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## Linear Programming Project

Objective: To write and solve your own linear programming problem.

Directions: You will need to choose two food items you wish to analyze. The nutrition label must be in English and you will need to cut the label from the two food items. You are to minimize cost while optimizing nutrition. You are to choose at least two nutritional values to optimize. Your project should be organized as explained below and include the following.

- 1) This page should be included and it will be your first page.
- 2) On the second page you will state the problem you are trying to solve. (It should look like and read like the problems we have been working.) The rest of this page should be blank. (You may use the computer to type your problem.)
- 3) On the third page you will have your problem written again and then you will solve it completely. Define the variable, write the constraints, graph, etc.. (This may take you more than one page – that is okay)
- 4) Cut out and tape the labels you used to a blank sheet of paper.
- 5) The last step is to write a paragraph or two explaining the process you used to come up with your problem. Include in your explanation any difficulties you had creating your problem. This should be in complete sentences and be grammatically correct.

### Grading Rubric

	Possible Points	Points Received
This page is included	5	
Problem clearly written	10	
Problem solved correctly Variables defined, constraints, graphs, objective function, etc	40	
Labels included	15	
Explanation of Process	25	
Neatness	5	
<b>Final Grade</b>	<b>100</b>	

### **High Fiber, High Protein, Low Sodium Diet**

I need to have a high fiber, high protein diet without having too much sodium. I need at least 50 grams of fiber per day and 60 grams of protein per day. Fiber One makes a Trail Mix Bar that contains 9 grams of fiber, 2 grams of protein, and 85 mg of sodium. They also make a Caramel Nut Protein Bar that contains 5 grams of fiber, 7 grams of protein, and 180 mg of sodium. I would like to get my fiber and protein from these bars, but keep the sodium intake to less than 2000 mg. How many of each bar should I eat to meet these requirements?

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A = Trail Mix Bar

B = Caramel Nut Protein Bar

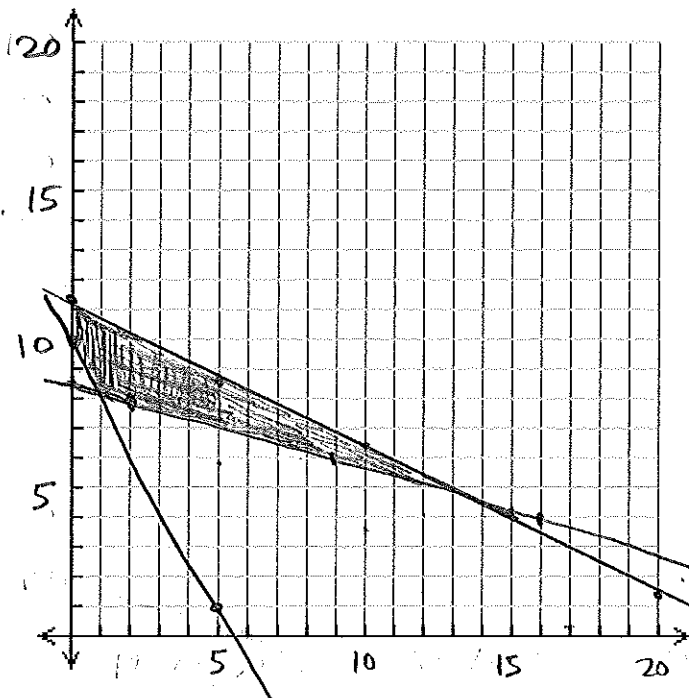
Protein:  $2A + 7B \geq 60$

Fiber:  $9A + 5B \geq 50$

Sodium:  $85A + 180B \leq 2000$

$A \geq 0, B \geq 0$

Minimize  $A + B$



$(.94, 8.30) \rightarrow (1, 9) \text{ or } (2, 8)$

$(0, 11.11) \rightarrow (0, 11)$

$(13.62, 4.68) \rightarrow (13, 4)$

1 Trail Mix Bar and 9 Protein Bars would meet all requirements,  
but so would 2 Trail Mix Bars and 8 Protein Bars,  
and so would 0 Trail Mix Bars and 10 Protein Bars.

