

**Matrix Basics Worksheet**

Name \_\_\_\_\_

Show all work for full credit.

Period \_\_\_\_\_ Date \_\_\_\_\_

**State the dimensions of the following matrices.**

1)  $\begin{bmatrix} 3 & -2 & 7 & 9 \\ 1 & 0 & -3 & 5 \\ -8 & 2 & 10 & -6 \end{bmatrix}$

2)  $[5 \quad -7 \quad -2 \quad 1]$

3)  $\begin{bmatrix} 9 \\ 6 \\ 5 \end{bmatrix}$

4)  $\begin{bmatrix} 6 & 8 & -17 \\ -7 & -5 & 15 \\ 1 & 14 & 2 \\ 11 & 13 & -3 \end{bmatrix}$

**Perform the indicated operations:**

5)  $3 \begin{bmatrix} 5 & -6 & 3 \\ 0 & -4 & 8 \\ 10 & -11 & 12 \end{bmatrix} - 2 \begin{bmatrix} 2 & -4 & 0 \\ 5 & 11 & -2 \\ 5 & 0 & -10 \end{bmatrix}$

6)  $\begin{bmatrix} -2 & 8 \\ -11 & 5 \end{bmatrix} + 3 \begin{bmatrix} 5 & 3 & -11 \\ 44 & 0 & 5 \\ -3 & 2 & 8 \end{bmatrix}$

**Solve for x and/or y:**

7)  $\begin{bmatrix} -3 & 5 \\ 25 & -2 \end{bmatrix} - 3 \begin{bmatrix} 0 & -2 \\ x & 4 \end{bmatrix} = \begin{bmatrix} -3 & 11 \\ 15 & -14 \end{bmatrix}$

8)  $-5 \begin{bmatrix} 5 & 6 \\ 10 & -7 \\ 8 & x \\ 1 & -6 \\ 7 & 8 \end{bmatrix} + 4 \begin{bmatrix} 0 & 1 \\ 1 & -2 \\ 2 & 3 \\ 4 & 11 \\ -5 & 3 \end{bmatrix} = 2 \begin{bmatrix} 12.5 & -13 \\ -23 & 13.5 \\ -16 & 100 \\ y & 37 \\ -27.5 & -14 \end{bmatrix}$

Matrix A represents the number of points scored in each quarter for the first 4 games of football played by Frederick High School. Matrix B represents the number of points scored in each quarter for the first 4 games of football played by Thomas Johnson High School.

	Matrix A			
	Q1	Q2	Q3	Q4
Game 1	6	0	13	3
Game 2	21	18	0	7
Game 3	14	28	6	0
Game 4	0	0	35	17

	Matrix B			
	Q1	Q2	Q3	Q4
Game 1	0	3	9	0
Game 2	7	14	7	6
Game 3	3	9	12	17
Game 4	23	0	9	7

9) Write a matrix that represents the combined points scored per quarter for the first 4 games.

10) A toymaker makes handcrafted toys for children. His output last year is represented by the matrix  $M$  below.

$$\begin{array}{l} \text{sm} \quad \text{med} \quad \text{lg} \\ \text{dolls} \quad \left[ \begin{array}{ccc} 5 & 10 & 18 \end{array} \right] \\ \text{stuffed animals} \quad \left[ \begin{array}{ccc} 12 & 22 & 9 \end{array} \right] \end{array} = M$$

a) Suppose he wants to increase his output by 30%. Write a matrix that represents the needed output.

b) Find  $2M$  and explain what the matrix represents.

**Matrix Multiplication Worksheet**

Name \_\_\_\_\_

**Show all work for full credit.**

Period \_\_\_\_\_ Date \_\_\_\_\_

**Find the product. If the product is not defined, state the reason.**

1)  $[3 \quad -1] \begin{bmatrix} 5 \\ 7 \end{bmatrix}$

2)  $\begin{bmatrix} -1 & 0 \\ 5 & 4 \end{bmatrix} [4 \quad -6]$

3)  $\begin{bmatrix} 9 & -3 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 0 & 1 \\ 4 & -2 \end{bmatrix}$

4)  $\begin{bmatrix} 5 & 2 \\ 0 & -4 \\ 1 & 6 \end{bmatrix} \begin{bmatrix} 3 & 7 \\ -2 & 0 \end{bmatrix}$

