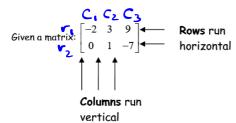
ACC Precalculus Introduction to Matrices

Date _____ Block ____ .

A matrix is a rectangular arrangement of numbers in rows and column s

The dimensions of a matrix with r rows and c columns are $\underline{}$ x $\underline{}$. The numbers inside the matrix are

the entries or elements.



To state the size/order/dimensions of the

row x column

The matrix to the left is $a \ge x \le 3$ matrix

State the size/order/dimensions of the following matrices:

1.
$$\begin{bmatrix} 6 & -9 & 11 & 4 \\ 3 & 7 & -6 & 0 \end{bmatrix}$$
 2. $\begin{bmatrix} 9 & 6 \\ 3 & -8 \end{bmatrix}$ 3. $\begin{bmatrix} 6 & 1 \\ 0 & 5 \\ 9 & 5 \end{bmatrix}$ 4. $\begin{bmatrix} -2 & 4 & 7 \end{bmatrix}$

$$2.\begin{bmatrix} 9 & 6 \\ 3 & -8 \end{bmatrix}$$

3.
$$\begin{bmatrix} 6 & 1 \\ 0 & 5 \\ 9 & 5 \end{bmatrix}$$

Name	Description	Example
Row Matrix	A matrix with only 1 row	[3 -2 0]
Column Matrix	A matrix with only 1 column	$\begin{bmatrix} 1\\3\\-4 \end{bmatrix}$
Square Matrix	A matrix with the same number of rows and columns	$\begin{bmatrix} 4 & -1 & 5 \\ 2 & 0 & 1 \\ 1 & -3 & 6 \end{bmatrix}$
Zero Matrix	A matrix whose entries are all zero	$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

If two matrices have the same dimensions and the same entries (or elements) in corresponding positions, then those matrices are said to be

One example of equal matrices: $\begin{bmatrix} \frac{18}{2} & 2(3) \\ 3 & -\frac{24}{3} \end{bmatrix} = \begin{bmatrix} 9 & 6 \\ 3 & -8 \end{bmatrix}$

To solve for a variable using equal matrices:

- Simplify one or both sides of the equation using matrix operations as needed.
- entries equal to each other and solve for the variable.

#5-6: Solve for x and y

$$5. \begin{bmatrix} 6 & 5 \\ x+8 & 4 \\ 0 & 2y-1 \end{bmatrix} = \begin{bmatrix} 6 & 5 \\ 14-x & 4 \\ 0 & -13-y \end{bmatrix}$$

$$4 + 2 = 14 - 2 = 24 - 2 = -13$$

2y-1=-13-4

Two or more matrices can be added or subtracted only if they have the same _______ in ensigns__. To add or subtract matrices, simply add or subtract the Corresponding entries.

Find the sum if possible. If not possible, state why.

$$7.\begin{bmatrix} 2 & -6 \\ 9 & 2 \end{bmatrix} + \begin{bmatrix} 4 & 1 \\ -9 & 8 \end{bmatrix} = \begin{bmatrix} 6 & -5 \\ 0 & 10 \end{bmatrix}$$

7. $\begin{bmatrix} 2 & -6 \\ 9 & 2 \end{bmatrix} + \begin{bmatrix} 4 & 1 \\ -9 & 8 \end{bmatrix} = \begin{bmatrix} 6 & -5 \\ 0 & 10 \end{bmatrix}$ 8. $\begin{bmatrix} -3 & 6 \\ 0 & 10 \end{bmatrix} + \begin{bmatrix} 8 \\ 7 \end{bmatrix} =$ matrices have different

In matrix Algebra, a real number is called a <u>SCalar</u>. To multiply a matrix by a scalar, multiply

_____in the matrix by the scalar. This process is called scalar

multiplication. Find the product of $\frac{1}{2}\begin{bmatrix} 4 & -3 \\ 7 & 2 \end{bmatrix}$. $= \begin{bmatrix} 2 & -\frac{3}{2} \\ \frac{7}{2} & 1 \end{bmatrix}$

Note: Matrix operations follow the order of operations rules. Perform the indicated operations.

