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,

\[ J = \text{the cost of one pound of Jellybeans} \]
\[ C = \text{the cost of one pound of Chocolates} \]
\[ K = \text{the cost of one pound of Caramels} \]
\[ L = \text{the cost of one pound of Licorice} \]

So we have,

\[ J + 2C = 200 \]
\[ J + 4K = 300 \]
\[ J + K + 3L = 150 \]
\[ J + C + K + L = X \]

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

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

\[
\begin{bmatrix}
1 & 2 & 0 & 0 & 200 \\
1 & 0 & 4 & 0 & 300 \\
1 & 0 & 1 & 3 & 150 \\
1 & 1 & 1 & 1 & X
\end{bmatrix}
\]

Now, let’s do row(3) – 3*row(4):

\[
\begin{bmatrix}
1 & 2 & 0 & 0 & 200 \\
1 & 0 & 4 & 0 & 300 \\
-2 & -3 & -2 & 0 & 150-3X \\
1 & 1 & 1 & 1 & X
\end{bmatrix}
\]

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

\[
\begin{bmatrix}
1 & 2 & 0 & 0 & 200 \\
1 & 0 & 4 & 0 & 300 \\
-1.5 & -3 & 0 & 0 & 300 - 3X \\
1 & 1 & 1 & 1 & X
\end{bmatrix}
\]

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