function to minimize the costs and added the relevant constraints for the minimum and maximum nutritional values. In addition, I added constraints to capture the 1/10<sup>th</sup> serving size as minimum, and a constraint to not include both frozen broccoli and raw celery.

To capture the constraint given in part c, I added another column called Meat to the dataset, so please use the excel file uploaded in Canvas to run the code effectively. The following are the results from the optimization run for this dataset.

I also added another variable to indicate if a food type should be included or not and these start with "Include" as shown below.

```
Status: Optimal
Foods_Celery,_Raw = 42.399358
Foods_Kielbasa,Prk = 0.1
Foods_Lettuce,Iceberg,Raw = 82.802586
Foods_Oranges = 3.0771841
Foods_Peanut_Butter = 1.9429716
Foods_Poached_Eggs = 0.1
Foods_Popcorn,Air_Popped = 13.223294
Foods_Scrambled_Eggs = 0.1
Include_Celery,_Raw = 1.0
Include_Kielbasa,Prk = 1.0
Include_Lettuce,Iceberg,Raw = 1.0
Include_Oranges = 1.0
Include_Peanut_Butter = 1.0
Include_Poached_Eggs = 1.0
Include_Popcorn,Air_Popped = 1.0
Include_Scrambled_Eggs = 1.0
.....
```

### 2) Large dataset:

For this run I used the following 4 constraints: - 1) minimum and maximum nutritional value 2) Minimum 1/10<sup>th</sup> of the serving size 3) I also added another constraint to restrict the food choices to a maximum of 5 because it is not reasonable to expect an individual to handle more than 5 types of food at a time 4) also created another column to capture if it's a baby food or not and then restricted the model to not include any baby or infant food. I created this column in the code itself, so the original dataset will suffice to run this part.

```
Status: Optimal
Foods_Cereals_ready_to_eat,_GENERAL_MILLS,_HARMONY = 0.9114157
Foods_Cheese_substitute,_mozzarella = 1.1259606
Foods_Hyacinth_beans,_mature_seeds,_cooked,_boiled,_without_salt = 0.54821044
Foods_Mushrooms,_shiitake,_cooked,_without_salt = 3.7530477
Foods_Pomegranates,_raw = 40.668062
Include_Cereals_ready_to_eat,_GENERAL_MILLS,_HARMONY = 1.0
Include_Cheese_substitute,_mozzarella = 1.0
Include_Hyacinth_beans,_mature_seeds,_cooked,_boiled,_without_salt = 1.0
Include_Mushrooms,_shiitake,_cooked,_without_salt = 1.0
Include_Pomegranates,_raw = 1.0
```