Given the following matrices, answer the questions that follow:

$$A = \begin{bmatrix} 4 & 2 \\ 9 & 0 \\ -1 & 5 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 1 & 4 \\ 3 & -1 & 7 \end{bmatrix} \quad C = \begin{bmatrix} 6 & -9 & 0 \\ 5 & 3 & -1 \\ 11 & 4 & 2 \end{bmatrix} \quad D = \begin{bmatrix} -4 & 3 & 7 \\ 1 & 2 & 0 \end{bmatrix} \quad E = \begin{bmatrix} -1 & 3 \\ 6 & 9 \\ 10 & 2 \end{bmatrix}$$
11. A+E
$$\begin{bmatrix} 3 & 5 \\ 15 & 9 \\ 10 & 2 \end{bmatrix}$$
12. B-D
$$\begin{bmatrix} 4 & 2 \\ -2 & -3 \\ 2 & -3 & 1 \end{bmatrix}$$
13. A+C
to different dimensions

$$2\left(\begin{bmatrix} 3x & -1 \\ 8 & 5 \end{bmatrix} + \begin{bmatrix} 4 & 1 \\ -2 & -y \end{bmatrix}\right) = \begin{bmatrix} 26 & 0 \\ 12 & 8 \end{bmatrix}$$

$$4x + 8 = 26 \quad |0-2y| = 8$$

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Applications using Matrices

Use matrices to organize the following information about health care plans.

This Year For individuals, Comprehensive, HMO Standard, and HMO Plus cost \$694.32, \$451.80, and \$489.48, respectively. For families, the Comprehensive, HMO Standard, and HMO Plus plans cost \$1725.36, \$1187.76, and \$1248.12.

Next Year For individuals, Comprehensive, HMO Standard, and HMO Plus cost \$683.91, \$463.10, and \$499.27,

A company offers the health care plans in the last example to its employees. The employees receive monthly paychecks from which health care payments are deducted. Use the matrices in the last example to write a matrix

A matrix is a rectangular arrangement of numbers (information).

Please turn in before the end of class. 1. What is a matrix? Describe and give an example of a row matrix, a column matrix, and a square matrix. Row: $\begin{bmatrix} 3 & -47 & 8 & \frac{1}{2} \end{bmatrix}$ column: $\begin{bmatrix} 6 & 0 \end{bmatrix}$ Square: $\begin{bmatrix} 36 & 0 \end{bmatrix}$ 2. Are the two matrices equal? Explain. $A = \begin{bmatrix} -6 & \frac{1}{2} \\ 4 & -5 \\ 3 & 5 \end{bmatrix}$ $B = \begin{bmatrix} -6 & 0.5 \\ 4 & -5 \\ 3 & 5 \end{bmatrix}$ Ves, since they have the same dimensions and corresponding entries are equal. 3. To add or subtract two matrices, what must be true?

The matrices must have the same dimensions. 4. Use the matrices in question 2 to find -2(A+B). $-2\begin{bmatrix} -12 & 1 \\ 8 & -10 \end{bmatrix} = \begin{bmatrix} 24 & -2 \\ -16 & 20 \\ -12 & -20 \end{bmatrix}$ $5. \begin{bmatrix} 20 \\ -22 \\ 9 \end{bmatrix} - \begin{bmatrix} -11 \\ -10 \\ -6 \end{bmatrix} = \begin{bmatrix} 3 \\ 13 \\ 15 \end{bmatrix}$ 6. $\begin{bmatrix} -6 & -7 & 4 \\ -4 & 0 & -1 \end{bmatrix} + \begin{bmatrix} -1 & -5 & 8 \\ 9 & 12 & -9 \end{bmatrix}$ $\left[\begin{bmatrix} -7 & -12 & (2) \\ 5 & (2) & -10 \end{bmatrix} \right]$ 7. $-4\begin{bmatrix} 2 & 0 \\ -4 & -5 \end{bmatrix} + \begin{bmatrix} -8 & 0 \\ 16 & 20 \end{bmatrix}$ 8. $6\begin{bmatrix} -5 & -1 \\ 2 & 0 \end{bmatrix} - 5\begin{bmatrix} -1 & 0 \\ 4 & -3 \end{bmatrix} = \begin{bmatrix} -30 & -6 \\ 12 & 0 \end{bmatrix} + \begin{bmatrix} 5 & 0 \\ -20 & 15 \end{bmatrix} \left\{ \begin{bmatrix} -25 & -6 \\ -8 & 15 \end{bmatrix} \right\}$ Solve for x and y. $9. \begin{bmatrix} 10 & -3y \\ 6 & 13 \end{bmatrix} = \begin{bmatrix} 10 & -15 \\ 6x & 13 \end{bmatrix} \qquad \begin{cases} 6 = 6x \\ 4 = 6x \end{cases} \qquad \begin{cases} -3y = -15 \\ 4 = 5 \end{cases}$ $10. \begin{bmatrix} 12 & 3 \\ 6y & 5 \end{bmatrix} = \begin{bmatrix} -4x & 3 \\ 24 & 5 \end{bmatrix} \qquad \begin{cases} 3 = -4x \\ 4 = 3 \end{cases} \qquad \begin{cases} 4y = 34 \\ 4y = 4 \end{cases}$ $11.-2\left(\begin{bmatrix} -3x & -1 \\ 4 & y \end{bmatrix} + \begin{bmatrix} 9 & -4 \\ -6 & 3 \end{bmatrix}\right) = \begin{bmatrix} 6 & 10 \\ 4 & -20 \end{bmatrix}$ $-2\begin{bmatrix} -3x+9 & -5 \\ -2 & y+3 \end{bmatrix}$ (5x-18=6) -2y-6=-6 (x-18=6) (x-18=6) (x-18=6)

