Homework
(to accompany section 8.6)

1. Solve this matrix equation:
\[
\begin{bmatrix}
2 & 3 \\
4 & 7
\end{bmatrix}
\begin{bmatrix}
x & a & u & w \\
y & b & v & z
\end{bmatrix}
= 
\begin{bmatrix}
-2 & 11 & 8 & -6 \\
-8 & 25 & 19 & -14
\end{bmatrix}
\]

2. Solve this matrix equation:
\[
\begin{bmatrix}
-4 & -4 & 5 \\
1 & 1 & -1 \\
5 & 4 & -6
\end{bmatrix}
\begin{bmatrix}
a & x \\
b & y \\
c & z
\end{bmatrix}
= 
\begin{bmatrix}
1 & 1 \\
0 & 0 \\
1 & -1
\end{bmatrix}
\]

3. The members of the Emerson family take 2 kinds of vitamin supplements. The pink capsules contain 45 units of vitamin C and 10 units of vitamin E. The green tablets contain 9 units of vitamin C and 6 units of vitamin E. Mom takes 153 units of vitamin C and 42 units of vitamin E. Dad takes 126 units of vitamin C and 44 units of vitamin E. Child #1 takes 72 units of vitamin C and 28 units of vitamin E. Child #2 takes 99 units of vitamin C and 26 units of vitamin E.

a) Set up a set of equations which describes this situation. (Be sure to define your variables clearly.)

b) Express the system(s) of equations you found in part a) as a matrix equation of the form \( AX = B \).

c) Find the inverse of the coefficient matrix \( A \) and use it to solve the matrix equation in part b). How many pills of each type (color) does each member of the Emerson family take?

Answers

1. \[
\begin{bmatrix}
x & a & u & w \\
y & b & v & z
\end{bmatrix}
= 
\begin{bmatrix}
5 & 1 & -1/2 & 0 \\
-4 & 3 & 3 & -2
\end{bmatrix}
\]

2. \[
\begin{bmatrix}
a & x \\
b & y \\
c & z
\end{bmatrix}
= 
\begin{bmatrix}
3 & 1 \\
-2 & 0 \\
1 & 1
\end{bmatrix}
\]

3. Mom takes 3 pink pills and 2 green ones. Dad takes 2 pink pills and 4 green ones. Child #1 takes 1 pink pill and 3 green ones. Child #2 takes 2 pink pills and 1 green one.