DAY 1 Name:________________________

MATRICES

A Matrix is simplified version of working with equations with multiple variables.

If a car company is building cars and trucks they can use matrices to determine the number of parts they will need over a given span of time, producing a particular number of vehicles. If each car needs 4 wheels, 2 bench seats, and 1 gas tank. Each truck needs 6 wheels, 1 bench seat and 3 gas tanks. Then we can set-up a matrix where each row and column are for a given part of the equation.

$$\begin{array}{c c} & \begin{array}{ccc} w & s & g \end{array} \\ \begin{array}{c} c \\ t \end{array} & \begin{bmatrix} 4 & 2 & 1 \\ 6 & 1 & 3 \end{bmatrix} \end{array}$$, where the c=cars, t=trucks, w=wheels, s=seats, and g=gas tanks

Using matrices we can solve for all kinds of situations. Matrices have their own specific rules for adding, subtracting, multiplying, and dividing.

The size (dimension) of a Matrix is ***# Rows by # Columns***. (Rows go across, columns up and down)

EXAMPLE: $B = \begin{bmatrix} 3 & 2 \\ 1 & 0 \\ -1 & -2 \end{bmatrix} \leftarrow row$ Matrix B is a 3 x 2 matrix.

$\uparrow Column$

An element of a Matrix is the value in a particular position.

EXAMPLE: $B = \begin{bmatrix} 3 & 2 \\ 1 & 0 \\ -4 & -5 \end{bmatrix}$ $b_{row,column}$ $b_{1,2} = 2$

2 is the element in the 1st row and 2nd column

<u>Use the matrices below to answer all questions.</u>

$$A = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 3 & 5 \\ 2 & -3 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 2 \\ 1 & 0 \\ -1 & -2 \end{bmatrix} \quad C = \begin{bmatrix} -3 & 0 & 2 \\ 1 & -1 & 0 \\ 0 & -4 & 3 \end{bmatrix} \quad D = \begin{bmatrix} -2 & -2 \\ 7 & 9 \\ 3 & 6 \end{bmatrix}$$

$$E = \begin{bmatrix} 2 & -8 & 13 & 5 \end{bmatrix} \quad F = \begin{bmatrix} 4 \\ 7 \end{bmatrix} \quad G = \begin{bmatrix} 0 & 2 & -4 \\ 3 & 5 & -5 \\ 1 & 1 & 6 \end{bmatrix} \quad H = \begin{bmatrix} -4 & 2 & 1 & 0 \\ -2 & -1 & 4 & 1 \end{bmatrix}$$

<u>List the dimensions for the specified matrix</u>

1. E ___________ 4. H ____________

2. F ___________ 5. A ____________

3. D ___________ 6. B ____________

Identify the element in the specified locations, If possible.

5. Matrix D, $d_{2,1}$ 5.__________

6. Matrix A, $a_{2,3}$ 6.__________

7. Matrix H, $h_{4,1}$ 7.__________

8. Matrix E, $e_{1,3}$ 8.__________

If the Matrices are set equal to each other, ***each element must be the same*.**

Solve for all variables

9. $\begin{bmatrix} 4 & x \\ y+3 & -8 \end{bmatrix} = \begin{bmatrix} 4 & 0 \\ 12 & z-8 \end{bmatrix}$

10. $\begin{bmatrix} 2a+1 & 16 \\ 7-b & 1 \end{bmatrix} = \begin{bmatrix} 17 & 16 \\ -15 & c+4 \end{bmatrix}$

ADDING, SUBTRACTING, AND SCALAR MULTIPLICATION

When Adding and Subtracting Matrices, the matrices ***must be the same exact size*!**

Adding- make sure you add ALL elements in the 2nd matrix.

Subtracting – make sure you subtract ALL elements in the 2nd matrix.

Scalar Multiplication – make sure you distribute the multiplier to ALL elements in the matrix.

EXAMPLES: $A = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 3 & 5 \\ 2 & -3 & 0 \end{bmatrix}$ $C = \begin{bmatrix} -3 & 0 & 2 \\ 1 & -1 & 0 \\ 0 & -4 & 3 \end{bmatrix}$ Use the following matrices for these examples:

Work:

1.A+C= $\begin{bmatrix} 1+-3 & 0+0 & -2+2 \\ 2+1 & 3+-1 & 5+0 \\ 2+0 & -3+-4 & 0+3 \end{bmatrix}$ 2. A-C= $\begin{bmatrix} 1-(-3) & 0-0 & -2-2 \\ 2-1 & 3-(-1) & 5-0 \\ 2-0 & -3-(-4) & 0-3 \end{bmatrix}$ 3. 4A= $\begin{bmatrix} 4(1) & 4(0) & 4(-2) \\ 4(2) & 4(3) & 4(5) \\ 4(2) & 4(-3) & 4(0) \end{bmatrix}$

Answer:

1. A + C = $\begin{bmatrix} -2 & 0 & 0 \\ 3 & 2 & 5 \\ 2 & -7 & 3 \end{bmatrix}$ 2. A - C = $\begin{bmatrix} 4 & 0 & -4 \\ 1 & 4 & 5 \\ 2 & 1 & -3 \end{bmatrix}$ 3. 4A = $\begin{bmatrix} 4 & 0 & -8 \\ 8 & 12 & 20 \\ 8 & -12 & 0 \end{bmatrix}$

Perform the appropriate operation on the given matrices. SHOW ALL YOUR WORK!!

$$A=\begin{bmatrix}1 & 0 & -2\\ 2 & 3 & 5\\ 2 & -3 & 0\end{bmatrix}\ C=\begin{bmatrix}-3 & 0 & 2\\ 1 & -1 & 0\\ 0 & -4 & 3\end{bmatrix}\ D=\begin{bmatrix}-2 & -2\\ 7 & 9\\ 3 & 6\end{bmatrix}\ B=\begin{bmatrix}3 & 2\\ 1 & 0\\ -1 & -2\end{bmatrix}\ G=\begin{bmatrix}0 & 2 & -4\\ 3 & 5 & -5\\ 1 & 1 & 6\end{bmatrix}$$

11. D + B

11. ________________

12. G – C

12. ________________

13. 3B

13. ________________

14. G + A – C

14. ________________

15. 4D + -3B

15. ________________