ACC Precalculus Name_ rxc Multiplying Matrices In order to multiply matrices A X B, the number of _______ in A must equal the number of in B. If the product is defined, the solution matrix will have the same number of as A, and the same number of as B. State whether the product is defined. If it is defined, give the dimension of the product. If not defined, columns of A & rows of B. say why. 2. A: 3 X 3; B: 3 X 2 3. $A = \begin{bmatrix} 6 & 2 \\ -1 & 3 \\ 0 & -4 \end{bmatrix}$ $B = \begin{bmatrix} -1 & 2 \\ 5 & -2 \end{bmatrix}$, find AB. $\begin{bmatrix} -6+10 & 12-4 \\ \hline r_1c_1 & \hline r_1c_2 \\ \hline 1+15 & -2-6 \\ \hline r_2c_1 & \hline r_2c_2 \\ \hline 0-20 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 8 \\ \hline 16 & -8 \\ \hline r_2c_1 & \hline r_2c_2 \\ \hline -20 & 8 \end{bmatrix}$ $r_1c_1 = 6(-1)+2(5)$ $r_1c_2 = 6(-1)+2(5)$ $r_1c_2 = 6(-1)+2(5)$ $r_1c_2 = 6(-1)+2(5)$ $r_2c_1 = (-1)+2(5)$ $r_2c_2 = 6(2)+2(-2)$ $r_2c_1 = (-1)+2(5)$ $r_2c_1 = (-1)+2(5)$ $r_2c_2 = 6(2)+2(-2)$ $r_2c_1 = (-1)+2(5)$ $r_2c_1 = (-1)+2(5)$ $r_2c_2 = 6(2)+2(-2)$ $r_2c_1 = (-1)+2(5)$ $r_2c_2 = (-1)+2(5)$ $r_2c_1 = (-1)+2(5)$ $r_2c_1 = (-1)+2(5)$ $r_2c_2 =$ 4. $A = \begin{bmatrix} 7 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 4 \\ -1 \end{bmatrix}$, find AB and BA. 1

$$A = \begin{bmatrix} 4 & -3 \\ -1 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 7 \\ -4 & -2 \end{bmatrix} \qquad c = \begin{bmatrix} 3 & -5 & -2 \\ 1 & 0 & 6 \end{bmatrix}$$
5. Find (A:B): Also find AC+BC.
$$\begin{bmatrix} 5 & 4 \\ 1 & 0 & 6 \end{bmatrix} \begin{bmatrix} 3 & -5 & -2 \\ 1 & 0 & 6 \end{bmatrix} = \begin{bmatrix} 19 & -35 & 14 \\ -15 & 25 & 10 \end{bmatrix}$$

$$\begin{bmatrix} -5 & 4 \\ -15 & 25 & 10 \end{bmatrix}$$

$$\begin{bmatrix} -12 & -3 & -2040 & -8 & -18 \\ -3+2 & 5+0 & 2+12 \end{bmatrix} = \begin{bmatrix} -12 & -2040 & 8 & -12 \\ -13 & 2 & 14 \end{bmatrix}$$

$$AB + BC = \begin{bmatrix} 19 & -25 & 14 \\ -12 & 2040 & 8 & -12 \\ -12 & 2040 & 8 & -12 \end{bmatrix} = \begin{bmatrix} 10 & -5 & 46 \\ -12 & 2040 & 8 & -12 \\ -14 & 2 & -14 \end{bmatrix}$$

$$AB + BC = \begin{bmatrix} 19 & -25 & 14 \\ -12 & 2040 & 8 & -12 \\ -12 & 2040 & 8 & -12 \\ -13 & 34 \end{bmatrix}$$

$$AB = \begin{bmatrix} 1 & 7 & 4 & -3 \\ -1 & 2 & -14 \end{bmatrix} = \begin{bmatrix} -3 & 11 \\ -14 & 8 \end{bmatrix}$$

