Diet Problem Write-Up
NU MSDS 460 – Assignment 1
John Leigh

Part 1:

The 5 packaged foods I chose were: 3 eggs, 3 pieces of bacon, 1 can of lentils, 1 can of tomatoes, and 3 servings of pasta. The label information can be found in the file entitled Food Labels.pdf. The prices per food item are included in the table below:

Item	Price
Eggs	1.5
Bacon	1.25
Lentils	1.59
Tomatoes	2.99
Pasta	8.99

Part 2:

I set up the linear programming problem in the following way:

Decision Variables:

x1 = The quantity of (3 eggs) servings
x2 = The quantity of (3 pieces of bacon) servings
x3 = The quantity of cans of lentils
x4 = the quantity of cans of tomatoes
x5 = The quantity of (3 servings) of Pasta

Objective Function:

Minimize cost = 1.5*x1 + 1.25*x2 + 1.59*x3 + 2.99*x4 + 8.99*x5

Constraints:

195*x1 + 540*x2 + 595*x3 + 630*x4 <= 35000 (sodium)
180*x1 + 180*x2 + 350*x3 + 140*x4 + 600*x5 >= 14000 (energy)
18*x1 + 12*x2 + 28*x3 + 7*x4 + 24*x5 >= 350 (protein)
18*x1 + 0.6*x2 >= 140 (vitamin d)
2.7*x1 + 0.6*x2 + 6.65*x3 + 5.1*x5 >= 126 (iron)
210*x1 + 210*x2 + 840*x3 + 1400*x4 + 417*x5 >= 32900 (potassium)
90*x1 + 30*x2 + 105*x3 + 45*x5 >= 9100 (calcium)
x1, x2, x3, x4, x5 >= 0 (non-negativity)

Part 3:

The output of my python code to solve the above linear programming problem can be found in The_Diet_Problem_output.txt. I have copied the results from that file here:
3_Eggs = 52.592593
3_Pieces_of_Bacon = 0.0
3_servings_of_pasta = 0.0
Can_of_Lentils = 41.587302
Can_of_Tomatoes = 0.0
Objective = 145.01269968000003

Part 4:

The output of my python code to solve the above linear programming problem can be found in The_Diet_Problem_output.txt. I have copied the results from that file here:
3_Eggs = 54.957672
3_Pieces_of_Bacon = 1.0
3_servings_of_pasta = 1.0
Can_of_Lentils = 38.845805
Can_of_Tomatoes = 1.0
Objective = 157.43133795000003

Part 5:

To solve this problem using ChatGPT, I provided tables with all of the relevant nutrient information and pricing information, and wrote a prompt asking it to solve the linear programming problem. The entire conversation is copied and pasted into the file called ChatGPT Conversation.pdf. The code that ChatGPT provided is included in the file called ChatGPT_Diet_Problem.py, and the output of ChatGPT's code is in a file called ChatGPT_Diet_Problem_Output.txt. The price of ChatGPT's outputs was almost exactly the same as my code, but with slightly different amounts of each food. Output shown below:
Status: Optimal
Bacon: 0.0
Eggs: 58.0
Lentils: 37.0
Pasta: 0.0
Tomatoes: 0.0
Total Cost: $ 145.83