# MATH 371 - An Optimal Diet

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Spring 2020

We are assuming the subject is Male, 25-30, and consumes approximately two thousand calories a day. For some reason this person can only eat his meals at sonic during this given day. He would also really like to maximize the amount of fiber in his diet as he eats far too much fast food, and is feeling the effects.

| | Calories | Calories from Fat | Fat (g) | Saturated Fat (g) | Trans Fat (g) | Cholesterol (mg) | Sodium (mg) | Carbs (g) | Dietary Fiber (g) | Sugar (g) | Protein (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Quarter Pound Double Cheeseburger | 570 | 310 | 34 | 14 | 1 | 105 | 1370 | 34 | 2 | 6 | 31 |
| Sonic Burger | 640 | 300 | 34 | 9 | 1 | 70 | 1070 | 57 | 3 | 14 | 27 |
| Chicken Wrap, Crispy | 570 | 190 | 22 | 5 | 0 | 45 | 1260 | 56 | 4 | 4 | 22 |
| Buffalo Boneless 6pc | 440 | 250 | 28 | 10 | 0.5 | 85 | 1430 | 17 | 2 | 1 | 29 |
| Crispy Tenders, 5pc | 430 | 180 | 20 | 2 | 0 | 95 | 1210 | 27 | 3 | 0 | 35 |
| Fish Sandwich | 540 | 240 | 27 | 5 | 0 | 35 | 1240 | 57 | 4 | 10 | 18 |
| All American Dog, 6in | 410 | 190 | 21 | 8 | 9 | 35 | 1120 | 41 | 2 | 12 | 13 |
| New York Dog, 6in | 400 | 210 | 23 | 8 | 1 | 35 | 1110 | 35 | 3 | 5 | 13 |
| Veggie Burger | 550 | 200 | 23 | 4 | 0 | 10 | 1960 | 73 | 7 | 14 | 14 |
| Crispy Tender Sandwich | 440 | 200 | 22 | 3 | 0 | 40 | 910 | 41 | 2 | 3 | 19 |

## Solution

We will be maximizing the following equation,

$$z = 2x_1 + 3x_2 + 4x_3 + 2x_4 + 3x_5 + 4x_6 + 2x_7 + 3x_8 + 7x_9 + 2x_{10}$$

subject to...

$$\begin{cases} 570x_1 + 640x_2 + 570x_3 + 440x_4 + 430x_5 + 540x_6 + 410x_7 + 400x_8 + 550x_9 + 440x_{10} \leq 2000 \\ 310x_1 + 300x_2 + 190x_3 + 250x_4 + 180x_5 + 240x_6 + 190x_7 + 210x_8 + 200x_9 + 200x_{10} \geq 585 \\ 34x_1 + 34x_2 + 22x_3 + 28x_4 + 20x_5 + 27x_6 + 21x_7 + 23x_8 + 23x_9 + 22x_{10} \geq 64.5 \\ 14x_1 + 9x_2 + 5x_3 + 10x_4 + 2x_5 + 5x_6 + 8x_7 + 8x_8 + 4x_9 + 3x_{10} \leq 27 \\ 1x_1 + 1x_2 + 0x_3 + 0.5x_4 + 0x_5 + 0x_6 + 9x_7 + 1x_8 + 0x_9 + 0x_{10} \leq 27 \\ x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_9 + x_{10} \leq 250 \\ 105x_1 + 70x_2 + 45x_3 + 84x_4 + 95x_5 + 35x_6 + 35x_7 + 35x_8 + 10x_9 + 40x_{10} \leq 2300 \\ 1370x_1 + 1070x_2 + 1260x_3 + 1430x_4 + 1210x_5 + 1240x_6 + 1120x_7 + 1110x_8 + 1960x_9 + 910x_{10} \geq 130 \\ 34x_1 + 57x_2 + 56x_3 + 17x_4 + 27x_5 + 57x_6 + 41x_7 + 35x_8 + 73x_9 + 41x_{10} \geq 10 \\ 2x_1 + 3x_2 + 4x_3 + 2x_4 + 3x_5 + 4x_6 + 2x_7 + 3x_8 + 7x_9 + 2x_{10} \leq 50 \\ 6x_1 + 14x_2 + 4x_3 + 1x_4 + 0x_5 + 10x_6 + 12x_7 + 5x_8 + 14x_9 + 3x_{10} \geq 56 \\ 31x_1 + 27x_2 + 22x_3 + 29x_4 + 35x_5 + 18x_6 + 13x_7 + 13x_8 + 14x_9 + 19x_{10} = 4 \end{cases}$$