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

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

**1)** The data in the table (and available online) is monthly gross sales for Ska Brewing Company from 2009 to 2012 (this is real data!). Let’s help Ska forecast 2013. Fill in the blanks in the table.

**a)** Sum up the totals for each year.

**b)** Forecast demand for each month and the total for 2013 using linear regression. (There was a really easy way to do this we learned in class.)

**c)** Determine the slope for each month.

**d)** According to the slopes, which two months are growing the fastest (at about the same rate)?

**e)** Interpret the slope for the fastest growing month(s) and annually.

**f)** Graph and **print** the data in chronological order, displaying the seasonal trend. Include both the original data and the 2013 forecasts on the graph.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **9** | **10** | **11** | **12** | **13** | **Slope** |
| **January** | $ 193,481 | $ 267,782 | $ 319,313 | $ 375,117 |  |  |
| **February** | $ 170,674 | $ 225,592 | $ 323,726 | $ 391,677 |  |  |
| **March** | $ 228,095 | $ 356,604 | $ 342,353 | $ 426,746 |  |  |
| **April** | $ 232,372 | $ 274,723 | $ 361,315 | $ 535,876 |  |  |
| **May** | $ 288,188 | $ 377,369 | $ 612,500 | $ 659,204 |  |  |
| **June** | $ 304,763 | $ 439,907 | $ 564,599 | $ 582,670 |  |  |
| **July** | $ 337,825 | $ 430,999 | $ 518,422 | $ 663,534 |  |  |
| **August** | $ 342,121 | $ 485,822 | $ 623,860 | $ 564,901 |  |  |
| **September** | $ 320,011 | $ 407,577 | $ 412,091 | $ 636,399 |  |  |
| **October** | $ 304,756 | $ 450,234 | $ 530,636 | $ 727,822 |  |  |
| **November** | $ 221,514 | $ 315,238 | $ 313,034 | $ 539,011 |  |  |
| **December** | $ 235,591 | $ 345,135 | $ 395,686 | $ 450,188 |  |  |
| **Total** |  |  |  |  |  |  |

|  |  |  |
| --- | --- | --- |
|  | **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 (4 piece) | $3.29 |
| 8 | Premium Bacon Ranch Salad with Crispy Chicken | $4.89 |
| 9 | Side Salad | $1 |
| 10 | Fruit 'n Yogurt Parfait | $1 |
| 11 | Large French Fries | $1.99 |
| 12 | Ketchup Packet | $0 |

**2)** Is it possible to eat healthy for a day 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.

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, Sodium, Dietary Fiber, Protein, Vitamin A, Vitamin C, Calcium and Iron. Hint: <http://nutrition.mcdonalds.com/getnutrition/nutritionfacts.pdf>. Build a table with the menu items and the nine nutritional facts for each. For example, a Big Mac has 550 calories, 29 grams of fat, 970 mg of sodium, …, and 25% of iron.

Now, go to the FDA website and determine daily requirements 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, *but since it’s listed as a percentage* in the McDonald’s chart, make the requirement 100%.

**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) Your answer in b) should involve a ridiculous number of side salads. Add a new constraint to determine the minimum (integer) number of side salads that has a feasible solution. What is the meal plan and cost with the minimum number of side salads?

d) Eliminate your new constraint from c) but 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) In parts b), c) and d), 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?