5)  $\begin{bmatrix} 1 & 3 & 0 \\ 2 & 12 & -4 \end{bmatrix} \begin{bmatrix} 9 & 1 \\ 4 & -3 \\ -2 & 4 \end{bmatrix}$

**Solve for the variables.**

6)  $\begin{bmatrix} -2 & 1 & 2 \\ 3 & 2 & 4 \\ 0 & -2 & 4 \end{bmatrix} \begin{bmatrix} 1 \\ x \\ 3 \end{bmatrix} = \begin{bmatrix} 6 \\ 19 \\ y \end{bmatrix}$

7)  $\begin{bmatrix} 4 & 1 & 3 \\ -2 & x & 1 \end{bmatrix} \begin{bmatrix} 9 & -2 \\ 2 & 1 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} y & -4 \\ -13 & 8 \end{bmatrix}$

**Write an inventory matrix and a cost per item matrix. The use matrix multiplication to write a total cost matrix.**

8) A softball team needs to buy 12 bats at \$21 each, 45 balls at \$4 each, and 15 uniforms at \$30 each.

9) A teacher is buying supplies for two art classes. For class 1, the teacher buys 24 tubes of paint, 12 brushes, and 17 canvasses. For class 2, the teacher buys 20 tubes of paint, 14 brushes, and 15 canvasses. Each tube of paint costs \$3.35, each brush costs \$1.75, and each canvas costs \$4.50.

**Solving Systems with Matrices Worksheet**

Name \_\_\_\_\_

**Show all work for full credit.**

Period \_\_\_\_\_ Date \_\_\_\_\_

**Find the inverse of each matrix, if it exists. No calculator.**

1)  $\begin{bmatrix} -2 & 6 \\ -1 & 3 \end{bmatrix}$

2)  $\begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$

3)  $\begin{bmatrix} 14 & 8 \\ 6 & 4 \end{bmatrix}$

**Solve for X. 2x2 by hand, 3x3 with calculator.**

4)  $\begin{bmatrix} 5 & 4 \\ -3 & 2 \end{bmatrix} X = \begin{bmatrix} 10 \\ -16 \end{bmatrix}$

5)  $\begin{bmatrix} 2 & -1 & 0 \\ 1 & 4 & 2 \\ 3 & -2 & 1 \end{bmatrix} X = \begin{bmatrix} -5 \\ 15 \\ -7 \end{bmatrix}$

**Solve the following systems using matrices. Check your answers. All 2x2 systems must be done by hand. Systems 3x3 and larger may be solved with a calculator. However, show the matrix equation for all systems.**

6)  $\begin{cases} 3x - 7y = 7 \\ 7x + 3y = 3 \end{cases}$

7)  $\begin{cases} x + 2y = 5 \\ 2x - 5y = -8 \end{cases}$

$$8) \begin{cases} x + 5y - 10z = 13 \\ 2x - y + 3z = 18 \\ -4x + 6y + 12z = 7 \end{cases}$$

$$9) \begin{cases} -x + z = 6 \\ 4y + 3z = -1 \\ x - y = 0 \end{cases}$$

10) A flower farmer wants to plant three types of bulbs: gladiolas, irises, and tulips. The gladiolas cost \$75 per acre to plant, the irises cost \$100 per acre, and the tulips cost \$50 per acre.

a) The farmer wants to plant 200 acres of bulbs and spend a total of \$15,000. The farmer decides to plant twice as many gladiolas as irises. Write a system of equations and use a matrix to find the total number of acres of each type of flower.

b) The farmer decides to plant 250 acres instead, using the same amount of money. The farmer wants to keep the ratio of gladiolas to irises the same as in part a. Write the matrix equation and find the total number of acres planted of each type of flower.

- 11) Three companies produce three products – tables, lamps, and chairs. In one hour, the first company produces 1 table, 3 lamps, and 2 chairs. In the same amount of time, the second company produces 2 tables, 1 lamp, and 1 chair. The hourly production of the third company is 2 tables, 3 lamps, and 2 chairs.
- a) Find the number of hours that each company needs to operate so their combined production fills an order for 60 tables, 78 lamps, and 56 chairs.

- b) Find the number of hours that each company needs to operate so their combined production fills an order for 42 tables, 52 lamps, and 39 chairs.