

Methods:

The first step in solving my diet cost minimization problem was to identify five foods that are consistent components of my diet but also possess distinct nutritional values. After gathering these five foods, I recorded their nutritional values in a spreadsheet to keep track and broke down the labeled values into serving sizes. I quickly realized that some of my chosen foods had significantly higher nutritional values than others, potentially affecting the variety within my solution. To determine the price of each food item, I divided the item's price by its serving sizes in the package. With the nutritional values known, I multiplied the daily minimums and maximum requirements by 7 to establish the weekly constraints for these 7 requirements. Then I went into VS Code and put in my total cost function, nutritional constraints, and my decision variables. After this, I ran the code to give the optimal solution.

Part 2: Linear Programming Problem in Standard Form

The linear programming problem I solved is represented as follows: Total cost = $0.15 * x_1 + 0.21 * x_2 + 1.33 * x_3 + 0.59 * x_4 + 2.29 * x_5$. The goal was to minimize the cost function while meeting dietary requirements. Decision variables (x_1, x_2, x_3, x_4, x_5) were constrained to be above zero because it would have been impossible to eat a negative amount of food. Nutritional constraints were set based on gathered values, ensuring the necessary minimums were met while staying under the daily maximums. The constraints were written as follows:

```
model += 0 * x1 + 170 * x2 + 0 * x3 + 470 * x4 + 340 * x5 <= 35000, "Sodium"
```

```
model += 200 * x1 + 80 * x2 + 70 * x3 + 270 * x4 + 200 * x5 >= 14000, "Calories"
```

```
model += 7 * x1 + 3 * x2 + 1 * x3 + 14 * x4 + 22 * x5 >= 350, "Protein"
```

```
model += 0 * x1 + 0 * x2 + 0 * x3 + 0 * x4 + 3 * x5 >= 140, "Vitamin_D"  
model += 0 * x1 + 30 * x2 + 25.6 * x3 + 0 * x4 + 358.4 * x5 >= 9100, "Calcium"  
model += 2 * x1 + 0.9 * x2 + 0.4 * x3 + 0 * x4 + 1.6 * x5 >= 126, "Iron"  
model += 118 * x1 + 27 * x2 + 210 * x3 + 130 * x4 + 306 * x5 >= 32900, "Potassium"
```

After all of these steps were laid out in the program I had python solve the linear programming problem, giving me an optimal solution.

Part 4: Solution to the Linear Programming Problem

The optimal solution involved using 157.79 servings of pasta, 46.667 servings of sardines, and no servings of chicken nuggets, mixed fruit, and bread. The minimum cost for this solution was \$130.54, approximately \$0.8 less than the grocery store cost for these foods for the week.

Part 5: Revised Linear Programming Problem

Introducing constraints to include at least one serving of each food item or meal during the week, the revised solution maintained only one serving of nuggets, fruit, and bread. However, it increased the meal cost by \$1.7, providing a bit more variety in meals.

Nutrition Facts

Serving Size about 2oz (56g)
Servings Per Container: 8

Amount Per Serving		% Daily Value*
Calories	200	
Total Fat 1g	1%	
Saturated Fat 0g	0%	
Trans Fat 0g		
Cholesterol 0mg	0%	
Sodium 0mg	0%	
Total Carbohydrate 42g	15%	
Dietary Fiber 3g	11%	
Soluble Fiber 2g		
Insoluble Fiber 1g		
Total Sugars 1g		
Protein 7g		

Vitamin D	0mcg	0%	Thiamin	0.5mg	40%
Calcium	12mg	0%	Riboflavin	0.2mg	15%
Iron	2mg	10%	Niacin	5mg	30%
Potassium	118mg	2%	Folate	199mcg DFE	50%

*The % daily value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.



Ingredients:
Semolina (wheat), durum wheat flour.

Vitamins/Minerals:
Vitamin B3 (Niacin), Iron, (Ferrous Sulfate), Vitamin B1 (Thiamin Mononitrate), Vitamin B2 (Riboflavin), Folic Acid.

Contains wheat ingredients.

Not a significant source of added sugars.

