The Candy Problem

Problem: Daniel bought one pound of jellybeans and two pounds of chocolates for $2.00. A week later, he bought four pounds of caramels and one pound of jellybeans, paying $3.00. The next week, he bought three pounds of licorice, one pound of jellybeans and one pound of caramels for $1.50. How much would he have to pay on his next trip to the candy store, if he bought one pound of each of the four candies?

Solution: Let,

J = the cost of one pound of Jellybeans

C = the cost of one pound of Chocolates

K = the cost of one pound of Caramels

L = the cost of one pound of Licorice

So we have,

$$\begin{aligned} J &+ 2C &&&&= 200 \\ J &&+ 4K &&&= 300 \\ J &&+ K &+ 3L &&= 150 \\ J &+ C &+ K &+ L &&= X \end{aligned}$$

Where, X is the total cost of one pound of each candy.

Using Matrices, we can re-write the equation as follows:

$$\begin{vmatrix} 1 & 2 & 0 & 0 & 200 \\ 1 & 0 & 4 & 0 & 300 \\ 1 & 0 & 1 & 3 & 150 \\ 1 & 1 & 1 & 1 & X \end{vmatrix}$$

Now, let's do row(3) – 3*row(4):

$$\begin{vmatrix} 1 & 2 & 0 & 0 & 200 \\ 1 & 0 & 4 & 0 & 300 \\ -2 & -3 & -2 & 0 & 150-3X \\ 1 & 1 & 1 & 1 & X \end{vmatrix}$$

Now, row(3) + $\frac{1}{2}$ row(2) gives us:

$$\begin{vmatrix} 1 & 2 & 0 & 0 & 200 \\ 1 & 0 & 4 & 0 & 300 \\ -1.5 & -3 & 0 & 0 & 300-3X \\ 1 & 1 & 1 & 1 & X \end{vmatrix}$$

Next, row(3) + $\frac{3}{2}$ row(1) yields:

$$\begin{vmatrix} 1 & 2 & 0 & 0 & 200 \\ 1 & 0 & 4 & 0 & 300 \\ 0 & 0 & 0 & 0 & 600-3X \\ 1 & 1 & 1 & 1 & X \end{vmatrix}$$

Based on row (3), we have 600 – 3X = 0. Hence X = total cost of one pound of each candy = 200 or $2.00.