Name(s) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(15 points) BA 353: Take Home Exam 2 Key Fall 21**

a) Paste the LP model here. Work together to very carefully enter the data into Excel, double-checking your numbers versus the actual values to ensure accuracy. Note: Below is the model for part d) with the salad included.



b) Try to solve the LP Model on Excel with the ten food items as they are above as variables and ten constraints. What do the Solver results say? (**DO NOT JUST WRITE DOWN THE ANSWER THAT POPS UP, READ THE SOLVER RESULTS!!!**). What does this imply about eating a healthy diet at McDonald’s by eating regular menu items?

Solver says no feasible solution. It is impossible to eat healthy eating regular menu items.

c) Until last year, McDonald’s sold side salads. Read this [article](https://www.eatthis.com/mcdonalds-ditched-salads/). Why did they stop selling them?

COVID hurt the supply chain. Too costly to have salads.

d) Add a new food item variable for a Side Salad that costs $1. Each side salad has only 35 calories, 0 fat, 3 carbs, 20 sodium, 1 fiber, 1 protein, 2% vitamin D, 2% calcium, 6% iron and 3% potassium. Re-solve the LP Model. What items should you eat at McDonald’s daily to meet FDA requirements **and** what is the minimum cost? (Allow the answers to not be integers, **round them to one decimal place**.)

1.6 Egg Mc, 3.0 Fries, 3.0 Milk and 15.8 Salads! **$23.41**.

e) How many of the items in your answer to d) cost $1 (or less). **Why?**

All of them since the objective is to minimize cost.

f) Add a constraint that all the menu items must be integers (since you can’t buy half an Egg McMuffin). Re-solve the LP Model. Now what should you eat **and** what’s the minimum cost? Would you feel even remotely “healthy” after eating like this for a day?

4 Fries, 5 Milk, and 16 salads. $25. Not healthy at all.

g) Eliminate the integer constraint, again allowing fractional items. Assume that you want to eat at least one burger (Big Mac, DQPwC or Cheeseburger). Add a constraint that forces at least one burger into the mix. Now what should you eat **and** how much does it cost? Is it feasible to require two burgers in the mix? What is the mix and cost? Is it feasible to require three burgers?

1 Cheeseburger, 0.7 Egg Mc, 2.3 Fries, 3.6 Milk and 17.7 salads. $25.34.

2 Cheeseburgers, 0.7 Fries, 3.7 Milk and 22.0 salads. $28.39.

3 is infeasible.

h) Eliminate the constraint requiring burgers. Requiring all ten constraints to be met, maximize the number of free ketchup packets you can include in your diet. What should you eat **and** what’s the minimum cost if you have the bizarre goal of eating a lot of free ketchup?

2.9 Milk, 16.4 Ketchup and 28 salads for $30.93. Yum.