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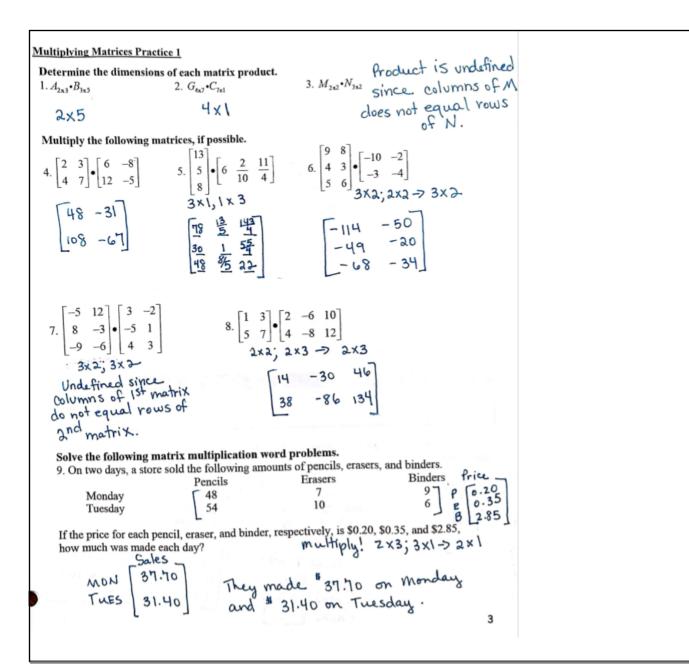
$$AB = \begin{bmatrix} 1 & 7 & 4 & -3 \\ -14 & 8 \end{bmatrix} = \begin{bmatrix} -3 & 11 \\ -14 & 8 \end{bmatrix}$$

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$$AB = \begin{bmatrix} 1 & 7 & 4 & -3 \\ -14 & 8 \end{bmatrix}$$



10. Old MacDonald has three fruit farms. On these farms he grows peaches, apricots, plums, and apples. When picked, the fruit is sorted into layered boxes in which they will be sold. The chart below shows the number of boxes for each type of fruit.

			Y	natrix A	Mari	B
Location		Peaches	Apricots	Plums	Apples	277
Farm1		152	225	395	2//	~ '
Farm 2	A =	236	183	245	183	15
Farm 3		95	132	0	285	34
		-	3 x 4			111

Suppose he sells peaches for \$27 a box, apricots for \$15 a box, plums for \$34 a box, and apples for \$17 a box. Find the income for each farm. How much will he make total?

Farm 1 [25,618]

2 20,558

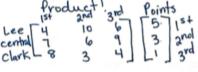
3 9390

Old MacDonald will make a total of \$ 55,566.00.

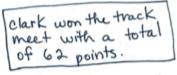
11. In a three team track meet, the following numbers of 1st, 2nd, and 3rd place finishes were recorded.

School	First Place	Second Place	Third Place
Lee	4	10	6
Central	7	6	9
Clarke	8	3	4

If 5 points are awarded for 1st, 3 points for 2nd, and 1 point for 3rd, determine who won the track meet.



Total Points



<u>Create Your Own Matrices I did not write actual answers but described what needs to be true about YOUR answers.</u>

Create two matrices, A and B, such that A + B is defined but AB is undefined. Find A + B; show why
AB in undefined.

Matrices A and B must have the same dimensions, but they can't be square matrices.

 Create two matrices, A and B, such that is AB defined but A + B is undefined. Find AB; explain why A + B is not defined.

The matrices cannot have the same dimensions; the row of matrix A must be the same as the columns of matrix B.

3. Create two matrices, A and B, such that A + B is defined AND AB is defined. Find A +B and AB.

A and B must be square matrices with the same dimensions.

4. Create two matrices, A and B, such that AB defined but BA is undefined. Find AB; explain why BA is not defined.

The number of columns in A must be the same as the number of rows in B, BUT the number of rows in A cannot be the same as the numbers of columns in B.

For example, A is a 2x3 and B is a 3x1.

5. Create two matrices, A and B, such that AB is defined AND BA is defined. Find AB and BA.

A and B need to be square matrices and have the same dimensions. For example, they are both 2x2 matrices, or both 3x3, etc.