7.1.1: Introduction to Matrices (Exercises)

A vendor sells hot dogs and corn dogs at three different locations. His total sales(in hundreds) for January and February from the three locations are given in the table below.

	JANUARY			FEBRUARY	
	HOT DOGS	CORN DOGS		HOT DOGS	CORN DOGS
PLACE I	10	8		8	7
PLACE II	8	6		6	7
PLACE III	6	4		6	5

Represent these tables as 3×2 matrices J and F, and answer problems 1 - 5.

1) Determine total sales for the two months, that is, find $J+F$.

2) Find the difference in sales, $J-F$.

3) If hot dogs sell for $3 and corn dogs for $2, find the revenue from the sale of hot dogs and corn dogs. *Hint: Let P be a 2×1 matrix. Find $(J+F)P$.*

4) If March sales will be up from February by 10%, 15%, and 20% at Place I, Place II, and Place III, respectively, find the expected number of hot dogs and corn dogs to be sold in March. *Hint: Let R be a 1×3 matrix with entries 1.10, 1.15, and 1.20. Find $M=RF$.*

5) Hots dogs sell for $3 and corn dogs sell for $2. Using matrix M that predicts the number of hot dogs and corn dogs expected to be sold in March from problem (4), find the 1×1 matrix that predicts total revenue in March. *Hint: Use 2×1 price matrix P from problem (3) and find MP.*

Determine the sums and products in problems 6-13. Given the matrices A, B, C, and D as follows:

$$\mathrm{A}=\begin{bmatrix}3 & 6 & 1\\ 0 & 1 & 3\\ 2 & 4 & 1\end{bmatrix} \quad \mathrm{B}=\begin{bmatrix}1 & -1 & 2\\ 1 & 4 & 2\\ 3 & 1 & 1\end{bmatrix} \quad \mathrm{C}=\begin{bmatrix}1\\ 2\\ 3\end{bmatrix} \quad \mathrm{D}=\begin{bmatrix}2 & 3 & 2\end{bmatrix}$$

6) $3A-2B$

7) AB

8) BA

9) $AB+BA$

10) A^2

11) $2BC$

12) $2CD+3AB$

13) A^2B

14) Let $E=\begin{bmatrix}m & n\\ p & q\end{bmatrix}$ and F $=\begin{bmatrix}\mathrm{a} & \mathrm{b}\\ \mathrm{c} & \mathrm{d}\end{bmatrix}$, find EF.

15) Let $E=\begin{bmatrix}m & n\\ p & q\end{bmatrix}$ and F $=\begin{bmatrix}\mathrm{a} & \mathrm{b}\\ \mathrm{c} & \mathrm{d}\end{bmatrix}$, find FE.

16) Let $G=\begin{bmatrix}3 & 6 & 1\\ 0 & 1 & 3\\ 2 & 4 & 1\end{bmatrix}$ and $H=\begin{bmatrix}x\\ y\\ z\end{bmatrix}$, find GH.

17) Let $G=\begin{bmatrix}3 & 6 & 1\\ 0 & 1 & 3\\ 2 & 4 & 1\end{bmatrix}$ and $H=\begin{bmatrix}x\\ y\\ z\end{bmatrix}$. Explain why the product HG does not exist.

Express the following systems as $AX=B$, where A, X, and B are matrices.

18)

$$\begin{aligned}4x-5y&=6\\ 5x-6y&=7\end{aligned} \tag{7.1.1.1}$$

19)

$$\begin{aligned}x-2y+2z&=3\\ x-3y+4z&=7\\ x-2y-3z&=-12\end{aligned} \tag{7.1.1.2}$$

20) $$\begin{array}{l}2x+3z=17\\3x-2y=10\\5y+2z=11\end{array} \tag{7.1.1.3}$$	21) $$\begin{array}{rrrrrrrr}x&+&2y&+&3z&+&2w&=14\\x&-&2y&-&z&&&=-5\\&&y&-&2z&+&4w&=9\\x&&&+&3z&+&3w&=15\end{array} \tag{7.1.1.4}$$