

2.3 – Addition & Subtraction of Matrices

Math 111

Warnock - Class Notes

We can use matrices to organize data.

Management There are three convenience stores in Folsom. This week, store I sold 88 loaves of bread, 48 qt of milk, 16 jars of peanut butter, and 112 lb of cold cuts. Store II sold 105 loaves of bread, 72 qt of milk, 21 jars of peanut butter, and 147 lb of cold cuts. Store III sold 60 loaves of bread, 40 qt of milk, no peanut butter, and 50 lb of cold cuts.

We could create a table to organize this data:

	Bread	Milk	Peanut Butter	Cold Cuts
Store I				
Store II				
Store III				

And likewise, if we want to do “math” with this information, we can organize it into a Matrix.

$$M = \begin{bmatrix} & & & & \\ & & & & \\ & & & & \\ & & & & \end{bmatrix}$$

Matrices are named with _____.

Matrices are classified by _____, by the number of _____ & _____.

The above matrix has _____ rows and _____ columns, so it is called _____.

A matrix with m rows and n columns is called an _____.

A matrix with 1 row is called a _____. (dimension would be _____)

A matrix with 1 column is called a _____. (dimension: _____)

A matrix with the _____ number of _____ & _____ is a _____ matrix.

Two matrices are _____ if they are the same _____ and the corresponding _____ are _____.

#1. Name the size of each matrix, and any special classification it has.

$$\text{a) } \begin{bmatrix} 1 & 2 & 3 \\ 4 & -5 & 6 \\ -9 & 8 & 7 \end{bmatrix}$$

$$\text{c) } \begin{bmatrix} 0 & 3 & \frac{1}{4} & \pi \end{bmatrix}$$

$$\text{b) } \begin{bmatrix} 5 & 2 \\ 3 & -7 \\ -4 & 5 \\ 1 & 0 \end{bmatrix}$$

$$\text{d) } \begin{bmatrix} 0.3 \\ -0.1 \\ 2.4 \end{bmatrix}$$

#2. Determine the values of the variables that make the matrices equal.

$$\text{a) } \begin{bmatrix} 3 & 5 & 7 \\ a & b & c \\ 4 & 2d & 10 \end{bmatrix} = \begin{bmatrix} x & y & z \\ 1 & 2 & 3 \\ 4 & -6 & 10 \end{bmatrix}$$

$$\text{b) } \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2 \\ -1 \\ 0 \end{bmatrix}$$

The sum of two matrices X & Y (must be the same _____, __ __) is the Matrix X+Y where each element is the sum of the corresponding elements of X & Y.

#3. Find the sum, if possible.

$$\text{a) } \begin{bmatrix} 2 & -3 \\ -1 & 5 \end{bmatrix} + \begin{bmatrix} -7 & -4 \\ 4 & 1 \end{bmatrix} =$$

$$\text{b) } \begin{bmatrix} 3 & 2 \\ 1 & 5 \end{bmatrix} \& \begin{bmatrix} 2 & -1 & 0 \\ 0 & 2 & 0 \end{bmatrix}$$

#4. Let's readdress the original problem given.

Management There are three convenience stores in Folsom. This week, store I sold 88 loaves of bread, 48 qt of milk, 16 jars of peanut butter, and 112 lb of cold cuts. Store II sold 105 loaves of bread, 72 qt of milk, 21 jars of peanut butter, and 147 lb of cold cuts. Store III sold 60 loaves of bread, 40 qt of milk, no peanut butter, and 50 lb of cold cuts.

- a. Use a 4×3 matrix to express the sales information for the three stores.
- b. During the following week, sales on these products at store I increased by 25%; sales at store II increased by $1/3$; and sales at store III increased by 10%. Write the sales matrix for that week.
- c. Write a matrix that represents total sales over the two-week period.

$$M = \begin{bmatrix} 88 & 48 & 16 & 112 \\ 105 & 72 & 21 & 147 \\ 60 & 40 & 0 & 50 \end{bmatrix}$$

The difference of two matrices X & Y (must be the same _____, _ _) is the Matrix X-Y where each element is found by subtracting the corresponding elements of X & Y.

#5. Subtract each pair of matrices.

$$\text{a) } \begin{bmatrix} 3 & 5 & 7 \\ -2 & -4 & -6 \end{bmatrix} - \begin{bmatrix} 5 & -3 & 1 \\ -6 & 4 & -6 \end{bmatrix} =$$

$$\text{b) } \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \& \begin{bmatrix} 7 & 8 & 9 \\ 10 & 11 & 12 \end{bmatrix}$$

47. Educational Attainment The following table gives the educational attainment of African Americans and Hispanic Americans 25 years and older since 1980. *Source: U. S. Census Bureau.*

- Write a matrix for the educational attainment of African Americans.
- Write a matrix for the educational attainment of Hispanic Americans.
- Use the matrices from parts a and b to write a matrix showing the difference in educational attainment between African and Hispanic Americans.

Year	African American		Hispanic American	
	Percentage with 4 Years of High School or More	Percentage with 4 Years of College or More	Percentage with 4 Years of High School or More	Percentage with 4 Years of College or More
1980	51.2	7.9	45.3	7.9
1985	59.8	11.1	47.9	8.5
1990	66.2	11.3	50.8	9.2
1995	73.8	13.2	53.4	9.3
2000	78.5	16.5	57.0	10.6
2008	83.0	19.6	62.3	13.3