

Problem 1

Consider the following problem:

Maximize: $Z = x_1 - 7x_2 + 3x_3$

Subject To: $2x_1 + x_2 - x + 3 \leq 4$ (resource 1)

$4x_1 - 3x_2 \leq 2$ (resource 2)

$-3x_1 + 2x_2 + x_3 \leq 3$ (resource 3)

With: $x_1, x_2, x_3 \geq 0$

- (a) Solve the problem using the simplex method.
- (b) Identify the shadow prices for the three resources and describe their significance.

Source: Hillier & Lieberman 4.7.4

Problem 2

Consider the following problem:

Maximize: $Z = 5x_1 + 4x_2 - x_3 + 3x_4$

Subject To: $3x_1 + 2x_2 - 3x_3 + x_4 \leq 24$

$3x_1 + 3x_2 + x_3 + 3x_4 \leq 36$

With: $x_1, x_2, x_3, x_4 \geq 0$

- (a) Solve the problem using the simplex method.
- (b) Identify the shadow prices for the two resources and describe their significance.

Source: Hillier & Lieberman 4.7.6

Problem n

Ashok the Artichoke and Molly the Mango were getting ready for the county fair (if you didn't go last weekend, you missed it). They were going to set up the "Rabbit Food Express" stand right between the food on a stick stand, and the "how many different things can we fry" stand as a healthy option for fair-goers and for the pro-salad platformers. They have a supply of tofu, fresh mown grass (environmentally friendly!), candied brazil nuts (they aren't actually nuts!), and bacon (sans bacon). They have 150 servings of tofu, 100 servings of grass, 50 servings of nuts, and 75 servings of bacon (sans bacon). They would like to focus on three menu items:

1. The Alex Meadow's Special - \$2.50, requires 2 servings of tofu, 1 serving of grass, 1 serving of nuts.
2. The Way the Pork was Done - \$3.00, requires 1 serving of tofu, 1 serving of grass, 2 servings of bacon (sans bacon)
3. I'm Scrappy and So Are You - \$2.00, requires 2 servings of grass, 1 serving of nuts, 1 serving of bacon (sans bacon)

Of course, being the poor college kids they are, they want to make as much money as possible. How many of each of the three items should they make for the fair?

Source: Blame Lindsay for this one. Really. I was drawing a blank.