Basic Matrix Operations Discovery Name: Key Period: ____

Shannon got her hands on someone's matrices notes from last semester. On the notes she saw:

$$\begin{bmatrix} 3 & 4 & 3 \\ 4 & 0 & -1 \\ 5 & 1 & -8 \end{bmatrix} + \begin{bmatrix} 2 & 3 & 1 \\ 2 & 1 & 5 \\ -4 & 0 & 6 \end{bmatrix} = \begin{bmatrix} 5 & 7 & 4 \\ 6 & 1 & 4 \\ 1 & 1 & -2 \end{bmatrix}$$

1. Based on the "stolen" notes above, how do you add two matrices? How would you subtract two matrices?

Add (or subtract) corresponding entries

2. Given what Shannon found, fill in the blanks to the problems below. Work with your team to find the answers.

$$\begin{bmatrix} 5 & 4 & \underline{3} \\ 50 & -10 & -9 \\ 7 & \underline{3} & 3 \end{bmatrix} + \begin{bmatrix} \underline{6} & -3 & 1 \\ 8 & \underline{24} & 5 \\ -10 & 0 & 6 \end{bmatrix} = \begin{bmatrix} 11 & \underline{1} & 4 \\ \underline{58} & 14 & -4 \\ \underline{-3} & 3 & 9 \end{bmatrix}$$

3. How does the problem change if it is a subtraction problem? Fill in the blanks below given it's a subtraction problem.

$$\begin{bmatrix} 3 & \underline{16} \\ 12 & 15 \end{bmatrix} - \begin{bmatrix} 9 & 11 \\ -7 & \underline{3} \end{bmatrix} = \begin{bmatrix} \underline{-6} & 5 \\ \underline{19} & 12 \end{bmatrix}$$

4. In the same notebook, Shannon found this crazy matrices problem with x's and y's. Can you work with your team and solve for the missing variables? Find x and y.

$$\begin{bmatrix} 3x & 16 \\ 12 & 15 \end{bmatrix} - \begin{bmatrix} 9 & 4 \\ 3 & y+3 \end{bmatrix} = \begin{bmatrix} 9 & 12 \\ 9 & 18 \end{bmatrix}$$

$3x - 9 = 9$
$3x = 18$
$x = 6$

$15 - (y+3) = 18$
$15 - y - 3 = 18$
$12 - y = 18$
$-y = 6$
$y = -6$

5. Chris is trying to add the two matrices below. How is he going to add these matrices?

$$\begin{bmatrix} 4 & 1 \\ 3 & -1 \end{bmatrix} + \begin{bmatrix} 2 & 4 \\ 2 & 3 \\ 1 & 0 \end{bmatrix} =$$

He can't add them. They don't have corresponding entries.

6. A high school basketball coach helps the four seniors on the team set goals for their season for eac game. The senior's goals are below:

Will: 2 3-pointers, 10 free throws, 6 steals
Colin: 4 3-pointers, 8 free throws, 3 steals
Larry: 3 3-pointers, 4 free throws, 2 steals
Timmy: 6 3-pointers, 2 free throws, 1 steal

a. Write a matrix that represents the game goals for the six seniors.

$$G = \begin{array}{c} \\ Will \\ Colin \\ Larry \\ Timmy \end{array} \begin{array}{c} \begin{array}{ccc} 3pt & FT & steal \end{array} \\ \begin{bmatrix} 2 & 10 & 6 \\ 4 & 8 & 3 \\ 3 & 4 & 2 \\ 6 & 2 & 1 \end{bmatrix} \end{array}$$

b. If there were 12 games in the season, write a matrix that represents their season goals.

$$\begin{bmatrix} 24 & 120 & 72 \\ 48 & 96 & 36 \\ 36 & 48 & 24 \\ 72 & 24 & 12 \end{bmatrix}$$

c. How did you change your matrix in part "a" to part "b."

multiply all the matrix elements by 12

7. We call that change "multiplying by a scalar." The "12" in question 6 is a scalar. What are the scalars below?

a. $2\begin{bmatrix} 4 & 4 \\ 3 & 2 \end{bmatrix} = \begin{bmatrix} 8 & 8 \\ 6 & 4 \end{bmatrix}$

b. $-10\begin{bmatrix} 12 & 4 \\ -2 & 8 \end{bmatrix} = \begin{bmatrix} -120 & -40 \\ 20 & -80 \end{bmatrix}$

c. $\frac{1}{2}\begin{bmatrix} 14 & 18 \\ 20 & 8 \end{bmatrix} = \begin{bmatrix} 7 & 9 \\ 10 & 4 \end{bmatrix}$

d. $\frac{3}{2}\begin{bmatrix} 20 & 16 \\ 8 & 18 \end{bmatrix} = \begin{bmatrix} 30 & 24 \\ 12 & 27 \end{bmatrix}$

8. Using what you have learned about matrix operations (adding, subtracting and multiplying by a scalar) and what you know about order of operations, simplifying the statement below.

$$\left(\begin{bmatrix} 2 & 3 \\ 8 & 5 \end{bmatrix} - \begin{bmatrix} 2 & -4 \\ -1 & 3 \end{bmatrix}\right) + 4\begin{bmatrix} 2 & 3 \\ 5 & 1 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 7 \\ 9 & 2 \end{bmatrix} + \begin{bmatrix} 8 & 12 \\ 20 & 4 \end{bmatrix} = \begin{bmatrix} 8 & 19 \\ 29 & 6 \end{bmatrix}$$