How to Make the Perfect Breakfast

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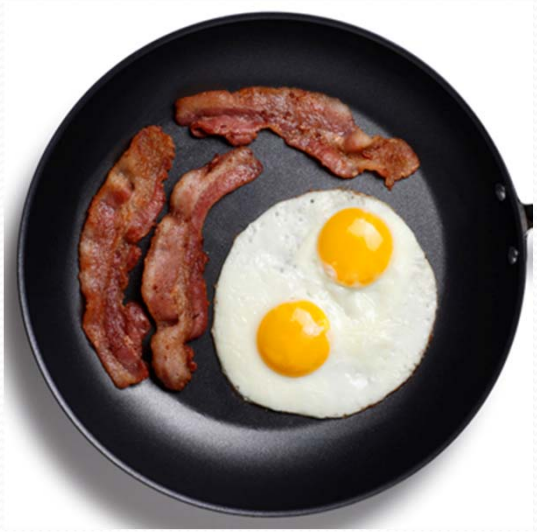
Introduction

- We wanted to figure out the perfect breakfast that a woman should eat everyday to maintain her weight.
- 1 serving of each food consists of 2 scrambled eggs and 2 strips of bacon.
- We are taking into account how many carbs, protein, fat, and calories are in each food.

Nutrition Facts

	Eggs	Bacon
Calories	199	70
Protein (grams)	13	4
Carbs (grams)	2	0
Fat (grams)	15.2	6



Process

- We want to find a perfect combination of eggs and bacon so that it will contain exactly 468 calories, 30 grams of fat, 4 grams of carbs, and 36.4 grams of protein.
- First we have to set up a vector equation for the problem.
- x_1 = number of servings for eggs
- x_2 = number of servings for bacon

Setup

$$x_1 \begin{bmatrix} \text{Nutrients per} \\ \text{serving of eggs} \end{bmatrix} + x_2 \begin{bmatrix} \text{Nutrients per} \\ \text{serving of bacon} \end{bmatrix} = \begin{bmatrix} \text{Amount of} \\ \text{servings each} \end{bmatrix}$$

Learning Process

- We originally had five different food items: eggs, bacon, toast, hash browns, and orange juice.
- We figured out our desired amount of nutrients (calories, carbs ,fat, and protein) by researching the appropriate amount of each nutrient that is healthy for breakfast.
- We row reduced the matrix, we saw that this was a problem because there were more columns than there were rows. Our final solution had either negative numbers of servings (for example -77.77 servings of bacon) or either an exaggerated number of servings (like 27.4 glasses for orange juice).

Learning Process

- We later changed the number of food items to our current matrix, following the example from our textbook. However, when we rref that matrix, we saw that we had an inconsistent solution.

$$\begin{bmatrix} 1 & 0 & 21 \\ 0 & 1 & -62.5 \\ 0 & 0 & 705.5 \\ 0 & 0 & 64.3 \end{bmatrix}$$

It was not only a problem of m>n, but the actual amount of total calories, carbs, fat, and protein as our solution. We needed to fix our numbers so that we would get a consistent solution.

Learning Process

- We wanted the total for each nutrient to be close to the sum of the combination of both components.
- We wanted to have 280 calories, 20 grams of proteins, 4 grams of carbs, and 25.2 grams of fat.
- When we set up an augmented matrix and ref it, we still got an inconsistent system.

$$\begin{bmatrix} 199 & 70 & 280 \\ 13 & 4 & 20 \\ 2 & 0 & 4 \\ 15.2 & 6 & 25.2 \end{bmatrix} \longrightarrow \begin{bmatrix} 1 & 0 & 2 \\ 0 & 4 & -6 \\ 0 & 70 & -118 \\ 0 & 6 & -5.2 \end{bmatrix}$$

Learning Process

- Since the matrix gave negative numbers, we decided to work backwards to figure out the appropriate numbers to get a consistent solution.
- We didn't want negative numbers so we knew that we had to increase the number for the target nutrients.
- We finally figured out the correct amount of nutrients to make this happen!!