	<u>Protein</u>	<u>Fiber</u>	<u>Sodium</u>
(1, 9)	65	54	1705
(2, 8)	60	58	1610
(0, 10)	70	50	1800

**FIBER One**  
Chewy Bars

**NEW!**

enlarged to show detail  
35% OF TOTAL FAT FIBER

**Trail Mix**  
Whole cast, delicious chocolate chunks, raisins, peanuts & cranberries

5-1.35 OZ (38g) BARS NET WT 6.75 OZ (191g)

**35% DAILY VALUE OF FIBER**

### Nutrition Facts

Serving Size 1 bar (38g)  
Servings Per Container 5

Amount Per Serving  
**Calories 130**  
Calories from Fat 30

	% Daily Value*
<b>Total Fat</b> 3.5g	5%
Saturated Fat 1g	6%
Trans Fat 0g	
<b>Cholesterol</b> 0mg	0%
<b>Sodium</b> 85mg	4%
<b>Total Carbohydrate</b> 28g	9%
Dietary Fiber 9g	35%
Sugars 10g	

**Protein** 2g

Vitamin A 0% • Vitamin C 0%  
Calcium 10% • Iron 4%

\*Percent Daily Values are based on a diet of 2,000 calories a day. Your daily values may be higher or lower depending on your calorie needs.

	Calories 2,000	2,500
Total Fat	Less than 65g	85g
Sat Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Ingredients: Chicory Root Extract, Whole Grain Oats, Barley Flakes, Sugar, Semisweet Chocolate Chunks (sugar, chocolate liquor, cocoa butter, soy lecithin, natural flavor), Corn Syrup, Raisins, Rice Flour, Roasted Peanuts, Canola Oil, Dried Cranberries, Vegetable Glycerin, Soluble Corn Fiber, Maltodextrin, Palm Kernel Oil, Calcium Phosphate, Soy Lecithin, Salt, Fructose, Cocoa Processed with Alkali, Barley Malt Extract, Baking Soda, Milk, Natural Flavor, Caramel Color, Mixed Tocopherols Added to Retain Freshness.

**CONTAINS PEANUT, SOY, MILK; MAY CONTAIN WHEAT, ALMOND AND SUNFLOWER INGREDIENTS.**

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Carbohydrate Choices: 2

**FIBER One**  
Chewy Bars

**NEW!**

**Protein**

**Caramel Nut**

5-1.17 OZ (33g) BARS NET WT 5.85 OZ (165g)

130 CALORIES 3g SAT FAT 180mg SODIUM 7g SUGARS 7g PROTEIN

**20% DAILY VALUE OF FIBER**

### Nutrition Facts

Serving Size 1 bar (33g)  
Servings Per Container 5

Amount Per Serving  
**Calories 130** Calories from Fat 60

	% Daily Value*
<b>Total Fat</b> 6g	9%
Saturated Fat 3g	15%
Trans Fat 0g	
<b>Cholesterol</b> 0mg	0%
<b>Sodium</b> 180mg	7%
<b>Total Carbohydrate</b> 16g	5%
Dietary Fiber 5g	20%
Sugars 7g	
<b>Protein</b> 7g	12%

**Calcium 2%** • **Iron 6%**

Not a significant source of vitamin A or vitamin C.

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	Calories 2,000	2,500
Total Fat	Less than 65g	85g
Sat Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g
Protein	50g	60g

Ingredients: Roasted Peanuts, Chicory Root Extract, Soy Protein Isolate, Sugar, Vegetable Oil (palm kernel, palm, canola), Whey Protein Concentrate, Corn Syrup, Rice Flour, Cocoa Powder, Water, Vegetable Glycerin, Rice Starch, Oligofructose, Skim Milk, Fructose, Maltodextrin, Soy Lecithin, Salt, Mono and Diglycerides, Disodium Phosphate, Barley Malt Extract, Caramel Color, Carrageenan, Natural Flavor, Mixed Tocopherols Added to Retain Freshness.

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Carbohydrate Choices: 1

I started this process by looking at labels of food in my pantry. I identified nutritional items that have been suggested to eat more of, as well as items that should be reduced when dieting. I then set minimum requirements for the ones that needed to be increased and a maximum for items to be reduced.

The requirements needed to be adjusted when I discovered that I originally did not have a feasible region. Once those were adjusted, I found that I did not have nice, whole number answers for my vertices. I had to round my points to the nearest whole number to get a reasonable answer.