MATH 371 - An Optimal Diet

Justin Overstreet, Austin Spurlin, and Jonas Smith

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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...

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