$$X_1 \begin{bmatrix} 199 \\ 13 \\ 2 \\ 15.2 \end{bmatrix} + X_2 \begin{bmatrix} 70 \\ 4 \\ 0 \\ 6 \end{bmatrix} = \begin{bmatrix} 468 \\ 30 \\ 4 \\ 36.4 \end{bmatrix}$$

$$\begin{bmatrix} 199 & 70 & 468 \\ 13 & 4 & 30 \\ 2 & 0 & 4 \\ 15.2 & 6 & 36.4 \end{bmatrix} \xrightarrow{\text{rref}} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$X_1 = 2$

$X_2 = 1$

2 Servings of Eggs

1 Serving of Bacon

Conclusion

When we first attempted to solve this by introducing eggs, bacon, hash browns, toast, and orange juice, we were getting unreasonable numbers. We believe this occurred because eating all of those foods would take a woman beyond the number of calories, protein, carbohydrates, or fat she needs in a day. Meaning she is most likely to gain weight.

However, by choosing only eggs and bacon we were able to produce proportions.

If a woman wants to eat eggs and bacon for breakfast, but she wants to maintain her weight, she must eat two servings of eggs (total of 4 eggs) and 1 serving of Bacon (2 strips).

These results mean that combination of the two foods meets the daily requirement of the nutrition components

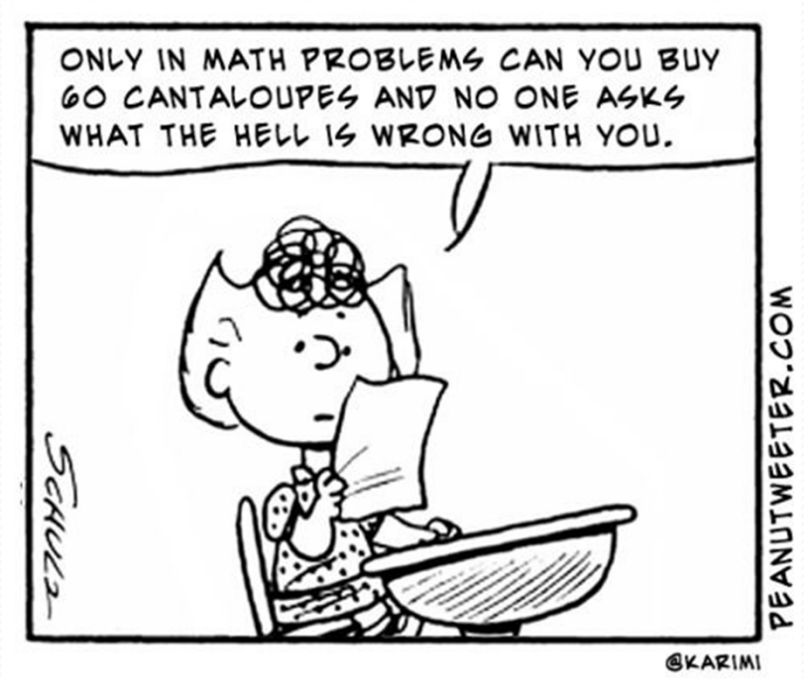
Acknowledgments

- Lay, David C. (2006). *Linear Algebra and Its Applications*. Third Edition. Boston, MA.
  - Section 1.10, Exercise 1
- Eggs nutrition facts, http://caloriecount.about.com/calories-egg-scrambled-i21018
- Hash Browns nutrition facts, http://www.oreida.com/products/country-style.aspx
- Bacon nutrition facts, http://www.myfitnesspal.com/food/calories/oscar-mayer-bacon-hardwood-smoked-17402286
- Wheat toast nutrition facts, http://caloriecount.about.com/calories-bread-wheat-toasted-i18065
- Orange Juice nutrition facts, http://www.dietfacts.com/html/nutrition-facts/floridas-natural-100percent-pure-florida-orange-juice-growers-pride-16-oz-plastic-bottle-34149.htm

Thanks Dr. Chang!!!!

THERE ARE 3 KINDS OF PEOPLE IN THIS WORLD

THOSE WHO ARE GOOD AT MATH, AND THOSE WHO AREN'T



seen on 9GAG.COM