Nutrition Facts

18 servings per container
Serving size 1 Slice (32g)

Amount per serving	Calories	80
	% Daily Value*	
Total Fat 1g	1%	
Saturated Fat 0g	0%	
Trans Fat 0g		
Cholesterol 0mg	0%	
Sodium 170mg	7%	
Total Carbohydrate 16g	6%	
Dietary Fiber 0g	0%	
Total Sugars 2g		
Includes 1g Added Sugars	2%	
Protein 3g		

Vitamin D 0mcg	0%
Calcium 32mg	2%
Iron 0.9mg	6%
Potassium 27mg	0%
Thiamin 0.2mg	15%
Riboflavin 0.1mg	8%
Niacin 2.1mg	15%
Folate 58mcg DFE (30mcg folic acid)	15%

* The % daily value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

SARDINES IN 100% OLIVE OIL

Nutrition Facts

1 serving per container

Serving size
1/2 cup drained (85g)

Calories per serving **200**

Vitamin D 15% • Calcium 28% • Iron 8% • Potassium 6%

INGREDIENTS: SARDINES (FISH), OLIVE OIL, SALT. CONTAINS: FISH.

Box# BSE 02208-20



CONTAINER COMPLIES WITH CALIFORNIA PROP. 65



EASY PEEL

STORE IN A COOL, DRY PLACE. REFRIGERATE LEFTOVERS IN A COVERED, NONMETALLIC CONTAINER AND CONSUME WITHIN 2 DAYS. SOLD BY WEIGHT, NOT PIECES.

DISTRIBUTED BY: SEASON BRAND
LYNDHURST, NJ 07071 USA
PRODUCT OF MOROCCO

Fish Education

SPECIES: SARDINA PILCHARDUS



FISHING REGION:

ATLANTIC OCEAN

EASTERN / CENTRAL WATERS

NUTRITION HIGHLIGHTS

22g PROTEIN | 28% CALCIUM | 1700mg OMEGA-3 PER SERVING

Learn more at
SEASONPRODUCTS.COM

SEASONSARDINES
SEASONBRANDOFFICIAL

Nutrition Facts

About 10 servings per container
Serving size 5 pieces (90g)

Amount per serving	Calories	% Daily Value*
Total Fat 17g	270	22%
Saturated Fat 4g		20%
Trans Fat 0g		
Polyunsaturated Fat 6g		
Monounsaturated Fat 6g		
Cholesterol 40mg		13%
Sodium 470mg		20%
Total Carbohydrate 15g		5%
Dietary Fiber 0g		0%
Total Sugars 0g		
Includes 0g Added Sugars		0%
Protein 14g		28%
Vitamin D 0mcg		0%
Calcium 0mg		0%
Iron 0.0mg		0%
Potassium 130mg		2%

*The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

DISTRIBUTED BY: TYSO SALES AND DISTRIBUTION, INC.
PO BOX 2020, SPRINGDALE, AR 72765-2020 USA
©2019 TYSO FOODS, INC.

INGREDIENTS: Chicken, water, wheat flour, contains 2% or less of the following: brown sugar, corn starch, dried garlic, dried onion, dried yeast, extractives of paprika, natural flavor, oat fiber, salt, spices, wheat starch, white whole wheat flour, yellow corn flour. Breading set in vegetable oil.
CONTAINS: WHEAT.

HEATING INSTRUCTIONS

CONVENTIONAL OVEN Preferred method.

1. Preheat oven to 400°F.
2. Place frozen nuggets on baking sheet.
3. Heat 11 to 13 minutes.

MICROWAVE

1. Arrange frozen nuggets on microwave safe plate.
2. Heat on HIGH:
5 nuggets for 1 to 1 1/2 minutes,
10 nuggets for 2 to 2 1/2 minutes,
15 nuggets for 2 1/2 to 3 minutes.
Do not overheat.
3. Let stand 1 to 2 minutes before serving.

AIR FRYER

1. Place 16-20 Frozen Chicken Nuggets, enough to cover, on the Air Fry Tray and close fryer.
2. No Preheating is needed.
3. Heat at 360°F for 7-8 minutes.

Appliances vary. Heating times approximate.

IN TOUCH WITH TYSO

800-233-6332
Questions or comments are important. Call Monday-Friday, 8 a.m.-5 p.m. CT.

www.tyson.com
For great recipes, food tips, information about our products and **TYSON CORE VALUES** visit us on the internet.

