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 each corresponding entry. Subtract " " "

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 - has to be same dimensions

6. A high school basketball coach helps the four seniors on the team set goals for their season for each 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.

$$12\begin{bmatrix} 2 & 10 & 6 \\ 4 & 8 & 3 \\ 3 & 4 & 2 \\ 6 & 2 & 1 \end{bmatrix} = \begin{array}{c} \\ Will \\ Colin \\ Larry \\ Timmy \end{array} \begin{array}{c} \begin{array}{ccc} 3pt & FT & steal \end{array} \\ \begin{bmatrix} 24 & 120 & 72 \\ 48 & 96 & 36 \\ 36 & 48 & 24 \\ 72 & 24 & 12 \end{bmatrix} \end{array}$$

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

multiplied 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.

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

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