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

**(7 points) BA 353: Take Home Exam 2**

Is it possible to eat healthy for a day on the cheap at McDonald’s? To answer this question, you will set up a large LP with several items from the McDonald’s menu versus the regulatory information from the FDA.

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|  | **Item** | **Price** |
| 1 | Big Mac | $3.99 |
| 2 | Double Quarter Pounder with Cheese | $4.79 |
| 3 | Cheeseburger | $1 |
| 4 | McChicken | $3.49 |
| 5 | Filet-O-Fish | $3.49 |
| 6 | Egg McMuffin | $1 |
| 7 | Chicken McNuggets (6 piece) | $3.29 |
| 8 | Bacon Ranch Salad & Buttermilk Crispy Chicken | $4.89 |
| 9 | Side Salad | $1 |
| 10 | Fruit 'n Yogurt Parfait | $1 |
| 11 | World Famous Fries (small) | $1 |
| 12 | Ketchup Packet | $0 |

Specifically, consider these twelve items from the menu. Go to the McDonald’s website and look up the nutritional information for each item, specifically:

* Calories
* Total Fat “Bad stuff”
* Sodium
* Dietary Fiber
* Protein
* Vitamin A

“Good stuff”

* Vitamin C
* Calcium
* Iron

Hint: <https://www.mcdonalds.com/us/en-us/about-our-food/nutrition-calculator.html> . Click “Show Details” to get all the facts. Build a table with the menu items and the nine nutritional facts for each. For example, a Big Mac has 540 calories, 28 grams of fat, 940 mg of sodium, …, and 4.5 milligrams of iron. The Ketchup Packet might be a little tricky to find…

Now, go to the FDA website and determine daily requirements (DV) for each of the nine nutritional facts (which are based on a 2000 calorie per day diet). Hint: <http://www.netrition.com/rdi_page.html>. For example, the DV for fat is 65 grams, the DV for Vitamin A is 5000 IU, etc.

**Assignment:**

Set up an LP with twelve variables and nine constraints with the goal of minimizing cost subject to a) not exceeding the limits on the **bad stuff** (calories, fat and sodium) while b) meeting or exceeding the requirements for the **good stuff** (fiber, protein, vitamins, calcium and iron).

a) Attach a clear copy of your LP Model to this page. Work together to very carefully enter the data into Excel, double-checking your numbers versus the actual values to ensure accuracy.

b) Solve the LP Model on Excel. What should you eat per day at McDonald’s to meet FDA requirements **and** what is the minimum cost? (It’s OK that the menu item answers are not integers, **round them to one decimal place**.)

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

d) Now figure out how you can eat a couple of burgers (it is McDonald’s after all): Add a new constraint that forces the combined number of burgers (the first three variables) to be at least 2. What is your meal plan **and** cost now?

e) Eliminate the restriction requiring at two burgers from part d) and now figure out (stupidly) what is the maximum number of free ketchup packets you can include in your diet. Now what is your meal plan **and** cost?

f) In parts b), d) and e), which of the three constraints on **bad stuff** is always binding (i.e. maxed out)? In other words, what is the primary issue with McDonald’s food items – calories, fat or sodium?

g) What is your meal plan and cost if your goal is (strangely) to maximize calories?

h) Re-solve part b) but now force the answers to be integers (with Solver). What is your meal plan and cost now?