Or write:
TYSON Foods, Inc., P.O. Box 2020, Springdale, AR 72765-2020 U.S.A.

Thank you for buying this TYSO product.

RESEALABLE PACKAGE

TEAR TO OPEN

Dole®

mixed fruit

DOLE® Mixed Fruit is hand-picked at peak ripeness to ensure you're getting only the finest fruits available. Each fruit is carefully washed, cut and quickly fresh-frozen after harvest to lock in the natural flavor and nutrition. The result is great-tasting fruit that is just as nutritious as fresh and available all year long.

Capturing the Sun®
At Dole, we use the best sun-ripened fruit that nature has to offer.
Plus, this product is non-GMO** and naturally gluten-free.

Simply DOLE. Higher Standards You Can Taste.®



Creamy Mixed Fruit Smoothie
Prep: 5 mins. Makes: 2 servings
 - 2 cups frozen DOLE® Mixed Fruit
 - 1 ripe, medium DOLE Banana
 - 3/4 cup DOLE Pineapple Juice or vanilla soymilk
 Combine all ingredients in a blender. Cover; blend until smooth.

Minted Ginger Fruit Salad
Prep: 3 hours. Makes: 8 servings
 - 1 cup water
 - 1/2 cup sugar
 - 4 tsp. peeled, grated fresh ginger
 - 4 tsp. chopped fresh mint
 - 1-1/2 tsp. lemon juice
 - 4 cups frozen DOLE® Mixed Fruit
 - 2 DOLE Bananas, peeled and sliced
 Combine water, sugar and ginger in small saucepan. Bring to a boil; reduce heat and simmer 10 minutes. Remove from heat; stir in mint. Chill syrup. Stir in lemon juice. Pour syrup over mixed fruit in shallow dish, to marinate. Cover; chill 2 hours. Stir in banana slices before serving. Spoon fruit into bowls. Garnish with mint.

Nutrition Facts
 Serving Size 1 cup (140g)
 Servings Per Container about 13

Amount Per Serving	Calories	Calories from Fat 0	% Daily Value*
Total Fat 0g	0	0%	
Saturated Fat 0g	0	0%	
Trans Fat 0g	0	0%	
Cholesterol 0mg	0	0%	
Sodium 0mg	0	0%	
Potassium 200mg	6%		
Total Carbohydrate 16g	5%		
Dietary Fiber 2g	8%		
Sugars 11g			
Protein less than 1g			
Vitamin A 8% • Vitamin C 140%			
Calcium 0% • Iron 4%			
*Percent Daily Value is based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.			
Total Fat	Less than 0.5g	0.0g	
Sat Fat	0g	0g	
Cholesterol	Less than 300mg	300mg	
Sodium	Less than 2,000mg	2,400mg	
Potassium	Less than 3,000mg	3,000mg	
Total Carbohydrate	300g	375g	
Dietary Fiber	25g	30g	
Calories from Fat	0	0	
Fat 9 • Carbohydrate 4 • Protein 4			

INGREDIENTS: STRAWBERRIES, PINEAPPLE, PEACHES, MANGO, ASCORBIC AND CITRIC ACIDS (TO PROMOTE COLOR RETENTION), MALIC ACID, AND NATURAL FLAVORS.
 CAUTION: MAY CONTAIN PIT OR PIT FRAGMENTS.

MANUFACTURED BY:
 DOLE PACKAGED FOODS, LLC
 WESTLAKE VILLAGE, CA 91361

PACKED IN U.S.A. 093016 SGS.R1
 SATISFACTION GUARANTEED
 CALL 1-800-232-8888

THAWING INSTRUCTIONS

Room Temperature: Evenly pour fruit on plate; defrost 30 min. or until partially thawed.

Microwave: Pour fruit in microwave-safe dish. Use Defrost setting for 30 seconds, or until partially thawed. Microwave ovens vary; heating time may change. Serve slightly frozen for best results.

DO NOT REFREEZE.

Visit dolesunshine.com for delicious recipes.

Connect with us at:
 dolesunshine
 @dolesunshine

For more than 100 years, Dole has been committed to our environment, our employees and the communities in which we operate. To learn how, please visit www.dolehritis.com

**no genetically modified (or engineered) ingredients